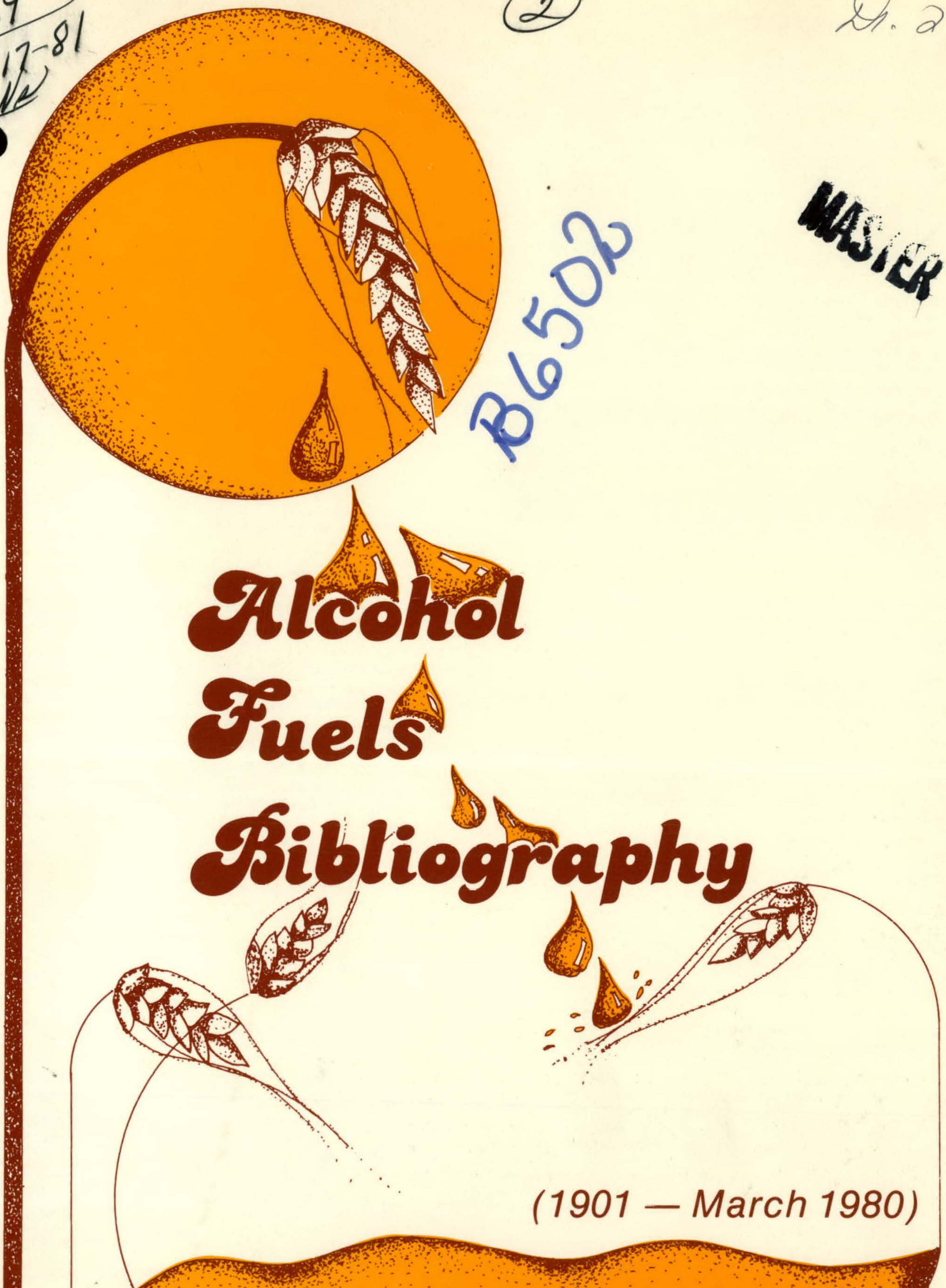
Alcohol Fuels Bibliography



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Notice

Alcohol Fuels Bibliography

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MASTER

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Table of Contents

Introduction

Due to the recent surge of national interest in alcohol fuels, the quantity of published information on this subject is increasing at a rapid rate. Literature on alcohol fuels is scattered among the disciplines of chemistry, biology, physics, engineering, agriculture, energy, the environment, economics, and business. Document types include international, federal, regional, local, and state government documents; journal articles; books; conference papers; theses; and unpublished papers. Because of this diversity in subject scope and type of document, there is currently no one source which provides comprehensive literature coverage on alcohol fuels. Known literature dates to around the turn of this century, with documents clustered in that period, during the 1930's and 1940's, and within the last 6-7 years, as popularity of the subject has fluctuated. As Figure 1 on page ii indicates, in the period 1901 to 1980, 10% of the total literature retrieved on alcohol fuels appeared from 1901 to 1930; 15% appeared between 1931 and 1949; and another 25% between 1950 and 1976. The other 50% has been published since 1976.

Not only has the volume of traditionally published literature increased recently, so also has the "fugitive" literature, or those documents which either are not regularly indexed, are not easily available, have not been published, or for other reasons are not widely known or available.

This bibliography has been created as part of the U.S. Department of Energy sponsored National Alcohol Fuels Information Center (NAFIC), located at the Solar Energy Research Institute (SERI), Golden, Colorado. As part of NAFIC's mission of coordinating national alcohol fuels information activities, the purpose of this bibliography is to provide simple, direct access to the body of alcohol fuels literature. It was produced through the Solar Biblio data base, a component of the Solar Energy Information Data Bank (SEIDB), a network of which NAFIC is a part. The Solar Energy Information Center (SEIC) at SERI plans to periodically update this bibliography. As new alcohol fuels publications are received by the SEIC, they will be catalogued, abstracted, and indexed, and this information will be entered into a data base from which updated supplements will be published.

Scope

Of the nearly 4000 citations retrieved in the literature search, approximately 1500 technical and non-technical English language citations were selected for inclusion in this bibliography. Selected foreign language documents will be translated and added to later updates. The bibliography covers literature written about biomass-derived ethyl and methyl alcohols, including production processes, economics, use as a vehicle fuel, engine conversion, feedstocks, financing, government regulations, and co-products.

Only documents with a focus on alcohol fuels were included. For example, an article dealing with geothermal energy in general has not been included unless there is specific discussion of its application for powering alcohol plants. Or, a book on the sugar cane industry has not been included unless its use as a feedstock for alcohol fuels is discussed.

Due to the large volume of literature on alcohol fuels, the following subjects or types of documents have been excluded in order to keep the bibliography to a manageable size:

- alcohol fuels other than methyl or ethyl (e.g., butyl and propyl);
- the production of alcohol fuels fron non-biomass sources (e.g., fossil fuels; hydrogen-carbon monoxide; OTEC methanol);
- methane;
- production of gasoline from methanol;
- methanol solid/gel fuels;

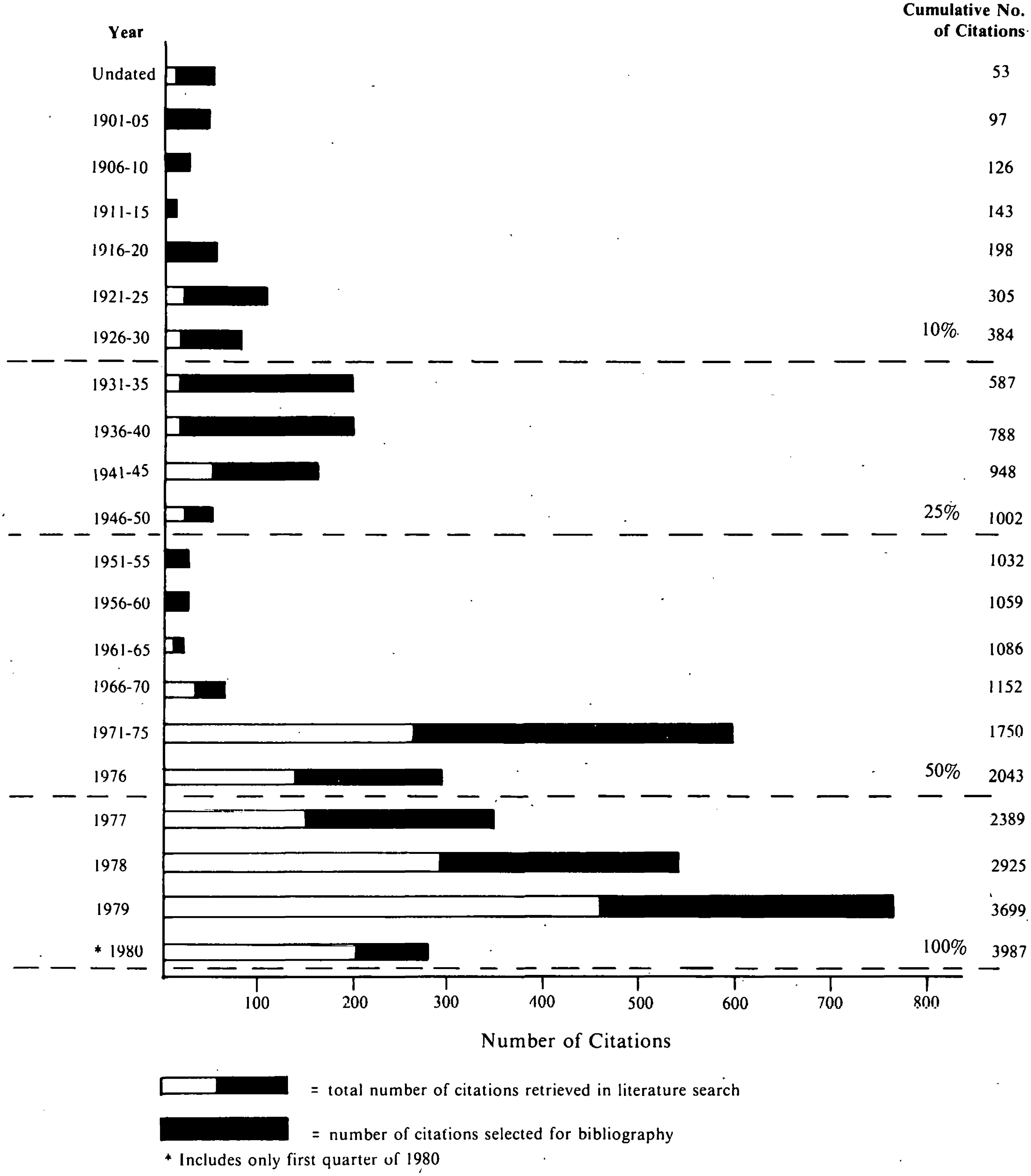

Figure 1. Number of Citations Retrieved in Literature Search.

- methanol fuels cells;
- use of alcohol fuels for aviation/rocket fuels;
- use of alcohol fuels in stationary power plants;
- unpublished papers (such as conference papers) which are no longer available;
- patents;
- "current news" (as opposed to hard data) of rapidly changing developments in areas such as legislation, unless it has been published in the last two years; and
- non-English language documents.

Citations to documents of historical interest (1900-1970) are included if they contain historical summaries of alcohol fuels development, data regarding specific feedstocks, or effects of alcohol fuels on engines, such as corrosion.

Abstracts have been included in the citations if they were available from the sources searched. Future supplements to the bibliography will contain fully abstracted citations prepared by the SEIC from the original documents.

How to Use This Publication

This publication is divided into the following three parts: **Bibliography**, **Title Keyword Index**, and **Author Index.**

Bibliography

Constituting the major portion of the publication, this is the part to which the two indexes refer. It is composed of bibliographic records, each of which contains information such as author, title, date, number of pages and so on.

The Bibliography is subdivided into 11 subject sections. The bibliographic records (citations) are arranged within each subject section numerically (disregarding the ":" or the "A") by "Citation Number," a unique identification number. If you want to see the references on a particular topic, such as the use of alcohol as a vehicle fuel, turn directly to one or more of the relevant subject sections (for example, IX. Use as a Vehicle Fuel) that follow. However, since many documents cover more than one subject category, it is important not to limit your search to a single subject section if you wish to be comprehensive. Following is a description of the topics covered in each of the subject sections.

I. **General**
Includes citations of general interest on alcohol fuels, as well as those which cover more than one of the major topics in the other sections.

II. **Feedstocks - General**
Covers discussion of feedstocks unspecified by type in the title, or citations containing a combination of sugar, starch, or cellulose feedstocks. See also Sections III, IV, V.

III. **Feedstocks — Sugar**
Feedstocks containing sugar, which can be directly fermented to produce alcohol (sugar beets, sugar cane, sweet sorghum, fruits, cheese whey, etc.).

IV. **Feedstocks — Starch**
Feedstocks containing starch, which must be broken down to sugars in order to be fermented to make alcohol. Includes all types of grains, potatoes, cassava, jerusalem artichokes, etc.

V. **Feedstocks — Cellulose Crops and Residues**
Includes agricultural wastes (such as corn stover and bagasse); wood and wood products; municipal solid wastes; mesquite; sisal; etc.

VI. **Production**
Production methods: fermentation and distillation processes, laboratory research on production technology, enzymes, denaturants, production rates, new plant installations. Includes "production manuals", even if they contain general information.

VII. **Coproducts**
Distillers' grain and solubles (DGS), distillers' dried grain (DDG); carbon dioxide (CO_2).

VIII. **Economics**
Marketing, sales, prices, investment, energy balance, "food vs. fuel" issue.

IX. **Use as Vehicle Fuel**
Gasohol; ethyl and methyl alcohols used as 200 proof or in any combination with other fuels; air pollution; engine performance; properties of ethanol and methanol.

X. **Government Policies**
Local, state, and federal legislation; financial incentives; government policies and programs.

XI. **Environmental Effects; Safety**
Toxicity; environmental effects; occupational exposure; transportation and storage.

Journal titles are standardly abbreviated according to the *Energy Information Data Base Serial Titles*, U.S. Department of Energy, Technical Information Center, February 1978, Report No. TID 4579-R10.

Title Keyword Index

Often called a "keyword-in-context" (KWIC) index, this index is arranged alphabetically according to keyword. The keywords, generated from terms in the titles of the journal articles, documents, conferences, and series, appear in boldface type in a column labelled "Keywords." Each keyword is preceded and followed by at least part of the title in which it appears. This index allows you to locate a specific title of a publication by looking up any major word (keyword) in the title, and then referring to the Citation Number and the roman numeral of the Subject Section in the Bibliography. For instance, if you were interested in titles containing the keyword "absorption," you would look under the Title Keyword column for the word "absorption." From Figure 2 you can see that there are two such citations. Looking to the left of these titles you will find that the corresponding bibliographic records are, respectively, in Section IX under Citation Number 80A002185 and in Section VI under Citation Number 80A002300.

You should also note from the Figure that there are two other things peculiar to the Title Keyword Index:

1. Asterisks. These delineate between the different titles (proceedings titles, article titles, subtitles, etc.) that a work may appear under.
2. Truncation. If a given title does not fit in the allotted space on a line, it is truncated.

Author Index

In this index each author is listed alphabetically. If a citation has several authors, each is listed. Once you find the appropriate author, use the corresponding Subject Section number and Citation Number to locate the complete citation in the Bibliography.

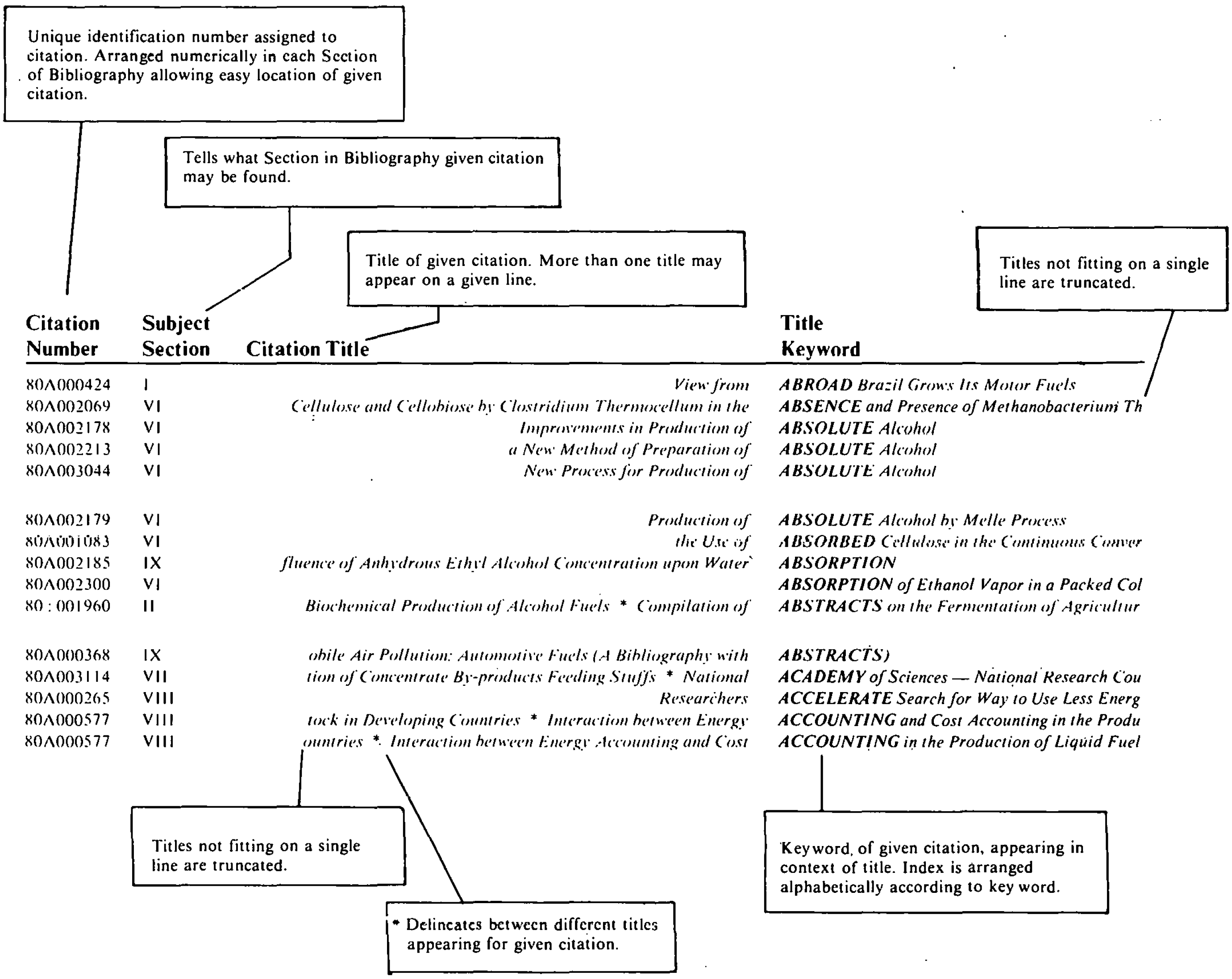

Figure 2. Example Listing in the Title Keyword Index.

Availability of Documents

We have tried to ensure that the complete documents represented by these citations can be acquired through libraries, bookstores, or other sources. Citations listing "Availability" can be obtained from the organization listed. Documents indicating "Availability NTIS" are available for purchase from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161, (703) 487-4650. All orders must be prepaid by check or credit card or charged to an existing account. Please include the first number listed under "Report Number" to ensure that your order is filled properly.

Journal articles, reports, theses, and books can be obtained through loan or photocopy from your local library. Most books also can be purchased through your local bookstore. Publications should not be ordered from SERI.

Sources

This bibliography was compiled through an extensive literature search by the SEIC at SERI. This effort was coordinated by Marilyn J. Shartran.

A study of the overlap among the sources searched indicates that, for the citations selected for inclusion in the bibliography, 72% were uniquely cited by single sources, i.e., they were not found in more than one index or data base. These citations were each singularly cited by one of 38 of the sources listed below, indicating that no single indexing source comprehensively covers the alcohol fuels literature. Furthermore, one-third of the uniquely cited references were not found in *any* of the indexes or data bases searched but were found in the SEIC document collection. This shows that a significant portion of the alcohol fuels literature is not being tracked by any of the major indexing services. It is hoped that this periodically updated bibliography will help to fill that void.

The following bibliographic data bases and printed indexing and abstracting services covering the literature published between 1900 and early 1980 were searched:

A. Data Bases

1. ABI/INFORM — Covers management and administration information from 1971 to the present. The abstracts indicated by "(ABI)" are reproduced with permission of Data Courier, Inc., 620 South Fifth St., Louisville, KY 40202, (502) 582-4111.
2. AGRICOLA (Agricultural On Line Access) — Provides extensive coverage of worldwide agricultural literature from 1970 onward.
3. ALTERNATIVE FUELS DATA BANK — Supported by the U.S. Department of Energy's Bartlesville Energy Technology Center. Contains references dealing with the use of fuels from non-petroleum sources and nonconventional fuels from petroleum sources in transportation applications.
4. APTIC — Covers all aspects of air pollution and its effects, prevention, and control from 1966 to 1978.
5. BIOSIS PREVIEWS — Contains citations from *Biological Abstracts* and *Bioresearch Index*. These publications constitute the major English language service providing comprehensive worldwide research in the life sciences from 1972 to the present. The abstract indicated by "(BA)" is published with permission of Biosciences Information Service, and may not be reproduced without their prior permission.
6. CA SEARCH — The online version of *Chemical Abstracts*, this data base provides extensive coverage of the worldwide chemical literature from 1967 onward.
7. CAB ABSTRACTS — A comprehensive file of agricultural information containing all records in the 22 journals published by the Commonwealth Agricultural Bureaux. Covers the period 1972 to the present.
8. CHEMICAL INDUSTRY NOTES — Extracts articles from over 80 worldwide business-oriented periodicals of interest to the chemical industry from 1974 onward.
9. COMPENDEX — The machine-readable version of *Engineering Index*, which indexes the world's significant engineering and technological literature from 1970 to the present. The abstracts indicated by "(EI)" are published with the permission of Engineering Index, Inc. (Copyright © 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980 by Engineering Index, Inc.), and may not be reproduced without their prior permission.
10. COMPREHENSIVE DISSERTATION ABSTRACTS — A data base containing records of American doctoral dissertations accepted at accredited institutions since 1861. The dissertation titles and abstracts contained here, indicated by "(DA)," are published with permission of University Microfilms International, publisher of *Dissertation Abstracts International* (Copyright © 1971, 1975, 1977 by University Microfilms International), and may not be reproduced without their prior permission.

11. CONFERENCE PAPERS INDEX — Provides an index to papers presented at approximately 1000 scientific and technical meetings worldwide each year. Covers the period 1973 to the present.
12. ECONOMICS ABSTRACTS INTERNATIONAL — Corresponds closely to the printed *Economics Titles and Abstracts* covering worldwide economic literature from 1974 onward.
13. EDB (Energy Data Base) — Contains all unclassified technical information processed by the U.S. Department of Energy Technical Information Center in the various energy fields.
14. ENERGYLINE — Provides broad coverage of scientific, engineering, political, and socio-economic aspects of energy policy, resources, conversion, and consumption. Covering the period 1971 to the present, this data base corresponds to the printed *Energy Information Abstracts*. The abstracts indicated by "(EL)" are reproduced with permission of the Environment Information Center.
15. ENVIROLINE — Contains bibliographic records from *Environment Abstracts*. From 1971 to the present, it provides interdisciplinary scientific, technical, and socio-economic coverage of the major environmental literature. The abstracts indicated by "(ENV)" are reproduced with permission of the Environment Information Center.
16. ENVIRONMENTAL PERIODICALS BIBLIOGRAPHY — Provides access to periodicals dealing with the environment. Covers 1974 onward.
17. F&S INDEXES — Corresponds to the printed *F&S (Funk and Scott) Index* and *F&S International Index*. Contains information on both domestic and international company, product, and industry information from 1972 onward.
18. FOOD SCIENCE AND TECHNOLOGY ABSTRACTS — Provides access from 1979 to the present to research and new development literature in the areas of chemistry, physics, biochemistry, and agriculture as they relate to food science and technology.
19. FOREST — Covers worldwide literature pertinent to the wood products industry from 1947 to date.
20. GPO MONTHLY CATALOG — Corresponds to the printed *Monthly Catalog of United States Government Publications*. This file indexes public documents published by the U.S. Government from 1976 to the present.
21. INSPEC — Covers the fields of physics, electrical engineering, electronics, computers, and control engineering. Corresponds to the hard copy *Physics Abstracts*, *Electrical and Electronics Abstracts*, and *Computer and Control Abstracts* from 1969 onward.
22. LIBCON — Provides extensive coverage of the books catalogued by the U.S. Library of Congress from 1965 to date.
23. MAGAZINE INDEX — Provides cover-to-cover indexing of over 370 popular American magazines from 1976 to the present.
24. MANAGEMENT CONTENTS — From 1974 to the present, this data base provides references on business and management related topics to aid decision making and forecasting. Abstracts indicated by "(MGMT)" are reproduced with the permission of Management Contents.
25. NATIONAL NEWSPAPER INDEX — Provides front-to-back indexing of the *Christian Science Monitor*, the *New York Times*, and the *Wall Street Journal*. 1979 onward.
26. NEWSEARCH — Updates MAGAZINE INDEX and NATIONAL NEWSPAPER INDEX.
27. NTIS — Covers government-sponsored research, development and engineering reports, plus analyses, journal articles, and translations prepared by Federal agencies, their contractors, and grantees from 1964 to the present.
28. PAIS INTERNATIONAL — Covers the whole range of the social sciences with emphasis on contemporary public issues and the making and evaluating of public policy. Corresponding to the hardcopy *PAIS Bulletin*, it covers documents published since 1972.
29. PAPERCHEM — An online version of *Abstract Bulletin of the Institute of Paper Chemistry*, this file provides worldwide coverage of the scientific and technical literature dealing with the pulp and paper industry from 1969 to date. The abstracts contained here are reproduced with permission of the Institute of Paper Chemistry.
30. POLLUTION — The machine-readable version of *Pollution Abstracts*, covering technical literature on pollution from 1970 to the present. The abstracts indicated by "(POLL)" are reproduced with permission of Data

Courier, Inc., 620 South Fifth St., Louisville, KY 40202, (502) 582-4111.

31. SAE — Created by the Society of Automotive Engineers, this data base indexes selected technical papers on the automotive industries presented at SAE-sponsored meetings from 1965 to date.
32. SAFETY — Corresponds to the printed *Safety Science Abstracts Journal* from 1975 to date.
33. SCISEARCH — A multidisciplinary index to the literature of science and technology. Contains all records published in *Science Citation Index* from 1974 forward.
34. SOLAR BIBLIO — Created by the Solar Energy Research Institute as part of the Solar Energy Information Data Bank (SEIDB), this file contains references on all aspects of solar energy.

B. Printed Indexes

1. *Applied Science and Technology Index* — An index to English language periodicals covering a range of scientific and technical fields, 1958-80.
2. *Chemical Abstracts* —Extensively indexes the world's chemical literature, 1907-1966. The abstracts contained here are reproduced with permission of Chemical Abstracts Service, publisher of *Chemical Abstracts* (Copyright © 1908, 1915, 1920, 1921, 1925, 1926, 1931, 1933, 1937, 1938, 1939, 1941, 1944, 1945 by Chemical Abstracts Service).
3. *Engineering Index* — Counterpart to COMPENDEX data base, 1884-1970. Abstracts indicated by "(EI)" are published with the permission of Engineering Index, Inc. (Copyright © 1907, 1920, 1921, 1922, 1926, 1927, 1928, 1929, 1930, 1932, 1933, 1934, 1935, 1936, 1938, 1939, 1941, 1942, 1943, 1944, 1945, 1946, 1947, 1948, 1952, 1953, 1955.)
4. *Industrial Arts Index* — Superceded by Applied Science and Technology Index, 1913-1957.
5. *Monthly Catalog of United States Government Publications* — Printed version of GPO MONTHLY CATALOG data base, 1789-1975.

Comments on the usefulness of this publication, additions or corrections, and suggestions for changes in subject scope or format are welcome. Please address them to:

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Bibliography

I
General

Citation Number	**75:001201**
Article Title	*Grow Alcohol as a Replacement for Gasoline*
Article Author	McCloskey, J.P.
Author Affiliation	Rockwell International Corp., Anaheim, Calif. (USA). Electronic Group
Journal	Energy Sources
Volume	2
Issue	1
Pages	53-60
Publication Date	1975
Document Type	Journal article

Citation Number	**76:001711**
Document Title	*Strategy for Solar Energy Research in Australia*
Document Author	Morse, R.N.
Corporate Author	Commonwealth Scientific and Industrial Research Organization, East Melbourne (Australia)
Conference	International Solar Energy Society, ANZ section symposium on solar energy resources: applications and perspectives
Conference Place	Canberra, Australia
Conference Date	11 Nov 1975
Report Number	CONF-751178 — 1 MN-59c
Publication Date	1975
Pages	14
Abstract	Solar energy could, by the end of the century, be making an important contribution to Australia's primary energy if it is given the necessary support now. It can do this, firstly, by solar heat generating systems, integrated with conventional fuels, supplying heat for industrial processes. Secondly, cellulose produced by photosynthesis can be converted to ethanol, which is a liquid fuel suitable for motor vehicles. The combination of solar-generated heat and renewable fuels such as ethanol could provide a permanent replacement for fossil fuels. The research programs needed to make this possible would involve a considerable expansion of the present effort and would include projects concerned with the collection of solar energy, storage of heat, energy transfer, and systems and applications engineering. The renewable fuels program would be a multi-disciplinary one, incorporating projects on forest and crop productivity, land use, environment impact, energy efficiency, improvements to hydrolysis and fermentation processes, and applications engineering. The program, to be fully effective, should involve industrial laboratories, universities, and colleges of advanced education, as well as government research laboratories on a scale needed to lay the foundation for two new major industries.
Availability	NTIS
Document Type	Report

Citation Number	**76:001878**
Document Title	*Ethanol and Methanol: Production Schemes and Use as Fuels*
Document Author	Lewis, R.
Corporate Author	Minnesota Univ., Minneapolis (USA). Center for Studies of the Physical Environment
Report Number	NP — 20971 MN-61
Publication Date	1 Apr 1974
Pages	13
Abstract	As ethanol and methanol could become important as liquid fuels, a brief discussion is presented of possible production schemes, difficulties that may be encountered with their use as fuels, and estimates of production costs. The most economically attractive method for methanol synthesis at the present is its synthesis from natural gas or naphtha. Synthesis from coal is discussed and the difficulties briefly cited. Ethanol could be synthesized from farm residues and could be economically attractive depending on the cost of the collection and transportation of the residues and on the sale of by-products of the production method. Although ethanol could be used to power farm equipment, its general use as a blend with gasoline might present some difficulties. (JSR)
Availability	Univ. of Minnesota, Minneapolis.
Document Type	Report

Citation Number	**76:001879**
Document Title	*Methanol and Ethanol: Short History, Current Production, Future and Available Literature*
Document Author	Lewis, R.
Corporate Author	Minnesota Univ., Minneapolis (USA). Center for Studies of the Physical Environment
Report Number	NP — 20972 MN-61
Publication Date	27 Feb 1974
Pages	16
Abstract	A review is given of the most common methods for the production of ethanol and methanol and their potentials as a fuel source. Methanol or methanol — gasoline blends appear attractive because of the fewer pollution products formed with no loss of engine power. Methanol can be produced synthetically from natural gas or coal at a price competitive with the current non-taxed price of gasoline if low cost sources of the raw materials are available. Insufficient information is available to determine energy requirements and economics of methanol production from crop wastes. Ethanol can be produced from waste cellulose materials by fermentation but not at a cost competitive with gasoline. The energy requirements for its production from crop wastes have not been evaluated. A bibliography of current literature on the production and fuel uses of methanol and ethanol is appended. (JSR)
Availability	Univ. of Minnesota, Minneapolis.
Document Type	Report

Citation Number	**76:001911**
Article Title	*Waste Materials*
Article Author	Golueke, C.G. McGauhey, P.H.
Author Affiliation	Univ. of California, Richmond
Journal	Annu. Rev. Energy
Volume	1
Pages	257-277
Publication Date	1976
Abstract	A bibliographic review is presented of the recovery of energy from waste materials. The amount of solid wastes and the fraction available for energy conversion are evaluated. The three basic types of energy conversion systems available for solid wastes are thermal processes, biological or fermentation processes, and solar energy processes. The present technology for each process is outlined. 65 references. (JSR)
Document Type	Journal article

Citation Number	**77:001079**
Article Title	*Australia Examines New Routes to Solar Energy Supply*
Article Author	Scott, W.E.
Journal	Energy Int.
Volume	13
Issue	7
Pages	19-22
Publication Date	Jul 1976
Abstract	The director of the Commonwealth Scientific and Industrial Research Organization, Roger Morse, believes that solar energy, with oil from coal, could make Australia independent of imported oil by the year 2000. Speaking at a symposium on solar energy resources, he suggested that at least half of the nation's liquid fuel requirements for transport could be produced from plant cellulose in the form solar ethanol. The ethanol could supply Australia's motor spirit requirements and oil distilled from coal could provide the country's heavy oil and distillate needs. Production of liquid fuels from forests involves the harvesting of the whole tree on a 10-year rotation in which the nutrients taken up by the tree are recycled. Marginal, unirrigated land could be used without large applications of energy-consuming fertilizers. The chemical conversion involves hydrolysis of cellulose to sugars and fermentation of the sugars to alcohol. Morse envisages that about 30 complexes, each comprising a forest plantation and a hydrolysis and fermentation processing plant, should be set up throughout Australia. Solar ethanol economics and the continuing studies on silicon solar cells are discussed briefly. (MCW)
Document Type	Journal article

Citation Number	**77:001296**
Article Title	*Speech Held in Washington, March 11, 1976, on the Bioconversion Conference "Capturing the Sun"*
Document Title	Capturing the Sun through Bioconversion
Article Author	Vendil, D.
Author Affiliation	Swedish Methanol Development Co., Stockholm
Conference	Conference on capturing the sun through bioconversion
Conference Place	Washington, DC, USA
Conference Date	10 Mar 1976
Publisher	Washington Center; Washington, DC, USA
Report Number	CONF-760354
Publication Date	1976
Pages	393-402
Abstract	A descriptive review is given of Swedish investigations on the possibility of introducing methanol as a motor fuel both in blends and as pure methanol in Otto engines and diesel engines. (JSR)
Document Type	Paper/Chapter from book

Citation Number	**77:002067**
Document Title	*Fuels from Biomass Program: Program and Project Status*
Corporate Author	Energy Research and Development Administration, Washington, D.C. (USA). Div. of Solar Energy
Report Number	ERDA — 76-137 STD-61
Publication Date	Nov 1976
Pages	47
Abstract	The Fuels from Biomass Program, part of the Division of Solar Energy, Energy Research and Development Administration (ERDA), supports projects dealing with the production of biomass and its conversion to clean fuels. Systems studies are underway to inventory biomass resources, estimate production costs, and identify and evaluate conversion processes. These studies will also assess impacts on food production, the environment, and society. Research contracts to develop processes for converting biomass to fuel have been awarded and the best sources of biomass and best conversion technologies for intensive development will be identified in the coming year. An

experimental facility in Albany, Oregon is nearly completed. Its mission is scale-up of the Bureau of Mines process for converting wood wastes to fuel oil.

Availability NTIS
Document Type Report

Citation Number **77:002070**
Document Title *Biosolar Synfuels for Transportation*
Document Author Anderson, C.J.
Corporate Author California Univ., Livermore (USA). Lawrence Livermore Lab.
Report Number UCRL — 52208
Contract W-7405-ENG-48
STD-61
Publication Date 17 Jan 1977
Pages 17
Abstract This paper presents a short review of biosolar sources of synthetic liquid fuels (synfuels) for transportation. There are a variety of ways to convert potentially large energy crops into fuels suitable for transportation use; e.g., liquid fuels such as methanol, ethanol, and pyrolytic oils. In addition, organic wastes are widely produced, and although they are still generally not considered a resource, there is little doubt that they will increasingly be recycled for their material and energy value. Major technical, social, economic, environmental, and political questions remain, and although the potential for biosolar transportation synfuels is large, it is still small compared to transportation energy demand. Because of their costs, early implementation of biosolar conversion schemes will likely not be in the area of transportation synfuels.
Availability NTIS
Document Type Report

Citation Number **78:000005**
Document Title *Alternative Energy Technologies in Brazil*
Document Author Miccolis, J.M.F.
Publisher George Washington University; Washington, DC, USA
Report Number NP — 22247
Publication Date 1977
Pages 31
Abstract It is imperative that Brazil consider alternative energy production and conservation techniques in order to cope with the energy crisis. Brazil imports about 650,000 bbl./day of petroleum, which accounts for more than 78 percent of total consumption. Oil amounts to 50 percent of the total energy utilized in Brazil. After a brief review of the energy resources in Brazil (water power, coal reserves, shale deposits, uranium reserves, petroleum and natural gas reserves), alternative energy production technologies are summarized. These include solar energy, bioconversion, a hydrogen economy, and fossil-fuel alternative technologies (coal gasification, shale oil). Incentives for the use of alternative energy sources include not only the gradual replacement of gasoline and other liquid fuels by ethyl alcohol, but also the more-efficient use of other natural resources. Recently, the government imposed very tough conservation regulations (January 1977). These are listed; they are expected to substantially change the energy consumption pattern in the country. (MCW)
Document Type Book

Citation Number **78:001547**
Article Title *Photosynthetic Solar Energy: Rediscovering Biomass Fuels*
Article Author Hammond, A.L.
Journal Science
Volume 197
Issue 4305
Pages 745-746
Publication Date 19 Aug 1977
Abstract Recent research efforts in the production and use of biomass as a fuel source are reviewed. These include a gasifier for the conversion of dry agricultural or wood waste to a low or medium Btu gas, inventory of agricultural residues in the US, production of ethanol from sugarcane and sweet sorghum, evaluation of energy recoverable from forestry wastes, cultivation of trees, algae, and giant kelp, and improvement of the photosynthetic efficiency of plants. The uncertainty of the economics of biomass energy systems is examined briefly. (JSR)
Document Type Journal article

Citation Number **78:002290**
Article Title *Prospects for Fuels from Biomass*
Document Title Proceedings of the 12th Intersociety Energy Conversion Engineering Conference. Volume I
Article Author Lipinsky, E.S.
Author Affiliation Battelle Columbus Labs., Ohio (USA)
Conference 12th intersociety energy conversion engineering conference
Conference Place Washington, DC, USA
Conference Date 28 Aug 1977
Publisher American Nuclear Society, Inc.; La Grange Park, IL, USA
Publication Date 1977
Pages 94-99
Notes See CONF-770804 — P1.
Abstract The need to reduce dependence on natural gas and petroleum has led to consideration of biological renewable resources (biomass) as fuel sources. Each biomass resource has physical, chemical, and economic characteristics that determine the most suitable end products and conversion processes. Sugarcane as a source of ethanol motor fuel is used to illustrate selected issues. A fermentation process with a favorable net energy balance yields ethanol that costs $0.31 per liter. Its availability would be low for nationwide use as a motor fuel. A 90-percent-gasoline/10 percent-ethanol blend for no-lead gasoline might add $0.02 per liter to the pump price. Chemical feedstock use of ethanol from sugarcane appears more appropriate than use as a motor fuel ingredient.
Document Type Paper/Chapter from book

Citation Number **79:000510**
Article Title *Use of Ethanol from Biomass as an Alternative Fuel in Brazil*
Document Title Proceedings of the International Symposium on Alcohol Fuel Technology: Methanol and Ethanol
Article Author Heitland, H.

	Czaschke, H.W.
	Pinto, N.
Author Affiliation	Volkswagen do Brasil S.A. (Brazil)
Conference	Symposium on alcohol fuel technology
Conference Place	Wolfsburg, F.R. Germany
Conference Date	21 Nov 1977
Report Number	CONF-771175 —
Publication Date	Jul 1978
Pages	1.3.1-1.3.18
Abstract	Present results have shown that ethanol is an attractive solution to the fuel problem in the future of Brazil. At this time, ethanol is industrially produced from produce on a broad basis. Sugar cane and manioc are the self-regenerating energy sources with optimum utilization of the inexhaustible solar radiation. However, further improvements are necessary to provide for energy balance of the individual process steps.
Document Type	Paper from report

Citation Number	**79:000547**
Article Title	*Solar Energy Conversion through Biology*
Article Author	Hall, D.O.
Author Affiliation	King's Coll., London (UK)
Journal	Energy Dig. (London)
Volume	7
Issue	2
Pages	28-33
Publication Date	Apr 1978
Abstract	Energy farms or plantations may be considered as a long-term alternative to fossil and nuclear energy and fossil-derived chemicals. The following advantages have been identified: a) capable of storing energy for use at will; b) renewable; c) dependent on technology already available, with minimal capital input; d) can be developed with present manpower and material resources; e) reasonably priced; f) ecologically inoffensive and free of hazards, other than fire risk. In Brazil a $400m. program is underway to produce ethanol from sugar canc and cassava so as to replace 20% of its petrol requirements in the early 1980's. Less than 2% of the land area of Brazil could produce enough fuel to replace all imported petroleum. Many of the liquid and semi-solid wastes from houses, industries and farms are ideal for the growth of photosynthetic algae. The harvested algae may be fed directly to animals, fermented to produce methane, or burnt to produce electricity.
Document Type	Journal article

Citation Number	**79:001111**
Article Title	*Fuels and Petrochemical Substitutes from Fermentation of Biomass*
Document Title	Fuels from Biomass Symposium
Article Author	Bungay, H.R.
	Pfeffer, J.T.
	Stukel, J.J. (eds.)
Author Affiliation	Rensselaer Polytechnic Inst., Troy, N.Y. (USA)
Conference	Fuels from biomass symposium
Conference Place	Champaign, IL, USA
Conference Date	18 Apr 1977
Report Number	COO — 4225-1
	CONF-770481 —
Publication Date	1977
Pages	145-150
Abstract	The research programs sponsored by DOE on the fermentation of biomass to ethanol and other fermentation products are briefly described. These include research on sugars or ethanol from cellulosic wastes, high cellulase mutants, the use of other organisms with the production of additional products, and thermophillic processes. (JSR)
Document Type	Paper from report

Citation Number	**79:003455**
Document Title	*Liquid Fuels from Renewable Resources: Feasibility Study Summary and Conclusions*
Corporate Author	InterGroup Consulting Economists Ltd., Winnipeg, Manitoba (Canada)
Report Number	NP — 23456
	MN-13
Publication Date	May 1978
Pages	146
Abstract	The summary report highlights the results of a five-volume study on the potential large scale use of Canada's renewable forest, farm, and municipal waste resources to produce liquid fuel alternatives to gasoline, diesel fuel, and other petroleum fuels by the mid 1980's and beyond. The extent to which development of the liquid fuel alternative should be explored is examined and the relative merits of different strategies are assessed. It is concluded that liquid fuel markets (methanol, primarily) offer the opportunity for a major new Canadian renewable resource development which could contribute significantly to Canada's economic growth, international competitiveness, and balanced regional development, while providing a perpetually renewable source of liquid fuel energy. The study identifies priority government action areas that require attention if it is considered desirable to create this option for initial production by the mid-1980's. (JSR)
Availability	NTIS
Document Type	Report

Citation Number	**79:004017**
Article Title	*Renewable Energy Crucial for Third World*
Article Author	Shirkie, R.
Journal	Can. Renewable Energy News
Volume	1
Issue	8
Pages	4
Publication Date	Aug 1978
Abstract	The historical correlation between economic growth and energy resources indicates that developing countries must concentrate their efforts on a combination of renewable energy sources, and use efficiency, and conservation. The Third World must develop techniques that will increase agricultural yields by developing new crop varieties, irrigation systems, fertilizers, and by replacing human and animal muscle with mechanical power. New technologies to use agricultural and human wastes as a substitute for chemical fertilizers and to use wind and solar-driven machinerv for irrigation and crop drying will help to mee these goals. Biogas generation and alcohol disti lation offer alternatives that match available energy sources with high-quality fuels. (DCK)
Document Type	Journal article

Citation Number	**79:004132**
Document Title	*Liquid Fuels from Renewable Reources: Feasibility Study. Volume A. Demand Studies*
Corporate Author	InterGroup Consulting Economists Ltd., Winnipeg, Manitoba (Canada)
Report Number	NP — 23604(Vol.A) MN-13
Publication Date	Mar 1978
Pages	268
Abstract	The first chapter outlines the unique features of the liquid fuels market within the overall energy scene, the problems created by anticipated petroleum shortages and price escalation during 1985 to 2025 time period, and general policy options available to meet these problems. The next chapter contains an overview of alcohol fuel versatility and reviews the international options for new liquid fuels. In other areas of this study, the reasons why alcohols represent the only significant liquid fuel that might be produced from Canada's renewable resources are outlined. The third chapter outlines potential end uses for alcohol fuels and estimates the values that alcohols could command in such uses. The chapter concludes with an examination of the potential demand for alcohols from renewable resources at different prices by region in Canada from 1985 until the year 2025. Additional, extensive evaluations are made in the appendices entiled: Overview of General Alcohol Fuel and Chemical Properties — Comparisons with Petroleum Liquids; Overview of Fuel and Engine Trends — Implications for Refinery Practices; Alcohol-Gasoline Blends — Applications in ICE's; Alcohol-Diesel Fuel Blends — Appliations in ICE's; End Uses of Methanol as an Alternate Fuel from Non-Petroleum Sources — Estimated Cost of Emulsifying System in New Cars; Straight Alcohol Fuel Applications — Transportation Sector; Alcohol Applications in Boilers, Furnaces, Process Heating; Alcohol Applications in Gas Turbines; Alcohol Use in Fuel Cells; Other Alcohol End Uses; Alcohol Distribution and Storage; and Illustrative Transport Sector Options for Alcohol Fuel Use. (MCW)
Availability	NTIS
Document Type	Report

Citation Number	**79:004370**
Article Title	*Focus on Renewable Energy in New Zealand*
Article Author	Chilcott, R.E.
Author Affiliation	Lincoln Coll., Canterbury (New Zealand)
Journal	N.Z. Energy J.
Volume	4
Issue	48-53
Pages	48-53
Publication Date	25 Apr 1976
Abstract	Following a discussion of the flow of radiant energy in the biosphere, means of using solar energy and other renewable energy sources to supply the energy needs of advanced countries are considered, with particular reference to the availability of these potential energy source in New Zealand. It is estimated that about half of the total domestic hot water consumed in New Zealand should be heated by solar energy. Some results indicate that production of ethyl alcohol from vegetable sources may be feasible, however, the extensive land area required must be considered. The average annual windelectric energy available in New Zealand is about 0.1% of the annual average solar energy incident on the horizontal plane. Small windmills have been in widespread use for stock watering. A national wind energy resource survey is under way.
Document Type	Journal article

Citation Number	**79:004644**
Article Title	*Energy from Biomass and Wastes: 1978 Update*
Document Title	Energy from Biomass and Wastes
Article Author	Klass, D.L.
Author Affiliation	Institute of Gas Technology, Chicago, Ill. (USA)
Conference	Symposium on energy from biomass and wastes
Conference Place	Washington, DC, USA
Conference Date	14 Aug 1978
Publisher	Institute of Gas Technology; Chicago, IL, USA
Report Number	CONF-780889 —
Publication Date	1978
Pages	1-27
Abstract	The technology for production of energy and synfuels from biomass and wastes is advancing on all fronts. Biomass energy may assume a major role in the energy market if the projected effects of increasing carbon dioxide in the ambient air are accurate. Recent economic analyses of integrated biomass energy systems, current research on biomass production and conversion, and the status of pilot, demonstration, and commercial projects are reviewed. Special attention is given to methanol and ethanol as motor fuels. New waste-to-energy plants are coming on-line to add those already in commercial use, and many research projects aimed at improved biomass and waste conversion processes are in progress. It is concluded that the technology of producing and using energy and synfuels from biomass and wastes is destined to grow and contribute more and more to our energy demand.
Document Type	Paper/Chapter from book

Citation Number	**79:004654**
Article Title	*Liquid Fuels from Renewable Resources in Canada: Systems Economics Studies*
Document Title	Energy from Biomass and Wastes
Article Author	Osler, C.F.
Author Affiliation	InterGroup Consulting Economists Ltd., Winnipeg, Manitoba (Canada)
Conference	Symposium on energy from biomass and wastes
Conference Place	Washington, DC, USA
Conference Date	14 Aug 1978
Publisher	Institute of Gas Technology; Chicago, IL, USA
Report Number	CONF-780889 —
Publication Date	1978
Pages	51-78
Abstract	This paper highlights the methodology and results of a six volume study completed for the Canadian federal government evaluating Canada's alternatives to derive liquid fuels from renewable resources in the mid 1980's and beyond. Alcohols, and specifically methanol, were concluded to be the best renewable liquid fuel production option for Canadian resources available today and during at least the next decade. The study's systems economics analysis methodology

is described. Demand studies are reviewed evaluating potential Canadian alcohol market options, volumes and values between 1985 and 2025. Conversion studies are reviewed evaluating Canadian methanol production process options, feedstock requirements, capital and operating costs. Feedstock studies are reviewed evaluating forest, farm and municipal waste biomass supply volumes and prices potentially available for liquid fuels production between 1985 and 2025. Development strategies analysis is presented specifying relevant options and evaluating net benefits for each option; possible institutional frameworks, commercial policy options and technical development sequences are also briefly reviewed. The study concluded that liquid fuel markets offer the opportunity for a major new Canadian renewable resource development initiative focused primarily on the forestry sector. This initiative, however, will not occur until a clear set of regulatory and other policies are established by the relevant federal and provincial jurisdictions.

Document Type — Paper/Chapter from book

Citation Number — **79:004655**
Article Title — *Agro-industrial System for Ethanol and Ethylene Production*
Document Title — Energy from Biomass and Wastes
Article Author — Yang, V.
Luchi, N.R.
Author Affiliation — Centro de Technologia, Rio de Janeiro (Brazil)
Conference — Symposium on energy from biomass and wastes
Conference Place — Washington, DC, USA
Conference Date — 14 Aug 1978
Publisher — Institute of Gas Technology; Chicago, IL, USA
Report Number — CONF-780889 —
Publication Date — 1978
Pages — 713-728
Abstract — Large scale availability of fermentation ethanol in Brazil is anticipated with the implementation of the National Alcohol Program — PNA. By 1985, total ethanol production is estimated to reach 4 to 6 million m^3yr. This massive ethanol pool may provide the basis for large-scale producion of basic and intermediate petrochemicals, such as ethylene. Feasibility of ethylene production from sugarcane-derived ethanol was analyzed. An agro-industrial system comprising farms and an integrated distillery/ethylene unit with a capacity for 40,000 t/yr polymer-grade ethylene was considered. Material and energy calculations showed that total bagasse availability is sufficient to meet the fuel requirements, thereby foregoing need of imported fuel oil. In the short-term, relative economics appears to favor naphtha-derived ethylene. Cost of sugarcane-derived ethylene estimated at $736/t based on state-of-art technology is considerably higher than current administered price in Brazil for naphtha-derived ethylene at $400/t. Nevertheless, agricultural and industrial technology developments offer promising prospects for considerable improvement in the ethylene economics. Combination of extended distillery operation with process improvement may lead to an ethylene cost of $558/t at a current sugarcane price of $11/t. Furthermore, net revenues from upgraded by-products appear to be able to close some of the gap. For example, if bagasse-based furfural production is included in the integrated unit, the ethylene cost may be lowered to $510/t.
Document Type — Paper/Chapter from book

Citation Number — **79:004656**
Article Title — *Brazilian Gasohol Program*
Document Title — Energy from Biomass and Wastes
Article Author — Yang, V.
Trindade, S.C.
Author Affiliation — Centro de Technologia, Rio de Janeiro (Brazil)
Conference — Symposium on energy from biomass and wastes
Conference Place — Washington, DC, USA
Conference Date — 14 Aug 1978
Publisher — Institute of Gas Technology; Chicago, IL, USA
Report Number — CONF-780889 —
Publication Date — 1978
Pages — 815-836
Abstract — Gasohols, gasoline and alcohol (ethanol) fuel blends, have been used in Brazil since the 1920's, and compulsory addition of alcohol to gasoline started in the 1930's as a support for the important food industry. Experience has shown that Brazilian manufactured Otto engines maintain desirable performance when fueled with gasohol containing up to 20 ethanol. Engines run with straight alcohol require minor changes. A national alcohol program was launched by the Brazilian in 1975 in order to reduce the dependence on petroleum imports. The current status of the program and its proposed development is outlined. Process economics and energetics are discussed. A primary problem is the potential pollution from stillage. Research and development needs are cited. (JSR)
Document Type — Paper/Chapter from book

Citation Number — **79:004663**
Article Title — *Study of the Energy Potential of Fuels from Land Biomass in Five Countries*
Document Title — Energy from Biomass and Wastes
Article Author — Vergara, W.
Pimentel, D.
Author Affiliation — Cornell Univ., Ithaca, N.Y. (USA)
Conference — Symposium on energy from biomass and wastes
Conference Place — Washington, DC, USA
Conference Date — 14 Aug 1978
Publisher — Institute of Gas Technology; Chicago, IL, USA
Report Number — CONF-780889 —
Publication Date — 1978
Pages — 87-105
Abstract — The energy potential of biomass conversion to fuels has been evaluated for five countries: the United States, Brazil, India, Sudan, and Sweden, representing different regions of the world and different environmental and social conditions. The following aspects of biomass energy conversion are considered: (1) the potential of biological materials for biomass energy conversion, (2) the amount of solar energy conversion represented b·· agricultural and forestry products, (3) the energ efficiencies of conversion technologies such as ethanol fermentation, anaerobic digestion, pyrolysis, and direct combustion, and (4) the environmental and social constraints in biological solar

energy conversion. The net output of biomass energy converson in the United States, Brazil, India, Sudan, and Sweden is estimated as 442 x 10^{12} Kcal, 1191 x 10^{12} Kcal, 509 x 10^{12} Kcal, 251 x 10^{12} Kcal and 49 x 10^{12} Kcal which represent 2.5%, 186%, 36%, 584% and 14% of their actual energy consumption respectively.

Document Type — Paper/Chapter from book

Citation Number — **79:007143**
Article Title — *Petroleum Plantations*
Document Title — Energy Technology V: Challenges to Technology
Article Author — Calvin, M.
Hill, R.F. (ed.)
Author Affiliation — Univ. of California, Berkeley
Conference — 5th energy technology conference
Conference Place — Washington, DC, USA
Conference Date — 27 Feb 1978
Publisher — Government Institutes, Inc.; Washington, DC, USA
Report Number — CONF-780222 —
Publication Date — 1978
Pages — 687-705
Abstract — Photosynthesis is examined as a possible annually renewable resource for material and energy. The production of fermentation alcohol from sugar cane as a major component of materials for chemical feedstocks is examined as well as the direct photosynthetic production of hydrocarbon from known plant sources. Experiments are underway to analyze the hydrocarbons from Euphorbias, Asclepias, and other hydrocarbon-containing plants with a view toward determining their various chemical components. In addition, experimental plantings have begun to obtain data on which species would be the most successful. Work is also underway on the development of chemical-process techniques for extraction of plant materials after harvesting. Indications are that a yield of approximately ten barrels per acre in a seven-month growing period on semiarid land may be expected. In addition, efforts are being made to construct synthetic systems on the basis of knowledge of the natural photosynthetic processes. These systems could be used to produce fuel, fertilizer, and power. As a result of studies of the natural quantum conversion process in green plants we can envisage several photoelectron transfer processes, some of which have already been demonstrated in synthetic systems. Methods of constructing system of this type and the principles of their use are described.
Document Type — Paper/Chapter from book

Citation Number — **80A000005**
Journal — New Sci.
Pages — 666
Publication Date — 15 Sep 1977
Abstract — Canada: discusses plans to mix methanol with petroleum and its advantages.
Document Type — Journal article

Citation Number — **80A000007**
Journal — Environ. Sci. Technol.
Pages — 1001
Publication Date — Sep 1978
Abstract — Canada: liquid methanol fuel could be new industry using a variety of raw materials.
Document Type — Journal article

Citation Number — **80A000010**
Article Title — *A Canadian Views Alcohol as a Farm Fuel*
Article Author — Kirik, M.
Journal — Agric. Eng.
Volume — 59
Issue — 5
Pages — 13-14
Publication Date — May 1978
Abstract — This is a quick, two-page question and answer style report in which the author discusses the use of alcohol derived from a renewable crop resource as a substitute for gasoline and diesel fuels. The author contends that the use of alcohol as a fuel is surely feasible and even advantageous. The topics discussed include the choice of crops to be grown for conversion (in Canada, sugar beets, potatoes, and the Jerusalem artichoke), the cost and set-up of distilleries (including portable on-site distilleries), problems of engine modification to allow for cold starting, engine lubrication (plant oils could be used), fuel additives which do away with engine corrosion due to acetic acid formation (and ammonia) and diesel engine modifications. (NAL)
Document Type — Journal article

Citation Number — **80A000032**
Article Title — *Cheaper Ethanol 'Gas' on Its Way*
Article Author — Brumm, J.
Journal — Christian Sciencc Monitor
Volume — 71
Pages — 11
Publication Date — 17 Jul 1979
Document Type — Journal article

Citation Number — **80A000040**
Article Title — *The Clean Synthetic Fuel That's Already Here*
Article Author — Faltermayer, E.
Journal — Fortune
Volume — 92
Issue — 3
Pages — 146
Publication Date — Sep 1979
Abstract — In the great hunt for alternative energy sources, the U.S. is largely ignoring a low polluting fuel that can be produced from abundant domestic resources with present technology. Methanol can be produced from coal, forest and farm wastes, and garbage. To produce methanol, all these materials are converted into a synthesis gas consisting of carbon monoxide and hydrogen — the same medium BTU gas that was used in homes for years before being replaced by cheaper natural gas. Methanol can be stored and transported easily and safely. It is a stable liquid at atmospheric temperature and pressure, unlike hydrogen, and is less combustible than gasoline. Almost every energy using device in the country could be adapted to burn methanol. It enables auto engines to use a lower than normal fuel to air ratio, thus achieving both energy savings and pollution reduction. (EL)
Document Type — Journal article

Citation Number **80A000051**
Article Title *CU Tries Gasohol*
Journal Consum. Rep.
Volume 44
Pages 505
Publication Date Sep 1979
Document Type Journal article

Citation Number **80A000052**
Article Title *CW Report: Methanol*
Article Author Burke, D.P.
Journal Chem. Week
Pages 32-42
Publication Date 24 Sep 1975
Document Type Journal article

Citation Number **80A000057**
Article Title *Brazil Continues Push for Gasohol*
Journal Energy Res. Rep.
Publication Date 15 Oct 1979
Document Type Journal article

Citation Number **80A000060**
Article Title *Brazil Exploits All Resources Seeking Energy Independence*
Journal Eng. News-Rec.
Volume 200
Issue 2
Pages 18
Publication Date 12 Jan 1978
Abstract To meet expected increases in energy demand, Brazil has begun one of the world's most ambitious energy-related construction programs. From massive hydroelectric projects on the Paraguayan border and in the remote Amazon region to undersea construction of oil gathering systems in the Atlantic Ocean, to breakthrough development of alcohol plants in central Brazil, and to shale oil plants in the south, Brazil has a wide ranging mix of high volume investments in energy projects. Energy projects, including nuclear and hydro power, are surveyed. Other energy projects currently being developed include tidal power systems, wind turbines, and ethyl alcohol as a gasoline substitute. Fossil fuel developments in Brazil are summarized. (EL)
Document Type Journal article

Citation Number **80A000067**
Article Title *Brazil Out to Show Methanol Grows on Trees*
Journal Chem. Week
Volume 124
Issue 11
Pages 38
Publication Date 14 March 1979
Abstract In order to solve the problem of too much dependence on imported petroleum, Brazil is undertaking an ambitious manufacturing plan to reduce 30% of its oil needs by 1985. The scheme involves constructing the world's largest network of wood-fueled methanol plants which, over a period of time, could save the country enormous amounts of fuel costs. The plan is put forth by the Energy Co. of San Paulo (CESP) and calls for construction of 65 methanol plants by 1985, space for which would require a startling 0.64% of the entire land area of Brazil. CESP thus far has undertaken the plan alone, as government and private investors are committed to expansion of ethyl alcohol capacity, but the program is open to public inspection. The program will need the support of industry and Brazil's new president to move forward. Much of the opposition to the proposal comes from those committed to ethyl alcohol as a replacement for gas in cars, but if prices continue to climb, methanol will be cheaper than oil by 1982, a point in the program's favor. (ABI)
Document Type Journal article

Citation Number **80A000068**
Article Title *Brazil Points Way to Relieve Australian Energy Problem*
Article Author Scott, W.E.
Journal Energy Int.
Volume 16
Issue 7
Pages 42
Publication Date Jul 1979
Abstract The Australian government recently approved a grant of $550,000 for research into the production of alcohol from major feedstock materials. The grants were in addition to $2.5 million for coal conversion research announced last year. At an international symposium in Melbourne, details of Brazil's progress in the production of alcohol from sugarcane were given. The first target of the National Alcohol Program in Brazil is to reach 3 million cubic meters of ethanol production in 1980. Typical autonomous and semi-autonomous distilleries are illustrated. (EL)
Document Type Journal article

Citation Number **80A000090**
Article Title *Energy Choices that Europe Faces*
Article Author Hafele, W.
Journal Science
Volume 184
Issue 4134
Pages 360
Publication Date 19 Apr 1974
Document Type Journal article

Citation Number **80A000092**
Article Title *The Energy Alternatives*
Article Author Stout, B.
Journal Agric. Eng.
Volume 60
Issue 2
Pages 12
Publication Date Feb 1979
Document Type Journal article

Citation Number **80A000095**
Article Title *Alcohol Fuels Are No Longer Small Potatoes*
Article Author Folster, D.
Journal Macleans
Volume 93
Pages 50
Publication Date 24 Mar 1980
Document Type Journal article

Citation Number **80A000097**
Article Title *Alcohol Fuels: Ford vs. Rockefeller*
Article Author Henle, R.J.
Journal America
Volume 142
Pages 60
Publication Date 26 Jan 1980
Document Type Journal article

Citation Number **80A000098**
Article Title *The Alcohol-gasohol Fuel Solution*
Article Author Krass, B.
Journal Mother Earth News
Pages 84
Publication Date Feb 1979
Document Type Journal article

Citation Number **80A000099**
Article Title *Alcohol-gasohol Fuel Solution*
Journal Mother Earth News
Volume 55
Pages 84-85
Publication Date Jan 1979
Document Type Journal article

Citation Number **80A000101**
Article Title *Alcohol — Permanent Alternative Fuel*
Journal Des. News
Volume 35
Pages 32
Publication Date 5 Nov 1979
Document Type Journal article

Citation Number **80A000140**
Article Title *Energy Crisis Raises Doubts over the Prospects for Organic Raw Materials*
Article Author Grunewald, H.
Journal Chem. Age (London)
Volume 117
Issue 3075
Pages 14
Publication Date 21 Jul 1978
Abstract At the world conference on future resources of organic raw materials, held in Toronto in July 1978, Herbert Grunewald spoke on the economic impact of changes in fuel supply on the chemical industry. Coal conversion of chemical plants, the more efficient use of oil and gas, the investigation of renewable energy sources, and the advantages of nuclear energy are discussed. Enzymatic processes, biomass conversion, and other biological production processes are assessed. Grunewald emphasizes the responsibility of industrialized nations in undertaking research to ensure adequate future supplies of energy, and in supporting research in developing countries. (EL)
Document Type Journal article

Citation Number **80A000143**
Article Title *Energy from Agriculture: the Brazilian Experiment*
Article Author Mears, L.G.
Journal Environment
Volume 20
Pages 16
Publication Date Dec 1978
Document Type Journal article

Citation Number **80A000146**
Article Title *The Energy War: Brew It Yourself*
Article Author Beck, M.
Morris, H.
Journal Newsweek
Volume 94
Pages 24
Publication Date 1 Oct 1979
Abstract Moonshine as fuel.
Document Type Journal article

Citation Number **80A000164**
Article Title *Fuels from Biomass Integration with Food and Materials Systems*
Article Author Lipinsky, E.S.
Author Affiliation Battelle Columbus Labs., Ohio (USA)
Journal Science
Volume 199
Issue 4329
Pages 644-651
Publication Date 1978
Document Type Journal article

Citation Number **80A000166**
Article Title *Fuels from Crops: Renewable and Clean*
Article Author Graham, R.W.
Journal Mech. Eng.
Volume 97
Issue 5
Pages 27-31
Publication Date May 1975
Document Type Journal article

Citation Number **80A000170**
Article Title *Future of Gasohol in the U.S. Depends on Decisions Today*
Journal High Plains Journal
Publication Date 17 Dec 1979
Document Type Journal article

Citation Number **80A000179**
Article Title *Gasohol and Other Alternative Vehicle Fuels — in Retrospect*
Article Author Quittenton, R.C.
Journal Eng. Dig. (Toronto)
Pages 27-30
Publication Date Jan 1980
Document Type Journal article

Citation Number **80A000180**
Article Title *Gasohol Booming across the Nation*
Journal Sol. Law Rep.
Volume 1
Issue 4
Pages 715
Publication Date 1979
Document Type Journal article

Citation Number **80A000181**
Article Title *Gasohol: Changing the Energy Drinking Habit*
Journal Industrial Marketing
Volume 65
Issue 2
Pages 48
Publication Date Feb 1980
Document Type Journal article

Citation Number	**80A000186**
Article Title	*Look What's Cooking on the Fuel-alcohol Front*
Article Author	Braun, D.
Journal	Farm J.
Volume	103
Pages	40
Publication Date	Nov 1979
Document Type	Journal article

Citation Number	**80:000188**
Article Title	*Plan for the Introduction of Biomass-based Methanol into the Energy Economy*
Document Title	Second Annual Symposium on Fuels from Biomass
Article Author	Wan, E.
	Shuster, W.W. (ed.)
Author Affiliation	Science Applications, Inc., McLean, Va. (USA)
Conference	2nd symposium on fuels from biomass
Conference Place	Troy, NY, USA
Conference Date	20 Jun 1978
Report Number	CONF-7806107 — P1
Publication Date	1978
Pages	125-150
Abstract	The background and program objectives of a current research effort to develop a plan for the evaluation and introduction of biomass-based methanol are presented. Projected uses and demand for methanol as well as the typical cost breakdown of biomass feedstocks production and procurement costs are tabulated. The program tasks include evaluations of current biomass-based methanol processes, determinations of plant siting criteria, and recommendations for research and development plans for conversion of biomass to methanol.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A000190**
Article Title	*Manufacture, Availability and Cost of Methanol and Ethanol Motor Fuels*
Article Author	Norton, J.H.R.
Author Affiliation	Afr. Explos. and Chem. Ind., Ltd., Northrand/ Johannesburg (South Africa)
Journal	South African Mechanical Engineer
Volume	29
Issue	5
Pages	156-158
Publication Date	May 1979
Abstract	This paper deals with the technical and economic feasibility of producing methanol and ethanol in South Africa from locally available raw materials. (EI)
Document Type	Journal article

Citation Number	**80A000193**
Article Title	*Gasohol Trickling In, but It's No Panacea: Advantages Are There; Big Output Is Elusive*
Article Author	Callahan, J.M.
Journal	Christian Science Monitor
Volume	72
Pages	14
Publication Date	5 May 1980
Document Type	Journal article

Citation Number	**80A000200**
Article Title	*Gasohol — Out in Iowa They Can't Pump It Fast Enough*
Article Author	Mouat, L.
Journal	Christian Science Monitor
Volume	72
Pages	5
Publication Date	11 Apr 1980
Document Type	Journal article

Citation Number	**80A000202**
Article Title	*Gasohol: Popular, Yes; Panacea, No*
Journal	Chem. Week
Volume	126
Issue	7
Pages	15-16
Publication Date	13 Feb 1980
Abstract	Gasohol has a lot going for it. It works, it sells, it has political glamor, and it could help conserve U.S. resources and curb reliance on foreign oil. The Administration is offering incentives to encourage production of ethanol, and although gasohol will not put much of a dent in the overall energy problem, it is picking up momentum, with an increasing number of companies getting ready to produce it. Furthermore, gasohol could spark a big comeback for fermentation alcohol, and National Distillers Corp. is working on more cost efficient methods of making ethyl alcohol from renewable carbohydrate raw materials by fermentation to make gasohol all the more cost efficient itself production-wise. "Fermentation fervor" is evident almost everywhere, with increasing activity in the southern states, Georgia in particular, and with a gasohol seminar sponsored by Georgia Institute of Technology. Shell Oil, however, has injected a word of caution to temper the enthusiasm. It warns that tremendous subsidiaries will have to come from the economy elsewhere than from the government to make gasohol attractive in the long-term, and it warns of technological problems in the form of water separation and vapor evolution. (ABI)
Document Type	Journal article

Citation Number	**80A000203**
Article Title	*Gasohol Poses Major Problems*
Article Author	Callahan, J.M.
Journal	Automot. Ind.
Volume	159
Pages	11
Publication Date	Feb 1979
Document Type	Journal article

Citation Number	**80A000212**
Article Title	*Grain Belt's "Miracle" Fuel Finds Many Obstacles*
Journal	Successful Farming
Volume	77
Pages	4
Publication Date	Aug 1979
Document Type	Journal article

Citation Number	**80A000228**
Article Title	*The Methanol Alternative Now...or Never?*
Journal	Technol. Rev.
Pages	61

Publication Date	Apr 1974
Document Type	Journal article

Citation Number	**80A000229**
Article Title	*Methanol*
Article Author	Burke, D.P.
Journal	Chem. Week
Pages	33
Publication Date	24 Sep 1975
Document Type	Journal article

Citation Number	**80A000232**
Article Author	McWaters, D.F.
Journal	Economic Activity. Studies in Economics and Business (Western Australia Univ., Perth)
Volume	20
Pages	2-9
Publication Date	Jul 1977
Abstract	Methanol as a replacement for petrol and distillate: a solution to a potential petroleum energy crisis in Australia.
Document Type	Journal article

Citation Number	**80A000249**
Document Title	*Methanol Technology and Economics*
Document Author	Danner, G.A.
Series	Chem. Eng. Prog., Symp. Ser., v. 66, no. 98
Publication Date	1970
Document Type	Book

Citation Number	**80A000262**
Article Title	*Renewable Resources for the Production of Fuels and Chemicals*
Article Author	Sarkanen, K.V.
Journal	Science
Volume	191
Pages	773-775
Publication Date	20 Feb 1976
Document Type	Journal article

Citation Number	**80A000283**
Article Title	*Solar Biomass Energy an Overview of USA Potential*
Article Author	Burwell, C.C.
Author Affiliation	Oak Ridge National Lab., Tenn. (USA)
Journal	Science
Volume	199
Issue	4333
Pages	1041-1048
Publication Date	1978
Document Type	Journal article

Citation Number	**80A000284**
Article Title	*Solar Energy Conversion through Biology: Could It Be a Practical Energy Source*
Article Author	Hall, D.O.
Author Affiliation	King's Coll., London (UK)
Journal	Biologist
Volume	26
Issue	1-2
Pages	235
Publication Date	1979
Abstract	Each year, plant photosynthesis fixes about 10 times the world's annual energy consumption. Energy stored in biomass presently on the Earth's surface is equivalent to total worldwide proved fossil fuel reserves of oil, coal, and gas. The processes involved in photosynthetic conversion of energy into biomass are described. The potential for converting biomass, via traditional and nonconventional synthetic mechanisms, into usable energy resources is explored. Technologies examined include energy farming, complete crop utilization, waste disposal and algae, and solar conversion. (EL)
Document Type	Journal article

Citation Number	**80A000351**
Article Title	*Biomass Ethanol as a Chemical Feedstock in the United States*
Article Author	Fathiafs, S. Rudd, D.F.
Journal	Biotechnol. Bioeng.
Volume	22
Issue	3
Pages	677-679
Publication Date	1980
Document Type	Journal article

Citation Number	**80A000383**
Document Title	*Feasibility Study of Alternative Fuels and Automotive Transportation. Volume III. Appendices*
Document Author	Kant, F.H. Cahn, R.P. Cunningham, A.R. Farmer, M.H. Herbst, W.
Author Affiliation	Exxon Research and Engineering Co., Linden, N.J. (USA)
Report Number	PB-235 583/2 Contract EPA-68-01-2112
Publication Date	Jun 1974
Pages	143
Notes	Paper copy also available in set of 3 reports as PB-235 580-SET.
Abstract	The appendices deal with supplementary material for some of the topics discussed in Volume II. The titles of the appendices are as follows: Background Considerations; Transportation Fuel Demand; Resource Base Information; Possible Approach of Other Countries to Alternative Transportation Fuels; Build-up of Synthetic Fuels Manufacturing Capacity; Significance of Fuel Properties; Bases for Capital Recovery; Refining of Shale and Coal Syncrude; Coal Mining Costs and Investments; and Cost of Operating an Automobile. (NTIS)
Document Type	Report

Citation Number	**80A000388**
Document Title	*Fuels Technology: a State-of-the-art Review*
Document Author	Hall, E.H.
Report Number	EPA/650/2-75-034 PB-242 535/3PSH
Publication Date	Apr 1975
Pages	260
Document Type	Report

Citation Number	**80A000390**
Document Title	*Hydrogen and Exotic Fuels*
Document Author	Michel, J.W.
Author Affiliation	Oak Ridge National Lab., Tenn. (USA)
Report Number	ORNL-TM-4461 Contract W-7405-eng-26
Publication Date	Jun 1973

Pages	39
Document Type	Report

Citation Number	**80A000391**
Document Title	*Hydrogen and Synthetic Fuels for the Future*
Document Author	Michel, J.W.
Author Affiliation	Oak Ridge National Lab., Tenn. (USA)
Report Number	CONF-730807-3
Publication Date	1973
Pages	36
Document Type	Report

Citation Number	**80A000393**
Document Title	*Methanol: a Raw Material for Synthesis and an Energy Source*
Document Author	Schwarzmann, M.
Report Number	UCRL-Trans-10908
Publication Date	Jan 1975
Notes	Transl. from Chem.-Ing.-Tech., vol. 47, no. 2 January 1975, p. 56-62.
Document Type	Report

Citation Number	**80A000396**
Document Title	*Methanol as a Fuel in the Urban Energy Economy and Possible Source of Supply*
Document Author	Steinberg, M. Salzano, F.J. Beller, M. Manowitz, B.
Author Affiliation	Brookhaven National Lab., Upton, N.Y. (USA)
Report Number	BNL-17800
Publication Date	1973
Pages	20
Document Type	Report

Citation Number	**80A000400**
Document Title	*Methanol: Its Synthesis, Use as a Fuel, Economics, and Hazards*
Document Author	Hagen, D.L.
Author Affiliation	Minnesota Univ., Minneapolis (USA)
Report Number	NP-21727
Publication Date	Dec 1976
Pages	186
Notes	Thesis
Abstract	The synthesis of methanol using existing and proposed means of production and sources of feedstocks is reviewed. Conventional methods of producing methanol are surveyed. Proposed methods of fermentation, electro-, and radiation-synthesis are discussed. Conventional production technology from synthesis gas is examined in detail. The range of possible sources of feedstocks from fossil fuels to biomass, atmospheric carbon dioxide, and carbonates are portrayed along with renewable and nonrenewable energy sources. A survey of recent studies and research on methanol is given within the historical context. Fuel related properties are reviewed and compared with isooctane. Combustion emissions and their variation with temperature and fuel preparation are similarly compared. Uses of methanol as a combustion fuel and recent tests in boilers, turbines, conventional and stratified charge Otto engines, and diesel engines are discussed emphazing comparative efficiencies. Current developments on the uses of methanol directly and indirectly in fuel cells and as a feedstock for single cell protein are examined. Historical prices of methanol are presented along with major causes for the fluctuations. The costs of synthesizing methanol are presented including overall production costs from organic feedstocks. Proposed costs of producing methanol from electrolytic hydrogen and carbon dioxide are also given. Fiscal and physical causes for inflation are discussed along with the costs of storage, transportation and conversion. The numerous biological, physical, and chemical hazards of using methanol as a fuel are discussed together with safety precautions and treatment. (NTIS)
Document Type	Report

Citation Number	**80A000408**
Document Title	*Study of the Importance of Energy R, D and D for the United States*
Document Author	Sussman, S.S. Rubin, B. Cooper, R.L. Nesbitt, D.M.
Author Affiliation	California Univ., Livermore (USA). Lawrence Livermore Lab.
Report Number	UCRL-52140
Publication Date	6 Oct 1976
Pages	79
Abstract	The Stanford Research Institute Energy Model (modified to include new energy technologies and revised data-base information) was used to examine and evaluate the potential benefits of energy research, development, and demonstration (R, D and D) to the United States. Six different scenarios were examined, and, based on the findings, it is concluded that: (1) implementation of the results of successful R, D and D/conservation programs could have large economic benefit to the country; (2) application of lower-cost synthetic-fuel-production processes resulting from successful supply R, D and D could substantially reduce U.S. dependence on foreign oil and stabilize energy prices; (3) introduction of the results of successful highway-transportation R, D and D potentially could save twice as much liquid fuel as any other end-use market; and (4) new fuels (e.g., methanol, electricity, and hydrogen) could penetrate the automotive market, if advanced engine types were available. (NTIS)
Document Type	Report

Citation Number	**80A000424**
Article Title	*View from Abroad Brazil Grows Its Motor Fuels*
Article Author	Garner, F.
Journal	Environment
Volume	20
Issue	1
Pages	5, 40
Publication Date	Jan 1978
Document Type	Journal article

Citation Number	**80A000425**
Article Title	*Gasohol; Alcohol Fuel: Likely to Produce More Problems than Benefits*
Journal	Chevron World
Volume	56
Issue	2
Pages	10-13

Publication Date	Spr 1978
Document Type	Journal article

Citation Number	**80A000428**
Article Title	*Iowa et al. vs OPEC — Corn States Uncork Gasohol Gusher*
Journal	Mach. Des.
Volume	52
Issue	6
Pages	18-24
Publication Date	20 Mar 1980
Document Type	Journal article

Citation Number	**80A000438**
Document Title	*On the Trail of New Fuels: Alternative Fuels for Motor Vehicles*
Report Number	UCRL-Trans-10879 N76-23447
Publication Date	1974
Pages	395
Abstract	A study is presented of motor vehicle alternate fuels which will alleviate the pollution and supply problems presented by the use of gasoline. Topics include: (1) an index of researchers; (2) properties of methanol and methyl fuel; (3) availability of the raw materials; (4) production of methanol; (5) ocean transport, storage, and inland distribution; (6) vehicle requirements and safety problems; (7) methanol operation of conventional vehicles; (8) methanol operation of other propulsion systems; (9) fuel cells and gas generators; and (10) a list of references. Likely prospects for alternate fuels are methanol in the short and intermediate term and hydrogen in the long term. For both these fuels, the manufacture does not depend on oil, combustion engines of known construction can be used, and these fuels can be substituted for gasoline in steps. (NTIS)
Document Type	Translation

Citation Number	**80A000439**
Document Title	*Overseas Research on the Biological Production of Fuels. Report No. 2*
Document Author	Updegraff, D.M.
Author Affiliation	New Zealand Energy Research and Development Committee, Auckland
Report Number	NP-21438
Publication Date	Feb 1975
Pages	6
Abstract	The research projects visited in a travel made to obtain technical information on the production of fuels by the fermentation of vegetable matter and organic wastes are tabulated. On the basis of the information gathered it is recommended that New Zealand should sponsor research on the biosynthesis of ethanol and methane. (ERA citation 02:029083) (NTIS)
Document Type	Report

Citation Number	**80A000440**
Document Title	*An Overview of Alternative Energy Sources for LDCs*
Publisher	Arthur D. Little, Inc.; Cambridge, MA, USA
Report Number	PB-239 465/8ST ADL-C-77105 Contract AID/ta/C-1089
Publication Date	7 Aug 1974
Pages	372
Abstract	The report presents an overview of alternative energy sources of types which could be of significant value to lesser-developed countries in adjusting to the impact of sharply higher world market prices of petroleum. It presents a highly condensed review of non-conventional energy technologies, together with some limited commentary on the relevance of the more conventional technologies in new lesser-developed country (LDC) economic settings. It also provides a summary on a country-by-country basis of the current economic posture and energy resources array in fifteen LDC's selected as being broadly representative — geographically and in terms of petroleum-price impacts — of the quite wide range of situations that need to be considered. (NTIS)
Document Type	Report

Citation Number	**80A000445**
Document Title	*Alternative Energy Technologies in Brazil*
Document Author	Miccolis, J.M.F.
Author Affiliation	George Washington Univ., Washington, D.C. (USA). Graduate Program in Science Technology and Public Policy
Conference	143rd meeting of the American Association for the Advancement of Science
Conference Place	Denver, CO, USA
Conference Date	Feb 1977
Report Number	NP-22247
Publication Date	Feb 1977
Pages	29
Document Type	Report

Citation Number	**80A000457**
Document Title	*Methanol: a Selective Cross-disciplinary Bibliography*
Document Author	Green, L.A.
Author Affiliation	California Univ., Livermore (USA). Lawrence Livermore Lab.
Report Number	UCRL-52332 Contract W-7405-eng-48
Publication Date	31 Aug 1977
Pages	29
Abstract	This bibliography represents an extensive literature search on methanol over such topic areas as biomedical effects, physical and technological effects, and environmental effects. More than 500 references, compiled from sources from 1965 to the present, are arranged in alphabetical order as a result of the efforts of the Lawrence Livermore Laboratory Technical Information Department and Environmental Research Program. (AUTHOR)
Availability	NTIS
Document Type	Report

Citation Number	**80A000480**
Article Title	*Liquid Fuels*
Document Title	Capturing the Sun through Bioconversion
Article Author	Reed, T.
Author Affiliation	Massachusetts Inst. of Tech., Cambridge (USA)
Conference	Conference on capturing the sun through bioconversion
Conference Place	Washington, DC, USA
Conference Date	10 Mar 1976
Publisher	Washington Center; Washington, DC, USA

Publication Date 1976
Pages 366
Notes Presented at Washington Center for Metropolitan Studies Conference on Bioconversion, Washington, D.C., March 10-12, 1976.
Abstract The fuels that can be produced from biomass by presently available technology are evaluated as potential natural gas substitutes. In particular, wood gas, methanol, and pyrolysis oils are available in sufficient quantities to fulfill most of the needs presently being met by natural gas and oil. Slurry fuels offer particular advantages for storage and transport, while synthetic gasoline from methanol can be used for airplane fuels.
Document Type Paper/Chapter from book

Citation Number 80A000481
Article Title *When the Oil Runs Out — a Survey of Our Primary Energy Sources and the Fuel We Can Make from Them*
Document Title Capturing the Sun through Bioconversion
Article Author Reed, T.B.
Conference Conference on capturing the sun through bioconversion
Conference Place Washington, DC, USA
Conference Date 10 Mar 1976
Publisher Washington Center; Washington, DC, USA
Publication Date 1976
Pages 366-388
Abstract The fuels which can be produced from primary energy sources by presently known processes are described and evaluated as potential substitutes. In particular, wood gas, methanol and pyrolysis oils could fill most needs when the oil runs out, and they can be made in sufficient quantity from municipal, agricultural and forest sources. Slurry fuels offer particular advantages for storage and transport, while synthetic gasoline from methanol can be used for airplane fuels. Since biomass is initially as widely distributed as the sunshine, it is desirable to match the scale of biomass synthetic fuel plants to solar production, and a number of factors are discussed which can make this decrease of scale economical in the larger human sense.
Document Type Paper/Chapter from book

Citation Number 80A000494
Article Title *Ethanol*
Document Title Encyclopedia of Chemical Technology, V. 9
Publisher Wiley; New York, NY, USA
Publication Date 1980
Pages 338-380
Notes 3rd ed.
Document Type Paper/Chapter from book

Citation Number 80A000501
Document Title *Proceedings of Third International Symposium on Alcohol Fuels Technology*
Conference 3. international symposium on alcohol fuels technology
Conference Place Asilomar, CA, USA
Conference Date 29 May 1979
Publisher U.S. Department of Energy; Washington, DC, USA
Report Number CONF-790520
Publication Date Apr 1980
Pages 802
Notes Volumes I, II, III bound together.
Document Type Report

Citation Number 80A000502
Article Title *Alcohol Fuels from Biomass in New Zealand — the Energetics and Economics of Production and Processing*
Document Title Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author Earl, W.B.
Brown, W.A.N.
Author Affiliation Canterbury Univ., Christchurch (New Zealand)
Lincoln Coll., Canterbury (New Zealand)
Conference 3. international symposium on alcohol fuels technology
Conference Place Asilomar, CA, USA
Conference Date 29 May 1979
Publisher U.S. Department of Energy; Washington, DC, USA
Report Number CONF-790520
Publication Date Apr 1980
Pages 12p, Paper I-1
Abstract This paper summarises the current state of the on-going research programme on the economics and energy balance associated with the production and processing of alcohol fuels from biomass in New Zealand. Detailed analysis is given on three biomass alternatives, fodder beet (Beta vulgaris), straw residue and trees (Pinus radiata) — and two processing routes — ethanol by fermentation and methanol by gasification, since each highlights different and important aspects of the production and processing system framework from farm/forest to final product. Current indications are that alcohol fuels can be produced in New Zealand at a price close to that of imported, refined motor spirit, and future relative price movements will probably favour the indigenous alcohol fuel. The next stage in the New Zealand programme is pilot plant production systems, and this should commence within the next 2-3 years. (AUTHOR)
Document Type Paper from report

Citation Number 80A000554
Article Title *Methyl Fuel and Its Effect on Crude Oil Consumption*
Document Title Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author Pecci, G.
Garibaldi, P.
Author Affiliation ASSORENI — Association for Scientific Research of ENI Group Companies (Italy)
Conference 3. international symposium on alcohol fuels technology
Conference Place Asilomar, CA, USA
Conference Date 29 May 1979
Publisher U.S. Department of Energy; Washington, DC, USA
Report Number CONF-790520
Publication Date Apr 1980
Pages 11p, Paper III-60
Abstract The study reported in this paper is part of a project on energy saving sponsored by the Italian National Council for Research. The impact of methyl fuel use on oil consumption is examined in

two energy scenarios characterized by different fuel oil demands. Two possible uses have been considered: methyl fuel as a component of gasoline and methyl fuel (or straight methanol) as a fuel oil substitute. The bigger advantages in terms of oil and investment savings are obtained using methyl fuel as a gasoline component having a very high octane rating. (AUTHOR)

Document Type	Paper from report
Citation Number	**80A000555**
Article Title	*Methanol, Its Precursors and/or Derivatives in Different Scenarios, Its Testing and Development of Hardware Required for Alcohol Fuels*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Hovestreydt, G. Van der Weide, J.
Author Affiliation	Research Institute for Road Vehicles TNO, Delft (Netherlands) DSM Corporate Development, Heerlen (Netherlands)
Conference	3. international symposium on alcohol fuels technolgogy
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	12p, Paper III-61
Abstract	In different areas of the world it is possible to produce methanol at costs, where it can economically be used as a motorblending component at normal conditions. If for example 15 vol% would be added, additional capacity should be constructed. During exceptional conditions of embargo's, calamity, this capacity of methanol can increase the degree of autarchy for transportation of basic human needs. For USA, EEC and the Netherlands possible scenarios are demonstrated. Adaptions of fuels and/or engines may be required, as well as development of auxiliaries especially when they can be retrofitted to ease introduction. Also possible is the use of raw materials and/or derivatives of methanol can be considered, of which fuel cells may be a promising example. At the Wolfsburg symposium of November 1977 the work in the Netherlands with respect to the testing and development of hardware required for the application of methanol in cars and vans was reported. In the second part of this paper the work carried out since then is reported. This work has been concentrating on further development of transducers for alcohol fuels versus petrol. Next a description is given of the development of retrofittable hardware for a relatively simple system to enable diesel engines to run with about 40% alcohol fuel in the air intake. A description is given of the hardware development of retrofittable hardware for a relatively simple system to enable diesel engines to run with about 40% alcohol fuel in the air intake. A description is given of the hardware development of retrofittable hardware to enable cars and vans to run on all mixtures (between 0-100%) of ethanol and petrol with automatic adaption via a transducer. It is stated that retrofittable kits help to move to alcohol fuels, bearing in mind that the results are not so good as from specially manufactured alcohol engines. (AUTHOR)
Document Type	Paper from report
Citation Number	**80A000556**
Article Title	*Alcohol Fuels and Agricultural Systems*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Cervinka, V. Mason, D.
Author Affiliation	California Dept. of Food and Agriculture, Sacramento (USA)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	10p, Paper III-62
Abstract	The production of energy sources and chemicals from agriculture crops is technically and economically feasible. Agricultural crops can become a part of a diversified energy system in the national economy. Their usage as an energy source will contribute not only to the energy supply, but also to the establishment of a sound farm economy and international agricultural development. In the future, agriculture can be developed as a system of food, fiber, and energy crops. (AUTHOR)
Document Type	Paper from report
Citation Number	**80A000557**
Article Title	*Alcohol Fuels: the Most Often Asked Questions*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Sklar, S.
Author Affiliation	National Center for Appropriate Technology, Washington, D.C. (USA)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA. USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	13p, Paper III-63
Document Type	Paper from report
Citation Number	**80A000564**
Article Title	*Power Alcohol in the Sudan*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Brown, O.M.R.
Author Affiliation	Tate and Lyle Technical Services Ltd., Bromley (UK)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979

Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	26 Mar 1979
Pages	12p, Paper ID/WG.293/1
Document Type	Paper from report

Citation Number	**80A000566**
Article Title	*Use of Ethyl Alcohol as Chemical Feedstock*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Yamozoe, A.
Author Affiliation	JGC Corp., Tokyo (Japan)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	26 Mar 1979
Pages	39p, Papers ID/WG.293/5 and ID/WG.293/5/Add.1
Document Type	Paper from report

Citation Number	**80A000568**
Article Title	*Experiences with the Brazilian Power Alcohol Plants*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Prado, O. Coimbra, G.C. Anderle, G.
Author Affiliation	Conger S.A., Piracicaba (Brazil) Proquip S.A., Sao Paulo (Brazil) Vogelbusch GES. m.b.H. Vienna (Austria)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	26 Mar 1979
Pages	16p, Paper ID/WG.293/7
Abstract	In 1975, Brazil has developed its alcohol programme due to the following six main reasons: (1) saving of foreign bills; (2) support of the national industry; (3) increase of the gross national product; (4) development of the agriculture in under-developed regions; (5) balance of regional economic differences; (6) creation of possibilities for work in regions which are economically under-privileged. The first phase of realization of the alcohol programme foresaw the economic utilization of molasses to alcohol; the second phase the utilization of juices from sugar production and further on the complete utilization of cane in the autonomous distilleries. For this, it was and it is necessary to enlarge the cultivation area and to reconstruct the existing sugar mills in such a way that the delivered quantity of cane can be processed, and to project with such a flexibility that, adjusted to the demand on sugar, the alcohol production can be regulated. In the third phase, all starch- and cellulose-containing raw materials, like mandioca or bagasse, should be utilized. With this alcohol programme the alcohol production was increased in the years 1975 to 1978 from 8 million litres to 2.500 million litres, which means that 120 plants with a medium capacity of 100.000 litres have been erected by Brazilian manufacturers of equipment. Besides the economic advantages the alcohol programme brought also a valuable knowledge on the fields of agriculture, biotechnology and energy; the decisive position of the agro-industry, especially the alcohol technology, in the actual energy conception was discovered. This recognition motivated also other countries to develop proper alcohol programmes.
Document Type	Paper from report

Citation Number	**80A000575**
Article Title	*Present Status of Alcohol and Alcohol Based Chemicals Industry in India*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Sharma, K.D.
Author Affiliation	Ministry of Chemicals and Fertilizer, New Delhi (India)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	10p, Paper ID/WG.293/14
Document Type	Paper from report

Citation Number	**80A000580**
Article Title	*Aspects of Fermentation Alcohol Production*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Saito, T.
Author Affiliation	Kyowa Hakko Kogyo Co. Ltd., Tokyo (Japan)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	10p, Paper ID/WG.293/20
Document Type	Paper from report

Citation Number	**80A000583**
Article Title	*Development of Alcogas Research in the Phillipines*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Sunico, E.M.
Author Affiliation	Bureau of Energy Development (Philippines). Nonconventional Energy Sources Division
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstocks in developing countries

Conference Place | Vienna, Austria
Conference Date | 26 Mar 1979
Publisher | United Nations Industrial Development Organization; New York, NY, USA
Report Number | CONF-7903101-1
Publication Date | 1979
Pages | 22p, Paper ID/WG.293/23/Rev.1
Document Type | Paper from report

Citation Number 80A000584
Article Title: *Necessary Conditions to Promote and Realize a Policy for Energy and Chemicals Based on "Green Petrol"*
Document Title: Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author: Mariotte, P.
Author Affiliation: Green Petrol Co., Paris (France)
Conference: Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place: Vienna, Austria
Conference Date: 26 Mar 1979
Publisher: United Nations Industrial Development Organization; New York, NY, USA
Report Number: CONF-7903101-1
Publication Date: 1979
Pages: 46p, Paper ID/WG.293/24
Document Type: Paper from report

Citation Number 80A000587
Article Title: *Fermentation Alcohol in the Commonwealth Caribbean*
Document Title: Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author: Ali, D.A.
Author Affiliation: Caribbean Industrial Research Institute (Trinidad)
Conference: Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place: Vienna, Austria
Conference Date: 26 Mar 1979
Publisher: United Nations Industrial Development Organization; New York, NY, USA
Report Number: CONF-7903101-1
Publication Date: 1979
Pages: 14p, Paper ID/WG.293/27
Document Type: Paper from report

Citation Number 80A000588
Article Title: *Can Fermentation Alcohol Be Substituted for Wood as a Cooking Fuel*
Document Title: Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author: Moundlic, J.
Author Affiliation: Prodial Sarl, Paris (France)
Conference: Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place: Vienna, Austria
Conference Date: 26 Mar 1979
Publisher: United Nations Industrial Development Organization; New York, NY, USA
Report Number: CONF-7903101-1
Publication Date: 1979
Pages: 12p, Paper ID/WG.293/28
Document Type: Paper from report

Citation Number 80A000590
Article Title: *Prospects of Developing Power Alcohol Industry in Thailand*
Document Title: Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author: Bejraputra, K.
Author Affiliation: National Energy Administration, Bangkok (Thailand)
Conference: Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place: Vienna, Austria
Conference Date: 26 Mar 1979
Publisher: United Nations Industrial Development Organization; New York, NY, USA
Report Number: CONF-7903101-1
Publication Date: 1979
Pages: 24p, Paper ID/WG.293/30
Document Type: Paper from report

Citation Number 80A000591
Article Title: *Trends in the Production of Ethyl Alcohol by Fermentation*
Document Title: Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author: Carracedo, R.G.B.
Author Affiliation: Cuban Research Institute of Sugar Byproducts
Conference: Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place: Vienna, Austria
Conference Date: 26 Mar 1979
Publisher: United Nations Industrial Development Organization; New York, NY, USA
Report Number: CONF-7903101-1
Publication Date: 1979
Pages: 19p, Paper ID/WG.293/31
Abstract: The energy crisis has brought about a substantial re-evaluation of the ways of obtaining fuels; hence a strong interest in carbohydrates as potential sources of raw materials has developed. The paper presents an analysis of the development of world ethanol production. It offers a panoramic view of the trends in the period 1935-1970 in the United States, France, United Kingdom and Japan. The paper also analyzes the new trends since 1973 in Brazil, Philippines, United States, Australia, England, Japan, Thailand, Costa Rica, Hawaii, Zambia, Paraguay. An analysis of the Cuban alcohol industry and a world balance of ethyl alcohol production by fermentation is presented. (AUTHOR)
Document Type: Paper from report

Citation Number 80A000592
Article Title: *Consumption Figures of Fermentation Alcohol in Japan*
Document Title: Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author: Yokoi, A.
Author Affiliation: Alcohol Association of Japan, Tokyo
Conference: Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place: Vienna, Australia
Conference Date: 26 Mar 1979

Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	1p, Paper ID/WG.293/32
Document Type	Paper from report

Citation Number	**80A000594**
Article Title	*Advantages and Limitations of the Use of Alcohol Produced by Fermentation as Fuel in Developing Countries*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Maurel, H.
Author Affiliation	Commission of the European Communities, Brussels (Belgium)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	8p, Paper ID/WG.293/36
Document Type	Paper from report

Citation Number	**80A000596**
Article Title	*Brazil's Energy Alternatives*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Andrade, A.E.I. de
Author Affiliation	Cooperativa Fluminense dos Produtores de Acucar e Alcool Ltda., Rio de Janeiro (Brazil)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	12p, Paper ID/WG.293/37
Document Type	Paper from report

Citation Number	**80A000597**
Article Title	*Provisional List of Participants*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	15p, Paper ID/WG.293/38
Notes	Listed by country. The affiliation of each is given.
Document Type	Paper from report

Citation Number	**80A000598**
Article Title	*Fermentation — Second Way for Utilization of Vegetable Sources*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Schreier, K.
Author Affiliation	Vogelbusch GES. m.b.H. Vienna (Austria)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	20p, Papers ID/WG.293/39 and ID/WG.293/39/Add.1
Document Type	Paper from report

Citation Number	**80A000600**
Article Title	*Products of Photosynthesis as Raw Material for the Chemical Industry*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Dupuy, P.
Author Affiliation	Institut National de Recherches Agronomiques (INRA), 21 — Dijon (France)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	16p, ID/WG.293/41
Document Type	Paper from report

Citation Number	**80A000602**
Article Title	*Review of Papers*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	UNIDO Secretariat
Author Affiliation	United Nations Industrial Development Organization, Vienna (Austria)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	35p, Paper ID/WG.293/43
Document Type	Paper from report

Citation Number	**80A000605**
Article Title	*Perspective of Ethanol Usage as Fuel in the Dominican Republic*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Pena, A.A.
Author Affiliation	Universidad Autonoma de Santa Domingo (Dominican Republic)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries

Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	6p, Paper ID/WG.293/46
Document Type	Paper from report

Citation Number	**80A000619**
Document Title	*Methanol Technology and Economics*
Document Author	Danner, G.A. (ed.)
Series	Chem. Eng. Prog., Symp. Ser., v. 66, no. 98
Publisher	American Institute of Chemical Engineers; New York, NY, USA
Publication Date	1970
Pages	71
Document Type	Book

Citation Number	**80A000620**
Article Title	*The PVT Behavior of Methanol at Elevated Pressures and Temperatures*
Document Title	Methanol Technology and Economics
Article Author	Finkelstein, R.S. Stiel, L.I. Danner, G.A. (ed.)
Publisher	American Institute of Chemical Engineers; New York, NY, USA
Publication Date	1970
Pages	11-15
Abstract	Experimental PVT data have been obtained for methanol by the constant volume method for temperatures from 200 to 300 degrees C and pressures from 1,200 to 10,000 lb/sq in. The experimental data are estimated to be accurate to within 0.4%. Smoothed compressibility factors are presented for this region and are found to be consistent with data previously reported for pressures to 3,000 lb/sq in. The compressibility factor of methanol is also analyzed by the fourth-parameter approach. (AUTHOR)
Document Type	Paper/Chapter from book

Citation Number	**80A000621**
Article Title	*A Review of Volumetric, Thermodynamic, and Other Physical Properties for Methanol*
Document Title	Methanol Technology and Economics
Article Author	Eubank, P.T. Danner, G.A. (ed.)
Publisher	American Institute of Chemical Engineers; New York, NY, USA
Publication Date	1970
Pages	16-23
Abstract	A general survey of physical property data for liquid and gaseous methanol is presented. Refractive index, density, heat capacity, entropy, and heat of combustion data are considered for the liquid state together with vapor pressure, heat of vaporization, critical properties, saturated liquid and vapor densities for the saturated envelope and virial coefficients, PVT, heat capacity, and thermodynamic properties for the gas state. (AUTHOR)
Document Type	Paper/Chapter from book

Citation Number	**80A000622**
Article Title	*Methanol: Its Technology and Economics*
Document Title	Methanol Technology and Economics
Article Author	Strelzoff, S. Danner, G.A. (ed.)
Publisher	American Institute of Chemical Engineers; New York, NY, USA
Publication Date	1970
Pages	54-68
Abstract	The chemistry and numerical data of thermodynamics, and kinetics of methanol synthesis from hydrogen and carbon oxides are reviewed. The method of calculating the conversion of a given synthesis gas to methanol is given. The composition and preparation of catalysts are discussed. The operating conditions for the two major industrial processes of methanol synthesis and product purification are given; these processes are generally designated as the high pressure process and the low pressure process. They are compared with respect to equipment costs, utilities consumption, and adaptability to a given single-train plant capacity, and local market conditions. Process flow diagrams are shown. (AUTHOR)
Document Type	Paper/Chapter from book

Citation Number	**80A000629**
Article Title	*Fueling Automotive Internal Combustion Engines with Methanol — Historical Development and Current State of the Art*
Document Title	Record of the Tenth Intersociety Energy Conversion Engineering Conference
Article Author	Gonnermann, C.H. Moore, J.S. McCallum, P.W.
Author Affiliation	Mueller Associates, Inc., Baltimore, Md. (USA)
Conference	10th Intersociety Energy Conversion Engineering Society
Conference Place	Newark, DE, USA
Conference Date	18 Aug 1975
Publisher	Institute of Electrical and Electronics Engineers; New York, NY, USA
Publication Date	1975
Pages	849-855
Abstract	The author finds that in general, it is not possible to clearly separate historical interest in methanol from that in alcohols generally nor from that in the spectrum of alternative fuels. Interest in alternative fuels, particularly alcohols, has gone through wide cycles from 1910 to the present. In all cases, general upswings in interest have been motivated by fears of impending petroleum shortage (to about 1925) or by actual shortage (the World Wars). (EI)
Document Type	Paper/Chapter from book

Citation Number	**80A000631**
Article Title	*Which Alcohol Fuel for Brasil — Methanol or Ethanol?*
Document Title	Proceedings of the 14th Intersociety Energy Conversion Engineering Conference; Volume 1
Article Author	Carvalho, A.V. Yang, V. Trindade, S.C.
Author Affiliation	Centro de Technologia Promon-CTP, Rio de Janeiro (Brazil)

Conference	14th Intersociety Energy Conversion Engineering Society
Conference Place	Boston, MA, USA
Conference Date	5 Aug 1979
Publisher	American Chemical Society; Washington, DC, USA
Publication Date	5 Aug 1979
Pages	295-300
Abstract	Examines the achievements of the Brasilian National Alcohol Program and of the recently proposed program on methanol from wood (eucalyptus). Both programs aim at production and utilization and process considerations of both methanol and ethanol are presented. Alcohols are still more expensive than petroleum fuels but provide more social benefits than imported energy.
Document Type	Paper/Chapter from book

Citation Number	**80A000636**
Article Title	*Integrated Biological and Agricultural Systems*
Document Title	Solar Technology Exhibition and Conference, Middle East (SOLTECH '78)
Article Author	Coombs, J.
Author Affiliation	Philip Lyle Memorial Lab. (UK)
Conference	Solar technology exhibition and conference, Middle East (SOLTECH '78)
Conference Place	Bahrain
Conference Date	24 Apr 1978
Publisher	International Solar Energy Society, U.K. Section; London, GB
Publication Date	1978
Pages	74
Abstract	Small-scale biomass systems that integrate biological and agricultural systems to supply energy to local markets are discussed. Worldwide potential for biomass use is evaluated. Discussed are: modifications in photosynthesis and water retention; limiting factors; fuel crops; liquid fuels from biomass; protein production; waste treatment; and algal production. Integrated biological-agricultural systems coupled with animal production, chemical processing, fermentation, and algal waste treatment will become more important in the future. (EL)
Document Type	Paper/Chapter from book

Citation Number	**80A000637**
Article Title	*Energy and the Public; Alternative Fuels*
Document Title	Energy and the Public, Public Awareness Workshops and Plenary Sessions, at the 6th Annual Conference and Exhibition (WATTEC) (Welding and Testing Technology)
Article Author	Sklar, S.
Author Affiliation	National Center for Appropriate Technology, Washington, D.C. (USA)
Conference	Energy and the public, public awareness workshops and plenary sessions, at the 6th annual conference and exhibition (WATTEC) (welding and testing technology)
Conference Place	Knoxville, TN, USA
Conference Date	21 Feb 1979
Publisher	National Technical Information Service
Publication Date	1979
Pages	85
Abstract	The development of alternative fuels for transportation is considered. Private inventors already have developed automobiles that run on fuel produced from agricultural crops. Crops can be used for both fuel production and food consumption. Producing alcohol from crops and running automobiles on alcohol fuel are technologically and economically feasible. (EL)
Document Type	Paper/Chapter from book

Citation Number	**80A000670**
Article Title	*Biomass and Wastes as Energy Resources: Update*
Document Title	Clean Fuels from Biomass and Wastes
Article Author	Klass, D.L.
Author Affiliation	Institute of Gas Technology, Chicago, Ill. (USA)
Conference	Symposium on clean fuels from biomass and wastes
Conference Place	Orlando, FL, USA
Conference Date	25 Jan 1977
Publisher	Institute of Gas Technology; Chicago, IL, USA
Report Number	CONF-770142
Publication Date	1977
Pages	1
Abstract	Work to develop processes and systems for the production of synfuels and energy-intensive products from renewable biomass and wastes is updated. Selected research and commercial developments are summarized. Combined waste disposal-energy recovery processes are receiving the most attention. Biomass production directed specifically toward energy applications has not yet been optimized for large systems and is in the initial stages. The primary problem is practical, economic system design and adaptation of known conversion processes to particular raw materials. (EL)
Document Type	Paper from report

Citation Number	**80A000671**
Document Title	*Ethyl Alcohol Production Technique*
Corporate Author	Noyes Development Corporation
Conference	Symposium on new developments of chemical industries relating to ethyl alcohol, its by-products and wastes
Conference Place	Delhi, India
Conference Date	1963
Publisher	Noyes Development Corp.; Pearl River, NY, USA
Publication Date	1964
Pages	142
Notes	Under the auspices of the All India Distillers' Association, in co-operation with the UNESCO South Asia Science Co-operation Office.
Document Type	Book

Citation Number	**80A000676**
Article Title	*Sources and Methods for Methanol Production*
Document Title	Hydrogen Energy; Proceedings of the Hydrogen Economy Miami Energy (Theme) Conference
Article Author	Reed, T.B. Lerner, R.M. Veziroglu, T.N. (ed.)
Author Affiliation	Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.
Conference	Hydrogen economy Miami energy conference
Conference Place	Miami Beach, FL, USA
Conference Date	18 Mar 1974
Publisher	Plenum Press; New York, NY, USA

Publication Date 1975
Pages 1265-1278
Notes Conference presented by the Clean Energy Research Institute, School of Engineering and Environmental Design, University of Miami, Coral Gables, FL.
Abstract Methanol and methyl fuel promise to be useful cleaning fuels for internal combustion engines and other liquid fuel applications. Methanol is presently made by combining hydrogen and carbon monoxide. The various other sources for synthesis of methanol are surveyed, and methods of synthesis are discussed. Various factors affecting production and use economics are listed and production costs from coal, lignin, waste and wood are estimated.
Document Type Paper/Chapter from book

Citation Number 80A000685
Article Title *Alcohols, the Now Fuels*
Document Title New Fuels Advances in Combustion Technologies. Symposium Paper
Article Author Miller, D.R.
Duhl, R.W.
Author Affiliation Vulcan-Cincinnati, Inc., Ohio (USA)
Conference New fuels and advances in combustion technologies symposium
Conference Place New Orleans, LA, USA
Conference Date 1979
Publisher Institute of Gas Technology; Chicago, IL, USA
Publication Date 1979
Pages 118-140
Document Type Paper/Chapter from book

Citation Number 80A000690
Article Title *Canadian Biomass Perspective: a New Interest in an Old Fuel*
Document Title Biomass for Energy: Conference at the Royal Society
Article Author Marshall, J.E.
Author Affiliation Environment Canada, Ottawa, Ontario
Conference Biomass for energy
Conference Place London, England
Conference Date 3 Jul 1979
Publisher International Solar Energy Society, U.K. Section; London, GB
Publication Date 1979
Pages 51
Notes Sponsored by the Commission of the European Communities (Directorate General for Research, Science and Education).
Abstract Biomass resources currently supply less than 4% of Canada's primary energy requirements. Forest biomass, agricultural biomass, and municipal solid wastes were analyzed as energy sources in Canada. Forestry resources dominate the nation's long-term renewable resource potential for biomass. Methanol is identified as the leading fuel-from-biomass option for Canada. Three biomass conversion options are examined: one relies on biomass alone, one involves a hydrogen donor, and one involves a methane donor. Plant capital and operating costs for each option are considered. Part of Canada's $380 million five-year program for development of solar energy and biomass production is a $30 million program that will permit, by 1985, the use of forest biomass to meet as much as 8% of Canada's total primary energy demand now supplied by fossil fuels. (EL)
Document Type Paper/Chapter from book

Citation Number 80A000692
Article Title *Barriers, Constraints, and Possible Solutions*
Document Title Increased Energy from Biomass: 1985 Possibilities and Problems, Working Papers for Planners; Recommendations and Proceedings from Pacific Northwest Bioconversion Workshop
Article Author Reed, T.
Smith, K.
Salo, D.
Spencer, D.
Currier, R.
Westgarth, W.
Hinckley, A.D.
Author Affiliation SRI International, Menlo Park, Calif. (USA)
Conference Pacific northwest bioconversion workshop
Conference Place Portland, OR, USA
Conference Date 24 Oct 1978
Publication Date 1978
Pages 97
Notes Sponsored by Region X, U.S. Department of Energy in cooperation with the Energy Offices of Alaska, Idaho, Montana, Oregon, and Washington; the U.S. Forest Service; and Oregon State University's Office of Energy Research and Development.
Abstract Barriers, constraints, and possible solutions to biomass energy development are discussed in seven papers on the following topics: alcohol motor fuels; residential and small scale commercial applications; near-term constraints to the utilization of wood fuels in the Pacific northwest; biomass utilization in the electric power industry; forestry potentials in the use of wood and bark biomass; laws affecting bioconversion; and ecological management of forest residues in the Pacific northwest. (EL)
Document Type Paper/Chapter from book

Citation Number 80A000743
Article Title *Alcohol as a Biofuel: Coming around Again?*
Document Title Energy Primer: Solar, Water, Wind, and Biofuels
Article Author Merrill, R.
Aston, T.
Merrill, R. (ed.)
Gage, T.
Publisher Dell; New York, NY, USA
Publication Date 1978
Pages 208-213
Notes Updated and revised edition published in cooperation with Portola Institute, Inc.
Document Type Paper/Chapter from book

Citation Number 80A000747
Article Title *The Gasohol Bubble*
Article Author Schruben, L.W.
Conference Distillers Feed/Research Council annual meeting
Conference Date 30 Mar 1978
Journal Proceedings, Distillers Feed Research Council
Volume 33
Pages 4-11
Publication Date 30 Mar 1978

Document Type	Journal article

Citation Number	**80A000753**
Article Title	*Alcohols and Gaseous Fuels from Biomass*
Document Title	Automotive Propulsion: Proceedings of the Fourth International Symposium on Automotive Propulsion Systems
Article Author	McCallum, P.W.
Author Affiliation	Mueller Associates, Inc., Baltimore, Md. (USA)
Conference	4th international symposium on automotive propulsion systems
Conference Place	Washington, DC, USA
Conference Date	18 Apr 1977
Publication Date	1978
Pages	789-794
Notes	North Atlantic Treaty Organization. Committee on the Challenges of Modern Society
Abstract	Research performed for the ERDA, dealing with the utilization of digestion gas from municipal sewage treatment plants, is described. Since the energy value of present daily surplus anaerobic digestion gas equals only 0.28% of the daily Btu demand of automobile transportation, it is clear that if it is to make a significant contribution to the nation's fuel supply, new sources are needed whose output would be dedicated to this new use. The use of gas in internal-combustion engines is a well-established technology. Livestock feedlots generate large quantities of bioconvertible manure. In Oklahoma, a project under the direction of Calorific Recovery Anaerobic Process is expected to generate N9.9x107.1/d of gas for sale to a local utility. Pacific Gas and Electric Company, in cooperation with the University of California, has investigated the possibility of producing 1,000 Btu/ft^3 gas for commercial distribution from California's beef cattle feedlots. Utilization of landfill-bioderived gas will recover a useful fuel while relieving a safety hazard. Liquid fuels, principally alcohols, can also be generated by biological processes. Methanol can be made using organically derived methane and carbon dioxide as feedstocks to a synthetic process, and ethanol can be generated by fermentation. In Nebraska, a move is being made to form a fermentation alcohol plant using about 2.82x105 m^3 yr of subgrade corn, milo, and wheat. It is estimated that the output can be produced at a price of about \$0.29/l, compared with a current synthetic alcohol price of \$0.33/l. (POLL)
Document Type	Paper/Chapter from book

Citation Number	**80A001002**
Journal	Mech. Eng.
Pages	62
Publication Date	Jan 1980
Abstract	Alcohol will have increasing and permanent role to play as liquid fuel and chemical feedstock.
Document Type	Journal article

Citation Number	**80A001005**
Article Title	*Alternate Fuels Vital to Brazil*
Article Author	Hoge, W.
Journal	New York Times
Volume	129
Pages	E5
Publication Date	9 Mar 1980
Notes	v. 129, Section 4
Document Type	Journal article

Citation Number	**80A001006**
Article Title	*An Alternative as Lovely as a Tree?*
Journal	Sci. News
Volume	117
Pages	120
Publication Date	23 Feb 1980
Document Type	Journal article

Citation Number	**80A001011**
Journal	Fortune
Pages	146
Publication Date	Sep 1975
Abstract	Analyzes potential of methanol as a fuel.
Document Type	Journal article

Citation Number	**80A001012**
Article Title	*An Ancient Fuel Provides Energy for Modern Times*
Article Author	Berry, R.L.
Journal	Chem. Eng. (N.Y.)
Pages	73-76
Publication Date	21 Apr 1980
Document Type	Journal article

Citation Number	**80A001014**
Article Title	*API Sees Alcohol as Negative Factor in Energy Situation*
Journal	Chem. Mark. Rep.
Volume	214
Pages	49
Publication Date	17 Jul 1978
Document Type	Journal article

Citation Number	**80A001015**
Journal	Chem. Mark. Rep.
Pages	5
Publication Date	16 Aug 1976
Abstract	API study on alcohol as a fuel shows need for more R&D on future potentials.
Document Type	Journal article

Citation Number	**80A001020**
Article Title	*Argument Clouds Gasohol Issue*
Article Author	Callahan, J.M.
Journal	Automot. Ind.
Volume	159
Issue	9
Pages	90-92
Publication Date	1979
Document Type	Journal article

Citation Number	**80A001025**
Article Title	*Australia Plans Alcohol Fuel*
Journal	New York Times
Volume	128
Pages	D11
Publication Date	31 Aug 1979
Notes	v. 128, Section D
Document Type	Journal article

Citation Number	**80A001027**
Article Title	*The Automobile's Endangered Future*
Article Author	Brennan, R.P.
Journal	Futurist
Volume	13.

Issue	5
Pages	317
Publication Date	Oct 1979
Abstract	Major changes lie ahead for the standard automobile, as designers respond to policy decisions concerning energy, environmental safety, highway safety, and the technical innovations now under development. Future energy sources for gasoline replacement are discussed, including liquid fuels derived from coal, tar sands, or shale oil; alcohol fuels or a combination of alcohol and gasoline; electricity; hydrogen; fuel cells; and mixed fuels based on hydrogen. (EL)
Document Type	Journal article

Citation Number	**80A001028**
Article Title	*Automotive Fuels: Future Options*
Article Author	Ciccarone, A. Antonini, C. Virgilio, V.
Author Affiliation	Alfa Romeo, Mich. (USA) Research Dept.
Journal	Automot. Eng. (N.Y.)
Volume	85
Issue	1
Pages	20
Publication Date	Jan 1977
Abstract	The increasingly intense focus on fuel economy will affect engine technology as never before. Still, automobile fuel to the year 2000 will be primarily conventional hydrocarbon liquids like gasoline, diesel fuel, or broadcut fuel. The alcohols, especially methanol, have certain advantages over the conventional fuels but it remains to be seen whether or not they can compete economically with the less expensive fuels made from crude oil. While shale oil production may augment the crude supply, the appearance of shale crude should have no significant influence on the characteristics of finished products available to the automotive sector. Although much emphasis has been placed recently on the potential fuel savings of diesel engines, the average diesel-powered vehicle is similar in fuel consumption to the same vehicle power by an equivalent-performing gasoline engine. Also, only 60% of the future motor fuel demand could be supplied as diesel fuel without extensive adjustments in demands external to the automotive sector. (EL)
Document Type	Journal article

Citation Number	**80A001041**
Article Title	*"Gasohol" Freshens the Air over Iowa, but May Rut the Roads, Too*
Journal	Wall Street Journal
Volume	101
Pages	1
Publication Date	10 Oct 1979
Document Type	Journal article

Citation Number	**80A001046**
Article Title	*Gasohol — New Fuel Source from Mother Nature*
Journal	Compressed Air
Volume	84
Issue	11
Pages	8-12
Publication Date	1979
Document Type	Journal article

Citation Number	**80A001054**
Article Title	*Iowa's Boom in Gasohol*
Journal	Farmer's Digest
Pages	24-27
Publication Date	Oct 1979
Document Type	Journal article

Citation Number	**80A001056**
Article Title	*It May Look Like a 'Sunflower,' but There's Fuel in Those Stalks*
Article Author	Crowell, T.
Journal	Christian Science Monitor
Volume	72
Pages	1
Publication Date	6 May 1980
Document Type	Journal article

Citation Number	**80A001058**
Article Title	*Japan-Brazil Fuel Plan*
Journal	New York Times
Volume	128
Pages	D4
Publication Date	8 Jun 1979
Notes	v. 128, Section D
Document Type	Journal article

Citation Number	**80A001066**
Article Title	*Lance Crombie Energy Self-sufficiency Now!*
Journal	Mother Earth News
Pages	16
Publication Date	Feb 1979
Document Type	Journal article

Citation Number	**80A001089**
Article Title	*Valid Alternative, A, to Petroleum*
Article Author	Leao, J.
Journal	Brazilian Business
Volume	59
Issue	11
Pages	3
Publication Date	Nov 1979
Abstract	Growing market for "proalcool". Anhydrous alcohol delivered to petroleum distributors, 1978-1979. Map of projects — values concerning alcohol distilleries. Retrieval of methane gas from waste by-product of sugar production. Data on the market for equipment. (EAI)
Document Type	Journal article

Citation Number	**80A001123**
Article Title	*Paving the Way for Alcohol Fuels*
Article Author	Bernton, H.
Journal	Environmental Action
Volume	10
Issue	10
Pages	4
Publication Date	23 Sep 1978
Abstract	With the recent development of gasohol (a mixture of gasoline and alcohol distilled from waste products) proponents of the idea are claiming that the dependence on foreign imports can be reduced, along with automobile exhaust and such waste products as whey from cheese-making, corn stalks, and algae. The U.S. lags behind Sweden, Brazil, and W. Germany in many areas of alcohol research for energy purposes. Until 1977,

most U.S. governmental alcohol fuel programs were delegated to obscure offices. When farm state senators revived the issue, grassroots support brought it to the attention of powerful congressional leaders, who are now urging stronger government backing. Some high level energy officials and major oil companies, however, are convinced that alcohol is not a fuel of the future; scientific opinion is divided on the matter. A strong push from environmentalists could give the alcohol issue the impetus it needs to become a major contributor to energy alternatives and waste recycling. (EL)

Document Type | Journal article

Citation Number **80A001128**
Article Title *Physical and Thermodynamic Properties of Aliphatic Alcohols*
Article Author Wilhoit, R.C.
Zwolinski, B.J.
Journal Journal of Physical and Chemical Reference Data
Volume 2
Issue 1
Pages 1.40-1.54
Publication Date 1973
Document Type Journal article

Citation Number **80A001136**
Article Title *Priorities on Energy Research and Development*
Article Author Werth, G.C.
Ramsey, W.J.
Rubin, B.
Cooper, R.L.
Green, E.A.
Anderson, C.J.
Author Affiliation California Univ., Livermore (USA)
Journal Energy (Stamford, Conn.)
Volume 1
Issue 1
Pages 11
Publication Date Mar 1976
Abstract An analysis of national R&D priorities indicates that transportation is the most critical sector. Fuel needs of the transportation sector are surveyed. Unlike other markets, competitive transportation alternatives do not exist and must be developed. R&D opportunities in oil shale, synthetic gasoline, methanol, improved engines, and electric vehicles are discussed. Transportation receives only 13% of the federal energy R&D budget, and this is not enough. (EL)
Document Type Journal article

Citation Number **80A001155**
Article Title *UN Workshop Urges Wider Use of Ethanol*
Article Author O'Sullivan, D.A.
Journal Chem. Eng. News
Volume 57
Pages 11-12
Publication Date 23 Apr 1979
Document Type Journal article

Citation Number **80A001180**
Article Title *Methanol*
Document Title Encyclopedia of Chemical Technology; Volume 13
Article Author Woodward, H.F.
Publisher Wiley; New York, NY, USA
Publication Date 1967
Pages 370-398
Notes 2nd edition
Abstract This chapter describes the physical properties of methanol, several synthesis processes and identifies commercial producers and commercial users. Storage, shipping and safety aspects are also discussed. (AFDB)
Document Type Paper/Chapter from book

Citation Number **80A001185**
Article Title *Methanol*
Document Title International Encyclopedia of Pharmacology and Therapeutics; Volume 2, Alcohols and Derivatives
Article Author Koivusalo, M.
Publisher Pergamon Press; Oxford, NY, USA
Publication Date 1970
Pages 465-505
Notes Sponsored by the International Union of Pharmacology; Sec. 20, p. 465-505.
Document Type Paper/Chapter from book

Citation Number **80A001189**
Document Title *Synthetic Oil vs. Methanol as a Liquid Fuel Product from Waste Conversion Processes*
Document Author Sessler, G.
Author Affiliation Tenekron, Inc., Berkeley, Calif. (USA). Energy and Environmental Engineering Div.
Publication Date Mar 1977
Pages 72
Notes Submitted to State of California, Energy Resources Conservation and Development Alternatives, Implementation Division, Sacramento (USA).
Abstract This paper focuses on the production of liquid fuels, particularly fuel methanol and synthetic oil, from wastes. Each of these fuels is examined in terms of its 1) production from wastes; 2) characteristics as a fuel; and 3) potential uses and markets. The sections of the paper which deal with the production process include descriptions of the technology, the status of development, the efficiency and costs conversion, byproducts, and to a limited extent, environmental effects. The sections on the characteristics of the fuels include properties related to their value as fuels, and to the environmental and safety aspects associated with their use. The uses of the fuel are discussed in terms of the properties of the fuel, the potential availability of the fuel as a product of wastes in California, and environmental factors. (AUTHOR)
Document Type Book

Citation Number **80A001196**
Document Title *Alcohol Fuels; Methanol, Ethanol, Gasohol*
Document Author Segal, M.R.
Author Affiliation Library of Congress, Washington, D.C. (USA). Science Policy Research Div.
Series U.S. Library of Congress. Congressional Research Service. Report IB74087
Publication Date 20 Feb 1979
Pages 10

Abstract	Evaluated is the potential of methanol (wood alcohol) and ethanol (grain alcohol) as additives to or substitutes for automobile gasoline. The technological and economic feasibility of using these compounds as automotive fuels is examined. Methanol has excellent potential as an alternative automotive fuel because it can be derived in quantity from coal, wood, and urban wastes. However, the practicality of utilization of methanol from coal and wood resources is debated. Ethanol, which is derived from grain, is more difficult to obtain; its use on a nationwide basis is impossible. Ethanol may be useful in specific regions where grain (or other crops that can be distilled to produce ethanol) are grown in large quantities. Gasohol, which is a blend of 10% ethanol with 90% conventional gasoline, would be a practical and technologically and economically feasible method of reducing petroleum consumption without totally replacing petroleum. (EL)
Document Type	Book

Citation Number	**80A001199**
Document Title	*Alcohol Fuel in India; a Critical Survey of the Problem*
Document Author	Chatterji, N.G.
Series	Dept. of Industries and Commerce, United Provinces. Bulletin, New Ser., no. 3
Publisher	Supt., Print. and Stationery, United Provinces; Allahabad, IN
Publication Date	1942
Pages	11
Document Type	Book

Citation Number	**80A001200**
Document Title	*Gasohol — One Answer to the Energy Crisis*
Document Author	Cook, J.L.
Series	Public administration series bibliography no. P-316
Publisher	Vance Bibliographies; Monticello, IL, USA
Publication Date	Spr 1979
Pages	7
Notes	Mimeographed
Document Type	Book

Citation Number	**80A001204**
Document Title	*Ethanol Production and Utilization for Fuel*
Publisher	Univ. of Nebraska, Cooperative Extension Service, Institute of Agriculture and Natural Resources; Lincoln, NE, USA
Publication Date	Oct 1979
Pages	83
Abstract	Presents results of a study to evaluate the potential for fuel ethanol as an energy source. Includes discussion of the suitability and availability of raw materials, production processes, utilization of ethanol and by-products, governmental and safety considerations, and economics for farm-scale considerations.
Availability	Extension Publication Service, Agricultural Engineering Annex, University of Nebraska, Lincoln, NE 68583 $2.00
Document Type	Book

Citation Number	**80A001205**
Document Title	*Ethyl Alcohol Production and Use as a Motor Fuel*
Document Author	Paul, J.K.
Series	Chemical Technology Review, no. 144
Publisher	Noyes Data Corp.; Park Ridge, NJ, USA
Publication Date	1979
Pages	354
Abstract	Presents an economic assessment of possible modes of preparation of ethanol from various forms of biomass, natural resources, and their waste materials or by-products. Includes discussion of production technology, the Brazilian and Nebraska programs, and motor vehicle operation with ethanol and ethanol blends.
Availability	Noyes Data Corp., Mill Rd. at Grand Ave., Park Ridge, NJ 07656 $48.00
Document Type	Book

Citation Number	**80A001239**
Article Title	*Methanol — Chemical Uses Today*
Document Title	Methanol as an Alternative Fuel
Article Author	Frick, L.T.
Author Affiliation	Du Pont de Nemours (E.I.) and Co. (USA)
Conference	1974 engineering foundation conference
Conference Place	Henniker, NH, USA
Conference Date	7 Jul 1974
Publisher	Engineering Foundation; New York, NY, USA
Publication Date	1974
Availability	Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type	Paper/Chapter from book

Citation Number	**80A001251**
Document Title	*Survey of Alcohol Fuel Technology; Volume I*
Document Author	Baratz, B. Ouellette, R. Park, W. Stokes, B.
Author Affiliation	Mitre Corp., McLean, Va. (USA)
Report Number	PB-256 007/6ST M74-61-Vol-1 Contract NSF-C925
Publication Date	Nov 1975
Pages	143
Notes	See also Volume 2, PB-256 008.
Abstract	This report summarizes a study on alcohol fuel technology sponsored by the National Science Foundation during the months of June through September 1974. The goals of this study have been to collect a base of information on alcohols as fuel, to synthesize current research on the subject, and to make an effort to tabulate current and ongoing research. The report also lists current researchers, their research topics, and their locations. (NTIS)
Availability	NTIS
Document Type	Report

Citation Number	**80A001252**
Document Title	*Survey of Alcohol Fuel Technology; Volume II.*
Document Author	Stokes, B. Park, W.
Author Affiliation	Mitre Corp., McLean, Va. (USA)
Report Number	PB-256 008/4ST M74-61-Vol-2 Contract NSF-C925
Publication Date	Nov 1975
Pages	68
Notes	See also Volume 1, PB-256 007.

Abstract	Research was conducted on alcohol fuel technology. The goals of this study have been to collect a base of information on alcohols as fuel, to synthesize current research on the subject, and to make an effort to tabulate current and ongoing research. This volume is a bibliography covering all aspects of alcohol fuel technology. (NTIS)
Availability	NTIS
Document Type	Report

Citation Number	**80A001258**
Document Title	*Hydrogen and Other Synthetic Fuels: a Summary of the Work of the Synthetic Fuels Panel*
Corporate Author	Atomic Energy Commission, Synthetic Fuels Panel
Report Number	PB-224 482
Publication Date	Sep 1972
Pages	135
Abstract	Synthetic fuels from nonfossil sources were studied as alternatives for supplying the long term needs for gaseous and liquid fuels. The selected fuels include hydrogen obtained from water and synthetic fuels containing hydrogen as ammonia, hydrazine, methanol, and related substances. Hydrogen has outstanding potential as a fuel for the transportation sector because of its unique, nonpolluting character. The applications would initially be for fleet-operated trucks and buses, high-speed trains, and aircraft, and may later extend to private automobiles. Methanol was identified as an attractive near-term automotive fuel. While not as clean burning as hydrogen, it is superior to gasoline and would more readily fit into existing vehicle designs and fuel logistics systems, although its relatively low heating value and boiling point imply changes in on-board storage concepts. The conversion of agricultural and urban wastes to synthetic fuels could supply a significant fraction of the 1985 shortage of pipeline gas, probably at costs competitive with imports. (Author summary modified) (APTIC)
Availability	NTIS
Document Type	Report

Citation Number	**80A001259**
Document Title	*Gasohol: a Technical Memorandum*
Corporate Author	Office of Technology Assessment (U.S. Congress), Washington, D.C. (USA)
Report Number	PB80-105885 OTA/TM/E-1
Publication Date	Sep 1979
Pages	89
Abstract	The Office of Technology Assessment is currently preparing an assessment of energy from biological processes. An extensive analysis of alcohol fuels from agricultural products was performed. This technical memorandum presents these findings in response to congressional interest in synthetic fuels. The purpose of the memorandum is to illuminate the technical and non-technical issues surrounding the development of gasohol. It discussed the resource base, production technologies, and economics of gasohol, and its use as a transportation fuel. The report also contains a discussion of the environmental problems and benefits of producing and using gasohol, and the social and institutional issues about using agricultural products for energy. The final report on energy from biological processes is scheduled for delivery to Congress in January 1980 and will contain an analysis of policy options about gasohol as well as other bioenergy technologies such as wood and methanol production. (NTIS)
Availability	NTIS
Document Type	Report

Citation Number	**80:002001**
Article Title	*Biological Production of Liquid Fuels from Biomass. Summary Report*
Document Title	3rd Annual Biomass Energy Systems Conference
Article Author	Humphrey, A.E. Nolan, E.J.
Author Affiliation	Pennsylvania Univ., Philadelphia (USA)
Conference	3rd annual biomass energy systems conference
Conference Place	Golden, CO, USA
Conference Date	5 Jun 1979
Report Number	SERI/TP — 33-285 CONF-790638 —
Publication Date	Oct 1979
Pages	581-587
Abstract	The purpose of this Summary is to describe past, present, and proposed technologies for the biological production of liquid fuels and chemical feedstocks from biomass raw materials and to assess their potential for contributing to the national energy supply. The biomass raw materials of interest can be grouped into four categories, i.e., (1) cereal grain starches, (2) sugar from cane and other similar agricultural crops, (3) cellulose from agricultural residues and municipal wastes, and (4) wood. The fuel under consideration is ethanol derived by fermentation processes. The Summary comprises three major considerations: (1) economic analysis of existing process technologies and estimation of alcohol production costs of these processes translated into mid-1978 costs; (2) comparison of processes based on present and envisioned technological developments; and (3) technological challenges and breakthroughs needed to make the production of alcohol from biomass economically and energetically attractive.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A002015**
Article Title	*Developing Gasohol*
Article Author	Hoge, W.H.
Journal	New York Times
Volume	129
Pages	A25
Publication Date	3 Dec. 1979
Notes	v. 129, Section A
Document Type	Journal article

Citation Number	**80A002022**
Article Title	*Alcohol as a Fuel*
Article Author	Blanchard, P.H.
Journal	Chemistry in Britain
Volume	15
Issue	5
Pages	232
Publication Date	1979
Document Type	Journal article

Citation Number	**80A002031**
Article Title	*Alcohol Fuels: a Major Source of Power Only a Few Years from Here*
Article Author	Bernton, H.
Journal	Environmental Action Bulletin
Publication Date	29 Oct 1977
Document Type	Journal article

Citation Number	**80A002040**
Journal	Eur. Chem. News
Pages	38
Publication Date	27 Sep 1974
Abstract	EPA researchers study supports use of methanol as fuel.
Document Type	Journal article

Citation Number	**80A002045**
Article Title	*Ethanol — an Alternative to Its Use as Fuel.*
Author Affiliation	Union Carbide Corp., New York (USA)
Journal	Int. Sugar J.
Volume	82
Issue	974
Pages	41-44
Publication Date	1980
Document Type	Journal article

Citation Number	**80A002050**
Article Title	*Ethanol: It's a Slow, Uphill Climb*
Journal	Chem. Week
Publication Date	12 Jan 1977
Document Type	Journal article

Citation Number	**80:002059**
Document Title	*New Fuels and Advances in Combustion Technologies*
Conference	New fuels and advances in combustion technologies symposium
Conference Place	New Orleans, LA, USA
Conference Date	26 Mar 1979
Publisher	Institute of Gas Technology; Chicago, IL, USA
Report Number	CONF-790337 —
Publication Date	1979
Pages	897
Abstract	The Symposium on New Fuels and Advances in Combustion Technologies was held March 26-30, 1979 at New Orleans, Louisiana. It was sponsored by the Institute of Technology, 3424 South State Street, Chicago, Illinois, 60616. The papers deal mainly with novel sources of energy (biomass conversion to methane, use of refinery off gases, alcohols, agricultural and urban wastes, etc.) and with methods of predicting the interchangeability of these and other gases as they are mixed by gas utilities and burned by their customers. The papers have been entered individually into EDB. Five papers had been entered previously from other sources. (LTN)
Availability	Institute of Gas Technology, Chicago, IL $60.00
Document Type	Book

Citation Number	**80A002062**
Article Title	*Farming for Fuel — Alcohol Motor Fuel Movement of the 1930's*
Article Author	Giebelhaus, A.W.
Author Affiliation	Georgia Inst. of Tech., Atlanta (USA). Dept. Social Sci.
Journal	Agricultural History
Volume	54
Issue	1
Pages	173-184
Publication Date	1980
Document Type	Journal article

Citation Number	**80A002077**
Article Title	*A Go-ahead for Gasohol*
Journal	Farm J.
Volume	104
Pages	48
Publication Date	Feb 1980
Document Type	Journal article

Citation Number	**80A002082**
Article Title	*"Green Petrol" — a Possible Palliative for the Oil Crisis*
Article Author	Fishlock, D.
Journal	OPEC Bulletin
Volume	10
Issue	22
Pages	9
Publication Date	4 Jun 1979
Abstract	Meaning of gasohol, a mixture of gasoline and alcohol, in the oil crisis, 1979. Gasohol production in Brazil, Thailand, Sudan, and the USA. Elements for the production of power alcohol. Production costs. (Financial Times, May 29, 1979). (EAI)
Document Type	Journal article

Citation Number	**80A002084**
Article Title	*Growing Fuel on the Farm May Help as the Oil Runs Out*
Journal	Rural Res. in CSIRO
Issue	103
Pages	4-11
Publication Date	1979
Document Type	Journal article

Citation Number	**80A002086**
Article Title	*Half of New Zealand's Gasoline Needs (Could Be Met by Methanol Conversion)*
Article Author	Ferkiss, B.
Journal	Environment
Volume	21
Pages	24
Publication Date	Aug 1979
Document Type	Journal article

Citation Number	**80A002087**
Article Title	*Heads Up Down Under*
Article Author	Conway, J.A.
Journal	Forbes
Volume	124
Pages	9
Publication Date	10 Dec 1979
Document Type	Journal article

Citation Number	**80A002101**
Article Title	*How Far Can Gasohol Go?*
Article Author	Levy, R.
Journal	Dun's Review
Volume	114
Issue	1
Pages	44-47
Publication Date	Jul 1979

Abstract	With the nation's energy crunch, interest is shaping up in the use of gasohol which is a blend of 90% gasoline and 10% alcohol. Gasohol is being touted as a means of stretching the supply of gas while improving mileage per gallon, as well as reducing exhaust emissions. Those senators from the agricultural states are pushing for the use of gasohol. Grain alcohol can be distilled from virtually any agricultural resource. Despite all the enthusiasm for gasohol, there is still doubt if it will fulfill expectations. There are questions about price and performance. The biggest question is whether gasohol can be produced in sufficient quantities to alleviate the nation's gas problem. At the present rate of production, there is little ethanol left over for gasohol. The big stumbling block is the large amount of additional grain that would have to be produced to get the needed ethanol. Gasohol is also difficult to handle. General Motors says that tests have not shown that gasohol really gives better mileage. At this point, no one is really certain about the future of gasohol. (ABI)
Document Type	Journal article

Citation Number	**80A002102**
Article Title	*How the Development of a Gasohol Industry Will Affect Farmers*
Article Author	Barton, W.
Journal	Tennessee Farmer
Pages	5
Publication Date	Sep 1979
Document Type	Journal article

Citation Number	**80A002103**
Article Title	*How to Beat OPEC's Hold on Diesel Fuel*
Article Author	Nelson, M.J.
Journal	Irrigation Age
Volume	14
Issue	4
Pages	15
Publication Date	Jan 1980
Abstract	To reduce U.S. dependence on OPEC oil supplies, ethanol production techniques are being developed. Efforts by various universities and private individuals in producing alcohol fuels, such as gasohol and diesohol, from grains and vegetables are reported. Work to modify the diesel engine to run on alcohol fuels is examined. While vegetable and grain fuels are not yet cost-competitive with diesel oil, expected increases in OPEC oil prices will soon change this situation. (EL)
Document Type	Journal article

Citation Number	**80A002122**
Article Title	*Alternate Portable Fuels for Internal Combustion Engines*
Journal	SAE Prepr.
Issue	790426
Pages	28
Publication Date	1979
Abstract	A comprehensive study of the alternative fuels is presented giving extraction, transportation, and processing efficiencies for each fuel type. Distillates and gasolines produced from coal and shale, ethanol, methanol, and hydrogen are all considered. (AFDB)
Document Type	Journal article

Citation Number	**80A002141**
Document Title	*Goosen's EtOH Fuel Book*
Document Author	Goosen, C. Goosen, B.
Publisher	Harvester Press; Henderson, NC, USA
Publication Date	1980
Pages	36
Document Type	Book

Citation Number	**80A002142**
Document Title	*Gasohol — Are Alcohol Fuels in Our Future?*
Document Author	Bossong, K. Paskin, M.
Series	Citizen's Energy Project Report Series, no. 24
Publisher	Citizen's Energy Project; Washington, DC, USA
Publication Date	Spr 1978
Pages	14
Document Type	Book

Citation Number	**80A002143**
Document Title	*A Background Report on Ethanol's Role in the Current Gasoline Crisis Presented to the U.S. Congressional Gasohol Caucus*
Document Author	Commoner, B. Carlson, R. Scott, R. Freedman, D.
Publisher	Center for the Biology of Natural Systems, Washington Univ.; St. Louis, MO, USA
Publication Date	25 Jun 1979
Pages	17
Notes	CBNS-AEP-4
Document Type	Book

Citation Number	**80A002144**
Document Title	*Solar Alcohol; the Fuel Revolution*
Document Author	Mandeville, M.W.
Publisher	Ambix; Seattle, WA, USA
Publication Date	Mar 1980
Pages	127
Notes	Second edition, 1980; includes bibliography.
Availability	Ambix, P.O. Box 353, Port Ludlow, WA 98365
Document Type	Book

Citation Number	**80A002145**
Document Title	*Alcohol as Fuel; References Selected from Current Awareness, 1977-1979*
Publisher	Tennessee Valley Authority, Technical Library; Muscle Shoals, AL, USA
Publication Date	1979
Pages	6
Document Type	Book

Citation Number	**80A002146**
Document Title	*Gasohol for Energy Production*
Document Author	Cheremisinoff, N.P.
Series	Energy Technology Series
Publisher	Ann Arbor Science Publishers; Ann Arbor, MI, USA
Publication Date	1979
Pages	150
Notes	Includes bibliography.
Abstract	The 9 chapters of this timely monograph discuss biomass as a source of energy (introduction, historical developments, sources of feedstocks), the chemistry of alcohols (MeOH, EtOH, PrOH, BuOH, and properties of biomass-derived alco-

hols), methanol synthesis (from synthesis gas, from hydrocarbon oxidation, and from wood wastes, incl. thermodynamic considerations), automotive uses of MeOH, ethanol synthesis and fuel use (incl. legal implications, and Brazil's experience with large-scale usage), development of a nationwide methanol/gasoline blend (incl. economic aspects of government involvement), special uses and problems with alcohol fuels (incl. electric power generation, MeOH use in natural gas industry, transport and storage hazards, and environmental considerations), and mass production of biomass for synthetic fuels (species and productivity, land suitability and availability, site characteristics, energy farming, systematic use of biomass-based energy generation). A selected bibliography, a list of specific reference, a glossary, and an index are appended. (PAPER CHEM)

Document Type: Book

Citation Number **80A002159**
Article Title: *Motor Alcohol in Czechoslovakia*
Article Author: Helwich, L.A.
Journal: Ind. Eng. Chem., News Ed.
Volume: 14
Pages: 278-279
Publication Date: 1936
Document Type: Journal article

Citation Number **80A002181**
Article Title: *Industrial Alcohol from Crops. Chemical Outlet for British Agriculture*
Journal: Chem. Age (London)
Volume: 51
Issue: 1331
Pages: 609-610
Publication Date: 30 Dec 1944
Abstract: Notes on growing of crops for alcohol production; before war much research work was carried out on alcohol motor fuel; alcohol gasoline mixtures, giving many advantages to internal combustion engine, were on British market for several years before 1939; alcohol from cereals; root crops; dehydration alcohol; gasoline in dehydration. (EI)
Document Type: Journal article

Citation Number **80A002183**
Article Title: *Industrial Alcohol for Motor Fuel*
Article Author: Williams, A.E.
Journal: Chem. Age (London)
Volume: 30
Issue: 776
Pages: 403
Publication Date: 12 May 1934
Abstract: Evaporation of alcohol fuel from molasses and potatoes and requirements for use in internal-combustion engines. (EI)
Document Type: Journal article

Citation Number **80A002227**
Article Title: *Alcohol for War*
Article Author: Othmer, D.F.
Journal: Nebraska Blue Print
Volume: 42
Issue: 4
Pages: 75-78
Publication Date: Jan 1943
Abstract: General features of plans to supply estimated 590,000,000 gal of alcohol in United States; conversion of whiskey plants; illustration showing flow sheet for production of 190 degree proof alcohol by Schenley process, using existing equipment and minimum of added equipment; anhydrous alcohol for motor fuels. (EI)
Document Type: Journal article

Citation Number **80A002239**
Document Title: *Ethyl Alcohol, Pure Ethyl Alcohol, Specially Denatured Alcohol, Completely Denatured Alcohol and U.S.; I. Proprietary Solvents*
Corporate Author: U.S. Industrial Chemicals, Inc.
Publisher: U.S. Industrial Chemicals, Inc.; New York, NY, USA
Publication Date: 1960
Pages: 131
Abstract: A comprehensive review of the authorized uses specifications and commercial date for industrial ethyl alcohol...Government regulations...are presented as a supplement in back cover pocket of this catalog. (NUC)
Document Type: Book

Citation Number **80A002240**
Document Title: *Power Alcohol, Its Production and Utilization*
Document Author: Monier-Williams, G.W.
Series: Oxford Technical Publications
Publisher: H. Frowde; London, GB
Publication Date: 1922
Pages: 335
Notes: References at ends of chapters
Document Type: Book

Citation Number **80A002241**
Document Title: *The Production and Use of Power Alcohol in Asia and the Far East; Report*
Conference: Regional seminar on the production and use of power alcohol
Conference Place: Lucknow, India
Conference Date: 1952
Publisher: United Nations; New York, NY, USA
Publication Date: 1954
Pages: 445
Document Type: Book

Citation Number **80A002243**
Article Title: *Alcohol — Consuming Apparatus. Paris Exhibition; Concerning an Exhibition in Paris of Inventions for the Use of Alcohol for Illuminating or Heating Purposes or for Motor Power*
Article Author: Couvert, J.C.
Publication Date: 1901
Pages: 500
Notes: House Document no. 556, part 4, 56th Congress, 2nd session
Document Type: Paper/Chapter from book

Citation Number **80A002244**
Article Title: *Methanol: How, Where, Who — Future*
Article Author: Hedley, B.
Powers, W.
Stobaugh, R.B.
Author Affiliation: Harvard Univ., Boston, Mass. (USA)
Journal: Hydrocarbon Process.

Volume	49
Issue	6
Pages	97
Publication Date	Sep 1970
Document Type	Journal article

Citation Number	**80A002267**
Article Title	*Biomass Energy Refineries for Production of Fuel and Fertilizer*
Article Author	Reed, T.B.
Author Affiliation	Massachusetts Inst. of Tech., Cambridge (USA)
Journal	Appl. Polym. Symp.
Volume	28
Pages	1-9
Publication Date	1975
Notes	Proc. Cellul. Conf., 8th, 1975, v. 1
Document Type	Journal article

Citation Number	**80A002269**
Article Title	*Do We Have a Choice?*
Journal	Automot. Eng. (N.Y.)
Volume	86
Issue	7
Pages	26-31
Publication Date	Jul 1978
Abstract	A Maryland DOT report discusses the future of automotive transportation, fuels, and powerplants. A number of other studies are quoted in the report, including such comments as: mass transit systems cannot at present compete with the automobile in terms of travel time and flexibility and often not in terms of cost either; new rail rapid transit systems consume much more energy in their construction than do highways. As for synthetic fuels, they cannot compete with natural crude at present prices; in addition, the OPEC countries could, in the short term, destroy such a new undertaking, simply by lowering the price of crude. Methanol seems to be better suited as a fuel for utility gas turbines than for automobiles, and could thus release liquid petroleum-based fuels for automotive use. Engines other than the Otto-cycle will probably not appreciably penetrate the automotive market much before petroleum shortages become severe. In the long term (after the year 2000) fuel cells, hydrogen, or very advanced electric propulsion may dominate transportation, especially if energy economics favor production of electricity from nuclear power or natural sources such as wind power. (EI)
Document Type	Journal article

Citation Number	**80A002270**
Document Title	*Bibliography on Alcohol Production and Use of Agricultural Crops as a Source of Motor Fuels*
Publisher	U.S. Dept. of Agriculture, Agricultural Research Service
Publication Date	Aug 1959
Pages	6
Notes	(ARS-71-7 Rev.)
Abstract	A bibliographical review of work conducted at the Northern Utilization Research and Development Division of the U.S. Department of Agriculture on alcohol production and use of agricultural crops as a source of motor fuels between 1940 and 1955 is presented. (AFDB)
Document Type	Book

Citation Number	**80A002274**
Document Title	*Power Alcohol, History and Analysis*
Corporate Author	American Petroleum Institute Committee on Motor Fuels
Publisher	American Petroleum Institute; New York, NY, USA
Publication Date	1940
Pages	58
Notes	Bibliography included.
Document Type	Book

Citation Number	**80A002275**
Document Title	*Power Alcohol; a Brief Analysis to Force Use of Farm Alcohol in Motor Fuel*
Publisher	American Petroleum Institute; New York, NY, USA
Publication Date	1940
Pages	16
Document Type	Book

Citation Number	**80A002276**
Document Title	*Alcohol Fuels*
Corporate Author	Committee on Appropriations (U.S. Senate), Washington, D.C. (USA)
Publisher	U.S. Government Printing Office; Washington, DC, USA
Publication Date	1978
Pages	706
Notes	Y4.Ap 6/2-A 1 1/3/979
Document Type	Book

Citation Number	**80A002285**
Article Title	*The Debut of the Alcoholic Automobile*
Article Author	Nerpel, C.
Journal	Motor Trend
Volume	32
Pages	100
Publication Date	Mar 1980
Document Type	Journal article

Citation Number	**80A002289**
Article Title	*Gasoline Substitutes*
Article Author	Judd, B.
Journal	N.Z. Energy J.
Volume	50
Issue	8
Pages	127
Publication Date	25 Aug 1977
Abstract	Several methods could substitute alternative fuels derived from indigenous sources to reduce New Zealand's $200 million/yr reliance on gasoline imports. Coal-derived fuels, natural gas, LPG, hydrogen, ammonia and hydrazine, and alcohols are discussed. Relevant data for the fuels are tabulated. In the short term, LPG and methanol are possible, but neither can be substituted immediately to meet more than part of the total gasoline demand. Ethanol produced by fermentation of plant material may offer the best long-term solution. (EL)
Document Type	Journal article

Citation Number	**80A002290**
Article Title	*Prospects for Energy Farming*
Article Author	Troughton, J.H. Cousins, W.J.
Journal	N.Z. Energy J.

Volume	49
Issue	12
Pages	190
Publication Date	25 Dec 1976
Abstract	Energy farming with proved technology could decrease turnover times of the biological carbon cycle from millions of years to 10-15 years, and could use solar energy captured by plants to provide a part of New Zealand's future energy demand. Plant material could be converted by various biological and nonbiological processes to methane gas, synthesis gas, methanol, ethanol, petroleum-like products, and benzene. Significant amounts of energy could be produced by energy farming on 10% of the agriculturally occupied land in New Zealand. Energy farming in New Zealand and the national energy market are discussed. (EL)
Document Type	Journal article

Citation Number	**80A002313**
Article Title	*Production and Use of Grain Alcohol as a Motor Fuel — an Evaluation*
Article Author	Klosterman, H.J. Banasik, O.J. Buchanan, M.L. Taylor, F.R. Harrold, R.L.
Author Affiliation	North Dakota State Univ., Fargo (USA). Agricultural Experiment Station
Journal	North Dakota Farm Research
Volume	35
Issue	2
Pages	3-9
Publication Date	Nov 1977
Document Type	Journal article

Citation Number	**80A003004**
Document Title	*Alcohol Fuels; Opportunities for Idaho*
Corporate Author	Department of Energy (USA). Office of Alcohol Fuels
Publisher	U.S. Department of Energy, Office of Alcohol Fuels
Publication Date	9 Apr 1980
Pages	85
Document Type	Book

Citation Number	**80A003007**
Document Title	*The Feasibility of Gasohol from Renewable Agricultural and Forest Resources for Use as a Gasoline Additive; an Examination of the Issues*
Document Author	Smith, S.M. Jackson, M.L. Johnson, L.
Author Affiliation	Idaho Univ., Moscow (USA). Coll. of Agriculture, Agricultural Experimental Station
Series	Idaho Agricultural Experimental Station. Progress Report
Publication Date	Apr 1978
Pages	16
Notes	Report no. 202
Document Type	Book

Citation Number	**80A003008**
Document Title	*Agriculture and Energy*
Document Author	Fischer, L.K.
Series	Nebraska Univ., Lincoln (USA). Coll. of Agriculture and Home Economics. Dept. of Agricultural Economics. Staff Paper 1973-10
Publication Date	1973
Pages	5
Notes	Guest editorial in the summer 1973 issue of "Nebraska Resources," the official publication of the Natural Resources Commission
Abstract	Proposals for alleviating the energy crisis include the use of wheat, corn or other grains as raw material for producing alcohol to be used as a motor fuel. The various grains do, of course, contain energy. Furthermore, some of the energy in these products has been captured by plants through photosynthesis. However, in a highly mechanized and capitalized agriculture such as we have in the U.S., the total amount of energy contained in agricultural products is only a small fraction of the fossil fuel energy consumed in their production. Consequently this alternative appears to hold no promise for providing (1) a solution to the energy crisis or (2) a lucrative market for farm products. (NAL)
Document Type	Book

Citation Number	**80A003012**
Document Title	*Canadian Renewable Energy Prospects; Canada Dept. of Energy Mines and Resources Report*
Document Author	Swain, H. Overend, R. Ledwell, T.A. Hollins, J.G.
Publisher	Canada Dept. of Energy, Mines and Resources; Ottawa, Ontario, CA
Pages	30
Abstract	Potential uses of various renewable energy sources in Canada are outlined in the context of current and future shortages in conventional energy supplies. Solar energy is the only potential renewable energy source that can provide energy at decreasing prices. But it will not become an important energy source in Canada in the near future because of installation problems. Forest biomass burning can provide limited relief to shortages in conventional energy supplies. Problems concerning wide-scale use of forest and agricultural biomass in the production of methanol fuel are outlined. Potential uses of wind and tidal power, ocean thermal gradients, and geothermal energy are still being assessed. Hydroelectric power stands as Canada's main renewable energy source; it supplies 72.6% of the nation's total electric generation. Technology for renewable energy source use must be improved as fossil fuel sources deplete. (EL)
Document Type	Book

Citation Number	**80A003019**
Document Title	*Chemicals from Fermentation*
Document Author	Hahn, P.A.
Publisher	Doubleday; Garden City, NY, USA
Publication Date	1968
Pages	118
Notes	Includes bibliography.
Document Type	Book

Citation Number	**80A003022**
Document Title	*Alcohols: Their Chemistry, Properties, and Manufacture*
Document Author	Monick, J.A.
Author Affiliation	Colgate-Palmolive Co., Research and Development (USA)
Publisher	Reinhold Book Corp.; New York, NY, USA
Publication Date	1968
Pages	594
Abstract	The entire chemical basis of alcohol is presented; the history and current industrial synthesis of alcohol is set forth.
Document Type	Book

Citation Number	**80A003025**
Document Title	*Methyl Alcohol from Brazil*
Document Author	Cates, B.
Series	USITC publication 837
Publisher	U.S. International Trade Commission; Washington, DC, USA
Publication Date	1977
Pages	56
Document Type	Book

Citation Number	**80A003043**
Article Title	*Use of Alcohol Fuel Outside of United States*
Article Author	Moseley, J.W.
Journal	Mines Mag.
Volume	26
Issue	10
Pages	12-14
Publication Date	Oct 1936
Abstract	Advantages and disadvantages of alcohol as motor fuel; manufacture of alcohol from sugar-cane molasses; alcohol yields by different types of fermentation; estimated cost of equipment for plant handling 5500 gallons of molasses per day; estimated manufacturing costs; alcohol gasoline blends. Bibliography. (EI)
Document Type	Journal article

Citation Number	**80A003046**
Article Title	*Industrial Alcohol*
Article Author	Williams, A.E.
Journal	Engineering (London)
Volume	140
Issue	3626
Pages	27-29, 40
Publication Date	12 Jul 1935
Notes	See also v. 140, no. 3627, July 19, 1935, pages 53-54.
Abstract	Review of practice in European countries; use of potatoes instead of molasses; examples of typical distillation plants; use of alcohol as motor fuel; alcohol-gasoline and alcohol-ether mixtures. (EI)
Document Type	Journal article

Citation Number	**80A003065**
Article Title	*Industrial Alcohol Production and Uses in the Phillipines*
Article Author	Cole, H.I.
Journal	Chemical Age (N.Y.)
Volume	30
Issue	11
Pages	489-492
Publication Date	Nov 1922
Abstract	Sources of alcohol in tropics; fermentation of molasses; alcohol mixtures as fuels; ether production. (EI)
Document Type	Journal article

Citation Number	**80A003072**
Article Title	*Fermentation Sphinx and Kobold Alcohol*
Article Author	Lindner, P. Arnstein, H.
Journal	Planter and Sugar Manufacturer
Volume	81
Issue	16
Pages	301-303
Publication Date	20 Oct 1928
Abstract	New development concerning fermentation, respiration and metabolism; utilizing surplus by manufacture of alcohol; decrease gasoline production; growth of automobile production; picture of world's oil situation visualized in Great Britain; comparison of gasoline and alcohol for fuel; desirability of union of sugar and alcohol industries. (EI)
Document Type	Journal article

Citation Number	**80A003087**
Article Title	*Fuel Alcohol Production from American Farm and Forest Resources*
Article Author	McHard, D.R.
Author Affiliation	Union Development Co. (USA)
Journal	Gasohol U.S.A.
Volume	2
Issue	3
Pages	22-23, 35
Publication Date	Mar 1980
Document Type	Journal article

Citation Number	**80A003098**
Article Title	*Get the Lead Out with Alcohol*
Journal	Gasohol U.S.A.
Issue	4
Pages	8-10
Publication Date	Sep 1979
Document Type	Journal article

Citation Number	**80A003100**
Article Title	*Alcohol and the Cattle Industry*
Article Author	Mavis, A.
Author Affiliation	National Gasohol Commission (USA)
Journal	Gasohol U.S.A.
Volume	1
Issue	6
Pages	6-8, 35
Publication Date	Nov 1979
Document Type	Journal article

Citation Number	**80A003106**
Article Title	*Alcohol Answers War against Automobile*
Journal	Gasohol U.S.A.
Volume	2
Issue	2
Pages	17-18
Publication Date	Feb 1980
Abstract	One of the early endorsements for gasohol came out of the American Automobile Association several months ago. In 1979 the reasoning behind that endorsement was brought to the fore by Richard F. Curry, Director of Environment and

	Energy at AAA, speaking before the San Antonio meeting of the National Gasohol Commission, December 3, 1979. Here is the text of Curry's message. (GAS. USA/MS)
Document Type	Journal article

Citation Number	**80A003125**
Document Title	*Grain Alcohol Study*
Publisher	Indiana Department of Commerce; Indianapolis, IN, USA
Publication Date	1975
Pages	66
Notes	F. Lindsey, project manager
Abstract	An indexed handbook on alcohol blended motor fuels, alcohol production, industrial alcohol, agricultural capabilities, economics and conclusions.
Availability	Indiana Solar Office, 440 N. Meridian, Indianapolis, IN 46204
Document Type	Book

Citation Number	**80A003128**
Document Title	*Alcohol Fuels (Citations from the Engineering Index Data Base); Report for 1970 — June 1979*
Publisher	National Technical Information Service; Springfield, VA, USA
Report Number	NTIS/PS-79/0714
Publication Date	Jul 1979
Pages	247
Abstract	Bibliography with abstracts on alcohol fuels. Includes synthesis, performance evaluation, safety, cost analysis, economic analysis, sources, agricultural wastes, process charting, pollution, plants, engines, and by-products.
Availability	NTIS
Document Type	Report

Citation Number	**80A003129**
Document Title	*Alcohol Fuels (Citations from the NTIS Data Base); Volume 1, 1964-1977*
Publisher	National Technical Information Service; Springfield, VA, USA
Report Number	NTIS/PS-79/0712
Publication Date	Jul 1979
Pages	170
Notes	See also Alcohol fuels (citations from the NTIS data base), v. 2, 1978-June 1979. NTIS/PS-79/0713
Abstract	Bibliography with abstracts covering federally-funded research on alcohol based fuels. The citations cover synthesis, chemical analysis, performance testing, processing, pollution, economics, environmental effects, and feasibility.
Availability	NTIS
Document Type	Report

Citation Number	**80A003130**
Document Title	*Alcohol Fuels (Citations from the NTIS Data Base); Volume 2, 1978 — June 1979*
Publisher	National Technical Information Service; Springfield, VA, USA
Report Number	NTIS/PS-79/0713
Publication Date	Jul 1979
Pages	144
Notes	Updates Alcohol fuels (citations from the NTIS data base), v. 1, 1964-1977. NTIS/PS-79/0712
Availability	NTIS
Document Type	Report

Citation Number	**80A003131**
Document Title	*Alcohol Fuels (Citations from the American Petroleum Institute Data Base); Report for 1973 — July 1979*
Publisher	National Technical Information Service; Springfield, VA, USA
Report Number	NTIS/PS-79/0911/2ST
Publication Date	Sep 1979
Pages	184
Abstract	Research on alcohol fuels are cited. The citations cover synthesis, chemical analysis, performance testing, processing, pollution, economics, environmental effects, and feasibility. (NTIS)
Availability	NTIS
Document Type	Report

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II
Feedstocks — General

Citation Number 79:004127
Document Title *Technology and Economics of Conversion of Cellulose (Wood) and Corn Starch to Sugars, Alcohol and Yeast. Final Report*
Document Author Wolnak, B.
Corporate Author Wolnak (Bernard) and Associates, Chicago, IL (USA)
Report Number COO — 5007-1
Contract ET-78-X-02-5007
STD-61
Publication Date Aug 1978
Pages 253
Abstract The present status of the technology and economics for the production of glucose, alcohol, and yeast from cellulose (wood), corn starch, and molasses is analyzed. The basic processes for producing glucose and the factors affecting the economics of its production are reviewed. The costs of producing ethanol and yeast from the glucose are derived. Market availability of glucose, ethanol, and yeast is surveyed. (JSR)
Availability NTIS
Document Type Report

Citation Number 80A000069
Article Title *Brazil Promotes PROALCOOL for Petroleum Independence*
Article Author Stout, B.A.
Peart, R.M.
Buchele, W.F.
Finch, E.
Journal Agric. Eng.
Volume 59
Issue 4
Pages 30-33
Publication Date Apr 1978
Abstract This article presents a review and update of the ethyl alcohol program in Brazil, sugarcane, mandioc, plant sorghum and rattoon sorghum as raw materials each show a positive energy balance when considered as the raw material for alcohol production. Ecalyptus wood and crops residue is used for process heat. (AFDB)
Document Type Journal article

Citation Number 80A000144
Article Title *Energy — New Crop Sources*
Article Author McClure, T.A.
Scantland, D.A.
Journal Agric. Eng.
Pages 17-20
Publication Date Sep 1977
Abstract The implications and potential of converting biomass to energy are discussed. Corn and sugar crops are emphasized. Battelles Columbus Laboratories, as part of DOE's fuels from biomass program, undertook a study of potential fuel applications of sugarcane, sweet sorghum, sugar beets, and corn. Some of the major findings of this study are summarized briefly in a series of questions and answers. (NAL)
Document Type Journal article

Citation Number 80A000253
Article Title *Michigan May Grow Potatoes for Fuel*
Journal Michigan Farmer
Pages 46
Publication Date Nov 1978
Abstract Renate L. Dezachs concludes that potatoes and sugar beets will become important crops as the crisis in liquid fossil fuel energy worsens. Comparisons between potatoes and corn as a source of ethyl alcohol. (NAL)
Document Type Journal article

Citation Number 80A000486
Article Title *American Agriculture — the Energy Production System — Gasohol*
Document Title Energy Technology VI: Achievements in Perspective, 6th Energy Conference and Exposition
Article Author Soleta, B.
Author Affiliation National Gasohol Commission (USA)
Conference Energy technology VI: achievements in perspective, 6th energy conference and exposition
Conference Place Washington, DC, USA
Conference Date 26 Feb 1979
Publisher Government Institutes, Inc.
Publication Date 1979
Pages 1026
Notes Presented at AGA/EPRI/NCA/Gas Research Institute 6th Energy Technology Conference, Washington, D.C., February 26-28, 1979.
Abstract The production of gasohol from agricultural crops is surveyed. Starch and sugar crops are the most effective feedstocks for ethanol generation. The Brazilian gasohol program is briefly reviewed. (EL)
Document Type Paper/Chapter from book

Citation Number 80A000491
Article Title *Energy from Agriculture*
Document Title Record of the Tenth Intersociety Energy Conversion Engineering Conference
Article Author Alich, J.A., Jr.

	Inman, R.E.
Author Affiliation	Stanford Research Inst., Menlo Park, Calif. (USA)
Conference	10th Intersociety Energy Conversion Engineering Society
Conference Place	Newark, DE, USA
Conference Date	18 Aug 1975
Publication Date	1975
Pages	834-841
Abstract	The Project Independence task force in their final Project Independence blueprint report, projected that under the accelerated implementation plan Bioconversion might provide as much as 8% of our energy requirements in the year 2000. They further speculate that under this scenario bioconversion will be the single most important solar energy concept. Under bioconversion four sources of biomass are included: urban solid waste, agricultural residues, and energy crops both terrestrial and marine. In this paper we will concentrate on terrestial energy crops while only briefly commenting on other schemes. The types of vegetation best suited for an intensive energy plantation as well as vegetation selection criteria will be discussed. The type and availability of land for, as well as logistics and economics of growing energy crops on a conceptual terrestrial plantation is discussed. An energy budget for plant material production and harvesting for the conceptual plantation is developed. A technoeconomic comparison of firing the crops directly for electric power generation with converting them to clean fuel gas (methane or low-Btu gas) either at the farm site or at selected markets is made. (AUTHOR)
Document Type	Paper/Chapter from book

Citation Number	**80A000567**
Article Title	*Fuel Alcohol from Crops by Continuous Fermentation*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Prince, R.G.H. McCann, D.J.
Author Affiliation	Sydney Univ. (Australia). Dept. of Chemical Engineering
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	26 Mar 1979
Pages	24p, Paper ID/WG.293/6
Abstract	Sources of agricultural material for power alcohol are reviewed: wastes, trees, and various crops. Wastes have high costs and limited potential: cellulose-based plants such as trees are expensive to process: crops of choice for Australia are cassava and sugar and fodder beet. The process under development at Sydney University for cassava to alcohol is described. The basis is a closely integrated agro-industrial complex, in which all wastes are processed: to generate methanol for internal fuel and/or external consumption: to allow recycling of fertilizer components and to convert other residuals to high protein animal feed. For both alcohol fermentation and waste digestion continuous tower fermenters are being developed. These are at the laboratory stage (12 Litres) for ethanol and pilot plant stage (6500 Litres) for methane. We expect a size reduction of an order of magnitude and hence a corresponding cost reduction in such equipment compared to conventional batch plant. Hydrolysis of starch and alcohol separation are also being investigated. Product cost ex-factory, of \$0.19 — \$0.28 per litre is expected for such a process for a 50,000 kl/a plant, from cassava and sugar and fodder beet, less if any by-product credits are obtained. These costs differ by little more than the present tax from current petrol costs. Sufficient suitable land appears to be definitely available in Australia to produce the alcohol required for 10-20% blends with petrol, and it is very likely that there will be sufficient quantities available for complete replacement of petrol by alcohol if and when that is needed. Crop based ethanol is discussed in relation to alternative "synthetic" fuels: methanol from natural gas and oil from coal: and a national development policy is outlined. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000593**
Article Title	*Potential Availability of Fermentation Alcohol from Sugars and Starches in Developing Countries*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Hepner, L.
Author Affiliation	Hepner and Associates Ltd., London (UK)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	24p, Paper ID/WG.293/33
Document Type	Paper from report

Citation Number	**80A001047**
Article Title	*Gasohol: New Role for Food Industry*
Article Author	Elias, S.
Author Affiliation	Chilton Co., Radnor, Pa. (USA)
Journal	Food Eng.
Volume	51
Issue	10
Pages	61-65
Publication Date	Oct 1979
Abstract	Ethanol production from agricultural products and wastes as source of fuel.
Document Type	Journal article

Citation Number	**80A001090**
Journal	Time
Pages	65
Publication Date	6 Aug 1979

Abstract	Vegetable matter & garbage used to produce ethanol for motor fuel at rate of 2-3 gal/bu.
Document Type	Journal article

Citation Number	**80A001178**
Article Title	*Feedstocks for Large-scale Fermentation Processes*
Document Title	Microbial Energy Conversion
Article Author	Dimmling, W.
Author Affiliation	Uhde (F.) G.m.b.H., Dortmund (Germany, F.R.)
Publisher	Pergamon Press; New York, NY, USA
Publication Date	1977
Pages	499-514
Abstract	The availability and costs of raw materials for fermentation processes are uncertain, and their future costs and availability cannot be predicted. A change to self-replenishable raw materials and increased recycling is desirable. Increased use of agricultural products in developing countries is possible. The great potential of waste matter and by-products is beginning to gain economic importance due to the necessity for recycling. Although wastes and by-products have good long-term possibilities, they cannot now compete with conventional processes and raw materials. Since fossil fuels and nuclear power will inevitably rise in price, preferred raw materials are methane and methanol. Price increases in methane and methanol are likely to be compensated by increased production capacities. (from AS) (POLL)
Document Type	Paper/Chapter from book

Citation Number	**80A001218**
Document Title	*Sources of Alcohol Fuels for Vehicle Tests*
Document Author	Barr, W.J. Parker, F.A.
Author Affiliation	American Energy Research Co., McLean, Va. (USA). Department of Energy
Report Number	CONS/2693-1 Contract EG-77-X-01-2693
Publication Date	Aug 1977
Pages	77
Abstract	Sources that are capable of supplying 50,000 gallons of methanol or ethanol per day are identified. Coal gasification projects and natural gas are primary sources for methanol production; agricultural wastes are the primary sources for ethanol production. (AFDB)
Document Type	Report

Citation Number	**80A001235**
Article Title	*Sugarcane versus Corn versus Ethylene as Sources of Ethanol for Motor Fuels and Chemicals*
Article Author	Lipinsky, E.S.
Author Affiliation	Battelle Columbus Labs., Ohio (USA)
Conference	American Society of Sugar Cane Technologists meeting
Conference Place	Fort Walton Beach, FL, USA
Conference Date	23 Jun 1977
Journal	Proceedings, American Society of Sugar Cane Technologists
Volume	7
Pages	152-162
Publication Date	1978
Notes	New series American Society of Sugar Cane Technologists
Abstract	This paper covers the idea to use sugar cane juice or molasses as the raw material to manufacture ethanol which is presently made from ethylene. Ethylene now is made either from natural gas liquids or from petroleum products. Fermentation ethanol can be used either as an industrial chemical or as a motor fuel, depending on economic and institutional considerations. The initial research indicates that attainment of low cost ethanol is facilitated by the presence of bagasse that can be used as the fuel distill ethanol. Thus, the ethanol concept has the potential for energy self-sufficiency. Furthermore, all sale of stillage, cane fiber, or electricity could provide byproduct credits to keep the cost of ethanol down. (NAL)
Document Type	Journal article

Citation Number	**80:001948**
Article Title	*Availability of Agricultural Processing Wastes for Utilization as a Feedstock for the Production Alcoholic Fuels*
Document Title	Report of the Alcohol Fuels Policy Review. Raw Material Availability Reports
Article Author	Guymont, F.J. Alpert, J.E.
Report Number	DOE/ET — 0114/1
Publication Date	Sep 1979
Pages	105p, Paper 1
Notes	Includes Appendix A.
Abstract	This study was undertaken to provide basic information to the Alcohol Fuels Subcommittee on the availability of food processing wastes as a feedstock for conversion to alcohol fuels. In this study, every attempt was made to obtain the latest available information on the amounts and types of wastes available. Whereever possible, several alternative sources were checked to verify the estimates obtained. In the course of the study, numerous food processors, associations, and individuals were contacted in addition to a thorough literature review. This study suffers from the same difficulties as do other broad general studies of this nature. By necessity generalities must be made which are not necessarily valid on the local level. While on the average the results are valid, the sum does not necessarily follow from the parts. For this reason, it is important that follow-up site specific studies be made to determine the mechanisms by which alcohol production from food processing wastes can be achieved.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80:001960**
Document Title	*Retrospective Search on the Biochemical Production of Alcohol Fuels*
Corporate Author	National Board for Science and Technology, Dublin (Ireland) Institute for Industrial Research and Standards, Dublin (Ireland). Technical Information Div.
Report Number	NP — 24137 MN-61
Publication Date	Jul 1979
Pages	233

Abstract	This search covers the period 1957 to 1979. The production of alcohol from a wide variety of carbohydrate sources is covered, i.e., sugar sources, starch sources, and cellulose sources. Some general information relating to the bioconversion process and alcohol fuels are also included.
Availability	NTIS
Document Type	Report

Citation Number	**80A002023**
Journal	Power farming
Volume	88
Pages	11-12
Publication Date	Mar 1979
Abstract	Alcohol as fuel — an oil industry view (includes ethanol produced from sugarcane and other crops).
Document Type	Journal article

Citation Number	**80A002026**
Journal	Brazilian Business
Pages	32
Publication Date	Mar 1977
Abstract	Alcohol for fuel production via sugarcane and manioc projection, 1980.
Document Type	Journal article

Citation Number	**80:002131**
Document Title	*Fuels from Biomass: Plants for Ethanol Production; Technical Report No. 4*
Document Author	Yoshida, L.
Publisher	Univ. of Hawaii; Honolulu, HI, USA
Publication Date	1977
Pages	24
Abstract	The primary aim of this report was to find plants that could be used to supply a cheap feedstock for fermentation into ethanol. The feedstock needed for a fermentation industry must be a plant that will produce either large amounts of sugar or starch. The use of starch as a feedstock will entail an extra process, the hydrolysis of the starch, before fermentation can take place. The most promising plants contained in this report were: (1) the aroids, (2) the yams, (3) sweet potato, and (4) cassava. These four crops are all relatively high yielding and have reasonably high percentages of carbohydrates in their usable parts. The plants finally included in this report were subjected to three criteria: (1) yield; (2) percentage carbohydrate; and (3) the plants' presence and establishment in the state of Hawaii. 1 table.
Document Type	Book

Citation Number	**80A002140**
Document Title	*The Potential for Liquid Fuels from Agriculture and Forestry in Australia*
Document Author	Stewart, G.A. Gartside, G. Gifford, R.M. Nix, H.A. Rawlins, W.H.M. Sieman, J.R.
Publisher	Commonwealth Scientific and Industrial Research Organization; Melbourne, AU
Publication Date	1979
Pages	151
Document Type	Book

Citation Number	**80A002156**
Article Title	*Western Wastes as Materials for Alcohol Production*
Article Author	McIndoe, W.C.
Journal	Chem. Metall. Eng.
Volume	48
Issue	9
Pages	111, 121
Publication Date	Sep 1941
Abstract	Present capacity for ethyl alcohol production on Pacific Coast is not sufficient to continue present uses and also supply requirements for projected military explosives plant in Northwest; article surveys wastes and culls available in or near region of proposed plant, from which alcohol could be made; sulphite waste liquors, wood wastes, beet sugar molasses, fruit canners' wastes, cull potatoes and ethylene and acetylene could be used. (EI)
Document Type	Journal article

Citation Number	**80A002196**
Article Title	*Possibilities of the Plant Growth of the Moist Tropics to Furnish Materials for Liquid Fuel*
Article Author	Whitford, H.N.
Journal	Ind. Eng. Chem.
Volume	14
Issue	2
Pages	151-152
Publication Date	Feb 1922
Abstract	Reviews possibility of tropics to produce crops of foodstuffs and wood capable of application to manufacture of cellulose and alcohol. (EI)
Document Type	Journal article

Citation Number	**80A002212**
Article Title	*Alcohol for Power Purposes*
Article Author	Nathan, F.
Journal	Industrial Chemist and Chemical Manufacturer
Volume	4
Issue	45
Pages	421-423
Publication Date	Oct 1928
Abstract	Production of alcohol from potatoes, etc.; production in Dominions, Colonies and Protectorates; possibilities of producing power alcohol in principal countries from various raw materials are briefly described; production from grasses, straws, and waste vegetable materials, synthetic production of alcohol from ethylene; production from sawdust and waste wood; production from carbide. Abstract of paper read before Fuel Conference, London. (EI)
Document Type	Journal article

Citation Number	**80A002225**
Article Title	*Raw Materials for Industrial Alcohol Production*
Article Author	Juritz, C.F.
Journal	South African Journal of Industries
Volume	4
Issue	2
Pages	167-175
Publication Date	Feb 1921
Abstract	Yields from sugar-beet, prickly-pear fruit, molasses, potatoes, sweet potatoes, maize, acorns, prickly-pear leafstems, straw and sawdust. (EI)
Document Type	Journal article

Citation Number	**80A002271**
Document Title	*Motor Fuels from Farm Products*
Document Author	Jacobs, P.B. Newton, H.P.
Series	U.S. Dept. of Agriculture. Miscellaneous Publication no. 327
Publisher	U.S. Department of Agriculture; Washington, DC, USA
Publication Date	Dec 1938
Pages	129
Abstract	Covers crop distribution, production, classification; location of raw materials; technical and economic aspects of alcohol production.
Document Type	Book

Citation Number	**80A003105**
Article Title	*Biomass Research in Idaho*
Journal	Gasohol U.S.A.
Volume	2
Issue	1
Pages	28-29, 35
Publication Date	Jan 1980
Abstract	Discusses ethanol production from various crops, especially sugarbeets and potatoes. (MS)
Document Type	Journal article

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III
Feedstocks — Sugar

Citation Number **76:001690**
Document Title *Systems Study of Fuels from Sugarcane, Sweet Sorghum, and Sugar Beets. Third Quarterly Report*
Document Author Lipinsky, E.S.
Nathan, R.A.
Sheppard, W.J.
Lawhon, W.T.
Otis, J.L.
Gurran, L.M.
Lemmon, A.W.
McClure, T.A.
Anderson, T.L.
Helper, E.W.
Corporate Author Battelle Columbus Labs., Ohio (USA)
Report Number TID — 27032
MN-61
Publication Date 14 Apr 1976
Pages 149
Abstract The primary objective of this study is to suggest methods to derive fuels economically from sugar cane, sugar beets, and sweet sorghum, evaluate the potential feasibility of the various suggestions, and to suggest means to convert the potential feasibility into practical feasibility. The sugar cane and sugar beet productivity per acre and the production costs are estimated. Sugar cane is suitable for tropical and subtropical climates, whereas the sugar beet can be grown in temperate climates. The two most promising methods for the thermochemical conversion of the plants into synthesis gas are the Bailie and the Purox process. Anaerobic conversion of sugar crop fiber into SNG has not yet been subjected to extensive laboratory investigation, but it is expected that pretreatment would probably be needed to improve the rate of digestion of the lignocellulosic fiber. (JSR)
Availability NTIS
Document Type Report

Citation Number **78:000583**
Document Title *Systems Study of Fuels from Sugarcane, Sweet Sorghum, Sugar Beets, and Corn. Volume V. Comprehensive Evaluation of Corn. Task 77, Final Report*
Document Author Lipinsky, E.S.
Sheppard, W.J.
Otis, J.L.
Helper, E.W.
McClure, T.A.
Scantland, D.A.
Corporate Author Battelle Columbus Labs., Ohio (USA)
Report Number BMI — 1957A(Vol.5)
Contract W-7405-ENG-92
STD-61
Publication Date 31 Mar 1977
Pages 177
Abstract Results of field interviews, literature searches, and analysis are reported. Information on the economics of energy production from corn silage, grain, and residues is presented. Three conversion systems are considered in detail. They are microbiological, hydrolytic, and thermochemical conversion processes. Microbiological conversion processes include: production of synthetic natural gas by anaerobic digestion of corn stover, possibly accompanied by the production of papermaking fiber; and the production of ethanol from corn. Hydrolytic conversion processes discussed include the hydrolysis of corn residues and other lignocellulosic materials and the production of furfural from corn stover. Thermochemical processes considered include the Purox Process and Syngas Recycling Corporation Process. The methods for derivation of economic parameters and a list of chemicals that could be derived from corn are included in the two appendices. It is concluded that corn can make a limited contribution to the future U.S. fuels supply. There are long-range technical improvements in the processing of the residues from corn grain production that could lead to brighter prospects, but the state of the art is in an embryonic or conceptual stage. Speculative research ideas center on the hydrolytic conversion processes mentioned above. (JGB)
Availability NTIS
Document Type Report

Citation Number **78:000584**
Document Title *Systems Study of Fuels from Sugarcane, Sweet Sorghum, and Sugar Beets. Volume I. Comprehensive Evaluation. Task 77, Final Report*
Document Author Lipinsky, E.S.
Nathan, R.A.
Sheppard, W.J.
McClure, T.A.
Lawhon, W.T.
Otis, J.L.
Corporate Author Battelle Columbus Labs., Ohio (USA)
Report Number BMI — 1957(Vol.1)
Contract W-7405-ENG-92
STD-61

Publication Date	15 Mar 1977
Pages	169
Abstract	Results of a comprehensive evaluation of sugar crops as renewable resources for production of fuels and chemical feedstocks are reported. Volume I contains the general systems analysis of using sugar crops as raw materials for production of fuels and chemical feedstocks, along with a discussion of the major issues affecting the feasibility and implementation of this concept. A technical economic analysis of the substitutability of sugar crop products for nonrenewable resources was also developed so that alternatives can be placed in perspective. Finally, research, development and demonstration needs relating to the development of sugar crops as renewable resources for the manufacture of fuels and chemical feedstocks are discussed. (JB)
Availability	NTIS
Document Type	Report

Citation Number	**78:000585**
Document Title	*Systems Study of Fuels from Sugarcane, Sweet Sorghum, and Sugar Beets. Volume III. Conversion to Fuels and Chemical Feedstocks. Task 77. Final Report*
Document Author	Lipinsky, E.S. Nathan, R.A. Sheppard, W.J. Otis, J.L.
Corporate Author	Battelle Columbus Labs., Ohio (USA)
Report Number	BMI — 1957(Vol.3) Contract W-7405-ENG-92 STD-61
Publication Date	31 Dec 1976
Pages	183
Abstract	Information developed in field interviews and literature research which form the basis of extensive calculations that pertain to numerous alternative means of converting the sugar crops into fuels and chemical feedstocks is reported. Investigation of numerous candidate fuels and chemical feedstocks that might be made from sugar crops indicates that ethanol and ammonia are the most promising. The projected cost of ethanol by use of well-established fermentation technology on juice extracted from sugarcane or on molasses is expected to be quite close to that projected for ethanol from natural gas liquids or petroleum by 1980. The ammonia market is substantial (17 million tons), but this key fertilizer and chemical product is expected to cost close to $200 per ton when made from sugar crop residues, well above what ammonia made from natural gas at $3 per million Btu costs. However, sugarcane-based ammonia might compete well with coal-based ammonia. Sugarcane appears to be the most promising sugar crop for conversion to fuels and chemicals in the short and intermediate term. The costs of sugarcane juice and bagasse are lower than for the corresponding sugar beet products. Of the sugar crops, sweet sorghum has the greatest long-range appeal for the United States because the crop can grow over a much wider geographical range than can sugarcane. The development of processes to manufacture ammonia, methanol, acetic acid, and thermochemical substitute natural gas (SNG) from sugar crop residues depends on technology to generate synthesis gas. Sugarcane bagasse appears to be the most economic source of furfural. Anaerobic digestion of sugarcane or sugan-containing juices to SNG is ruled out on economic grounds. The principal findings of the conversion aspects of the research are summarized quantitatively. Alternative routes for conversion of sugar crops to fuels and chemicals are presented.
Availability	NTIS
Document Type	Report

Citation Number	**78:002730**
Document Title	*Fuels from Sugar Crops. Second Quarterly Report*
Document Author	Lipinsky, E.S. Kresovich, S. McClure, T.A. Helper, E.W. Lawhon, W.T.
Corporate Author	Battelle Columbus Labs., Ohio (USA)
Report Number	TID — 27834 Contract W-7405-ENG-92 STD-61
Publication Date	31 Oct 1977
Pages	167
Abstract	Substantial progress was made on both the agricultural and the processing aspects of the fuels from biomass research program. Despite droughts and hurricanes, yields on narrow row spacings show substantial gains over conventional spacings at all locations for both sugarcane and sweet sorghum. The biomass gains are most pronounced (40% to 100% increase) for Louisiana sugarcane and for sweet sorghum in Louisiana and Texas (50 to 100% gains). Although biomass increases are smaller in Florida, early ripening and possible soil conservation effects cause interest in close spacing in Florida to be maintained. The concept of integrating sweet sorghum production with sugarcane production could expand the area available for extensive sugar crop production by a factor of 10 or more. Sugar beets and sweet sorghum mesh together well from an agronomic viewpoint and the introduction of the Canadian Separator Equipment Process may make feasible integration of the processing of these crops. Evaluation of U.S. and Brazilian ethanol technology indicates that ethanol can be made quite economically in locations with long sugarcane processing seasons (e.g., Hawaii and Puerto Rico). The Melle Process practiced in Brazil appears to make possible extremely short fermentation times (10 to 16 hours, compared with 24 to 30 hours for U.S. practices). The primary key to reducing processing costs lies in increasing the concentration of ethanol in the fermented mash, not reduction in fermentation time. Suggestions for appropriate improvements have been made and the Reports of Invention filed with DOE's patent office. Five appendices are included.
Availability	NTIS
Document Type	Report

Citation Number **79:000053**
Document Title *Fuels from Sugar Crops. First Quarterly Report*
Document Author Lipinsky, E.S.
Kresovich, S.
McClure, T.A.
Lawhon, W.T.
Corporate Author Battelle Columbus Labs., Ohio (USA)
Report Number TID — 28414
Contract EG-77-C-02-4147
STD-61
Publication Date 29 Jul 1977
Pages 153
Abstract The primary objectives of the present study are to evaluate the feasibility of reducing the costs of fermentable sugars derived from sugar crops and to increase their availability for the following methods: (1) close space of sugar crops; (2) production of sweet sorghum varieties high in fermentable sugar, regardless of table sugar prospects; and (3) harvesting and processing of the entire aerial part of sugarcane and/or sweet sorghum. Close row spacing of sugarcane is under investigation in Florida and Louisiána. Preliminary research indicates that the cost of this sugarcane may be approximately 30 percent less than that of conventional cane. In addition, tests have shown that the close-spaced sugarcane has virtually the same content of fermentable sugars as does conventional cane. Close-spacing of sweet sorghum is being studied in Louisiana and Texas with record yields being obtained in field tests. The material and energy balances of a facility to process 8,200 metric tons/day of sugarcane into ethanol, stillage, and electricity leads to the preliminary conclusion that more than enough biomass will be available to make the facility energy self-sufficient. The mechanical difficulties of a novel rind/pith separation system have been corrected and an economic analysis of the systems is being made. (JSR)
Availability NTIS
Document Type Report

Citation Number **79:000540**
Document Title *Fuels from Sugar Crops: Systems Study for Sugarcane, Sweet Sorghum, and Sugar Beets*
Document Author Nathan, R.A. (ed.)
Corporate Author Battelle Columbus Labs., Ohio (USA)
Report Number TID — 22781
STD-61
Publication Date Jul 1978
Pages 148
Abstract An extensive analysis is made of the technical and economic feasibility of producing fuels and chemicals from the sugar crops (sugar cane, sweet sorghum, and sugar beets). It is concluded that ethanol and ammonia are the most promising products. Ethanol produced by fermentation on juice or molasses is close to economic competitiveness. The ammonia cost is not yet competitive but could be competitive with coal-produced ammonia. Sugar cane appears to be the most promising crop in the short and intermediate term; sweet sorghum has the greatest long-range appeal. The development of processes to manufacture ammonia, methanol, acetic acid, and thermochemical substitute natural gas (SNG) from sugar crop residues depends on technology to generate synthesis gas. Anaerobic digestion of sugar cane or juices to SNG is not attractive on economic grounds. The agricultural aspects of sugar crops research are summarized. Energy balances of input/output are derived for sugar cane and sugar beets. Recommendations are made for US-DOE actions and policy decisions. (JSR)
Availability NTIS
Document Type Report

Citation Number **79:001109**
Article Title *Systems Study of Sugarcane, Sweet Sorghum, Sugar Beets, and Corn for Fuels and Chemical Feedstocks*
Document Title Fuels from Biomass Symposium
Article Author Lipinsky, E.S.
Pfeffer, J.T.
Stukel, J.J. (eds.)
Author Affiliation Battelle Memorial Inst., Columbus, Ohio (USA)
Conference Fuels from biomass symposium
Conference Place Champaign, IL, USA
Conference Date 18 Apr 1977
Report Number COO — 4225-1
CONF-770481 —
Publication Date 1977
Pages 1-12
Abstract Speculative results obtained in the economic analysis of the potential of sugarcane, sweet sorghum, sugar beets, and corn for fuels and chemical feedstocks are summarized. Estimated production costs for ethanol and ethylene are given. Possibilities of ammonia production are indicated. Research and development needs in the Fuels from Biomass Program are tabulated. (JSR)
Document Type Paper from report

Citation Number **79:004628**
Article Title *Tentative Projection of Costs for Conversion of Sugar Wastes to Ethanol to Be Used as Fuel or as an Industrial Feedstock*
Document Title Proceedings of the Symposium on Energy
Article Author Thorn, L.
Conference Symposium on energy
Conference Place Hilo, HI, USA
Conference Date 18 May 1977
Report Number CONF-7705119 —
Publication Date 1977
Pages 71-74
Document Type Paper from report

Citation Number **79:005180**
Document Title *Sugar Crops as a Source of Fuels. Volume I. Agricultural Research. Final Report*
Document Author Lipinsky, E.S.
Kresovich, S.
McClure, T.A.
Jackson, D.R.
Lawhon, W.T.
Kalyoncu, A.A.
Daniels, E.L.
Corporate Author Battelle Columbus Labs., Ohio (USA)
Report Number TID — 29400/1
Contract W-7405-ENG-92-077
STD-61
Publication Date 31 Jul 1978

Pages 222

Abstract

This report by Battelle Columbus Division presents the results of a study of the feasibility of using sugar crops as a source of fuels. The program is a cooperative effort, including universities, USDA field experiment stations, research organizations, and engineering companies. Narrow-row spacing experiments were conducted at Houma, Louisiana; Baton Rouge, Louisiana; and Belle Glade, Florida. Narrow-row spacing promotes more rapid canopy closure which helps a short season location more than a long season location. Sweet sorghum experiments in Texas, Louisiana, Mississippi, and Ohio indicate favorable yields compared with sugarcane, and yield increases with close spacing in all areas. The project team concludes that sweet sorghum has considerable fuel potential, based on its ability to grow wherever corn or soybeans grow. Initial evaluation of the Tilby cane separator process, which separates the pith from the rind fiber without crushing and grinding, indicates that the process is promising as a means of obtaining fermentable sugars at low cost. The advantages of the Tilby process (yet to be demonstrated on a commercial scale) are low energy consumption, high value for the rind fiber coproducts in products that perform like plywood, pulp or paper making, and ability to use high fiber sugarcane or sweet sorghum.

Availability NTIS

Document Type Report

Citation Number **79:005181**

Document Title *Sugar Crops as a Source of Fuels. Volume II. Processing and Conversion Research. Final Report*

Document Author Lipinsky, E.S.
Birkett, H.S.
Polack, J.A.
Atchison, J.E.
Kresovich, S.
McClure, T.A.
Lawhon, W.T.

Corporate Author Battelle Columbus Labs., Ohio (USA)

Report Number TID — 29400/2
Contract W-7405-ENG-92-077
STD-61

Publication Date 31 Aug 1978

Pages 315

Abstract

After a summary of the principal findings with respect to both the agricultural research reported in Volume I and processing and conversion research reported in the present volume, detailed discussions are presented on the following topics: processing of sugar crops for the manufacture of fermentable sugars, conversion of fermentable sugars into ethanol considered from both a technical and economic viewpoint, research and development implications of the technical and economic results. Appendices provide detailed equipment lists, materials and energy balances, and costs for the manufacture of ethanol from sugarcane and from molasses, using state-of-the-art technology. Ethanol from sugarcane or sweet sorghum is unlikely to be available in large quantities for less than \$1.00 per gallon because improvements in sugar crop production and processing are needed to hold the raw material costs for ethanol to \$0.70 per gallon. When reasonable provisions are made for fermentation, distillation and return on investments, the target of \$1.00 per gallon appears appropriate. There are opportunities to manufacture liquid motor fuels other than ethanol from sugar crop juice and/or associated lignocellulosic fractions. Typical alternatives are 2,3-butanediol, ketones derived from short-chain fatty acids, and microbial oils.

Availability NTIS

Document Type Report

Citation Number **79:007134**

Article Title *Biomass Energy for Hawaii*

Article Author Murata, D.

Author Affiliation Hawaii Energy Office, Honolulu (USA)

Conference 177th national meeting of the American Chemical Society

Conference Place Honolulu, HI, USA

Conference Date 1 Apr 1979

Journal Am. Chem. Soc., Div. Pet. Chem., Prepr.

Volume 24

Issue 2

Pages 497-499

Report Number CONF-790415 — P4

Publication Date Mar 1979

Abstract

In biomass there existed the potential for supplying a significant portion of Hawaii's present energy needs (concluded from previous report). The previous study considered Hawaii's sugar industry held the greatest promise of near term implementation. The sugar industry was already generating a large quantity of high-grade usable energy from biomass but this paper pointed out several modifications in current industry practices to increase energy. These modifications were: (1) develop, propagate, and cultivate plant varieties which maximize the production of the combination sucrose and cellulosic material; (2) recover and prepare all currently disposed of plant material for use as boiler fuel, and (3) use the by-product molasses as the feedstock for alcohol fermentation. The third option attracted the greatest amount of Federal, state, and county government interest. A brief process description and a preliminary technical and economic assessment of the process were presented. A background of Hawaii's sugar industry was also included. 1 table

Document Type Journal article

Citation Number **80A000048**

Article Title *Conversion of Sugar Cane Products into Fuels and Chemical Feedstocks*

Article Author Lipinsky, E.S.

Author Affiliation Battelle Columbus Labs., Ohio (USA)

Journal Sugar Journal

Volume 39

Issue 3

Pages 27-30

Publication Date 1976

Abstract

A discussion on the costs of manufacture of ethanol from cane juice by fermentation, and the thermochemical production of ammonia via synthesis gas from sugar cane fibre.

Document Type Journal article

Citation Number	**80A000258**
Article Title	*Researcher Suggests Sugar Beets*
Journal	Cash Crop Farming
Pages	23-24
Publication Date	Sep 1979
Document Type	Journal article

Citation Number	**80A000345**
Journal	Journal of Commerce
Pages	5
Publication Date	3 Nov 1976
Abstract	Sugar crops have the potential to play a strategic role in solving the nation's interlocked chemical, fuel, food and feed availability problems, according to a study conducted by Battelle's Columbus Laboratories. Sugar crop products can be converted into ammonia, methanol, ethanol and ethylene, according to Edward S. Lipinsky, who headed the Battelle study. The above chemicals, which can be produced from sugar crops along with food-grade sugar and feed molasses, can be used as fertilizers or staring materials for polymers when the price of nonrenewable resources such as petroleum and natural gas are relatively low. Moreover, they could be used for fuel when petroleum and natural gas prices are high or when supplies of these critical fuels are curtailed. It was sponsored by the Energy Research and Development Administration's Fuels From Biomass Program on a 15-month study on sugar crop use carried out by Battelle and also to obtain feedback from the chemical industry, the fuels industry, food companies and researchers. (NICEM)
Document Type	Journal article

Citation Number	**80A000349**
Article Title	*Sweet Sorghum — an Alcohol Crop for the U.S.*
Article Author	Jackson, D.R. Arthur, M.F.
Journal	Gasohol U.S.A.
Volume	2
Issue	3
Pages	26
Publication Date	Mar 1980
Document Type	Journal article

Citation Number	**80A000386**
Document Title	*Fuels from Sugar Crops: Report on System Study of Fuels from Sugarcane, Sweet Sorghum and Sugar Beets*
Report Number	ERDA Report BMI-1957
Publication Date	15 Mar 1977
Pages	160
Abstract	Although sugar in a gas tank may irreparably damage an automobile, sugar beets, sweet sorghum, and sugar cane are under investigation by ERDA as potential sources of fuel. ERDA's fuel from biomass program has been attempting experimentally to fit natural products, such as trees, grains, various marine sources, into the consumer's gas tank. Sugar crops hold advantages over other types of biomass because they convert easily into simple fermentable sugars. Information relating to the extraction of cane juice from sugarcane, and the construction of a central power station are areas being researched under this program. (EL)
Document Type	Report

Citation Number	**80A000468**
Article Title	*Ethanol from Sugarcane*
Document Title	Proceedings...53rd Annual Congress, South African Sugar Technologists Association
Article Author	Thompson, G.D.
Author Affiliation	South African Sugar Association, Experimental Station, Mount Edgecombe (South Africa)
Conference	53rd annual congress, South African Sugar Technologists' Association
Conference Date	1979
Publication Date	1979
Pages	1-5
Document Type	Paper/Chapter from book

Citation Number	**80A000499**
Document Title	*Systems Study of Fuels from Sugarcane, Sweet Sorghum, and Sugar Beets; Volume II: Agricultural Considerations Task 77, Final Report*
Document Author	Lipinsky, E.S. McClure, T.A. Nathan, R.A. Anderson, T.L. Sheppard, W.J. Lawhon, W.T.
Author Affiliation	Battelle Columbus Labs., Ohio (USA)
Series	Battelle Memorial Institute BMI-1957 (v. 2)
Publisher	U.S. Energy Research and Development Administration, Division of Solar Energy; Washington, DC, USA
Publication Date	31 Dec 1976
Pages	245
Notes	Contract no. W-7405-eng-92
Availability	NTIS
Document Type	Book

Citation Number	**80A000503**
Article Title	*The Growing of Sugarcane for Energy*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Humbert, R.P.
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	8p, Paper I-2
Abstract	Sugar cane as an energy crop is illustrated as being the world's most efficient plant in terms of converting sunlight into stored energy. The author quotes studies which show that up to five times more energy is stored in a given quantity of sugar cane as is required to plant, fertilize, cultivate, harvest, and transport the crop. (AFDB)
Document Type	Paper from report

Citation Number	**80A000578**
Article Title	*Cane Molasses Fermentation Alcohol Industry in Fiji*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Karan, R.
Author Affiliation	Fiji Sugar Corp. Ltd., Suva

Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	12p, Paper ID/WG.293/18
Document Type	Paper from report

Citation Number	**80A000589**
Article Title	*Fuel and Chemical Feedstock from Sugar Cane in Central America*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Ingram, L.
Author Affiliation	Central American Research Institute for Industry (ICAITI) Guatemala Ciudad (Guatemala)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	8p, Paper ID/WG.293/29
Document Type	Paper from report

Citation Number	**80A000606**
Article Title	*Molasses Production and Utilization Potential in Tanzania*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Mungai, J.J.
Author Affiliation	Sugar Development Corp., Dar-es-Salaam (Tanzania)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	12p, Paper ID/WG.293/47
Document Type	Paper from report

Citation Number	**80A000607**
Article Title	*Potential of Sugar Cane Derived Alcohol as a Fuel in Jamaica*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Sangster, I.
Author Affiliation	Sugar Industry Research Institute (Jamaica)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	14p, Paper ID/WG.293/48
Document Type	Paper from report

Citation Number	**80A000686**
Article Title	*Using Sugar Crops to Capture Solar Energy*
Article Author	Lipinsky, E.S. McClure, T.A. Mitsui, A. (ed.)
Conference	Biological solar energy conversion conference
Conference Place	Miami, FL, USA
Conference Date	15 Nov 1976
Publisher	Academic Press; New York, NY, USA
Publication Date	1977
Pages	397-410
Document Type	Paper/Chapter from book

Citation Number	**80A000739**
Article Title	*Direct Processing of Sugar Cane into Ethanol*
Document Title	Proceedings of the International Symposium on Alcohol Fuel Technology: Methanol and Ethanol
Article Author	Bruschke, H.
Author Affiliation	Ballweg Gas Technik G.m.b.H., Bonn-Bad Godesberg
Conference	Symposium on alcohol fuel technology
Conference Place	Wolfsburg, F.R. Germany
Conference Date	21 Nov 1977
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-771175
Publication Date	Jul 1978
Pages	6p, Paper 5-5
Notes	Organized by Volkswagenwerk AG in cooperation with the German Federal Ministry for Research and Technology (BMFT).
Abstract	The process of using sugar cane to produce ethanol typically requires a roller mill to extract the sugar from the cane. This extraction process can be replaced by introducing steam to the sugar cane feedstock; the elevated temperature extraction process is more efficient and allows fermentation without additional separation processes. (AFDB)
Document Type	Paper from report

Citation Number	**80A001024**
Journal	National Bank Monthly Statement (Australia)
Pages	8
Publication Date	Mar 1978
Abstract	Australia: examines use of sugar-cane alcohol as a fuel.
Document Type	Journal article

Citation Number	**80A001043**
Article Title	*Gasohol from Sugarcane (Saccharum Spontaneum, Energy Sources)*
Article Author	Likums, E.
Author Affiliation	Department of Agriculture, Washington, D.C. (USA). Science and Education Administration
Journal	Agric. Res.
Volume	27
Issue	11
Pages	7
Publication Date	May 1979
Document Type	Journal article

Citation Number	**80A001072**
Article Title	*Molasses as Raw Material for Industry*
Article Author	Cruz, R.A.
Journal	Sugar News
Volume	46
Issue	6
Pages	230-233
Publication Date	1970
Document Type	Journal article

Citation Number	**80A001114**
Article Title	*New Options for Sweet Sorghum*
Article Author	Ferraris, R. Stewards, G.A.
Journal	J. Aust. Inst. Agric. Sci.
Volume	45
Issue	3
Pages	156-164
Publication Date	1979
Document Type	Journal article

Citation Number	**80A001241**
Article Title	*Alcoholic Fermentation of Molasses; Chapter 3*
Document Title	Industrial Fermentations
Article Author	Hodge, H.M. Hildebrandt, F.M. Underkofler, L.A. (ed.) Hickey, R.J.
Author Affiliation	Iowa State Univ. of Science and Technology, Ames (USA)
Publisher	Chemical Publishing Co., Inc.; New York, NY, USA
Publication Date	1954
Pages	73-94
Document Type	Paper/Chapter from book

Citation Number	**80:001950**
Article Title	*Availability of Sugar Crops for Production of Alcohol Fuels. Final Report*
Document Title	Report of the Alcohol Fuels Policy Review. Raw Material Availability Report
Article Author	Riddle, W.E. McClure, T.A. Lipinsky, E.S.
Author Affiliation	Battelle Columbus Labs., Ohio (USA)
Report Number	DOE/ET—0114/1
Publication Date	Sep 1979
Pages	88p, Paper 3
Notes	Includes Appendixes A, B, and C.
Abstract	This report estimates the costs and quantities of fermentable sugars produced from sugarcane, sugar beets and sweet sorghum for ethanol production. For policy purposes four scenarios were developed describing possible conditions for sugar crop production. The first scenarios were developed describing possible conditions for sugar crop production. The first scenario — Optimistic Sugarcane and Sweet Sorghum Production — resulted in the potential production of more than 10 billion gallons of ethanol by 2000 at a cost of $0.97 for the fermentable sugars in a gallon of ethanol. The second scenario - Pessimistic Sugarcane and Sweet Sorghum Production — resulted in the potential production of slightly less than 5 billion gallons of ethanol by 2000 at a cost of $1.58 for the fermentable sugars in each gallon of ethanol. The remaining scenarios were between the two extremes. The Southeast, Delta States and Southern Plains accounted for nearly 60 percent of the fermentable sugar production, while the Corn Belt, Lake States and Northern Plains accounted for nearly one-third of the fermentable sugar production. The production of fermentable sugars produced in the southern tier of the US did not change appreciably among the four scenarios. Sugarcane and sweet sorghum would be produced in the southern states while sweet sorghum would be produced only in the northern states. The cost estimates do not consider additional revenue from the sale of possible byproducts derived from the production of sugar crops. Considering only the energy expended in agricultural production, grain crops have a net energy balance of 0.42 to 0.45 quads from 1980 to 2000. Sugar crops show a net energy balance of 0.05 quads in 1983, 0.37 quads in 1990, and 0.89 quads in the year 2000. Deduction of energy required for processing and conversion of each crop into alcohol will, of course, lower these estimates.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A002028**
Article Title	*Alcohol for Gasoline from Sugarcane*
Article Author	Humbert, R.P.
Journal	Sugar y Azucar
Volume	71
Issue	2
Pages	33
Publication Date	Feb 1976
Document Type	Journal article

Citation Number	**80A002029**
Article Title	*Alcohol from Molasses as a Possible Fuel and the Economics of Distillery Effluent Treatment*
Article Author	Kujala, P. Hull, R. Engstrom, F. Jackman, E.
Journal	Sugar y Azucar
Volume	71
Issue	3
Pages	28-39
Publication Date	1976
Document Type	Journal article

Citation Number	**80:002045**
Article Title	*Photosynthetic Pathway and Biomass Energy Production*
Article Author	Marzola, D.L. Bartholomew, D.P.
Author Affiliation	Univ. of Hawaii, Honolulu
Journal	Science
Volume	205
Pages	555-558
Publication Date	10 Aug 1979
Abstract	The current interest in locating new or alternative sources of energy has focused attention on solar energy capture by crops that can be subsequently utilized as a substitute for fossil fuels. The very high productivity of sugarcane and the fact that it accumulates sugars that are directly fermentable to alcohol may have caused seemingly less

productive crops to be overlooked. We show here that recoverable alcohol from achievable commercial yields of pineapple can actually equal that of sugarcane, with the pineapple crop requiring only a fraction of the water used by sugarcane. Pineapple is well adapted to the subhumid or semiarid tropics and thus is particularly well suited for exploiting large areas not now under cultivation with any crop of commercial value. 7 tables.

Document Type | Journal article

Citation Number **80A002049**
Article Title *Ethanol from Sugarcane EX-FERM Concept*
Article Author Rolz, C.
Cabrera, S. de
Journal Biotechnol. Bioeng.
Volume 21
Issue 12
Pages 2347-2349
Publication Date Dec 1979
Document Type Journal article

Citation Number **80:002125**
Document Title *Fuels from Biomass: Alcohol Production; Alcohol as a Motor Fuel Supplement; Technical Report No. 5 and 6*
Document Author Murata, D.
Publisher Hawaii Natural Energy Institute; Honolulu, HI, USA
Publication Date 1978
Pages 33
Abstract Alcohol production from molasses at a renovated Hawaiian Commercial and Sugar Company's alcohol plant appears to be a marginal business venture. Operating costs run slightly higher than incoming revenues. As a means to develop an in-stock source of motor fuel, it is suggested that the alcohol produced in the pilot facility be used as an additive in commercially available no-lead gasoline. There should be a program to test the consumer acceptance of the gasoline-alcohol fuel, a progam to create a model infastructure to blend, transport, store, and market the fuel; and a program to investigate the incentives that could speed along the development of this in-state motor fuel. The potential for developing an in-state source of motor fuel and thereby reducing oil imports and the outflow of oil dollars is considerable. Coupled with a healthy and viable sugarcane industry, the creation of a gasohol producing industry could provide a needed increase in diversity within the State's economy. 5 tables.
Document Type Book

Citation Number **80:002130**
Article Title *Pithecolobium saman Benth. (Rain Tree) Fruits as Raw Material for the Production of Ethanol*
Article Author Nand, K.
Srikanta, S.
Murthy, V.S.
Author Affiliation Central Food Technological Research Inst., Mysore (India)
Journal J. Food Sci. Technol. (India)
Volume 14
Issue 2
Pages 80-83
Publication Date 1977
Abstract Mature fruits of P. saman Benth. (rain tree) contained approx. 33% sucrose, 4.8% glucose, 0.8% fructose, and 9.6% total protein on a fresh weight basis. The free amino acid pool of the kernels was particularly rich in an unidentified amino acid which was similar to proline in some characteristics but distinctly separated from it in the amino acid analyzer. It also contained substantial amounts of glutamic acid, serine, and threonine. A water extract of the kernels was found to be a complete medium for growth and alcohol production by Saccharomyces cerevisiae ellipsoildus.
Document Type Journal article

Citation Number **80A002135**
Article Title *Hawaiian Sugarcane Energy Plantations*
Article Author Mashima K.I.
Gibson, W.O.
Author Affiliation Hawaii Sugar Plant Assoc, Aiea (USA)
Journal Am. Soc. Mech. Eng.
Issue Paper 79-Sol-31
Pages 4
Publication Date 1979
Abstract Hawaiian sugarcane plantations are presently in the business of producing food sugar and are nearly energy self-sufficient through use of residual fiber for fuel. They could be converted to "energy plantations" by converting sugar to ethanol by fermentation. Energy and economic analyses of this alternative energy source are presented. (EI)
Document Type Journal article

Citation Number **80A002188**
Article Title *Design of Modern Molasses Distillery*
Article Author Reich, G.T.
Journal Chem. Metall. Eng.
Volume 41
Issue 2
Pages 64-65
Publication Date Feb 1934
Abstract Brief description and flow sheet of continuous still producing 8000 gal per day of 95 per cent alcohol; designed and installed by Lummus Co. in new plant of New England Alcohol Co., Everett, Mass. (EI)
Document Type Journal article

Citation Number **80A002198**
Article Title *Feed Yeast and Industrial Alcohol from Citrus-waste Press Juice*
Article Author Nolte, A.J.
von Loesecke, H.W.
Pulley, G.N.
Journal Ind. Eng. Chem.
Volume 34
Issue 6
Pages 670-673
Publication Date Jun 1942
Abstract Method described for production of feed yeast from press juice of cannery waste dehydration plants; average yield of 46% of dry yeast, based on total sugar content of press juice, was obtained; torula utilis is most suitable of yeasts tried for protein synthesis; alcohol can be obtained from

	press juice with average yield of 91% of theoretical. (EI)
Document Type	Journal article

Citation Number	**80A002201**
Article Title	*Alcohol Production from Molasses*
Article Author	Appell, G.M.
Journal	Chemical Age (N.Y.)
Volume	92
Issue	2
Pages	53-57
Publication Date	Feb 1921
Abstract	Diagram of classes of raw material and procedure of treatment for production of alcohol. (EI)
Document Type	Journal article

Citation Number	**80A002211**
Article Title	*Industrial Alcohol*
Journal	Industrial Australian and Mining Standard
Volume	79
Issue	2047
Pages	538
Publication Date	7 Jun 1928
Abstract	Sugar industry important in Australia; 511,408 tons produced in 1924-1926, against 427,327 and 286,004 in two preceding years; much molasses by-product goes to waste; distilleries used 807,100 cwt.; one ton molasses will produce 65 gal power alcohol; fermentation by yeasts of pure culture type; article tells how to make it; where used for industrial purposes; only nominal tax imposed; for special use, denaturing is omitted, under careful supervision. (EI)
Document Type	Journal article

Citation Number	**80A002214**
Article Title	*Now, Real Motor Fuel from Molasses*
Article Author	Owen, W.L.
Journal	Sugar. Azucar (N.Y.)
Volume	36
Issue	11
Pages	21-23
Publication Date	Nov 1941
Abstract	Details pertaining to conversion of molasses into motor fuel, known as Jeanite, which is practically identical with gasoline in fuel value and octane rating; process involves production of ethyl and butyl alcohols and molasses, and polymerization of these into ethyl and butyl polymers having same octane rating as better grades of gasolines. (EI)
Document Type	Journal article

Citation Number	**80A002215**
Article Title	*Ethanol Fermentation of Molasses*
Article Author	Arroyo, R.
Journal	Sugar. Azucar (N.Y.)
Volume	38
Issue	2
Pages	18-19
Publication Date	Feb 1943
Abstract	Improved process for treatment of blackstrap for manufacture of alcohol and rum. (EI)
Document Type	Journal article

Citation Number	**80A002217**
Article Title	*Continuous Fermenting of Beet Juice*
Journal	Sugar. Azucar (N.Y.)
Volume	48
Issue	5
Pages	45-47
Publication Date	May 1953
Abstract	Report of commission appointed by French Syndicate of Agricultural Distillers to study continuous process, where alcohol is made from beet diffusion juice, which is supplanting batch method of fermenting sugar solutions in individual vats; data given on six plants. (EI)
Document Type	Journal article

Citation Number	**80A002218**
Article Title	*Fermentation of Molasses*
Article Author	Owen, W.L.
Journal	Sugar. Azucar (N.Y.)
Volume	43
Issue	4
Pages	37-39
Publication Date	Apr 1948
Abstract	Observations on Arroyo process and typical fermentation of clarified molasses mashes. (EI)
Document Type	Journal article

Citation Number	**80A002268**
Article Title	*Fuel Alcohol from Nipa Palm*
Journal	Automot. Ind.
Volume	53
Pages	627
Publication Date	8 Oct 1925
Document Type	Journal article

Citation Number	**80A002284**
Article Title	*Alcohol Fuel from Sugarcane (for an Alternative Energy Source) — Is It Economic?*
Article Author	Percival, R.H.
Journal	New South Wales. Department of Agriculture. Commodity Bulletin
Volume	7
Issue	6
Pages	13-17
Publication Date	Jan 1979
Document Type	Journal article

Citation Number	**80A003045**
Article Title	*Production of Power Alcohol in Australia*
Article Author	Anderson, C.R.
Journal	Fuel
Volume	21
Pages	17-18
Publication Date	Jan 1942
Abstract	Alcohol distilleries in Australia using molasses as raw material; table indicates yield of 99.7% alcohol in gallons per ton from principal raw materials producing power alcohol; power alcohol and defense. (EI)
Document Type	Journal article

Citation Number	**80A003047**
Article Title	*Alcohol Motor Fuel from Molasses; I. Use of Cane Molasses for Manufacture of Motor Fuel*
Article Author	Freeland, E.C.
Journal	Ind. Eng. Chem.
Volume	17

Pages	615-621
Publication Date	1925
Abstract	Freeland discusses in detail (1) reasons for considering molasses important as a raw material for motor fuel; (2) yield and composition of molasses; (3) fermentation; (4) distribution; (5) quality and yield of alcohol; (6) denaturing; (7) manufacture of ether; (8) cost of plant and, operation to handle 5,500 gals molasses per day; (9) chemical control; (10) research problems. (CA)
Document Type	Journal article

Citation Number	**80A003076**
Article Title	*Sugar Cane Bagasse as a Source of Industrial Alcohol*
Article Author	Owen, W.L. Denson, W.P.
Journal	Planter and Sugar.Manufacturer
Volume	80
Issue	4
Pages	61-64
Publication Date	28 Jan 1928
Abstract	Treats of processes of extracting sugar from bagasse by fermentation to produce alcohol but leave bagasse in suitable condition for fiber board; experiments in fermentation and alcohol yield are described. (EI)
Document Type	Journal article

Citation Number	**80A003077**
Article Title	*Sugar Cane Bagasse as a Source of Industrial Alcohol*
Article Author	Owen, W.L. Denson, W.P.
Journal	Planter and Sugar Manufacturer
Volume	80
Issue	6
Pages	102-105
Publication Date	11 Feb 1928
Abstract	Experiments on percolation of fermenting molasses wort over bagasse; relative efficiency of sterilized and unsterilized bagasse for use as fermentation accelerant; preservation of exhausted bagasse after its fermentation in molasses distilleries; procedure in industry; value of bagasse in molasses distilleries. Bibliography. (EI)
Document Type	Journal article

Citation Number	**80A003079**
Article Title	*Motor Fuel from Molasses*
Article Author	Owen, W.L.
Journal	Sugar. Azucar (N.Y.)
Volume	38
Issue	12
Pages	22-24
Publication Date	Dec 1943
Notes	See also v. 39, no. 1, 1944, p. 22-24
Abstract	Value of survey of potentialities of sugar producing area for converting its surplus molasses or grain into motor fuel or chemicals.
Document Type	Journal article

Citation Number	**80A003082**
Article Title	*Motor Fuel from Molasses*
Article Author	Owen, W.L.
Journal	Sugar. Azucar (N.Y.)
Volume	39
Issue	4
Pages	26-29
Publication Date	Apr 1944
Abstract	Adapting sugar factories to producing ethyl alcohol during idle season between sugar campaigns.
Document Type	Journal article

Citation Number	**80A003083**
Article Title	*Motor Fuel from Molasses*
Article Author	Owen, W.L.
Journal	Sugar. Azucar (N.Y.)
Volume	38
Issue	5
Pages	22-26
Publication Date	May 1943
Abstract	Survey of potentialities of molasses utilization important now to sugar industry in preparing for future; present situation; sugar, in form of molasses, or starches in grains can furnish suitable raw material for rubber, either through conversions into butylene glycol or into butyl alcohol; dehydration processes. (EI)
Document Type	Journal article

Citation Number	**80A003084**
Article Title	*Motor Fuel from Molasses*
Article Author	Owen, W.L.
Journal	Sugar. Azucar (N.Y.)
Volume	38
Issue	3
Pages	22-27
Publication Date	Mar 1943
Abstract	Motor fuel program as integrated with milling of entire cane stalk discussed. (EI)
Document Type	Journal article

Citation Number	**80A003088**
Article Title	*Alcohol Crop for the U.S.; Sweet Sorghum*
Article Author	Jackson, D.R. Arthur, M.F.
Author Affiliation	Battelle Columbus Labs., Ohio (USA)
Journal	Gasohol U.S.A.
Volume	2
Issue	3
Pages	26-27, 32-33
Publication Date	Mar 1980
Notes	Presented at National Gasohol Commission Meeting, held Dec. 2-5, 1979, in San Antonio, Texas
Document Type	Journal article

Citation Number	**80A003096**
Article Title	*Power Alcohol from Beet*
Journal	J. Soc. Chem. Ind., London
Volume	43
Pages	1268-1269
Publication Date	19 Dec 1924
Document Type	Journal article

Citation Number	**80A003119**
Article Title	*Motor Fuel from Waste Molasses*
Journal	Sugar. Azucar (N.Y.)
Volume	22
Pages	335-337
Publication Date	1920
Abstract	It is pointed out that all the disadvantages of alcohol as a motor fuel can be overcome by an

admixture of 40 parts of ether to 60 of alcohol denatured by formula No. 3 for completely denatured alcohol, U.S. Bur. of Internal Revenue. Buildings and equipment necessary for the manufacture of both alcohol and ether from Hawaiian waste molasses are described in full, and yields are given. There is also a table showing the percent of ether in ether-alcohol mixtures of specific gravity 0.72021 to 0.75623. (CA)

Document Type: Journal article

Citation Number **80A003120**

Article Title: *Motor Fuel from Molasses*

Article Author: Owen, W.L.

Journal: Sugar. Azucar (N.Y.)

Volume: 39

Issue: 4

Pages: 26-29

Publication Date: 1944

Abstract: The average cane raw sugar factory can be converted at moderate cost into a distillery operating during the off-season and producing alcohol for use as motor fuel. Existing molasses storage tanks can be utilized as fermenters, pan supply tanks as seed tubs, and the triple effect for distilling the beer and for concg. the slops, as in the Reich process. The other equipment required, such as a rectifying column, yeast machine, sterilizing tank, piping and other accessories can be provided by the machine shop and partly improvised. There is little danger from possible corrosion. The slops can be returned to the fields to maintain their fertility. At the end of the distilling season the factory can be reconverted at small cost. (CA)

Document Type: Journal article

Citation Number **80A003133**

Document Title: *Systems Study of Fuels from Sugarcane, Sweet Sorghum, and Sugar Beets; Volume II., Agricultural Considerations, Task 77, Final Report*

Document Author: Lipinsky, E.S.
McClure, T.A.
Nathan, R.A.
Anderson, T.L.
Sheppard, W.J.

Author Affiliation: Battelle Columbus Labs., Ohio (USA)

Report Number: BMI-1957 (vol. 2)
Contract W-7405-ENG-92

Publication Date: 31 Dec 1976

Pages: 255

Notes: Work performed under contract to the Energy Research and Development Administration.

Availability: NTIS

Document Type: Report

Citation Number **80A003135**

Document Title: *Systems Study of Fuels from Sugarcane, Sweet Sorghum, Sugar Beets, and Corn; Volume IV., Corn Agriculture, Task 77, Final Report*

Document Author: Lipinsky, E.S.
McClure, T.A.
Otis, J.L.
Scantland, D.A.
Sheppard, W.J.

Author Affiliation: Battelle Columbus Labs., Ohio (USA)

Report Number: BMI-1957A (vol. 4)
Contract W-7405-ENG-92

Publication Date: 31 Mar 1977

Pages: 211

Notes: Work performed under contract to Energy Research and Development Administration.

Availability: NTIS

Document Type: Report

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IV
Feedstocks — Starch

IV

Citation Number 78:002289
Article Title *Cassava Fuel Alcohol in Brazil*
Document Title Proceedings of the 12th Intersociety Energy Conversion Engineering Conference. Volume I
Article Author Yang, V.
Milfont, W.N. Jr.
Scigliano, A.
Massa, C.O.
Sresnewsky, S.
Trindade, S.C.
Author Affiliation Centro de Technologia Promon-CTP, Rio de Janeiro (Brazil)
Conference 12th intersociety energy conversion engineering conference
Conference Place Washington, DC, USA
Conference Date 28 Aug 1977
Publisher American Nuclear Society, Inc.; La Grange Park, IL, USA
Publication Date 1977
Pages 44-53
Notes See CONF-770804 — P1.
Abstract Energetics and economics of ethanol production from cassava under Brazilian conditions were analyzed. A 150 m^3/day alcohol distillery based on batch conversion and fermentation steps and employing a totally enzymatic process was the base-distillery chosen. Comparison with alcohol production from sugar cane juice was made. Prospects for process energy improvements and effects on alcohol production costs are discussed and compared to base-distillery results. Net energy/ratio concept was used as basis for process energetics analysis. Sharp increase in cassava agriculture productivity is expected to considerably improve cassava fuel alcohol economics.
Document Type Paper/Chapter from book

Citation Number 78:002733
Article Title *Production of Ethyl Alcohol from Babassu*
Article Author Carioca, J.O.B.
Scares, J.B.
Thiemann, W.H.P.
Author Affiliation Universidad Federal do Ceara, Fortaleza, Brazil
Journal Biotechnol. Bioeng.
Volume 20
Issue 3
Pages 443-445
Publication Date Mar 1978
Abstract The babassu coconut palm tree of northeastern Brazil was studied as a source of ethanol. The feasibility was shown on a laboratory scale by fermenting babassu flour obtained by grinding the mesocarp, the intermediate fibers of the coconut, with a relative ethanol yield of 76%. It is suggested that the optimization of the process should be investigated as the annual production is about 210 tons and at present only the "almonds," oil-rich kernels, are utilized. (JSR)
Document Type Journal article

Citation Number 78:003190
Document Title *Jerusalem Artichoke*
Document Author Stauffer, M.D.
Chubey, B.B.
Dorrell, D.G.
Publisher Agriculture Canada, Research Branch; Morden, Manitoba, CA
Publication Date 1977
Pages 6
Notes Agriculture Canada, no. 1741
Abstract The potential of the Jerusalem artichoke as a source of sugar, ethanol, animal feed supplement, and methanol is assessed. Agronomic characteristics of the plants are described. From very preliminary data it appears that the sugar content and theoretical yields of ethanol make it a potentially economic source for these materials. (JSR)
Document Type Book

Citation Number 80A000008
Journal Financial Post (Toronto)
Pages 8
Publication Date 7 Jul 1979
Abstract Canada: possibility of producing alcohol-based auto fuel from potato cull resources discussed.
Document Type Journal article

Citation Number 80A000017
Article Title *Cassava — Florida's Future Fuel?*
Journal Florida Engineering Society, Gainesville Journal
Volume 33
Issue 1
Pages 15,34
Publication Date Jul 1979
Document Type Journal article

Citation Number 80A000018
Article Title *Cassava: Its Potential as an Industrial Crop*
Article Author Kutianawala, S.N.
Robinson, R.K.
Journal World Crops and Livestock
Volume 31
Issue 5
Pages 168

Publication Date Oct 1979
Document Type Journal article

Citation Number 80A000110
Journal Am. Met. Mark.
Pages 18
Publication Date 12 May 1978
Abstract Discusses use of grain to make 'gasohol', cutting need for foreign oil and using up grain surplus.
Document Type Journal article

Citation Number 80A000130
Article Title *The Economics of Ethyl Alcohol Production with Particular Reference to Potatoes as a Raw Material*
Article Author Pearson, G.G.
Journal Canadian Farm Economics
Volume 3
Issue 6
Pages 20
Publication Date 1969
Document Type Journal article

Citation Number 80A000160
Journal Feedstuffs
Pages 41
Publication Date 9 Jul 1979
Abstract Fuel-grade alcohol can be made from corn starch using solar still.
Document Type Journal article

Citation Number 80A000270
Article Title *The Roots of Power: the Growing of Manioc in Brazil and Australia Will Lessen Dependency upon Oil Imports*
Article Author Cowan, E.
Journal Humanist
Volume 40
Pages 26
Publication Date Apr 1980
Document Type Journal article

Citation Number 80A000292
Article Title *Soviet Grain for Gasohol*
Journal Sci. News
Volume 117
Pages 24
Publication Date 12 Jan 1980
Document Type Journal article

Citation Number 80A000427
Article Title *Potato Alcohol; a Solution to the Energy Crisis and Higher Prices for Spuds?*
Journal Potato Grower of Idaho
Volume 8
Issue 4
Pages 48-50
Publication Date Apr 1978
Document Type Journal article

Citation Number 80A000498
Document Title *Feasibility of Establishing Potato Ethanol Plants on Prince Edward Island*
Document Author Hall, E.
Series Institute of man and resources publication 1/80
Publisher Institute of Man and Resources
Publication Date Jan 1980
Document Type Book

Citation Number 80A000687
Article Title *Alcohol Production from Cassava*
Document Title Cassava Harvesting and Processing, Workshop
Article Author de Menezes, T.J.B.
Weber, J. (ed.)
Cock, J.H. (ed.)
Chouinard, A. (ed.)
Conference Cassava harvesting and processing, workshop
Conference Place Cali, Colombia
Conference Date 24 Apr 1978
Publisher International Development Research Center
Publication Date 1978
Pages 41-45
Availability UNIPUB, Inc., 345 Park Avenue South, New York, NY 10010 $5.00
Document Type Paper/Chapter from book

Citation Number 80A000688
Article Title *Large-scale Cassava Starch Extraction Processes*
Document Title Cassava Harvesting and Processing, Workshop
Article Author Dahlberg, B.
Weber, J. (ed.)
Cock, J.H. (ed.)
Chouinard, A. (ed.)
Conference Cassava harvesting and processing, workshop
Conference Place Cali, Colombia
Conference Date 24 Apr 1978
Publisher International Development Research Center
Publication Date 1978
Pages 33-36
Availability UNIPUB, Inc., 345 Park Avenue South, New York, NY 10010 $5.00
Document Type Paper/Chapter from book

Citation Number 80A000689
Article Title *Prospects of Cassava Fuel Alcohol in Brazil*
Document Title Cassava Harvesting and Processing, Workshop
Article Author Milfont, W.N., Jr.
Weber, J. (ed.)
Cock, J.H. (ed.)
Chouinard, A. (ed.)
Conference Cassava harvesting and processing, workshop
Conference Place Cali, Colombia
Conference Date 24 Apr 1978
Publisher International Development Research Center
Publication Date 1978
Pages 46-48
Availability UNIPUB, Inc., 345 Park Avenue South, New York, NY 10010 $5.00
Document Type Paper/Chapter from book

Citation Number 80A001023
Journal Australian Financial Review
Pages 3
Publication Date 30 Aug 1979
Abstract Australia: alcohol from wheat may soon provide 15% of car fuel in Australia.
Document Type Journal article

Citation Number 80A001052
Article Title *Intnl Mandioca Dev to Set Up Joint Venture with Brazilian Interests to Process Manioc into Fuel Alcohol*
Journal Asian Wall Street Journal
Pages 14
Publication Date 16 Jul 1979

Document Type | Journal article

Citation Number **80A001060**
Article Title *Jerusalem Artichoke, a Potential Fructose Crop for the Prairies*
Article Author Chubey, B.B.
Dorrell, D.G.
Journal Can. Inst. Food Sci. Technol. J.
Volume 7
Issue 2
Pages 98-100
Publication Date 1974
Document Type Journal article

Citation Number **80A001061**
Article Title *Jerusalem Artichoke Gets Attention as Possible Fuel Ethanol Alcohol Source*
Journal Solar Energy Digest
Pages 2
Publication Date Nov 1977
Document Type Journal article

Citation Number **80:001949**
Article Title *Availability and Cost of Grain for Use as Alcohol Fuels Feedstocks. Final Report, November 28, 1978*
Document Title Report of the Alcohol Fuels Policy Reivew. Raw Material Availability Report
Report Number DOE/ET — 0114/1
Publication Date Sep 1979
Pages 34p, Paper 2
Abstract The primary objective of this research effort was to obtain an estimate of the amount of corn, wheat, and grain sorghum which would be available for ethanol production to the year 2000. Severe limitations on time and funds prevented an in depth study of grain availability and the implication of using grain for fuel. Given this framework two techniques were developed to project grain availability. The first technique to determine the amount of grain which could be produced on the current total cropland base assumed a USDA policy which does not involve production restrictions. For a bases of comparison straight line projections were made for the three grains. This second set of projections were based strictly on historical production trends
Availability NTIS
Document Type Paper from report

Citation Number **80A002067**
Article Title *Feed Grains as Fuel*
Article Author Angrist, S.W.
Journal Forbes
Volume 125
Issue 6
Pages 203
Publication Date 17 Mar 1980
Abstract The Carter Administration has stated that it would like to use some of the embargoed corn to produce gasohol, which is 90% gasoline and 10% ethanol. Ethanol is an alcohol distilled from corn, and supporters of this proposal say that it would reduce supplies of surplus corn as well as dependence on foreign oil. Two methods used to extract ethanol from corn are: 1. fermentation, which is the simplest, cheapest, and most easily adapted to on-farm production, and 2. the wet milling process, which is more complicated and requires a large plant. Opponents of gasohol assert that: 1. the soybean meal industry could be disrupted by large-scale gasohol production. 2. Large amounts of grain cannot be assigned to gasohol production with assurance because corn crops depend on the weather. 3. A large part of the world depends on our corn exports, which would be cutback by gasohol production. All these objections are answerable, and at current prices, the displacement of our gasoline consumption makes the trade of 5-10% of our corn crop worth it. (ABI)
Document Type Journal article

Citation Number **80A002148**
Document Title *Feasibility of Ethanol from Grain in Montana*
Document Author Stroup, R.
Miller, T.
Author Affiliation Montana State Univ., Bozeman (USA) Agricultural Experiment Station
Series Montana State Univ., Montana Agriculture Experiment Station, Research Report no. 118
Publication Date Jan 1978
Pages 25
Document Type Book

Citation Number **80A002174**
Article Title *Fermentative Utilization of Cassava*
Article Author Banzon, J.R.
Journal Iowa State J. Sci.
Volume 16
Pages 15-18
Publication Date 1941
Document Type Journal article

Citation Number **80A002204**
Article Title *Granular Wheat Flour Increases Alcohol Yields*
Article Author Handren, R.T.
Journal Chemical Industries
Volume 53
Issue 3
Pages 350-352
Publication Date Sep 1943
Abstract Methods used by Park & Tilford Distilleries in making industrial alcohol from wheat flour. (EI)
Document Type Journal article

Citation Number **80A002206**
Article Title *Alcohol from Granular Wheat Flour*
Article Author Singleton, P.A.
Journal Chemical Industries
Volume 52
Issue 5
Pages 594-596
Publication Date May 1943
Abstract Manner in which New England Alcohol Company's Everett plant was converted from molasses to granular flour process; equipment results obtained; flow sheet for grain mash given. (EI)
Document Type Journal article

Citation Number **80A002209**
Article Title *Alcohol: in History, Science and Industry*
Article Author McGovern, J.P.
Journal Chemicals
Volume 31

Issue	14
Pages	29-31
Publication Date	8 Apr 1929
Abstract	In Germany, potatoes constitute chief source of large output of industrial alcohol; development of still; relation of alcohol to taxation; denatured alcohol; cooperation between government and industry; uses of alcohol, especially in rayon and lacquers, medicine, etc. Address before Louisiana State University. (EI)
Document Type	Journal article

Citation Number	**80A002228**
Article Title	*Saccharification of Grain Mashes for Alcoholic Fermentation*
Journal	Ind. Eng. Chem. (Industrial Edition)
Volume	38
Issue	10
Pages	980-985
Publication Date	Oct 1946
Abstract	Report of results of industrial scale tests of mold bran in alcohol plant of Farm Corps Processing Corp., Omaha, Nebraska during early months of 1945. Bibliography. Before American Chemical Society. (EI)
Document Type	Journal article

Citation Number	**80A002299**
Document Title	*The Relation between Method of Saccarification and Yields of Ethanol from Various Cereals*
Document Author	Schoene, D.L.
Author Affiliation	Iowa State Univ. of Science and Technology, Ames (USA)
Thesis	Ph.D. Dissertation
Publication Date	1939
Notes	Dissertation abstracts, 1938-1947, v. 1-7
Availability	Not available from University Microfilms International
Document Type	Thesis/Dissertion

Citation Number	**80A002308**
Article Title	*Fuel from Crops*
Document Title	2nd New Zealand Energy Conference
Article Author	Mulcock, A.P.
Author Affiliation	Canterbury Univ., Christchurch (New Zealand). School of Engineering
Conference	2nd New Zealand energy conference
Conference Place	Christchurch, New Zealand
Conference Date	22 May 1975
Journal	Canterbury Eng. J. (New Zealand)
Issue	4
Pages	76-77
Publication Date	1975
Abstract	The method described converts the carbohydrate in the plants to sugar and use this to produce ethanol by fermentation. Ethanol can be produced from a wide variety of crops. The carbohydrate may be broken down into fermentable sugars, either by acid hydrolysis or enzymatic degradation, and the sugars can then be fermented with yeast to ethanol. The ethanol may then be purified and concentrated. The pure compound can be easily stored and transported; it may be used as the basis of chemical synthesis or up to 20 per cent may be mixed with petrol to give an acceptable blend. (BIOSIS)
Document Type	Journal article

Citation Number	**80A003003**
Document Title	*Cassava as an Energy Source*
Document Author	Sherman, C.
Publisher	Calvin Sherman; FL, USA
Publication Date	Mar 1980
Pages	20
Document Type	Book

Citation Number	**80A003009**
Document Title	*Production and Use of Fuel Ethanol from Corn or Wheat; Sources of Energy*
Document Author	Litterman, M.S. Thimsen, D.P.
Author Affiliation	The Service, St. Paul, Minn. (USA)
Publication Date	1979
Pages	8
Document Type	Book

Citation Number	**80A003034**
Article Title	*Potato Products Industry*
Journal	Engineer
Volume	171
Issue	4459
Pages	410-412
Publication Date	27 Jun 1941
Abstract	Notes on manufacture of potato flour, starch, dextrine, glucose and power alcohol; illustrated description of methods and equipment employed. (EI)
Document Type	Journal article

Citation Number	**80A003036**
Article Title	*Potatoes an Important Source of Motor Fuel in Germany*
Journal	Ind. Eng. Chem., News Ed.
Volume	13
Pages	286
Publication Date	10 Jul 1935
Document Type	Journal article

Citation Number	**80A003054**
Article Title	*Production of Industrial Alcohol from Grain by Amylo Process*
Article Author	Owen, W.L.
Journal	Ind. Eng. Chem.
Volume	25
Issue	1
Pages	87-89
Publication Date	Jan 1933
Notes	See also Chem. Age (London) v. 28, no. 711, Feb. 11, 1933, p. 118-119.
Abstract	Operation of process; advantages. Bibliography. (EI)
Document Type	Journal article

Citation Number	**80A003057**
Article Title	*Wheat as Raw Material for Alcohol Production*
Article Author	Stark, W.H. Kolachov, P. Willkie, H.F.
Journal	Ind. Eng. Chem.
Volume	35
Issue	2
Pages	133-137
Publication Date	Feb 1943
Notes	See also Chem. Age, v. 48, no. 1247, May 22, 1943, p. 561-562.

Abstract	Problems in connection with use of wheat for alcohol manufacture investigated; type best suited for alcohol manufacture, methods of processing, and expected yields; data from laboratory studies and production experience presented; utilization of wheat and various combinations of corn and wheat. Bibliography. (EI)
Document Type	Journal article

Citation Number	**80A003058**
Article Title	*Manufacture of Alcohol from Potatoes*
Article Author	Ryder, C.D.
Journal	Industrial Australian and Mining Standard
Volume	78
Issue	2023
Pages	621
Publication Date	8 Dec 1927
Abstract	Outline of composition of raw material, methods of production, and refining crude alcohol, with special regard to Australian conditions; arrangement of agricultural distillery. (EI)
Document Type	Journal article

Citation Number	**80A003109**
Document Title	*Potato Culls as a Source of Industrial Alcohol; with a General Discussion of the Availability of Other Wastes*
Document Author	Wente, A.O. Tolman, L.M.
Series	Farmer's Bulletin. (U.S. Dept. of Agriculture) no. 4101
Publication Date	1910
Pages	40
Document Type	Book

Citation Number	**80A003126**
Document Title	*Corn as a Raw Material for Ethyl Alcohol*
Document Author	Arnold, L.K. Kremer, L.A.
Series	Iowa Engineering Experiment Station. Bulletin 167
Publisher	Iowa State Univ.; Ames, IA, USA
Publication Date	15 Mar 1950
Document Type	Book

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V
Feedstocks — Cellulose Crops and Residues

Citation Number	**76:000667**
Document Title	*Cellulose: the Ultimate Resource. New Pathways to Its Utilization*
Corporate Author	Chemurgic Council on Renewable Resources, New York (USA)
Conference	Editorial Seminar
Conference Place	New York, NY, USA
Conference Date	23 Oct 1974
Report Number	CONF-7410149 — MN-13
Publication Date	1974
Pages	20
Abstract	Three papers are presented on cellulose as the ultimate renewable resource, its enzymatic hyrolysis, and its use in the production of fuel oils or methanol. (JSR)
Availability	Chemurgic Chemical on Renewable Resources, New York, NY.
Document Type	Report

Citation Number	**76:001689**
Document Title	*Production of Solar Ethanol from Australian Forests*
Document Author	Siemon, J.R.
Corporate Author	Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia)
Report Number	S.E.S. — 75/5 MN-61
Publication Date	Dec 1975
Pages	51
Abstract	The large-scale production of ethanol as an alternative transport fuel has been studied. The manufacturing route used acid hydrolysis of wood cellulose followed by fermentation of the sugars to ethanol. The wood is provided by growing eucalyptus on intensively managed plantations. To provide one-half of Australia's liquid fuel requirements in the year 2000, some 21.2 Mt/a of ethanol will be required. This could be met by 17 production complexes each producing 4,000 t/d of ethanol. The total land area required is 13 Mha which is about 65 percent of currently unused arable land. Using established technology, solar ethanol could be produced for about $450/t (in 1974 prices) which is a retail price of $2.00/gal. It is suggested that, with further research, this could be reduced to about $1.50/gal. By comparison petrol from coal is estimated to cost about 75 cents/gal at 1974 coal prices. This latter figure will increase if coal prices continue to rise, solar ethanol becoming competitive at a coal price of about $80/t.
Availability	NTIS
Document Type	Report

Citation Number	**76:001883**
Article Title	*Solar Energy for Australia. the Role of Biological Conversion*
Document Title	Institution of Engineers 1976 Engineering Conference
Article Author	Morse, R.N. Siemon, J.R.
Conference	Institution of Engineers 1976 engineering conference
Conference Place	Townsville, Queensland, Australia
Conference Date	11 May 1976
Publisher	Institution of Engineers; Sydney, AU
Publication Date	1976
Pages	1-5
Abstract	Solar energy by means of photosynthesis stores energy in trees and plants which can be converted to liquid fuel suitable for internal combustion engines. Ethanol could be produced this way from cellulose on a scale sufficient to supply half Australia's estimated needs for transportation in 2000 from forest plantations totalling 13 million ha. The process has been used on a small scale, but is not fully developed. Rising energy costs will improve the prospects that research could make solar ethanol competitive with synthetic fuels such as oil from coal, and introduce a major renewable source of liquid fuel.
Document Type	Paper/Chapter from book

Citation Number	**77:000111**
Article Title	*Production of Ethanol from Materials Containing Cellulose*
Document Title	Solar Energy Fixation by Plants and Synthetic Fuel Production
Article Author	Lewis, R.P.
Corporate Author	Minnesota Univ., Minneapolis (USA). Center for Studies of the Physical Environment
Report Number	NP — 20973
Pages	24p, Appendix E
Abstract	Because of the abundance of cellulose waste materials in Minnesota, it appears relevant to consider these materials as a source of ethanol. Past and recent process development for the production of ethanol from materials containing cellulose are reviewed. The current economic feasibility of developed processes is evaluated. (JSR)
Document Type	Paper from report

Citation Number	**78:001830**
Article Title	*Energy and Materials from the Forest Biomass*
Document Title	Clean Fuel from Biomass and Wastes
Article Author	Saeman, J.F.
Author Affiliation	Forest Products Lab., Madison, Wis. (USA)
Conference	Symposium on clean fuels from biomass and wastes
Conference Place	Orlando, FL, USA
Conference Date	25 Jan 1977
Publisher	Institute of Gas Technology; Chicago, IL, USA
Report Number	CONF-770142 —
Publication Date	Mar 1977
Pages	153-168
Abstract	Priorities and strategies are offered in optimizing the contribution of forest biomass to our materials and energy budget. The net photosynthetic productivity of the earth has been estimated at 155 x 10^9 tons per year. Forests account for 42% of this total, and croplands for 6%. The net productivity of forests, including tropical forests, is equivalent to more than the world consumption of fossil fuels. The most cost-effective energy contribution of U.S. forests is an indirect one resulting from the use of conventional forest products rather than more energy-intensive alternative products. Next in importance is the direct use of residues as a fuel, particularly in wood processing industries. Wood industries now use 1.1 Q (10^{15} Btu's) of residues and 1.5 Q of purchased fuel. There are over 2 Q of energy available from unused but accessible manufacturing and logging residues. Equipment is readily available for handling and burning wood residues in an environmentally acceptable manner. Achieving energy self-sufficiency would constitute a direct 3% contribution to the energy budget. Net timber growth in the United States, particularly of hardwoods, exceeds consumption. This can be used for forest products, chemicals, or fuel. An economic assessment of available technology for converting such wood to ethanol, furfural, methanol, formaldehyde, and phenol with various assumed plant sizes and wood prices showed high capital costs and profits too low for the risks involved. Research opportunities for the improved chemical or biochemical conversion of forest biomass are outlined. Intensification and reorientation of timber production and utilization offer the realistic hope of an energy self-sufficient industry with twice present output. This holds high economic potential in maintaining balance of trade and improving the relationship between gross national product and energy consumption.
Document Type	Paper/Chapter from book

Citation Number	**78:001832**
Article Title	*Utilization of Waste Cellulose for Production of Chemical Feedstocks via Acid Hydrolysis*
Document Title	Clean Fuel from Biomass and Wastes
Article Author	Brenner, W. Rugg, B. Rogers, C.
Author Affiliation	New York Univ.
Conference	Symposium on clean fuels from biomass and wastes
Conference Place	Orlando, FL, USA
Conference Date	25 Jan 1977
Publisher	Institute of Gas Technology; Chicago, IL, USA
Report Number	CONF-770142 —
Publication Date	Mar 1977
Pages	201-212
Abstract	Solid waste is now generally recognized as both a major problem and an underutilized renewable resource for materials and energy recovery. The large amounts of cellulose present in such wastes warrant their consideration as an alternate feedstock to petrochemicals for fuels, intermediates and synthetic proteins. The crucial step in this developing technology is optimizing the conversion of cellulose to its monomer — glucose. Experiments are described which show that selected pretreatments of cellulosic waste followed by a rapid high temperature acid hydrolysis can produce glucose yields in the order of 50% based on the available cellulose. Studies are under way toward the design and construction of a continuous acid hydrolysis process which is to be initially demonstrated in a 1 ton/day pilot plant facility. Consideration is being given to combining acid hydrolysis-anaerobic fermentation for methane production as a potentially economic attractive alternative to ethanol manufacture from glucose.
Document Type	Paper/Chapter from book

Citation Number	**78:002268**
Document Title	*Silvicultural Biomass Farms. Volume V. Conversion Processes and Costs*
Document Author	Bliss, C. Blake, D.O.
Corporate Author	Mitre Corp., McLean, Va. (USA). METREK Div.
Report Number	MTR — 7347(Vol.5) Contract EX-76-C-01-2081 STD-61
Publication Date	May 1977
Pages	279
Abstract	An assessment of the products and processes that appear to be the candidates for the conversion of wood biomass to energy forms suited to the national energy scene is presented. Identification was achieved by comparing market-oriented selling prices of competitive products projected for the future with estimations of production-oriented selling prices utilizing wood-biomass feedstocks needed to make the production attractive to the investor. The products assessed include: electricity from combustion of wood, wood and wood charcoal in combustion with oil or coal, ammonia, methanol, medium-Btu fuel gas, substitute natural gas, and ethanol. Conversion technologies are reviewed and data and information gaps for ultimate design of viable processes are identified as an input to the formulation of research and development needs.
Availability	NTIS
Document Type	Report

Citation Number	**78:002269**
Document Title	*Economic Pre-feasibility Study: Large-scale Methanol Fuel Production from Surplus Canadian Forest Biomass. Part 2. Working Papers*
Corporate Author	InterGroup Consulting Economists Ltd., Winnipeg, Manitoba (Canada)
Report Number	NP — 22159/2 MN-61

Publication Date Sep 1976
Pages 249
Abstract Working papers supporting information presented in NP — 22159/1 are included. The research presented deals with the practicability of using methanol produced from surplus renewable Canadian forest roundwood as a substitute for nonrenewable hydrocarbons in meeting Canadian energy requirements. Titles of the five working papers are: methanol plant technologies, characteristics and costs; resource harvesting; opportunity costs; product demand analysis; and alternative feedstocks for methanol production. (JGB)
Availability NTIS
Document Type Report

Citation Number 78:002720
Document Title *Cellulose, Food and Energy*
Document Author Wilke, C.R.
Corporate Author California Univ., Berkeley (USA). Lawrence Berkeley Lab.
Conference International congress on engineering and food
Conference Place Boston, MA, USA
Conference Date 9 Aug 1976
Report Number LBL — 5275
CONF-7608115 — 1
Contract W-7405-ENG-48
MN-61
Publication Date Nov 1977
Pages 44
Abstract The potential of cellulose as a source of energy and food is reviewed with consideration of raw material sources, processing methods, and economics. A tentative scheme for production of Torula yeast and ethanol from sugars produced by enzymatic hydrolysis of cellulose is described.
Availability NTIS
Document Type Report

Citation Number 78:002751
Article Title *General Considerations on Cellulose Utilization: an Overview*
Article Author Bassham, J.A.
Author Affiliation Univ. of California, Berkeley
Conference National Science Foundation special seminar, cellulose as a chemical and energy source
Conference Place Berkeley, CA, USA
Conference Date 25 Jun 1974
Journal Biotechnol. Bioeng. Symp.
Issue 5
Pages 9-19
Publication Date 1975
Abstract Factors to be considered in the special raising of crops for their cellulose are reviewed with primary emphasis on photosynthetic energy conversion and productivity. As arable land cannot be diverted from its primary use of food production, one is forced to consider dry desert and desert scrub. Much of this land, however, is highly fertile when irrigated and has high agricultural productivity. The maximum global yield of photosynthetic products is evaluated and an estimate is made of how close field production can come to this maximum. Experiments have shown that non C-4 plants grown in high partial pressures of CO can perform as efficiently as C-4 plants. This suggests the possibility of a closed system in the southwest deserts to recycle water and maintain a sufficiently high CO level. The energetics of the hydrolysis of cellulose to glucose followed by the fermentation of glucose to ethanol appears too highly efficient in terms of energy conservation, yield, and quality of product. (JSR)
Document Type Journal article

Citation Number 79:001713
Document Title *Raw Materials Evaluation and Process Development Studies for Conversion of Biomass to Sugars and Ethanol*
Document Author Wilke, C.R.
Yang, R.D.
Sciamanna, A.S.
Freitas, R.P.
Corporate Author California Univ., Berkeley (USA). Lawrence Berkeley Lab.
Conference 2nd symposium on fuels from biomass
Conference Place Troy, NY, USA
Conference Date 20 Jun 1978
Report Number LBL — 7847
CONF-7806107 — 1
Contract W-7405-ENG-48
MN-61
Publication Date Jun 1978
Pages 41
Abstract A range of cellulosic raw materials in the form of agricultural crop residue was analyzed for chemical composition and assessed for potential yields of sugars through chemical pretreatment and enzymatic hydrolysis of these materials. Corn stover was used as a representative raw material for a preliminary process design and economic assessment of the production of sugars and ethanol. With the process as presently developed, 23 gallons of ethanol can be obtained per ton of corn stover at a processing cost of about $1.80 per gallon exclusive of by-product credits. The analysis shows the cost of ethanol to be highly dependent upon (1) the cost of the biomass, (2) the extent of conversion to glucose, (3) enzyme recovery and production cost and (4) potential utilization of xylose. Significant cost reduction appears possible through further research in these directions.
Availability NTIS
Document Type Report

Citation Number 79:002492
Article Title *Forest Fuels, USA*
Document Title Symposium on Forest and Field Fuels
Article Author Zerbe, J.I.
Conference Forest and field fuels symposium
Conference Place Winnipeg, Manitoba, Canada
Conference Date 12 Oct 1977
Report Number CONF-7710156 —
Publication Date 1977
Pages IV.1-IV.13
Abstract The potential of using wood wastes for fuel by the wood products industry is evaluated. The combustion equipment available is described and an indication is given of its cost. The conversion of wood to synthesis gas or methanol by thermochemical processes or to ethanol by hydrolysis and fermentative processes is discussed as a possible future alternative. (JSR)
Document Type Paper from report

Citation Number	**79:002502**
Article Title	*Canadian Production Potential — Fuel Grade Methanol from Canadian Forests*
Document Title	Proceedings Forest and Field Fuels Symposium
Article Author	Marshall, J.E.
Author Affiliation	Environment Canada, Ottawa, Ontario
Conference	Forest and field fuels symposium
Conference Place	Winnipeg, Manitoba, Canada
Conference Date	12 Oct 1977
Report Number	CONF-7710156 —
Publication Date	1977
Pages	XXX.1-XXX.9
Abstract	After indicating the difficulties in estimating the forest biomass available for methanol production, figures are cited which indicate that Canada in the year 2000 would have sufficient surplus biomass to produce 6 billion gallons of methanol. This figure does not take into consideration the increased biomass production that might be accomplished with short-rotation intensive forest management. The possibility of combining nuclear power with biomass to produce methanol was also briefly discussed. (JSR)
Document Type	Paper from report

Citation Number	**80A000003**
Article Title	*Can There Be Effective Utilization of Cellulosic Feedstock in the Production of Fuel Grade Ethanol*
Article Author	Yu, J. Miller, S.F.
Author Affiliation	Bechtel Corp., San Francisco, Calif. (USA)
Journal	Am. Chem. Soc., Abstracts of Papers
Volume	1979
Pages	60
Publication Date	Apr 1979
Document Type	Journal article

Citation Number	**80A000025**
Article Title	*Cellulose to Sugars: Gives Quantitative Yield*
Article Author	Tsao, G.T.
Journal	Science
Volume	201
Publication Date	1978
Document Type	Journal article

Citation Number	**80A000031**
Article Title	*Cheap Alcohol from Cellulose*
Journal	Bus. Week
Issue	2619
Pages	36D
Publication Date	14 Jan 1980
Abstract	In Long Island, New York, an extruder that originally was designed to turn out plastic products is converting one ton of newspapers and sawdust daily into a syrup containing 1,200 lbs. of glucose. The prototype, developed by researchers at New York University, has attracted the interests of a number of paper processors. Since it can continuously process cellulose wastes into glucose which can then be fermented into alcohol, the machine represents a breakthrough in the economics of producing fuel from biomass. Scientists have known for centuries that cellulose can be chemically converted into glucose, but until energy costs soared, there was no economical way to do it. And, until this breakthrough, a continuous process to unlock the fermentable sugar from cellulose has eluded researchers. The process could make it possible to turn out lower-priced alcohol. The lack of an inexpensive source of sugar has always been a barrier to the widespread use of alcohol as a fuel. The procedure could cut cost of manufacturing alcohol in half which, in turn, could cut the cost of manufacturing a gallon to as little as 80c. Werner & Pfleiderer is an equipment manager interested in building a pilot plant at a cost of $2.5 million. (ABI)
Document Type	Journal article

Citation Number	**80A000034**
Article Title	*Chemical Breakdown of Cellulosic Materials*
Article Author	Grethlein, H.E.
Author Affiliation	Dartmouth Coll., Hanover, N.H. (USA). Thayer School of Engineering
Journal	J. Appl. Chem. Biotechnol.
Volume	28
Issue	4
Pages	296-308
Publication Date	Apr 1978
Abstract	The cellulose, the major component, is converted to glucose while the hemi-cellulose essentially is converted to xylose and glucose, and the lignin remains insoluble. Because the sugars also decompose in acid media, a kinetic model is used to find the optimum yield of glucose. A modern integrated continuous hydrolysis plant has the potential of overcoming the past economic problems of acid hydrolysis — especially when several products are recovered such as glucose, xylose, and furfural. The conversion to glucose to ethanol via fermentation provides a way to utilize waste cellulose to produce a valuable fuel and chemical feedstock. (EI)
Document Type	Journal article

Citation Number	**80A000036**
Article Title	*Chemicals from Lignocellulose*
Article Author	Goldstein, I.S.
Journal	Biotechnol. Bioeng. Symp.
Issue	6
Pages	293-301
Publication Date	1976
Notes	Held Sept. 1975.
Abstract	Among the numcrous chemicals synthesizable from wood and other LC raw materials and their components, those offering industrial large-scale production opportunities via enzymic conversion include: ammonia, carbon, methanol, and hydrocarbon oils from total LC; ethanol and furfural from hemicelluloses; ethanol, ethylene, butadiene, and levulinic acid from cellulose; and phenol and benzene from lignin. Economic feasibility will depend on shifts in the availability and cost of alternative raw materials, notably petroleum and coal. (PAPER CHEM)
Document Type	Journal article

Citation Number	**80A000037**
Article Title	*Chemicals from Trees*
Article Author	Zinkel, D.F.
Journal	Chem. Technol.
Pages	235-241
Publication Date	Apr 1975

Abstract	In addition to providing building materials, paper products, and fuels, trees also furnish a large array of silvichemicals derived from tree components and spent pulping liquors. Silvichemicals include charcoal, lignin derivatives, vanillin, essential oils, resins, yeast, alkaloids, tannins, rubber, true gums, ethanol, acetic acid, vitamin pastes, and waxes. Of all the silvichemicals, those from the pines (naval stores) have the largest aggregate volume and value. The historical uses of naval stores, current sources, and main products and uses are reviewed. The future outlook for pine chemicals is also discussed. (PAPER CHEM)
Document Type	Journal article

Citation Number	**80A000049**
Article Title	*Costs Prohibit Cellulosic Use as Feedstock*
Article Author	Becher, P.
Journal	Chem. Eng. News
Publication Date	12 Apr 1976
Document Type	Journal article

Citation Number	**80A000093**
Article Title	*Energy for All: We'll Get Tanked Up on Wood Alcohol*
Article Author	Saul, J.
Journal	Wood Wood Prod.
Publication Date	Feb 1974
Document Type	Journal article

Citation Number	**80A000115**
Article Title	*Distilling the News' New Process to Convert Recycled Newspapers into Glucose and Alcohol for Fuel*
Article Author	Douglas, J.H.
Journal	Sci. News
Volume	105
Pages	195
Publication Date	23 Mar 1974
Document Type	Journal article

Citation Number	**80A000142**
Article Title	*Energy Forests and Fuel Plantations*
Article Author	Kemp, C.C. Szego, G.C.
Journal	CHEMTECH
Volume	3
Issue	5
Publication Date	May 1973
Document Type	Journal article

Citation Number	**80A000154**
Article Title	*Forest and Wood Waste Utilisation: Conversion to Fuel Alcohol — a FRI Study*
Article Author	Whitworth, D.A.
Author Affiliation	New Zealand Forest Service, Rotorua. Forest Research Inst.
Journal	Forest Industries Review
Volume	8
Issue	1
Pages	26-28
Publication Date	1976
Document Type	Journal article

Citation Number	**80A000163**
Article Title	*Fuels and Chemicals from Biomass*
Article Author	Ladisch, M.R. Flickinger, M.C. Tsao, G.T.
Author Affiliation	Purdue Univ., Lafayette, Ind. (USA). A.A. Potter Center
Journal	Energy (Oxford)
Volume	4
Issue	2
Pages	263-275
Publication Date	1979
Abstract	A review with 75 refs. with special emphasis on the Purdue process, including solvent pretreatment of cellulosic material to make it readily accessible to hydrolysis to sugars by either acid or enzyme together with fermentation of the resulting sugar to EtOH.
Document Type	Journal article

Citation Number	**80:000189**
Article Title	*Raw Materials Evaluation and Process Development Studies for Conversion of Biomass to Sugars and Ethanol*
Document Title	Second Annual Symposium on Fuels from Biomass
Article Author	Wilke, C.R. Yang, R.D. Sciamanna, A.S. Freitas, R.P. Shuster, W.W. (ed.)
Author Affiliation	Univ. of California, Berkeley
Conference	2nd symposium on fuels from biomass
Conference Place	Troy, NY, USA
Conference Date	20 Jun 1978
Report Number	CONF-7806107 — P1
Publication Date	1978
Pages	421-459
Abstract	A range of cellulosic raw materials in the form of agricultural crop residue was analyzed for chemical composition and assessed for potential yields of sugars through chemical pretreatment and enzymatic hydrolysis of these materials. Corn stover was used as a representative raw material for a preliminary process design and economic assessment of the production of sugars and ethanol. With the process as presently developed, 23 gallons of ethanol can be obtained per ton of corn stover at a processing cost of about $1.80 per gallon exclusive of by-product credits. The analysis shows the cost of ethanol to be highly dependent upon (1) the cost of the biomass, (2) the extent of conversion to glucose, (3) enzyme recovery and production cost, and (4) potential utilization of xylose. Significant cost reduction appears possible through further research in these directions.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A000213**
Article Title	*Green Gold (Converting Cellulose into Ethyl Alcohol)*
Journal	Chemistry
Volume	51
Pages	23
Publication Date	Apr 1978

Document Type	Journal article
Citation Number	**80A000226**
Journal	Chem. Eng. (N.Y.)
Pages	58
Publication Date	5 Nov 1979
Abstract	Mesquite shrub offers significant energy potential for ethanol and methanol production.
Document Type	Journal article
Citation Number	**80A000230**
Journal	Chem. Week
Pages	19
Publication Date	26 Feb 1975
Abstract	Maine and Seattle move to develop alternative energy sources like methanol based on wood and other wastes.
Document Type	Journal article
Citation Number	**80A000237**
Article Title	*Methanol, Ethanol, and Acetone in Kraft Pulp Mill Condensate Streams. (Paper Industry)*
Article Author	Wilson, D.F. Johanson, L.N. Hrutfiord, B.F.
Journal	Tappi
Volume	55
Issue	8
Pages	1244-1246
Publication Date	Aug 1972
Document Type	Journal article
Citation Number	**80:000244**
Article Title	*Mesquite: a Possible Source of Energy*
Document Title	Technology of Utilizing Bark and Residues as an Energy and Chemical Resource
Article Author	Wiley, A.T. Mater, J. Mater, M.H. (eds.)
Author Affiliation	Forest Products Lab., Lufkin, Tex. (USA)
Publisher	Forest Products Research Society; Madison, WI, USA
Publication Date	1976
Pages	79-91
Abstract	The possibility of utilizing mesquite (Prosopis juliblora) as fuel was studied by means of rough cost analysis. Five possible means of energy conversion were considered, namely, direct residential use for heating, production of commercial electricity, conversion to methane and methanol, and as a boiler fuel for industry. By the harvesting method proposed, which consisted of root plowing all the mesquite within the immediate vicinity of the plant and hauling the trees whole to the plant for shredding, only the use of industrial boiler fuel appeared economically competitive with other fuels, and here, the competitiveness is dependent upon an unknown parameter — the cost of hauling.
Document Type	Paper/Chapter from book
Citation Number	**80A000268**
Article Title	*The Role of Forests as a Source of Solar Energy*
Article Author	Morse, R.N. Siemon, J.R.
Journal	J. Inst. Wood Sci.
Volume	7
Issue	4
Pages	37-42
Publication Date	1976
Abstract	Ethanol could be produced from cellulose on a scale sufficient to supply half Australia's estimated needs for transport in 2000 AD from forest plantations totalling 13 million ha. Rising energy costs will improve the prospects that research could make solar ethanol competitive with synthetic fuels such as oil from coal. From author's summary. (PAPER CHEM)
Document Type	Journal article
Citation Number	**80A000269**
Article Title	*The Role of Wood in Future Energy Concerns*
Article Author	Luke, D.L. Resler, R.A. Zerbe, J.I.
Author Affiliation	Westvaco Corp., North Charleston, S.C. (USA)
Journal	For. Farmer
Volume	37
Issue	9
Pages	6
Publication Date	Aug 1978
Abstract	The forest farming business has many advantages that will contribute to future energy concerns: a renewable crop, growing demand, successful competition with foreign markets, and strong organization. Governmental influence in the form of tax policies and land withdrawals for wilderness will have positive and negative effects on forest farming respectively. In the future, a greater variety of energy sources must be developed to avoid dependence on too few resources; wood must be a part of the new mix of energy sources. The U.S. has great potential for obtaining energy from wood. Numerous research programs on such uses of wood for energy as manufacturing petrochemical substitutes from wood residues, conversion to charcoal, methanol, or fuel oil, and burning for direct heat and process steam are briefly reviewed. Recycling of wastepaper will be a significant part of wood energy programs. (EL)
Document Type	Journal article
Citation Number	**80A000354**
Article Title	*Hydrolysis of Cellulosic Materials to Useful Products*
Article Author	Humphrey, A.E.
Journal	Adv. Chem. Ser.
Issue	181
Pages	25-53
Publication Date	1979
Notes	Symp. Cellulose Hydrol., May, 1978
Abstract	Being the most abundant renewable resource, cellulose holds high promise as a source of liquid fuel, food, and chemical feedstocks. However, with present technology its utilization via hydrolysis is not economical for production of sugar syrups or alcohol fuels, especially where biomass costs exceed $30/ton. Ways should be explored to improve yields and to achieve total biomass utilization with simultaneous improvement of byproduct values. Important economic factors are the raw materials costs and the cost of pretreatments to improve yields and biomass utilization.

New ways of pressing water from the cellulose fermentation products could also enhance the process economics. (PAPER CHEM)

Document Type: Journal article

Citation Number **80A000372**
Document Title: *Converting Cellulosic Waste to Fuel: a Literature Review*
Document Author: Bundy, M.M.
Report Number: ADA009400
Publication Date: 1 Feb 1975
Pages: 12
Abstract: Hydrogenation, hydrogasification, pyrolysis, and bioconversion of cellulosic wastes, and the production of methanol from synthesis gas are reviewed briefly as potential processes for producing fuels. Pyrolysis appears to be the most useful for meeting the energy needs of the U.S. Navy. (PAPER CHEM)
Document Type: Report

Citation Number **80A000379**
Document Title: *The Feasibility of Utilizing Forest Residues for Energy and Chemicals*
Corporate Author: Forest Service, Washington, D.C. (USA)
Report Number: PB-258 630/3ST
Publication Date: Mar 1976
Pages: 184
Abstract: This report is a feasibility study of the Forest Industry Energy Program (FEIP), a major Forest Service effort to explore the use of wood residues to meet the energy requirements of individual forest industry operations within the forest land management environmental objectives. The feasibility phase addressed two major objectives: direct energy conversion and chemical conversion. (NTIS)
Document Type: Report

Citation Number **80A000401**
Document Title: *Wood Waste for Energy Study: Inventory Assessment and Economic Analysis (Washington)*
Document Author: Koss, W.
Bergvall, J.A.
Bullington, D.C.
Gee, L.
Author Affiliation: Washington State Department of Natural Resources, Olympia (USA). Div. of Technical Services
Report Number: PB-298 693/3ST
Publication Date: 1 Sep 1978
Pages: 224
Abstract: This report consists of an inventory and an economic analysis. It quantifies Washington's residue availability, analyzes the cost of residue removal and discusses the economic conditions which must occur to make wood a viable energy alternative. It includes a look at new products being developed to use forest residue, forest management problems created or eliminated by residue removal and use, forms of energy and chemicals available from residue, and products originating from residue that would directly supplement energy supplies. (NTIS)
Document Type: Report

Citation Number **80A000410**
Document Title: *Synthetic Fuels from Municipal, Industrial, and Agricultural Wastes (Citations from the NTIS Data Base)*
Document Author: Hundemann, A.S.
Author Affiliation: National Technical Information Service, Springfield, Va. (USA)
Report Number: PS-79/0545/8ST
Publication Date: Jun 1979
Pages: 172
Notes: For the companion Published Searches of the American Petroleum Institute Data Base, see NTIS/PS-79/0546 and NTIS/PS-79/0547.
Abstract: Research efforts directed toward production of gaseous and liquid synthetic fuels from solid wastes are discussed. Waste products used in the syntheses include manure, sewage, paper, and wood. In most citations, methane is the primary fuel produced; however, the production of oils, methanol, and ethanol is also discussed. (This updated bibliography contains 164 abstracts, 50 of which are new entries to the previous edition.) (NTIS)
Document Type: Report

Citation Number **80A000433**
Document Title: *Synthetic Fuels from Municipal, Industrial and Agricultural Wastes. Volume I. 1975-1977 (Citations from the American Petroleum Institute Data Base)*
Document Author: Hundemann, A.S.
Author Affiliation: National Technical Information Service, Springfield, Va. (USA)
Report Number: PS-79/0546/6ST
Publication Date: Jun 1979
Pages: 289
Notes: For the companion Published Search of the NTIS Data Base, see NTIS/PS-79/0545.
Abstract: The bibliography cites worldwide literature on the production of fuels from waste materials such as animal manure, wood chips, sewage sludge, urban garbage, agricultural wastes, and old automobile tires. (This updated bibliography contains 283 abstracts, none of which are new entries to the previous edition.) (NTIS)
Document Type: Report

Citation Number **80A000434**
Document Title: *Synthetic Fuels from Municipal, Industrial and Agricultural Wastes. Volume II. 1978 — March, 1979 (Citations from the American Petroleum Institute Data Base)*
Document Author: Hundemann, A.S.
Author Affiliation: National Technical Information Service, Springfield, Va. (USA)
Report Number: PS-79/0547/4ST
Publication Date: Jun 1979
Pages: 63
Notes: Supersedes NTIS/PS-78/0500 and NTIS/PS-77/0113. For the companion Published Search of the NTIS Data Base, see NTIS/PS-79/0545
Abstract: The bibliography cites worldwide literature on the production of fuels from waste materials, such as animal manure, wood chips, sewage sludge, urban garbage, agricultural wastes, and old automobile tires. (This updated bibliography contains 57 abstracts, all of which are new entries to the previous edition.) (NTIS)
Document Type: Report

Citation Number	**80A000442**
Document Title	*The Potential of Lignocellulosic Materials for the Production of Chemicals, Fuels, and Energy*
Corporate Author	National Research Council, Washington, D.C. (USA) Committee on Renewable Resources for Industrial Materials
Report Number	PB-264 458/1ST Contract NSF-STP75-10169
Publication Date	1976
Pages	99
Notes	See also report dated Sept. 76, PB-257 357.
Abstract	There is an abundance of lignocellulose potentially available in the United States beyond that needed for structural, packaging and communications applications. This material could satisfy about 10 percent of our national energy needs or alternatively could provide the basis for a substantial chemicals industry in perpetuity. For conservation of energy and materials the logical sequence of approaches to obtaining chemicals and polymers from lignocellulose is suggested as follows: (1) recovery of lignocellulose chemicals from waste existing manufacturing operations now using these materials for other uses and from urban and agricultural solid waste; (2) conversion of cellulose, lignin and hemicelluloses and their derivatives into useful products taking advantage of their existing polymeric structure; (3) conversion of cellulose, lignin and hemicelluloses into chemical intermediates which can be reassembled into useful polymers. A strong research program should be directed at all the approaches, and engineering and economic analyses carried on concurrently with the conceptual development or processes and modified products. (NTIS)
Document Type	Report

Citation Number	**80A000449**
Article Title	*Utilization of Cellulosic Waste for Energy Production*
Article Author	Deshpande, U. Mishra, C. Rao, M. Seeta, R. Srinivasan, M.C. Jagannathan, V.
Journal	Reg. J. Energy Heat Mass Transfer
Volume	2.
Issue	1
Pages	23-29
Publication Date	1980
Abstract	Bioconversion of cellulose for the production of food or alcohol is of importance for the utilization of a renewable and abundant resources. The hydrolysis of different cellulosic materials by the cellulolytic enzymes produced by Penicillium funiculosum was studied. 50 to 70% saccharification was obtained from pretreated bagasse, cotton and wood. The major product of hydrolysis was glucose, possibly due to the high B-glucosidase activity of the enzyme preparation. The effect of different pretreatments to make the cellulose more susceptible to enzyme breakdown was also studied. Alkali pretreatment was found to be effective for most of the substrates. The recovery and reuse of enzyme with different eluants from the residual substrate were studied. The production of alcohol from the hydrolysates by yeast fermentation without isolation of glucose was studied. Different substrates such as cellulose, powered bagasse and cotton were tested. The conversion of glucose to alcohol was about 50% and the optimum conditions for the maximum conversion to alcohol are under investigation.
Document Type	Journal article

Citation Number	**80A000453**
Document Title	*An Evaluation of the Use of Agricultural Residues as an Energy Feedstock — a Ten Site Survey; Volume I — Summary and General Information*
Document Author	Alich, J.A., Jr. Schooley, F.A. Ernest, R.K. Hamilton, R. Louks, B.M. Miller, K.A. Veblen, T.C. Witwer, J.G.
Author Affiliation	Stanford Research Inst., Menlo Park, Calif. (USA)
Report Number	TID-27904/1 Contract EY-76-C-03-0115 Contract E(04-3)115
Publication Date	July 1977
Pages	88
Notes	Prepared for the U.S. Energy Research and Development Administration, Division of Solar Energy, Fuels from Biomass Branch.
Abstract	This report by SRI International presents the results of a study of the feasibility of converting agricultural residues to produce energy. The study, sponsored by the Fuels from Biomass Branch of the U.S. Energy Research and Development Administration, presents the results of on-site surveys of ten study areas selected for analysis on the basis of a previous SRI county-by-county inventory of the quantity and availability of residues produced within the continental United States. Two important factors in determining the feasibility of residue conversion to energy are price and availability of the residues. Eight of the ten study areas have significant quantities of relatively low-cost residues. Three currently available proven technologies, process steam production, electric power generation, and anaerobic digestion of residues to produce methane gas, are the most economically feasible conversion possibilities. Residue conversion by these technologics is frequently cost-competitive with energy production at new facilities fueled with oil, propane, coal, or natural gas. (AUTHOR)
Availability	NTIS
Document Type	Report

Citation Number	**80A000455**
Document Title	*An Evaluation of the Use of Agricultural Residues as an Energy Feedstock; Volume II.*
Author Affiliation	Stanford Research Inst., Menlo Park, Calif. (USA)
Report Number	PB-260 764 NSF/RA-760287 Grant AER 74-18615 A03, GI 18615
Publication Date	Jul 1976

Pages	608
Notes	Prepared for National Science Foundation, Washington, D.C., Research Applied to National Needs.
Abstract	Since agricultural residues (crop and forest wastes and animal manures) constitute a potential supplemental source of energy, the authors examine the availability of such residues and evaluate their potential use as an energy feedstock. The research objectives are: (1) to develop a nationwide county-by-county inventory of residues generated, their quantity and condition, their current uses or disposal practices, their net availability, location, distribution and seasonality, and to create a computer file as an aid in summarization and analysis; and (2) to assess the practicality and costs of collecting and using residues on the basis of geographic concentration patterns and the economics of collection, transportation, and usage. The report is presented in two volumes. The county-by-county inventory as well as selected data summaries are presented in Volume II. (AUTHOR)
Availability	NTIS
Document Type	Report

Citation Number	**80A000456**
Document Title	*An Evaluation of the Use of Agricultural Residues as an Energy Feedstock; Volume I*
Document Author	Alich, J.A., Jr. Inman, R.E. Ernest, K.
Author Affiliation	Stanford Research Inst., Menlo Park, Calif. (USA)
Report Number	PB-260-763 NSF/RA-760286 Grant AER 74-18615 A03, GI 18615
Publication Date	Jul 1976
Pages	174
Notes	Prepared for National Science Foundation, Washington, D.C., Research Applied to National Needs.
Abstract	Since agricultural residues (crops and forest wastes and animal manures) constitute a potential supplemental source of energy, the authors examine the availability of such residues and evaluate their potential use as an energy feedstock. The research objectives are to: (1) develop a nationwide county-by-county inventory of residues generated, their quantity and condition, their current uses or disposal practices, their net availability, location, distribution and seasonality, and a computer file as an aid in summarization and analysis; and (2) assess the practicality and costs of collecting and using residues on the basis of geographic concentration patterns and the economics of collection, transportation, and usage. The report is presented intwo volumes: the method of approach used in inventory development, the collection, harvesting, and conversion economics, and the overall concept assessment are presented in Volume I. (AUTHOR)
Availability	NTIS
Document Type	Report

Citation Number	**80A000463**
Article Title	*Biomass in the Northwest — Available Inventory*
Document Title	Solar 79 Northwest
Article Author	Miles, T.R.
Conference	Solar 79 Northwest conference
Conference Place	Seattle, WA, USA
Conference Date	12 Aug 1979
Report Number	CONF-790845
Publication Date	1979
Pages	275
Abstract	The magnitude and distribution of available biomass energy in the Pacific Northwest are discussed. The feasibility of using crop residues, manure, logging residues, sawmill residues, and municipal solid wastes as energy resources is examined. Thermal and gasification bioconversion systems are described. Alternative transportation fuels, ammonia, and methane can readily be produced from biomass sources in the Pacific Northwest.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A000479**
Article Title	*Silviculture Energy Plantations*
Document Title	Sharing the Sun: Solar Technology in the Seventies, V. 7
Article Author	Inman, R.E.
Author Affiliation	Mitre Corp., McLean, Va. (USA)
Conference	Joint conference of the American section of the International Solar Energy Society and the Solar Energy Society of Canada, Inc.
Conference Place	Winnipeg, Manitoba, Canada
Conference Date	15 Aug 1976
Publisher	International Solar Energy Society, American Section; Cape Canaveral, FL, USA
Publication Date	1976
Pages	100
Notes	Presented at ISES/SES of Canada Sharing the Sun Conference, Winnipeg, Aug 15-20, 1976.
Abstract	The Mitre Corp. is conducting a systems analysis of land-based energy plantations consisting of selected trees grown under intensively managed, short rotation conditions. Wood can be burned for generation of electric power or directly for process steam. It can also be pyrolyzed or degraded into sugars for conversion to ethanol. Production appears to be critical. Even if yield were increased to 15 dry ton/acre/yr, a land area equal to the sizes of Connecticut and Rhode Island would be needed to produce 1 q of wood fuel — slightly more than 1% of projected U.S. energy demand for 1985. At yields of about 8 dry ton/acre/yr and higher, wood fuel compares favorably with the use of coal for electric power generation, according to preliminary calculations. (EL)
Document Type	Paper/Chapter from book

Citation Number	**80A000489**
Article Title	*Biomass Production of Southern Tree Plantations and Its Conversion to Energy or Chemical Products*
Document Title	Complete Tree Utilization of Southern Pine, Proceedings of a Symposium
Article Author	Inman, R.E.

	Salo, D.J.
Author Affiliation	Mitre Corp., McLean, Va. (USA). METREK Div.
Conference	Complete tree utilization of southern pine, symposium
Conference Place	New Orleans, LA, USA
Conference Date	Apr 1978
Publisher	Forest Products Research Society; Madison, WI, USA
Publication Date	1978
Pages	314-322
Document Type	Paper/Chapter from book

Citation Number	**80A000507**
Article Title	*Some Implications of Large-scale Methanol Production from Canadian Forest Biomass*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Keefer, T.A.J.
Author Affiliation	Department of the Environment, Ottawa, Ontario (Canada)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	9p, Paper I-6
Document Type	Paper from report

Citation Number	**80A000530**
Article Title	*Ethanol from Municipal Cellulosic Wastes*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Parker, A.J., Jr. Timbario, T.J. Mulloney, J.A., Jr.
Author Affiliation	Mueller Associates, Inc., Baltimore, Md. (USA) Mueller Associates, Inc., Baltimore, Md. (USA) Carling National Breweries, Inc., Baltimore, Md. (USA)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	12p, Paper II-33
Abstract	This paper has presented a preliminary analysis of the use of municipal cellulosic wastes in conjunction with the application of enzymatic hydrolysis technology for the production of ethanol. The envisioned concept appears feasible, but more thorough engineering analysis is required before firm process details can be established. The cost of producing ethanol in a converted idle brewery was shown to be competitive with synthetically-derived ethanol from petroleum. The per-gallon-of-ethanol feedstock cost of 39 cents is significantly less than that of corn (about 90 cents per gallon) as used in several fermentation ethanol plants. The close proximity of cellulosic feedstock supply to the idle Carling brewery offers a significant cost advantage, as does the availability of the plant and associated fermentation equipment. The nationally dispersed system of breweries (and its excess capacity) and its distribution in urban/suburban waste generating areas may offer a means of developing a nationwide ethanol fuel supply. The complexity or practicality of utilizing this excess beer-producing capacity have not been addressed. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000533**
Article Title	*Production of Ethanol for Lignocellulose — Current Status*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Miller, S.F. Yu, J.
Author Affiliation	Cutter Laboratories, Inc., Berkeley, Calif. (USA) Bechtel National, Inc., San Francisco, Calif. (USA)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	5p, Paper II-36
Abstract	Recent interest in producing ethanol from renewable resources has focused on the use of lignocellulose as a possible feedstock. Ethanol production could become a compatible addition to integrated forest products operations. This paper outlines the status of the various process steps available for liberating fermentable sugars from the lignocellulose, for fermenting the sugars to alcohol and for recovering alcohol and by-products. Process and laboratory studies associated with these steps are discussed. Finally, this paper outlines some of the developmental activities which will lead towards commercialization. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000535**
Article Title	*The Production of Methanol from Wood, Processes, Foresting and Economics*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Mundo, K.-J. Wehner, H.
Author Affiliation	Uhde (F.) G.m.b.H., Dortmund (Germany, F.R.)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	14p, Paper II-38
Document Type	Paper from report

Citation Number	**80A000538**
Article Title	*Production of Methanol from Wood*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Kohan, S.M.
Author Affiliation	SRI International, Menlo Park, Calif. (USA)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	12p, Paper II-41
Document Type	Paper from report

Citation Number	**80A000624**
Article Title	*Energy from Biomass through Hydrolysis of Wood*
Document Title	Proceedings of the 13th Intersociety Energy Conversion Engineering Conference
Article Author	Guha, B. Titchener, A.L.
Author Affiliation	Auckland Univ. (New Zealand)
Conference	13th intersociety energy conversion engineering conference
Conference Place	San Diego, CA, USA
Conference Date	20 Aug 1978
Publisher	Society of Automotive Engineers, Inc.; Warrendale, PA, USA
Publication Date	1978
Pages	233-238
Notes	v. 1, p. 233-238
Abstract	An effective method for converting biological material to liquid fuel is the production of ethanol by hydrolysis of cellulose and fermentation of the resulting sugar. The conversion of wood cellulose to sugar is best achieved through dilute sulfuric acid hydrolysis process. The hydrolysis of wood is described by a two-steconsecutive reaction of saccharification and decomposition. The first order reaction kinetics of both of these reactions have been established. Experiments with wood chips show the presence of considerable resistance to diffusion of sugar and the nature of wood growth. An optimization analysis for maximum yield of sugar in a percolator reactor used for hydrolysis reaction is presented. The analysis shows possible improvements in parameters of temperature, liquid flow rate and total percolation time.
Document Type	Paper/Chapter from book

Citation Number	**80A000683**
Article Title	*The Activities of Richland Operations Office Department of Energy in the Use of Forest Residues for Energy*
Document Title	Solar 78 Northwest Conference Proceedings
Article Author	Durham, R.L.
Author Affiliation	Department of Energy, Washington, D.C. (USA)
Conference	Solar 78 Northwest
Conference Place	Portland, OR, USA
Conference Date	14 Jul 1978
Publisher	Oregon Department of Energy; Salem, OR, USA
Publication Date	1978
Pages	205
Abstract	The major conclusion of a U.S. Department of Energy Fuels from Biomass Systems Branch Study on Silvicultural Biomass Farms are summarized. Potential sources of wood/bark biomass include underutilized standing forests, logging residues, mill residues, precommercial thinnings, and silvicultural biomass farms. The two major factors influencing biomass marketability are biomass productivity and land availability. The tree genera that appear most suited to silvicultural energy farms are platanus, populus, eucalyptus, and alnus. Discussed are: biomass farming costs; biomass energy budgets; wood-derived energy products (electricity, ammonia, methanol, ethanol, and possibly medium Btu fuel gas); and current research by the U.S. Department of Energy's Richland Operations Office on utilizing dead timber and forest residues in the Blue Mountain area of Umatilla and Wallow-Whitman National Forests. (EL)
Document Type	Paper/Chapter from book

Citation Number	**80A000699**
Article Title	*Alternative Uses of Excess Crop Residues*
Document Title	Crop Residue Management Systems. Proceedings of a Symposium
Article Author	Epstein, E. Alpert, J.E. Calvert, C.C. Oschwald, W.R. (ed.)
Conference	Crop residue management systems
Conference Place	Houston, TX, USA
Conference Date	28 Nov 1976
Publisher	American Society of Agronomy; Madison, WI, USA
Publication Date	1978
Pages	219-229
Notes	Sponsored by divisions C-3, 5-3, 5-4, and 5-6 of the American Society of Agronomy, the Crop Science Society of America, and the Soil Science Society of America. ASA Special Publication no. 31
Document Type	Paper/Chapter from book

Citation Number	**80A001035**
Article Title	*Big Push for a Biomass Bonanza*
Journal	Chem. Week
Volume	122
Issue	14
Pages	40
Publication Date	5 Apr 1978
Abstract	The prospects of using biomass materials for fuel or feedstock are improving. Technology for cellulose hydrolysis — a key step in many biomass conversion processes — has developed considerably. Methods formulated at the Union Carbide Co., Gulf Oil Co., New York Univ., and other organizations have resolved pretreatment problems involving acid and enzymatic hydrolysis. Other research is directed at achieving lower conversion temperatures and conversion of ethanol into ethylene. Forest wastes are among the largest potential sources for biomass materials, although the high cost of harvesting and the low energy-density of wood are major stumbling blocks to their widespread use. (EL)
Document Type	Journal article

Citation Number	**80A001044**
Article Title	*Gasohol from Wood Chips*
Journal	Christian Science Monitor
Volume	71
Pages	6
Publication Date	1 Jun 1979
Document Type	Journal article

Citation Number	**80A001105**
Article Title	*Will Chemicals Build a Base on Wood*
Journal	Chem. Week
Volume	2
Pages	53-54
Publication Date	1977
Document Type	Journal article

Citation Number	**80A001106**
Article Title	*Will Old Newspapers Make a Good Chem Brew*
Journal	Chem. Week
Volume	115
Issue	5
Pages	33
Publication Date	31 Jul 1974
Document Type	Journal article

Citation Number	**80A001109**
Article Title	*Wood Energy*
Article Author	Campbell, J.
Journal	Forestry and British Timber
Volume	8
Issue	2
Pages	38-40
Publication Date	1979
Abstract	The possibilities are discussed of using more wood for heating and drying in rural industries, adjacent to forest areas in Britain. Wood and wood residue burning are discussed, and the production of ethanol from wood. It is suggested that wood for fuel might come from forest residues, scrub woodland, and industrial residues.
Document Type	Journal article

Citation Number	**80A001113**
Article Title	*New Opportunities for Fuel from Biological Processes*
Article Author	Morris, W.
Author Affiliation	Toronto Univ., Ontario (Canada)
Journal	Chem. Can.
Volume	29
Issue	10
Pages	26
Publication Date	Nov 1977
Abstract	Rising prices for gas, oil, and coal have begun to make wood and wood products seem attractive as alternatives to traditional energy sources. Simple processes for obtaining ethanol from wood have been developed. One of them — feeding a continuous reactor with fresh aspen chips at the rate of 10 ton/day, and treating this material with enzymes to convert the wood's carbohydrates into sugar — produces yields as great as 50% of the wood's weight. The wood sugars on fermentation are then converted into half their weight in ethanol. Microbial systems that reduce carbonates and carbon dioxide to organic substances are other potentially profitable methods of obtaining energy from biological sources. (EL)
Document Type	Journal article

Citation Number	**80A001201**
Document Title	*Utilization of Agricultural Crop Residues; an Annotated Bibliography of Selected Publications 1966-1976*
Document Author	Han, Y.W. Smith, S.K.
Series	U.S. Agriculture Research Service
Publisher	U.S. Dept. of Agriculture, Agriculture Research Service, Western Region; Berkeley, CA, USA
Publication Date	Jun 1978
Pages	122
Notes	Prepared in cooperation with Oregon Agriculture Experiment Station.
Document Type	Book

Citation Number	**80A001214**
Document Title	*Disposal of Cellulosic Waste Materials by Enzymatic Hydrolysis*
Document Author	Mandels, M. Hontz, L. Brandt, D.
Author Affiliation	Army Natick Labs., Mass. (USA)
Report Number	AD-750 351
Publication Date	1972
Pages	16
Abstract	The paper summarizes studies on pollution abatement by enzymatic conversion of waste cellulose to useful products. Cellulose is the major component of cardboard boxes, kraft paper, paper bags, correspondence paper, and newsprint, or any other product of wood pulp or cotton. One approach has been the direct conversion of cellulose to animal protein by ruminant feeding, or to single cell protein by growing bacteria or fungi on cellulose. The authors' approach has been a different one. Cellulose was converted to glucose by acid or enzymatic hydrolysis. (NTIS)
Availability	NTIS
Document Type	Report

Citation Number	**80A001222**
Document Title	*The Conversion of Agricultural By-products to Sugars; Progress Report*
Document Author	Reilly, P.J.
Author Affiliation	Iowa State Univ. of Science and Technology, Ames (USA). Engineering Research Inst.
Publisher	Iowa State Univ.; Ames, IA, USA
Report Number	ERI-ISU-AMES-79025 Grant PFR77-00198
Publication Date	Aug 1978
Pages	107
Notes	Submitted to the National Science Foundation, Division of Problem Focused Research Applications.
Document Type	Report

Citation Number	**80A001264**
Article Title	*The Role of Forests in Meeting World Energy Problems*
Document Title	Forests for People: a Challenge in World Affairs
Article Author	Jamison, R.L. Jahn, E.C. Herrington, L.P. Heisler, G.M. Hellmers, H.
Author Affiliation	Weyerhaeuser Co., Tacoma, Wash. (USA)

Conference	Forests for people: a challenge in world affairs. Society of American Foresters national convention
Conference Place	Albuquerque, NM, USA
Conference Date	Oct 1977
Publisher	Society of American Foresters
Publication Date	1977
Pages	53
Notes	Presented at Society of American Foresters national conference, Albuquerque, 1977.
Abstract	The greatest limit to the long-term use of wood as an energy fuel is the size of wood energy sources. If all of the trees harvested by the forest products industry in 1976 had been converted to energy using conventional technology, less than 3% of total U.S. energy demand would have been met. Any potential use of biomass as fuel will require improved methods of burning biomass in all forms. Methods of converting biomass into energy include: direct combustion; gasification to produce low Btu gas and methanol; pyrolysis to form low Btu gas and charcoal; liquefaction to produce oil and hydrocarbon fuels; and anaerobic fermentation to produce methane. The role of urban forests in reducing urban energy consumption is examined. How trees reduce energy losses in cities is discussed. Forests can contribute significantly to the energy pool if wood can be used efficiently on a cost-benefit basis near the site of production. (ENV)
Document Type	Paper/Chapter from book

Citation Number	**80:001947**
Document Title	*Report of the Alcohol Fuels Policy Review. Raw Material Availability Report*
Corporate Author	SRI International, Menlo Park, Calif. (USA)
Report Number	DOE/ET — 0114/1 Contract EJ-78-C-01-6665 STD-61
Publication Date	Sep 1979
Pages	425
Abstract	The purpose of this study was to support the US Department of Energy's Alcohol Fuels Policy Review effort by identifying US regions containing significant amounts of agricultural residues and municipal solid wastes as possible feedstocks for conversion to alcohol fuels. Emphasis was placed on the regional estimation of feedstock quantities, the cost of feedstock acquisition, energy balances, and institutional effects of a federal alcohols program. The availability and cost of feedstocks suitable for the production of alcohol fuels are crucial factors insofar as project feasibility is concerned. In this report, SRI analyzes two potential feedstock sources: agricultural residues and municipal solid waste (MSW). These feedstocks result from ongoing production and consumption activities in all regions of the country, and the amount of the residues produced is only minimally tied to economic fluctuations (although changing weather patterns affect supply). The abundance of the residues by location is also a function of agricultural activity and productivity, in the case of agricultural residues, and population base, in the case of MSW. Although these residues result from continuing production and consumption activities, their use as an alcohols feedstock is limited by several economic considerations. The most abundant of the agricultural residues are seasonal and are currently used for their nutrient properties by the agricultural sector. Diverting these residues for energy use will require changes in current agricultural practices and provision of other nutrients for the soil. MSW, currently disposed of at a cost, does not come in a form suitable for an energy feedstock; transforming MSW into suitable feedstock quality will require some expense. Separate abstracts were prepared for the 5 appendixes.
Availability	NTIS
Document Type	Report

Citation Number	**80:001951**
Article Title	*Potential Availability of Wood as a Feedstock for Methanol Production*
Document Title	Report of the Alcohol Fuels Policy Review. Raw Material Availability Report
Article Author	Salo, D.J. Henry, J.F.
Author Affiliation	Mitre Corp., McLean, Va. (USA)
Report Number	DOE/ET — 0114/1
Publication Date	Sep 1979
Pages	88p, Paper 4
Abstract	In support of the Alcohol Fuels Policy Review Group/DOE, MITRE/Metrek has estimated the availability of wood as a source of feedstock for methanol production during the 1975 to 2000 period. Enough wood is potentially available to support a national program which requires the equivalent of a 10 percent alcohol in gasoline blend. The long term projected cost of feedstock is estimated to be 21 to 27 c/gallon. In the long term, Silviculture Energy Farms will have a favorable impact on the cost and availability of feedstock.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A002020**
Article Title	*Agricultural and Forest Products as Sources of Cellulose*
Article Author	Stephens, G.R.
Journal	Biotechnol. Bioeng. Symp.
Issue	5
Pages	27-42
Publication Date	1975
Document Type	Journal article

Citation Number	**80A002048**
Article Title	*Ethanol from Agricultural Residues*
Article Author	Sitton, O.C. Foutch, G.L. Book, N.L. Gaddy, J.L.
Author Affiliation	Missouri Univ., Rolla (USA)
Journal	Chem. Eng. Prog.
Volume	75
Issue	12
Pages	52-57
Publication Date	Dec 1979
Abstract	This paper presents results of laboratory studies to produce ethanol from one agricultural residues, corn stover. The cornstalks are hydrolyzed using sulferic acid to produce a mixture of glucose

	and xylose, which is then fermented to ethanol with yeast. Plant design for fermentation of hydrolyzate to ethanol is included, along with capitol cost requrements and production costs. It is demonstrated that the use of ethanol as a gasoline additive becomes attractive as gasoline prices exceed $/gal. Present quantities of corn stover could yield about 600,000 bbl (95,000m^3) per day of fuel, about 10% of the U.S. requirement. (EI)
Document Type	Journal article

Citation Number	**80:002049**
Article Title	*Biomass Refinery Turns Crop Wastes into Fuel*
Article Author	Mann, W.C.
Journal	Pop. Sci.
Pages	78-80
Publication Date	Apr 1979
Abstract	The use of agricultural wastes and municipal wastes as feedstock for ethanol production to be used as an alternate fuel is discussed. Diagrams of a basic system for hydrolysis of cellulosic products is included. The use of ethanol as an automobile fuel is evaluated. The composition of cellulose is explained in lay language. The author's future plans for pilot scale production and his assessment of the role of ethanol in the future are included.
Document Type	Journal article

Citation Number	**80A002089**
Article Title	*High-yield Wood: a Promising Fuel*
Article Author	Wayman, M.
Author Affiliation	Toronto Univ., Ontario (Canada)
Journal	Canadian Forest Industries
Volume	97
Issue	12
Pages	27
Publication Date	Dec 1977
Abstract	Work on wood as a source of chemicals and fuel, and new microbiological systems tht upgrade carbon dioxide to products of higher energy content are described. Rather simple processes have been developed for making ethanol from wood. The 12 million ton/yr of waste wood recoverable from Canadian forest operations could yield the equivalent of more than 526 million gal of gasoline, and process variations can yield a bonus of fuel equivalent to 8.8 million bbl of crude oil. Efforts with fast-growing trees are mentioned. Microbial processes for fuel production are surveyed. (EL)
Document Type	Journal article

Citation Number	**80A002118**
Article Title	*Fibrous Material in Feedlot Waste Fermented by Trichoderma Viride*
Article Author	Kaneshiro, T. Kelson, B.F. Sloneker, J.H.
Journal	Appl. Microbiol.
Publication Date	Nov 1975
Document Type	Journal article

Citation Number	**80A002154**
Article Title	*A Fermentation Process for the Production of Acetone, Alcohol, and Volatile Acids from Corncobs*
Article Author	Petersan, W.H. Fred, E.B. Verhulst, J.H.
Journal	Ind. Eng. Chem.
Volume	13
Issue	9
Pages	757-759
Publication Date	Sep 1921
Abstract	Concludes that corncobs may be utilized to produce acetone, ethyl alcohol, formic acid, and acetic acid, by fermenting a syrup made from corncobs by hydrolysis with dilute sulphuric acid. (EI)
Document Type	Journal article

Citation Number	**80A002163**
Article Title	*Fermentation Products of Cellulose*
Article Author	Boruff, C.S. Buswell, A.M.
Journal	Ind. Eng. Chem.
Volume	21
Issue	17
Pages	1181-1182
Publication Date	Dec 1929
Document Type	Journal article

Citation Number	**80A002164**
Article Title	*Fermentation Products from Cornstalks*
Article Author	Boruff, C.S. Buswell, A.M.
Journal	Ind. Eng. Chem.
Volume	22
Issue	9
Pages	931-933
Publication Date	Sep 1930
Document Type	Journal article

Citation Number	**80A002166**
Article Title	*Sugars from Wood*
Article Author	Hilbert, G.E.
Journal	Ind. Eng. Chem.
Volume	37
Issue	1
Pages	4-40
Publication Date	1945
Document Type	Journal article

Citation Number	**80A002167**
Article Title	*Wood Hydrolysis to Become Source of War Alcohol*
Article Author	Collins, C.
Journal	Chem. Metall. Eng.
Volume	51
Issue	7
Pages	100-101
Publication Date	Jul 1944
Abstract	Recent approval for construction of plant in Oregon to produce alcohol by acid hydrolysis of wood wastes has attracted considerable attention on process and its potentialities in United States; brief discussion of German practices; outline of some of processing and equipment features of American improved process that will probably be used in Oregon plant. (EI)
Document Type	Journal article

Citation Number	**80A002172**
Article Title	*Sugar from Wood*
Article Author	Ormandy, W.R.
Journal	J. Soc. Chem. Ind., London, Trans. Commun.
Volume	45
Pages	267T-272T
Publication Date	1926
Document Type	Journal article

Citation Number	**80A002190**
Article Title	*Kinetics of Wood Saccharification: Hydrolysis of Cellulose and Decomposition of Sugars in Dilute Acid at High Temperature*
Article Author	Saeman, J.F.
Journal	Ind. Eng. Chem.
Volume	37
Pages	43-54
Publication Date	1945
Document Type	Journal article

Citation Number	**80A002195**
Article Title	*Acid Hydrolysis of Wood*
Article Author	Titchener, A.L.
Journal	New Zealand Department of Scientific and Industrial Research. Bulletin. Information Series
Volume	117
Pages	69-76
Publication Date	1976
Document Type	Journal article

Citation Number	**80A002203**
Article Title	*Ethyl Alcohol from Wood Waste*
Article Author	Johnson, H.C.E.
Journal	Chemical Industries
Volume	56
Issue	2
Pages	226-229
Publication Date	Aug 1944
Abstract	Details of Forest Products Laboratory's modification of Scholler process for acid hydrolysis of wood to sugar, and thence by fermentation to ethyl alcohol; process, it is claimed, overcomes certain shortcomings of Scholler method, and provides access to large additional sources of alcohol, but chances of its attaining much more than insurance status seem remote at present. (EI)
Document Type	Journal article

Citation Number	**80A002205**
Article Title	*Chemical Economics of Wood Hydrolysis*
Article Author	Farber, E.
Journal	Chemical Industries
Volume	56
Issue	5
Pages	780-782
Publication Date	May 1945
Abstract	Willamette Valley Wood Company near Eugene, Ore., will produce over 10,000 gal of alcohol per day from wood waste by modified Scholler process; raw materials, equipment, labor and products discussed; operational costs evaluated for comparison with established alcohol process. (EI)
Document Type	Journal article

Citation Number	**80A002208**
Article Title	*Alcohol Production from Sisal (Agaves)*
Article Author	Slawson, D.H.
Journal	Chemicals
Volume	30
Issue	17
Pages	29
Publication Date	22 Oct 1928
Abstract	Mexico has tremendous amount of raw material from which both fertilizer and motor fuel may be obtained by new French process; 80 to 160 gal to ton; production in French West Africa; cost price at factory would be from $0.07 to $0.12 per gal of alcohol; project on foot in France to establish distilleries in Mexico; production of sisal. (EI)
Document Type	Journal article

Citation Number	**80A002219**
Article Title	*Alcohol from Wood*
Journal	Scientific American Supplement
Volume	78
Pages	103
Publication Date	15 Aug 1914
Document Type	Journal article

Citation Number	**80A002226**
Article Title	*Sugar and Alcohol from Wood Waste*
Journal	Timberman (Portland, OR)
Volume	35
Issue	3
Pages	12-14, 16
Publication Date	Jan 1934
Abstract	Scholler-Tornesch process for sugar conversion, by which 65 gallons of ethyl alcohol, not to be confused with so-called "wood alcohol", can be recovered from ton of Douglas fir or other Pacific Coast wood waste. (EI)
Document Type	Journal article

Citation Number	**80A002230**
Article Title	*Industrial Use of Wood Waste*
Article Author	Schaefer, E.M.
Journal	South. Lumberman
Volume	167
Issue	2105
Pages	284-286
Publication Date	15 Dec 1943
Abstract	Author's views with reference to manufacture of alcohol and sugar from wood waste. (EI)
Document Type	Journal article

Citation Number	**80A002231**
Article Title	*Ethyl Alcohol from Waste Wood by Modified Scholler Process*
Article Author	Faith, W.L. Hall, J.A.
Journal	Chem. Eng. News
Volume	22
Issue	7
Pages	525-526
Publication Date	10 Apr 1944
Abstract	Summary of reports on pilot plant investigations on wood hydrolysis at Dow Chemical plant in Marquette, Mich., and laboratory studies on fermentation of wood sugar solutions at Forest Products Laboratory, Madison, Wis. (EI)
Document Type	Journal article

Citation Number **80A002232**
Article Title *Madison Wood Sugar Process*
Article Author Harris, E.E.
Beglinger, E.
Journal Ind. Eng. Chem. (Industrial edition)
Volume 38
Issue 9
Pages 890-895
Publication Date Sep 1946
Abstract Process, known as Madison wood sugar process, has been developed for hydrolyzing mixtures of wood waste with 0.5 to 0.6% sulphuric acid at 150 to 180 degrees C by allowing dilute acid to flow continuously through charge of wood. Bibliography. (EI)
Document Type Journal article

Citation Number **80A002236**
Article Title *The Production of Alcohol from Wood Waste; Chapter 5*
Document Title Industrial Fermentations
Article Author Saeman, J.F.
Andreasen, A.A.
Underkofler, L.A. (ed.)
Hickey, R.J. (ed.)
Publisher Chemical Publishing Co., Inc.; New York, NY, USA
Publication Date 1954
Pages 136-171
Abstract Alcohol production by fermentation of sugar from wood waste is discussed. (AFDB)
Document Type Paper/Chapter from book

Citation Number **80A002250**
Article Title *Saccharification of Wood*
Article Author Auden, H.A.
Joshua, W.P.
Journal J. Soc. Chem. Ind., London
Volume 51
Issue 3
Pages 11T-16T
Publication Date 15 Jan 1932
Abstract History of developments; design of plant to overcome defects of previous systems; by means of process described, yields of alcohol 35-40 gallons per M kg of dry wood were obtained and actual conversion of wood into sugars was 45-50%. (EI)
Document Type Journal article

Citation Number **80A002298**
Document Title *The Anaerobic Fermentation of Cellulose and Cellulosic Materials*
Document Author Boruff, C.S.
Author Affiliation Illinois Univ., Urbana (USA)
Thesis Ph.D. Dissertation
Publication Date 1931
Pages 8
Notes Abstract of thesis (Ph.D.) — University of Illinois, 1931
Availability Not available from University Microfilms International
Document Type Thesis/Dissertion

Citation Number **80A002310**
Article Title *Production of Liquid Transport Fuel from Cellulose Material (Wood); Laboratory Preparation of Wood Sugars and Fermentation to Ethanol and Yeast*
Article Author Whitworth, D.A.
Harwood, V.D.
Author Affiliation Forest Research Institute, Rotorua (New Zealand). Forest Products Div.
Journal N.Z. Energy J.
Volume 50
Issue 10
Pages 4
Publication Date 1977
Document Type Journal article

Citation Number **80A002314**
Article Title *Production of Liquid Transport Fuel from Cellulose Material (Wood)*
Article Author Whitworth, D.A.
Author Affiliation Forest Research Institute, Rotorua (New Zealand). Forest Products Div.
Journal N.Z. Energy J.
Volume 49
Issue 11
Pages 173
Publication Date 25 Nov 1976
Abstract New Zealand's most important energy need is liquid fuel for transportation because of: the high per capita consumption of liquid fuel; the need to import almost all such fuel; and the increasing proportion of export revenues needed to finance oil imports. The economic considerations involved in acid hydrolysis of wood for subsequent conversion into ethyl alcohol are presented. Processes for wood hydrolysis, capital cost for a wood hydrolysis plant, and production costs are discussed. (EL)
Document Type Journal article

Citation Number **80A002315**
Article Title *Chemicals from Wood Waste*
Article Author Hokanson, A.E.
Katzen, R.
Journal Chem. Eng. Prog.
Volume 74
Issue 1
Pages 67-71
Publication Date Jan 1978
Abstract Waste wood or forest residue represents a potential feedstock for the production of methanol, ethanol, furfural, and phenolics. Investment requirements and operating costs are developed for commercial installations employing currently available technology to produce methanol and ethanol from waste wood. The costs of this operation are compared with those from plants using conventional raw materials to produce methanol and ethanol. (EL)
Document Type Journal article

Citation Number **80A003005**
Document Title *Liquid Fuels from Renewable Resources: Feasibility Study; Volume D. Agricultural Studies, Volume E. Municipal Waste Studies*
Corporate Author InterGroup Consulting Economists Ltd., Winnipeg, Manitoba (Canada)
Publication Date May 1978
Pages 189
Notes Prepared for Canada, Interdepartment Steering Committee on Canadian Renewable Liquid Fuels, Program Options, Ottawa, Canada.

Document Type	Book

Citation Number	**80A003016**
Document Title	*Methanol from Wood Waste*
Document Author	Rowell, R.M. Hokanson, A.E.
Author Affiliation	Forest Products Lab., Madison, Wis. (USA)
Series	U.S. Dept. of Agriculture. Forest Service. General Technical Report FPL 12
Publisher	U.S. Dept. of Agriculture, Forest Service, Forest Products Laboratory; Madison, WI, USA
Publication Date	1977
Pages	20
Document Type	Book

Citation Number	**80A003026**
Document Title	*Maine Methanol; Collected Working Papers on the Production of Synthetic Fuel from Wood*
Corporate Author	Maine Office of Energy Resources, Augusta (USA)
Publisher	Maine, Office of Energy Resources; Augusta, ME, USA
Publication Date	1975
Pages	33
Notes	Includes bibliography.
Document Type	Book

Citation Number	**80A003060**
Article Title	*Fermentation of Douglas Fir Hydrolyzate*
Article Author	Cerevisiae, S. Harris, E.E. Hajny, G.J. Hannan, M. Rogers, S.C.
Journal	Ind. Eng. Chem. (Industrial Edition)
Volume	38
Issue	9
Pages	896-904
Publication Date	Sep 1946
Abstract	Wood sugar solutions produced by hydrolysis of Douglas fir sawmill waste contain inhibiting substances that make them difficult to ferment by procedures usually used in fermentation industries; report shows that neutralized wood hydrolyzates ferment more readily if they are pretreated with aluminum chloride, or if they are produced under conditions of rapid sugar removal to prevent decomposition. Bibliography. (EI)
Document Type	Journal article

Citation Number	**80A003066**
Article Title	*Manufacture of Ethyl Alcohol from Wood Waste*
Article Author	Sherrard, E.C.
Journal	Chemical Age (N.Y.)
Volume	29
Issue	2
Pages	76-79
Publication Date	Feb 1921
Abstract	Plant requirements. (EI)
Document Type	Journal article

Citation Number	**80A003071**
Article Title	*Utilization of Wood for Production of Foodstuffs, Alcohol and Glucose*
Article Author	Bergius, F.
Journal	Chem. Age (London)
Volume	29
Issue	752
Pages	481-483
Publication Date	25 Nov 1933
Abstract	Short historical review of subject of saccharification of wood; steps by which it has been developed up to commercial scale in works at Mannheim-Rheinau. (EI)
Document Type	Journal article

Citation Number	**80A003078**
Article Title	*Sugar Cane Bagasse as a Source of Industrial Alcohol*
Article Author	Owen, W.L. Denson, W.P.
Journal	Planter and Sugar Manufacturer
Volume	80
Issue	5
Pages	83-85
Publication Date	4 Feb 1928
Abstract	Results of experiments very clearly show that there is effect quite apart from carbon dioxide liberation that contributes share to accelerative action of inert substances upon alcoholic fermentation; effect of removal of bagasse after initial period upon subsequent rate of fermentation. Bibliography. (EI)
Document Type	Journal article

Citation Number	**80A003085**
Article Title	*Fine Grinding, Enzyme Digestion and the Lignin-cellulose Bond in Wood*
Article Author	Pew, J.C. Weyna, P.
Journal	Tappi
Volume	45
Issue	3
Pages	247-256
Publication Date	1962
Document Type	Journal article

Citation Number	**80A003086**
Article Title	*Properties of Powdered Wood and Isolation of Lignin by Cellulytic Enzymes*
Article Author	Pew, J.C.
Journal	Tappi
Volume	40
Issue	7
Pages	553-558
Publication Date	1957
Document Type	Journal article

Citation Number	**80A003092**
Article Title	*Wood, a Front Runner as an Alcohol Source*
Article Author	Fry, M.S.
Journal	Gasohol U.S.A.
Volume	2
Issue	4
Pages	12-14
Publication Date	Apr 1980
Document Type	Journal article

Citation Number	**80A003094**
Article Title	*Incorporating Cellulosic Feedstocks with Starch and Sugar-based Raw Materials for Alcohol Production*
Article Author	Miller, D.R.

80A003094

Author Affiliation	Vulcan-Cincinnati, Inc., Ohio (USA)	Issue	5
Journal	Gasohol U.S.A.	Pages	20-23
Volume	2	Publication Date	May 1980
		Document Type	Journal article

VI
Production

Citation Number	**78:001793**
Article Title	*Ethanol and Furfural from Corn*
Document Title	Biomass: a Cash Crop for the Future
Article Author	Sheppard, W.J.
Conference	Conference on the production of biomass from grains, crop residues, forages and grasses for conversion to fuels and chemicals
Conference Place	Kansas City, MO, USA
Conference Date	2 Mar 1977
Report Number	CONF-770368 —
Publication Date	1977
Pages	178-204
Abstract	Processes for the production of ethanol and furfural from corn are discussed. The cost of producing these compounds from corn is calculated and compared with figures for their production from bagasse. Current and projected economics are considered. (JGB)
Document Type	Paper from report

Citation Number	**78:002267**
Document Title	*Pilot Plant Studies of the Bioconversion of Cellulose and Production of Ethanol*
Document Author	Wilke, C.R.
Corporate Author	California Univ., Berkeley (USA). Lawrence Berkeley Lab.
Report Number	LBL — 6860 Contract W-7405-ENG-48 MN-61
Publication Date	30 Jun 1977
Pages	40
Abstract	Progress is reported in the following studies on analysis and evaluation of potential raw materials: preliminary pretreatment studies using wheat straw; extraction of wheat straw with alcohol and water at elevated temperatures; extraction of ground wood with alcohol and water at elevated temperatures; and, delignification of newsprint with ethylene glycol. Other research in progress includes studies on: utilization of hemicellulose sugars; process design and economics of hydrolysis processes and ethanol fermentation; and, pilot plant process development and design, including cell-recycle systems for cellulase production, continuous hydrolysis, countercurrent hydrolysis, and ethanol fermentation studies. (JGB)
Availability	NTIS
Document Type	Report

Citation Number	**78:002738**
Article Title	*Building a New Base for Methanol*
Conference	27th Canadian chemical engineering conference
Conference Place	Calgary, Alberta, Canada
Conference Date	23 Oct 1977
Journal	Processing
Volume	61
Issue	8
Pages	76-79
Publication Date	Aug 1977
Abstract	Current research on the synthesis of methane/methanol from biomass is reviewed as an indication of feasible new sources of chemical feedstocks for Canadian industry. Biomass can be converted by thermochemical (pyrolysis) methods or by biological (anaerobic digestion) methods. Pyrolysis of biomass yields a mixture of carbon oxides, hydrogen, and methane, a fuel gas suitable for methanol production. Anaerobic digestion yields CH , CO , and H S. Alternatively the biomass can be hydrolyzed to glucose and this fermented to ethanol. The economics of the processes are briefly considered. (JSR)
Document Type	Journal article

Citation Number	**78:002739**
Article Title	*Production of Liquid Transport Fuel from Cellulose Material (Wood). II. Energy Conversion Efficiencies of the Processes*
Article Author	Whitworth, D.A.
Author Affiliation	Forest Research Institute, Rotorua (New Zealand)
Journal	N.Z. Energy J.
Volume	50
Issue	2
Pages	14-17
Publication Date	25 Feb 1977
Abstract	Alternative processes for conversion of wood to liquid fuels by acid hydrolysis and fermentation are analyzed and discussed from the viewpoint of energy conversion efficiencies. The products considered are ethanol, methane (for conversion to methanol), and butanol-acetone. Energy conversion efficiencies are in the range of 33 percent for liquid fuels (20 to 25 percent for methanol) and 44 percent for methane. Ethanol production shows the most promise since it is a proven process and the end-product is useful either as liquid fuel or chemical feedstock. (RME)
Document Type	Journal article

Citation Number **78:004663**
Article Title *Enzymes Show Promise for Biomass Conversion*
Article Author Pye, E.K.
Journal Energy (Stamford, Conn.)
Volume 3
Issue 2
Pages 23-24
Publication Date Spr 1978
Abstract The concept of converting cellulose from biomass into an end product of alcohol fuel is relatively simple. Using cellulase enzymes, cellulose, the major substance in plant fiber, can be converted into glucose. This glucose is then fermented by yeast or other microorganisms into alcohol. The fermentation process is similar to that used in fermenting beer and wine. The resultant product, depending on the organisms employed, is one of several types of alcohol fuels. In other countries where gasoline prices are higher, ethanol from biomass already appears to be an attractive alternative.
Document Type Journal article

Citation Number **79:000531**
Document Title *Bioconversion of Plant Biomass to Ethanol. Annual Report and Revised Research Plan, January 1977 — January 1978*
Document Author Brooks, R.E.
Bellamy, W.D.
Su, T.M.
Corporate Author General Electric Co., Schenectady, N.Y. (USA)
Report Number COO — 4147-4
Contract EG-77-C-02-4147
STD-61
Publication Date 23 Mar 1978
Pages 147
Abstract The objective of this research is to demonstrate on a laboratory scale the technical feasibility of the direct microbial conversion of pretreated wood to ethanol. During the first year of this contract, we investigated the feasibility of biologically delignifying wood with C. pruinosum and directly fermenting the pretreated wood to ethanol with a mixed culture. Bench-top fermentations of a thermophilic bacillus growing on glucose and of a mixed culture of thermophilic sporocytophaga (US) and a thermophilic bacillus growing on microcrystalline and amorphous cellulose were evaluated for growth and ethanol production. In the mixed culture fermentation of amorphous and microcrystalline cellulose, the specific rate of substrate depletion was calculated to be 0.087 hr^{-1} and 0.0346 hr^{-1}, respectively. However, defining the growth requirements of C. pruinosum and sporocytophaga (US) proved more difficult than originally anticipated. In order to achieve the program objectives within the contract period, a revised research plan was developed based upon chemical pretreatment and the direct fermentation of pretreated hardwood to ethanol. In place of the biological delignification pretreatment step, we have substituted a chemically supplemented steam pretreatment step to partially delignify wood and to enhance its accessibility to microbial utilization. Clostridium thermocellum, which ferments cellulose directly to ethanol and acetic acid, has replaced the mixed culture fermentation stage for ethanol production. Research on the production of ethanol from xylose by the thermophilic bacillus ZB-B2 is retained as one means of utilizing the hemicellulose fraction of hardwood. Work on the genetic improvement of the ethanol yields of both cultures by suppressing acetic acid production is also retained. The rationale, experimental approach, and economic considerations of this revised research plan are also presented.
Availability NTIS
Document Type Report

Citation Number **79:001106**
Document Title *Degradation of Cellulosic Biomass and Its Subsequent Utilization for the Production of Chemical Feedstocks. Progress Report, March 1 — May 31, 1978*
Document Author Wang, D.I.C.
Cooney, C.L.
Demain, A.L.
Gomez, R.F.
Sinskey, A.J.
Corporate Author Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nutrition and Food Science
Report Number COO — 4198-6
Contract EG-77-S-02-4198
STD-61
Publication Date May 1978
Pages 212
Abstract Studies on the xylanase activity of Clostridium thermocellum and other thermophilic anaerobes were continued. It was shown that the xylanase and CMCase activities of C. thermocellum during fermentation are nearly identical. The enzyme complex from C. thermocellum continues to show resistance to feedback inhibition in every assay system tested. No inhibitory effect on Avicel hydrolysis by 50 mgatl of glucose, cellobiose, or xylose was observed. In experiments on thermally exploded poplar, corn cob granules, corn stover, and sugar cane bagasse, C. thermocellum was found to be capable of degrading all of these materials, but the amount of reducing sugars accumulated was found inversely related to particle size. To increase biomass surface area, as well as biomass concentrations, a packed-bed cellulose fermentor was constructed and tested. Research on the production of ethanol directly from cellulosic biomass by C. thermocellum continued. A method for generating protoplasts from growing cultures of C. thermocellum was developed. Acrylic acid production by Clostridium propionicum was further studied in order to optimize the oxidation of propionic and to acrylic acid. Studies conducted on the aerobic oxidation of lactic acid and propionic acid to acrylic acid by resting cells and cell-free extracts prepared from Escherichia coli were unsuccessful. Production of lactic acid was investigated by employing mixed cultures of Clostridium thermocellum and a thermophilic lactic acid producing bacterium. Studies on the acetone-butanol fermentation focused on means of increasing butanol tolerance by Clostridium acetobutylicum. Acetic acid production by Clostridium thermoaceticum continued to isolate product tolerant strains. (JGB)

Availability	NTIS
Document Type	Report

Citation Number	**79:001110**
Article Title	*Production of Sugars and Ethanol Based on the Enzymatic Hydrolysis of Cellulose*
Document Title	Fuels from Biomass Symposium
Article Author	Wilke, C.R. Pfeffer, J.T. Stukel, J.J. (eds.)
Author Affiliation	Univ. of California, Berkeley
Conference	Fuels from biomass symposium
Conference Place	Champaign, IL, USA
Conference Date	18 Apr 1977
Report Number	COO — 4225-1 CONF-770481 —
Publication Date	1977
Pages	115-144
Abstract	Hydrolysis of cellulose by acids and enzymes is discussed from the viewpoint of producing fermentable carbohydrates. Particular emphasis is given to recent developments and problems of enzymatic hydrolysis. Tentative processing schemes for producing ethanol from cellulosic materials are described. Plant biomass consists primarily of carbohydrate polymers, lignin and small amounts of ash and extractives. The carbohydrate fraction can be characterized in various ways depending upon the methods of analysis and the chemical degradation which may be caused by the separation methods employed. For the purpose of the present discussion, the carbohydrate content of plant biomass will be viewed simply as consisting of cellulose (more correctly alpha-cellulose) and hemicellulose. Cellulose is a polymer of D-glucose having a degree of polymerization in the range of several thousand with the glucose units linked at the beta, 1-4 position. Hemicellulose is primarily a polymer of xylose having a lower degree of polymerization in the range of several hundred. Lesser amounts of other hexoses such as mannose and of other pentose such as aribinose are often present. Soft woods typically contain 65 to 73% total carbohydrate with 10 to 13% pentosans. Hardwoods typically contain 70 to 82% carbohydrate with 18 to 25% pentosans. The objective of the present paper is to review briefly some methods for obtaining carbohydrates and to discuss some engineering and economic aspects of the utilization of plant biomass as a fermentation raw material. The discussion will emphasize the enzymatic hydrolysis of cellulose in which we have been engaged at Berkeley. Acid hydrolysis will be discussed briefly as an alternative processing method.
Document Type	Paper from report

Citation Number	**79:001712**
Document Title	*Preliminary Engineering and Cost Analysis of Purdue/Tsao Cellulose Hydrolysis (Solvent) Process*
Corporate Author	McKee (Arthur G.) and Co., Chicago, IL (USA)
Report Number	HCP/T4641 — 01 Contract ET-78-X-01-4641 STD-61
Publication Date	Oct 1978
Pages	63
Abstract	Using information published on the Purdue/Tsao Acid Solution Process for the Hydrolysis of Ligno-Cellulosic materials — specifically corn stovers — an engineering and cost analysis was performed for a battery limits facility to produce sufficient glucose syrup for 25 million gallons per year of ethanol. A capital investment estimate of 59 million dollars was derived. This estimate was based on vendor quoted equipment prices and a detailed consideration of all aspects of constructing the facility. The product transfer cost of the fermentable sugars — pentoses and hexoses — was estimated at 4.5 cents/pound. The major factor impacting the commercial feasibility of such a facility is the price assigned to the delivered corn stover. Although considerable development work on the process is required before it will be ready for commercialization, no technical problem was uncovered to preclude this commercialization.
Availability	NTIS
Document Type	Report

Citation Number	**79:002521**
Document Title	*Technical and Economic Assessment of Methods for Direct Conversion of Agricultural Residue to Usable Energy. Final Report*
Document Author	Bailie, R.C.
Corporate Author	Battelle Pacific Northwest Labs., Richland, Wash. (USA)
Report Number	TID — 28552 STD-61
Publication Date	20 Oct 1976
Pages	136
Abstract	Various methods for conversion of agricultural wastes to usable energy were evaluated for further consideration for user operated and commercially operated systems. Advantages and disadvantages of anaerobic digestion and low Btu gas pyrolysis, the only two alternatives that were considered to be worthy of evaluation for user operated systems, are discussed. Both systems were also considered feasible for use with commercially operated systems. In addition, two liquid product systems, hydrolysis and fermentation to ethanol and medium Btu gas pyrolysis followed by Fischer-Tropsch reaction to form a liquid product, were evaluated. (JGB)
Availability	NTIS
Document Type	Report

Citation Number	**79:003453**
Document Title	*Effect of Nitrogen Oxide Pretreatments on Enzymatic Hydrolysis of Cellulose*
Document Author	Borrevik, R.K. Wilke, C.R. Brink, D.L.
Corporate Author	California Univ., Berkeley (USA). Lawrence Berkeley Lab.
Report Number	LBL — 7879 Contract W-7405-ENG-48 MN-61
Publication Date	Sep 1978
Pages	113
Notes	Thesis
Abstract	This work considers the effect of nitrogen oxide pretreatments on the subsequent enzymatic hy-

drolysis by Trichoderma viride cellulase of the cellulose occurring in wheat straw; Triticum Aestivum-L, em. Thell. In the pretreatment scheme the straw is first reacted with nitric oxide and air, and then extracted in aqueous solution. In this way, overall sugar yields increased from 17% for the case of no pretreatment to 70%. The glucose yield increased from 20 to 60%. The yield of glucose during enzymatic hydrolysis is dependent on the reaction time of the gas phase reaction. For a 24 hour reaction the yield is 60%, but drops to 45% for a reaction time of 2 hours. Xylose, a potentially valuable side product of the pretreatment, is obtained by dilute acid hydrolysis during the extraction stage in yields of 90 to 96%. In acidic media, the kinetics of both the rate of formation and destruction of xylose were found to follow the first-order rate laws reported in the literature. These were determined to be 4.5 (liter/gmole)($hr.^{-1}$) and 0.03 $hr.^{-1}$, respectively. However, the rate of formation is much greater (20.4 (liter/gmole) ($hr.^{-1}$)) when the extraction liquor is recycled. The most likely explanation for this is that the increased total acidity of the recycled liquor compensates for diffusional limitations. A preliminary design and cost analysis of the pretreatment-hydrolysis scheme indicates that glucose can be produced at 10.86 cents per pound, exclusive of straw cost. The corresponding cost per pound of total sugars produced is 5.0 cents. Sensitivity analyses indicate that 42% of the pretreatment cost (excluding hydrolysis) can be attributed to nitric oxide production, and the high yield of sugar obtained is advantageous when considering the cost of straw.

Availability NTIS
Document Type Report

Citation Number **79:003456**
Document Title *Liquid Fuels from Renewable Resources: Feasibility Study. Volume B. Conversion Studies*
Corporate Author InterGroup Consulting Economists Ltd., Winnipeg, Manitoba (Canada)
Report Number NP — 23604(Vol.B)
MN-13
Publication Date Mar 1978
Pages 162
Abstract Volume B reviews the major conversion routes that can be taken to produce liquid fuels (synthetic oils, methanol, ethanol, and hydrogen) from forest, agricultural, and municipal waste. Conversion Route A (hydrogenation/carboxylolysis and pyrolysis) directly produces synthetic oils without providing any intermediate products. The thermochemical processes are characterized by large energy inputs and are suited to relatively dry, cellulosic feedstocks. Conversion Route B (biophotolysis) produces gaseous hydrogen that can be liquefied for use as a fuel. This biological process is characterized by minimal energy inputs, is suited to water-based feedstocks such as algae. Conversion Route C (acid hydrolysis and enzyme hydrolysis) produces ehtanol fuel, is suited to cellulosic feedstocks such as forests, crops, and related municipal wastes. The processes do not require the feedstock-drying normally associated with thermal-chemical processes. This route is also capable of producing by-products. Conversion Route D (gasification, hydrogasification, hydrogenation/carboxylolysis, anaerobic digestion) can produce synthetic oils and gasoline, and methanol by utilizing a wide variety of wet and dry feedstocks. The conversion routes are discussed in detail in Appendix B.1. Additional appendices cover hydrogen supply systems and costs; the production of methane from waste organic matter; and the criteria of the cost analysis. (MCW)
Availability NTIS
Document Type Report

Citation Number **79:004125**
Document Title *Material and Energy Balances in the Production of Ethanol from Wood*
Document Author Wayman, M.
Lora, J.H.
Gulbinas, E.
Corporate Author Toronto Univ., Ontario (Canada). Dept. of Chemical Engineering and Applied Chemistry
Conference Symposium on chemistry for energy
Conference Place Winnipeg, Manitoba, Canada
Conference Date Jun 1978
Report Number CONF-7806139 — 1
MN-61
Publication Date 1978
Pages 19
Abstract Experimental production of ethanol from aspen wood gave yields of 70.7% or 83.4% or theory when acid hydrolysis or enzymatic hydrolysis were used after autohydrolysis and extraction of lignin. These were, respectively, 58.4 and 68.9 gallons of 95% ethanol per ton of aspen wood (dry basis). In addition 426 lb of lignin with heat of combustion 11,100 Btu/lb were obtained per ton of wood. Gross energy recovery (ethanol + lignin) was 52.4 and 58.0% by these two processes, or allowing for processing energy, net energy recovery was 36.1 and 42.3% respectively. Multi stage hydrolysis was beneficial for both acid and enzymatic hydrolysis, 80% and over 99% of theoretical yields of sugar being obtained by the two processes. Economic estimates show a significant advantage in investment and operating costs for the enzymatic process. The price of 95% ethanol, including a reasonable return on investment by this process is estimated at $1.34/gallon. This would be a good price for industrial ethanol, but would be quite high for gasoline use under prevailing circumstance.
Availability NTIS
Document Type Report

Citation Number **79:004131**
Document Title *Process Development Studies on the Bioconversion of Cellulose and Production of Ethanol*
Document Author Wilke, C.R.
Blanch, H.W.
Corporate Author California Univ., Berkeley (USA). Lawrence Berkeley Lab.
Report Number LBL — 8658
Contract W-7405-ENG-48
STD-61
Publication Date Dec 1978
Pages 55

Abstract | Progress is reported in the following areas: raw materials and process evaluation, enzyme fermentation studies, ethanol fermentation studies, hydrolysis reactor development, and utilization of hemi-cellulose sugars. (MHR)
Availability | NTIS
Document Type | Report

Citation Number | **79:004141**
Document Title | *Mission Analysis for the Federal Fuels from Biomass Program. Volume V. Biochemical Conversion of Biomass to Fuels and Chemicals*
Document Author | Jones, J.L.
Fong, W.S.
Schooley, F.A.
Dickenson, R.L.
Corporate Author | SRI International, Menlo Park, Calif. (USA)
Report Number | TID — 29093
Contract EY-76-C-03-0015-131
STD-61
Publication Date | Dec 1978
Pages | 203
Abstract | In the analysis of the anaerobic digestion options, specific feedstocks, including animal manure, wheat straw, and marine algae (giant kelp), are considered on a case by case basis. The processes are described, investment and operating costs estimated, and the availability and reliability of the technology and environmental considerations briefly discussed. The analysis of the fermentation of biomass feedstocks to ethanol from sugars and the actual production of the sugars. After describing the process for fermentation of sugars to alcohol, estimating investment and operating costs, and commenting on the availability and reliability of the technology and environmental considerations, a number of alternative feedstocks and processes for producing the fermentable sugar solutions are examined. These processes for producing the sugar solutions are examined in a manner comparable with that mentioned above. The feedstocks included in the analysis are sugar cane, wheat straw, and aquatic biomass.
Availability | NTIS
Document Type | Report

Citation Number | **79:005694**
Document Title | *Conversion of Biomass from Agriculture into Useful Products. Final Report*
Document Author | Tsao, G.T.
Corporate Author | Purdue Univ., Lafayette, Ind. (USA). School of Chemical Engineering
Report Number | COO — 4298-1
Contract EG-77-S-02-4298
STD-61
Publication Date | 31 Jul 1978
Pages | 37
Abstract | The fermentation of the pentoses produced by the hydrolysis of hemicelluloses either to 2,3-butanediol by Klebsiella pneumoniae or to a mixture of 2,3-butanediol and ethanol by Aeromonas hydrophilia was studied to develop optimum conditions for the Klebsiella fermentation, confirm the xylose fermentation by Aeromona hydrophilia, and to study the growth of these microbes on pentoses and uronic acids and on actual hemicellulose hydrolyzates of corn stover. The results obtained in the solvent pretreatment in cellulose hydrolysis are reported. The solvents used were Cadoxen (solution of 5 to 7% cadmium oxide in 28% aqueous ethylene diamine), CMCS (an aqueous solution of 17% sodium tartrate, 6.6% ferric chloride, 7.8% caustic, and 6.2% sodium sulfite), and concentrated sulfuric acid. Almost quantitative yields of glucose can be obtained from the reprecipitated cellulose by enzymatic hydrolysis. (JSR)
Availability | NTIS
Document Type | Report

Citation Number | **79:005707**
Document Title | *Mission Analysis for the Federal Fuels from Biomass Program. Volume VI. Mission Addendum. Final Report*
Document Author | Jones, J.L.
Kohan, S.M.
Semrau,
Corporate Author | SRI International, Menlo Park, Calif. (USA)
Report Number | SAN — 0155-T4
Contract EY-76-C-03-0115-131
STD-61
Publication Date | Jan 1979
Pages | 115
Abstract | This volume contains the results of additional evaluation work requested by the Department of Energy after initiation of the original Mission Analysis Project contract. The descriptive material can be categorized as biochemical and thermochemical mission analyses and in general includes process descriptions, energy balances, material balances, and economic summaries. The volume consists of four main sections: ethanol from the acid hydrolysis of corn stover by the Tsao-Purdue Process; the Tilby Sugarcane Separation Process; the extraction of hydrocarbon liquids from Euphorbia-type plants; and the production of IBG from wood. The processes vary considerably in their level of development and with the exception of the Tilby Sugarcane Separation process all are in early stages of testing. Therefore, they were evaluated on the basis of extremely limited laboratory or pilot plant information. As a result it was necessary for the SRI staff to conceptualize much of the process design used in the evaluations. Accordingly, the results shown are subject to revision as additional process information is developed. The economic design bases used in preparing the investment and operating cost data contained in Sections II through V are shown in the appendix.
Availability | NTIS
Document Type | Report

Citation Number | **79:007133**
Article Title | *Biomass Allocation Model: Conversion of Biomass to Methanol*
Article Author | Ahn, Y.K.
Author Affiliation | Gilbert Associates, Inc., Reading, Pa. (USA)
Conference | 177th national meeting of the American Chemical Society
Conference Place | Honolulu, HI, USA
Conference Date | 1 Apr 1979
Journal | Am. Chem. Soc., Div. Pet. Chem., Prepr.
Volume | 24

Issue	2
Pages	464-471
Report Number	CONF-790415 — P4
Publication Date	Mar 1979
Abstract	Results of the optimum allocation policy for the three biomass feedstocks in satisfying the demand of the three consuming sectors are presented. Furfural residue alone was sufficient to satisfy the demand of chemical grade methanol. This is due to the fact that all the available, least expensive fuel (furfural residue) was used to manufacture the most expensive product (chemical grade methanol). The transportation sector requires the second most expensive methanol fuel, and any furfural residue left over after chemical grade methanol was used for production of the transporation grade methanol. The balance of the transportation grade methanol was supplied by the wood residue, the second least expensive feedstock. All the electric utility demand was satisfied by wood residue, and no corn stover was used. Profit calculated from the optimal policy was 23.6 MMS/yr, indicating that various grade methanols made from the three biomass feedstocks can be competitive with those made from conventional sources. The calculation was based on the unit manufacturing cost determined from a 26,200 MMBtu/day methanol plant capacity. The study however disclosed the fact that the biomass feedstock cost is the dominating factor on the economics of the methanol production and that continued improvements toward the biomass production, collection and storage techniques are desired to improve the total profit. 1 figure, 5 tables.
Document Type	Journal article

Citation Number	**79:007164**
Article Title	*Chemicals from Biomass by Improved Enzyme Technology*
Article Author	Emert, G.H. Katzen, R.
Author Affiliation	Gulf Oil Chem. Co., Shawnee Mission, KS (USA)
Conference	177th national meeting of the American Chemical Society
Conference Place	Honolulu, HI, USA
Conference Date	1 Apr 1979
Journal	Am. Chem. Soc., Div. Pet. Chem., Prepr.
Volume	24
Issue	2
Pages	488-496
Report Number	CONF-790415 — P4
Publication Date	Mar 1979
Abstract	A two part article, Cellulose to Ethanol Process and Technical and Economic Evaluation, is presented. Bioconversion technology included to remove or decrease the volume of solid waste and to provide ethyl alcohol and other chemicals which can be utilized to supplant fossil fuel sources as a feedstock. The cellulose to ethanol process included: feedstock handling and pretreatment, enzyme production, yeast production, simultaneous saccharification fermentation (SSF), and ethanol recovery. With respect to conversion to ethanol or other chemicals, three factors must be considered regarding the susceptibility of native cellulose to biodegradation, its insolubility in water, extent of liquefaction, and crystallinity. A detailed study was made of the technical and economic feasibility of the process. The technical feasibility was demonstrated by research work carried out at the Gulf Oil Chemicals Company. The commercial process, based on producing 25 MM gallons per year alcohol, showed a more favorable selling price than grain fermentation and synthetic alcohols with 100% investor equity capital financing. With municipal bond financing, cellulosic waste alcohol yielded much greater profitability or much lower selling prices to obtain a 15% return on investor equity. 6 figures, 3 tables.
Document Type	Journal article

Citation Number	**80A000004**
Journal	Can. Res. Dev.
Pages	23
Publication Date	Feb 1978
Abstract	Canada: discusses development of alcohol fuels for internal combustion engines.
Document Type	Journal article

Citation Number	**80A000019**
Article Title	*Catalytic Decomposition of Cellulose under Biological Conditions*
Article Author	Halliwell, G.
Journal	Biochem. J.
Volume	95
Issue	35
Pages	35-40
Publication Date	1965
Document Type	Journal article

Citation Number	**80A000020**
Article Title	*Cellulose from Sunlight*
Article Author	Graham, C.
Journal	New Sci.
Volume	65
Issue	939
Pages	572
Publication Date	6 Mar 1975
Abstract	Using photosynthesis to turn sunlight into cellulose, and subsequently other enzymatic reactions to turn the cellulose into methane or alcohol, could relieve the strain on hydrocarbons as a source of petrochemicals. Appropriation of photosynthesis to produce hydrogen directly at efficiencies approaching 10% could have truly startling consequences for the world's energy supply. Several programs in the U. S. based on biochemical and photosynthetic aspects of energy conversion are described. (ENV)
Document Type	Journal article

Citation Number	**80A000021**
Article Title	*Cellobiose from Trichoderma Viride: Purification, Properties, Kinetics, and Mechanism*
Article Author	Gong, C.S. Ladisch, M.R. Tsao, G.T.
Journal	Biotechnol. Bioeng.
Volume	19
Pages	959-981
Publication Date	1977

Document Type: Journal article

Citation Number **80A000022**
Article Title: *Cellulase Production by Trichoderma Viride*
Article Author: Brown, D.E.
Journal: Biotechnol. Bioeng. Symp.
Issue: 6
Pages: 75-77
Publication Date: 1976
Document Type: Journal article

Citation Number **80A000023**
Article Title: *Cellulase Production in Semisolid Cultures of Trichoderma Viride*
Article Author: Vilela, L.C.
Torillo, A.R.
de Ocampo, A.T.
del Rosario, E.J.
Journal: Agric. Biol. Chem.
Volume: 41
Issue: 2
Publication Date: 1977
Document Type: Journal article

Citation Number **80A000024**
Article Title: *Cellulase Production: Summary*
Article Author: Reese, E.T.
Journal: Biotechnol. Bioeng.
Issue: 6
Pages: 91-93
Publication Date: 1976
Document Type: Journal article

Citation Number **80A000026**
Article Title: *Cellulosic Substrates for Enzymatic Saccharification*
Article Author: Andren, R.K.
Journal: Biotechnol. Bioeng. Symp.
Issue: 6
Pages: 177-203
Publication Date: 1976
Document Type: Journal article

Citation Number **80A000028**
Journal: Battery Man
Pages: 4
Publication Date: Jan 1980
Abstract: Champion Spark Plug will test alternative fuel effects on spark plug performance.
Document Type: Journal article

Citation Number **80A000033**
Journal: Oil Gas J.
Pages: 166
Publication Date: 30 Apr 1973
Abstract: Chem. Systems detailed breakdown of methanol fuel process.
Document Type: Journal article

Citation Number **80A000042**
Article Title: *Comments on Cellulase Production*
Article Author: Demain, A.L.
Journal: Biotechnol. Bioeng. Symp.
Issue: 6
Pages: 79-81
Publication Date: 1976
Document Type: Journal article

Citation Number **80A000045**
Article Title: *Connecticut Firms Experiment with Garbage-to-fuel/The Energy-from-wood Movement*
Journal: New England Business Journal
Volume: 1
Issue: 9
Pages: 10-12
Publication Date: 16 May 1979
Abstract: The Connecticut Resources Recovery Authority will initiate a test in Bridgeport soon of a plant designed to reclaim 83% of the energy in the garbage produced by 9 Fairfield County towns. The plant was built by Combustion Equipment Assoc. (New York) in partnership with Occidental Petroleum. Success of the plant will be monitored closely. Failure of the plant would be a great setback to resource recovery in the U.S. Following the example set by several midwestern states and Brazil, New England is beginning to experiment with gasohol, the gasoline substitute made of 90% gasoline and 10% alcohol. New Hampshire and Massachusetts will use the fuel in state vehicles. The big question that remains to be answered is whether or not the New England states have enough of some organic substance (biomass) to produce alcohol in economically feasible amounts. It appears that the wood supply is not sufficient to meet long term needs. (ABI)
Document Type: Journal article

Citation Number **80A000046**
Article Title: *Continuous Cultivation of Trichoderma Viride on Cellulose*
Article Author: Peitersen, N.
Journal: Biotechnol. Bioeng.
Volume: 19
Pages: 337-348
Publication Date: 1977
Document Type: Journal article

Citation Number **80A000047**
Article Title: *Continuous Enzymatic Saccharification of Cellulose with Culture Filtrate of Trichoderma Viride QM 6A*
Article Author: Ghose, T.K.
Journal: Biotechnol. Bioeng.
Volume: 11
Pages: 239-261
Publication Date: 1968
Document Type: Journal article

Citation Number **80A000056**
Journal: Japan Economic Journal
Pages: 5
Publication Date: 10 Jul 1979
Abstract: Brazil: considers joint project for mass-producing fuel alcohol from mandioca cassava with Japan.
Document Type: Journal article

Citation Number **80A000059**
Journal: Chem. Eng. Prog.
Pages: 11
Publication Date: Apr 1979
Abstract: Brazil: examines projected alcohol for fuel distillery capacities.
Document Type: Journal article

Citation Number **80A000066**
Journal Farm Chemicals and Croplife
Pages 136
Publication Date Feb 1978
Abstract Brazil: motor fuels production via alcohol projection, 1995.
Document Type Journal article

Citation Number **80A000076**
Journal Eur. Chem. News
Pages 20
Publication Date 24 Feb 1978
Abstract Brazil: to build 5 glucose-from-cassava units, to manufacture alcohol for use as motor fuel. DDS-Kroyer to design glucose-from-cassava units for Brazil.
Document Type Journal article

Citation Number **80A000084**
Article Title *The Cellulose Hydrolysis Pathway to Ethanol*
Journal Gasohol U.S.A.
Pages 13-16
Publication Date Nov 1979
Document Type Journal article

Citation Number **80A000085**
Article Title *Effect of Pretreatment of Molasses and Recycling of Yeast on Ethanol Fermentation*
Article Author Samaniego, R.
Srivastas, R.L.
Journal Sugar News
Volume 47
Issue 7
Pages 301-304
Publication Date Jul 1971
Document Type Journal article

Citation Number **80A000088**
Article Title *Efficiencies of Methanol Production from Gas, Coal, Waste or Wood*
Article Author Reed, T.B.
Author Affiliation Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.
Journal Am. Chem. Soc., Div. Fuel Chem., Prepr.
Volume 21
Issue 2
Pages 37-55
Publication Date 1976
Document Type Journal article

Citation Number **80A000102**
Journal Ward's Auto World
Pages 65
Publication Date Sep 1979
Abstract Brazil: alcohol fuel from sugar cane target for cars to total 30 billion/yr or 100% by 1990.
Document Type Journal article

Citation Number **80A000105**
Article Title *Differential Speed Two Roll Mill Pretreatment of Cellulosic Materials for Enzymatic Hydrolysis*
Article Author Tassinari, T.
Journal Biotechnol. Bioeng.
Volume 19
Pages 1321-1330
Publication Date 1977
Document Type Journal article

Citation Number **80A000108**
Journal Hydrocarbon Process.
Pages 141
Publication Date Jun 1978
Abstract Discusses technological improvements necessary to make methanol for fuel production cost-competitive.
Document Type Journal article

Citation Number **80A000111**
Article Title *Discussion of Pretreatments to Enhance Enzymatic and Microbiological Attack of Cellulosic Materials*
Article Author Nystrom, J.
Journal Biotechnol. Bioeng. Symp.
Issue 5
Pages 221-224
Publication Date 1975
Document Type Journal article

Citation Number **80A000113**
Article Title *Distillery Fuel Savings by Efficient Molasses Processing and Stillage Utilization*
Article Author Kujala, P.
Journal Sugar y Azucar
Pages 13-16
Publication Date Oct 1979
Document Type Journal article

Citation Number **80A000114**
Article Title *Distilling a Better Fuel Solution*
Journal Ind. Res.
Volume 16
Issue 6
Pages 33-34
Publication Date Jun 1974
Abstract In a process developed at the Univ. of Calif., cellulose is converted to glucose by means of cellulase obtained from the fungus Trichoderma viride, and the glucose is then fermented by yeast into EtOH. The cellulose can be obtained from domestic and agricultural wastes or from certian crops grown especially for their energy potential. The lab cost of converting cellulose to glucose is 2 cents/kg (the current market price for glucose is about 26 cents/kg). The cost of converting the glucose into alcohol is about 8 cents/liter (about one-half the current market price for alcohol). If low-cost glucose were produced in large amounts from cellulose, as the process suggests, several additional chemicals, such as acetone, now manufactured from petroleum-based materials, could also be made from the glucose. This would help reduce the demand on crude oil. Ethylene which is used in manufacturing PE plastics can be produced from EtOH. Gasoline diluted with 10-15% EtOH can be used as an automobile fuel without any carburetor modification. (PAPER CHEM)
Document Type Journal article

Citation Number **80A000120**
Journal Hydrocarbon Process.
Pages 19
Publication Date Apr 1978

Abstract	DOE to intensify methane and ethanol studies and may create alcohol fuels commission for gasohol R&D.
Document Type	Journal article

Citation Number	**80A000126**
Journal	Chem. Eng. News
Pages	22
Publication Date	7 Aug 1978
Abstract	The economic extraction of fuels and chemical feedstocks from agricultural wastes and urban garbage — trash that is now gaining respectability as biomass — may have been brought a step closer by the recent discovery of a high-temperature cellulase enzyme complex by researchers at SRI International, Menlo Park, California. The SRI cellulase functions in a realm that both SRI economists and Department of Energy spokesman see as the major limiting factor in economic biomass conversion: the breakdown of cellulose into simple sugars. From that point, fermentation into methyl and ethyl alcohol is straightforward. The experimental SRI cellulase, however, does its work at uniquely high temperatures, between 60 degrees and 70 degrees C. In comparison, commercially available cellulases begin to degrade at 50 degrees C.
Document Type	Journal article

Citation Number	**80A000134**
Article Title	*Effect of Cultural Conditions on Cellulase Formation by Trichoderma Viride*
Article Author	Gupta, J.K. Das, N.B. Gupta, Y.P.
Journal	Agric. Biol. Chem.
Volume	36
Issue	11
Publication Date	1972
Document Type	Journal article

Citation Number	**80A000135**
Article Title	*The Effect of Discontinuous Feeding on Ethanol Production by Saccharomyces Cerevisiae (Yeast)*
Article Author	Weller, J.B. Blanch, H.W.
Journal	Biotechnol. Bioeng.
Volume	18
Issue	1
Pages	129-132
Publication Date	Jan 1976
Document Type	Journal article

Citation Number	**80A000148**
Article Title	*Engineering Methanol Plant on a Fuel Scale*
Journal	Processing
Volume	25
Issue	8
Pages	21-23
Publication Date	1979
Document Type	Journal article

Citation Number	**80A000156**
Article Title	*Former Brewery May Soon Be Turning Corn to Gasohol*
Journal	Christian Science Monitor
Volume	72
Pages	15
Publication Date	14 Jan 1980
Document Type	Journal article

Citation Number	**80A000168**
Article Title	*Fuels via Bioconversion*
Article Author	Keenan, J.D.
Journal	Energy Convers.
Volume	16
Issue	3
Pages	95-103
Publication Date	1977
Abstract	Photosynthetic production of organic matter and the subsequent processing of this material to other fuels such as alcohol and methane.
Document Type	Journal article

Citation Number	**80A000169**
Article Title	*Fungal Cellulases as an Aid for the Saccharification of Cassava*
Article Author	Menezes, T.J.B. de Arakaki, T. DeLamo, P.R. Sales, A.M.
Journal	Biotechnol. Bioeng.
Volume	20
Pages	555-565
Publication Date	1978
Document Type	Journal article

Citation Number	**80A000184**
Article Title	*Liquid Chromatography for Monitoring the Conversion of Cellulosic Wastes to Sugars*
Article Author	Palmer, J.K.
Journal	Appl. Polym. Symp.
Issue	28
Pages	237-245
Publication Date	1975
Document Type	Journal article

Citation Number	**80A000185**
Journal	Eur. Chem. News
Pages	27
Publication Date	31 Dec 1979
Abstract	New Zealand: Liquid Fuels Trust Board to set up 660,000 tpy methanol-from-gas plant by 1983.
Document Type	Journal article

Citation Number	**80A000189**
Article Title	*Making Sugar and Protein from Trash*
Journal	Environ. Sci. Technol.
Volume	8
Issue	9
Pages	784-785
Publication Date	1974
Abstract	The biochemical effect of fungal cellulase enzymes which break cellulose down to reducing sugars such as glucose is discussed. Two mutant strains of the fungus Trichoderma viride, capable of producing 2-4 times the cellulases the parent strain produces have been developed by Fermentation Design Inc. (Bethlehem, Pa.) in conjunction with the Army's Natick Lab. (Natick, Mass.). The glucose syrups recovered from trash which are relatively free of extraneous matter and reversion compounds have been used as a

	substrate for culturing single-cell protein. The glucose may also be used as a base for ethanol for fuel or other purposes or as a base for chemical feedstocks. However, if the origin of cellulose is trash, it may contain lignin and other foreign matter which makes waste cellulose a difficult substrate with slow glucosification. Such difficulties can apparently be overcome by breaking the substrate down before processing. Pilot plant studies are described, and European technology is outlined. (PAPER CHEM)
Document Type	Journal article

Citation Number	**80:000191**
Article Title	*Bioconversion of Plant Biomass to Ethanol*
Document Title	Second Annual Symposium on Fuels from Biomass
Article Author	Brooks, R.E. Shuster, W.W. (ed.)
Author Affiliation	General Electric Co., Schenectady, N.Y. (USA)
Conference	2nd symposium on fuels from biomass
Conference Place	Troy, NY, USA
Conference Date	20 Jun 1978
Report Number	CONF-7806107 — P1
Publication Date	1978
Pages	511-536
Abstract	The research presented here was directed toward demonstrating on a laboratory scale the technical feasibility of the direct microbial conversion of pretreated wood to ethanol. In order to find the most effective method of wood pretreatment, the soluble sugar yields obtainable from acid and enzymatic hydrolysis of variously pretreated woods were studied. Clostridium thermocellum (LQ8), a thermophilic cellulolytic organism just recently shown to ferment cellulose directly to ethanol, was examined under controlled fermentor conditions. The overall yield of ethanol, which was limited by acid production, was 36% of theoretical yield from cellulose. Preliminary cost estimates were performed for ethanol production via chemically augmented hardwood steaming followed by direct fermentation with C. thermocellum (LQ8) and found to be promising. A mutation program leading to bacterial strains with enhanced ethanol yields from soluble sugars was also discussed.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A000209**
Article Title	*Gasohol Sparks Study on New Ethanol Plant*
Journal	Chem. Eng. News
Volume	57
Issue	48
Pages	8
Publication Date	1979
Document Type	Journal article

Citation Number	**80A000211**
Journal	Oil Gas J.
Pages	47
Publication Date	21 Jan 1980
Abstract	Government to raise gasohol capacity 600% by 1981 using $2.2 billion alternative fuel program. Government goals for alcohol-for-gasoline production detailed through end-1983.
Document Type	Journal article

Citation Number	**80:000213**
Article Title	*Low Technology Fermentation*
Document Title	Second Annual Symposium on Fuels from Biomass
Article Author	Bungay, H.R. Shuster, W.W. (ed.)
Author Affiliation	Rensselaer Polytechnic Inst., Troy, N.Y. (USA)
Conference	2nd symposium on fuels from biomass
Conference Place	Troy, NY, USA
Conference Date	20 Jun 1978
Report Number	CONF-7806107 — P2
Publication Date	1978
Pages	609-611
Abstract	This brief article summarizes some fermentation-related projects aimed at making major economic savings for investment in facilities. Reuse of yeast cells for fermentation of sugars to ethanol spares substrate and improves both cost and the net energy balance. To avoid enormous sedimentation units for gravity settling for recycle of yeast, a plastic chamber 66 x 10 x 3/8 inches has been devised to act as a plate settler. Preliminary tests with Saccharomyces cerevisiae are encouraging. Another project concerns controlled concentration continuous culture in which limiting substrate concentration is fixed through proportional feedback control. This is to prevent wash out of continuous culture at very high dilution rates.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80:000214**
Article Title	*Anaerobic Biomass Degradation to Produce Sugars, Fuels and Chemicals*
Document Title	Second Annual Symposium on Fuels from Biomass
Article Author	Wang, D.I.C. Cooney, C.L. Wang, S.D. Gordon, J. Wang, G.Y. Shuster, W.W. (ed.)
Author Affiliation	Massachusetts Inst. of Tech., Cambridge (USA)
Conference	2nd symposium on fuels from biomass
Conference Place	Troy, NY, USA
Conference Date	20 Jun 1978
Report Number	CONF-7806107 — P2
Publication Date	1978
Pages	537-570
Abstract	The degradation of cellulosic biomass by an anaerobic and thermophilic bacterium, Clostridium thermocellum, is under investigation. It is found that this organism is able to degrade cellulose and accumulate reducing sugars in the fermentation broth. The degradation of cellulose and the utilization of the sugars is being tested in mixed-cultures where the second organism is used to produce acetic acid. The direct production of a chemical (acetic acid) and a liquid fuel (ethanol) from cellulosic biomass by a pure culture of C. thermocellum also appears possible. Although the conversion efficiency is quite good, the product concentration must be increased. A selection and adaptation technique is being used where a strain capable of tolerating 5 volume % ethanol has been isolated.

Availability	NTIS
Document Type	Paper from report

Citation Number	**80:000216**
Article Title	*Thermophilic Degradation of Cellulose for Production of Liquid Fuels*
Document Title	Second Annual Symposium on Fuels from Biomass
Article Author	Pye, E.K. Shuster, W.W. (ed.)
Author Affiliation	Pennsylvania Univ., Philadelphia (USA)
Conference	2nd symposium on fuels from biomass
Conference Place	Troy, NY, USA
Conference Date	20 Jun 1978
Report Number	CONF-7806107 — P2
Publication Date	1978
Pages	601-608
Abstract	The Fuels From Biomass research program being carried out jointly by the University of Pennsylvania and General Electric Company is devoted to the investigation, improvement and assessment of a complete process for the total conversion of biomass to oil-sparing liquid fuels and valuable by-products. The process entails high-temperature solvent treatment of wood chips, derived from fast growing poplar trees, to produce readily-degradable cellulose solids, an aqueous stream of partially-degraded hemicellulose and a solvent lignin slurry suitable as a bunker C type fuel. The cellulose is further degraded at 60° C by cellulase enzymes from the organism Thermoactinomyces to produce a 20% sugar (primarily glucose) syrup suitable for fermentation to ethanol by yeast, or alternatively it is subjected to an enzymatic saccharification simultaneously with fermentation by Cl. thermocellum to produce ethanol and acetate. Such a system would be run at 60° C and under partial vacuum to yield a 23 to 27% ethanol condensate. A third alternative is a simultaneous enzymatic saccharification and fermentation with Cl. acetobutylicum or production and continuous extraction of butanol. The degraded hemicellulose will be used as additional substrate for butanol production and the pure linear xylan stream would produce xylose and ultimately xylitol. Preliminary economic analysis is encouraging and points to initial biomass cost, pretreatment, enzyme production and enzymatic hydrolysis, by-product credit and alcohol recovery as the major cost sensitive areas.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80:000223**
Article Title	*Hypercellulolytic Mutants and Their Role in Saccharification*
Document Title	Second Annual Symposium on Fuels from Biomass
Article Author	Montenecourt, B.S. Eveleigh, D.E. Shuster, W.W. (ed.)
Author Affiliation	Rutgers — the State Univ., New Brunswick, N.J. (USA)
Conference	2nd symposium on fuels from biomass
Conference Place	Troy, NY, USA
Conference Date	20 Jun 1978
Report Number	CONF-7806107 — P2
Publication Date	1978
Pages	613-625
Abstract	To overcome the high cost of producing enzymes to convert cellulose to glucose, an intensive program of strain development has been initiated. Enzyme yield has been increased fifteen fold through the design of selective screening methods which have allowed the selection of hyperproducing cellulase mutants of Trichoderma reesei. Several catabolite repression resistant strains have been selected allowing for the use of inexpensive nitrogen and carbon sources without reducing enzyme yield. Mutant strains of T. reesei which grow at elevated temperatures (37° C) have been isolated, but to date none have shown the hypercellulase yields of the parent strains.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A000223**
Journal	Eur. Chem. News
Pages	18
Publication Date	31 Dec 1976
Abstract	May be first nation to produce methanol fuel mixtures
Document Type	Journal article

Citation Number	**80A000224**
Article Title	*Measurement of Saccharifying Cellulase*
Article Author	Mandels, M. Andreotti, R. Roche, C.
Journal	Biotechnol. Bioeng. Symp.
Issue	6
Pages	21-33
Publication Date	1976
Document Type	Journal article

Citation Number	**80A000240**
Journal	Chem. Eng. (N.Y.)
Pages	48
Publication Date	25 Jun 1973
Abstract	Methanol fuel processes discussed with data and reasons for growing importance.
Document Type	Journal article

Citation Number	**80A000245**
Journal	Hydrocarbon Process.
Pages	19
Publication Date	Jun 1977
Abstract	Methanol is too expensive to compete with conventional fuels, says Stanford Research. By the year 2000, world production will be 60,000 metric tons, made mostly outside the U.S. and subsidized.
Document Type	Journal article

Citation Number	**80A000251**
Article Title	*A Method for Increasing Cellulase Production by Trichoderma Viride*
Article Author	Sternberg, D.
Journal	Biotechnol. Bioeng.
Volume	18
Pages	1751-1760
Publication Date	1976
Document Type	Journal article

Citation Number	**80A000254**
Article Title	*Properties of Cellulose and Lignocellulosic Materials as Substrates for Enzymatic Conversion Processes*
Article Author	Cowling, E.B. Kirk, T.K.
Journal	Biotechnol. Bioeng. Symp.
Issue	6
Pages	95-123
Publication Date	1976
Document Type	Journal article

Citation Number	**80A000256**
Article Author	Abou-Zeid, A.A. Shehata, Y.M. Madi, A.G. el-Sherbiny, A. el-Nagar, A.A.
Journal	J. Appl. Chem. Biotechnol.
Volume	26
Issue	2
Pages	97-104
Publication Date	Feb 1976
Abstract	Purification of carbon dioxide produced during the fermentative production of fodder yeast and ethyl alcohol by Saccharomyces cerevisiae.
Document Type	Journal article

Citation Number	**80A000257**
Article Title	*Rapid Ethanol Fermentations Using Vacuum and Cell Recycle Saccharomyces Cerevisiae*
Article Author	Cysewski, G.R. Wilke, C.R.
Journal	Biotechnol. Bioeng.
Volume	19
Issue	8
Pages	1125-1143
Publication Date	Aug 1977
Document Type	Journal article

Citation Number	**80A000260**
Article Title	*Remarks on Saccharification Technology*
Article Author	Brandt, D.
Journal	Biotechnol. Bioeng. Symp.
Issue	6
Pages	205-206
Publication Date	1976
Document Type	Journal article

Citation Number	**80A000261**
Article Title	*Renewable Fuels — Ethanol Produced by Fermentation*
Article Author	Trevelyan, W.E.
Author Affiliation	Trop. Prod. Inst., London (UK)
Journal	Trop. Sci.
Volume	17
Issue	1
Pages	1-13
Publication Date	1975
Document Type	Journal article

Citation Number	**80A000266**
Article Title	*The Re-use of Stillage Water in the Mashing of Grain as a Means of Energy Conservation*
Article Author	Ronkainen, P. Leppaenen, O. Harju, K.
Author Affiliation	State Alcohol Monopoly (ALKO), Helsinki (Finland). Res. Lab.
Journal	Journal of the Institute of Brewing
Volume	84
Issue	2
Pages	115-117
Publication Date	1978
Document Type	Journal article

Citation Number	**80A000267**
Journal	Handelsblatt
Pages	10
Publication Date	12 Nov 1979
Abstract	Rhodesia: builds ethanol fuel facility to start up in 1980.
Document Type	Journal article

Citation Number	**80A000271**
Article Title	*The Rotorfermentor*
Article Author	Margaritis, A. Wilke, C.R.
Journal	Biotechnol. Bioeng.
Volume	20
Issue	5
Pages	726-753
Publication Date	May 1978
Abstract	Application to ethanol fermentation of glucose by Saccharomyces cerevisiae.
Document Type	Journal article

Citation Number	**80A000274**
Article Title	*Saccharification of Cassava for Ethyl Alcohol Production*
Article Author	Menezes, T.J.B. de
Journal	Process Biochem.
Volume	13
Issue	9
Pages	24, 26
Publication Date	Sep 1978
Document Type	Journal article

Citation Number	**80A000275**
Article Title	*Saccharification Technology: Summary*
Article Author	Mandels, M.
Journal	Biotechnol. Bioeng. Symp.
Issue	6
Pages	221-222
Publication Date	1976
Document Type	Journal article

Citation Number	**80A000285**
Article Title	*Soluble and Immobilized Enzyme Technology in Bioconversion of Barley Starch*
Article Author	Linko, Y.Y. Lindroos, A. Linko, P.
Journal	Enzyme and Microbial Technology
Volume	1
Issue	4
Pages	273-278
Publication Date	1979
Document Type	Journal article

Citation Number	**80A000286**
Article Title	*Some Aspects of Structures of Turbulent Poo. Fires*
Article Author	Alger, R.S. Corlett, R.C.

	Gordon, A.S.
	Williams, F.A.
Author Affiliation	Stanford Research Inst., Menlo Park, Calif. (USA)
Journal	Fire Technol.
Volume	15
Issue	2
Pages	142-156
Publication Date	May 1979
Abstract	The results of an experimental study of the burning of multicomponent hydrocarbon (JP-5) and methanol pools emphasize structural differences between JP-5 and methanol fires as well as the importance of radiant feedback of energy to the pool surface in controlling rates of burning. The study concerns methanol and JP-5, burning in pans 305 cm in diameter well into the turbulent range. The objective is to gain understanding of somewhat more detailed aspects of these fires, including composition and temperature structures and radiant flux to the fuel surface. (EI)
Document Type	Journal article

Citation Number	**80A000290**
Journal	Chem. Week
Pages	26
Publication Date	6 Feb 1980
Abstract	Southern New Mexico Fuel Alcohol Producers Inc. says a module for making 1,000 gal/day of alcohol from milo will start up next month near Roswell, N.M. If the module is successful, the Department of Energy will lend 90% of the $3.5 million needed to build a 10,000-gal/day commercial plant. Product would be for gasohol.
Document Type	Journal article

Citation Number	**80A000294**
Journal	Wall Street Journal
Pages	20
Publication Date	8 Aug 1979
Abstract	Stone & Webster Canada gets contract for work on fuel-grade alcohol plant from Farmers Grain.
Document Type	Journal article

Citation Number	**80A000295**
Article Title	*Structural Features of Cellulosic Materials in Relation to Enzymatic Hydrolysis*
Article Author	Cowling, E.B.
	Brown, W.
Journal	Adv. Chem. Ser.
Issue	95
Pages	152-187
Publication Date	1969
Document Type	Journal article

Citation Number	**80A000297**
Article Title	*Structural Characterization of a Glycoprotein Cellulase, 1, 4-D-Glucan Cellobiohydrolase C from Trichoderma Viride*
Article Author	Gum, E.K., Jr.
	Brown, R.D., Jr.
Journal	Biochim. Biophys. Acta
Volume	446
Pages	371-386
Publication Date	1976
Document Type	Journal article

Citation Number	**80A000298**
Article Title	*Studies of Continuous Fermentation of Indian Cane Sugar Molasses by Yeast*
Article Author	Bose, K.
	Ghose, T.K.
Journal	Process Biochem.
Pages	23-33
Publication Date	Feb 1973
Document Type	Journal article

Citation Number	**80A000299**
Article Title	*Studies on Biomass Production from Methanol. Application of Tower Type Fermentor with 2-fluid Nozzle to Biomass Production from Methanol*
Article Author	Goto, S.
	Kuwajima, T.
	Okabe, M.
	Okamoto, R.
	Takamats, A.
Journal	J. Ferment. Technol.
Volume	57
Issue	4
Pages	341-348
Publication Date	1979
Document Type	Journal article

Citation Number	**80A000346**
Article Title	*Sugar Production from Agricultural Woody Wastes by Saccharification with Trichoderma Viride Cellulase*
Article Author	Toyama, N.
	Ogawa, K.
Journal	Biotechnol. Bioeng. Symp.
Issue	5
Pages	225-244
Publication Date	1975
Document Type	Journal article

Citation Number	**80A000350**
Journal	Journal of Commerce
Pages	32
Publication Date	13 Feb 1980
Abstract	West Germany: finances large scale test on use of gasoline-methanol as motor fuel.
Document Type	Journal article

Citation Number	**80A000361**
Document Title	*Acid Hydrolysis of Cellulose in Refuse to Sugar and Its Fermentation to Alcohol*
Document Author	Converse, A.O.
	Grethlein, H.E.
	Karandikar, S.
	Kuhrtz, S.
Author Affiliation	Dartmouth Coll., Hanover, N.H. (USA). Thayer School of Engineering
Report Number	EPA-670/2-73-11
	PB-221 239
Publication Date	June 1973
Document Type	Report

Citation Number	**80A000367**
Document Title	*Anaerobic Mechanisms for the Degradation of Cellulose*
Document Author	Compere, A.L.
	Griffith, W.L.
Author Affiliation	Oak Ridge National Lab., Tenn. (USA)

Report Number ORNL-5056
Publication Date Jun 1975
Pages 33
Abstract The state of the art of anaerobic fermentation processes for the conversion of cellulosic waste materials to chemicals and fuels is reviewed. The fermentation products from cellulose degradation include hydrogen, carbon dioxide, short-chain volatile acids, dicarboxylic acids, and ethanol. The various fermentations have generally been performed only at bench scale. The dollar values of products that could be produced from various anaerobic fermentations of cellulose range to as much as $2000/metric ton of substrate fermented. (EL)
Document Type Report

Citation Number **80A000384**
Document Title *Fermentation Kinetics and Process Economics for the Production of Ethanol*
Document Author Cysewski, G.R.
Wilke, C.R.
Author Affiliation California Univ., Berkeley (USA). Lawrence Berkeley Lab.
Report Number LBL-4480
Publication Date Mar 1976
Notes Energy Research and Development Administration (USA)
Document Type Report

Citation Number **80A000385**
Document Title *Fuel and Energy Production by Bioconversion of Waste Materials — State-of-the-art*
Document Author Ware, S.A.
Author Affiliation Ebon Research Systems, Silver Springs, Md. (USA)
Report Number PB-258 499/3ST
Contract EPA-68-03-0295
Publication Date Aug 1976
Pages 78
Abstract This report is a state-of-the-art summary of biological processes for converting waste cellulosic materials (agricultural, municipal and lumbering wastes) to fuels. It indicates the locations and quantities of suitable wastes and discusses the status of the current processing schemes. The processes discussed are: acid hydrolysis followed by fermentation; enzyme hydrolysis followed by fermentation; anaerobic digestion of manure and municipal solid waste; and biophotolysis. (NTIS)
Document Type Report

Citation Number **80A000407**
Document Title *Study of the Fermentation of Xylose to Ethanol by Fusarium Oxysporum*
Document Author Batter, T.R.
Wilke, C.R.
Author Affiliation California Univ., Berkeley (USA). Lawrence Berkeley Lab.
Report Number LBL-6351
Publication Date Jun 1977
Pages 106
Abstract Using pure xylose as a carbon source, the optimum temperature for growth was found to be 30 degrees C and the optimum pH was found to be 5. The ethanol yield factor was determined to be 0.41 g ethanol/g xylose fermented. The cell mass yield factor was found to be 0.12 g cell mass/g xylose fermented. Kinetic growth data indicate that growth is not exponential, but rather it appears to be linear showing that the increase in the cell mass of the culture occurs at a constant rate. Studies on the effect of increasing ethanol concentrations in the growth of the organism show that decreased growth rates are apparent at concentrations of ethanol greater than 1.5% by wt, and growth is completely halted at concentrations greater than 4.1% by wt. Batch data also indicate that a growth associated inhibitory substance, as yet unidentified, is also present resulting in a cessation of fungal growth before all xylose is utilized. Fermentation studies were also conducted using a mixture of sugars obtained from the dilute acid hydrolysis of wheat straw. Preliminary results indicate that a process involving fermentation by F. oxysporum of sugars produced by acid hydrolysis and fermentation by S. cerevisae of the sugars produced by enzymatic hydrolysis would yield 117% more ethanol than the fermentation of the enzymatic hydrolysis sugars only. Due to the low growth rate of the organism, further development will be necessary to improve the economic feasibility of the xylose fermentation. (NTIS)
Document Type Report

Citation Number **80A000416**
Journal Chem. Week
Pages 26
Publication Date 6 Feb 1980
Abstract Southeastern New Mexico fuel plant to produce 1,000 gal/day of alcohol-from-milo.
Document Type Journal article

Citation Number **80A000419**
Article Title *The Squabble over a Sugarcane Processor*
Journal Bus. Week
Issue 2561
Pages 48H, 48J
Publication Date 20 Nov 1978
Document Type Journal article

Citation Number **80A000423**
Article Title *Alcohol Fuels Spark Construction Plans*
Journal Eng. News-Rec.
Pages 16
Publication Date 27 Mar 1980
Document Type Journal article

Citation Number **80A000426**
Article Title *Low-energy Processes Vie for Ethanol — Plant Market*
Article Author Remirez, R.
Journal Chem. Eng. (N.Y.)
Volume 87
Issue 6
Pages 57-59
Publication Date 24 Mar 1980
Document Type Journal article

Citation Number **80A000432**
Article Title *High Productivity Fermentation for Ethanol Production*
Article Author Rogers, P.L.

Author Affiliation	New South Wales Univ., Kensington (Australia). School of Biological Technology
Journal	Reg. J. Energy Heat Mass Transfer
Volume	1
Issue	4
Pages	281-290
Publication Date	Oct 1979
Document Type	Journal article

Citation Number	**80A000451**
Document Title	*The Conversion of Agricultural By-products to Sugars; Progress Report*
Document Author	Reilly, P.J.
Author Affiliation	Iowa State Univ. of Science and Technology, Ames (USA). Engineering Research Inst.
Publisher	Iowa State Univ.; Ames, IA, USA
Report Number	ISU-ERI-AMES-79128 Project 1295 Grant PFR77-00198
Publication Date	Feb 1979
Pages	131
Notes	Submitted to the National Science Foundation, Division of Problem-Focused Research Applications.
Document Type	Report

Citation Number	**80A000452**
Document Title	*Fuel from Farms; a Guide to Small Scale Ethanol Production*
Corporate Author	Solar Energy Research Inst., Golden, Colo. (USA)
Report Number	SERI/SP-451-519 Contract EG-77-C-01-4042
Publication Date	May 1980
Pages	162
Availability	NTIS
Document Type	Report

Citation Number	**80A000472**
Article Title	*Enzymatic Hydrolysis of Cellulosic Materials*
Document Title	Microbial Energy Conversion
Article Author	Spano, L.A.
Author Affiliation	U.S. Army Natick Research and Development Command, Mass. (USA)
Conference	Microbial energy conversion symposium
Conference Place	Gottingen, F.R. Germany
Conference Date	Oct 1976
Publisher	Pergamon Press; Elmsford, NY, USA
Publication Date	1977
Pages	157
Notes	Presented at U.N. Institute for Training and Research Seminar on microbial energy conversion, 1976.
Abstract	Worldwide cellulose production is more than 100 billion ton/yr. Hydrolysis of cellulose to glucose and use of the glucose as a source of fuels, food, chemicals, vitamins, single-cell protein, and other products are a process that opens new vistas in the field of energy, food, and chemicals. The U.S. Army Natick R&D Command, Mass., has developed an enzyme complex that can convert cellulosic materials into glucose sugar. The complex is produced by a mutant of Trichoderma viride. More than 100 types of cellulosic wastes have been tested. A prepilot plant in operation can process 100-130 lb/day of cellulosic wastes. Sugars are being furnished to industry for evaluation. (EL)
Document Type	Paper/Chapter from book

Citation Number	**80A000473**
Article Title	*The Competition between Microbial and Chemical Processes for the Manufacture of Basic Chemicals and Intermediates*
Document Title	Microbial Energy Conversion
Article Author	Pape, M.
Author Affiliation	BASF Aktiengesellschaft (Germany, F.R.)
Conference	Microbial energy conversion symposium
Conference Place	Gottingen, F.R. Germany
Conference Date	Oct 1976
Publisher	Pergamon Press; Elmsford, NY, USA
Publication Date	1977
Pages	515
Notes	Presented at U.N. Institute for Training and Research Seminar on microbial energy conversion, 1976.
Abstract	Among the 100 most important organic chemicals by production volume, only six compounds exist for which microbial alternative syntheses are known: ethanol, acetic acid, isopropanol, acetone, N-butanol, and glycerol. Under conditions for the free market, the microbial syntheses have proved to be less economical than chemical syntheses. Production of acetic acid by fermentation of ethanol or by catalytic carbonylation of methanol and its economics is discussed. The future of microbial synthesis is examined through five different scenarios. (EL)
Document Type	Paper/Chapter from book

Citation Number	**80A000483**
Article Title	*Enzymatic Hydrolysis of Cellulosic Wastes to Fermentable Sugars for Alcohol Production*
Document Title	Symposium Papers (on) Clean Fuels from Biomass, Sewage, Urban Refuse, (And) Agriculture Wastes
Article Author	Spano, L.A.
Author Affiliation	Army Natick Development Command, Mass. (USA). Food Engineering Lab.
Conference	Clean fuels from biomass, sewage, urban refuse, and agricultural wastes
Conference Place	Orlando, FL, USA
Conference Date	27 Jan 1976
Publisher	Institute of Gas Technology; Chicago, IL, USA
Publication Date	1976
Pages	325-348
Abstract	Energy consumption in the USA is estimated at 7-8 x 10^6 Btu/yr, of which 43% comes from oil, 35% from gas, and 19% from coal. The present demand is 17-20 times what it was 100 years ago, and the demand in 2000 A.D. may be 2.5 times the present one. With 6% of the world's population (4 billion) the USA consumes 1/3 of the world's energy. Although nuclear power may become a major source, the harnessing of solar energy through utilization of photosynthesized cellulose seems more promising, considering that worldwide cellulose production is estimated at 100 billion ton/yr — 150 lb/day for every human alive. Utilization of this vast reservoir is simplified if it is first hydrolyzed into glucose which can be metabolized directly, converted into single-cell protein, fermented to EtOH, and/or made into solvents, plastics, and other chemicals presently obtained largely from petroleum. It is estimated that 1 ton of waste paper can yield 0.5 ton of glucose fermentable into 78 gal of ethanol.

	Although alcohol production from cellulosic (agricultural, industrial, or domestic/municipal) wastes is presently uneconomical, research should be actively pursued on production of protein and chemicals from saccharides obtained by cellulose hydrolysis (acidolysis with HCl) or enzymolysis (fungal cellulase). (PAPER CHEM)
Document Type	Paper/Chapter from book

Citation Number	**80A000487**
Article Title	*Adaptation of Geothermal Energy to Produce Alcohol from Agricultural Commodities*
Document Title	Expanding the Geothermal Frontier: Geothermal Resources Council Annual Meeting
Article Author	Garing, K.L. Coury, G.E.
Author Affiliation	Coury and Associates, Denver, Colo. (USA)
Conference	Geothermal Resources Council annual meeting
Conference Place	Reno, NV, USA
Conference Date	24 Sept 1979
Publisher	Geothermal Resources Council
Publication Date	1979
Pages	241
Notes	Presented at Geothermal Resources Council 3rd Annual Meeting, Reno, September 24-27, 1979.
Abstract	Geothermal energy resources can be utilized to supply the thermal energy requirements of ethanol producing facilities. The production of ethanol requires maximum geothermal brine temperatures of 350 degrees F if corn or wheat is the initial raw material. This application is economically competitive with the use of fossil fuels. The processes of distillation and fermentation, augmented by geothermal energy, are described. Geothermal energy can be supplied at a cost of \$2.38 and \$2.29 per million Btu delivered for resource temperatures of 350 degrees F and 275 degrees F respectively. (EL)
Document Type	Paper/Chapter from book

Citation Number	**80A000500**
Document Title	*The Conversion of Agricultural By-products to Sugars*
Document Author	Reilly, P.J.
Author Affiliation	Iowa State Univ. of Science and Technology, Ames (USA). Engineering Inst., Chemical Department
Series	ISU-ERI-Ames Project 1295
Publisher	Iowa State Univ., Engineering Research Institute; Ames, IA, USA
Publication Date	Oct 1979
Pages	67
Document Type	Book

Citation Number	**80A000531**
Article Title	*Engineering of a Fuel Scale Methanol Plant*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Humphreys, G.C. Dunster, M.
Author Affiliation	Davy International, Ltd., England (UK)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	12p, Paper II-34
Abstract	The world's two largest methanol plants, each having a design capacity of 2750 tons/day, are being engineered by Davy International Limited of London, England, for construction in the USSR. The detailed engineering has highlighted the technical problems associated with the design, engineering and procurement of the equipment and bulk commodities associated with the sheer scale of plants of this size. These problems are described. The economics of fuel methanol production have often been assessed utilizing a plant size of 5000 tons/day. The realities associated with the engineering of methanol plants of this even larger scale are investigated and conclusions drawn. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000537**
Article Title	*Novel Continuous Fermentation Process for Ethyl Alcohol*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Faust, U. Knecht, R.
Author Affiliation	Uhde (F.) G.m.b.H., Dortmund (Germany, F.R.)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	11p, Paper II-40
Document Type	Paper from report

Citation Number	**80A000565**
Article Title	*Direct Hydrolysis of Wet Milled Cassava Roots*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Bos, C.
Author Affiliation	DDS-Kroyer Als, Copenhagen (Denmark)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	26 Mar 1979
Pages	14p, Paper ID/WG.293/2
Document Type	Paper from report

Citation Number	**80A000569**
Article Title	*New Developments in Continuous Alcoholic Fermentation Intensification — Simplification — Economization*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries

Article Author	Meyrath, J.
Author Affiliation	University of Agriculture, Vienna (Austria). Institute of Applied Microbiology
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	8p, Paper ID/WG.293/8
Document Type	Paper from report

Citation Number	**80A000571**
Article Title	*Simplified and Economical Cassava Starch Process*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Caransa, A.
Author Affiliation	Dorr-Oliver, B.V., Amsterdam (Netherlands)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	13p, Paper ID/WG.293/10
Document Type	Paper from report

Citation Number	**80A000574**
Article Title	*Interrelationships between Fermentation Parameters and Ethanol Production*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Lafferty, R.M.
Author Affiliation	Technical University, Graz (Austria)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	10p, Paper ID/WG.293/13
Notes	Paper itself is not available.
Abstract	The biotechnological production of ethanol is still carried out to a large extent on the basis of empirical findings. In order to optimize the yield of ethanol and thereby the economics of ethanol production, particular interrelationships with respect to the regulatory effects of substrates and products on ethanol production must be taken into account. Some of these effects can be most easily understood and explained by the use of model conceptions of regulatory functions in conjunction with simple mathematical equations. The understanding of such fundamental conceptions and the consideration of these during fermentation permits the optimization of the biotechnology of ethanol production. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000576**
Article Title	*Fermentation Alcohol Industry in Egypt in the Last Three Decades*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Madi, A.G.
Author Affiliation	Egyptian Sugar and Distillation Company (Egypt). Hawamdieh Distillery
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	10p, Paper ID/WG.293/16
Abstract	Cane blackstrap molasses is the only and most economical starting material for industrial alcohol fermentation in Egypt. Its analysis reveals that it is a suitable medium. Two large scale modern distilleries, are owned by the Egyptian Sugar and Distillation Company, with total plant capacity of 66 million litres of alcohol. There is a surplus of pure and industrial alcohol for exportation. Some technical problems encountered like scaling in the mash column, flocculation of yeast, purification of carbon dioxide which were solved in our distilleries, are mentioned. It is planned to invest the slops for manufacturing fodder yeast and to reduce its B.O.D.
Document Type	Paper from report

Citation Number	**80A000595**
Article Title	*Distillation, Rectification, Low Energy Processes*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Eder, K.
Author Affiliation	Vogelbusch GES. m.b.H. Vienna (Austria)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	8p, Paper ID/WG.293/36
Document Type	Paper from report

Citation Number	**80A000604**
Article Title	*Alcoholic Fermentation*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Panuschka, G.
Author Affiliation	Vogelbusch GES. m.b.H., Vienna (Austria)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1

Publication Date 1979
Pages 25p, Paper ID/WG.293/45
Document Type Paper from report

Citation Number 80A000663
Document Title *Symposium on Enzymatic Hydrolysis of Cellulose*
Document Author Bailey, M. (ed.)
Enari, T-M. (ed.)
Linko, M. (ed.)
Conference Symposium on enzymatic hydrolysis of cellulose
Conference Place Aulanko, Finland
Conference Date 12 Mar 1975
Publisher Finnish National Fund for Research and Development; Helsinki, FI
Publication Date 1975
Notes Distributed by the Biotechnical Laboratory of the Technical Research Centre of Finland.
Document Type Book

Citation Number 80A000664
Article Title *Action of the Components of the Cellulase Complex*
Document Title Symposium on Enzymatic Hydrolysis of Cellulose
Article Author Halliwell, G.
Bailey, M. (ed.)
Enari, T-M. (ed.)
Linko, M. (ed.)
Conference Symposium on enzymatic hydrolysis of cellulose
Conference Place Aulanko, Finland
Conference Date 12 Mar 1975
Publisher Finnish National Fund for Research and Development; Helsinki, FI
Publication Date 1975
Pages 319-336
Notes Distributed by the Biotechnical Laboratory of the Technical Research Centre of Finland.
Document Type Paper/Chapter from book

Citation Number 80A000665
Article Title *Growth and Cellulase Production by Trichoderma*
Document Title Symposium on Enzymatic Hydrolysis of Cellulose
Article Author Mandels, M.H.
Sternberg, D.
Andreotti, R.E.
Bailey, M. (ed.)
Enari, T-M. (ed.)
Linko, M. (ed.)
Conference Symposium on enzymatic hydrolysis of cellulose
Conference Place Aulanko, Finland
Conference Date 12 Mar 1975
Publisher Finnish National Fund for Research and Development; Helsinki, FI
Publication Date 1975
Notes Distributed by the Biotechnical Laboratory of the Technical Research Centre of Finland.
Document Type Paper/Chapter from book

Citation Number 80A000666
Article Title *Kinetic and Dynamic Studies of Trichoderma Viride Cellulase Production*
Document Title Symposium on Enzymatic Hydrolysis of Cellulose
Article Author Ghose, T.K.
Pathak, A.N.
Bisaria, V.S.
Bailey, M. (ed.)
Enari, T-M. (ed.)
Linko, M. (ed.)
Conference Symposium on enzymatic hydrolysis of cellulose
Conference Place Aulanko, Finland
Conference Date 12 Mar 1975
Publisher Finnish National Fund for Research and Development; Helsinki, FI
Publication Date 1975
Notes Distributed by the Biotechnical Laboratory of the Technical Research Centre of Finland.
Document Type Paper/Chapter from book

Citation Number 80A000667
Article Title *Topological Effects in Enzymatic and Microbial Degradation of Highly Ordered Polysaccharides*
Document Title Symposium on Enzymatic Hydrolysis of Cellulose
Article Author Hofsten, B.
Bailey, M. (ed.)
Enari, T-M. (ed.)
Linko, M. (ed.)
Conference Symposium on enzymatic hydrolysis of cellulose
Conference Place Aulanko, Finland
Conference Date 12 Mar 1975
Publisher Finnish National Fund for Research and Development; Helsinki, FI
Publication Date 1975
Notes Distributed by the Biotechnical Laboratory of the Technical Research Centre of Finland.
Document Type Paper/Chapter from book

Citation Number 80A000679
Article Title *Production of Sugars from Waste Cellulose by Enzymatic Hydrolysis. I. Primary Evaluation of Substrates*
Document Title Proceedings of the Eighth Cellulose Conference
Article Author Andren, R.K.
Mandels, M.H.
Medeiros, J.E.
Timell, T.E. (ed.)
Conference 8th cellulose conference
Conference Place Syracuse, NY, USA
Conference Date 19 May 1975
Publisher Wiley; New York, NY, USA
Publication Date 1975
Pages 205-219
Document Type Paper/Chapter from book

Citation Number 80A000680
Article Title *Process-development Studies of the Enzymatic Hydrolysis of Newsprint*
Document Title Proceedings of the Eighth Cellulose Conference
Article Author Wilke, C.R.
Yang, R.D.
Timell, T.E. (ed.)
Conference 8th cellulose conference
Conference Place Syracuse, NY, USA
Conference Date 19 May 1975
Publisher Wiley; New York, NY, USA
Publication Date 1975
Pages 175-188
Document Type Paper/Chapter from book

Citation Number 80A000681
Article Title *Acid Hydrolysis and Dehydration Reactions for Utilizing Plant Carbohydrates*
Document Title Proceedings of the Eighth Cellulose Conference
Article Author Harris, J.F.
Timell, T.E. (ed.)
Conference 8th cellulose conference
Conference Place Syracuse, NY, USA
Conference Date 19 May 1975
Publisher Wiley; New York, NY, USA
Publication Date 1975
Pages 131-144
Document Type Paper/Chapter from book

Citation Number 80A000682
Article Title *Enzymatic Hydrolysis of Waste Cellulose*
Document Title Proceedings of the Eighth Cellulose Conference
Article Author Mandels, M.H.
Lihontz, M.
Nystrom, J.
Conference 8th cellulose conference
Conference Place Syracuse, NY, USA
Conference Date 19 May 1975
Publisher Wiley; New York, NY, USA
Publication Date 1975
Document Type Paper/Chapter from book

Citation Number 80A000708
Article Title *Potential Long Range Improvements in Methanol Production*
Document Title Methanol as an Alternative Fuel
Article Author Sherwin, M.B.
Frank, M.E.
Author Affiliation Chem. Systems, Inc. (USA)
Conference 1974 engineering foundation conference
Conference Place Henniker, NH, USA
Conference Date 7 Jul 1974
Publisher Engineering Foundation; New York, NY, USA
Publication Date 1974
Availability Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type Paper/Chapter from book

Citation Number 80A000716
Article Title *Development of Processes for Industrial Production of Enzymes*
Document Title Proceedings of the Second National Meeting on Biophysics and Biotechnology in Finland
Article Author Linko, M
Kairento, A.L. (ed.)
Riihim, M. (ed.)
Tarkka, P. (ed.)
Conference 2nd national meeting on biophysics and biotechnology in Finland
Conference Place Espoo, Finland
Conference Date 13 Feb 1976
Publication Date 1976
Abstract Problems of biochemical and process-control engineering and industrial planning in the development of commercial enzyme manufacturing technology are outlined and exemplified by a review of progress in enzymatic hydrolysis of cellulosic wastes to obtain glucose for protein (food) and ethanol (energy fuel) production. Of numerous cellulase producing microorganisms screened worldwide, Trichoderma viride strains appear most promising for submerged cultivation to achieve an economically feasible enzymolysis process. (PAPER CHEM)
Document Type Paper/Chapter from book

Citation Number 80A000717
Article Title *Process Developmental Studies on the Enzymatic Hydrolysis of Cellulose*
Document Title Cellulose as a Chemical and Energy Resource
Article Author Wilke, C.R.
Mitra, G.
Wilke, C.R. (ed.)
Author Affiliation California Univ., Berkeley (USA). Lawrence Berkeley Lab
California Univ., Berkeley (USA). Dept. of Chemical Engineering
California Univ., Berkeley (USA). Lawrence Berkeley Lab
Conference National Science Foundation special seminar, cellulose as a chemical and energy source
Conference Place Berkeley, CA, USA
Conference Date 25 Jun 1974
Publisher Wiley; New York, NY, USA
Publication Date 1975
Pages 253-274
Document Type Paper/Chapter from book

Citation Number 80A000718
Article Title *The Acid Hydrolysis of Refuse*
Document Title Cellulose as a Chemical and Energy Resource
Article Author Grethlein, H.E.
Wilke, C.R. (ed.)
Author Affiliation California Univ., Berkeley (USA). Lawrence Berkeley Lab
Conference National Science Foundation special seminar, cellulose as a chemical and energy source
Conference Place Berkeley, CA, USA
Conference Date 25 Jun 1974
Publisher Wiley; New York, NY, USA
Publication Date 1975
Pages 303-318
Document Type Paper/Chapter from book

Citation Number 80A000719
Article Title *Continuous Cellulose Production*
Document Title Cellulose as a Chemical and Energy Resource
Article Author Mitra, G.
Wilke, C.R.
Wilke, C.R. (ed.)
Author Affiliation California Univ., Berkeley (USA). Dept. of Chemical Engineering
California Univ., Berkeley (USA). Lawrence Berkeley Lab
California Univ., Berkeley (USA). Lawrence Berkeley Lab
Conference National Science Foundation special seminar, cellulose as a chemical and energy source
Conference Place Berkeley, CA, USA
Conference Date 25 Jun 1974
Publisher Wiley; New York, NY, USA
Publication Date 1975
Pages 1-13
Document Type Paper/Chapter from book

Citation Number 80A000724
Article Title *Enzymatic Hydrolysis of Cellulosic Wastes to Glucose*
Document Title Capturing the Sun through Bioconversion

Article Author	Spano, L.A. Medeiros, J. Mandels, M.
Author Affiliation	Army Natick Development Center, Mass. (USA)
Conference	Conference on capturing the sun through bioconversion
Conference Place	Washington, DC, USA
Conference Date	10 Mar 1976
Publisher	Bio-energy Council; Washington, DC, USA
Publication Date	1976
Pages	541-566
Document Type	Paper/Chapter from book

Citation Number	**80A000725**
Document Title	*Enzymatic Conversion of Cellulosic Materials*
Document Author	Gaden, E.L., Jr. (ed.) Mandels, M.H. (ed.) Reese, E.T. (ed.) Spano, L.A. (ed.)
Conference	6th biotechnology and bioengineering symposium
Conference Place	Newton and Natick, MA, USA
Conference Date	8 Sept 1975
Series	Biotechnology and bioengineering symposium no. 6
Publisher	Wiley; New York, NY, USA
Publication Date	1976
Document Type	Book

Citation Number	**80A000726**
Article Title	*Fermentation Ethyl Alcohol*
Document Title	Enzymatic Conversion of Cellulosic Materials
Article Author	Miller, D.L. Gaden, E.L., Jr. (ed.)
Conference	6th biotechnology and bioengineering symposium
Conference Place	Newton and Natick, MA, USA
Conference Date	8 Sept 1975
Series	Biotechnology and bioengineering symposium no. 6
Publisher	Wiley; New York, NY, USA
Publication Date	1976
Pages	307-312
Document Type	Paper/Chapter from book

Citation Number	**80A000727**
Article Title	*Physical and Chemical Pretreatments for Enhancing Cellulose Saccharification*
Document Title	Enzymatic Conversion of Cellulosic Materials
Article Author	Millett, M.A. Gaden, E.L., Jr. (ed.)
Conference	6th biotechnology and bioengineering symposium
Conference Place	Newton and Natick, MA, USA
Conference Date	8 Sept 1975
Series	Biotechnology and bioengineering symposium no. 6
Publisher	Wiley; New York, NY, USA
Publication Date	1976
Pages	125-153
Document Type	Paper/Chapter from book

Citation Number	**80A000728**
Article Title	*Cellulose Saccharification for Fermentation Industry*
Document Title	Enzymatic Conversion of Cellulosic Materials
Article Author	Seeley, D.B. Gaden, E.L., Jr. (ed.)
Conference	6th biotechnology and bioengineering symposium
Conference Place	Newton and Natick, MA, USA
Conference Date	8 Sept 1975
Series	Biotechnology and bioengineering symposium no. 6
Publisher	Wiley; New York, NY, USA
Publication Date	1976
Document Type	Paper/Chapter from book

Citation Number	**80A000729**
Article Title	*Ethanol Fermentation and Potential*
Document Title	Cellulose as a Chemical and Energy Resource
Article Author	Miller, D.L. Wilke, C.R. (ed.)
Conference	National Science Foundation special seminar, cellulose as a chemical and energy source
Conference Place	Berkeley, CA, USA
Conference Date	25 Jun 1974
Publisher	Wiley; New York, NY, USA
Publication Date	1975
Pages	345-352
Notes	Biotechnology and bioengineering symposium no. 5
Abstract	There are three primary processes that are currently in use in the U.S. to produce ethanol; fermentation of grain, sugar cane, etc., fermentation of sulfite liquors from wood and chemical synthesis from petroleum or hydrocarbon sources (hydration of ethylene). The quality of the product from the three sources is comparable and the economics of production are shown to be dependent on the cost of the feedstock. (AFDB)
Document Type	Paper/Chapter from book

Citation Number	**80A000732**
Article Title	*Methanol Synthesis and Possibilities for Production of Fuel-methyl*
Document Title	Proceedings of the International Symposium on Alcohol Fuel Technology: Methanol and Ethanol
Article Author	Baron, G. Moeller, F.W. Supp, E.
Author Affiliation	Lurgi Kohle und Mineraltechnik, G.m.b.H., Frankfurt/Main (Germany, F.R.)
Conference	Symposium on alcohol fuel technology
Conference Place	Wolfsburg, F.R. Germany
Conference Date	21 Nov 1977
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-771175
Publication Date	Jul 1978
Pages	14p, Paper 3-6
Notes	Organized by Volkswagenwerk AG in cooperation with the German Federal Ministry for Research and Technology (BMFT).
Abstract	The technical operating characteristics of the lurgi-low-pressure methanol process is shown. Potential raw material sources are reviewed. The process economics in terms of cost per unit energy of product versus cost per unit of energy of raw material are given. The composition of a methyl fuel product from this same process with an altered catalyst are also described. (AFDB)
Document Type	Paper from report

Citation Number **80A000736**
Article Title *Economical and Technical Aspects of Ethanol Production from Maniok*
Document Title Proceedings of the International Symposium on Alcohol Fuel Technology: Methanol and Ethanol
Article Author Schmidt-Holthausen, H.
Engelbart, W.
Author Affiliation Schumacher'sche Fabrik, Bietigheim-Bissingen (Germany)
Conference Symposium on alcohol fuel technology
Conference Place Wolfsburg, F.R. Germany
Conference Date 21 Nov 1977
Publisher U.S. Department of Energy; Washington, DC, USA
Report Number CONF-771175
Publication Date Jul 1978
Pages 4p, Paper 5-2
Notes Organized by Volkswagenwerk AG in cooperation with the German Federal Ministry for Research and Technology (BMFT).
Abstract The use of solar energy for the production of alcohol fuels by agricultural and biotechnological conversion processes, is in the first place a question of economy. Using fresh maniok and the common technology of today, only a small net-yield of energy can be attained. The aspects of an ethanol-plant, to be built in Mato Grasso, Brazil, are discussed. Continuous process techniques are proposed and some alternative solutions for economizing "waste" treatment are given.
Document Type Paper from report

Citation Number **80A000737**
Article Title *Basic Data on Continuous Alcoholic Fermentation of Sugar Solutions and of Mashes from Starch Containing Raw Materials*
Document Title Proceedings of the International Symposium on Alcohol Fuel Technology: Methanol and Ethanol
Article Author Englebart, W.
Dellweg, H.
Author Affiliation Schumacher'sche Fabrik, Bietigheim-Bissingen (Germany)
Conference Symposium on alcohol fuel technology
Conference Place Wolfsburg, F.R. Germany
Conference Date 21 Nov 1977
Publisher U.S. Department of Energy; Washington, DC, USA
Report Number CONF-771175
Publication Date Jul 1978
Pages 8p, Paper 5-3
Notes Organized by Volkswagenwerk AG in cooperation with the German Federal Ministry for Research and Technology (BMFT).
Abstract Continuous alcoholic fermentations are shown to be preferably one stage processes. It was found that the specific yield of ethanol (based upon the fermented sugar) can be about 98% of the theoretical value compared to about 93% yield in normal batch processes. Continuous fermentation of enzymatically saccharified starch containing raw materials is limited by the saccharification rate and takes about 40 hours fermentation time. Fermentation of clarified beet or cane juices only needs 6 hours fermentation time. Scale-up is no problem. The processes do not need sterile conditions because bacteria do not have a chance for considerable growth and because of selective conditions for growing and fermenting yeast. (EI)
Document Type Paper from report

Citation Number **80A000738**
Article Title *Direct Production of Ethanol from Sugar Cane*
Document Title Proceedings of the International Symposium on Alcohol Fuel Technology: Methanol and Ethanol
Article Author Rulolph, K.
Osianowski, R.P.
Tentscher, W.
Author Affiliation Ger Soc for Tech Coop, Eschborn (F.R. Germany)
Conference Symposium on alcohol fuel technology
Conference Place Wolfsburg, F.R. Germany
Conference Date 21 Nov 1977
Publisher U.S. Department of Energy; Washington, DC, USA
Report Number CONF-771175
Publication Date Jul 1978
Pages 7p, Paper 5-4
Notes Organized by Volkswagenwerk AG in cooperation with the German Federal Ministry for Research and Technology (BMFT).
Abstract This report concerns a new process for the production of ethanol as engine fuel-additive, resp. substitute from sugar-resp. starch-containing plants. The new process is based upon a steaming process at 110 degrees C of the plant material that has been size-reduced in a hammer mill. The material is subsequently extracted. The sugar-containing juice is then treated as usual. Ripe ("young"), overripe, frost-damaged and poor-quality sugar cane, sorghum etc. can be utilized. The installations can operate independent of existing sugar factories. In 1978, a pilot installation with a daily production of 3000 liters will be erected in a Latin American country. Reference is, further, made to a second, simpler, process in which the size-reduced material is fermented without juice extraction. Cost considerations are included. (EI)
Document Type Paper from report

Citation Number **80A000748**
Article Title *Use of Mycotoxin Contaminated Grain in the Ethanol Fermentation Process*
Article Author Lillehoj, E.B.
Conference Distillers Feed/Research Council annual meeting
Conference Date 30 Mar 1978
Journal Proceedings, Distillers Feed Research Council
Volume 33
Pages 23-29
Publication Date 30 Mar 1978
Document Type Journal article

Citation Number **80A001009**
Journal Eur. Chem. News
Pages 14
Publication Date 24 Sep 1979
Abstract Ampol Petroleum to do joint research on fuel ethanol fermentation technology; biotechnology to do joint research on fuel ethanol fermentation technology.
Document Type Journal article

Citation Number 80A001063
Journal: Financ. Times
Pages: 21
Publication Date: 15 Jan 1980
Abstract: Kenya: builds new gasohol plant which will use molasses by-product.
Document Type: Journal article

Citation Number 80A001064
Article Title: *Kinetics of Acid Hydrolysis of Cellulose Found in Paper Refuse*
Article Author: Fagan, R.D.
Grethlein, H.E.
Converse, A.O.
Porteous, A.
Journal: Environ. Sci. Technol.
Volume: 5
Issue: 6
Pages: 545-547
Publication Date: Jun 1971
Document Type: Journal article

Citation Number 80A001065
Article Title: *Kinetics of Solka Floc Cellulose Hydrolysis by Trichoderma Viride Cellulase*
Article Author: Howell, J.A.
Stuck, J.D.
Journal: Biotechnol. Bioeng.
Volume: 17
Pages: 873-893
Publication Date: 1975
Document Type: Journal article

Citation Number 80A001082
Journal: Chem. Week
Pages: 37
Publication Date: 11 Jun 1975
Abstract: Union Carbide Corp.'s nuclear division, which operates Holifield National Laboratory (Oak Ridge, Tenn.), has packed an anaerobic waste treatment pond into a column. The technique overcomes the requirements of large land tracts and long treatment times. And it provides a dividend: liquid wastes can be converted into chemicals or fuels. For example, the process, called anflow, could produce lactic acid from whey or milk by-product wastes, methanol from sewage, ethanol from fruit canning wastes. Chemical recovery and fuel generation may be the biggest selling points for anflow.
Document Type: Journal article

Citation Number 80A001083
Article Title: *The Use of Absorbed Cellulose in the Continuous Conversion of Cellulose to Glucose*
Article Author: Kostick, J.
Journal: J. Polym. Sci.
Issue: 36
Pages: 445-459
Publication Date: 1971
Notes: Pt.C, no.36, p.445-459
Document Type: Journal article

Citation Number 80A001086
Article Title: *Utilization of Cellulosic Materials through Enzymatic Hydrolysis; Fermentation of Hydrolysate to Ethanol and Single Cell Protein*
Article Author: Cysewski, G.R.
Wilke, C.R.
Journal: Biotechnol. Bioeng.
Volume: 18
Pages: 1279-1313
Publication Date: 1976
Document Type: Journal article

Citation Number 80A001087
Article Title: *Utilization of Cellulosic Materials through Enzymatic Hydrolysis; Preliminary Assessment of an Integrated Processing Scheme*
Article Author: Wilke, C.R.
Cysewski, G.R.
Yang, R.D.
VonStockar, V.
Journal: Biotechnol. Bioeng.
Volume: 18
Pages: 1315-1323
Publication Date: 1976
Document Type: Journal article

Citation Number 80A001088
Article Title: *The Vacuferm Process: a New Approach to Fermentation Alcohol*
Article Author: Ramalingham, A.
Finn, R.K.
Journal: Biotechnol. Bioeng.
Volume: 19
Pages: 583-589
Publication Date: 1977
Document Type: Journal article

Citation Number 80A001095
Journal: Chem. Mark. Rep.
Pages: 5
Publication Date: 3 Mar 1980
Abstract: Voss International Corp., Houston, Tex., has been awarded a contract to provide detailed engineering and construction for a 55-million-gal./year alcohol plant for the production of gasohol to be owned and operated by Chemgas Inc. The $60 million plant will utilize yellow corn to the alcohol distillation process. Final site selection will be announced soon. Construction is slated to start within sixty to ninety days, with start-up and operation scheduled for late 1981. The gasohol to be produced is earmarked as automobile fuel.
Document Type: Journal article

Citation Number 80A001100
Article Title: *Cellulose as a Chemical and Energy Resource*
Article Author: Wilke, C.R.
Journal: Biotechnol. Bioeng. Symp.
Issue: 5
Pages: 361
Publication Date: 1975
Abstract: This volume contains the edited proceedings of a cellulose conference held at the Univ. of Calif. at Berkeley, June 25-27, 1974 under the auspices of the NSF. The 34 contributions by different experts deal with substrates (cellulosic biomass, agricultural and forest products, cellulosic wastes), cellulolytic and lignolytic enzyme systems, lignocellulose hydrolysis (enzymolysis) processes (wood saccharification), and cellulose-derived products (ethanol, fuel gas). (Individual

articles are abstracted separately in this issue of ABIPC). (PAPER CHEM)
Document Type Journal article

Citation Number **80A001121**
Article Title *Non-aqueous Solvents of Cellulose*
Article Author Burkart, P.
Schleicher, H.
Wagenknecht, W.
Journal American Chemical Society Symposium Series
Volume 48
Pages 278-297
Publication Date 1977
Document Type Journal article

Citation Number **80A001125**
Article Title *Perspectives on Preparation of Cellulose for Hydrolysis*
Article Author Lipinsky, E.S.
Journal Adv. Chem. Ser.
Volume 181
Pages 1-23
Publication Date 1979
Document Type Journal article

Citation Number **80A001127**
Article Title *Physical and Chemical Constraints in the Hydrolysis of Cellulose and Lignocellulosic Materials*
Article Author Cowling, E.B.
Journal Biotechnol. Bioeng. Symp.
Issue 5
Pages 163-181
Publication Date 1975
Document Type Journal article

Citation Number **80A001129**
Article Title *Pilot Scale Investigations and Economics of Cellulase Production*
Article Author Nystrom, J.M.
Journal Biotechnol. Bioeng. Symp.
Issue 6
Pages 55-74
Publication Date 1976
Document Type Journal article

Citation Number **80A001130**
Journal Solar Energy Digest
Pages 1
Publication Date Jul 1979
Abstract Pittsburgh-Corning holds patent for solar still that may provide alcohol fuel
Document Type Journal article

Citation Number **80A001134**
Article Title *Pretreatment of Cellulosic Wastes to Increase Enzyme Reactivity*
Article Author Nesse, N.
Journal Biotechnol. Bioeng.
Volume 19
Pages 1321-1330
Publication Date 1977
Document Type Journal article

Citation Number **80A001135**
Article Title *Pretreatments to Enhance Chemical, Enzymatic, and Microbiological Attack of Cellulosic Materials*
Article Author Millett, M.A.
Baker, A.J.
Satter, L.D.
Journal Biotechnol. Bioeng. Symp.
Issue 5
Pages 193-219
Publication Date 1975
Document Type Journal article

Citation Number **80A001137**
Journal Japan Economic Journal
Pages 13
Publication Date 14 Mar 1978
Abstract A private non-profit research institute has embarked on studies to derive high polymers and monomers from bagasse, waste sugar canes. The Noguchi Institute recently disclosed it has undertaken such studies from belief that such waste is one of the most promising renewable natural resources. Such raw materials, mostly of organic carbon type, are now drawing wide attention as potential substitute for oil and coal. The institute said it already has completed the basic stage of such studies to turn cellulose of lumber or bagasse into glucose, and ferment it into an ethanol and ethylene from such items. It has thus advanced to a new stage of developing efficient, practical methods of processing the item into various plastic or chemical intermediate substances and fuel.
Document Type Journal article

Citation Number **80A001142**
Article Title *Production of Cellulase by Trichoderma*
Article Author Sternberg, D.
Journal Biotechnol. Bioeng. Symp.
Issue 6
Pages 35-53
Publication Date 1976
Document Type Journal article

Citation Number **80A001143**
Article Title *Production of Glucose by Enzymatic Hydrolysis of Cellulose*
Article Author Reese, E.T.
Journal Appl. Microbiol.
Volume 16
Pages 419
Publication Date 1968
Document Type Journal article

Citation Number **80A001146**
Journal Journal of Commerce
Pages 5
Publication Date 21 Nov 1979
Abstract Texaco Inc. and CPC International Inc. have initiated a study to determine the feasibility of a joint venture for the production of up to 60 million gallons a year of fuel-grade ethanol from corn at CPC's corn wet milling plant in Pekin, Ill.
Document Type Journal article

Citation Number **80A001148**
Journal Chem. Eng. (N.Y.)
Pages 172
Publication Date 21 Apr 1980
Abstract Texaco Inc., White Plains, N.Y., and CPC International Inc. have agreed to proceed with the

	design and some equipment orders for the proposed production of 60 million gal/yr of fuel-grade ethanol at CPC's wet-milling plant in Pekin, Ill. Commercial ethanol production is expected to start by late 1981.
Document Type	Journal article

Citation Number	**80A001154**
Journal	Chem. Eng. (N.Y.)
Pages	152
Publication Date	18 Jun 1979
Abstract	A $200,000 pilot plant to produce ethanol from wood has been commissioned by the Forest Research Institute at Rotorua, New Zealand, in the hope that this will lead to a 50,000-L/yr facility within the next three years. The ethanol will by used as a fuel in blends with gasoline.
Document Type	Journal article

Citation Number	**80A001159**
Article Title	*Dehydration of Ethanol: New Approach Gives Positive Energy Balance*
Article Author	Ladisch, M.R. Dyck, K.
Journal	Science
Volume	205
Pages	898-900
Publication Date	31 Aug 1979
Abstract	This article presents alternative methods to conventional distillation methods for producing anhydrous ethanol from aqueous solutions of ethanol. The conventional distillation methods require significant energy expenditures in terms of the energy contents in the anhydrous ethanol product. The bench scale tests that were conducted suggest that by using a water absorbent such as corn hydroxide or mineral oxides, it is possible to obtain a 99% ethanol product while expending only 10% of the combustion energy of the ethanol. (AFDB)
Document Type	Journal article

Citation Number	**80A001169**
Article Title	*A Mechanism for Improving the Digestibility of Lignocellulosic Materials with Dilute Alkali and Liquid Ammonia*
Article Author	Tarkow, H. Feist, W.C.
Journal	Adv. Chem. Ser.
Volume	95
Pages	197-218
Publication Date	1969
Document Type	Journal article

Citation Number	**80A001171**
Article Title	*The Effect of Extracellular Variables on the Enriched-lysine Baker's Yeast — Ethanol Fermentation Process*
Article Author	Essajee, C.K. Tanner, R.D.
Author Affiliation	Vanderbilt Univ., Nashville, Tenn. (USA)
Journal	Am. Chem. Soc., Abstracts of Papers
Pages	176
Publication Date	1978
Abstract	Conditions for the production of an edible baker's yeast, high in lysine, for a human nutritional supplement, and the simultaneous synthesis of ethanol as a by-product for use as a fuel, from renewable resources such as sugar, are explored. Particular attention is given to quantification of the effect of extracellular variables which include: dissolved CO_2, dissolved O_2, dissolved NH_3, and dissolved Mg_2 on intracellular free lysine yield, using specific ion, polarographic and gas sensing probes for the measurements. The system is modelled in terms of the known biochemical pathways and the mathematical notion of kinetic hysterisis. The analysis focuses on the interactive effects of the parallel pathways of lysine and ethanol biosynthesis and cellular and enzyme synthesis. (AS) (FSTA)
Document Type	Journal article

Citation Number	**80A001186**
Document Title	*Basic Fermentation Chemistry in a Nut Shell*
Document Author	Rago, J.W.
Publisher	Micro-Tec Laboratories, Inc.; Logan, IA, USA
Pages	9
Availability	Micro-Tec Laboratories, Inc., Rt. 2, Box 19, Logan, IA 51546
Document Type	Book

Citation Number	**80A001187**
Document Title	*Making Fuel in Your Back Yard*
Document Author	Bradley, J.
Publisher	Biomass Resources; Wenatchee, WA, USA
Publication Date	1979
Pages	63
Availability	Biomass Resources, Wenatchee, WA 98801
Document Type	Book

Citation Number	**80A001188**
Document Title	*Making Alcohol Fuel; Mother's Alcohol Fuel Seminar*
Publisher	Mother Earth News; Hendersonville, NC, USA
Publication Date	1979
Pages	115
Notes	Loose leaf note book
Abstract	A teaching guide to Mother Earth seminars on alcohol fuel production.
Availability	Mother Earth News, P.O. Box 70, Hendersonville, NC 28739 $25.00
Document Type	Book

Citation Number	**80A001192**
Document Title	*Lore of Still Building; a Primer on the Efficient Use of Alcohol for Food and Fuel*
Series	Alcohol Series, v. 2
Publisher	Popular Topics Press; Fostoria, OH, USA
Publication Date	1978
Pages	190
Abstract	Describes distillation for beverage consumption. An excellent reference for making alcohol with conversion tables in abundance. There is a down-to-earth description of what is involved in the distillation process.
Availability	Popular Topics Press, Box 1004, Fostoria, OH 44830 $5.00
Document Type	Book

Citation Number	**80A001206**
Document Title	*Alcohol Distiller's Manual for Gasohol and Spirits*
Document Author	DeRasor, R.

Publisher	Dona Carolina Distillers; San Antonio, TX, USA
Publication Date	1980
Pages	202
Abstract	Discusses fermentation processes of grains, rice, potatoes, beets, grapes, sorghum, and molasses; distillation; and alcohol as a motor fuel. Includes many tables and illustrations.
Availability	Dona Carolina Distillers, Box 13189, San Antonio, TX 78213 $12.50
Document Type	Book

Citation Number	**80A001207**
Document Title	*Individual and Group Gasohol-alcohol Fuel Production and Usage*
Document Author	Kirby, B.W.
Publisher	B.W. Kirby Co.; Columbia, SC, USA
Publication Date	1979
Pages	70
Abstract	Includes chapters on an overview of gasohol and alcohol fuels; alcohol fuel production; and legislative, technical, and marketing advancements needed for the national gasohol movement to win energy independence.
Availability	Energy Economy Digest, 3615 Verner St., Columbia, SC 29204 $10.00
Document Type	Book

Citation Number	**80A001209**
Document Title	*A Manual on Ethanol and Gasohol Production in Louisiana*
Publisher	Louisiana Dept. of Natural Resources; Baton Rouge, LA, USA
Pages	115
Notes	Prepared for the Louisiana Department of Natural Resources for use in conjunction with the First Inter-American Conference on Renewable Sources of Energy, scheduled for Nov. 25-29, 1979.
Document Type	Book

Citation Number	**80A001210**
Document Title	*Industrial Alcohol by Continuous Fermentation and Vacuum Distillation with Low Energy Consumption*
Publisher	Chemapec, Inc.; Woodbury, NY, USA
Publication Date	1979
Pages	44
Document Type	Book

Citation Number	**80A001224**
Document Title	*Indiana Grain Fermentation Alcohol Plant*
Document Author	Corcoran, W.P. Brackett, A.T. Lindsey, F.
Author Affiliation	Indianapolis Center for Advanced Research, Ind. (USA) Indianapolis Center for Advanced Research, Ind. (USA) R.L. Longgardner and Associates
Publisher	Indianapolis Center for Advanced Research; Indianapolis, IN, USA
Publication Date	1976
Pages	78
Abstract	Book covers anhydrous production and deals with cattle feedlot and other closed system scenarios.
Availability	Indiana Dept. of Commerce, Room 336, State House, Indianapolis, IN 46204
Document Type	Book

Citation Number	**80A001226**
Document Title	*Small-scale Fuel Alcohol Production*
Publisher	U.S. Department of Agriculture; Washington, DC, USA
Publication Date	Mar 1980
Pages	231
Notes	Prepared with the assistance of Development Planning and Research Associates, Inc., Manhattan, Kansas. Bibliographic references are included.
Abstract	This book plays a role in implementation of national alcohol fuels policy by providing information on small-scale, on-farm production. The emphasis is on utilization of alcohol fuel in vehicles and use of the stillage by-product. Additional information is given on feedstocks, production processes and costs
Availability	U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402
Document Type	Book

Citation Number	**80A001236**
Article Title	*The Production of Cellulases*
Document Title	Cellulases and Their Applications
Article Author	Mandels, M. Weber, J. Hajny, G.J. (ed.) Reese, E.T. (ed.)
Conference	156th meeting of the American Chemical Society. Division of cellulose, wood, and fiber chemistry
Conference Place	Atlantic City, NJ, USA
Conference Date	11 Sept 1968
Publication Date	1969
Pages	391-414
Notes	Advances in Chemistry Series no. 95
Document Type	Paper/Chapter from book

Citation Number	**80A001237**
Article Title	*Enzymatic Saccharification of Cellulose in Semi- and Continuously Agitated Systems*
Document Title	Cellulases and Their Applications
Article Author	Ghose, T.K. Hajny, G.J. (ed.) Reese, E.T. (ed.)
Conference	156th meeting of the American Chemical Society. Division of cellulose, wood, and fiber chemistry
Conference Place	Atlantic City, NJ, USA
Conference Date	11 Sept 1968
Publication Date	1969
Pages	415-446
Notes	Advances in Chemistry Series no. 95
Document Type	Paper/Chapter from book

Citation Number	**80A001244**
Article Title	*Development and Application of a Mathematical Model of the Methanol Synthesis*
Document Title	Methanol Technology and Economics
Article Author	Bakemeier, H. Laurer, P.R. Schroder, W. Donner, G.A. (ed.)
Series	Chem. Eng. Prog., Symp. Ser., v. 66, no. 98
Publication Date	1970
Pages	1-10
Document Type	Paper/Chapter from book

Citation Number	**80:001983**
Article Title	*Production of Liquid Fuels from Cellulosic Biomass*
Document Title	3rd Annual Biomass Energy Systems Conference
Article Author	Pye, E.K. Humphrey, A.E.
Author Affiliation	Pennsylvania Univ., Philadelphia (USA)
Conference	3rd annual biomass energy systems conference
Conference Place	Golden, CO, USA
Conference Date	5 Jun 1979
Report Number	SERI/TP — 33-285 CONF-790638 —
Publication Date	Oct 1979
Pages	69-75

Abstract

A novel, elevated temperature process for the total conversion of cellulosic biomass to liquid fuels has been devised and shown to be technically feasible by our research group. It has several unique features which allow reduced process energy costs in the simultaneous production of two liquid fuels — ethanol for use as a gasoline extender and octane enhancer, and a butanol/lignin slurry for use as a pumpable furnace or diesel fuel. The process relies on a hot aqueous butanol pretreatment of the biomass to yield an enzyme-degradable cellulose fraction, a high quality polymer-grade lignin fraction, a partially degraded hemicellulose fraction for fermentation to butanol, and a butanol/lignin slurry for use as a fuel. The cellulose is fermented to ethanol either by an elevated temperature (approx. 60° C) simultaneous saccharification/vacuum fermentation step using cellulase from Thermoactinomyces, and the anaerobic bacterium C. thermocellum; or by hydrolyzing it to a high glucose syrup (greater than 20%) with Thermoactinomyces cellulase for use in a standard yeast fermentation. The process is currently being tested and optimized with wood chips from fast growing poplar trees, but it also appears attractive for conversion of municipal solid waste and agricultural residues. Production costs for ethanol appear to be about 70 to 80 cent/gallon, depending on biomass costs, yields and byproduct credits.

Availability	NTIS
Document Type	Paper from report

Citation Number	**80:001985**
Article Title	*Bioconversion of Plant Biomass to Ethanol*
Document Title	3rd Annual Biomass Energy Systems Conference
Article Author	Brooks, R. Su, T.M. Brennan, M. Frick, J.
Author Affiliation	General Electric Co., Schenectady, N.Y. (USA)
Conference	3rd annual biomass energy systems conference
Conference Place	Golden, CO, USA.
Conference Date	5 Jun 1979
Report Number	SERI/TP — 33-285 CONF-790638 —
Publication Date	Oct 1979
Pages	275-280

Abstract

The General Electric Corporate Research and Development (GE/CRD) process employs low pressure chemically augmented hardwood steaming and rapid decompression to produce a readily digestible substrate. A mixed culture of Clostridum thermocellum and Clostridum thermosaccharolyticum ferments the pretreated wood at 60° C directly to ethanol. C. thermocellum is used primarily to solubilize cellulose and to convert cellobiose to ethanol. Co-culture with C. thermosaccharolyticum enhances the rate of cellulose degradation and permits the xylose produced during pretreatment to also be fermented to ethanol. Product recovery is accomplished via continuous withdrawal of the fermentation broth to a separate vacuum distillation chamber (modified vacuferm) and subsequent distillation to produce 95% ethanol. After ethanol separation, the cell mass is returned to the fermentor to maintain cell density while lignin is discharged, partially dried, and used to fuel the pretreatment boiler. If practical, spent silage is recovered and used as fertilizer. The preliminary ethanol cost analysis is encouraging; however, pretreatment optimization and improvements in the overall mixed culture ethanol tolerance and yield is required before larger scale process evaluation is justified.

Availability	NTIS
Document Type	Paper from report

Citation Number	**80:001986**
Article Title	*Enzymatic Saccharification of Waste Cellulose*
Document Title	3rd Annual Biomass Energy Systems Conference
Article Author	Mandels, M.
Author Affiliation	Army Natick Research and Development Command, Mass. (USA)
Conference	3rd annual biomass energy systems conference
Conference Place	Golden, CO, USA
Conference Date	5 Jun 1979
Report Number	SERI/TP — 33-285 CONF-790638 —
Publication Date	Oct 1979
Pages	281-289

Abstract

The objective is to develop a practical process for the conversion of cellulose in biomass to ethanol, a liquid fuel, via enzymatic conversion of cellulose and yeast fermentation of glucose. The process can be divided into five steps: (1) selection of a suitable substrate; (2) pretreatment of the substrate to enhance its enzyme susceptibility; (3) production of active cellulase; (4) utilization of the cellulase to saccharify cellulose; and, (5) fermentation of saccharification syrups to ethanol. The principal contributions of Natick have been in defining the basic microbiology and biochemistry of the process, particularly the identification of Trichoderma reesei as the best source of active cellulase, the realization that cellulase is a complex of enzymes that act synergistically with each other, and the demonstration of rapid extensive saccharification of many cellulosic materials with Trichoderma cellulase. Cellulase production has been increased by mutation of the strain and optimization of the fermentation. The efficiency of the cellulase has been increased by addition of supplemental glucosidase from Aspergillus phoenicis. Various pretreatments including chemical, high pressure steam, and various types of milling increase substrate susceptibility. Enzyme has been produced at pilot plant scale (400 liters) at high titre (15 g soluble pro-

tein per liter of broth) and productivity (85 filter paper cellulase units per liter per hour). Saccharification by Trichoderma cellulase plus Aspergillus glucosidase has been advantageously coupled with yeast fermentation to ethanol, resulting in greater conversion than in the uncoupled system and preventing contamination of the saccharification reactor without addition of toxic or inhibitory chemicals.

Availability	NTIS
Document Type	Paper from report

Citation Number	**80:001988**
Article Title	*Conceptual Design of a Biomass Fermentation Facility*
Document Title	3rd Annual Biomass Energy Systems Conference
Article Author	O'Neil, D.J. Bery, M.K. Colcord, A.R. Roberts, R.S. Sondhi, D.
Author Affiliation	Georgia Inst. of Tech., Atlanta (USA)
Conference	3rd annual biomass energy systems conference
Conference Place	Golden, CO, USA
Conference Date	5 Jun 1979
Report Number	SERI/TP — 33-285 CONF-790638 —
Publication Date	Oct 1979
Pages	515-546
Abstract	This report summarizes the initial results of Phase I of a planned multi-year program sponsored by the US Department of Energy. The overall objective is the design, construction, and operation of a three oven-dry ton per day process development unit (PDU) to demonstrate the economic and technical feasibility of producing anhydrous ethanol from lignocellulosic biomass residues (wood, corn stover, wheat straw, principally). The report specifically focuses on a proposed conceptual design for the PDU. It discusses biomass cost and availability in addition to unit operations: (1) pretreatment, (2) hydrolysis, (3) fermentation, (4) alcohol recovery, (5) by-product utilization, and (6) environmental monitoring. Results of a process optimization and sensitivity analysis for dilute acid hydrolysis are included.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80:001996**
Article Title	*Acid Hydrolysis of Cellulosic Biomass*
Document Title	3rd Annual Biomass Energy Systems Conference
Article Author	Converse, A.O. Grethlein, H.E.
Author Affiliation	Dartmouth Coll., Hanover, N.H. (USA)
Conference	3rd annual biomass energy systems conference
Conference Place	Golden, CO, USA
Conference Date	5 Jun 1979
Report Number	SERI/TP — 33-285 CONF-790638 —
Publication Date	Oct 1979
Pages	91-95
Abstract	A continuous plug flow reactor was built for acid hydrolysis of cellulosic materials. A single pass hydrolysis at 240°C with 1% acid gives 50 to 57% glucose yield for a slurry concentration of 5 to 13.5% solids. Glucose and xylose yield maps are developed that indicate the trade off of product, by-product, and unreacted product. For high xylose recovery, a two-stage hydrolysis is needed, the first stage at low temperature (180 to 200°C) and the second at high temperature (230 to 240°C). Furfural recovery from xylose may lead to important by-product credits. The flow reactor has also been used to give acid pretreatments to cellulosic materials prior to enzymatic hydrolysis. The yield increase by enzymatic hydrolysis is significant for oak (21% to 90%), corn stover (58% to 100%), and newsprint (60% to 93%) as a result of the pretreatment. Thus, a combination of acid hydrolysis pretreatment with enzymatic hydrolysis can achieve nearly quantitative yields of glucose. Estimates of the cost of ethanol from newsprint and wood are given for one-pass acid hydrolysis, enzymatic hydrolysis, and the combination of the two.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A002003**
Article Title	*Degradation of Cellulosic Materials by Trichoderma Viride Cellulase*
Article Author	Gupta, J.K. Gupta, Y.P. Das, D.B.
Journal	Agric. Biol. Chem.
Volume	37
Issue	11
Publication Date	1973
Document Type	Journal article

Citation Number	**80A002004**
Article Title	*Dehydrating Alcohol*
Journal	New York Times
Volume	128
Pages	C2
Publication Date	11 Sep 1979
Notes	v. 128, Section C
Abstract	Research about this process
Document Type	Journal article

Citation Number	**80A002009**
Article Title	*Design of a Two-bushel Per Day Continuous Alcohol Unit*
Article Author	Altsheller, W.
Journal	Chem. Eng. Prog.
Volume	43
Issue	9
Pages	467
Abstract	An excellent article on small-scale technology for farmers and alcohol enthusiasts alike. Total fermentation time is eleven hours, which produces 190-proof alcohol.
Document Type	Journal article

Citation Number	**80:002014**
Article Title	*Direct Microbiological Conversion of Cellulosic Biomass to Ethanol*
Document Title	3rd Annual Biomass Energy Systems Conference
Article Author	Wang, D.I.C. Biocic, I. Fang, H.Y. Wang, S.D.

Author Affiliation	Massachusetts Inst. of Tech., Cambridge (USA)
Conference	3rd annual biomass energy systems conference
Conference Place	Golden, CO, USA
Conference Date	5 Jun 1979
Report Number	SERI/TP — 33-285 CONF-790638 —
Publication Date	Oct 1979
Pages	61-67
Abstract	One of the major objectives of this project is to achieve the direct microbiological conversion of cellulosic biomass to a liquid fuel, ethanol. Within the scope of this objective, it is also the intent to maximize the conversion efficiency of ethanol production from biomass. This can be achieved through the effective utilization of both the cellulosic (6-carbon sugar) and hemicellulosic (5-carbon sugar) in biomass. The degradation of cellulosic biomass is achieved through the use of a thermophillic and anaerobic bacterium, Clostridium thermocellum. This microorganism is quite unique in that it is able to hydrolyse both the cellulosic and hemicellulosic fractions of biomass but, unfortunately, it is not able to metabolize the pentoses. Therefore, to achieve total utilization of biomass, a second thermophilic and anaerobic microogranism, Clostridium thermo-sac-charolyticum, has been under study due to its ability to convert pentoses to ethanol. Mutation, selection and adaptation programs have yielded ethanol tolerant strains of both organisms. Lastly, mixed culture fermentations using these two organisms show environmental and biological compatibilities to convert cellulosic biomass to ethanol.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A002017**
Article Title	*Adsorption of Trichoderma Cellulase on Cellulose*
Article Author	Peitersen, N. Medeiros, J. Mandels, M.
Journal	Biotechnol. Bioeng.
Volume	19
Pages	1091-1094
Publication Date	1977
Document Type	Journal article

Citation Number	**80A002033**
Article Title	*Enzymatic Conversion of Cellulosic Materials: Technology and Applications*
Article Author	Gaden, E.L.
Journal	Biotechnol. Bioeng. Symp.
Issue	6
Publication Date	1976
Document Type	Journal article

Citation Number	**80A002034**
Article Title	*Enzymatic Hydrolysis of Cellulose and Simultuneous Fermentation to Alcohol*
Article Author	Blotkamp, P.J. Takagi, M. Pemberton, M.S. Emert, G.H.
Author Affiliation	Gulf Oil Chem. Co., Merriam, KS (USA)
Journal	AIChE Symp. Ser.
Volume	74
Issue	181
Pages	85-90
Publication Date	Feb 1978
Notes	Presented at the Symposium on Biochem. Sources of Energy at Pac. Chem. Eng. Congr., 2nd, Denver, Colo, Aug 1977; Symposium on Biol. Sources of Energy and Chem. Feedstocks at AIChE Meeting 84th, Atlanta, GA, Feb. 1978.
Abstract	The simultaneous saccharification of cellulose and fermentation to ethanol, utilizing the cellulase enzymes of T. reesei and the yeast S. cerevisiae, has been shown to give increased rates of hydrolysis when compared to saccharification alone due to removal of competitive inhibition by glucose and cellobiose. The effect of increasing the concentrations of enzyme and substrate resulted in increased yields of ethanol while an increase in the size of the yeast inoculum had little effect on the yield. In addition, experiments indicate no inhibitory effect of the cellulase enzymes due to accumulation of ethanol in the reaction mixture. (EI)
Document Type	Journal article

Citation Number	**80A002035**
Article Title	*Enzymatic Hydrolysis of Waste Cellulose*
Article Author	Mandels, M. Hontz, L. Nystrom, J.
Journal	Biotechnol. Bioeng.
Volume	16
Pages	1471
Publication Date	1974
Document Type	Journal article

Citation Number	**80A002036**
Article Title	*Enzymatic Saccharification of Cellulose by Thermophilic Actionmyces*
Article Author	Su, T.M. Paulavicius, I.
Journal	Appl. Polym. Symp.
Issue	28
Pages	221-236
Publication Date	1975
Document Type	Journal article

Citation Number	**80:002043**
Article Title	*Fermentation Alcohol Grows in Power*
Journal	Processing
Volume	25
Issue	9
Pages	21, 23
Publication Date	Sep 1979
Abstract	Alcohol as an alternate fuel source is of increasing industrial interest. The present situation is surveyed and some proposed methods for increasing the competitive value of fermentation are presented. The Melle-Boinot process in Brazil is described. Research and development advances in the United Kingdom are discussed. Costs are influenced greatly by the fermentation step. The cost of distilling the fermentation broth can be offset if crop by-products are used as energy sources for the steam and low pressure required. Recent advances in continuous fermentation plants are discussed. A drawing is included.
Document Type	Journal article

Citation Number	**80A002044**
Journal	Hydrocarbon Process.
Pages	61
Publication Date	Oct 1976
Abstract	ERDA awards $1.6 mil methanol fuels plant contract to Badger Plant; Badger to build $1.6 mil methanol fuel plant for ERDA.
Document Type	Journal article

Citation Number	**80:002047**
Article Title	*Chemicals from Renewable Raw Materials*
Article Author	Spear, M.
Journal	Chem. Eng. (London)
Issue	345
Pages	419-421
Publication Date	Jun 1979
Abstract	Various ways to use alternative sources of raw materials for the production of chemicals are reviewed. Three existing and potential routes for the use of biomass are direct chemical processing of extracted carbohydrates, as a fermentation substrate, and thermal treatment for the production of synthesis gas. Commercial applications of each of these routes are cited. Production of ethanol from the anaerobic fermentation of carbohydrates is discussed. Methane production from fermentation of both wastes and biodegradable crops is cited. Processes are briefly described for hydrolyzing activated sludges to yield glucose as a fermentable substrate for the production of single cell protein that leads to the production of animal feed.
Document Type	Journal article

Citation Number	**80:002055**
Document Title	*Biological Conversion of Corn Residue into Ethyl Alcohol Using an Immobilized-cell Reactor*
Document Author	Sitton, O.C.
Author Affiliation	Missouri Univ., Rolla (USA)
Thesis	Ph.D. Dissertation
Publication Date	1979
Pages	158
Abstract	In most parts of the world, large quantities of agricultural residues exist which can serve as raw materials for manufacturing chemicals. Corn stover is the most abundant type of residue. Corn stover can be converted to sugars by hydrolysis with mineral acid. These sugars can be converted into a number of chemical intermediates in biological reactors. Biological reactions are generally slow and conventional reactors have low productivities. By immobilizing Saccharomyces cerevisiae to a fixed support, ethanol productivity was as high as 15.9 g/l-hr which is 9 times the maximum productivity measured in a conventional, stirred-tank reactor. Moreover, dilution rates as high as 1.75/hr were attained in the immobilized-cell reactor which is 6 times the washout rate in the stirred-tank reactor. Cell overgrowth was removed by repeatedly sparging the reactor with nitrogen gas. Hydrolyzing corn residue with sulfuric acid achieved 89% conversion of the cellulose to glucose. The reaction is first order with a rate constant of 0.043/minute. Tests with hydrolyzate materials as a glucose source reduced maximum ethyl alcohol productivity from 1.75 g/l-hr for synthetic glucose media to 1 g/l-hr in the stirred tank reactor. However, when using hydrolyzate material in the immobilized-cell column the productivity was only slightly reduced. Glucose concentrations of 30 and 60 g/l and residence times of 4.1, 2.4, and 1.3 hours were tested in the immobilized-cell reactor. A plug-flow first-order reaction model described the data in these tests allowing calculations of apparent rate constants.
Availability	University Microfilms International, Dissertation Copies, P.O. Box 1764, Ann Arbor, MI 48106, Order no. 79-21,536
Document Type	Thesis/Dissertion

Citation Number	**80A002056**
Journal	Engineer
Pages	47
Publication Date	5 Apr 1979
Abstract	Examines factors behind rise in alcohol-for-fuel production.
Document Type	Journal article

Citation Number	**80A002065**
Article Title	*The Feasibility of Basic Chemicals for Fermentation Processes*
Article Author	Hepner, L.
Journal	Eng. Proc. Econ.
Volume	3
Issue	1
Pages	17-23
Publication Date	Jan 1978
Abstract	Increasing attention has been given to the possibility of producing basic chemicals such as alcohol by fermentation processes. Simple molecules such as ethanol can be produced either by fermentation or petrochemical routes. The feasibility of using fermentation processes for the production of ethanol from starches and sugars is examined and compared with petrochemical routes from naphtha. Biochemical processes for the production of such simple molecules can be competitive with petrochemical routes in certain parts of the world. Two reasons the fermentation routes are competitive are due to: 1. the potentially lower cost of raw materials used in fermentation processes, and 2. the improvements in fermentation technology. (ABI)
Document Type	Journal article

Citation Number	**80A002068**
Article Title	*Ferment in the Alcohol Movement*
Article Author	Holzman, D.
Journal	Sol. Age
Volume	4
Issue	12
Pages	42-46
Publication Date	Dec 1979
Abstract	Describes the National Academy Still-building workshop held at Colby Community College, Colby, Kansas, summer 1979.
Document Type	Journal article

Citation Number	**80A002069**
Article Title	*Fermentation of Cellulose and Cellobiose by Clostridium Thermocellum in the Absence and Presence of Methanobacterium Thermoautotrophicum*

Article Author	Weimer, P.J. Zeikus, J.G.
Journal	Appl. Environ. Microbiol.
Volume	33
Pages	289-297
Publication Date	1977
Document Type	Journal article

Citation Number	**80A002070**
Article Title	*Fermentation Products from Methanol*
Article Author	Oki, T. Kitai, A.
Journal	Process Biochem.
Volume	9
Issue	9
Pages	31-32
Publication Date	Nov 1974
Document Type	Journal article

Citation Number	**80A002075**
Article Title	*Glucose Production by Biochemical Hydrolysis of Mesquite*
Article Author	Beck, S.R. Tuttle, R.J.
Journal	AIChE J.
Volume	25
Issue	5
Pages	890-892
Publication Date	1979
Document Type	Journal article

Citation Number	**80A002076**
Article Title	*B-Glucosidase: Microbial Production and Effect on Enzymatic Hydrolysis of Cellulose*
Article Author	Sternberg, D. Vijayakumar, P. Reese, E.T.
Journal	Can. J. Microbiol.
Volume	23
Pages	139-147
Publication Date	1977
Document Type	Journal article

Citation Number	**80:002077**
Article Title	*Production of Ethyl Alcohol from Cellulose Hydrolysate*
Document Title	Bioconversion of Cellulosic Substances into Energy Chemicals and Microbial Protein
Article Author	Tyagi, R.D. Ghose, T.K. Ghose, T.K. (ed.)
Author Affiliation	Indian Inst. of Tech., New Delhi
Conference	Symposium on bioconversion of cellulosic substances into energy, chemicals and protein
Conference Place	New Delhi, India
Conference Date	Feb 1977
Publisher	Indian Institute of Technology; New Delhi, IN
Report Number	CONF-770222 —
Publication Date	1978
Pages	585-597
Abstract	Alcoholic fermentation of bagasse hydrolysate by a strain of Saccharomyces cerevisiae NRRL Y-132 has been studied in batch and continuous cultures. The glucose input into the system undergoes fermentation with 91% into ethanol and the rest goes into cell mass formation, including cell respiration and maintenance. Remaining sugars, mostly cellobiose and xylose are not consumed. Approximate value of yield constant Y_P is found to be 0.465 with maximum concentration alcohol in batch experiment of 9.1% (w/v), based on 20.6 initial glucose content. It has been demonstrated in batch experiments that the product of fermentation continues to form during the negative acceleration phase of growth. Therefore, continuous fermentation was carried out in a single flow two stage battery. The optimum conditions for the maximum productivity of alcohol in continuous cultures are discussed.
Document Type	Paper/Chapter from book

Citation Number	**80A002079**
Article Title	*Continous Cellulose-to-glucose Process*
Journal	Chem. Eng. News
Pages	19-20
Publication Date	8 Oct 1979
Document Type	Journal article

Citation Number	**80A002085**
Article Title	*Growth Kinetics and Cellulase Biosynthesis in the Continuous Culture of Trichoderma Viride*
Article Author	Brown, D.E.
Journal	Biotechnol. Bioeng.
Volume	19
Pages	941-958
Publication Date	1977
Document Type	Journal article

Citation Number	**80A002090**
Article Title	*History of Cellulase Program at U.S. Army Natick Development Center*
Article Author	Reese, E.T.
Journal	Biotechnol. Bioeng. Symp.
Volume	6
Pages	9-20
Publication Date	1976
Document Type	Journal article

Citation Number	**80A002093**
Article Title	*Hot Bug for Energy*
Article Author	Miller, J.A.
Journal	Sci. News
Volume	116
Pages	317
Publication Date	3 Nov 1979
Abstract	Bacteria may supply alcohol for synthetic fuels.
Document Type	Journal article

Citation Number	**80A002104**
Article Title	*How to Turn Wastes into Fuel*
Journal	Chem. Week
Pages	24
Publication Date	2 Feb 1977
Abstract	The resources and technology are available for converting biomass residues into fuels, specifically oil and gas. Each year 150 billion tons of biomass are produced. Though chemical hydrolysis of cellulosic feed has a conversion efficiency of only 50 per cent, there is much effort being spent on converting wood wastes into fuel by means of enzymatic catalysis and hydrolysis. Anaerobic digestion produces methane from wood and other biomaterials at a 50 per cent thermal yield efficiency. To make bioconversion economically fea-

sible, it must be adapted to a specific feed to optimize operation conditions and maximize yield and efficiencies. A mild acid hydrolysis of hemicellulose in wood could produce 30 per cent profits. Hydrogen can be produced from water, ammonia and feedlot waste, and ethanol can be derived from ethylene. (ABI)

Document Type	Journal article

Citation Number	**80A002116**
Article Author	Nagodawithana, T.W.
	Steinkraus, K.H.
Journal	Appl. Microbiol.
Volume	31
Issue	2
Pages	158-162
Publication Date	Feb 1976
Abstract	Influence of the rate of ethanol production and accumulation on the viability of Saccharomyces cervisiae (yeasts) in "rapid fermentation."
Document Type	Journal article

Citation Number	**80:002118**
Article Title	*Method for Production of Alcohol Directly from Cellulose Using Cellulase and Yeast*
Document Title	Bioconversion of Cellulosic Substances into Energy Chemicals and Microbial Protein
Article Author	Takagi, M.
	Abe, S.
	Suzuki, S.
	Emert, G.H.
	Yata, N.
	Ghose, T.K. (ed.)
Author Affiliation	BioResearch Centre Co., Ltd., Toda (Japan)
Conference	Symposium on bioconversion of cellulosic substances into energy, chemicals and protein
Conference Place	New Delhi, India
Conference Date	Feb 1977
Publisher	Indian Institute of Technology; New Delhi, IN
Report Number	CONF-770222 —
Publication Date	1978
Pages	551-571
Abstract	Ethyl alcohol was produced directly from cellulosic materials by a simultaneous saccharification-fermentation (SSF) with an anaerobic system that consisted of cellulosic substrate, a yeast, nutrients, and cellulases. Accumulation of reducing sugars including glucose was observed at the initial stage of the SSF, but after the initial production, the concentration of glucose and cellobiose were kept at zero. An increase in the number of yeast cells was found at the initial stage and then the number was maintained on the order of 10^8 cells/ml. The optimum temperature for the SSF was found to be 30 to 40° C, lower than the optimum temperature for cellulase reactions because of the restricted thermostability of the yeast. No problem occurred when culture broth or whole Koji of T. viride was used as the cellulase source. Rather, these crude cellulases brought about better results than culture filtrate or Koji extract. The process of the production of ethanol from cellulosic materials was simplified and the production rate was accelerated by the SSF method compared to a two-step saccharification and fermentation.
Document Type	Paper/Chapter from book

Citation Number	**80A002132**
Article Title	*Alternatives for Energy Savings at Plant Level for the Production of Alcohol for Use as Automotive Fuel*
Article Author	Espinosa, R.
	Cojulun, V.
	Marroquin, F.
Journal	Biotechnol. Bioeng. Symp.
Issue	8
Pages	69-74
Publication Date	1979
Document Type	Journal article

Citation Number	**80A002150**
Document Title	*Making Fuel in Your Back Yard*
Document Author	Bradley, J.
Publisher	Biomass Resources; Wenatchee, WA, USA
Publication Date	1979
Pages	63
Abstract	Down-to-earth book by a person who built the small still he is writing about. Written in narrative form with easy instructions and useful drawings and pictures.
Availability	Biomass Resources, Box 2912, Wenatchee, WA 98801 $10.95
Document Type	Book

Citation Number	**80A002151**
Document Title	*Makin' It on the Farm: Alcohol Fuel Is the Road to Independence*
Document Author	Nellis, M.
Publisher	American Agriculture News; Iredell, TX, USA
Publication Date	1979
Pages	88
Abstract	Summary of the "Schroeder Plant" in Colorado, one of the first legally built, farm-sized operations put together in the 1970's. Includes discussion of ethanol production, solar stills, use of alcohol as a fuel, and regulations. (MS)
Availability	American Agriculture News, Box 100, Iredell, TX 76649 $4.00
Document Type	Book

Citation Number	**80A002153**
Document Title	*Making Alcohol Fuel — Recipe and Procedure*
Document Author	Crombie, L.
Publisher	Rutan Publishing; Minneapolis, MN, USA
Publication Date	1979
Pages	111
Abstract	This book contains information not available from any other source presently. In language which is non-technical, yet thorough, it covers the necessary steps one-at-a-time for making alcohol fuel. Discussed is the use of enzymes for both cellulose and starch grains, where to get them and how to use them. Procedures for using hydrometers, pH papers, iodine solution for starch test are also covered. Malting procedures are explained with the right recipes for mash fermentation. There are descriptions of how to build various types of stills and make them work. The book contains information about solar distillation. At the back of the book is a request form that merely has to be filled in and sent to the regional office of the Bureau of Alcohol, Tobacco and Firearms in order to obtain an experimental permit to legally make alcohol fuel.

Availability	Rutan Publishing, Box 3585, Minneapolis, MN 55403 $8.00
Document Type	Book

Citation Number	**80A002155**
Article Title	*The Saccharification of Agricultural Residues — a Continuous Process*
Article Author	Dunning, J.W. Lathrop, E.C.
Journal	Ind. Eng. Chem.
Volume	37
Pages	24-29
Publication Date	1945
Document Type	Journal article

Citation Number	**80A002157**
Article Title	*Mold Bran Aids Production of Grain Alcohol*
Article Author	Boyer, J.W. Underkofler, L.A.
Journal	Chem. Metall. Eng.
Volume	52
Issue	12
Pages	110-111
Publication Date	Dec 1945
Abstract	Brief description of production of mold bran (culture of Aspergillus oryzae on wheat bran) used in place of barley malt for saccharification of grain starch to fermentable sugars; similar to many war time developments, only post war economics can determine future status of product. (EI)
Document Type	Journal article

Citation Number	**80A002158**
Article Title	*Making Alcohol-ether Mixture in Cuba for Motor Fuel*
Article Author	Humboldt, E.
Journal	Chem. Metall. Eng.
Volume	33
Pages	333-336
Publication Date	1926
Abstract	The plant and process are described for making an $EtOHEt_2O$ mixture from waste molasses. (CA)
Document Type	Journal article

Citation Number	**80A002165**
Article Title	*Fermentation of Wood Sugars to Ethyl Alcohol*
Article Author	Leonard, R.H. Hajny, G.J.
Journal	Ind. Eng. Chem.
Volume	37
Issue	4
Pages	390-395
Publication Date	Apr 1945
Abstract	Fermentation of neutralized wood sugar liquors was difficult except under special conditions; acid sugar liquors, which had been treated with lime to pH of 5 and then heated to 138 C for short time before filtering, gave preparation that fermented anaerobically in 14 to 20 hr. with 2% by volume of distiller's yeast. Bibliography. (EI)
Document Type	Journal article

Citation Number	**80A002169**
Article Title	*The Manufacture of Anhydrous Ethyl Alcohol*
Article Author	Keyes, D.B.
Journal	Ind. Eng. Chem.
Volume	21
Issue	11
Pages	998-1001
Publication Date	Nov 1929
Abstract	Brief resume of important processes developed in United States and France, together with date of patent applications, starting with Young's process, brief abstract of important new features of each invention is given. (EI)
Document Type	Journal article

Citation Number	**80A002173**
Article Title	*Steam Consumption of Two-column Alcohol Distillation Units*
Article Author	Arias, E.R.
Journal	Int. Sugar J.
Volume	49
Issue	578
Pages	45-47
Publication Date	Feb 1947
Abstract	Steam consumption of still varies with efficiency of fermentation and distillation, and is dependent to greater extent upon design of still, and way in which outside connections are made; equal attention should be paid to distillation fermentation and steam consumption, if successful results in operation of distillery are to be achieved; calculations made varying operating conditions of stills; results. From Proc, 18th meeting Assn. Tecn Azucar, Cuba, p. 207. (EI)
Document Type	Journal article

Citation Number	**80A002175**
Article Title	*Instrumentation in Alcohol Distillation*
Article Author	Puertas, R.P.
Journal	Int. Sugar J.
Volume	49
Issue	582
Pages	157-158
Publication Date	Jun 1947
Abstract	Explanation of necessary installations and method for operation of distilling column, as well as of instruments required to make operation as automatic as possible; each variable under control facilitates control of other variables of process. From 18th meetings Assoc. Azuc Tech, Cuba, p. 223-230. (EI)
Document Type	Journal article

Citation Number	**80A002176**
Article Title	*Industrial Dehydration of Alcohol*
Article Author	Guinot, H.
Journal	Int. Sugar J.
Volume	32
Issue	374
Pages	77-82
Publication Date	Feb 1930
Abstract	Processes used in dehydrating substances; dehydration by rectification in presence of hydrocarbons; treatment of impure alcohol. (EI)
Document Type	Journal article

Citation Number	**80A002177**
Article Title	*Production of 95-97 Per Cent Alcohol for Motor Fuel*
Journal	Int. Sugar J.
Volume	23

Issue	273
Pages	513-516
Publication Date	Sep 1921
Abstract	Describes improved triple column continuous still made by Blair, Campbell & McLean of Glasgow for production of Natilite. (EI)
Document Type	Journal article

Citation Number	**80A002178**
Article Title	*Improvements in Production of Absolute Alcohol*
Article Author	Guinot, H.
Journal	Int. Sugar J.
Volume	36
Issue	421
Pages	24-27
Publication Date	Jan 1934
Abstract	Rapid development of plants all over world has been due to assured success of alcohol-gasoline liquid fuel; dehydration not costly; absolute alcohol direct from fermented mash; apparatus used; purification during dehydration. (EI)
Document Type	Journal article

Citation Number	**80A002179**
Article Title	*Production of Absolute Alcohol by Melle Process*
Article Author	Jumentier, R.
Journal	Int. Sugar J.
Volume	34
Issue	402
Pages	231-232
Publication Date	Jun 1932
Notes	See also v. 34, no. 404, Aug. 1932, p. 297-302
Abstract	It is claimed that absolute alcohol (not 96 proof) will be product of most tropical distilleries in near future; plant used, steam consumed, and yields obtained in making absolute alcohol. (EI)
Document Type	Journal article

Citation Number	**80A002182**
Article Title	*Industrial Alcohol*
Article Author	Williams, A.F.
Journal	Chem. Age (London)
Volume	52
Issue	1346
Pages	325-330
Publication Date	14 Apr 1945
Abstract	Brief commentary on its production; raw materials; fermentation efficiency; efficient recovery; improvements in plant and equipment; note on Hiag system of dehydrating alcohol; synthetic alcohol; acetaldehyde; decreasing evaporation losses. (EI)
Document Type	Journal article

Citation Number	**80A002187**
Article Title	*Bubble-plate Efficiencies in Ethanol-water Fractionation*
Article Author	Shilling, G.D. Beyer, G.H. Watson, C.C.
Journal	Chem. Eng. Prog.
Volume	49
Issue	3
Pages	128-134
Publication Date	Mar 1953
Abstract	Efficiency data presented for ethanol water fractionation at 1 atm for center plate of three plate 18-in. diam bubble cap tower containing ten 3-in. caps/plate; results shown for 126 runs, for liquid concentrations from 70 to less than 1.0 mole % ethanol; all runs were conducted at superficial vapor velocity of 2 fps. (EI)
Document Type	Journal article

Citation Number	**80A002191**
Article Title	*Mashing of Corn*
Article Author	Ernst, R.C. Brown, C.E. Tepe, J.B.
Journal	Ind. Eng. Chem.
Volume	31
Issue	10
Pages	1247-1249
Publication Date	Oct 1939
Abstract	Results of investigation undertaken to determine optimum pH for diastase conversion of corn mash and effect of pressure cooking corn prior to mashing; pH of mashing medium was varied from 1.30 to 1.13, and pressures of cooking studied were from atmospheric to 50 lb gage; percentage of reducing sugars and total soluble extract resulting from mashing under each condition were determined. (EI)
Document Type	Journal article

Citation Number	**80A002192**
Article Title	*Mechanical Equipment for Continuous Fermentation of Fibrous Materials*
Article Author	Buswell, A.M. Boruff, C.S.
Journal	Ind. Eng. Chem.
Volume	25
Issue	2
Pages	147-148
Publication Date	1933
Document Type	Journal article

Citation Number	**80A002193**
Article Title	*Commercial Demonstration to Test Power Alcohol Feasibility*
Article Author	Hull, H.G.
Journal	Chem. Metall. Eng.
Volume	43
Issue	7
Pages	352-354
Publication Date	Jul 1936
Abstract	Brief description of plant of Bailor Manufacturing Co., Atchison, Kansas, first to be devoted exclusively to production of absolute alcohol for motor-fuel purposes, with rated capacity of 10,000 gal per day; manufacturing process explained. (EI)
Document Type	Journal article

Citation Number	**80A002194**
Article Title	*Microbial Amylase Preparations Conversion Agents for Alcoholic Fermentation*
Article Author	Cheng Hao, L. Jump, J.A.
Journal	Ind. Eng. Chem.
Volume	37
Issue	6

Pages	521-525
Publication Date	Jun 1945
Abstract	Activity of number of commercial bacterial and mold amylase preparations as conversion agents in alcoholic fermentation were determined. Bibliography. (EI)
Document Type	Journal article

Citation Number	**80A002197**
Article Title	*Some Unusual Alcoholic Fermentations*
Article Author	Eoff, J.R., Jr. Buttler, H. Melchior, W.
Journal	Ind. Eng. Chem.
Volume	21
Issue	12
Pages	1277-1279
Publication Date	Dec 1929
Abstract	Analysis of fermentation solutions of various fruit juices from which three essential factors for high alcohol yield were discovered; yeast variety, temperature of fermentation, fresh fruit. (EI)
Document Type	Journal article

Citation Number	**80A002202**
Article Title	*Alcohol on Hoof*
Journal	Chemical Industries
Volume	59
Issue	4
Pages	650-651
Publication Date	Oct 1946
Abstract	Features of Joseph E. Seagram & Sons' designs for continuous process alcohol unit making possible mobile distilleries and compact individual equipment for farms; design comprises 5-car railroad train with fermenter, distillery utilities, cooling tower, and steam plant cars. (EI)
Document Type	Journal article

Citation Number	**80A002210**
Article Title	*How to Convert Brewery to Industrial Alcohol Production*
Article Author	Reich, G.T.
Journal	Food Industries
Volume	14
Issue	5
Pages	46-48, 98
Publication Date	May 1942
Abstract	Author shows how brewery can be converted to make alcohol; flow diagrams given; table of comparative material balance in breweries and distilleries. (EI)
Document Type	Journal article

Citation Number	**80A002213**
Article Title	*A New Method of Preparation of Absolute Alcohol*
Journal	Planter and Sugar Manufacturer
Volume	76
Issue	20
Pages	391
Publication Date	15 May 1926
Abstract	Method has for its object transformation of impure alcohol titrating about 90 degrees into absolute alcohol chemically pure. Translated from Bul. de l'Assn. des Chemates de Sucrerie. (EI)
Document Type	Journal article

Citation Number	**80A002216**
Article Title	*Continuous Fermentation*
Article Author	Owen, W.L.
Journal	Sugar. Azucar (N.Y.)
Volume	43
Issue	2
Pages	36-38
Publication Date	Feb 1948
Abstract	Report of experimental results with new process for fermentation in ethyl alcohol distilleries, applying principle of downflow of mash through column equipped with series of decks. (EI)
Document Type	Journal article

Citation Number	**80A002259**
Article Title	*The Barbet Methods of Distillation and Rectification*
Article Author	Wardell, V.A.
Journal	Chem. Eng. Min. Rev.
Volume	21
Issue	242
Pages	71-73
Publication Date	5 Nov 1928
Abstract	Barbet continuous rectifying still installed at Melbourne produces 95.6 per cent alcohol free from ordinary secondary products to industrial fermentation, when plant is fed with fermented wash derived from malt, grain, molasses, dried fruit, and other raw materials; fusel oil is collected separately as by-product. (EI)
Document Type	Journal article

Citation Number	**80A002263**
Article Title	*The Production of Ethanol from Farm Crops*
Article Author	Mulcock, A.P.
Journal	New Zealand Department of Scientific and Industrial Research. Bulletin. Information Series
Issue	117
Pages	41-47
Publication Date	1976
Document Type	Journal article

Citation Number	**80A002265**
Article Title	*Enzymic Hydrolysis of Cellulosic Wastes to Glucose*
Article Author	Spano, L.A. Medeiros, J. Mandels, M.
Author Affiliation	Army Natick Labs., Mass. (USA)
Journal	J. Wash. Acad. Sci.
Volume	66
Issue	1
Pages	279-294
Publication Date	1976
Document Type	Journal article

Citation Number	**80A002266**
Article Title	*Methanol Process Makes Production Possible in Small Plants*
Article Author	Ellwood, P.
Journal	Chem. Eng. (N.Y.)
Volume	75
Issue	4
Pages	104-106
Publication Date	1968
Document Type	Journal article

Citation Number **80A002272**
Document Title *Forget the Gas Pumps — Make Your Own Fuel*
Document Author Wortham, J.
Whitener, B.
Publisher Love Street Books; Louisville, KY, USA
Publication Date 1979
Pages 80
Availability Love Street Books, P.O. Box 58163, Louisville, KY 40258 $3.95
Document Type Book

Citation Number **80A002278**
Document Title *A Practical Handbook on the Distillation of Alcohol from Farm Products, Including the Processes of Malting...etc., with Chapters on Alcoholometry and the De-naturing of Alcohol*
Document Author Wright, F.B.
Publisher Spon and Chamberlain; New York, NY, USA
Publication Date 1933
Pages 271
Notes 2nd ed., revised and greatly enlarged, c. 1907. Cover title: Distillation of alcohols and de-naturing
Abstract Describes processes of malting, mashing, fermenting and distilling alcohol from grain, beets, potatoes, molasses. Also describes denaturing and use of alcohol in engines and for heating and lighting.
Document Type Book

Citation Number **80A002279**
Document Title *Extractive and Azeotropic Distillation*
Series Adv. Chem. Ser., no. 115
Publisher American Chemical Society; Washington, DC, USA
Publication Date 1972
Pages 176
Notes Based on papers presented at two symposia sponsored by the Division of Industrial and Engineering Chemistry of the American Chemical Society at the 160th meeting, Chicago, Ill., Sept. 17, 1970 and the 163rd meeting in Boston, Mass., Apr. 14, 1972, Dimitrios P. Tassios, symposia chairman.
Abstract This book gives basic chemical information on distillation processes.
Document Type Book

Citation Number **80A002280**
Document Title *Fuel Alcohol from Crops by Continuous Fermentation*
Document Author Prince, R.G.H.
McCann, D.J.
Author Affiliation Sydney Univ. (Australia)
Publication Date 26 Feb 1979
Pages 21
Abstract Australian R&D on the production of synthetic liquid fuels from crops is discussed. Suitable crop materials can be fermented into ethanol and used as a fuel in internal combustion engines or mixed with petrol to extend petrol supplies. For large-scale power alcohol production under Australian conditions, costs are estimated at 16-50/L. The most suitable crops for alcohol production are cassava, sugar, and fodder beet. The Sydney process, a new technology that could reduce production costs to 19-28/L, is described. The use of power ethanol is compared with the use of methanol and oil. Crop-based ethanol is the only fuel that exploits a completely renewable resource. It is the preferred fuel of the future. Ethanol production for a 10-20% blend with petrol should be undertaken.
Document Type Book

Citation Number **80A002287**
Article Title *Ethanol Production and Utilization by Aphelenchus Avenae and Caenorhabditis Sp. Plant Nematodes*
Article Author Cooper, A.F.
Van Gundy, S.D.
Journal Journal of Nematology
Volume 3
Issue 3
Pages 205-214
Publication Date Jul 1971
Document Type Journal article

Citation Number **80A002297**
Document Title *The Erection and Testing of a Methanol Stripping Column*
Document Author Goodman, M.
Author Affiliation Minnesota Univ., Minneapolis (USA)
Thesis M.S. Thesis
Publication Date 1949
Pages 23
Document Type Thesis/Dissertion

Citation Number **80A002300**
Document Title *Absorption of Ethanol Vapor in a Packed Column*
Document Author Parsly, L.F., Jr.
Author Affiliation Pennsylvania Univ., Philadelphia (USA)
Thesis Ph.D. Dissertation
Publication Date 1948
Availability Not available from University Microfilms International
Document Type Thesis/Dissertion

Citation Number **80A002301**
Document Title *The Efficiency and Capacity of a Bubble Plate Fractionating Column when Distilling Mixtures of Ethyl Alcohol and Water*
Document Author Peavy, C.C.
Author Affiliation Michigan Univ., Ann Arbor (USA)
Thesis Ph.D. Dissertation
Publication Date 1937
Pages 22
Notes Not on microfilm. Dissertation abstracts, 1938-1947, v. 1-7
Availability Not available from University Microfilms International
Document Type Thesis/Dissertion

Citation Number **80A002306**
Document Title *Vacuum Alcohol Fermentation*
Document Author Ramalingam, A.
Author Affiliation Cornell Univ., Ithaca, N.Y. (USA)
Thesis Ph.D. Dissertation
Publication Date 1975
Pages 140
Abstract An attempt was made to remove alcohol inhibition by conducting the fermentation under vacuum, thereby distilling off the alcohol as it was formed. If additional nutritional requirements

were taken care of, it was possible to get higher fermentation rates. Experiments on batchwise fermentation with 18 per cent sugar media showed that the cell densities reached 25 O.D. units under atmospheric pressures. The yield coefficients and the rate of sugar utilization were higher. However the maximum specific growth rates were the same in both cases and had a value of 0.29 hr.-1. Continuous fermentations with 18 per cent sugar media under vacuum conditions showed that additional nutrients like ergosterol and oleic acid were needed for stable operation. Once the media were supplemented witt these nutrients, it was possible to obtain stable conditions. With a dilution rate of about 0.091 hr.-1, equivalent to a residence time of 11 hours, the sugar level fell from 18 per cent to less than 0.1 per cent. Fermentations were also carried out with molasses media under both the atmospheric and vacuum conditions. While the same trend as before was observed, difficulties were encountered in analytical determinations due to the presence of unfermentable sugars. The presence of inhibitory substances also affected the fermentation. It was possible to use 50 per cent sugar media directly as feed in continuous fermentations and the data showed that the sugar concentration fell to lower than 1 per cent in about 20 hours of residence time. Cost estimates for the atmospheric process and the proposed vacuum process were made for comparison. The savings in capital costs were about 60 per cent and in manufacturing costs about 3 per cent. (DA)

Availability — University Microfilms International, Dissertation Copies, P.O. Box 1764, Ann Arbor, MI 48106, Order no. AAD 76-09559
Document Type — Thesis/Dissertion

Citation Number — **80A003020**
Document Title — *A Learning Guide for Alcohol Fuel Production*
Corporate Author — Colby Community College
Publisher — Colby Community College; Colby, KS, USA
Publication Date — Jul 1979
Pages — 348
Abstract — Covers resources, principles of alcohol fuel production, and decisions for implementing alcohol fuel production and plant design. (MS)
Availability — National Alcohol Fuel Producers Association, 1700 South 24th St., Lincoln, NE 68502 $45.00
Document Type — Book

Citation Number — **80A003023**
Document Title — *Manual for the Home and Farm Production of Alcohol Fuels*
Document Author — Mathewson, S.W.
Publisher — J.A. Diaz Publications; Los Banos, CA, USA
Publication Date — 1980
Pages — 208
Notes — Second edition
Abstract — Primer for small-scale ethanol production. Deals with fuel theory, government regulations, water and alcohol injection, engine modifications, equipment design, and production processes.
Availability — J.A. Diaz Publications, Box 709, Las Banos, CA 93635 $12.95
Document Type — Book

Citation Number — **80A003044**
Article Title — *New Process for Production of Absolute Alcohol*
Article Author — Fritzweiler, R.; Dietrich, K.R.
Journal — Int. Sugar J.
Volume — 35
Issue — 409
Pages — 29-32
Publication Date — Jan 1933
Notes — See also v. 35, no. 410, Feb 1933, pages 71-74.
Abstract — Jan: information regarding new modification of azeotropic process, using trichlorethylene. Feb: plant used for carrying out this process, now being used on license by German State Alcohol Monopoly in nine of their plants. (EI)
Document Type — Journal article

Citation Number — **80A003051**
Article Title — *Laboratory Cooking, Mashing, and Fermentation Procedures*
Article Author — Stark, W.H.; Adams, S.L.; Scalf, R.E.; Kolachov, P.
Journal — Ind. Eng. Chem., Anal. Ed.
Volume — 15
Issue — 7
Pages — 443-446
Publication Date — Jul 1943
Abstract — Procedure presented for conducting test laboratory fermentations for production of alcohol from corn, wheat, or rye; analytical procedure is sufficiently flexible to be used for testing variety of fermentation conditions or fermentation raw materials. Bibliography. (EI)
Document Type — Journal article

Citation Number — **80A003053**
Article Title — *Saccharification of Wheat by Fungal Amylases for Alcohol Production*
Article Author — Roberts, M.; Laufer, S.; Stewart, E.D.; Saletan, L.T.
Journal — Ind. Eng. Chem.
Volume — 36
Issue — 9
Pages — 811-812
Publication Date — Sep 1944
Abstract — Mold bran is compared with barley malt for saccharification of mashes intended for production of industrial alcohol; five grains were tested, one corn, two types of wheat, and two corresponding granular wheat flours; results discussed. Bibliography. (EI)
Document Type — Journal article

Citation Number — **80A003056**
Article Title — *Production of Ethanol*
Article Author — Veldhuis, M.K.; Christensen, L.M.; Fulmer, E.I.
Journal — Ind. Eng. Chem.
Volume — 28
Issue — 4
Pages — 430-433
Publication Date — Apr 1936

Abstract	Preparation of cultures; method of analysis; influence of temperature on fermentation; influence of pH of fermenting medium; influence of cellulose concentration; development of medium; effect of aeration during fermentation; ratio of products. Bibliography. (EI)
Document Type	Journal article

Citation Number	**80A003064**
Article Title	*Development and Design of Continuous Cooking and Mashing System for Cereal Grains*
Article Author	Unger, E.D. Willkie, H.F. Blankmeyer, H.C.
Journal	American Institute of Chemical Engineers. Transactions
Volume	40
Issue	4
Pages	421-442
Publication Date	25 Aug 1944
Abstract	History of development of system in which grain is converted to fermentable mash in period of 5-6 minutes under optimum processing conditions; objectives of continuous cooking process; various experimental stages of development described; design of system which meets objectives, outlined. Bibliography. (EI)
Document Type	Journal article

Citation Number	**80A003073**
Article Title	*Fermentation Sphinx and Kobold Alcohol*
Article Author	Lindner, P. Arnstein, H.
Journal	Planter and Sugar Manufacturer
Volume	81
Issue	19
Pages	360, 364-365
Publication Date	10 Nov 1928
Abstract	New development concerning fermentation, respiration and metabolism; illustrates course of fermentation in presence of oxygen; oxygen represents our most potent alcohol preserver and protector, as well as alcohol transformer. (EI)
Document Type	Journal article

Citation Number	**80A003074**
Article Title	*Fermentation Sphinx and Kobold Alcohol*
Article Author	Lindner, P. Arnstein, H.
Journal	Planter and Sugar Manufacturer
Volume	81
Issue	18
Pages	344-345
Publication Date	3 Nov 1928
Abstract	Observation of fact that both yeast and fungi cease to reproduce themselves when they accumulate fat; experiments with wheat capable of germinating. (EI)
Document Type	Journal article

Citation Number	**80A003075**
Article Title	*Fermentation Sphinx and Kobold Alcohol*
Article Author	Lindner, P. Arnstein, H.
Journal	Planter and Sugar Manufacturer
Volume	81
Issue	17
Pages	323-325
Publication Date	27 Oct 1928
Abstract	It is shown that other investigators have been fooled by this micro-organism, and most of fermentation experiments give entirely incorrect results which have been erroneously interpreted; revises some ancient hypotheses concerning fermentation and metabolism. (EI)
Document Type	Journal article

Citation Number	**80A003090**
Article Title	*Physical Properties of Ethanol and Water*
Article Author	Glassett, J. Rankin, J.
Author Affiliation	Brigham Young Univ., Provo, Utah (USA). Dept. of Chemical Engineering
Journal	Gasohol U.S.A.
Volume	2
Issue	4
Pages	6-7
Publication Date	Apr 1980
Abstract	This is the first in a series of articles dealing with some of the fundamentals of the distillation of ethyl alcohol (ethanol). The purposes of these articles are: (1) To indicate how distillation towers may be used to separate liquid mixtures such as ethanol and water; (2) To increase familiarity with the basic process used in petroleum refineries, petrochemical plants, and other industries to produce fuels, solvents, paints, plastics, synthetic rubber and synthetic textile fibers; (3) To give instruction concerning how one may optimize the operation of existing distillation towers. The complete series includes the following topics: (1) Some physical properties of ethanol, water, and ethanol-water mixtures; (2) The simple batch still; (3) Continuous shell stills; (4) The batch still with reflux; (5) The distillation tower; (6) Controlling the tower; (7) Simplifying tower equipment and controls; (8) Improving the product; (9) Designing the tower; (10) Ethanol dehydration. (GAS. USA)
Document Type	Journal article

Citation Number	**80A003091**
Article Title	*Continuous Fermentation Comes of Age*
Journal	Gasohol U.S.A.
Volume	2
Issue	4
Pages	8-10
Publication Date	Apr 1980
Document Type	Journal article

Citation Number	**80A003095**
Article Title	*Simple Batch Still*
Article Author	Glassett, J. Rankin, J.
Author Affiliation	Brigham Young Univ., Provo, Utah (USA). Dept. of Chemical Engineering
Journal	Gasohol U.S.A.
Volume	2
Issue	5
Pages	26-27
Publication Date	May 1980
Abstract	This is the second in a series of articles dealing with some of the fundamentals of the distillation of ethyl alcohol (ethanol). The purpose of these

articles are: (1) to indicate how distillation towers may be used to separate liquid mixtures such as ethanol and water; (2) to increase familiarity with the basic process used in petroleum refineries, petrochemical plants, and other industries to produce fuels, solvents, paints, plastics, synthetic rubber and synthetic textile fibers; (3) to give instruction concerning how one may optimize the operation of existing distillation towers. The complete series includes the following topics: (1) some physical properties of ethanol, water, and ethanol-water mixtures (Gasohol U.S.A., April 1980); (2) the simple batch still, (this issue); (3) continuous shell stills; (4) the batch still with reflux; (5) the distillation tower; (6) controlling the tower; (7) simplifying tower equipment and controls; (8) improving the product; (9) designing the tower; (10) ethanol dehydration. (GAS. USA)

Document Type | Journal article

Citation Number | **80A003110**
Document Title | *Agricultural Alcohol: Studies of Its Manufacture in Germany*
Document Author | Kremmers, E.
Series | U.S. Dept. of Agriculture. Bulletin no. 182
Publication Date | 1915
Pages | 36
Document Type | Book

Citation Number | **80A003111**
Document Title | *The Manufacture of Ethyl Alcohol from Wood Waste*
Document Author | Kressman, F.W.
Series | U.S. Dept. of Agriculture. Bulletin no. 983
Publication Date | 1922
Pages | 100
Document Type | Book

Citation Number | **80A003118**
Article Title | *Role of the Chemist in Relation to the Future Supply of Liquid Fuel*
Article Author | Hibbert, H.
Journal | J. Ind. Eng. Chem.
Volume | 13
Pages | 841-843
Publication Date | 1921
Abstract | The problem of a future supply of liquid fuel depends upon the production of alcohol. The treatment of cellulosic and starchy materials and their conversion into alcohol by action of fermenting organisms appear to solve the problem (see Chemical Abstracts v. 13: 246). It is claimed as a result of experiments undertaken by Boulard that starch may thus be converted directly into alcohol, and that yields of 39 to 44 l. of pure alcohol can be obtained from 100 kg. of grain as compared with 27 to 33 by the acid and 34 by the malt process. (CA)
Document Type | Journal article

Citation Number | **80A003121**
Article Title | *The Motor Alcohol Distillery*
Article Author | Foster, J.P.
Journal | Sugar News
Volume | 3
Pages | 73-79
Publication Date | 1922
Abstract | Molasses is diluted with 4 times its volume of pure water to obtain 10-15% fermentable sugar in the sugar solution. Aerating equipment in the fermentation vats is essential for high yields. A minimum of 45 gallons fermenting capacity is required for each gallon of alcohol desired. If pure cultures are not used, rapid distillation of the beer is essential to avoid loss of alcohol by acetic fermentation. Careful fractionation of the alcohol is not essential as all combustible products are valuable in motor alcohol. A still with 50% overcapacity should be used, as emergencies often necessitate the handling of large volumes of low-alcohol beer. Special attention is necessary in the ether still. Safety devices and easily replaced parts add to the value of the ether still. Absolute neutralization of all ether prepared is essential in the manufacture of motor alcohol. (CHC)
Document Type | Journal article

VII
Coproducts

Citation Number **80A000112**
Article Title *Distillery Effluent Treatment in the Brazilian National Alcohol Programme*
Article Author Jackman, A.E.
Journal Chem. Eng. (London)
Pages 240
Publication Date Apr 1977
Document Type Journal article

Citation Number **80A000272**
Article Title *Silage Made from Sugarcane Bagasse Treated with Sodium Hydroxide*
Article Author Andrels, H.J.
DeStefano, R.P.
Journal Sugar Journal
Pages 13-16
Publication Date Oct 1978
Document Type Journal article

Citation Number **80A000429**
Article Title *Some Problems Associated with the Treatment of Effluents from Malt Whisky Distilleries*
Article Author Brown, D.
McKay, R.
Weir, W.
Journal Prog. Wat. Tech.
Volume 8
Issue 2/3
Pages 291-300
Publication Date 1976
Document Type Journal article

Citation Number **80A000447**
Document Title *Stillage Treatment Technologies*
Corporate Author Argonne National Lab
Publication Date Oct 1979
Pages 24
Document Type Report

Citation Number **80A000532**
Article Title *The Production of Grain Alcohol and Electric Power with Cogeneration of Steam*
Document Title Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author Scheller, W.A.
Author Affiliation Nebraska Univ., Lincoln (USA). Dept. of Chemical Engineering
Conference 3. international symposium on alcohol fuels technology
Conference Place Asilomar, CA, USA
Conference Date 29 May 1979
Publisher U.S. Department of Energy; Washington, DC, USA
Report Number CONF-790520
Publication Date Apr 1980
Pages 9p, Paper II-35
Document Type Paper from report

Citation Number **80A000582**
Article Title *Production, Application and Marketing of Concentrated Molasses — Fermentation — Effluent (Vinasses)*
Document Title Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author Lewicki, W.
Author Affiliation B.V. Prohama, Mannheim (Germany, F.R.)
Conference Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place Vienna, Austria
Conference Date 26 Mar 1979
Publisher United Nations Industrial Development Organization; New York, NY, USA
Report Number CONF-7903101-1
Publication Date 1979
Pages 7p, Paper ID/WG.293/22/Rev.1
Document Type Paper from report

Citation Number **80A000608**
Article Title *Present Situation on the Utilization of By-products of the Sugar Industry in Mauritius*
Document Title Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author Antoine, R.
Author Affiliation Mauritius Sugar Industry Research Board, Port Louis
Conference Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place Vienna, Austria
Conference Date 26 Mar 1979
Publisher United Nations Industrial Development Organization; New York, NY, USA
Report Number CONF-7903101-1
Publication Date 1979
Pages 8p, Paper ID/WG.293/49
Document Type Paper from report

Citation Number **80A000678**
Article Title *Protein Concentrates from Distillers By-products*
Document Title Proceedings of the 9th National Conference on Wheat Utilization Research

Article Author Scheller, W.
Conference 9th national conference on wheat utilization research
Conference Place Seattle, WA, USA
Conference Date 8 Oct 1975
Publisher U.S. Government Printing Office; Washington, DC, USA
Publication Date 1976
Notes ARS-NC-40
Document Type Paper/Chapter from book

Citation Number 80A000745
Article Title *Nutrient Composition of Distillers Feeds*
Article Author Carpenter, L.E.
Conference Distillers Feed/Research Council annual meeting
Conference Date 31 Mar 1970
Journal Proceedings, Distillers Feed Research Council
Volume 25
Pages 54-61
Publication Date 31 Mar 1970
Document Type Journal article

Citation Number 80A000746
Article Title *The Use of Distillers Dried Grains with Solubles in Feeds for Egg Production*
Article Author Harms, R.H.
Conference Distillers Feed/Research Council annual meeting
Conference Date 31 Mar 1970
Journal Proceedings, Distillers Feed Research Council
Volume 25
Pages 34-40
Publication Date 31 Mar 1970
Document Type Journal article

Citation Number 80A000749
Article Title *Feed By-products from Grain Alcohol and Whiskey Stillage*
Document Title Proceedings 1st Industrial Waste Utilization Conference
Article Author Boruff, C.S.
Weiner, L.P.
Conference Industrial waste utilization conference
Conference Place Lafayette, IN, USA
Conference Date 1944
Publication Date 1944
Pages 83-88
Notes Sponsored by the University Dept. of Sanitary Engineering, Division of Environmental Sanitation of Indiana.
Document Type Paper/Chapter from book

Citation Number 80A001152
Article Title *Treated with Chemicals, Corn Residue as Good Feed as Corn Silage*
Journal Beef
Pages A-18, A-19
Publication Date Mar 1977
Document Type Journal article

Citation Number 80A001191
Document Title *Current State-of-the-art Stillage Use and Disposal*
Publication Date Oct 1979
Pages 45
Notes Work performed for Argonne National Lab-W.
Document Type Book

Citation Number 80A001233
Article Title *Enhancement of Food Protein Quality through Computer Blending — the Competitiveness of Proteins from the Alcohol Fermentation of Corn and Wheat*
Article Author Satterlee, L.D.
Conference Distillers Feed Research Council
Conference Place Cincinnati, OH, USA
Conference Date 31 Mar 1976
Journal Proceedings, Distillers Feed Research Council
Volume 31
Pages 58-64
Publication Date 31 Mar 1976
Document Type Journal article

Citation Number 80A001234
Article Title *Distillers' Feeds as Protein Sources for Beef Cattle*
Article Author Klopfenstein, T.W.
Rounds, W.
Waller, J.
Conference Distillers Feed Research Council
Conference Place Cincinnati, OH, USA
Conference Date 31 Mar 1976
Journal Proceedings, Distillers Feed Research Council
Volume 31
Pages 52-57
Publication Date 31 Mar 1976
Document Type Journal article

Citation Number 80A002152
Document Title *By-products of the Cane Sugar Industry*
Document Author Paturau, J.M.
Publisher Elsevier; Amsterdam, NL
Publication Date 1969
Pages 274
Abstract As well as a complete discussion on production, this book provides a comprehensive examination of those coproducts of ethanol fermentation when molasses is used as the feedstock.
Document Type Book

Citation Number 80A002162
Article Title *Amino Acid Composition of Grain Alcohol Fermentation By-products*
Article Author Baumgarten, W.
Stone, L.
Boruff, C.S.
Journal Cereal Chem.
Volume 22
Pages 311
Publication Date 1945
Document Type Journal article

Citation Number 80A002237
Article Title *Recovery and Use of Grain Distillery Stillage*
Document Title Proceedings 2nd Ontario Waste Conference
Article Author Van Lanen, J.M.
Boruff, C.S.
Carson, C.T.
Conference 2nd Ontario Industrial Waste Conference
Publication Date 1955
Pages 87
Document Type Paper/Chapter from book

Citation Number	**80A002311**
Article Title	*The Recovery of Fermentation Products from Cellulose Wastes via Acid Hydrolysis*
Article Author	Porteous, A.
Author Affiliation	Open Univ., Milton Keynes (UK)
Journal	Octagon Papers
Volume	3
Pages	17-57
Publication Date	1976
Notes	Issue: Cellulose Substrates
Document Type	Journal article

Citation Number	**80A003035**
Article Title	*By-product Recovery — Pollution Control Measure in the Fermentation Industry*
Article Author	Boruff, C.S.
Journal	Chem. Eng. Prog.
Volume	55
Pages	82
Publication Date	1959
Document Type	Journal article

Citation Number	**80A003052**
Article Title	*Nutrient Content of Alcohol Fermentation By-products from Corn*
Article Author	Bauernfeind, J.C. Garey, J.C. Baumgarten, W. Stone, L. Boruff, C.S.
Journal	Ind. Eng. Chem.
Volume	36
Issue	1
Pages	76-78
Publication Date	Jan 1944
Abstract	New data on vitamin, mineral, and amino acid content of corn distillers' by-products, which should be of value in feeding of by-products to livestock; corn distillers' dried solubles is valuable source of water-soluble vitamins, for simple stomached animals; corn distillers' grains (no solubles), would be best utilized in rations of ruminants. Bibliography. (EI)
Document Type	Journal article

Citation Number	**80A003055**
Article Title	*Recovery of Fermentation Residues as Feeds*
Article Author	Boruff, C.S.
Journal	Ind. Eng. Chem.
Volume	39
Pages	602
Publication Date	1947
Document Type	Journal article

Citation Number	**80A003063**
Article Title	*Distillery Slop as a Feed for Hogs*
Article Author	Wilford, E.J.
Journal	American Society of Animal Production. Record of Proceedings
Volume	29
Pages	106-110
Publication Date	1936
Document Type	Journal article

Citation Number	**80A003089**
Article Title	*Use of Grain Alcohol By-products in Colorado*
Article Author	Kienholz, E.W.
Author Affiliation	Colorado State Univ., Fort Collins (USA). Dept. of Animal Science
Journal	Gasohol U.S.A.
Volume	2
Issue	3
Pages	34
Publication Date	Mar 1980
Abstract	One of the important considerations in grain alcohol production is the use of the spent grains and solubles. The sale of distillers grain and solubles (DGS) represents roughly 1/4 of the total gross income of a grain alcohol plant. This report summarizes the study that was undertaken to describe the potential use of DGS for livestock and poultry feeding in the state of Colorado.
Availability	Bulletin Room, Aylesworth Hall, CSU, Fort Collins, CO 80523 $3.50
Document Type	Journal article

Citation Number	**80A003097**
Article Title	*Recovery of Grain Alcohol By-products*
Journal	Chem. Metall. Eng.
Volume	52
Pages	130
Publication Date	1945
Document Type	Journal article

Citation Number	**80A003103**
Article Title	*About* Co_2
Journal	Gasohol U.S.A.
Volume	2
Issue	1
Pages	15-17
Publication Date	Jan 1980
Abstract	Low pressure CO_2 vapor saturated with water vapor from the fermenters is boosted to 6.0 PSIG through the CO_2 booster. This vapor is then cooled through a water cooled shell and tube heat exchanger. Free water and alcohol created by the drop in temperature is then separated in a mechanical separator. The vapor is further cooled through a refrigerated shell and tube heat exchanger with more water and alcohol being knocked out in a second separator. The CO_2 vapor is compressed to approximately 250 PSIG by a two stage, non-lubricated compressor. The compressor is complete with intercooler, aftercooler and separators to remove heat of compression and free water. The high pressure CO_2 vapor is cooled to approximately 50 F. through a refrigerated shell and tube heat exchanger with the free water again removed in a separator. The high pressure, cooled CO_2 vapor is then dried in a desiccant type dryer to a dw point of -80 to -90 F. at atmospheric pressure. This is to remove the water vapor from the gas to prevent freeze up in the CO_2 condenser. The dried CO_2 then flows through a carbon bed absorber unit to remove any odor or impurities. The extremely dry and high purity carbon dioxide gas is liquified in the shell and tube CO_2 condenser. From the condenser the liquid CO_2, at approximately -8 F., is piped to the insulated CO_2 storage tank for distribution. (GAS. USA/MS)
Document Type	Journal article

Citation Number	**80A003108**
Document Title	*Grain Alcohol Fermentation By-products for Feeding in Colorado*
Document Author	Kienholz, E.W. Rossiter, D.L.
Author Affiliation	Colorado State Univ., Fort Collins (USA). Dept. of Animal Science
Series	Colorado State Univ., Fort Collins (USA). Agricultural Experiment Station. General Series, no. 983
Publication Date	1979
Pages	119
Notes	Prepared for and funded by: Colorado Gasohol Promotion Committee, Colorado Dept. Agriculture, Denver.
Availability	Bulletin Room, Aylesworth Hall, Colorado State University, Fort Collins, CO 80523 $3.50
Document Type	Book

Citation Number	**80A003114**
Document Title	*Composition of Concentrate By-products Feeding Stuffs*
Series	National Academy of Sciences — National Research Council. Publication no. 449
Publication Date	1956
Document Type	Book

Citation Number	**80A003127**
Document Title	*Economic Aspects of Using Grain Alcohol as a Motor Fuel with Emphasis on By-product Feed Markets*
Document Author	Wisner, R.N. Gidel, J.O.
Author Affiliation	Iowa State Univ. of Science and Technology, Ames (USA)
Publication Date	1977
Pages	110
Document Type	Book

VIII
Economics

Citation Number **77:001299**
Article Title *Ethyl Alcohol*
Document Title Capturing the Sun through Bioconversion
Article Author Miller, D.L.
Author Affiliation Agricultural Research Service, Peoria, Ill. (USA)
Conference Conference on capturing the sun through bioconversion
Conference Place Washington, DC, USA
Conference Date 10 Mar 1976
Publisher Washington Center; Washington, DC, USA
Report Number CONF-760354
Publication Date 1976
Pages 441-448
Abstract The economics of ethanol production by fermentation of biomass is briefly discussed and compared with the economics of production from ethylene. (JSR)
Document Type Paper/Chapter from book

Citation Number **78:001792**
Article Title *Corn Production Practices*
Document Title Biomass: a Cash Crop for the Future
Article Author McClure, T.A.
Conference Conference on the production of biomass from grains, crop residues, forages and grasses for conversion to fuels and chemicals
Conference Place Kansas City, MO, USA
Conference Date 2 Mar 1977
Report Number CONF-770368 —
Publication Date 1977
Pages 145-177
Abstract The agricultural production and cost aspects of corn as a potential biomass crop are presented. The major topics of discussion include an overview of U.S. corn production, presentation of agricultural aspects of various alternatives of using corn as an energy feedstock, and a rough assessment of the energy balance of theoretical energy output-input ratios associated with U.S. corn production. Three alternatives for using corn as an energy or industrial feedstock are considered in detail. These include the use of silage to produce synthetic natural gas, using corn grain to produce ethanol, and using the crop residues to produce either fuel gas or ammonia. (JGB)
Document Type Paper from report

Citation Number **78:001809**
Document Title *Economic Pre-feasibility Study: Large-scale Methanol Fuel Production from Surplus Canadian Forest Biomass. Part 1. Summary Report*
Corporate Author InterGroup Consulting Economists Ltd., Winnipeg, Manitoba (Canada)
Report Number NP — 22159/1
MN-61
Publication Date Sep 1976
Pages 83
Abstract The practicability of using methanol produced from surplus renewable Canadian forest roundwood as a substitute for non-renewable hydrocarbons in meeting Canadian energy requirements was studied. The discussion is presented under the following subject headings: methanol demand as substitute for non-renewable hydrocarbons; surplus roundwood availability and opportunity costs; methanol plant technologies, characteristics and costs; wood procurement technologies and costs; financial analysis and appraisal; and, economic impacts and institutional implications. (JGB)
Availability NTIS
Document Type Report

Citation Number **78:003706**
Document Title *Preliminary Economic Evaluation of a Process for the Production of Fuel Grade Ethanol by Enzymatic Hydrolysis of an Agricultural Waste*
Corporate Author SRI International, Menlo Park, Calif. (USA)
Report Number HCP/T3891 — 1
Contract EG-77-X-01-3891
STD-61
Publication Date Jan 1978
Pages 42
Abstract This study concerns the preliminary economic feasibility of a process for converting agricultural waste (wheat straw) to fuel grade ethanol through enzymatic hydrolysis. A preliminary design for the process was developed on the basis of research concepts described in the literature. The base case design is for a 25 million gal/yr plant for 95 vol % ethanol from wheat straw. The preliminary design included material and energy balances and major equipment specifications and sizing, which in turn were used for estimating the required capital investment. Estimates of process operating costs and required selling prices were based on typical industrial conditions. The sensitivity of product ethanol cost to changes in key operating variables was determined in order to indicate where future process improvements are needed and more R and D effort is warranted. (JGB)
Availability NTIS
Document Type Report

Citation Number	**79:002491**
Article Title	*Ethanol for Motor Fuel from Biomass*
Document Title	Proceedings Forest and Field Fuels Symposium
Article Author	Wayman, M.
Author Affiliation	University of Toronto, Ontario
Conference	Forest and field fuels symposium
Conference Place	Winnipeg, Manitoba, Canada
Conference Date	12 Oct 1977
Report Number	CONF-7710156 —
Publication Date	1977
Pages	XXIX.1-XXIX.13
Abstract	Operating experience in Brazil has firmly established fermentation industrial alcohol (ethanol) as a satisfactory motor fuel, with advantages over gasoline in anti-knock and anti-pollution characteristics. Extensive under-utilized wood species in Canadian forests such as aspen and birch can supply about 20% of Canada's motor fuel requirements by this route. The technology is well-known and the economics show fermentation alcohol to be profitable now.
Document Type	Paper from report

Citation Number	**79:002528**
Article Title	*Energy from Biomass and Wastes: an Overview*
Article Author	Klass, D.L.
Journal	Energy Top.
Pages	1-6
Publication Date	23 Oct 1978
Abstract	Forecasters have proposed seven different ways to estimate potential energy that the U.S. can derive from biomass, but no one method has been agreed upon. Economic factors will determine biomass developments in the near term, while a major energy source role can be anticipated in the long term. The large-scale use of biomass will require extensive monitoring and modeling to determine the effect on carbon dioxide balance from forest cutting and combustion. Over 130 research and demonstration programs have included a feasibility study from Hawaii, production techniques, and conversion methods, such as anaerobic digestion, thermochemical gasification or liquefaction, and alcohol fuels. Economic feasibility for biomass and waste energy sources will improve as fossil-fuel costs increase and will ultimately make a significant contribution.
Document Type	Journal article

Citation Number	**79:002535**
Article Title	*Biomass Based Methanol Process*
Document Title	Solar Diversification. Vol. 2.1
Article Author	Wan, E.I. Lowery, G.L. Boeer, K.W. Franta, G.E. (eds.)
Author Affiliation	Science Applications, Inc., McLean, Va. (USA)
Conference	Meeting of the American Section of the International Solar Energy Society
Conference Place	Denver, CO, USA
Conference Date	28 Aug 1978
Publisher	International Solar Energy Society, American Section; Newark, DE, USA
Report Number	CONF-780808 — P1
Publication Date	1978
Pages	66-70
Abstract	Essentially all current methanol production in the United States is produced by catalytic steam reforming of natural gas or other light hydrocarbon feedstocks. However, the dwindling supply of natural gas and other fossil energies has prompted the need to consider alternative revewable feedstocks for the production of methanol. A comprehensive study is underway to assess the over-all strategies for the introduction of biomass-based methanol into our nation's energy economy. An assessment on the technical and economic feasibility of the biomass-based methanol process is presented.
Document Type	Paper/Chapter from book

Citation Number	**79:003451**
Document Title	*Comparative Economic Assessment of Ethanol from Biomass*
Corporate Author	Mitre Corp., McLean, Va. (USA). METREK Div.
Report Number	HCP/ET — 2854 Contract ET-78-C-01-2854 STD-61
Publication Date	Sep 1978
Pages	140
Abstract	Metrek reviewed fourteen studies and reports in which the economic aspects of producing ethanol from various biomass feedstocks were evaluated. These studies presented 28 ethanol plant configurations. The major assumptions made and the financial and cost/performance parameters used for each configuration were identified. This information was used to compute life cycle costs of ethanol production using the Metrek Full Life Cycle Cost (FLC) model and the Metrek (Systems to Project the Utilization of Renewable Resources) SPURR model. The differences between ethanol selling prices given in the studies reviewed and those obtained with the Metrek models are discussed. Life cycle costs were also calculated using a common set of financial parameters for all ethanol configurations.
Availability	NTIS
Document Type	Report

Citation Number	**79:003467**
Document Title	*Economics of Manufacturing Liquid Fuels from Corn Stover*
Document Author	Jenkins, D.M. Reddy, T.S. Harrington, J.R.
Corporate Author	Battelle Columbus Labs., Ohio (USA)
Report Number	TID — 29419 Contract ET-78-X-01-3992 MN-61
Publication Date	20 Oct 1978
Pages	23
Abstract	A brief process and economic analysis was made of the manufacture of liquid fuels from agricultural residues. Corn stover was selected as typifying agricultural residues and as being the most readily available of the cellulosic agricultural residues. The economics were based upon a conceptual process design, which was based in the research of Purdue University and is considered very advanced technology. The conceptual process converts 1427 tons per day dry corn stover

(dry basis) into 209 tons per day anhydrous ehtanol and 161 tons per day furfural. The heating content of the liquid fuels manufactured is equivalent to 1500 barrels per day petroleum. The estimated cost of manufacturing liquid fuels from corn stover by the conceptual process is estimated at about $15/million Btu. Although this is significantly less than the estimated $37/million Btu of a previous study, which used more conservative assumptions and process yields based on actual experimental data, it is still far above the price of fuels made by coal liquefaction. Several areas requiring further research have been identified in this study. These include (1) better utilization of hemicellulose and perhaps lignin in the manufacture of liquid fuels, and (2) characterization and utilization of the waste water streams. Research on alternative methods to increase the yield of converting cellulose to sugars without using the complex and corrosive solvents of the Purdue process is recommended.

Availability	NTIS
Document Type	Report

Citation Number	**79:004146**
Article Title	*Biomass: Is It Viable*
Article Author	Miskell, J.T.
Journal	Energy (Stamford, Conn.)
Volume	3
Issue	4
Pages	4-6
Publication Date	Fal 1978
Abstract	Studies of the economic viability of renewable energy sources in the form of biomass and a potential "cellulose economy" are a part of the National Energy Program, although little research money has been budgeted. Present funding ($20 million in 1978) has been used for systems analyses of various plants to determine which show the greatest potential. Other funding has gone to develop equipment for collecting and harvesting biomass materials and for conversion processes. Conversion research has focused on anaerobic digestion, fermentation, liquefaction, biophotolysis, and photoelectrolysis. Among the questions to be answered are the energy contribution available from biomass, which kinds of crops to develop, and appropriate land use. Several biomass projects and applications are summarized. States looking for energy self-sufficiency are expected to encourage biomass development. (DCK)
Document Type	Journal article

Citation Number	**79:004665**
Article Title	*Ethanol-gasoline Motor-fuel Mixtures: a Study in the Use of Simple Logic*
Document Title	Energy from Biomass and Wastes
Article Author	Jawetz, P.
Conference	Symposium on energy from biomass and wastes
Conference Place	Washington, DC, USA
Conference Date	14 Aug 1978
Publisher	Institute of Gas Technology; Chicago, IL, USA
Report Number	CONF-780889 —
Publication Date	1978
Pages	847-857
Abstract	The economics of ethanol production and the energy balance of the process are analyzed to show that the energy balance is favorable if the energy content of the gasoline replaced in the ethanol-gasoline blend is used in energy balance equations. With respect to the economics it is proposed that the present subsidy being paid to farmers to leave part of their land fallow to prevent surpluses should be paid to distillers to encourage ethanol production. Farm subsidies would be replaced by the income received from additional crops. (JSR)
Document Type	Paper/Chapter from book

Citation Number	**79:006441**
Document Title	*Agricultural Adjustments to Brazil's Alcohol Program: a Regional Economic Analysis*
Document Author	Adams, R.I.
Author Affiliation	Ohio State Univ., Columbus (USA)
Thesis	Ph.D. Dissertation
Publication Date	1979
Pages	194
Abstract	The main purpose of this study is to evaluate the impact of the Brazilian alcohol program on the agricultural sector. A profit-maximizing linear-programming model was used to examine the competitiveness of alcohol production under current (1976-policy directed) price relationships and under a simulated free energy market price structure, and to estimate the impact of different alcohol production and use levels on resource use and allocation within agriculture. Results indicate that, at simulated 1976 free market energy prices, alcohol produced from sugarcane and/or cassava would be competitive with food crops at approximately US $.85 to US $.90 per gallon wholesale gasoline price. This is roughly double 1976 wholesale gasoline prices. Labor-surplus areas, with low-cost family labor inputs are competitive at slightly lower price levels. Under the 1976 administered price relationships in Brazil (for gasoline, sugar, alcohol and other crops and inputs) energy crops for alcohol are competitive at the farm level. Alcohol production from energy crops will be competitive with other alternatives to petroleum, like shale oil and coal lignification at current production technologies. Energy crops are relatively labor intensive. Thus, as energy prices increase, and more energy crops are produced, income to rural areas increases. The increased energy prices are themselves a source of increased cost of production,but the net effect is positive and principally so in non-mechanized production technology areas. Energy from biomass may become an attractive alternative to costly oil imports from many Third World countries located in tropical areas.
Availability	University Microfilms International, Dissertation Copies, P.O. Box 1764, Ann Arbor, MI 48106, Order no. 79-15,947
Document Type	Thesis/Dissertion

Citation Number	**79:006466**
Article Title	*Energy Analysis of Two Technologies: Gasohol and Solar Satellite Power Station*
Document Title	Symposium Papers: Energy Modeling and Net Energy Analysis

Article Author	Herendeen, R.A.
Author Affiliation	Univ. of Illinois, Urbana
Conference	Conference on net energy analysis and energy modeling
Conference Place	Colorado Springs, CO, USA
Conference Date	21 Aug 1978
Publisher	Institute of Gas Technology; Chicago, IL, USA
Report Number	CONF-780843 —
Publication Date	1978
Pages	145-159
Abstract	A large flurry over net energy analysis in 1975 died down quickly when calculations showed that the energy-supply technologies under study were far from the net energy limit (i.e., that according to anyone's interpretation they were not in danger of requiring more energy than they would produce). Here the author reports on two technologies which are close to that limit, the production of ethanol from the fermentation of grain for ethanol/gasoline mixture (gasohol) and the production of electricity by the solar satellite power station (SSPS). Many of the classic methodological problems of net energy analysis exhibit themselves in the analysis; these are discussed in context. The SSPS suffers from uncertainty of input data, since much of the technology is only speculative, but appears to provide positive net energy. Gasohol lies either on the good or bad side of the energy limit depending on assumptions of system boundary and end-use efficiency. 20 references.
Document Type	Paper/Chapter from book

Citation Number	**79:007129**
Article Title	*Biomass: the Self-replacing Energy Resource*
Article Author	Bylinsky, G.
Journal	Fortune
Volume	100
Issue	6
Pages	78-79, 81
Publication Date	24 Sep 1979
Abstract	Trees and plants contain more than 300 quads of energy — 15 times more than the amount the US imports annually as oil and nearly 4 times the 78 quads of total energy used each year. Properly managed, green power should be almost inexhaustible. The producton of gasohol from biomass has been oversold. In the US, at least, most ethanol is distilled from corn, and corn production would have to be increased by 50% to produce enough ethanol to serve as a 10% additive to the 110 billion gallons of gasoline used each year. Even if the extra acreage were available — which it is not — the effort would require an increase in oil imports, rather than a decrease, barring a spectacular technological advance that may require years of scientific effort. Distilling a gallon of pure ethanol from corn consumes 1.6 Btus of energy for every Btu of energy in the end product. If the energy used to the fertilize and transport the corn is considered, the ratio drops to 2.7 Btus of energy input to obtain 1 Btu of energy output. It is noted that using domestic coal as the fuel in the distillation process would be more sensible. A rule of thumb in the US Corn Belt is that a 1% increase in corn consumption results in a 2% rise in price; this would add to inflation in the US. Wood is considered a much better bet as a near-term energy source, and authorities believe that today's rate of forest growth could be doubled with proper management to yield the equivalent of 6 quads a year, or one-third of our annual oil imports. The use of wood chips for power plants, harvesting kelp to produce methane, and converting water hyacinths to methane and fertilizer are discussed.
Document Type	Journal article

Citation Number	**79:007163**
Article Title	*Perspectives on the Economic Analysis of Ethanol Production from Biomass*
Article Author	Prebluda, H.J. Williams, R. Jr.
Author Affiliation	Roger Williams Technical and Economic Services, Inc., Princeton, N.J. (USA)
Conference	177th national meeting of the American Chemical Society
Conference Place	Honolulu, HI, USA
Conference Date	1 Apr 1979
Journal	Am. Chem. Soc., Div. Pet. Chem.; Prepr.
Volume	24
Issue	2
Pages	481-487
Report Number	CONF-790415 — P4
Publication Date	Mar 1979
Abstract	To help clarify the many misapprehensions pertaining to the practical use of ethyl alcohol from biomass as an extender for motor fuel purposes, a neutral position was taken to point out the pitfalls in the logic and thinking on the subject. Large-scale usage may someday take place to correct the present day economic inequities. This will come about as a result of new breakthroughs in fermentation and engineering technology. Over 90% of the present non-beverage ethyl alcohol production in the USA came from petroleum or natural gas derived ethylene synthesis. Less than 10% of the remaining alcohol market came from fermentation of grains, fruits, and sulfite liquors. Other reports indicated that unless ethyl alcohol from biomass was subsidized for political reasons or for national security purposes, it would not be the fuel choice to be used in large quantities. Beef industry and farming impacts were discussed. The possibility of using other raw materials, such as sugar cane or cane molasses, for ethanol production was considered. Other methods for producing ethanol were also presented. Yet in the midst of pessimism there is some hope to at least make use of waste material to extend our fuel supplies. 2 tables.
Document Type	Journal article

Citation Number	**80A000006**
Journal	CPI Management Service
Pages	4
Publication Date	15 May 1978
Abstract	Canada: examines costs of producing methanol fuel from various materials.
Document Type	Journal article

Citation Number	**80A000009**
Journal	Solar Energy Digest
Pages	8

Publication Date	Dec 1977
Abstract	Canada: study shows savings of $800 mil/yr in oil imports by 2000 by mixing 15% methanol with gasoline.
Document Type	Journal article

Citation Number	**80A000029**
Article Title	*Changing Targets for the Investor*
Journal	Bus. Week
Pages	88
Publication Date	21 Jan 1980
Abstract	The immediate response to the sudden and dramatic revival of the cold war has been to create chaos in the investment markets. Stocks are up sharply, bonds up a little, and commodities mostly lower. In the long run, however, most analysts feel that the present chaos will lessen and that the new cold war, with increased defense appropriations, will bolster the stocks of some key industries and will cause a bullish futures market. Opinions on the effect of governmental policy on grain vary. One commodity trader indicates that grain prices may ultimately suffer sharp declines if price supports do not work out. Some experts believe that the new cold war mentality should make metals futures an even more attractive investment. And analysts already are searching for new investment winners. This list includes: 1. companies aided by the new commitment to gasohol, 2. regional banks that are the primary financiers for the small manufactures of components for defense suppliers, and 3. semiconductor and computer companies. (ABI)
Document Type	Journal article

Citation Number	**80A000030**
Journal	Sol. Age
Pages	12
Publication Date	Jul 1977
Abstract	Channeling agricultural acreage for fuel alcohol production could endanger food supplies.
Document Type	Journal article

Citation Number	**80A000050**
Article Title	*Critical Analysis of the Technology and Economics for the Production of Liquid and Gaseous Fuels from Waste*
Article Author	Chiang, S.H. Cobb, J.T. Klinzing, G.E.
Author Affiliation	Pittsburgh Univ., Pa. (USA)
Journal	Energy Commun.
Volume	5
Issue	1
Pages	31-73
Publication Date	1979
Abstract	In order to meet the growing demand for gaseous and liquid fuels, waste shows a sizable potential for serving as a source. The current and projected technologies have been considered and their economic aspects treated extensively. Economics in the literature has been updated to 1977 values for a uniform comparison of the various processes. Both utility and private financing costs have been calculated, showing fuel gas to range in cost from $3/10^6$ BTUs to $5/10^6$ BTUs. These costs of gas from waste are comparable to the projected costs of gas from coal gasification processes. The product cost of liquids are seen to be more expensive than the gas costs with a less developed technological basis. Considering the three liquid fuels from waste as fuel oil, methanol and ethanol, one finds product costs for fuel oil at $7.40/10^6$ BTUs, methanol at $10/10^6$ BTUs and ethanol at $20/10^6$ BTUs. (EI)
Document Type	Journal article

Citation Number	**80A000053**
Journal	New York Times
Pages	31
Publication Date	9 Jun 1979
Abstract	Brazil: alcohol fuels programs expend by national government projection, 1985.
Document Type	Journal article

Citation Number	**80A000054**
Article Title	*Brazil at the Brink*
Article Author	Gall, N.
Journal	Forbes
Volume	125
Pages	67
Publication Date	4 Feb 1980
Document Type	Journal article

Citation Number	**80A000058**
Journal	Environ. Sci. Technol.
Pages	1012
Publication Date	Sep 1978
Abstract	Brazil: ethanol used in liquid fuel projection, 1990.
Document Type	Journal article

Citation Number	**80A000071**
Article Title	*Brazil to Spend $5 Billion on Alcohol Fuels Project*
Journal	New York Times
Volume	128
Pages	31
Publication Date	9 Jun 1979
Document Type	Journal article

Citation Number	**80A000075**
Journal	New York Times
Pages	31
Publication Date	9 Jun 1979
Abstract	Brazil: to invest $5 bil thru 1985 in national alcohol fuels program.
Document Type	Journal article

Citation Number	**80A000077**
Journal	Eur. Chem. News
Pages	24
Publication Date	4 Aug 1978
Abstract	Brazil: to build 170 sugar cane distilleries to make alcohol for car fuel. Brazil: notes increasing use of car fuel substitutes with cane alcohol base.
Document Type	Journal article

Citation Number	**80A000078**
Journal	Chem. Week
Pages	51
Publication Date	28 Feb 1979
Abstract	Brazil: may build $240 mil, 2,000 m tpd methanol plant using wood fuel by 1981.
Document Type	Journal article

Citation Number 80A000079
Journal: Bank of London and South America Review
Pages: 604
Publication Date: Oct 1979
Abstract: Brazil: will spend $5 bil for fuel alcohol development in 1979-84.
Document Type: Journal article

Citation Number 80A000081
Journal: Can. Chem. Process.
Pages: 8
Publication Date: Jul 1978
Abstract: Canada: predicts methanol production as viable fuel source with $10-20 bil capital outlay.
Document Type: Journal article

Citation Number 80A000082
Journal: Chem. Week
Pages: 38
Publication Date: 14 Mar 1979
Abstract: Brazil: methanol replace of petroleum liquids projection, 1985.
Document Type: Journal article

Citation Number 80A000083
Journal: Journal of Commerce
Pages: 5
Publication Date: 1 Jun 1978
Abstract: Canada: suggests mid-1980s goal of 10-30 methanol fuel plant construction at $2.5-3 bil.
Document Type: Journal article

Citation Number 80A000091
Journal: Chem. Week
Pages: 38
Publication Date: 14 Mar 1979
Abstract: Energetica de Sao Paulo plans 65 wood-fueled methanol plants; seeks government OK.
Document Type: Journal article

Citation Number 80A000094
Article Title: *Agriculture as a Source of Fluid Energy: Gasohol et al.*
Article Author: Tyner, W.E.
Author Affiliation: Purdue Univ., Lafayette, Ind. (USA)
Journal: Am. J. Agric. Econ.
Volume: 60
Issue: 5
Pages: 1071
Publication Date: Aug 1978
Document Type: Journal article

Citation Number 80A000122
Article Title: *Don't Be Fuelish: Producing Gasohol Will Be Expensive*
Article Author: Habicht, E.R., Jr.
Journal: Wall Street Journal
Volume: 102
Pages: 20
Publication Date: 1 May 1980
Abstract: Criticizes the government's subsidy program for gasohol, citing net energy loss, vehicle operating problems, and high cost of production among problems facing the gasohol program in the future.
Document Type: Journal article

Citation Number 80A000124
Article Title: *Driving on Gasohol in Midwest*
Journal: New York Times
Pages: D13
Publication Date: 27 Mar 1979
Abstract: Gasohol, which contains 90% unleaded gasoline and 10% ethyl alcohol (200 proof), is now being sold in 500 service stations in Missouri, Iowa, Nebraska, Kansas, and Illinois. The MFA Oil Co. began selling gasohol in February 1979. Gasohol has been popular in rural areas because the alcohol is produced from grain — in Iowa and Nebraska, the state tax on gasohol has been waived, making the price comparable with the price of unleaded gasoline. Gasohol sells for about 7 cents/gal more than regular unleaded gasoline in states with sales taxes. Drawbacks and advantages of the widespread use of gasohol are discussed. The energy savings issue is examined. MFA will not make any decisions about expanding gasohol production until a market study is completed at the end of July. (EL)
Document Type: Journal article

Citation Number 80A000127
Article Title: *Economic Factors in the Assessment of Various Cellulosic Substrates as Chemical and Energy Resources*
Article Author: Humphrey, A.
Journal: Biotechnol. Bioeng. Symp.
Issue: 5
Pages: 49-65
Publication Date: 1975
Document Type: Journal article

Citation Number 80A000128
Article Title: *Economic Realities of Alcohol Fuels*
Article Author: Jawetz, P.
Journal: Sugar Journal
Volume: 42
Issue: 8
Pages: 13-15
Publication Date: 1980
Document Type: Journal article

Citation Number 80A000132
Article Title: *Economics of Methanol*
Article Author: Bare, B.M.; Lambe, H.W.
Journal: Chem. Eng. Prog.
Volume: 64
Issue: 5
Pages: 23-30
Publication Date: May 1968
Document Type: Journal article

Citation Number 80A000139
Article Title: *Energy Conservation Needs American Brains*
Article Author: Cohen, L.C.
Journal: New York Times
Volume: 129
Pages: E20
Publication Date: 11 May 1980
Notes: v. 129, Section 4
Document Type: Journal article

Citation Number 80A000145
Article Title *The Energy to Grow Maize*
Article Author Pain, B.
Phillips, R.
Journal New Sci.
Volume 66
Publication Date May 1975
Document Type Journal article

Citation Number 80A000159
Article Title *Fuel from Biomass: a Positive Balance*
Journal Sci. News
Volume 116
Pages 173
Publication Date 8 Sep 1979
Document Type Journal article

Citation Number 80A000167
Article Title *Fuels to Replace Oil Would Be Subsidized in Energy Unit's Plan*
Journal Wall Street Journal
Volume 100
Pages 4
Publication Date 1 Jun 1979
Document Type Journal article

Citation Number 80A000174
Article Title *Food or Fuel: the Liquids Dilemma*
Journal Sci. News
Volume 117
Pages 186
Publication Date 22 Mar 1980
Document Type Journal article

Citation Number 80A000176
Article Title *Gasohol*
Article Author Krohe, J., Jr.
Journal Across Board (Conference Board)
Volume 16
Issue 10
Pages 7-17
Publication Date Oct 1979
Document Type Journal article

Citation Number 80A000178
Journal New York Times
Pages c1
Publication Date 22 May 1979
Abstract Gasohol and straight alcohol make good auto fuel, but carry economic penalties.
Document Type Journal article

Citation Number 80A000182
Journal Chem. Eng. (N.Y.)
Pages 26
Publication Date 7 May 1979
Abstract Gasohol came to the U.S. East Coast at the retail level late in April, as Mar-Cam Industries (Glenside, Pa.) began selling the 90% gasoline, 10% ethanol blend through two independent service stations in Virginia. Competing against premium unleaded motor fuel, the gasohol was priced at 82.9 cents/gal, and Mar-Cam reports it to be outselling unleaded regular at one of the stations by a 55-to-45 margin. Stuart Marcus, president of the Mar-Cam, says that 10,000 gal of gasohol were sold from the two stations within the first 3 1/2 days, and that Mar-Cam projects sales of around 30,000 gal/wk. Marcus indicates that the firm is seeking a dedicated alcohol supply, and that once such a supply is assured, Mar-Cam hopes to establish a network of around 200 gasohol stations along the East Coast.
Document Type Journal article

Citation Number 80A000183
Article Title *Gasohol Coming on Strong; Its Effect on Marketing Equipment*
Journal Petroleum Marketer
Pages 12-14
Publication Date Oct 1979
Document Type Journal article

Citation Number 80A000187
Article Title *Lowering the Cost of Alcohol*
Article Author Hartline, F.F.
Journal Science
Volume 206
Issue 4414
Pages 41
Publication Date 5 Oct 1979
Document Type Journal article

Citation Number 80A000192
Article Title *Gasohol: the Issue Is Practicality*
Article Author McQuiston, J.T.
Journal New York Times
Pages 29
Publication Date 19 May 1979
Abstract The current gasoline shortage has stimulated enthusiasm for gasohol — a mixture of 90% regular unleaded gasoline and 10% alcohol. Increasing numbers of motorists in the U.S. are using the fuel because it promises better mileage, better engine performance, and, for the country, less dependence on foreign oil. However, the alcohol industry can currently produce only a small part of what a nationwide program would require. Union Carbide Corp. officials estimate that the alcohol gives off less energy when burned than was required to make the alcohol. At least 1 gal of oil is needed to produce 1 gal of ethyl alcohol. The alcohol industry, of which the Union Carbide Corp. is the leader, produces about 225 million gal ethynol/yr from synthetic hydration of ethylene, and 400 million gal ethanol/yr from fermentation of agricultural products. Substantial technological progress is needed before fermentation can produce the required bulk for gasohol. Publicker Industries is testing the gasohol market. (EL)
Document Type Journal article

Citation Number 80A000194
Article Title *Gasohol Use Jumps Despite U.S. Skeptics*
Article Author Salisbury, D.
Journal Christian Science Monitor
Volume 71
Pages 1
Publication Date 17 May 1979
Document Type Journal article

Citation Number	**80A000195**
Article Title	*Gasohol versus Oil*
Article Author	Conway, J.A.
Journal	Forbes
Volume	125
Issue	12
Pages	9
Publication Date	21 Jan 1980
Abstract	Gasohol is a product which combines gasoline with alcohol. The energy to manufacture the alcohol is usually oil which makes it too costly to make. The alcohol can be made by fermenting corn.
Document Type	Journal article

Citation Number	**80A000196**
Article Title	*Gasohol: Where's the Payoff?*
Article Author	Nevans, R.
Journal	Financial World
Volume	149
Issue	4
Pages	18-22
Publication Date	15 Feb 1980
Document Type	Journal article

Citation Number	**80A000197**
Article Title	*Gasohol Will Be Marketed (by Amoco)*
Article Author	Ferkiss, B.
Journal	Environment
Volume	21
Pages	21
Publication Date	Aug 1979
Document Type	Journal article

Citation Number	**80A000198**
Article Title	*Gasohol: Would It Take Food from the Poor?*
Article Author	Yemma, J.
Journal	Christian Science Monitor
Volume	72
Pages	1
Publication Date	19 Mar 1980
Document Type	Journal article

Citation Number	**80A000199**
Article Title	*Gasoholics Agronomous*
Article Author	Chapman, S.
Journal	New Republic
Volume	180
Issue	26
Pages	14
Publication Date	30 Jun 1979
Abstract	The current popularity of gasohol as an alternative energy source is discussed. Gasohol production is not cost competitive with gasoline production; governmental subsidies are keeping gasohol on the market. Gasohol production requires large amounts of energy. Even under favorable market conditions, gasohol will not become a major energy source in the U.S. (EL)
Document Type	Journal article

Citation Number	**80A000201**
Article Title	*Gasohol Pioneer Shows It Isn't Cheap*
Article Author	Sieniawski, M.
Journal	Christian Science Monitor
Volume	71
Pages	13
Publication Date	28 Aug 1979
Document Type	Journal article

Citation Number	**80A000204**
Article Title	*Gasohol Pumps Do a Gushing Business: Drivers Line Up for Fuel, but Efficiency Still in Question*
Article Author	Van Slambrouck, P.
Journal	Christian Science Monitor
Volume	71
Pages	4
Publication Date	19 Jul 1979
Document Type	Journal article

Citation Number	**80:000205**
Article Title	*Near Term Potential of Biomass-based Alcohol-gasoline Transportation Fuels*
Document Title	Second Annual Symposium on Fuels from Biomass
Article Author	Park, W.R. Shuster, W.W. (ed.)
Author Affiliation	Mitre Corp., McLean, Va. (USA)
Conference	2nd symposium on fuels from biomass
Conference Place	Troy, NY, USA
Conference Date	20 Jun 1978
Report Number	CONF-7806107 — P1
Publication Date	1978
Pages	77-104
Abstract	The current results of an effort to perform an assessment of the near-term (to 1990) potential for a nationwide alcohol-gasoline fuel system based on biomass resources are reported. Current and predicted future costs of biomass based alcohol production as well as consumer costs of blended alcohol-gasoline fuels are given. Requirements are outlined for the production of methanol and ethanol based on a nationwide 5% alcohol-gasoline system in 1990. An estimate of the scope of government support required for this nationwide system is also discussed. The preliminary assessment indicates that the potential for biomass-based alcohol fuels should be more promising on a longer term basis.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A000205**
Article Title	*Gasohol Sales in Area Increasing as Gas Prices Rise*
Article Author	McQuiston, J.T.
Journal	New York Times
Volume	129
Pages	34
Publication Date	2 Mar 1980
Notes	v. 129, Section 1
Document Type	Journal article

Citation Number	**80A000207**
Article Title	*Gasohol (Solution to the Gas Shortage)*
Article Author	Janeway, E.
Journal	Atlantic
Volume	244
Pages	62
Publication Date	Nov 1979
Document Type	Journal article

Citation Number 80A000208
Article Title *Gasohol Likely to Produce More Problems than Benefits for Petroleum Marketers and Consumers*
Article Author Wilburn, G.
Journal Oil Daily
Publication Date 31 Jan 1978
Document Type Journal article

Citation Number 80A000210
Article Title *Government Research Concludes Methanol-mix Fuels to Reach Marketing Stage after 1982*
Journal German Tribune
Pages 8
Publication Date 13 Feb 1977
Document Type Journal article

Citation Number 80A000216
Article Title *Methanol as a Fuel Still a Big Question*
Journal Chem. Eng. News
Volume 55
Issue 7
Pages 12,15
Publication Date 14 Feb 1977
Abstract Methanol could become the largest volume chemical product in the world or just another major chemical depending on whether or not it makes it as a fuel. What the world needs is a gambler willing to invest $1 billion in the first large scale methanol plant. This gambler faces some big risks. Gas rich nations still flaring gas could decide to turn it into methanol using an artificially low price. Also, some firms are playing a waiting game playing for second generation coal gasification plants. Perhaps the greatest risk lies in lack of an energy policy, both in Europe and the U.S. Roger Williams of Williams Technical & Economic Services estimates that the first large, coal based methanol unit will not come on stream before 1982. To him, the question is not if, but when, methanol makes it as a fuel. Utility investment in methanol turbines appears not to be a problem once proof of performance is present. (ABI)
Document Type Journal article

Citation Number 80:000217
Article Title *Reassessment of Economics of Cellulase Process Technology: for Production of Ethanol from Cellulose*
Document Title Second Annual Symposium on Fuels from Biomass
Article Author Spano, L.
Allen, A.
Tassinari, T.
Mandels, M.
Ryu, D.D.Y.
Shuster, W.W. (ed.)
Author Affiliation Army Natick Labs., Mass. (USA)
Conference 2nd symposium on fuels from biomass
Conference Place Troy, NY, USA
Conference Date 20 Jun 1978
Report Number CONF-7806107 — P2
Publication Date 1978
Pages 671-684
Abstract This economic analysis evaluates recent technology relating to enzymatic hydrolysis of cellulose. The cost analysis is based on a plant scale that has a production capacity of 25 x 10^6 gallons of ethanol per year from cellulosic material. Three cases with urban waste, wheat straw, and poplar wood are evaluated to estimate the effect of cellulosic substrate material on the cost. The only credits considered are the residual cellulose waste from hydrolysis plant as combustible material and cellular biomass from ethanol plant as animal feed and/or fertilizer. The factory cost for a gallon of ethanol is found to range from $0.89 to $1.21 which is competitive with the current market price as of June 1978. This points to cellulase production technology as one of the best choices for practical utilization of biomass.
Availability NTIS
Document Type Paper from report

Citation Number 80:000226
Document Title *Research and Evaluation of Biomass Resources/Conversion/Utilization Systems (Market/Experimental Analysis for Development of a Data Base for a Fuels from Biomass Model). Quarterly Report for October 1 — December 31, 1978*
Document Author Ahn, Y.K.
Brumberg, R.J.
Nelson, E.T.
Stringer, R.P.
Bailie, R.C.
Corporate Author Gilbert Associates, Inc., Reading, Pa. (USA)
Environmental Energy Engineering, Inc., Morgantown, W.Va. (USA)
Report Number COO — 5022-T1
Contract ET-78-C-02-5022
STD-61
Publication Date 25 Jan 1979
Pages 52
Abstract Candidate biomass materials for use in the experimental analysis portions of the project have been identified. Standard procedures are being developed for analyzing biomass and biomass conversion products from the TGA (Thermal Gravimetric Analyzer) runs. Equipment has been ordered for making modifications on the TGA's and Process Development Units. In addition, a linear programming problem involving three biomass feedstocks for production of methanol used in three market sectors has been formulated. The example problem was hand-solved and is being used as a model to develop a computer package for system optimization.
Availability NTIS
Document Type Report

Citation Number 80:000231
Document Title *Preparation of a Cost Data Bank for DOE/biomass Energy Systems Branch. Third Quarterly Progress Report, April 1 — June 30, 1979*
Document Author Kam, A.Y.
Dickenson, R.L.
Jones, J.L.
Chatterjee, A.K.
Wilhelm, D.J.
Corporate Author SRI International, Menlo Park, Calif. (USA)
Report Number SAN — 115/141-3
SRI-P — 7885
Contract EY-76-C-03-0115-141
MN-61

Publication Date 1979
Pages 28
Abstract This study deals with the preparation of a biomass conversion technology and cost data bank for the Biomass Energy Systems Branch (BES) of DOE/Solar. When completed, it may be used with an appropriate methodology to analyze the complex issues of research program planning and analysis. In addition, future market penetration of BES products may be projected, and the options available to the federal government to influence the outcome of BES products marketing may also be examined. A total of 21 biomass conversion technology options (13 thermochemical and 8 biochemical) have been selected for inclusion in the data bank. These options cover the production of electric power, steam, gases, liquids, and solid fuels from biomass. The majority of the options are believed to be available now or in the near term. A consistent methodology for construction of the data bank has been developed. For each option, the most up-to-date process/product data are gathered and analyzed. A base case is established to generate estimates for plant investments required, operating cost, and product cost. The estimates are then examined systematically to identify and quantify the uncertainties. The uncertainties are combined using statistical methods to produce error band estimates. Technical and economic analysis has been completed for the following options: power generation, steam generation, co-generation, liquids from pyrolysis, densification, and ethanol from wood. Among the options nearing completion are catalytic liquefaction, medium-Btu gas, low-Btu gas, methanol, ethanol from sugar crops, and ethanol from corn. The available results are summarized.
Availability NTIS
Document Type Report

Citation Number **80A000248**
Article Title *Methanol Primed for Future Energy Role*
Article Author Stinson, S.C.
Journal Chem. Eng. News
Volume 57
Issue 14
Pages 28-30
Publication Date 2 Apr 1979
Abstract Current and future methanol prices are projected based on Vulcan Cincinnati and Badger production plant plans. The range of methanol prices range from a current 46 cents/gal, fob, to a future price projected to be 24 cents/gal. Current production is based on the catalytic reaction of CO and H_2 from partial oxidation of methane. (AFDB)
Document Type Journal article

Citation Number **80A000259**
Article Title *Remarks on the Process Economics of Enzymatic Conversion of Cellulose to Glucose*
Article Author Brandt, D.
Journal Biotechnol. Bioeng. Symp.
Issue 5
Pages 275-277
Publication Date 1975
Document Type Journal article

Citation Number **80A000263**
Journal Eur. Chem. News
Pages 16
Publication Date 6 Aug 1979
Abstract A report from the West German agriculture ministry has shown that a litre of motor fuel from sugar beet would cost DM2.20 and from corn DM3.00. This compares with a price of DM0.43-0.45 for gasoline. In addition, around 70 litres of fuel oil are required to make 100 litres ethanol.
Document Type Journal article

Citation Number **80A000265**
Article Title *Researchers Accelerate Search for Way to Use Less Energy in Making Gasohol*
Article Author Cox, M.
Journal Wall Street Journal
Volume 102
Pages 13
Publication Date 31 Jan 1980
Document Type Journal article

Citation Number **80A000276**
Article Title *A Rubarb over Gasohol*
Journal Bus. Week
Issue 2614
Publication Date 3 Dec 1979
Document Type Journal article

Citation Number **80A000293**
Journal Wall Street Journal (East. Ed.)
Pages 4
Publication Date 28 Jun 1979
Abstract Standard Oil Co. (Indiana) received permission from the U.S. Energy Department to sell one million gallons of gasohol a month this summer in twelve Midwestern states. Gasohol is a mixture of nine parts unleaded gasoline to one part alcohol. The alcohol will be derived from farm products. The mixture will be tested in five stations in Ottumwa, Iowa, with plans calling for adding stations and cities later. The fuel will be premium priced.
Document Type Journal article

Citation Number **80A000300**
Article Title *Study Indicates that Producing Alcohol from Crops Would Result in Energy Loss*
Article Author Bishop, J.E.
Journal Wall Street Journal
Volume 102
Pages 9
Publication Date 15 Jan 1980
Document Type Journal article

Citation Number **80A000320**
Article Title *Practicality of Alcohols as Motor Fuel*
Article Author Wagner, T.O.
Gray, D.S.
Zarah, B.Y.
Kozinski, A.A.
Journal SAE Prepr.
Issue 790429
Pages 29
Publication Date 1979

Abstract	Production processes, costs of production, and sources of raw materials for the manufacture of ethanol and methanol are considered. The production of methanol from lignite is projected to cost twice as much per unit of energy as gasoline and 45% of the energy in the feedstock would be rendered as methanol. Ethanol production from a corn source is projected as being a net energy consumer. (AFDB)
Document Type	Journal article

Citation Number	**80A000357**
Article Title	*Perspectives on the Economic Analysis of Ethanol Production from Biomass*
Article Author	Prebluda, H.J. Williams, R., Jr.
Journal	Am. Chem. Soc., Div. Pet. Chem., Prepr.
Volume	24
Issue	2
Pages	481-487
Publication Date	Mar 1979
Abstract	The authors review the feasibility of using ethyl alcohol from biomass as a motor fuel from the viewpoint of total world production of the competing resources: petroleum, and select biomass products. The results suggest that if entire world production of corn, wheat, rice, and soybeans were converted to ethanol, the product would only represent 6.9% (energy basis) of the petroleum products consumed. A review of the projects that are underway to increase the cellulose — sugar — alcohol conversion efficiency is also presented. (AFDB)
Document Type	Journal article

Citation Number	**80A000360**
Article Title	*Production of Ethanol and Vegetable Protein by Grain Fermentation*
Article Author	Scheller, W.A. Mohr, B.J.
Author Affiliation	Univ. of Nebraska, Lincoln (USA). Dept. of Chemical Engineerng
Journal	Am. Chem. Soc., Abstracts of Papers
Volume	169
Publication Date	1975
Abstract	Historically the cost of ethanol produced by grain fermentation has been higher than the cost of synthetically produced ethanol. However, the recent large price increases for ethylene and fuel, coupled with the potential for the recovery of protein concentrate suitable for human consumption from the fermentation by-product of grain, has produced a favourable change in the competitive position of fermentation ethanol, in spite of the current high price of grain. (FSTA)
Document Type	Journal article

Citation Number	**80A000363**
Document Title	*Agricultural Sector Impacts of Making Ethanol from Grain*
Document Author	Hertzmark, D.
Author Affiliation	Solar Energy Research Inst., Golden, Colo. (USA)
Report Number	SERI/TR-352-554
Publication Date	Mar 1980
Pages	64
Abstract	The role of renewable alcohol fuels as extenders of gasoline supplies is considered. Questions discussed include the effects of grain diversions to ethanol on supplies and prices, the net energy output of the conversion process, the impacts of land for energy crop production, and the impacts of products from ethanol conversion on feed markets.
Document Type	Report

Citation Number	**80A000417**
Article Title	*Alcohol Fuels — Energy Savior or Wastrel?*
Article Author	Jenkins, D.M.
Author Affiliation	Battelle Columbus Labs., Ohio (USA)
Journal	Proc., Am. Pet. Inst., Sect. 3
Issue	58
Pages	41-47
Publication Date	1979
Document Type	Journal article

Citation Number	**80A000422**
Article Title	*A New Way to Calculate the Savings from Fuels Substituted for Petroleum*
Article Author	Jawetz, P.
Journal	Energy Res. Rep.
Volume	5
Issue	18
Pages	3-4
Publication Date	15 Oct 1979
Document Type	Journal article

Citation Number	**80A000431**
Article Title	*Fuels from Biomass — Energy Outlay versus Energy Returns: a Critical Appraisal*
Article Author	Lewis, C.W.
Author Affiliation	Strathclyde Univ., Glasgow (UK). Energy Analysis Unit
Journal	Energy (Oxford)
Volume	2
Pages	241-248
Publication Date	1977
Abstract	The concept of fuel production by the microbial conversion of biomass is discussed with particular emphasis upon the energy implications involved. Both the energy requirements and energy returns for a number of selected systems are assessed in the light of current technology, while areas for future improvements are also mentioned. The general trend of such biological energy systems is that energy gains made via plant photosynthesis using intensive systems are subsequently more than lost in the conversion of biomass energy content into storable, high-energy fuels such as ethanol and methane. Of the operations under investigation, the growth of sugarcane and its fermentation to ethanol is considered to be the most favourable as a marginal net energy production process.
Document Type	Journal article

Citation Number	**80A000459**
Document Title	*Preliminary Analysis of Economics of Scale in Grain Alcohol Production*
Document Author	Carlson, R.
Publisher	Center for the Biology of Natural Systems, Washington Univ.; St. Louis, MO, USA
Report Number	CBNS-AEP-2

Publication Date	12 Mar 1979
Pages	26
Document Type	Report

Citation Number	**80A000460**
Article Title	*Economics of Wood Biomass*
Document Title	Energy from Biomass and Wastes
Document Author	Gibson, N.
Author Affiliation	Georgia Inst. of Tech., Atlanta (USA). Engineering Experiment Station
Conference	Symposium on energy from biomass and wastes
Conference Place	Washington, DC, USA
Conference Date	14 Aug 1978
Publisher	Institute of Gas Technology; Chicago, IL, USA
Report Number	CONF-780889
Publication Date	1978
Pages	39-49
Abstract	Because of the escalation in fossil fuel prices over the last five years, interests have expanded into new areas for energy resources. One such area is wood biomass. Research shows that there are immense quantities of wood residue from logging slash and sawmill wastes; problems exist with economical techniques of harvesting and collecting wood residues although much work and many advances have been made in equipment and techniques. A topic receiving much attention is the potential economic and energy gain from short-rotation forests; technology is rapidly changing in both the harvest machinery and the cultural development of high yield hybrid species. The future calls for further research, development, and demonstration in these areas.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A000490**
Article Title	*Policy Aspects of Biomass Utilization*
Document Title	Solar Diversification, Annual Meeting of ISES American Section
Article Author	Flaim, S.J. Witholder, R.E.
Author Affiliation	Solar Energy Research Inst., Golden, Colo. (USA)
Conference	Solar diversification, annual meeting of ISES American section
Conference Place	Denver, CO, USA
Conference Date	28 Aug 1978
Publisher	International Solar Energy Society, American Section
Publication Date	1978
Pages	56
Notes	Presented at ISES-AS annual conference, Denver, August 28-31, 1978.
Abstract	Potential energy made available from biomass fuels, through various conversion processes is discussed. Cost studies of using such energy indicate that, when compared with the expected costs of conventional energy sources in 1981, conversion of biomass to energy will be economically competitive. Estimates of the availability of different types of biomass residues vary widely. Most wastes with energy potential will probably be used by the industries that generate the wastes. (EL)
Document Type	Paper/Chapter from book

Citation Number	**80A000493**
Article Title	*The Technical and Economic Feasibility of Some Alternative Fuels for Automotive Transportation*
Document Title	Record of the Tenth Intersociety Energy Conversion Engineering Conference
Article Author	Gillis, J.C. Pangborn, J.B. Vyas, K.C.
Author Affiliation	Institute of Gas Technology, Chicago, Ill. (USA)
Conference	10th Intersociety Energy Conversion Engineering Society
Conference Place	Newark, DE, USA
Conference Date	18 Aug 1975
Publication Date	1975
Pages	856-862
Abstract	The use of domestic energy resources to make a synthetic alternative or supplemental automotive fuel that would lessen the need for imported petroleum is under active investigation. This paper discusses alternative fuels that are the most promising on technical and economic grounds. Assessments are made for three time frames: 1975-1985, 1985-2000, and beyond 2000. The maximum potential quantity or rate of energy supply is estimated for both renewable and nonrenewable raw energy sources. To estimate the synthetic-fuel market, an energy supply-demand model is presented. The model assumes an all-out effort to reduce fuel imports, but shows a large deficit in the energy supply of the automotive sector. Coal, oil shale, and nuclear fuels appear to be the most promising domestic resources to support a synthetic automotive fuels industry. Nine promising fuels, derived from the available resources, are listed, and their synthesis processes are briefly discussed. The compatibility of these fuels with existing fuel-distribution systems is considered. Changes in automotive fuel storage and engine design required to accommodate these fuels are identified, and potential fuel costs and fuel synthesis process efficiencies are estimated. On the basis of these considerations, the most worthy alternative (or supplemental) fuels for automotive transportation are liquid hydrocarbons made from coal or oil shale. Methanol made from coal is another possibly useful fuel in the near and middle time frames. In the far term, beyond the turn of the century, hydrogen may become important. (AUTHOR)
Document Type	Paper/Chapter from book

Citation Number	**80A000527**
Article Title	*Economics of Methanol in Motor Fuel — Value and Cost of Production*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Brandberg, A.R.L.
Author Affiliation	Swedish Methanol Development Co., Stockholm
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC USA
Report Number	CONF-790520
Publication Date	Apr 1980

Pages	12p, Paper II-30
Abstract	The costs of producing methanol as a motor fuel and a motor fuel supplement are projected for a variety of feedstocks including natural gas, residuals, coal, peat, and wood. Plant efficiencies, current feedstock prices, and plant size are considered in the production costs. The value of methanol as a fuel supplement is projected to be between 135 and 150 dollars/ton to the refinery. (AFDB)
Document Type	Paper from report

Citation Number	**80A000528**
Article Title	*The Energetics of Alternative Biomass Sources for Ethanol Production in Brazil*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Serra, G.E. Goldenberg, J. de Carvalho, C.M. Moreira, J.R.
Author Affiliation	Universidade Estadual Paulista, Sao Paulo (Brazil). Faculdade de Ciecias Agronomicas, Campus de Botucatu Sao Paulo Univ. (Brazil). Instituto de Fisica Universidade Estadual Paulista, San Paulo (Brazil). Faculdade de Ciecias Agronomicas, Campus de Botucatu Sao Paulo Univ. (Brazil). Instituto de Fisica
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	12p, Paper II-31
Abstract	A detailed energy balance is presented showing energy expended and produced in the production of ethanol from a variety of biomass sources. The results of the study show the greatest production efficiency can be achieved by using forest materials as ethanol processing feedstocks instead of sugar cane and cassava. (AFDB)
Document Type	Paper from report

Citation Number	**80A000534**
Article Title	*A Comparative Economic Analysis of Alcohol Fuels Production Options*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Jones, J.L. Barkhordar, P.M. Bomberger, D.C. Clark, C.F. Dickenson, R.L. Fong, W.S. Johnk, C.B. Kohan, S.M. Phillips, R.C. Semrau, K.T. Teater, N.R.
Author Affiliation	SRI International, Menlo Park, Calif. (USA)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	12p, Paper II-37
Abstract	The estimated prices for ethanol and methanol are shown in Figure 1 for the feedstocks and conversion processes considered. Most of the estimated prices shown are those calculated for highly leveraged regulated ventures. Because one of the major proposed uses for alcohol fuels is as a supplement to or substitute for petroleum-derived transportation fuels, it is appropriate to present some reference prices for gasoline and chemical grade alcohols to provide perspective; these prices are shown in Table 3. Fuel-grade methanol and ethanol will not need to meet the high purity standards for methanol and ethanol products now marketed as chemical commodities. Therefore, prices would probably be somewhat lower. Also note that the prices listed in Table 3 are for nonregulated ventures and most of those in Figure 1 are for regulated ventures. Prices for alcohol fuels are presented on a dollar-per-million-Btu basis as well as on a dollar-per-gallon basis. It should be borne in mind that a gallon of ethanol has close to two-thirds the fuel of gasoline and methanol has about one-half the fuel value. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000536**
Article Title	*Technical and Economic Assessment Motor Fuel Alcohol from Grain and Other Biomass*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Moon, G.D., Jr. Messick, J.R. Easley, C.E. Katzen, R.
Author Affiliation	Katzen (Raphael) Associates, Cincinnati, Ohio (USA)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	11p, Paper II-39
Document Type	Paper from report

Citation Number	**80A000553**
Article Title	*Canadian Scenario for Methanol Fuel*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Osler, C.F.
Author Affiliation	InterGroup Consulting Economists Ltd., Winnipeg, Manitoba (Canada)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA

Report Number	CONF-790520
Publication Date	Apr 1980
Pages	12p, Paper III-59
Abstract	The Canadian crude oil supply situation indicates that when imported oil exceeds $25/barrel methanol from natural gas/forest feedstocks will be economically competitive with petroleum based fuels. (AFDB)
Document Type	Paper from report

Citation Number	**80A000573**
Article Title	*Common Sense Approach in Developing Fuel Alcohols*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Jawetz, P.
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	8p, Paper ID/WG.293/12
Document Type	Paper from report

Citation Number	**80A000577**
Article Title	*Interaction between Energy Accounting and Cost Accounting in the Production of Liquid Fuels from Biological Materials*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Greenfield, P.F. Nicklin, D.J.
Author Affiliation	Queensland Univ., St. Lucia (Australia). Dept. of Chemical Engineering
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	8p, Paper ID/WG.293/17
Abstract	The authors discuss briefly the concepts of energy accounting and cost accounting. They argue that in a plant built to produce synthetic fuel, the fuel used as an input in production must be debited against the gross production of the plant. If this is not done, serious errors (several fold) can result in those situations where the cost of producing the synthetic fuel is much greater than the market price; and where the energy needed as an input in producing the synthetic fuel is large relative to the output. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000581**
Article Title	*Energy Balance for the Production of Ethyl and Methyl Alcohol*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Moreira, J.R. Vanin, V.R. Goldemberg, J. Serra, G.E.
Author Affiliation	Sao Paulo Univ. (Brazil). Instituto de Fisica Sao Paulo Univ. (Brazil). Instituto de Fisica Sao Paulo Univ. (Brazil). Instituto de Fisica Universidade Estadual Paulista, Sao Paulo (Brazil). Faculdade de Ciecias Agronomicas, Campus de Botucatu
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	36p, Paper ID/WG.293/21
Abstract	Energy requirements to produce ethyl and methyl alcohol from five different crops (sugar cane, cassava, sweet sorghum, eucalyptus and pinus) were calculated considering different processing systems: a) transformation of fermentable and/or non-fermentable sugars into ethanol and b) transformation of cellulosic materials into methanol. Whenever possible we used energy coefficients evaluated from Brazilian input-output matrix. Figures are presented for all the energy consumption in the agricultural phase and for the energy consumed as combustible for the industrial phase. In two particular cases, ethanol produces from sugar cane juice and methanol produced by hydro-carbonization, all the energy embodied in the industrial processes were measured. Capital and maintenance energies became very important when considering crops that require small amounts of agricultural energy. Wood is the less energy intensive crop for ethanol production and, at least for the two examples examined in detail, methanol requires less energy than ethanol to be produced. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000586**
Article Title	*Ethanol — an Alternative to Its Use as a Fuel*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countrics
Article Author	Johnston, P.J.
Author Affiliation	Union Carbide Corp., New York (USA)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	14p, Paper ID/WG.293/26
Document Type	Paper from report

Citation Number	**80A000668**
Article Title	*Alternative Organizational and Marketing Arrangements for Marketing Biomass*
Document Title	Biomass: a Cash Crop for the Future
Article Author	Black, W.E.

Conference	Conference on the production of biomass from grains, crop residues, forages and grasses for conversion to fuels and chemicals
Conference Place	Kansas City, MO, USA
Conference Date	2 Mar 1977
Publisher	National Technical Information Service; Springfield, VA, USA
Report Number	CONF-770368
Publication Date	1977
Pages	121-129
Document Type	Paper from report

Citation Number	**80A000722**
Article Title	*Some Aspects of the Economics of Ethanol Production in New Zealand*
Document Title	Proceedings of a Symposium on the Potential for Energy Farming in New Zealand
Article Author	Mulcock, A.P.
Author Affiliation	Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Physics and Engineering Lab
Conference	Symposium on the potential for energy farming
Conference Place	Lower Hutt, New Zealand
Conference Date	26 Nov 1975
Publisher	New Zealand Department of Scientific and Industrial Research
Publication Date	1976
Pages	115-122
Notes	New Zealand Department of Scientific and Industrial Research, Information Series no. 117.
Document Type	Paper/Chapter from book

Citation Number	**80A000735**
Article Title	*Production of Ethanol by the Fermentation of Grain*
Document Title	Proceedings of the International Symposium on Alcohol Fuel Technology: Methanol and Ethanol
Article Author	Scheller, W.A.
Author Affiliation	Nebraska Univ., Lincoln (USA)
Conference	Symposium on alcohol fuel technology
Conference Place	Wolfsburg, F.R. Germany
Conference Date	21 Nov 1977
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-771175
Publication Date	Jul 1978
Pages	4p, Paper 5-1
Notes	Organized by Volkswagenwerk AG in cooperation with the German Federal Ministry for Research and Technology (BMFT)
Abstract	After about 1945, ethanol produced from ethyl sulfate and ethylene replaced fermentation ethanol in the U.S. industrial chemical market because it could be produced at a lower price. The current price of OPEC oil caused ethanol produced by grain fermentation to be competitive in the industrial market if produced in large plants (20 million gallons per year or larger). An economic evaluation of the profitability of the production of 20 million (75.8 million liters) per year of anyhydrous ethanol from 21,490 bushels (546 metric tons) per calendar day of milo (a maize grain) indicates an annual rate of return above 20% on the total investment of $27,000,000. In larger plants the economic outlook is even more attractive. The price of ethanol from ethylene is expected to increase at a considerably greater rate than ethanol from grain. (EI)
Document Type	Paper from report

Citation Number	**80A000751**
Article Title	*The Methanol Economy: a Practical Version of the Hydrogen Economy*
Document Title	Proceedings of the Cornell International Symposium and Workshop on the Hydrogen Economy
Article Author	Reed, T.B.
Author Affiliation	Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.
Conference	Cornell international symposium and workshop on the hydrogen economy
Conference Place	Ithaca, NY, USA
Conference Date	20 Aug 1973
Report Number	PB-244 394/3ST
Publication Date	Apr 1975
Pages	379-392
Availability	NTIS
Document Type	Paper from report

Citation Number	**80:000772**
Article Title	*Case for Solar Energy*
Journal	Challenge
Volume	22
Issue	4
Pages	35-40
Publication Date	Sep 1979
Abstract	An interview with Barry Commoner elaborates on his support for developing solar energy in all its forms and his belief that they can contribute 20% of the US energy mix by the year 2000 if the solar bank proposed by President Carter is enacted. He envisions an ultimate transition to 90% solar and 10% natural gas. This will involve changes in agricultural patterns to produce alcohol fuels. Renewable energy fuels will not have the exponential rise in costs of nonrenewable costs because solar energy has only high front-end costs, while nonrenewable fuels also have increasing maintenance costs. Commoner suggests replacing the present soybean crops with a corn-sugar-beet-hay rotation and describes the political and socio-economic changes necessary for this transition. He challenges the wisdom of a synthetic fuels program and sees the major issue as one of developing the political power to put the solar transition in place.
Document Type	Journal article

Citation Number	**80:000950**
Document Title	*California Clean Fuels Study*
Corporate Author	Little (Arthur D.), Inc., Cambridge, Mass. (USA)
Report Number	NP — 23927 MN-95f
Publication Date	1979
Pages	112
Abstract	The Clean Fuels Study attempted to ascertain the price and availability of certain clean fuels to industrial and utility consumers in California over the period to the year 2000. The use of clean-burning fuels will be an alternative in many circumstances to installation of expensive post-combustion cleanup equipment. Thus, a knowledge of likely costs and availability of selected clean fuels will assist in regulatory and policy planning. Electric utilities are planning new or modified generating facilities based on oil-fueled burners. In deciding whether or not to authorize

such facilities, California authorities require a forecast of availability of the requisite fuel and the economic terms under which it will be available. Not all fuels are covered in this study. Fuels covered include products produced from crude oil: LPG (also imported directly), naphtha, distillate, low-sulfur fuel oil at several levels of sulfur content, and gasified high-sulfur residual fuel oil. Other clean fuels covered by the study include low- and medium-Btu gas and methanol produced from coal and from solid wastes, including agricultural and municipal wastes. Hydrogen is assumed not to be a fuel technologically usable under reasonable economic conditions, i.e., reasonably commercial, in any significant quantities over the time period covered by this study. Excluded from this study on the basis that the State already has sufficient data are LNG, high-Btu gas produced from coal or other feedstocks, and products produced from potential coal-liquefaction processes.

Availability: Arthur D. Little, Acorn Park, Cambridge, MA.
Document Type: Report

Citation Number **80A001008**
Article Title: *Amoco Encouraged by Its Gasohol Trial*
Article Author: Neher, J.
Journal: Advertising Age
Volume: 50
Issue: 35
Pages: 33
Publication Date: 20 Aug 1979
Abstract: Amoco Oil Co., the first of the majors to test gasohol at the pump, is encouraged by its first month in the market. Gasohol sales did as well as the unleaded premium it replaced, according to Bill Waller, staff director, light oils technical services for Amoco. The nine parts gasoline to one part alcohol mixture has accounted for 15% of sales volume at the four test stations in Ottumwa, Iowa. Gasohol was priced lower than premium, and a higher-octane gasohol was sold for the same price as unleaded. Waller said buying patterns could mean there are consumer fears over the effects gasohol could have on their cars. Amoco will enter a fourth test market in Wisconsin in September. Meanwhile Phillips Petroleum Co., the second company to market gasohol, has been temporarily stymied by federal red tape. Observers contend that if even one major oil company goes national with gasohol, the mass supplier cannot meet the demand. Already, the nation's corn farmers have formed a group to promote the usage of alcohol. Gasohol is currently being sold in 28 states. (ABI)
Document Type: Journal article

Citation Number **80A001019**
Article Title: *Arco Says It Test Markets Gasohol in Indiana, Hawaii*
Journal: Wall Street Journal
Volume: 101
Pages: 35
Publication Date: 20 Nov 1979
Document Type: Journal article

Citation Number **80A001029**
Article Title: *Bank of America...(Car-fleet)*
Article Author: Shannon, M.J.
Journal: Wall Street Journal
Volume: 101
Pages: 1
Publication Date: 8 Nov 1979
Document Type: Journal article

Citation Number **80A001030**
Article Title: *Banks Are Lining Up a $1 Billion Loan to Finance Brazil's Alcohol-fuel Plans*
Article Author: Hertzberg, D.
Journal: Wall Street Journal
Volume: 101
Pages: 32
Publication Date: 8 Oct 1979
Document Type: Journal article

Citation Number **80A001032**
Article Title: *The Best Incentive for Finding Fuel Is Plain Greed (Developing New Sources)*
Article Author: Wingate, P.J.
Journal: Wall Street Journal
Volume: 101
Pages: 12
Publication Date: 13 Jul 1979
Document Type: Journal article

Citation Number **80A001033**
Article Title: *A Big-league Test of Gasohol Marketing*
Journal: Bus. Week
Issue: 2608
Pages: 76
Publication Date: 22 Oct 1979
Document Type: Journal article

Citation Number **80A001034**
Article Title: *Big Oil's 'Inexplicable' Aversion to Gasohol*
Article Author: Wingate, P.J.
Journal: Wall Street Journal
Volume: 101
Pages: 26
Publication Date: 27 Nov 1979
Document Type: Journal article

Citation Number **80A001036**
Article Title: *Biochemical Engineering: Renewable Sources of Energy and Chemical Feedstocks (Food and Energy Crop System)*
Article Author: Cervinka, V.
Rollins, E.S.
Schweickart, V.L.
Author Affiliation: California Dept. of Food and Agriculture and Long-range Planning, Sacramento (USA)
Journal: AIChE Symp. Ser.
Volume: 74
Issue: 2
Pages: 6
Publication Date: 1978
Abstract: The feasibility of growing fuel crops in the current agricultural system was determined. Development of fuel farming will depend on future increases in demand for agricultural food products. Except in emergency cases, food is considered by nations as a trade commodity on the world market. Despite food shortages in under-

	developed nations, the world market will encourage U.S. agriculture to produce fuel crops. The production of ethanol and other energy sources from crops is now technically and economically feasible. Agriculture should be developed as an interacting system of food, fiber, and energy crops. (EL)
Document Type	Journal article

Citation Number	**80A001042**
Article Title	*Gasohol from Corn — Good Sense?*
Article Author	Sanderson, F.H.
Journal	New York Times
Volume	129
Pages	23
Publication Date	3 May 1980
Document Type	Journal article

Citation Number	**80A001045**
Article Title	*The Gasohol Gambit*
Journal	Consumers Digest
Volume	19
Pages	20
Publication Date	Apr 1980
Document Type	Journal article

Citation Number	**80A001051**
Journal	Agra Europe
Pages	e7
Publication Date	14 Dec 1979
Abstract	Initial studies show that motor fuel from sugar beet is 3 times more expensive than gasoline.
Document Type	Journal article

Citation Number	**80A001062**
Article Title	*Keeping that Tiger in Your Tank*
Article Author	Raloff, J.
Journal	Sci. News
Volume	117
Pages	234
Publication Date	12 Apr 1980
Document Type	Journal article

Citation Number	**80A001067**
Journal	Wall Street Journal
Pages	36
Publication Date	10 Jul 1979
Abstract	LDCs: rising oil prices cause conversion of sugar surpluses into fuel.
Document Type	Journal article

Citation Number	**80A001073**
Journal	Feedstuffs
Pages	6
Publication Date	21 May 1979
Abstract	USDA to spend $6 million on alcohol fuel R&D in FY80.
Document Type	Journal article

Citation Number	**80A001096**
Article Title	*What's Brewing at National Distillers*
Article Author	Kulkosky, E.
Journal	Financial World
Volume	148
Issue	22
Pages	50-56
Publication Date	15 Nov 1979
Abstract	A small research company called Cetus Corporation has developed a possible cure for cancer and a cheaper way to make alcohol and therefore gasohol. National Distillers & Chemical Corporation owns 16% of Cetus. National Distillers also owns a liquor business, a brass fabrication plant, and numerous chemical plants. National Distillers recently acquired a producer of oleochemicals and an insurance company. It also owns Almaden, a fast-growing wine company in California. The possibility of producing cheaper alcohol, perhaps for use in gasohol, caused Distillers to begin building plants to manufacture alcohol. The shift away from petrochemicals towards oleochemicals is important with the increasing cost of petroleum, and Distillers expects the liquor business to increase also. All in all, Distillers expects the future to be very bright.
Document Type	Journal article

Citation Number	**80A001098**
Article Title	*Net Energy Analysis of Ethanol Production*
Article Author	Scheller, W.A. Mohr, B.J.
Author Affiliation	Nebraska Univ., Lincoln (USA)
Journal	Am. Chem. Soc., Div. Fuel Chem., Prepr.
Volume	21
Issue	2
Pages	29-35
Publication Date	1976
Notes	Proc. Symp. on Net Energy of Integrated Synfuel Syst, at 171st National Meeting, New York, NY, Apr 5-9, 1976.
Abstract	This paper is concerned with the energy aspect of ethanol production from grain by the fermentation process. In the overall evaluation of the use of grain alcohol in automotive fuel one should consider the net energy production or consumption associated with the grain alcohol manufacture. As part of a National Science Foundation grant the authors carried out detailed material and energy balances and prepared process designs for a fermentation alcohol plant capable of producing 20 million gallons per year of anhydrous ethanol from corn. A detailed set of utility requirements (steam, electricity, cooling water) for the plant were obtained as a part of this design. This information coupled with Pimentel's analysis of the energy requirements for corn production has made it possible to carry out a detailed total energy analysis for the manufacture of ethanol by the fermentation of corn. Results of the study are presented which show that if 75% of the stalks, cobs and husks are used as an energy source that there will be a net energy production of at least 27,405 Btu's per gallon of ethanol produced. If the energy consumption associated with the preparation of distiller's by-product grains is not included then the overall net energy production is at least 45,575 Btu's per gallon of ethanol produced. Thus the potential actually exists to extend automotive fuel energy. (EI)
Document Type	Journal article

Citation Number	**80A001107**
Journal	World Oil
Pages	11

Publication Date 15 Feb 1980
Abstract Without a subsidy, gasohol would not be viable at present, an Amoco Oil Co. marketing executive says. (The company has been test-marketing gasohol in four Midwest markets since summer 1979.) Without state and federal tax subsidies, says Amoco, gasohol would cost about 9 cents per gallon more than regular unleaded gasoline. The company also sees a need for the alcohol industry to come up with an alternative to using scarce fuels in the production of ethanol. Either a technology breakthrough is needed or the switch to coal or other fuel sources in the distillation process. At present it takes about 2.2 times as much energy to raise the corn and produce the alcohol as you get out of it.
Document Type Journal article

Citation Number 80A001116
Journal Science
Pages 898
Publication Date 31 Aug 1979
Abstract New process for fuel alcohol renders 10 times the energy required for manufacturing.
Document Type Journal article

Citation Number 80A001117
Journal Solar Energy Digcst
Pages 4
Publication Date Oct 1979
Abstract New process for fuel alcohol renders 10 times the energy required for manufacturing.
Document Type Journal article

Citation Number 80A001132
Article Title *Preliminary Cost Analyses for Enzymatic Hydrolysis of Newsprint*
Article Author Wilke, C.R.
Yang, R.D.
Von Stockar, V.
Journal Biotechnol. Bioeng. Symp.
Issue 6
Pages 155-175
Publication Date 1976
Document Type Journal article

Citation Number 80A001133
Article Title *Present Methanol Manufacturing Costs and Economics Using the ICI Process*
Article Author Kenard, R.J., Jr.
Nimmo, N.M.
Journal Chem. Eng. Prog., Symp. Ser.
Volume 66
Issue 98
Pages 47
Publication Date 1970
Document Type Journal article

Citation Number 80A001139
Journal Journal of Commerce
Pages 32
Publication Date 12 Jul 1978
Abstract The production of alcohol from grains requires the use of more energy than can be derived from its application as a fuel, an oil industry spokesman told a congressional subcommittee. Jack Freeman, testifying in behalf of the American Petroleum Institute, told the House Advanced Energies Technologies Subcommittee that current processes for converting grain into alcohol are highly energy intensive, requiring petroleum or natural gas to convert the solids into liquids. Mr. Freeman, a senior engineer with Sun Oil Co., said: Almost two energy units must be invested to yield one in the form of ethanol from grain sources, while ethanol from sugar cane looks like a break-even energy balance. The same seems true for at least one of the routes to methanol from woods.
Document Type Journal article

Citation Number 80A001144
Journal Wall Street Journal
Pages 10
Publication Date 15 Jan 1980
Abstract More energy required to convert sugar cane into fuel alcohol than alcohol produces.
Document Type Journal article

Citation Number 80A001147
Article Title *Texaco Inc. Plans to Test Gasohol in 3 U.S. Markets: Meanwhile, 17 Connecticut Dealers Have Already Begun to Sell the Product*
Journal Wall Street Journal
Volume 101
Pages 32
Publication Date 13 Aug 1979
Document Type Journal article

Citation Number 80A001156
Article Author Weisz, P.B.
Marshall, J.F.
Journal Science
Volume 206
Pages 24-29
Publication Date 5 Oct 1979
Abstract A framework for examining the biomass to high quality fuel conversion process is presented with an example application to the agricultural product to ethanol process. The analysis indicates that with current practices in agriculture and processing technology between 2 and 3 gallons of high quality fuel equivalent is consumed for every gallon of ethanol produced. The process can be a net producer of high quality fuel when high quality fuel input to the alcohol processing facility is eliminated. (AFDB)
Document Type Journal article

Citation Number 80A001163
Article Title *Methanol and Energy Shortage — a Feasibility Study of Manufacturing Synthetic Fuel from Available Energy Sources*
Article Author Clanton, G.W.
Journal AIME Soc. Pet. Eng. Pap.
Issue SPE 5095
Publication Date Oct 1974
Notes 49th annual fall meeting of Society of Petroleum Engineers of AIME, Houston, Texas, Oct. 6-9, 1974
Document Type Journal article

Citation Number	**80A001175**
Document Title	*Use of Alternative Fuels in Highway Vehicles: the Relevance of U.S. Energy Flows*
Document Author	Anderson, C.J.
Author Affiliation	California Univ., Livermore (USA). Lawrence Livermore Lab.
Report Number	UCRL-52558 Contract W-7405-ENG-48
Publication Date	9 Oct 1978
Pages	17
Abstract	A new energy model for the United States has been completed and tested at Lawrence Livermore Laboratory. The transportation submodel uses more recent fuel and energy data than the 1976 Gulf Oil Co./Stanford Research Institute data base, and the LLL model calculates energy flows and prices through the year 2020. This equilibrium or "balance of forces" type of model calculates a slow rise in prices for transportation fuels over the time period studied. Two import oil price situations — a $12.75 per barrel and a $15.50 per barrel price have been modeled. The model calculated that the higher price would result in the earlier introduction of synthetic fuels. The model also shows that the alternative fuels methanol, electricity, and broadcut fuel could be economically competitive and thus enter the transportation market but that hydrogen could not. (ERA citation 04:010920) (NTIS)
Availability	NTIS
Document Type	Report

Citation Number	**80A001176**
Document Title	*Systems Descriptions and Engineering Costs for Solar-related Technologies; Volume IX. Biomass Fuels Production and Conversion Systems*
Document Author	Blake, D. Salo, D.
Author Affiliation	Mitre Corp., McLean, Va. (USA). METREK Div.
Report Number	MTR-7485 (v. 9) Contract EX-76-C-01-2322
Publication Date	Jun 1977
Pages	197
Abstract	This document presents descriptions of conceptual production and conversion systems for biomass fuels. The data presented are developed from system performance analysis and estimated engineering and operation and maintenance costs of these conceptual designs to provide a data base for predicting penetration for future solar and solar-associated technologies. Biomass production and conversion systems utilize various technologies and process routes to transform feedstock into energy-related products. There are several sources of feedstock but basically only three distinctly different approaches exist for feedstock conversion to specific products. The biomass production systems which are considered here include: silvicultural biomass farms, agricultural biomass farms, forestry residues, and crop residues. Forestry residues include: logging residues, unutilized standing biomass, and unused mill residues. The basic conversion approaches used in the various processes are: thermochemical, aqueous processing and combustion. Representative products considered in the conversion section are: methanol, ethanol, medium-Btu fuel gas, ammonia, fuel oil, electricity, and charcoal. METREK estimated biomass production costs for ten different locations. Annual production was set at 250,000 DTE for each. Six of the sites were representative of areas where biomass farms would probably be established. They included: Wisconsin, Missouri, Louisiana, Georgia, New Hampshire/Vermont, and Washington. Illinois represented prime nonirrigated cropland, California represented irrigated cropland; the Mississippi site was established on U.S. Forest System land; and the Florida site was located in a wetland area. Detailed analyses are provided for Wisconsin and Louisiana. (ERA citation 03:056703) (NTIS)
Availability	NTIS
Document Type	Report

Citation Number	**80A001181**
Article Title	*Energy Efficiency*
Document Title	Automotive Fuels
Document Author	Colucci, J.M. (ed.) Galhopoulos, N.E. (ed.)
Publisher	Plenum Press; New York, NY, USA
Publication Date	1977
Pages	96-120
Abstract	The entire spectrum of alternate energy production, processing and utilization is reviewed. The author introduces the combined energy efficiency aspect in his evaluation of all the alternatives for automotive fuels. The sources for consideration include petroleum, oil shale, coal, biomass, and nuclear. Fuel conversion efficiency and fuel utilization efficiency for each source, and each fuel energy couple are presented. The paper provides an excellent basis for comparisons among all the different source/processing and utilization schemes. (AFDB)
Document Type	Paper/Chapter from book

Citation Number	**80A001190**
Document Title	*Design, Operation and Economics of the Energy Plantation (TM)*
Document Author	Fraser, M.D. Henry, J. Vail, C.
Author Affiliation	InterTechnology Corp., Warrenton, Va. (USA)
Conference	Clean fuels from biomass, sewage, urban refuse and agricultural wastes
Conference Place	Orlando, FL, USA
Conference Date	27 Jan 1976
Pages	25
Document Type	Book

Citation Number	**80A001195**
Document Title	*Economic Feasibility of Gasohol; Hearing Before the Subcommittee on Agricultural Research and General Legislation of the Committee on Agriculture, Nutrition, and Forestry, United States Senate, 95th Congress, 1st Session, Dec. 12, 1977, Indianapolis, Indiana.*
Corporate Author	United States. Congress. Senate. Committee on Agriculture, Nutrition, and Forestry. Subcommittee on Agricultural Research and General Legislation.

Publisher	U.S. Government Printing Office; Washington, DC, USA
Publication Date	1978
Pages	174
Notes	Includes bibliographical references.
Document Type	Book

Citation Number	**80A001198**
Document Title	*Economic Analysis of Synthetic Liquid Fuels*
Corporate Author	Ontario Ministry of Energy Advisory Group on Synthetic Liquid Fuels (Canada)
Series	Ontario Ministry of Energy Advisory Group on Synthetic Liquid Fuels Report, v. 2
Publication Date	May 1978
Pages	262
Abstract	Projected supplies, demand, and prices of conventional and experimental fuels in Canada are assessed. Potential supplies and costs of Canadian resources, such as municipal wastes, forest biomass , and agricultural residues that could be used as fuels are surveyed. The cost of producing and using methanol and synthetic gasoline is projected. Alternative uses for Canada's indigenous resources and the economic impacts of liquid fuel production are discussed. Possible measures to alleviate potential near-term oil shortages are proposed. Summaries and recommendations are provided. (EL)
Document Type	Book

Citation Number	**80A001208**
Document Title	*Net Energy Analysis of Alcohol Fuels*
Document Author	Jenkins, D.M. McClure, T.A. Reddy, T.S.
Series	API Publication no. 4312
Publisher	American Petroleum Institute; Washington, DC, USA
Publication Date	Nov 1979
Pages	39
Abstract	Presents the results of a study undertaken by Battelle Columbus Laboratories to determine the net energy required to make alcohol from sugar cane, corn, corn stover, and wood.
Availability	American Petroleum Institute, 2101 L St. NW, Washington, DC 20037 $3.00
Document Type	Book

Citation Number	**80A001212**
Document Title	*The Small Fuel-alcohol Distillery; General Description and Economic Feasibility Workbook*
Document Author	Chambers, R.
Publisher	ACR Process Corporation; Westfield, NJ, USA
Publication Date	1979
Pages	21
Notes	In September 1975 supplement #1 (4 pages) to the small fuel-alcohol distillery: general description and economic feasibility workbook by R.S. Chambers was published by ACR Process Corporation, Champaign, IL.
Abstract	Thorough walk-through of the economics (including financing and payback), technology and marketing. A practical and important workbook for the would be alcohol fuel entrepreneur. Chambers is the foremost in the field and reviews alcohol production in a systematic way.
Document Type	Book

Citation Number	**80A001213**
Document Title	*Grain Motor Fuel Alcohol; Technical and Economic Assessment Study*
Corporate Author	Katzen (Raphael) Associates, Cincinnati, Ohio (USA)
Publisher	U.S. Government Printing Office; Washington, DC, USA
Report Number	HCP/J6639-01 EJ-78-C-01-6639
Publication Date	Dec 1978
Pages	353
Availability	U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402
Document Type	Report

Citation Number	**80A001221**
Document Title	*On-farm Production of Fuel-alcohol in mid-America — Technical and Economic Potential*
Document Author	Hohmann, M.A.
Author Affiliation	Mid-American Solar Energy Complex, Minneapolis (USA)
Conference	12th annual meeting of the Mid-continent Regional Science Association
Conference Place	Lincoln, NE, USA
Conference Date	24 Apr 1980
Report Number	MASEC-TP-80-009
Publication Date	Mar 1980
Pages	22
Availability	NTIS
Document Type	Report

Citation Number	**80A001245**
Document Title	*Prosperity Beckons; the Dawn of the Alcohol Era*
Document Author	Hale, W.J.
Publisher	Stratford Co.; Boston, MA, USA
Publication Date	1937
Pages	160
Notes	Graphics and commentary copyright 1979 by Rutan Publishing, Minneapolis, MN
Abstract	It lays the foundation for bringing money to the farmer and independence from petroleum to the nation with farm-produced alcohol.
Document Type	Book

Citation Number	**80:001952**
Article Title	*Cropland Reserve for Fuel Production*
Document Title	Report of the Alcohol Fuels Policy Review. Raw Material Availability Report
Article Author	Dovring, F.
Report Number	DOE/ET — 0114/1
Publication Date	Sep 1979
Pages	21p, Paper 5
Abstract	Fuel from field crops is a short-term prospect of limited significance for the country's energy problem but of larger potential significance for farm support policy if costs are found acceptable. In the spring of 1978, 24 million acres were signed up for set-aside. Potential grain production from this acreage is estimated at 21.8 million metric tons (857 million bushels) of corn and 13.9 million metric tons of other grains. Cost of production per bushel of corn (56 pounds) in 1978 is estimated at $2.60, of which $1.65 non-land costs and $1.40 costs other than land, labor and taxes. The latter figure represents real cost to the national economy. For other grains, the same costs are $2.75 to $2.00, $2.00 to $2.10, and $1,60 to

$1.65, respectively. Whole plants and root crops raise unsolved technical problems which leave open whether these could be viable alternatives to grain. Long-term outlook is uncertain. Substitution of vegetable foods for meat could eventually set free 100 million tons of grain (early next century). For long-term fuel supply, forest production holds more promise than field crops.

Availability	NTIS
Document Type	Paper from report

Citation Number	**80:001961**
Document Title	*Preliminary Report on the Agricultural Sector Impacts of Obtaining Ethanol from Grain*
Document Author	Hertzmark, D.I.
Corporate Author	Solar Energy Research Inst., Golden, Colo. (USA)
Report Number	SERI/RR — 51-292 Contract EG-77-C-01-4042 STD-61
Publication Date	Jul 1979
Pages	24
Abstract	This report was prepared as a part of SERI task number 3321.3, Gasohol Policy Analysis. This work is supported by the Biomass Energy Systems Branch of the Office of Energy Technology, US Department of Energy. The report describes some of the preliminary results that affect such issues as the balance of payments and energy import impacts of obtaining liquid fuels from agricultural crops. This report is a precursor to a more detailed and comprehensive look at these and other issues such as food price impacts and farm income impacts that will come in Fall 1979. Policy issues related to this work concern farm income and production programs and tax and subsidy schemes for the end products.
Availability	NTIS
Document Type	Report

Citation Number	**80:001987**
Article Title	*Biomass Based Methanol Processes*
Document Title	3rd Annual Biomass Energy Systems Conference
Article Author	Wan, E.I. Simmons, J.A. Price, J.D. Nguyen, T.D.
Author Affiliation	Science Applications, Inc., McLean, Va. (USA)
Conference	3rd annual biomass energy systems conference
Conference Place	Golden, CO, USA
Conference Date	5 Jun 1979
Report Number	SERI/TP — 33-285 CONF-790638 —
Publication Date	Oct 1979
Pages	477-487
Abstract	The three major components of the biomass to methanol system are the availability of biomass feedstocks, the thermochemical conversion of biomass to methanol fuels, and the distribution and market analysis of methanol fuels. Initial efforts were undertaken to identify and evaluate the regional potential of biomass resources and to assess the market for methanol fuels. Three commercially available oxygen-blown gasification processes were analyzed and compared in terms of their feasibilities for producing methanol synthesis gas from biomass. These processes include the fixed bed Wellman-Galusha and Purox gasifiers, and the entrained-bed Koppers-Totzek gasifier. Two commercially available methanol synthesis processes plus one advanced liquid-phase methanol system were also analyzed. Empirical and theoretical process models were developed so that parametric analysis and economic sensitivity can be determined. An optimized process design based on 1000 tpd biomass throughput has been derived. Detailed material and energy information of this base design were used for economic sensitivity analysis. The results of this study have indicated that currently the cost of methanol production from biomass ranges from 60 to 90 cents per gallon depending upon regional feedstock costs, the conversion plant size, the gasification process employed, and overall process energy integration and optimization. In order to achieve higher conversion efficiency and competitive economics, several alternative biomass to methanol production concepts were formulated. This involved the incorporation of an advanced biomass gasification concept, simplification of synthesis gas modification processes, optimization of methanol synthesis, and the adaptation of hybrid synthesis gas schemes.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80:001995**
Article Title	*Fuels from Fermentation of Biomass*
Document Title	3rd Annual Biomass Energy Systems Conference
Article Author	Bungay, H.R.
Author Affiliation	Rensselaer Polytechnic Inst., Troy, N.Y. (USA)
Conference	3rd annual biomass energy systems conference
Conference Place	Golden, CO, USA
Conference Date	5 Jun 1979
Report Number	SERI/TP — 33-285 CONF-790638 —
Publication Date	Oct 1979
Pages	59-60
Abstract	The fermentation of biomass as a commercial energy source technology is discussed. Areas that have progressed to the point of commercialization are presented. These are programs financed by DOE contracts. The costs of production are also discussed. It was concluded that the rapid rate of progression makes it likely that production of alcohol fuels and petrochemical substitutes from biomass can soon become a very large scale operation in the United States.
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A002010**
Article Author	Blustein,P.
Journal	Wall Street Journal
Volume	102
Pages	6
Publication Date	10 Jan 1980
Abstract	Despite political hoopla about gasohol, some experts call program impractical.
Document Type	Journal article

Citation Number	**80A002011**
Journal	Chem. Eng. News
Pages	12

Publication Date	14 Feb 1977
Abstract	Details future prospects of methanol as a fuel, market data.
Document Type	Journal article

Citation Number	**80A002012**
Journal	Cleveland Plain Dealer
Publication Date	6 Mar 1977
Abstract	Details plans to expand crop areas to aid in fuel requirements.
Document Type	Journal article

Citation Number	**80A002025**
Article Title	*Alcohol for Cars Termed Spur to Rising Food Prices*
Article Author	King, S.S.
Journal	New York Times
Volume	129
Pages	25
Publication Date	16 Mar 1980
Notes	v. 129, Section 1
Document Type	Journal article

Citation Number	**80:002033**
Article Title	*High-grade Fuels from Biomass Farming: Potentials and Constraints*
Article Author	Weisz, P.B. Marshall, J.F.
Author Affiliation	Mobil Research and Development Corp., Princeton, N.J. (USA)
Journal	Science
Volume	206
Pages	24-28
Publication Date	5 Oct 1979
Abstract	The key parameters controlling the productivity and the cost of net high-grade fuel from a system for biomass agriculture and conversion are analyzed. Performance depends sensitively on a symbiotic interaction between agronomy and technology. The conditions for obtaining net productivity and costs are explored for US grain alcohol as a reference point. Currently practiced technology consumes more high-grade fuel than it generates. Some potentials and constraints for future systems, including use of other plant species and conversion systems, are explored. 8 figures, 2 tables.
Document Type	Journal article

Citation Number	**80A002037**
Article Title	*EOK Proposes Deregulation of Gasohol Prices*
Journal	Chem. Eng. News
Volume	56
Issue	17
Pages	21
Publication Date	24 Apr 1978
Abstract	Gasohol (a mixture of 90% gasoline and 10% ethanol) has been successfully test marketed in Nebraska and Illinois, and the results have been so satisfactory that the Dept. of Energy is proposing to change the regulations that govern pricing of petroleum-based motor fuels. Gasoline is a regulated commodity, but ethanol for motor fuels is not. Since a blend of the 2 is considered gasoline for legal purposes, the blend sold as gasoline would become exempt from regulation. Gasohol advocates are pushing hard for the DOE proposal. It would probably raise the price of the new fuel, but advocates indicate that increased costs would be partially offset by better mileage and engine performance. Formulators maintain they need a price increase to recover their manufacturing costs. As far as dealers are concerned, their main problem is with the proper blending of the mixture, required by many state laws to be done locally. Oil companies have not taken an official stance yet, but privately leave no doubt that they are not in favor of gasohol. (ABI)
Document Type	Journal article

Citation Number	**80A002051**
Article Title	*Ethanol Price to Rise*
Journal	New York Times
Volume	129
Pages	D16
Publication Date	5 Mar 1980
Notes	v. 129, Section D
Document Type	Journal article

Citation Number	**80A002060**
Article Title	*Exxon Puts Limits on Gasohol Sales*
Journal	New York Times
Volume	129
Pages	D20
Publication Date	9 Jan 1980
Notes	v. 129, Section D
Document Type	Journal article

Citation Number	**80A002072**
Article Title	*Gasoline-alcohol Mixture Ignites Dispute*
Article Author	Parisi, A.J.
Journal	New York Times
Pages	D3
Publication Date	3 May 1978
Abstract	Despite examples in which gasohol — a mixture consisting of 90% unleaded gasoline and 10% anhydrous ethyl alcohol — is being sold commercially at prices slightly above ordinary unleaded gasoline, problems exist for the marketing of the product on a large-scale basis. Although mileage gains of as much as 20% were reported, gasohol currently costs more to make than gasoline, and it depends on sizable tax advantages to be competitive. Manufacturing the alcohol acutally consumes more energy than the product saves. The major oil companies are openly critical of mixing alcohol with gasoline and of the tax breaks awarded to producers of gasohol. The oil companies choose instead to put R & D dollars into ways of converting coal into a liquid fuel for use in automobiles. But as the oil companies struggle with the economics of coal conversion, gasohol proponents are hoping to get an important jump on them in the market, with a plan for a "gasohol giveaway day." (EL)
Document Type	Journal article

Citation Number	**80A002074**
Article Title	*Getting Serious About Gasohol*
Journal	Chem. Week
Volume	125
Issue	18
Pages	45
Publication Date	31 Oct 1979

Abstract	The fledgling gasohol industry stands to benefit greatly from new federal and state financial incentives. A number of municipalities and cooperatives are considering building plants that would use nonhydrocarbon feedstocks to make ethanol, and some engineering firms are offering improved versions of their fermentation expertise. The Department of Energy is offering an entitlements program that includes alcohol fuels, and the federal excise tax of 4c/gal on motor fuels has been waived temporarily for gasoline-alcohol fuels. The major disadvantage in gasohol production up until now has been lack of profits, but the economic feasibility may now be changing thanks to the incentives that are appearing. The energy benefit in making ethanol is being debated, with consensus being that if coal, crop residues, or waste heat from other resources is utilized, there is a net energy benefit. The Commerce Department has been authorized to give loans and grants to help in the construction of small alcohol plants in rural areas. (ABI)
Document Type	Journal article

Citation Number	**80A002097**
Article Title	*The Gasohol Controversy*
Article Author	Austin, G.T.
Author Affiliation	Washington State Univ., Pullman (USA). Coll. of Engineering
Journal	Quest
Volume	14
Issue	2
Pages	1-5
Publication Date	1979
Document Type	Journal article

Citation Number	**80A002098**
Article Title	*Gasohol: Does It or Doesn't It Produce Positive Net Energy?*
Article Author	Chambers, R.S. Herendeen, R.A. Joyce, J.J. Penner, P.S.
Journal	Science
Volume	206
Pages	789
Publication Date	16 Nov 1979
Abstract	A detailed analysis of energy inputs and outputs is applied to grain-based gasohol. The energy used to produce gasohol is compared with the net energy gain from the fuel product. Energy inputs include agricultural and processing energies. In terms of nonrenewable energy, gasohol is close to the energy break-even point. (EL)
Document Type	Journal article

Citation Number	**80A002099**
Article Title	*Gasohol: Does It Save Energy?*
Journal	Environ. Sci. Technol.
Volume	14
Issue	2
Pages	140
Publication Date	Feb 1980
Abstract	Whether gasohol saves energy or not depends on a number of basic assumptions. Fossil fuel inputs to produce gasohol. Energy balance in producing 1 gallon of gasohol from corn. End-use efficiency. (EAI)
Document Type	Journal article

Citation Number	**80A002100**
Article Title	*Gasohol — Economy or Gluttony*
Journal	SciQuest
Volume	46
Pages	7
Publication Date	Apr 1979
Document Type	Journal article

Citation Number	**80A002112**
Article Title	*In Search of Alcohol for Gasohol*
Journal	Bus. Week
Issue	2588
Pages	122F,122J
Publication Date	4 Jun 1979
Abstract	Gasohol is the 9-to-1 blend of gasoline and grain alcohol that has begun selling as fuel. Energy politics and the rise in gasoline prices are boosting the demand for gasohol. Gasohol has the advantage of increased gas mileage and higher octane. As a result, an alcohol supply crunch has developed, causing beverage oriented domestic alcohol distillers to add capacity. The major problem has been locating the alcohol. Only alcohol or ethanol from renewable sources qualifies for the federal tax subsidy. The only U.S. distillery making significant amounts of anhydrous grain alcohol for gasohol is Archer-Daniels-Midland Co., Decatur, Illinois. Since March, the plant's annual anhydrous production of 3 million gallons has been sold out. The reemerging market for fermentation ethanol as an industrial solvent and chemical feedstock also adds to the renewed interest in alcohol. (ABI)
Document Type	Journal article

Citation Number	**80A002115**
Article Title	*Indiana Standard to Sell Gasohol in the Midwest*
Journal	Wall Street Journal
Volume	100
Pages	4
Publication Date	28 Jun 1979
Document Type	Journal article

Citation Number	**80A002131**
Article Title	*Gasohol: Energy Mountain or Molehill?*
Article Author	Anderson, E.V.
Journal	Chem. Eng. News
Pages	8-15
Publication Date	31 Jul 1978
Abstract	The article examines both sides of the gasohol issue from Schellers standpoint to that of the oil industry. Other than quoting economic information from several sources, the authors give indications as to where each of the diverse groups stand, and what they are doing to clarify the issue. (AFDB)
Document Type	Journal article

Citation Number	**80A002137**
Document Title	*Biomass-based Alcohol Fuels: the Near-term Potential for Use with Gasoline*
Document Author	Park, W. Price, G. Salo, D.
Author Affiliation	Mitre Corp., McLean, Va. (USA). METREK Div.

Publication Date Aug 1978
Pages 84
Abstract
This report serves as an introduction to the requirements and prospects for a nationwide alcohol-gasoline fuel system based on alcohols derived from biomass resources. Technological and economic factors of the production and use of biomass-based methanol and ethanol fuels are evaluated relative to achieving 5 or 10 percent alcohol-gasoline blends by 1990. It is concluded the maximum attainable is a nationwide 5 percent methanol or ethanol-gasoline system replacing gasoline by 1990. Relative to existing gasoline systems, costs of alcohol-gasoline systems will be substantial. (NTIS)
Document Type Report

Citation Number **80:002138**
Article Title *Energy Relationships of Fuel from Biomass*
Article Author Lewis, C.
Author Affiliation Strathclyde Univ., Glasgow (UK)
Journal Process Biochem.
Volume 11
Issue 9
Pages 29
Publication Date 1976
Abstract
Consideration of energy input and output of various processes for converting plant material into CH_4 or EtOH indicated that only the sugar cane EtOH route was a net energy producer (51 GJ/ha-year).
Document Type Journal article

Citation Number **80A002139**
Document Title *Food or Fuel — New Competition for the World's Cropland*
Document Author Brown, L.R.
Series Worldwatch Paper 35
Publisher Worldwatch Institute; Washington, DC, USA
Publication Date Mar 1980
Pages 43
Document Type Book

Citation Number **80:002140**
Article Title *Decision Making in the Utilization of the Organic Fraction of Municipal Waste*
Article Author Miller, I.J.
Journal N.Z. J. Sci.
Volume 19
Issue 4
Pages 339-344
Publication Date 1976
Abstract
An outline of the processes available for utilization of refuse and an estimate of the distribution and composition of New Zealand municipal refuse are given. A procedure is given for decision making. Ethanol production and slagging pyrolysis appear to be the most attractive processes. Estimated costs are given.
Document Type Journal article

Citation Number **80A002260**
Article Title *Gasohol — a Critical Choice (Fuel, Energy Sources)*
Article Author Deimel, R.
Author Affiliation Department of Agriculture, Washington, D.C. (USA). Science and Education Administration
Journal Extension Review
Volume 50
Issue 3
Pages 2
Publication Date Jun 1979
Notes Date: Summer 1979
Document Type Journal article

Citation Number **80A002282**
Article Title *Gasohol: Costly Way to Go. Fuel Made from Grain*
Journal Agricultural Situation
Volume 62
Issue 3
Pages 6-7
Publication Date Apr 1978
Document Type Journal article

Citation Number **80A002283**
Article Title *Ethanol — Solution to the Sugar Problem*
Journal Agra Europe
Issue 361
Pages D/1-D/2
Publication Date 1978
Abstract
A recent paper by a French company is quoted which discusses the economic possibility of disposing of sugar surpluses by distilling them in combination with tapioca to producing a nonpollutant fuel, ethanol which can be blended with petrol in proportions up to 15 or 20%. At present although the price of ethanol is two to three times greater than that of fuel oil and one and a half times greater than that of petrol, both India and Brazil have adopted policies to develop ethanol as a primary energy commodity. The possibilitics and development costs of producing the fuel in sugar cane producing countries is discussed. (EI)
Document Type Journal article

Citation Number **80A002286**
Article Title *Alcohol as a Solution to the Energy Crisis*
Article Author Fong, P.
Journal Bulletin of the American Physical Society
Volume 19
Pages 422-431
Publication Date 1974
Document Type Journal article

Citation Number **80A002291**
Journal Chem. Mark. Rep.
Pages 4
Publication Date 18 Feb 1980
Abstract
A study sponsored by the state of Washington has determined that a 50-million-gallon-per-year alcohol plant would be both economical in scale and sufficient in size to support the conversion of 25% of the states's motor fuel needs to gasohol. The study, which was performed by Rocket Research Company, a division of Rockcor, Inc., for the Washington State Department of Commerce and Economic Development. Based on statewide gasoline consumption of 2 billion gallons per year, 200 million gallons of alcohol would be required to convert all motor fuel to gasohol.
Document Type Journal article

Citation Number	**80A002294**
Document Title	*Economics of the Production of Ethanol*
Document Author	Kremer, L.A.
Author Affiliation	Iowa State Univ. of Science and Technology, Ames (USA)
Thesis	M.S. Thesis
Publication Date	1949
Pages	233
Document Type	Thesis/Dissertion

Citation Number	**80A002295**
Document Title	*Some Economic Aspects of a Corn-alcohol Fuel Program*
Document Author	Dalton, J.J.
Author Affiliation	Iowa State Univ. of Science and Technology, Ames (USA)
Thesis	M.S. Thesis
Publication Date	1933
Pages	95
Document Type	Thesis/Dissertion

Citation Number	**80A003006**
Document Title	*Grain Alcohol in Motor Fuels; an Evaluation*
Document Author	Kendrick, J.G. Murray, P.J.
Author Affiliation	Nebraska Univ., Lincoln (USA). Agricultural Experiment Station, Institute of Agriculture and Natural Resources
Series	Nebraska Univ., Lincoln (USA). Coll. of Agriculture and Home Economics. Dept. of Agricultural Economics. Report no. 81
Publication Date	1978
Pages	7
Notes	Includes bibliography.
Abstract	A review of the energy and economic balances involved with producing ethyl alcohol from grain is presented. Conclusion of this study suggests that the energy intensive agriculture typical of farming in the U.S. precludes the use of grain as a source for ethanol that would be used as the automotive fuel supplement. The energy balance gives a credit of 121,700 Btu/gallon of EtOH while incurring a 217,200 Btu/gallon of EtOH energy consumption, showing a net loss of 95,000 Btu per gallon of product loss. (AFDB)
Document Type	Book

Citation Number	**80A003011**
Document Title	*Gasohol — Economic Feasibility Study*
Document Author	David, M.L. Hammaker, G.S. Buzenberg, R.J. Wagner, J.P.
Publisher	Development Planning and Research Associates, Inc.; Manhattan, KS, USA
Publication Date	Jul 1978
Abstract	The report presents a comprehensive, well documented investigation into the economics of large scale ethyl alcohol production from grain for use as an automotive fuel. Impacts on refinery operations, consumer prices, and agriculture are also assessed. (AFDB)
Document Type	Book

Citation Number	**80A003014**
Document Title	*Studies on the Economic Potential of On-farm Energy Production Systems; Interim Report on Possible Energy-production Alternatives in Crop/Livestock Agriculture*
Document Author	Carlson, R. Commoner, B. Freedman, D. Scott, R.
Series	Univ. of Washington. Center for the Biology of Natural Systems. Report
Publication Date	4 Jan 1979
Pages	51
Abstract	Ways to optimize economic potentials of on-farm energy production systems are developed. Advances in ethanol and biogas energy technologies are reported. Potential barriers to agricultural biomass energy production are regulations, research deficiencies, and lack of economic support. Barriers to biogas production are deficiencies in digester and transport R&D, and governmental regulations. R&D needs are defined. (EL)
Document Type	Book

Citation Number	**80A003015**
Document Title	*Economics of Gasohol*
Document Author	Litterman, M. Eidman, V. Jensen, H.
Author Affiliation	Minnesota Univ., St. Paul (USA). Dept. of Agricultural and Applied Economics
Series	Minnesota Univ. Dept. of Agricultural and Applied Economics. Economic Report ER 78-10
Publication Date	Dec 1978
Pages	87
Document Type	Book

Citation Number	**80A003040**
Article Title	*Economic and Market Aspects of Ethyl Alcohol from Sulphite Waste Liquor*
Journal	Pap. Trade J.
Volume	123
Issue	10
Pages	37-40
Publication Date	5 Sep 1946
Abstract	Prospects for development in Pacific Northwest presented; analysis of production, prices, and probable picture of ethyl alcohol industry. Before Tech. Assn. Pulp & Paper Industry. (EI)
Document Type	Journal article

Citation Number	**80A003080**
Article Title	*Motor Fuel from Molasses*
Article Author	Owen, W.L.
Journal	Sugar. Azucar (N.Y.)
Volume	39
Issue	2
Pages	24-27
Publication Date	Feb 1944
Abstract	Factors affecting cost of producing ethyl alcohol for motor fuel. (EI)
Document Type	Journal article

Citation Number	**80A003099**
Article Title	*Corn Prices and Alcohol Production*
Article Author	Wangsness, W.
Journal	Gasohol U.S.A.
Issue	4
Pages	18-21, 29

Publication Date	Sep 1979
Document Type	Journal article

Citation Number	**80A003107**
Article Title	*Small Fuel Alcohol Distillery; General Description and Economic Feasibility Workbook*
Article Author	Chambers, R.S.
Author Affiliation	ACR Process Corp. (USA)
Journal	Gasohol U.S.A.
Volume	2
Issue	3
Pages	8-15, 20-21
Publication Date	Mar 1980
Document Type	Journal article

Citation Number	**80A003116**
Document Title	*A Look at the Economic Feasibility of Converting Wood into Liquid Fuel*
Document Author	Marshall, J.E. Petrick, G. Chan, H.
Series	Canada. Forestry Service. Information Report, no. E-X-25
Publication Date	1975
Pages	47
Abstract	A review, based on U.S. and Canadian literature, of the production of liquid fuel (principally methanol and ethanol) from wood, and of the possibility for extending it in the future. The combustion of fuel alcohol is shown to create fewer pollutants than the combustion of petroleum, and it is suggested that the potential annual fuel-alcohol supply (from waste wood) may be equal to the amount of petroleum now used in Canada. Though the supply of fuel alcohol is at present restricted by production capacity and cost of production, the outlook for this renewable energy resource is considered promising, and further research is recommended on the most economic production methods.
Document Type	Book

Citation Number	**80A003122**
Document Title	*Economics of Dieselhol — a Supplement to Economics of Gasohol*
Document Author	Litterman, M. Eidman, V. Jensen, H.
Publisher	Univ. of Minnesota; St. Paul, MN, USA
Publication Date	1979
Availability	Dept. of Agriculture and Applied Economics, Univ. of Minnesota, 231 Classroom Office Bldg., St. Paul, MN 55108
Document Type	Book

Citation Number	**80A003123**
Document Title	*Economics of Gasohol*
Document Author	Litterman, M. Eidman, V. Jensen, H.
Publisher	Univ. of Minnesota; St. Paul, MN, USA
Publication Date	1978
Notes	ER 78-10
Availability	Dept. of Agriculture and Applied Economics, Univ. of Minnesota, 231 Classroom Office Bldg., St. Paul, MN 55108
Document Type	Book

IX
Use as Vehicle Fuel

Citation Number **77:001295**
Article Title *Liquid Fuels: Workshop No. 6*
Document Title Capturing the Sun through Bioconversion
Conference Conference on capturing the sun through bioconversion
Conference Place Washington, DC, USA
Conference Date 10 Mar 1976
Publisher Washington Center; Washington, DC, USA
Report Number CONF-760354
Publication Date 1976
Pages 389-392
Abstract The discussion centered on the use of methanol- and ethanol-gasoline blends and 100% methanol as automotive fuels. The advantages and disadvantages of each were outlined. Other comments concerned the economics of fuel utilization, the production of oils from biomass, and exhaust emissions from alternative fuels. (JSR)
Document Type Paper/Chapter from book

Citation Number **77:001297**
Article Title *Volkswagen Alternative Fuel Programs*
Document Title Capturing the Sun through Bioconversion
Article Author Heitland, H.
Author Affiliation Drive Train Research, Englewood Cliffs, NJ (USA)
Conference Conference on capturing the sun through bioconversion
Conference Place Washington, DC, USA
Conference Date 10 Mar 1976
Publisher Washington Center; Washington, DC, USA
Report Number CONF-760354
Publication Date 1976
Pages 403-416
Abstract Test results from VW's fleet test program on the use of gasoline — 15% methanol blend as an automotive fuel are reported. Seven anticipated problem areas are defined and the solutions found for them are outlined. (JSR)
Document Type Paper/Chapter from book

Citation Number **77:001298**
Article Title *Properties and Characteristics of Gasoline/Methanol Fuel*
Document Title Capturing the Sun through Bioconversion
Article Author Hurn, R.W.
Author Affiliation Fuel/Engine Systems Research, Energy Research and Development Administration, Washington, DC (USA)
Conference Conference on capturing the sun through bioconversion
Conference Place Washington, DC, USA
Conference Date 10 Mar 1976
Publisher Washington Center; Washington, DC, USA
Report Number CONF-760354
Publication Date 1976
Pages 425-436
Abstract The results of studies at the Bartlesville Center on the properties and characteristics of gasoline — methanol automotive fuel blends are summarized. These studies show that the blending stock must have a carefully controlled composition for successful blending, engines must be adjusted for methanol concentrations above 5 to 10%, and water contamination must be avoided. (JSR)
Document Type Paper/Chapter from book

Citation Number **78:001794**
Article Title *Use of Ethanol-gasoline Mixtures for Automotive Fuel*
Document Title Biomass: a Cash Crop for the Future
Article Author Scheller, W.A.
Conference Conference on the production of biomass from grains, crop residues, forages and grasses for conversion to fuels and chemicals
Conference Place Kansas City, MO, USA
Conference Date 2 Mar 1977
Report Number CONF-770368 —
Publication Date 1977
Pages 205-218
Abstract The properties and performance of a grain alcohol blended automotive fuel are discussed. The value of ethanol as an automotive fuel additive is also considered. It is concluded that grain alcohol has certain desirable properties when blended with unleaded gasoline such that its value as an automotive fuel component lies within the range of values for which ethanol can be produced from grain. Since grain supplies are not adequate to provide for the production of sufficient grain alcohol to blend 10 percent in all gasoline in the United States, it is concluded that the gasohol program is a regional program that will find applications in grain producing areas of our nation. (JGB)
Document Type Paper from report

Citation Number **79:004150**
Article Title *Ethanol Motor Fuels and "Gasohol"*
Article Author Sladek, T.A.
Author Affiliation Colorado School of Mines, Golden (USA)
Journal Colo. Sch. Min., Miner. Ind. Bull.
Volume 21
Issue 3

Pages	1-18
Publication Date	May 1978
Abstract	This bulletin is concerned with the development of synthetic, nonpetroleum transportation fuels from biomass, and in particular with ethyl alcohol motor fuels obtained by biomass conversion. Included is a brief survey of solar and biomass energy resources of various types, descriptions of ethanol manufacturing processes, and identification of the advantages and disadvantages of alcohol-fuel use. Special attention is given to the blend of ethyl alcohol and gasoline, which is known as "gasohol". 27 refs.
Document Type	Journal article

Citation Number	**80A000016**
Article Title	*Cars, Fuel, and Pollution*
Article Author	Crossland, J.
Journal	Environment
Volume	16
Issue	2
Pages	15-20
Publication Date	Mar 1974
Abstract	Automobile pollution control is reviewed, including add-on devices to present cars and the development of alternative, less-polluting engines. The impetus for the development of clean engines comes from the U. S. Clean Air Act which has set up standards for the emission of nitrogen oxides, hydrocarbons, and carbon monoxide. Methods to reduce internal combustion engine emissions include decreased compression ratios, lean air/fuel ratios, positive crankcase ventilation valves, exhaust gas recirculation, and catalytic converters. Catalytic converters have been criticized since they may deteriorate, reduce fuel economy, and cause additional metal pollution. The Clean Air Act has thus been the subject of controversy centered on the effectiveness of catalytic converters. Because of their fuel economy, there has been a trend toward lightweight, smaller cars. Rotary piston, stratified charge, Rankine (steam), gas turbine, diesel, and Stirling engines are being studied as low-polluting engines. By changing fuel composition, emissions can also be reduced; methane, methyl alcohol, propane, and hydrogen are being studied as fuels. The future production of low-polluting engines will depend on their technical feasibility, the willingness of the automobile industry to change their entire manufacturing process the willingness of the government to spend money on research, and the ability of the government to secure industry cooperation. (APTIC)
Document Type	Journal article

Citation Number	**80A000041**
Article Title	*Coming Diesohol?*
Journal	Sci. News
Volume	116
Pages	344
Publication Date	17 Nov 1979
Abstract	Diesel equivalent of gasohol.
Document Type	Journal article

Citation Number	**80A000043**
Article Title	*Comparative Study of Fuel-air Otto Cycle for Five Different Fuels*
Article Author	Khan, S.R. Malik, K.A.
Author Affiliation	Aligarh Muslim Univ. (India)
Journal	J. Inst. Eng. (India), Mech. Eng. Div.
Volume	56
Issue	3
Pages	123-127
Publication Date	Nov 1975
Notes	v. 56, part ME 3
Abstract	The paper is concerned with the analysis of fuel-air Otto cycle using a digital computer. Earlier work in this direction is briefly discussed and results of calculations for five different fuels, viz, octane, octene, ethanol (ethyl alcohol), ammonia, and nitromethane are presented graphically. The paper concludes that the thermal efficiency and indicated mean effective pressure continue to increase with increase in compression ratio. However, the effect on NO and CO emission is in reverse. Further, the indicated mean effective pressure decreases with increased percentage of exhaust gas recirculation and water addition. (EI)
Document Type	Journal article

Citation Number	**80A000055**
Journal	Chem. Week
Pages	49
Publication Date	28 Nov 1979
Abstract	Brazil: automobiles consumption of hydrated alcohol fuel projection, 1989.
Document Type	Journal article

Citation Number	**80A000061**
Journal	Bank of London and South America Review
Pages	604
Publication Date	Oct 1979
Abstract	Brazil: gasohol-fueled automobiles in use (w/ converted engines) projection, 1985.
Document Type	Journal article

Citation Number	**80A000062**
Article Title	*Brazil — Gearing Up to Produce the All Alcohol Car*
Journal	Bus. Week
Issue	2605
Pages	60-61
Publication Date	1 Oct 1979
Abstract	A car that can run solely on alcohol is about to go into regular production in Brazil. Already, there is approximately 20% alcohol in Brazilians' gas tanks. Predictions state that by 1985, 3 million cars, trucks, and buses, about half of the country's vehicles, will be running on sugar-based ethanol alone. At present, only 4 billion liters are being produced as opposed to a 9 billion liter production by 1985. Even though they will have to double production in alcohol, Brazil is hoping to save $1.5 billion a year in import costs. In a few months, every car maker in the country will be trying its hand at producing its first all-alcohol-powered vehicle. To change a car over to an all-alcohol model, adjustments must be made to redesign cylinder heads and preheating systems

and substitute alcohol-resistant tin for lead in fuel-line components. The amount of time it will take for the transition will depend on how fast the government can finance new privately owned distillers and establish a nationwide system of alcohol pumps. (ABI)

Document Type: Journal article

Citation Number **80A000080**
Journal: New York Times
Pages: D1
Publication Date: 14 Jun 1979
Abstract: Brazil: seen proud of alcohol fuel for cars.
Document Type: Journal article

Citation Number **80A000087**
Article Title: *Effectiveness of Fuel Cetane Number for Combustion Control in Bi-fuel Diesel Engine*
Article Author: Murthy, B.S.
Pless, L.G.
Journal: J. Inst. Eng. (India)
Volume: 45
Issue: 7
Pages: 155-183
Publication Date: Mar 1965
Abstract: Four fuels covering a broad range of cetane number were carburetted while injecting either a high or low cetane fuel. The carburation rate was about 25% of the total heat input, which was held constant for all tests. Ignition delay, as compared with full load injection only, was reduced with all except the lowest cetane fuel carburetted. Delay decreased with increasing cetane number of the carburetted fuel. Audible combustion noise was greatly reduced with the carburation of high cetane fuels when the low cetane fuel was injected. With high cetane fuel injection, the entire combustion noise level was lower. Further reductions were not evident when either high or low cetane fuel was carburetted. Concurrent carburation of fuel improved the full load thermal efficiency up to a certain cetane number range. At a carburation rate of 12% of total heat input, methanol did not fire at the compression ratio for standard ignition delay of high cetane injected fuel. The ignition delay with methanol at the higher compression ratio used when injecting the low cetane fuel was longer than with any of the other fuels tested. Audible combustion noise, peak cyclinder pressure and rate of pressure rise increased with the increasing rate of propane carburation. When low cetane fuel was injected, exhaust temperature was slightly lower and smoke density slightly higher with methanol carburation. With the injection of higher cetane fuel, the exhaust temperature was lower with carburation of all fuels compared with full load injection only. Exhaust smoke density was reduced with carburation of high cetane fuels, but was increased slightly with methanol carburation. This small effect of dual-fuel operation on exhaust smoke does not agree with large smoke reductions reported by other workers. The difference may be due to the fuels used, percentage of total heat input carburetted, combustion chamber design of the engines used and/or methods of measuring smoke density. (APTIC)
Document Type: Journal article

Citation Number **80A000096**
Article Title: *Alcohol Fuels — Can They Replace Gasoline?*
Article Author: Hill, R.
Journal: Pop. Sci.
Volume: 216
Pages: 25
Publication Date: Mar 1980
Document Type: Journal article

Citation Number **80A000100**
Article Title: *Alcohol May Be Realistic Source of Automobile Fuel*
Journal: CIM Bull.
Volume: 69
Pages: 91
Publication Date: Dec 1976
Document Type: Journal article

Citation Number **80A000103**
Article Title: *Diesel-ethanol Fuel Blends Investigated*
Journal: Automot. Eng. (N.Y.)
Volume: 87
Issue: 9
Pages: 58
Publication Date: Sep 1979
Abstract: When blended with diesel fuel, ethyl alcohol reduces engine power output, increases fuel consumption, and increases engine noise. The feasibility of blending ethanol with diesel fuel for diesel-powered farm tractors is examined using Ford and John Deere diesel tractor engines. Power and fuel consumption, and combustion in the engines are summarized. (EL)
Document Type: Journal article

Citation Number **80A000104**
Article Title: *Diesel Oil and Ethanol Mixtures for Diesel-powered Farm Tractors*
Article Author: Strait, J.
Boedicker, J.J.
Johansen, K.C.
Author Affiliation: Minnesota Univ., Minneapolis (USA)
Journal: SAE Prepr.
Issue: 790958
Pages: 15
Publication Date: 1979
Notes: Presented at meeting held Oct 1-4, 1979.
Abstract: Absolute ethanol can be mixed with No. 1 diesel oil without separation if the mixture remains free of water. Mixtures of diesel oil and up to 30 percent by volume of ethanol were used in laboratory and field experiments in diesel tractor engines. When engines were operated on fuels containing ethanol, the maximum power output of the engines was reduced, fuel consumption increased, engine noise increased, and the delay period was extended. No significant performance characteristic of the diesel engine measured in this study was improved by the use of a diesel oil-ethanol blend to replace diesel oil to fuel the engine. (EI)
Document Type: Journal article

Citation Number **80A000106**
Journal: Pop. Sci.
Pages: 90
Publication Date: Aug 1977

Abstract	Discusses advantages of methanol over gasoline for cars.
Document Type	Journal article

Citation Number	**80A000107**
Journal	Chem. Week
Pages	13
Publication Date	16 Nov 1977
Abstract	Discusses gasohol for motor fuel and tax incentives for grain growing.
Document Type	Journal article

Citation Number	**80A000109**
Journal	New York Times
Pages	11
Publication Date	29 Jan 1978
Abstract	Discusses use of alcohol fuel in cars and request government to back alcohol-from-grain plants.
Document Type	Journal article

Citation Number	**80A000121**
Article Title	*Does Alcohol Have a Place in Your Car's Future?*
Journal	Our Sun
Volume	42
Issue	1
Pages	26
Publication Date	1977
Document Type	Journal article

Citation Number	**80A000133**
Article Title	*Effect of Alcohols as Supplemental Fuel for Turbocharged Diesel Engines*
Article Author	Barnes, K.D Kittelson, D.B. Murphy, T.E.
Author Affiliation	Minnesota Univ., Minneapolis (USA)
Journal	SAE Prepr.
Issue	750469
Pages	9
Publication Date	1975
Notes	Presented at meeting held Feb 24-28, 1975
Abstract	Alcohols are examined as supplemental carbureted fuels for highspeed turbocharged diesels. Most of the work was with methanol; ethanol and isopropanol were compared at a few points. Fumigation (dual-fueling) with alcohol significantly reduced smoke and intake manifold temperature. These effects were largest at high load. Efficiency and HC emissions were essentially unchanged. Cylinder pressures and rise rates were examined for possible adverse effects on engine structure. The range of speed and load favorable to alcohol dual-fueling are such that, should alcohols become economically competitive as fuels, a practical dual-fuel system could be applied to existing diesel engines. (EI)
Document Type	Journal article

Citation Number	**80A000136**
Article Title	*Effect of Methanol on Exhaust Composition of a Fuel Containing Toluene, N-heptane, and Isooctane*
Article Author	Ninomiya, J.S. Golovoy, A. Labana, S.S.
Journal	J. Air Pollut. Control Assoc.
Volume	20
Issue	5
Pages	314-317
Publication Date	May 1970
Abstract	Variations in the chemical composition of the exhausts from a single-cylinder engine are observed when up to 25% methanol is added to a fuel blend of toluene, isooctane, and n-heptane. Under fuel-rich conditions, and with increasing methanol concentration, unburned fuel and benzene emissions increase, exhaust acetylene remains constant, and propylene, isobutylene, methane, ethylbenzene, and styrene concentrations decrease. As oxygen becomes more available, the effects of methanol are reduced, and at an equivalence ratio of 1.25 (excess oxygen now is present) methanol no longer affects the concentration of exhaust hydrocarbons. These observations are explained by the reactions of formaldehyde, an incomplete combustion product of methanol, with alkyl radicals derived from the fuel. The photochemical reactivity of the exhaust is unchanged when up to 15% of methanol is present in the fuel at an equivalence ratio of 0.85, but increases at higher methanol contents because of the increase in unburned toluene in the exhaust. (APTIC)
Document Type	Journal article

Citation Number	**80A000141**
Article Title	*Energy-ecological Characteristics of Synthetic Fuels*
Article Author	Smal, F.V. Chulkov, A.Z. Arsenov, E.E.
Journal	Solid Fuel Chem.
Volume	12
Issue	3
Pages	138-141
Publication Date	1978
Abstract	The results are given of a comparative calculation of the main energy-ecological characteristics (calorific value of the mixture, temperature and equilibrium composition of the combustion products) of synthetic fuels (hydrogen, methanol, ethanol, ammonia) as functions of the coefficient of excess air. The calculations were performed as applied to a heat engine at pressures in the isobaric semiclosed combustion chamber and at the exhaust of 80 and 1 kgf/cm^2, respectively. It is demonstrated that the highest power-weight indices are given by hydrogen, after which ethanol, methanol, and ammonia follow. For the working mixtures of heat engines of characteristic composition, ammonia and hydrogen possess the best ecological indices. (EI)
Document Type	Journal article

Citation Number	**80A000149**
Article Title	*Engines Set for Brazil Use*
Journal	Automot. Ind.
Volume	159
Pages	29
Publication Date	Aug 1979
Document Type	Journal article

Citation Number	**80A000152**
Journal	New York Times
Pages	32
Publication Date	9 Jun 1979
Abstract	Ford Motor Brazil will cooperate in 100% alcohol fuel program; modifications needed.
Document Type	Journal article

Citation Number	**80A000153**
Article Title	*Ford Motor Sets Outlays for Cars Run on Alcohol*
Journal	Wall Street Journal
Volume	101
Pages	2
Publication Date	4 Sep 1979
Document Type	Journal article

Citation Number	**80A000158**
Article Title	*Fuel Blends Create Solubility Problems*
Article Author	Ancillotti, F. Pescarollo, E.
Author Affiliation	Snamprogetti, Milan (Italy)
Journal	Hydrocarbon Process.
Volume	56
Issue	11
Pages	295-299
Publication Date	Nov 1977
Abstract	Use of alcohols in gasoline blends can raise phase separation problems due to solubility differences of the compounds in water and hydrocarbons. This paper presents results of a test program in which the solubility problems encountered in gasoline-alcohol blends with particular attention to mixtures with methanol and methyl-tert-butyl ether (MTBE). It is shown that methanol and MTBE have a quite different solubility behavior in hydrocarbons. Dry methanol can be partially soluble in fuels because of a gap in its miscibility with saturated hydrocarbons. On the other hand, there are no problems with the use of MTBE since it is soluble in all types of hydrocarbons. Moreover, MTBE has a solvent power for methanol-saturated hydrocarbon blends that exceeds that of aromatics. Thus use of MTBE can greatly reduce the amount of aromatics needed to dissolve a given amount of methanol. Extensive test data are tabulated, plotted and evaluated in practical terms. (EI)
Document Type	Journal article

Citation Number	**80A000162**
Article Title	*Fuel of the Future?*
Journal	Automot. Eng. (London)
Volume	85
Issue	12
Pages	48-52
Publication Date	Dec 1977
Abstract	Evaluations of methanol vs gasoline as an automotive fuel reveals that methanol has low heating value per unit volume; low vapor pressure and high latent heat of vaporization. Further desirable characteristics of methanol fueled engines include low emission rates, low energy consumption, high power output, satisfactory cold start behavior and good driveability. (EI)
Document Type	Journal article

Citation Number	**80A000191**
Article Title	*Gasohol Tests Are Begun by AT+T's Illinois Bell*
Journal	Wall Street Journal
Volume	100
Pages	6
Publication Date	4 Jan 1979
Document Type	Journal article

Citation Number	**80A000206**
Article Title	*Gasohol. Should It Ever Go to Sea?*
Article Author	Banse, T.P.
Journal	Boating
Volume	47
Pages	75
Publication Date	Feb 1980
Document Type	Journal article

Citation Number	**80A000214**
Article Title	*Methanol — Fuel of Future*
Journal	Automot. Eng. (N.Y.)
Volume	85
Issue	12
Pages	48-52
Publication Date	1977
Abstract	Compared with gasoline, methanol has low heating value per unit volume; high latent heat of vaporization; and low vapor pressure. A research project by Volkswagenwerk AG studied use of methanol in a single-cylinder engine, basic adjustment work on four-cylinder engines, cold-start and driving tests, emission tests, and durability tests. Laboratory studies and on-road tests are discussed. Some methanol-fueled Volkswagon Rabbit prototypes have logged more than 100,000 mi. (EL)
Document Type	Journal article

Citation Number	**80A000215**
Article Title	*Methanol — a Clean Burning Fuel for Automobile Engines*
Article Author	Mathur, H.B. Bakshi, R.K.
Author Affiliation	Indian Inst. of Tech., Hauz Khas. Dept. of Mechanical Engineering
Journal	Mech. Eng. Bull.
Volume	6
Issue	3
Pages	102-108
Publication Date	1975
Document Type	Journal article

Citation Number	**80A000217**
Article Title	*Methanol as a Gas Substitute*
Article Author	Pink, J.F.
Journal	Energy Pipelines Syst.
Volume	1
Issue	6
Pages	55-56
Publication Date	Jun 1974
Document Type	Journal article

Citation Number	**80A000219**
Article Title	*Methanol as a Motor Fuel*
Article Author	Hall, M. Harrison, G.
Journal	Pet. Rev.
Volume	31

Issue 361
Pages 11-12
Publication Date Jan 1977
Abstract Methanol can meet both engine performance and exhaust emission standards and can be produced from a wide variety of materials, and production does not necessarily depend on available supplies of crude oil. It is for these reasons that methanol as a motor fuel is being actively studied by at least 25 organizations around the world. Nine disadvantages of methanol as a gasoline extender or substitute are summarized. In principle, however, all such technical problems can be solved. It is concluded that the projected use of methanol in the developed western nations as a motor fuel could, by 1985, reach around 15 mm tons/year. This estimate is based on a 2% penetration of a 770 mm ton/year gasoline market. (EI)
Document Type Journal article

Citation Number **80A000220**
Article Title *Methanol as a Replacement for Gasoline*
Article Author McCloskey, J.P.
Journal Energy Sources
Volume 2
Issue 1
Publication Date 1975
Document Type Journal article

Citation Number **80A000225**
Article Title *Mercedes Benz of Brazil Uses Sugar Byproduct to Fuel Buses with Modified Fuel Pumps*
Journal Transports
Pages 315
Publication Date Aug 1979
Document Type Journal article

Citation Number **80A000233**
Article Title *Methanol as Gasoline Substitute Seen 'Unrealistic' by EPA Scientist*
Journal Journal of Commerce
Pages 2
Publication Date 22 May 1974
Document Type Journal article

Citation Number **80A000236**
Article Title *Methanol Engine Revs Up for Road Testing*
Journal Chem. Week
Pages 41
Publication Date 27 Feb 1980
Document Type Journal article

Citation Number **80A000238**
Article Title *Methanol Feasible as Auto Fuel*
Journal Mach. Des.
Volume 49
Pages 10
Publication Date 26 May 1977
Document Type Journal article

Citation Number **80A000241**
Article Title *Methanol/Gasoline Blends as a Motor Fuel for New Zealand*
Article Author Graham, E.E.
Judd, B.T.
Journal N.Z. Eng.
Volume 33
Issue 8
Pages 180-183
Publication Date 15 Aug 1978
Abstract An overview of the potential problems and benefits associated with the use of methanol/gasoline blends is presented. Results from tests of methanol blends in a Ricardo single cylinder engine are described along with a summary of potential materials compatability problems associated with using the blend. The solubility of methanol in a number of local gasolines with small amounts of water present was also determined. (AFDB)
Document Type Journal article

Citation Number **80A000242**
Article Title *Methanol-gasoline Blends: How Promising Are They?*
Journal Automot. Eng. (N.Y.)
Volume 82
Issue 12
Pages 38-42
Publication Date Dec 1974
Abstract Mixing a little methanol with gasoline would stretch limited petroleum supplies. However, a recent study indicating problems of increased fuel volatility, vapor locking tendency, poor throttle response and phase separation in the tank, currently eliminates the blends for motor vehicle engines.
Document Type Journal article

Citation Number **80A000243**
Article Title *Methanol Injection Cuts Costs*
Journal Hydrocarbon Process.
Volume 52
Pages 161-163
Publication Date Sep 1973
Document Type Journal article

Citation Number **80A000246**
Article Title *Methanol Gasoline Blends — Future Automotive Fuels*
Article Author Johnson, R.T.
Author Affiliation Missouri Univ., Rolla (USA)
Journal Energy (Stamford, Conn.)
Volume 2
Issue 2
Pages 27-29
Publication Date 1977
Abstract The fact that the technology exists today to construct large-scale plants to manufacture methanol from coal or waste products adds to the reasons for giving this material a thorough consideration as a liquid fuel alternative to gasoline. For the past three years, there has been a program in the Mechanical Engineering Department at the University of Missouri-Rolla to evaluate the advantages and disadvantages of methanol/gasoline blends for use as vehicle fuels. The emphasis has been on the use of these blends as possible fuels for existing and near-future United States automobiles. These studies indicate that methanol can be used with gasoline in small percentages. For methanol/gasoline blends of 15% methanol or less, the fuel chemistry is such that most internal combustion engines will operate. For this type of use, methanol could be considered a fuel extender. Two major problems that have

not been addressed in this investigation are the phase separation problems associated with methanol/gasoline blends contaminated with small amounts of water, and the corrosion problems associated with methanol and the materials normally used in automotive fuel systems. For existing vehicles no simple economic solutions to these problems are evident. (EI)

Document Type | Journal article

Citation Number **80A000247**
Article Title: *Methanol-gasoline Blends: Performance and Emissions*
Article Author: Adt, R.R., Jr.
Chester, K.A.
Pappas, J.
Swain, M.R.
Author Affiliation: Miami Univ., Coral Gables, Fla. (USA)
Journal: AIChE Symp. Ser.
Volume: 73
Issue: 165
Pages: 319-327
Publication Date: 1975
Abstract: Some steady state performance and emissions characteristics of a multicylinder, carburated engine fueled with Indolene and 10, 20, and 30% methanol-Indolene blends over a limited range of operation are presented. Within the precision of the experiments, the blend-leaning effect if found to be in agreement with elementary carburetor theory. With no engine adjustments, the torque is found to decrease with increasing blend levels, the rate of decrease becoming greater at higher blend levels. At torque and engine speed equal to those of gasoline-fueled operation: 1) brake thermal efficiency for the blends is greater than that for gasoline up to about a 30% methanol blend level; 2) NOx mass emissions are less for the blends, about 60% less for the 30% blend; 3) CO mass emissions increase with increasing blend levels; and 4) intake manifold mixture temperatures are decreased by about 10 degrees F (5.6 degrees C) for each 10% increase in methanol blend level. The monitoring of exhaust-gas oxygen emissions of individual cylinders showed that, for the operating conditions of approximately equal to 2000 rpm, approximately equal to 16 in. Hg, lean fuel-air ratios, and 10 and 20% methanol blends, the methanol addition had no significant effect on cylinder-to-cylinder fuel-air distribution. (EI)
Document Type: Journal article

Citation Number **80A000252**
Article Title: *Methylnitrite in the Exhaust from a Methanol-gasoline Fueled Automobile*
Article Author: Jonsson, A.
Berg, S.
Bertilsson, B.M.
Author Affiliation: Stockholm Univ., (Sweden). Dept. Analytical Chemistry. Arrhenius Lab.
Journal: Chemosphere
Volume: 8
Issue: 11-1
Pages: 835-841
Publication Date: 1979
Document Type: Journal article

Citation Number **80A000273**
Journal: Eur. Chem. News
Pages: 24
Publication Date: 4 Aug 1978
Abstract: Saab-Valmet tests new fuel substitutes in cars, Finland TNO develops special carburetor for ethanol-gas fuel.
Document Type: Journal article

Citation Number **80A000287**
Article Title: *Some Examples of Combustion Tests for Putting New Fuels to Practical Use*
Article Author: Ikebe, H.
Ohshima, T.
Kaneko, I.
Higuchi, I.
Asai, M.
Author Affiliation: Ishikawajima-Harima Heavy Industries Co. Ltd., Tokyo (Japan)
Journal: IHI Eng. Rev.
Volume: 9
Issue: 4
Pages: 1-8
Publication Date: Oct 1976
Abstract: For the purpose of establishing a combustion technique to put the new fuels to practical use, combustion tests were done at IHI using a test tunnel with a firing capacity of $50x10^6$kcal/h as heat input. Tests were made both on the liquid fuels including naphtha, methanol, butylene-butadiene, polymer such as atactic polypropylene and low polymer, and on the gaseous fuels including LNG and LPG. In the combustion tests, the flame characteristics comprising flame structure, temperature, emissivity, stability limit and flame shape, pollutant emissions, and flame detection were mainly investigated, and it was confirmed that the above fuels are suitable for existing boilers without any modification, or at most, with only a little change of equipment. (EI)
Document Type: Journal article

Citation Number **80A000288**
Article Title: *Some Studies on the Performance and Nitrogen-oxides Emissions Using Gasoline-methanol Blends in SI Engines*
Article Author: Sahu, O.P.
Ghosh, B.B.
Author Affiliation: Government Eng. Coll., Bilaspur (India)
Journal: J. Inst. Eng. (India), Mech. Eng. Div.
Volume: 58
Issue: ME 6
Pages: 289-293
Publication Date: May 1978
Abstract: Due to the limited resources of conventional fuels, emphasis is being given to alternative, non-conventional fuel. This paper reports a study on the effect of different blends of methanol with unleaded gasoline on a single-cylinder Briggs and Stratton engine's performance and NOx emission by varying some operating variables. Experiments were carried out at three different percentages of blends, and two compression ratios at a constant 1200 rpm. The concentration of NOx was measured with the help of Saltzman's technique. At 20% gasoline-ethanol blends, about 40% reduction of NOx emission was achieved at

	the expense of slightly higher fuel consumption. Higher thermal efficiency was also achieved by the addition of methanol at different compression ratios. (EI)
Document Type	Journal article

Citation Number	**80A000291**
Journal	Chem. Eng. News
Pages	17
Publication Date	12 Apr 1976
Abstract	Southwest Research Institute develops auto fuel system that uses methanol/gas mixture.
Document Type	Journal article

Citation Number	**80A000296**
Article Title	*Structure and Extinction of Laminar Diffusion Flames above Condensed Fuels with Water and Nitrogen*
Article Author	Seshadri, K.
Author Affiliation	California Univ., San Diego, La Jolla (USA). Dept. of Applied Mechanics and Engineering Science
Journal	Combust. Flame
Volume	33
Issue	2
Pages	197-215
Publication Date	Oct 1978
Document Type	Journal article

Citation Number	**80A000301**
Article Title	*Effects of Methanol Injection on Emission and Performance in a Carbureted SI Engine*
Article Author	Chiu, C.P. Hong, L.H.
Author Affiliation	Wisconsin Univ., Madison (USA)
Journal	SAE Prepr.
Issue	790954
Pages	9
Publication Date	1979
Abstract	A single-cylinder carburetor SI engine with a modified L type cylinder head and equipped with a fuel injector was used to inject methanol into the combustion chamber. Four series of runs at an engine speed of 2500 rpm were made. One series with different values of overall air-fuel equivalence ratio was performed with gasoline, and the other three series methanol was injected into the gasoline-air mixture. Each series of methanol injected run was supplied with the same energy input per cycle to correspond to that of the gasoline. The results of the experiments indicated that the performance (BHP) of the engine was proportional to the energy input of the mixture up to about 50% methanol injected. (EI)
Document Type	Journal article

Citation Number	**80A000302**
Article Title	*Emissions from a Methanol-fueled Single-cylinder Engine*
Article Author	Hilden, D.L.
Journal	SAE Prepr.
Issue	760378
Publication Date	1976
Document Type	Journal article

Citation Number	**80A000303**
Article Title	*Engineering Options in the Choice of Automotive Fuels in the Next Decade*
Article Author	Hurn, R.W.
Author Affiliation	Energy Research and Development Administration, Bartlesville, Okla. (USA)
Journal	SAE Prepr.
Issue	760584
Pages	9
Publication Date	1976
Abstract	Within the next decade there may be significant developments toward "new" automotive fuels — either alternative fuel forms or traditional fuels from non-petroleum sources. These include methanol as the most likely alternative fuel form, hydrocarbons from coal or from oil shale, and modified conventional fuels from either traditional or alternative sources. The characteristics of traditional fuels will not change significantly solely as a result of using synthetic crude in refinery feedstocks. Increased use of distillate transportation fuels could result in process energy savings, but, measured roughly, beyond a 1:1 distillate/gasoline ratio, increased automotive diesel demand may involve process energy penalty. (EI)
Document Type	Journal article

Citation Number	**80A000304**
Article Title	*Exhaust Hydrocarbon and Nitrogen Oxide Concentrations with an Ethyl Alcohol-gasoline Fuel*
Article Author	Jackson, M.W.
Journal	SAE Spec. Publ.
Issue	SP-254
Pages	33
Publication Date	1964
Abstract	The exhaust hydrocarbon and nitrogen oxide concentrations of a single-cylinder engine operating on a 25% wt ethyl alcohol-75% gasoline fuel are compared to those of the same engine operating on gasoline. Comparisons at an air-fuel ratio below 15.3 indicate that adding ethyl alcohol to gasoline reduces exhaust hydrocarbon concentrations but increases nitrogen oxide concentrations. At an air-fuel ratio higher than 15.3 ethyl alcohol reduces both hydrocarbon and nitrogen oxide concentrations. However, tests at the same air-fuel ratio indicate that ethyl alcohol increases surge and, in some cases, results in a power loss. To overcome these performance problems, the ethyl alcohol-gasoline fuel must be operated at about the same percent theoretical air as gasoline and comparative tests at the same percent theoretical air show that the additive has little effect on exhaust hydrocarbon and nitrogen oxide concentrations. The fuel mixture offers no promise for reducing pollution by automobiles. (Author abstract modified) (APTIC)
Document Type	Journal article

Citation Number	**80A000305**
Article Title	*Evaporative and Exhaust Emissions from Cars Fueled with Gasoline Containing Ethanol and Methyl Tert-butyl Ether*
Article Author	Furey, R.L. King, J.B.
Author Affiliation	General Motors Research Labs., Mich. (USA)

Journal SAE Prepr.
Issue 800261
Publication Date 1980
Abstract Vehicle tests showed that evaporative emissions were increased significantly by adding 10 percent ethanol to gasoline, but were increased less with 15 percent MTBE in gasoline. The quantity of ethanol or MTBE in evaporative emissions was investigated in laboratory tests. Exhaust HC, CO, and NOx emissions from a car without closed-loop fuel control were significantly lower with the ethanol and MTBE fuel blends than with gasoline. For cars equipped with closed-loop carburetors, the absolute differences in exhaust emissions among the fuels were small. Fuel economy and driveability were worse with ethanol and MTBE fuel blends than with gasoline. (SAE)
Document Type Journal article

Citation Number **80A000306**
Article Title *Fuel Droplet Size Distribution in Diesel Combustion Chamber*
Article Author Hiroyasu, H.
Author Affiliation Hiroshima, Univ. (Japan)
Journal SAE Prepr.
Issue 740715
Pages 10
Publication Date 1974
Abstract In order to determine spray droplet size in a diesel engine, fuel was injected into high-pressure, room-temperature gaseous environments with a diesel engine injection system. Droplet size was measured using the liquid immersion sampling technique with a mixture of water-methylcellulose solution and ethanol used as an immersion liquid for diesel fuel oil. The volume distribution of diesel spray droplets is well correlated with chi square distribution with freedom, phi = 8, in the range of this investigation. The Sauter mean diameter increased with increasing back pressure, with the amount of fuel in a spray, and with decrease in pump speed. An empirical correlation was developed between effective injection pressure, air density, the quantity of the fuel delivery, and the Sauter mean diameter of spray droplets. (EI)
Document Type Journal article

Citation Number **80A000307**
Article Title *Fuel Economy and Emission Characteristics of Methanol-gasoline Blends*
Article Author Bradow, R.L.
Journal SAE Prepr.
Issue 750125
Publication Date 1975
Document Type Journal article

Citation Number **80A000308**
Article Title *Kinetic Wall Quenching of Methanol Flames with Applications to Spark Ignition Engines*
Article Author Browning, L.H.
Pefley, R.K.
Journal SAE Prepr.
Issue 790676
Pages 10
Publication Date 1979
Abstract A computer model was used to predict perpendicular flame quenching distances for methanol-air mixtures at a variety of operating conditions. Quenching distances were found to decrease with increasing pressure and increasing wall temperature and increases with lean and very rich equivalence ratios, and increasing exhaust gas recirculation. (AFDB)
Document Type Journal article

Citation Number **80A000309**
Article Title *Knocking and Performance Characteristics of Low Octane Primary Reference Fuels Blended with Methanol*
Article Author Gething, J.A.
Lestz, S.S.
Author Affiliation Pennsylvania State Univ., University Park (USA)
Journal SAE Prepr.
Issue 780079
Pages 11
Publication Date 1978
Abstract Single-cylinder SI engine tests were conducted with low octane primary reference fuel (PRF) blends and methanol. The investigated parameters were equivalence ratio, and PRF octane number ranging from 100 to 53 blended with weight percentages of methanol to 75 percent. In order to evaluate the performance of these different fuels, knock intensity, effeciency and emissions were considered. Methanol can act as an effective knock suppressant in primary reference fuel blends with octane numbers as low as 53. Generally methanol-PRF blends burning under optimized conditions yield a higher efficiency than either pure isooctane or pure methanol. Methanol-low octane PRF blends appear to burn with approximately the same emissions as isooctane. (IE)
Document Type Journal article

Citation Number **80A000310**
Article Title *Methanol and Ethanol as a Motor Fuel Substitute*
Article Author Powell, T., III
Journal SAE Prepr.
Issue 750124
Publication Date Feb 1975
Document Type Journal article

Citation Number **80A000311**
Article Title *Methanol and Gasoline/Methanol Blends as Automotive Fuels*
Article Author Fleming, R.D.
Journal SAE Prepr.
Issue 750121
Publication Date 28 Feb 1975
Document Type Journal article

Citation Number **80A000312**
Article Title *Methanol and Other Alternative Fuels for Off-highway Mobile Engines*
Article Author Ecklund, E.E.
Author Affiliation Department of Energy (USA)
Journal SAE Prepr.
Issue 780459
Publication Date 1978

Abstract	Alcohols are useful in small percentage blends with gasoline, with only modest requirements placed on the engine/fuel system design. Straight alcohol is an excellent fuel in an engine optimized for it, providing cold start problems are avoided or overcome. Since alcohols have high octane ratings, they are suitable for high compression applications and thereby may have use in modified compression ignition engines which include supplemental means of igniting the fuel change. (EI)
Document Type	Journal article

Citation Number	**80A000313**
Article Title	*Methanol as a Fuel: a Review with Bibliography*
Article Author	Hagen, D.L.
Author Affiliation	Minnesota Univ., Minneapolis (USA). Department of Mechanical Engineering
Journal	SAE Prepr.
Issue	770792
Pages	33
Publication Date	1977
Abstract	A survey of recent studies and research on methanol is given within the historical context. Fuel related properties are reviewed and compared with isooctane. Combustion emissions and their variation with temperature and fuel preparation are similarly compared. Uses of methanol as a combustion fuel and recent tests in boilers, turbines, conventional and stratified charge Otto engines, and diesel engines are discussed emphasizing comparative efficiencies. Current developments on the uses of methanol directly and indirectly in fuel cells and as a feedstock for single cell protein are examined. The relevant biological, physical and chemical hazards of using methanol as a fuel are discussed together with safety precautions and treatment. A comprehensive bibliography is given covering the above topics. (EI)
Document Type	Journal article

Citation Number	**80A000315**
Article Title	*Methanol, Ethanol and Jet Fuel Emissions Comparison from a Small Gas Turbine*
Article Author	Pullman, J.B.
Author Affiliation	Santa Clara Univ., Calif. (USA)
Journal	SAE Prepr.
Issue	781013
Pages	22
Publication Date	1978
Abstract	Alcohol fuels are currently reasserting their attractiveness as feasible liquid fuel alternatives for transportation and electrical power generation. A 60 H.P. gas turbine engine has been easily converted to operate on methanol and ethanol fuels. No unusual fuel system hardware problems were experienced during 15 hours of testing with methanol and one hour of testing with ethanol. A computer model's predicted low emissions of NOx and CO for methanol were closely approximated after the installation of an air atomizing fuel nozzle. Substantial NOx reductions also resulted from ethanol fuel. Hydrocarbon unburned fuel emissions were increased with methanol and ethanol. Agreement is found with five previously reported methanol gas turbine experiments which indicate from 60% to 80% NOx reductions in comparison with distillate-type fuels. Combustor inlet temperature variation is considered as one cause of variability of reported CO emissions with methanol. Droplet size effects and increased ignition delay are considered to adversely affect methanol's CO and hydrocarbon emissions. Detailed emissions data for NOx, NO, NO_2CO and hydrocarbons are reported for several series of fuel nozzle tests with methanol, ethanol and Jet A fuels. (EI)
Document Type	Journal article

Citation Number	**80A000316**
Article Title	*Modified Fuels for Diesel Engines by Application of Unstabilized Emulsions*
Article Author	Lawson, A. Last, A.J.
Author Affiliation	Ontario Research Foundation, Mississauga (Canada)
Journal	SAE Prepr.
Issue	790925
Pages	18
Publication Date	1979
Abstract	An in-fuel-line mechanical emulsification has been developed at Ontario Research (the ORF HydroShear) which is compatible with installation in the fuel system of both light duty and heavy duty diesel engines. The HydroShear has been used to prepare both water/diesel and methanol/diesel emulsions having particle sizes of a few microns and with sufficient stability to be used in unstabilized form in the fuel management system of diesel engines. The installation of the HydroShear on 97 and 149 kW diesel engines is described, together with its mode of operation. (EI)
Document Type	Journal article

Citation Number	**80A000317**
Article Title	*Other Engines, Other Fuels: an Overview*
Article Author	Caretto, L.S.
Author Affiliation	California State Univ. (USA)
Journal	SAE Prepr.
Issue	760608
Pages	13
Publication Date	1976
Abstract	The current state of development of several alternative engines for light duty ground transportation is reviewed. Development of such engines will affect the introduction of various types of fuels, and the availability of fuels may restrict the type of engine used. The interdependence of fuel and engine types is thus considered. Although the introduction of new engines will change the fuel use pattern, continued use of present spark ignition engines will require a continued supply of high octane fuels. (EL)
Document Type	Journal article

Citation Number	**80A000318**
Article Title	*Performance of the Late Model Cars with Gasoline-methanol Fuel*
Article Author	Pudlow, G. Grinberg, L.
Journal	SAE Prepr.
Issue	780948
Pages	8

Publication Date	1978
Abstract	A test program was conducted to determine how the incorporation of 15% methanol in gasoline would affect the driveability, exhaust emissions, and fuel economy of three 1978 model automobiles. The vehicles were evaluated both with and without carburetor modifications to accomodate the methanol blend. (AFDB)
Document Type	Journal article

Citation Number	**80A000319**
Article Title	*Potential for Methanol as an Automotive Fuel*
Article Author	Tillman, R.M. Spilman, O.L.R. Beach, J.M.
Author Affiliation	Continental Oil Co., Ponca City, Okla. (USA)
Journal	SAE Prepr.
Issue	750118
Pages	6
Publication Date	1975
Abstract	Lean methanol operation reduces maximum power output somewhat from that obtained from gasoline without emission controls. Modification of gasoline operation to produce NOx emissions equivalent to those produced by methanol, however, causes the gasoline maximum power output to drop below that obtained with lean methanol. Nitrogen oxides emissions are significantly greater for gasoline than for methanol at either road load or maximum power. The differences are more pronounced at higher speeds. Carbon monoxide emissions from methanol are not greatly different from gasoline at road loads, but at maximum power there is a significant difference favoring methanol. (EI)
Document Type	Journal article

Citation Number	**80A000321**
Article Title	*Racing Experiences with Methanol and Ethanol-based Motor-fuel Blends*
Article Author	Powell, T.
Author Affiliation	Hofstra Univ., Hemstead, N.Y. (USA)
Journal	SAE Prepr.
Issue	750124
Pages	9
Publication Date	1975
Abstract	Specialized experience with alcohols as high-performance racing fuels more or less parallels World War I era results with substitute motor fuels. These indicate several types of practical operational problems with water solubility, plastics solvent action, metal corrosion and galvanic effects, low air-fuel ratios and low calorific content, and high latent heat. Simply switching to alcohol-gasoline blends in conventional automotive fuel systems and engines is not as straightforward a matter as some short-term laboratory tests might tend to indicate. Some of the modern-day racing techniques for handling alcohol fuels include: anodizing and plating of nonferrous alloy fuel system and engine castings; using solvent-resistant plastics and corrosion-resistant metals; draining and flushing out the fuel system and engine with hydrocarbon-fuel oil mixes after running; using alcohol-soluble synthetic lube oils; sealing and storage of fuel containers and tanks so as to reduce atmospheric moisture absorption; using higher-energy ignition systems to better fire the "wet" alcohol fuels at high C.R.'s; and nearly tripling and doubling the fuel system capacity. (EI)
Document Type	Journal article

Citation Number	**80A000322**
Article Title	*Role of Methanol as a Clean Fuel*
Article Author	Jackson, R.G.
Author Affiliation	Continental Oil Co., Ponca City, Okla. (USA)
Journal	SAE Prepr.
Issue	740642
Pages	6
Publication Date	1973 Methanol is produced by the combination of carbon monoxide (CO) and H_2 over a catalyst. The basic process reacts coal with steam and oxygen in a gasifier to produce heat for the reaction and a mixture of gases whose composition depends on the gasifier used. Methanol is crude methyl alcohol which will contain small concentrations of higher alcohols, dimethyl ether, and water. It has a boiling point of 148 degrees F, a vapor pressure of 4.6 psi, a heating value of about 19.5 million Btu/ton, and occupies about 7.2 barrels/ton. Because it is such a simple molecule, it has very wide combustion limits, and has low combustion temperature, it should be possible to burn it without producing any exhaust products other than CO_2 and water. (EI)
Document Type	Journal article

Citation Number	**80A000323**
Article Title	*Single-cylinder PROCO Engine Studies — Fuel and Engine Calibration Effects on Emissions, Fuel Economy and Octane Number Requirements*
Article Author	Hillyer, B.J. Wade, W.R.
Author Affiliation	Mobil Research and Development Corp. (USA)
Journal	SAE Spec. Publ.
Issue	SP-431
Pages	59-77
Publication Date	1978
Notes	SAE Prepr. 780593
Abstract	This paper reports the results of an experimental test program to define the interrelationships among exhaust emissions, fuel economy, octane requirement and fuel properties in an experimental, research, single-cylinder, fuel injected, stratified charge Ford PROCO (PROgrammed COmbustion) engine. In the first section, the unique operating characteristics of the PROCO engine are discussed, after an initial evaluation of engine operation with three different ignition system configurations. In section two, the emissions and fuel economy data obtained with five fuels with significantly different volatility properties are discussed. The fuels tested included gasolines and blends with diesel fuel and with methanol. In section three, data from an octane requirement test program are discussed. Primary reference fuel (PRF) and Full Boiling Range Unleaded Fuel (FBRU) octane requirements are presented for a series of 13 speed-load points which represents both the CVS-H cycle and certain other engine operating conditions. Subsequently, at six speed-load points, where the PRF octane require-

	ment was above 80 octane numbers, the effects of five engine operating parameters on octane requirement, exhaust emissions, fuel consumption, and power output are presented. (EI)
Document Type	Journal article

Citation Number	**80A000324**
Article Title	*A Survey of Alcohol as a Motor Fuel*
Article Author	Bolt, J.A.
Journal	SAE Spec. Publ.
Issue	SP-254
Pages	1-13
Publication Date	1964
Abstract	A bibliographical survey of information pertinent to the use of alcohol (primarily ethanol) as a S.I. engine is presented. Engine performance, octane qualities, exhaust composition and solubility data are reviewed. Data for neat alcohol and alcohol blends are considered. (AFDB)
Document Type	Journal article

Citation Number	**80A000325**
Article Title	*Synthetic Fuels for Transportation and National Energy Needs*
Article Author	Gregory, D.P. Rosenberg, R.B.
Author Affiliation	Institute of Gas Technology, Chicago, Ill. (USA)
Journal	SAE Spec. Publ.
Issue	SP-383
Pages	37-45
Publication Date	Jul 1973
Notes	SAE Prepr. 730520; SAE Trans. v. 82
Abstract	The United States petroleum supplies cannot keep up with the demands made upon them by the use of automobiles. Increased importation of oil is not a satisfactory long-term solution. Supplies of coal, nuclear, and solar energy, however, are abundant. We suggest that "clean" fuels could be synthesized from these resources by using these abundant materials. This paper examines the possibilities of making methanol, ethanol, hydrogen, and ammonia for use as vehicle fuels. In the short term, methanol and methanol-gasoline blends appear attractive. In the long term, hydrogen is ideal if its handling problems can be solved. (EI)
Document Type	Journal article

Citation Number	**80A000326**
Article Title	*Combustion and Emission Characteristics of Methanol*
Article Author	Harrington, J.A. Pilot, R.M.
Author Affiliation	Ford Motor Co.
Journal	SAE Spec. Publ.
Issue	SP-395
Pages	37
Publication Date	Jan 1975
Notes	SAE Prepr. 750420; SAE Trans. vol.84
Abstract	A single cylinder engine was used to study the combustion and emission characteristics of methanol and indolene clear fuel. Measurements on ignition delays, combustion intervals, power and exhaust emissions were made over a range of speeds, loads and air-fuel mixture ratios. The results were used to determine the difference in relative power, efficiency and emissions between the two fuels. Relative to Indolene, methanol exhibits faster overall burning rates, (shorter ignition delay periods and combustion intervals). At the same engine air flows and equivalence ratios, methanol produces more power than Indolene. Fuel consumption with methanol is higher but the energy consumption rate is lower. NO emissions with methanol are generally lower but, depending on equivalence ratio, CO and HC emissions are less than, equal to or greater than those with Indolene fuel. (EI)
Document Type	Journal article

Citation Number	**80A000327**
Article Title	*Engine Performance and Exhaust Emissions: Methanol versus Isooctane*
Article Author	Ebersole, G.D. Manning, F.S.
Author Affiliation	Phillips Petroleum Co., Bartlesville, Okla. (USA). Research and Development Department
Journal	SAE Prepr.
Issue	720692
Pages	21
Publication Date	1972
Notes	SAE Trans. vol.81
Abstract	Operating characteristics of a single-cylinder, spark-ignition engine fueled by both methanol and isooctane were determined. Engine output, indicated specific fuel consumption, and specific emissions of hydrocarbon, carbon monoxide, nitric oxide, and aldehydes were measured for both fuels and compared using performance maps. The engine output comparisons showed that lean misfire limits occurred at leaner mixtures with methanol than with isooctane and that maximum engine output levels were nearly equal for both fuels. At maximum power spark timing, methanol results in higher indicated specific fuel consumption, greater emission of aldehydes, but lower emissions of hydrocarbon and nitric oxide. Carbon monoxide emission levels are similar for both fuels. (EI)
Document Type	Journal article

Citation Number	**80A000328**
Article Title	*Exhaust Emissions from a Methanol-fueled Automobile*
Article Author	Adelman, H.G. Andrews, D.G. Devoto, R.S.
Author Affiliation	Stanford Univ., Calif. (USA). Department of Aeronautics and Astronautics
Journal	SAE Prepr.
Issue	720693
Pages	13
Publication Date	1972
Notes	SAE Trans. vol.81
Abstract	An American Motors Gremlin has been converted to low-pollution operation on methanol through the use of an exhaust-heated intake manifold, a rejetted carburetor with heat exchanger for heating of fuel-air charge, a catalytic muffler, and an exhaust-port air injector. Tests carried out at EPA laboratories demonstrated that this car surpasses the 1975-1976 federal standards for unburned HC, CO, and NOx. The low levels of HC and CO are due to lean operation and the use

of an oxidizing catalyst. The low NOx emissions are due partially to retarded spark-timing and lean operation, and, as indicated in a chemical kinetic model of NO formation, to properties of methanol that are favorable to low NO levels. Results of gas chromatograph and chemical analyses of the exhaust for organics, aldehydes, and ammonia are also discussed. (EI)

Document Type | Journal article

Citation Number **80A000329**
Article Title *Exhaust Emissions, Fuel Economy, and Driveability of Vehicles Fueled with Alcohol-gasoline Blends*
Article Author Brinkman, N.D.
Gallopoulos, N.E.
Jackson, M.W.
Author Affiliation General Motors Research Labs., Warren, Mich. (USA). Fuels and Lubricants Department
Journal SAE Prepr.
Issue 750120
Pages 27
Publication Date 1975
Notes SAE Trans. vol.84
Abstract Current national interest in alternative fuels has placed considerable emphasis on alcohols, mainly methanol and its blends with gasoline. Vehicle studies with methanol-gasoline and ethanol-gasoline blends showed that adding alcohol to gasoline without carburetor modifications decreased carbon monoxide emissions, volume-based fuel economy, driveability, and performance. Depending on the carburetor's air-fuel ratio characteristics, hydrocarbon and nitrogen oxide emissions are road octane are either increased, decreased, or not affected. These effects can be explained on the basis of changes in stoichiometry, energy content, combustion temperatures, and detonation resistance caused by the addition of alcohol to gasoline. (EI)
Document Type Journal article

Citation Number **80A000330**
Article Title *Fuels and Emissions — Update and Outlook, 1974*
Article Author Hurn, R.W.
Chamberlain, T.W.
Journal SAE Prepr.
Issue 740694
Pages 13
Publication Date 1974
Abstract The effect of ambient temperature, engine modification, and fuel composition on exhaust emissions from internal combustion engines are reviewed along with the possible advantages of alternative fuels. The ambient temperature at which hydrocarbon and carbon monoxide emissions are minimal ranges between 65 and 80 degrees F, depending on the vehicle. Nitrogen oxide emissions are relatively unaffected by ambient temperature. Catalytic converter emissions are very seriously affected by ambient temperature changes; sharp emission increases with reduced temperature occur within a very short interval during cold start. Engine modification for emissions reduction, used alone, increases the photochemical reactivity of exhaust hydrocarbons; however, in conjunction with either thermal or catalytic conversion, reactivity is lowered substantially. Increased fuel aromaticity can raise exhaust reactivity except from systems employing thermal or catalytic exhaust conversion. Inadequate fuel volatility increases hydrocarbon and carbon monoxide emissions during cold start and warmup. Among alternative fuels, methanol offers the only viable option for the 1975-1980 time frame. Gasoline mixtures containing 3-5% methanol will probably not result in significant emission differences, though pure methanol offers excellent possibilities for reducing exhaust emissions. Carburetion or fuel injection equipment suitable for general use with straight methanol are not yet available. (APTIC)
Document Type Journal article

Citation Number **80A000331**
Article Title *Ignition, Combustion and Exhaust Emissions of Lean Mixtures in Automotive Spark Ignition Engines*
Article Author Tanuma, T.
Sasaki, K.K.
Kaneko, T.
Kawasaki, H.
Journal SAE Prepr.
Issue 710159
Publication Date 1971
Notes SAE Trans. vol. 80
Document Type Journal article

Citation Number **80A000332**
Article Title *Lean Combustion of Methanol-gasoline Blends in a Single Cylinder SI Engine*
Article Author Canton, E.J.
Lestz, S.S.
Meyer, W.E.
Author Affiliation Pennsylvania State Univ., University Park (USA)
Journal SAE Prepr.
Issue 750698
Pages 11
Publication Date 1975
Abstract Blends of up to 40% by volume methanol in a methanol-gasoline fuel blend were supplied to a single-cylinder engine operating under controlled conditions. As the methanol concentration increases, the lean misfire limit is extended 0.04 Φ by using a blend containing 40% methanol compared to the base fuel. The lean misfire limit does not vary until a blend containing greater than 20% methanol is used. Torque and thermal efficiency increase significantly. Percent by volume concentrations of carbon monoxide, carbon dioxide and oxides of nitrogen do not change, although oxides of nitrogen reported as mass per power output per hour decrease. (EI)
Document Type Journal article

Citation Number **80A000333**
Article Title *Methanol as a Gasoline Extender-fuel Economy, Emissions, and High Temperature Driveability*
Article Author Wigg, E.E.
Lunt, R.S.
Journal SAE Prepr.

Issue	741008
Publication Date	1974
Notes	SAE Trans. vol. 83
Abstract	Methanol's potential as a gasoline extender has been evaluated, with data being obtained in the areas of fuel economy, exhaust emissions, and driveability. The results of tests with three cars, having carburetion spanning the range normally encountered in the existing car population, showed that methanol's effect on fuel economy and emissions could be directly related to its leaning effect on carburetion. The data suggest than any benefits in these two areas would only be significant for older, rich operating cars. A 13-car driveability study indicated that the large increase in fuel volatility which occurs with the addition of methanol to gasoline could pose serious problems. A marked increase in vapor locking tendency was observed when no front-end volatility adjustments were made to the methanol blends. Stretchiness, a lack of expected response to throttle movement, was also found with the methanol blends. This operational characteristic, being related to excessively lean operation, was more pronounced with the newer cars tested. Phase separation is also a potential problem with methanol-gasoline blends. Data are presented which show the effect of including higher molecular weight alcohols along with the methanol. Phase separation still occurred in the presence of less than 1% water. Taken as a whole, the data suggest that, if it becomes available in large quantities, the use of methanol in applications other than in motor gasoline would be preferred. (SAE)
Document Type	Journal article

Citation Number	**80A000334**
Article Title	*Methanol as Automotive Fuel — 1. Straight Methanol*
Article Author	Fleming, R.D. Chamberlain, T.W.
Author Affiliation	Energy Research and Development Administration (USA)
Journal	SAE Prepr.
Issue	750121
Pages	11
Publication Date	1975
Notes	CONF-750264-1
Abstract	A study of methanol as an automotive fuel was conducted using a single-cylinder research engine, a 4-cylinder 122-CID (2,000 cc) engine, and an 8-cylinder 350-CID engine. Results showed that when using methanol as fuel, the single-cylinder engine could operate leaner than the multicylinder engines. This difference is attributable to air-fuel mixture maldistribution associated with the multicylinder engines. Steady-state fuel economy and emissions data are presented and discussed. Results indicate that fuel economy (on an energy input basis) using methanol fuel is about 5% improved as compared to gasoline fuel economy and with substantially lower nitrogen oxides emissions for methanol. (EI)
Document Type	Journal article

Citation Number	**80A000335**
Article Title	*Methanol as a Motor Fuel or a Gasoline Blending Component*
Article Author	Ingamells, J.C. Lindquist, R.H.
Author Affiliation	Chevron Research Co., Richmond, Calif. (USA)
Journal	SAE Prepr.
Issue	750123
Publication Date	1975
Notes	SAE Trans. vol. 84
Abstract	Laboratory and road tests showed methanol to be an effective octane booster. Adding 10% methanol to unleaded gasoline raised the Road octane 2-3 numbers. However, significant deterioration in driveability tests occurred because of methanol's "leaning" effect. The water sensitivity of methanol/gasoline requires a separate fuel distribution system. Fuel storage in a vehicle must be protected from water absorption. Corrosion and degradation problems occur in the vehicle fuel system where methanol/gasoline mixtures contact lead, magnesium, aluminum, and some plastics. Methanol burned more efficiently under lean conditions than gasoline. However, the cold start problems require a separate starting fuel. Methanol is not a useful fuel additive for existing unmodified cars. Methanol could be used effectively in special vehicles designed to handle the corrosion, water absorption, and vaporization characteristics. The cost of manufacture and distribution in a separate system that overcomes the water sensitivity problem will determine the extent of methanol's use as a vehicular fuel. (SAE)
Document Type	Journal article

Citation Number	**80A000336**
Article Title	*Methanol/Gasoline Blends as Automotive Fuel*
Article Author	Allsup, J.R.
Author Affiliation	Department of Energy, Bartlesville, Okla. (USA). Bartlesville Energy Research Center
Journal	SAE Prepr.
Issue	750763
Pages	9
Publication Date	1975
Notes	CONF-7509105-1
Abstract	Ten 1974 and 1975 model vehicles were used in the study. Ambient temperature was varied from 20 degrees to 100 degrees F to determine temperature effects while using methanol/gasoline blends. Emissions were generally modified as a consequence of the fact that the addition of methanol to gasoline alters both the fuel vapor pressure and the stoichiometry of the air-fuel mixture. Fuel economy was generally decreased by methanol addition. Moderate mileage accumulation using 10% methanol fuel showed no deterioration either in emissions control or of fuel-related engine components. Driveability differences between methanol 10% blends and gasoline were detectable but were judged not to be objectionable. (EI)
Document Type	Journal article

Citation Number	**80A000337**
Article Title	*Methanol-gasoline Blends Performance in Laboratory Tests and in Vehicles*
Article Author	Crowley, A.W.

Kuebrich, J.P.
Roberts, M.A.
Koehl, W.J.
Wascher, W.L.
Wotring, W.T.

Journal: SAE Spec. Publ.
Issue: SP-395
Pages: 59
Publication Date: 1975
Abstract: Blends of up to 20% methanol in gasoline were evaluated in both engine dynamometer and controlled vehicle tests, and in a 50,000 mile road test. Vapor lock tests in six 1974 cars strongly suggested that the vapor lock tendency of methanol blends is greater than would be predicted for gasoline having the same volatility characteristics. Cold start and warm-up driveability of two 1974 cars at 70 degrees F depreciated as methanol concentration increased in base fuels of three volatility levels. Engine deposits, rusting, wear and crankcase oil performance were not significantly affected by methanol in gasoline when evaluated in four laboratory engine tests and in four-car, 50,000 mile road test. Fuel consumption was found generally to increase with increasing methanol concentration, while exhaust emissions from both vehicles and stationary engines varied as expected from the stoichiometric air/fuel ratio of the blends. With the possible exception of copper and brass, screening tests with methanol blends indicated no serious potential compatibility problems with the fuel system metals tested or with Buna N or Neoprene rubbers. Methanol solubility in gasoline was shown to be increased by co-solvent alcohols. These also increased the stability of blends to phase separation by added water, but still phase separation occurred with as little as 0.1 or 0.2% of water. (EI)
Document Type: Journal article

Citation Number **80A000338**
Article Title: *Performance of Methanol-gasoline Blends in a Stratified Charge Engine Vehicle*
Article Author: Johnson, R.T.
Riley, R.K.
Dalen, M.D.
Author Affiliation: Missouri Univ., Rolla (USA)
Journal: SAE Prepr.
Issue: 760546
Pages: 12
Publication Date: 1976
Notes: CONF-760678-9
Abstract: For the Honda CVCC vehicle tested, the addition of up to 10% methanol to the base gasolines used did not produce substantial changes in the operation of the vehicle. In terms of emissions and fuel economy, the addition of 10% methanol to the fuel produces no significant improvement or degradation of vehicle performance. An assessment of the influence of 10% methanol on the vehicle driveability would indicate a slight degradation of total driveability. (EI)
Document Type: Journal article

Citation Number **80A000339**
Article Title: *Single-cylinder Engine Evaluation of Methanol — Improved Energy Economy and Reduced NOx*
Article Author: Most, W.J.
Longwell, J.P.
Author Affiliation: Exxon Research and Engineering Co., Linden, N.J. (USA)
Journal: SAE Prepr.
Issue: 750119
Pages: 11
Publication Date: 1975
Notes: SAE Trans. v. 84
Abstract: Comparative testing of pure methanol, methanol/water blends and isooctane in single-cylinder engines has demonstrated that through proper utilization of methanol's fuel-lean combustion characteristics, it may be possible to reach CO emissions of the order of 0.1 percent and NOx emission levels of less than 100 ppm in the raw (undiluted) exhaust. Concomitant with decreased emissions are specific energy consumption improvements estimated to be in the range of 26 to 45 percent better than achievable with current gasolines and the associated low compression ratio engines and emission control systems. Despite these potential end-use technical advantages for methanol, its large scale use as an automotive fuel is precluded for at least one or two decades because of inadequate supply, the need for immense capital expenditures to increase supply and the need for special engine and fuel control designs. (EI)
Document Type: Journal article

Citation Number **80A000340**
Article Title: *Single-cylinder Engine Study of Methanol Fuel-emphasis on Organic Emissions*
Article Author: Hilden, D.L.
Parks, F.B.
Author Affiliation: General Motors Research Labs., Warren, Mich. (USA)
Journal: SAE Prepr.
Issue: 760378
Pages: 14
Publication Date: 1976
Notes: CONF-750264-3; Gen. Mot. Res. Pub. GMR-2072-R
Abstract: In all cases with methanol fueling, the unburned fuel (UBF) emissions were virtually all methanol as opposed to hydrocarbon compounds. Without special measures to overcome methanol's large heat of vaporization, UBF emissions were four times greater with methanol than those with gasoline. Similarly, aldehyde emissions were an order of magnitude greater with methanol. Modifying the single-cylinder engine intake system to improve vaporization reduced UBF emissions 80 to 90 percent with methanol and 30 to 50 percent with gasoline. Aldehyde emissions were also significantly reduced by improving mixture preparation, but remained three to four times greater for methanol than for gasoline. Blending 10 percent water with methanol resulted in: reduced engine efficiency and power, increased UBF emissions, no measurable effect on aldehyde and CO emissions, and reduced NOx emissions. (EI)
Document Type: Journal article

Citation Number	**80A000341**
Article Title	*Single Cylinder Spark Ignition Engine Study of the Octane, Emissions, and Fuel Economy Characteristics of Methanol-gasoline Blends*
Article Author	Johnson, R.T. Riley, R.K.
Author Affiliation	Missouri Univ., Rolla (USA)
Journal	SAE Prepr.
Issue	760377
Pages	12
Publication Date	1976
Notes	750264-2
Abstract	A two phase test program was carried out on a single-cylinder, fuel research engine (CFR) to determine the octane, emissions, and fuel economy characteristics of methanol-gasoline blends. General conclusions were that a blend of 10% methanol and gasoline demonstrated no significant change in the emissions or energy efficiency over the gasoline fueled engine when operated at equivalent conditions. Under some operating conditions, the addtion of methanol could increase the octane rating of the base fuel. This increase could conceivably be enough to reduce knock problems in some vehicles. (EI)
Document Type	Journal article

Citation Number	**80A000342**
Article Title	*Technical and Economical Aspects of Methanol as an Automotive Fuel*
Article Author	Koenig, A. Lee, W. Bernhardt, W.
Author Affiliation	Volkswagenwerk A.G., Wolfsburg (Germany, F.R.)
Journal	SAE Prepr.
Issue	760545
Pages	12
Publication Date	1976
Notes	CONF-760678-12
Abstract	The results of basic test series conducted on a single-cylinder engine are used to establish the reasons that advocate the introduction of methanol or methanol-gasoline blends as alternative fuel for motor-vehicle operation: lower exhaust emission concentrations, improved energy utilization, higher engine output, and improved knock-resistance. Fuel and energy consumption data are submitted for four vehicle concepts operated on methanol fuels, to establish data on the economic aspects of methanol-operated vehicles. It is apparent that the utilization of the anti-knock effects of methanol can lead to competitive gasoline-methanol blend vehicle operation at the present cost of gasoline and methanol. Vehicle operation of pure methanol would offer economic advantages over gasoline operation if gasoline is derived from coal. (EL)
Document Type	Journal article

Citation Number	**80A000343**
Article Title	*Water-cooled Volkswagen PCI-stratified Charge Engine*
Article Author	Brandstetter, W.R. Decker, G. Reichel, K.
Journal	SAE Prepr.
Issue	750869
Pages	11
Publication Date	1975
Notes	SAE Trans. v. 84
Abstract	The development of a 1600 ccm SCE with a divided combustion chamber and fuel injection into the prechamber is described. Mathematical simulation was used to study the influence of several parameters. Single and multi-cylinder engine tests were carried out to determine the most suitable fuel mass fraction for the prechamber. The effectiveness of the lean thermal reactor was measured. Vehicles were tested accordingly to the CVS-procedure. PNA emissions and octane requirements were also determined. Some limited testing was done with methanol fuel. During the test program no specific problems on components were encountered. (EI)
Document Type	Journal article

Citation Number	**80A000344**
Article Title	*Studies on Mixed Fuels — Hydrazine and Ethyl-alcohol System*
Article Author	Rastogi, R.P. Singh, H.J. Kishore, K.
Author Affiliation	Gorakhpur Univ. (India). Department of Chemistry
Journal	AIAA J.
Volume	12
Issue	2
Pages	227-229
Publication Date	1974
Abstract	Physical properties and performance characteristics were determined for hydrazine-ethyl alcohol mixtures at a number of different ratios. Mixed fuel containing 63% by weight hydrazine is stable in glass containers even for a year, whereas hydrazine as such decomposes appreciably in 10 days. The lower the hydrazine concentration, the greater the stability. The mixture was found to be a better fuel than pure hydrazine in that it has a lower surface tension, but was worse in terms of density and viscosity. Ignition delay is longer in the case of mixed fuel as compared to hydrazine, and delay increases with increase of ethyl alcohol concentration. However, the delay can be reduced by the addition of hydrazinium nitrate. The qualitative analysis of gaseous combustion products indicated the presence of nitrous oxide, hydrazoic acid, ammonia, and nitrogen. When the mixed fuel is used the only additional product is aldehyde produced by the oxidation of alcohol. This means that during the combustion of mixed fuels simultaneous reactions take place the values of performance parameters show that specific impulse, chamber temperature, and characteristic velocity all decrease with decrease in hydrazine content. The storability of the mixed fuel increases with the decrease in the concentration of hydrazine. For practical purposes, optimization is found at 70-80% by weight hydrazine. (APTIC)
Document Type	Journal article

Citation Number	**80A000353**
Article Title	*Methanol as a Gasoline Extender: a Critique*
Article Author	Wigg, E.E.
Author Affiliation	Exxon Research and Engineering Co. (USA)
Journal	Science
Volume	186
Issue	4166
Pages	785
Publication Date	29 Nov 1974
Abstract	Methanol, a synthetic fuel made from domestic coal, has projected manufacturing costs that, on an energy-equivalent basis, are comparable to synthetic gasoline and SNG. The potential sources of coal for conversion to methanol could make large quantities of the fuel becoming available for fuel usage within the next few years, however, tests conducted with vehicles at different emission control levels suggest that potential benefits with methanol blends, in the area of fuel economy and emissions, are insignificant. If methanol does not become available in large quantities, it would be most practical to use it for fuels other than motor gasoline. (ENV)
Document Type	Journal article

Citation Number	**80A000358**
Article Title	*Clean Air Car Race Winners Announced*
Journal	J. Air Pollut. Control Assoc.
Volume	20
Issue	11
Pages	764-765
Publication Date	Nov 1970
Abstract	Final results were announced on September 15th of the 1970 intercollegiate Clean Air Car Race which began August 24th at the Massachusetts Institute of Technology in Cambridge, Mass., and ended at the California Institute of Technology at Pasadena. Winners of the seven-day, 3600-mile competition were chosen in five separate classifications by power plants: internal combustion - fuel in gaseous form; internal combustion — fuel in liquid form; hybrid electric; electric and turbine. The five class winners were scored by a complex formula taking into account performance, fuel economy (thermal efficiency), actual race time, and pollution emission. In addition, an overall winner was picked by a panel of experts in the field of automotive air pollution on the basis of superior engineering and potential as an answer to the problem of air pollution from automobile exhaust. A 1971 Ford Capri which was the overall winner was powered by an internal combustion engine equipped with a fuel injection afterburner, an exhaust gas recirculator and four catalytic mufflers to clean the exhaust. It was fueled by lead-free gasoline. In the internal combustion engine fuel in gaseous form category, a 1971 Chevy Nova modified to run on liquid propane gas was the winner; in the fuel in liquid form class, the winner was a 1970 American Motors Gremlin using alcohol as a fuel. Co-winners were chosen in the hybrid electric class, and the turbine electric vehicle from MIT was in a class by itself. Car number 65 from Cornell University won the pure electric class, while all entering steamers dropped out shortly after the start of the race. All winners will be accepted into the prototype phase of the NAPCA's Clean Car Incentive Program.
Document Type	Journal article

Citation Number	**80A000359**
Article Title	*Predicted Exhaust Emissions from a Methanol and Jet Fueled Gas Turbine Combustor*
Article Author	Adelman, H.G. Browning, L.H. Pefley, R.K.
Author Affiliation	Santa Clara Univ., Calif. (USA)
Journal	AIAA Paper
Issue	75-1266
Pages	9
Publication Date	1975
Notes	AIAA/SAE 11th Propulsion Conference, Anaheim, Calif., 29 Sep — 1 Oct 1975
Document Type	Journal article

Citation Number	**80A000365**
Document Title	*Alternative Fuels for Automotive Transportation: a Feasibility Study. Volume I. Executive Summary*
Document Author	Pangborn, J. Gillis, J.
Author Affiliation	Institute of Gas Technology, Chicago, Ill. (USA)
Report Number	EPA-460/3-74-012a Contract no. 68-01-2111
Publication Date	Jul 1974
Pages	33
Abstract	The objectives of this study were to identify and characterize potenially feasible alternative fuels, to assess their economic and technical practicality and to recommend the most promising fuels for three specific time frames. A model for energy supply and demand by market sectors was devised, and cost estimates were made. It was concluded that alternative automotive fuels from domestic sources can alleviate petroleum imports. Coal, oil shale, and fissionable nuclear fuels are adequate resources, while the preferred fuels are gasoline and hydrocarbon distillates, methanol, and hydrogen. An executive summary of this study is presented. (NTIS)
Document Type	Report

Citation Number	**80A000366**
Document Title	*Alternative Fuels for Automotive Transportation: a Feasibility Study. Volume III. Appendices*
Document Author	Pangborn, J. Gillis, J.
Author Affiliation	Institute of Gas Technology, Chicago, Ill. (USA)
Report Number	PB-276 793/7ST
Publication Date	Jul 1974
Pages	115
Notes	See also Volume 1, PB-276 791, and Volume 2, PB-276 792. Also available in set of 3 reports PC E11, PB-276 790-SET.
Abstract	Contents: Appendix A. Properties of potential alternative fuels for automotive transportation — (data sheets for 18 candidate fuels and bibliography); Appendix B. Detailed process descriptions and economics for candidate fuels from coal and oil shale — (gasoline and distillate fuels from coal, gasoline and distillate fuels from oil shale, methanol from coal, and SNG from coal). (NTIS)
Document Type	Report

Citation Number 80A000368
Document Title *Automobile Air Pollution: Automotive Fuels (A Bibliography with Abstracts)*
Document Author Cavagnaro, D.M.
Author Affiliation National Technical Information Service, Springfield, Va. (USA)
Report Number PS-79/0226/5ST
Publication Date Mar 1979
Pages 143
Abstract The use of fuels and fuel additives to reduce pollution from automobiles is covered in this bibliography. The use of methyl alcohol, natural gas, methane, and hydrogen is reported. Improvements to gasoline and its properties which affect air pollution are discussed, along with studies on lead additives. (This updated bibliography contains 137 abstracts, 33 of which are new entries to the previous edition.) (NTIS)
Document Type Report

Citation Number 80A000370
Document Title *Characterization of Methanol/Gasoline Blends as Automotive Fuel — Performance and Emissions Characteristics*
Document Author Adt, R.R., Jr.
Chester, K.A.
Kurucz, C.N.
Pappas, J.
Rajan, S.
Author Affiliation Miami Univ., Coral Gables, Fla. (USA). Dept. of Mechanical Engineering
Report Number PB-277 135/0ST
Publication Date Jul 1977
Pages 204
Abstract Recent concern about environmental problems and the eventual shortage of conventional petroleum-based fuels coupled with the potential of obtaining methyl alcohol (methanol) as a product of coal gasification has brought about a recent interest in the use of methanol as a fuel. In order to assess the feasibility of using methanol as a motor vehicle fuel, either alone (neat) or as a blend in gasoline-type base stocks, its performance, emissions and practical use characteristics must be ascertained. To this end the authors and their colleagues are conducting a series of experiments which will determine methanol blend-fueledengine characteristics information. This report contains some of the results obtained to date. (Portions of this document are not fully legible.) (NTIS)
Document Type Report

Citation Number 80A000371
Document Title *Combustion Studies of Alternative Fuels. Annual Report, Fiscal Year 1975*
Document Author Kelmm, R.B.
Prasad, C.R.
Rosso, M.J., Jr.
Author Affiliation Brookhaven National Lab., Upton, N.Y. (USA)
Report Number BNL-20378
Publication Date 1975
Pages 32
Abstract A program is reported for the development of instrumentation for research on combustion phenomena in an internal combustion engine using alternate fuels. Included in the study were: (1) a single cylinder test engine capable of providing performance data and a means for observing the burning gases in situ; (2) a rapid scanning spectrometer and associated electronics that disperse and record the radiation emitted from the combustion chamber of the test engine; and (3) an experimental apparatus designed to provide absolute rate data for elementary combustion reactions. The primary results obtained in this initial phase of the program were engine performance data and spectroscopic data obtained for the operation of the test engine using methanol fuel. (NTIS)
Document Type Report

Citation Number 80A000373
Document Title *Current Status of Alternative Automotive Power Systems and Fuels. Volume I. Executive Summary*
Document Author Lapedes, D.E.
Hinton, M.G.
Meltzer, J.
Iura, T.
Author Affiliation Aerospace Corp., El Segundo, Calif. (USA)
Report Number EPA-460/3-74-013-a(v. 1)
Contract 68-01-0417
Publication Date Jul 1974
Pages 51
Abstract A summary is given of technical information collected on: (1) alternatives to the conventional internal combustion engine for automobiles; and (2) nonpetroleum-based automotive fuels derived from domestic sources. Alternative heat engines considered were gas turbine engines, Rankine cycle engines, Stirling cycle engines, diesel engines, rotary engines, and stratified charge engines. Electric and hybrid power systems were also studied, including battery and flywheel systems. Fuel candidates were: (1) synthetic gasoline and distillate hydrocarbon fuels; (2) methanol and methanol-gasoline mixtures; (3) methane (synthetic natural gas); (4) propane; (5) ethanol and ethanol-gasoline blends; (6) hydrogen; (7) ammonia; and (8) hydrazine. (NTIS)
Document Type Report

Citation Number 80A000374
Document Title *Current Status of Alternative Automotive Power Systems and Fuels. Volume III. Alternative Nonpetroleum-based Fuels*
Document Author Lapedes, D.E.
Hinton, M.G.
Meltzer, J.
Author Affiliation Aerospace Corp., El Sequndo, Calif. (USA)
Report Number EPA-460/3-74-013-c(v. 3)
Contract 68-01-0417
Publication Date Jul 1974
Pages 380
Abstract Available data are presented on possible alternative automotive fuels not derived from petroleum but obtainable from domestic resources. The fuels are characterized, their suitability for automotive use is examined, and the current status and projected status are discussed for each fuel. Detailed information is given on: (1) synthetic gasoline and distillate hydrocarbons; (2) methanol and methanol-gasoline blends; (3) methane

(natural gas and synthetic natural gas); (4) propane and butane; (5) ethanol and ethanol-gasoline blends; (6) hydrogen; (7) ammonia; (8) hydrazine; and (9) fuels reformed on-board conventional gasoline engine-powered automobiles. Overviews of general energy supply and demand trends and of energy resources for transportation in the U.S. are given.

Document Type: Report

Citation Number **80A000375**

Document Title: *Energy Carriers in Space Conditioning and Automotive Applications: a Comparison of Hydrogen, Methane, Methanol and Electricity*

Document Author: Davitian, H.

Author Affiliation: Cornell Univ., Ithaca, N.Y. (USA) Cornell Energy Project

Report Number: PB-287 999/7ST

Publication Date: Oct 1974

Pages: 33

Notes: Paper-74-6

Abstract: Petroleum and natural gas serve not only as energy resources but also as convenient energy carriers. Replacement of these resources by large, stationary power plants based on energy from fission, fusion, solar, geothermal, etc., sources creates a greatly expanded need for alternative energy carriers. Hydrogen, methane, methanol, and electricity are compared as potential future energy carriers supplying energy for two applications — space conditioning and automobiles. Several methods of employing each energy carrier in each application are investigated. The comparison is based primarily on the net efficiency of energy use and the operating costs (for energy) for each method of utilization which are computed for technology anticipated to be available in the year 2000. (NTIS)

Document Type: Report

Citation Number **80A000376**

Document Title: *Evaluation of Methyl Alcohol as a Vehicle Fuel Extender*

Document Author: Johnson, R.T.
Riley, R.K.

Author Affiliation: Missouri Univ., Rolla (USA). Department of Mechanical Engineering

Report Number: PB-251 108/7ST
Contract DOT-OS-40104

Publication Date: Aug 1975

Pages: 166

Abstract: Methyl alcohol (methanol) can be made from coal and waste products with reasonable thermal efficiency. Strong interest in blending this liquid fuel with gasoline for automotive use has developed. This research was a characterization program for the behavior of methanol-gasoline blends in spark ignition engines, particularly those used in automobiles. The program included: characterizing octane ratings of methanol-gasoline blends, a single-cylinder engine study of the effects of engine parameter variations on emissions and fuel economy of methanol-gasoline blends, and a simulated vehicle program to determine the behavior of the blends for the federal emissions test procedure. Results indicated that no substantial changes in emissions or fuel economy should be expected from operating blends of 10% or less in existing vehicles. Performance, vapor lock, phase separation, and corrosion problems are pointed out. (NTIS)

Document Type: Report

Citation Number **80A000377**

Document Title: *Experimental Results Using Methanol and Methanol/Gasoline Blends as Automotive Engine Fuel*

Document Author: Allsup, J.R.

Author Affiliation: Energy Research and Development Administration, Bartlesville, Okla. (USA). Bartlesville Energy Research Center

Report Number: BERC/RI-76/15

Publication Date: Jan 1977

Pages: 87

Abstract: Comparative emission and fuel energy economy data were generated using 1975 model vehicles adjusted for gasoline fuel and using gasoline and gasoline blended with 5 and 10% methanol; tests were made at temperatures of 20 degrees, 75 degrees, and 100 degrees F on a chassis dynamometer in a climate-controlled test chamber. Results suggest that emissions and fuel energy economy are generally affected to the extent that methanol addition affects air-fuel stoichiometry, fuel heat content, and fuel vapor pressure. The term "fuel energy economy" is used to denote calculations on the basis of fuel energy content in lieu of fuel quantity. Vehicle emissions and fuel economy were essentially unchanged during approximately 7,500 miles of road testing; no engine or fuel system component failures were encountered during that testing. Road octane measurements were made for the fuels containing 5, 10, and 15% methanol in base gasolines of 84, 87, and 91 research octane quality. Results show significantly better octane improvement in blending methanol with the lower octane fuels as compared with the improvement in blending with the higher octane fuels. Steady-state engine emission and fuel energy economy data were generated using a late model automotive engine fueled with 5, 10, 15, and 100% methanol/gasoline blend. Test variables and engine parametric adjustments included engine speed, exhaust gas recirculation rate, air-fuel ratio, ignition timing, and compression ratio. Results suggest that operation with pure methanol may allow use of high-compression engines to realize improved fuel energy economy with relatively low oxides of nitrogen emission. (NTIS)

Document Type: Report

Citation Number **80A000378**

Document Title: *Experiments with Novel Fuels for Diesel Engines*

Document Author: Marshall, W.F.

Author Affiliation: Department of Energy, Bartlesville, Okla. (USA). Bartlesville Energy Research Center

Report Number: BERC/TPR-77/8

Publication Date: Feb 1978

Pages: 7

Abstract: Engine tests were conducted with two fuels that would be considered as novel for use in diesel engines. The fuels, methanol and a water/diesel

fuel emulsion, were used in this study because of their potential for reductions in exhaust emissions. The test results showed that these fuels yield no advantages over standard diesel fuel with respect to emissions of unburned hydrocarbons and oxides of nitrogen. Although smoke and carbon monoxide emissions were reduced with the use of the water/fuel emulsion, the same effect could also have been achieved via engine adjustment. (NTIS)

Document Type	Report

Citation Number	**80A000380**
Document Title	*Formation of NO and No_2 in the I.C. Engine Combustion of Methyl Alcohol and Fuel-nitrogen Doped Methyl Alcohol*
Document Author	Prasad, C.R. Davis, R.E. Klemm, R.B. Brateman, J.M.
Author Affiliation	Brookhaven National Lab., Upton, N.Y. (USA)
Report Number	BNL-22444 Contract EY-76-C-02-0016
Publication Date	Jan 1977
Pages	15
Abstract	Measurements of NOx levels in the exhaust gas from a CFR engine fueled with methyl alcohol are reported. The results showed that the dominant form of NOx for lean combustion conditions was NO_2. The significance of this observation is discussed. Also, the conversion to NOx of several added "fuel-nitrogen" compounds was studied. The data for the conversion of pyridine, di-ethylamine, and acetonitrile added to methyl alcohol were qualitatively similar showing equal to or greater than 50 percent conversion for lean operation but less than 50 percent conversion for rich operation. (NTIS)
Document Type	Report

Citation Number	**80A000381**
Document Title	*Feasibility Study of Alternative Fuels for Automotive Transportation. Volume I. Executive Summary*
Document Author	Kant, F.H. Cahn, R.P. Cunningham, A.R. Farmer, M.H. Herbst, W.
Author Affiliation	Exxon Research and Engineering Co., Linden, N.J. (USA)
Report Number	PB-235 581/6 Contract EPA-68-01-2112
Publication Date	Jun 1974
Pages	29
Notes	Paper copy also available in set of 3 reports as PB-235 580-SET.
Abstract	Highlights of a study dealing with alternative liquid fuels derived from domestic coal and oil shale are discussed. Economic, technical, and performance criteria are considered for gasolines, distillates, and methanol for the time period 1975-2000. Estimated cost for producing the fuels is covered as well as safety, toxicity, reliability, compatibility with various engines, and convenience of use. (NTIS)
Document Type	Report

Citation Number	**80A000382**
Document Title	*Feasibility Study of Alternative Fuels for Automotive Transportation. Volume II. Technical Section*
Document Author	Kant, F.H. Cahn, R.P. Cunningham, A.R. Farmer, M.H. Herbst, W.
Author Affiliation	Exxon Research and Engineering Co., Linden, N.J. (USA)
Report Number	PB-235 582/4 Contract EPA-68-01-2112
Publication Date	Jun 1974
Pages	238
Notes	Paper copy also available in set of 3 reports as PB-235 580-SET.
Abstract	This study identifies feasible and practical alternatives to automotive fuels derived from petroleum for the 1975-2000 time period. The alternative fuels are liquids derived from domestic coal and oil shale — specifically, gasolines, distillates, and methanol. Fuels were screened on the basis of economic, technical, and performance criteria, with consideration given to the way in which each fuel could be brought into general use. Consideration was given to the environmental impact of producing and using the fuels. Feasible and practical alternative automotive fuels were identified and gasoline-type and distillate-type fuels from oil shale together with gasoline-type, distillate-type, and methanol fuels from coal were evaluated in detail. Safety, toxicity, reliability, compatibility with different engines, and convenience of use were considered. (NTIS)
Document Type	Report

Citation Number	**80A000392**
Document Title	*Lawrence Livermore Labs Contribution to the AEC Methanol Report*
Document Author	Anderson, C.J. Berger, B. Carlson, J. Crothers, W. Gregg, D. Grens, J. Pasternack, A.
Author Affiliation	California Univ., Livermore (USA). Lawrence Livermore Lab.
Report Number	UCID-16442
Publication Date	18 Jan 1974
Abstract	The introduction of methanol into the automotive market by way of large scale demonstration programs with and without using retrofit devices is considered. The technical problems anticipated in such a program are reviewed including the environmental impact and the effect on oil imports. (AFDB)
Document Type	Report

Citation Number	**80A000395**
Document Title	*Methanol as a Fuel*
Document Author	Yamamoto, T.
Report Number	UCRL-Trans-10697
Publication Date	1973
Pages	16
Notes	Translated from Sekiyu Gakkaishi.

Abstract	The significant difference between methanol fuel and hydrocarbon fuel is that the latter has a heating value of 10,000 cal and the former has 5,000 cal, one half of the latter, and the latter has 50-100 cal of latent heat of vaporization and the former has a great latent heat of vaporization of 263 cal. Moreover, methanol is soluble in water and sensitive to various kinds of chemical reaction. These properties are drawbacks as a fuel. However, they are changed into advantages by suitable application and treatment. The following uses for methanol are discussed: 1) source material for hydrogen; 2) fuel for small scale electricity generation by fuel cells; 3) fuel for a boiler which does not produce NOx; 4) fuel for a non-polluting car; 5) resources for city gas; 6) use for the production of deoxidizing gas in metallurgy; and 7) use for the synthesis of protein from methanol feeding microbes. These usages make use of the special properties of methanol and can display the true value of methanol as a fuel. It is not fair to compare methanol with petroleum fuel or LNG only from the standpoint of the heating value. Recently the discussion on the economical comparison of LNG with imported methanol which is produced in great amounts in the place of production of natural gas is prevailing. It is clear that methanol has an advantage when it is used for the previously stated purposes. (NTIS)
Document Type	Report
Citation Number	**80A000397**
Document Title	*Methanol as an Automotive Fuel: a Summary of Research in the M.I.T. Energy Laboratory*
Document Author	Donnelly, R.G. Heywood, J.B. LoRusso, J. O'Brien, F. Reed, T.B.
Author Affiliation	Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.
Report Number	MIT-EL-76-013 PB-262 980/6ST
Publication Date	Apr 1976
Pages	57
Abstract	The current status of studies on the use of methanol blends as automotive fuels is briefly reviewed. Experiments with a single-cylinder spark-ignition engine demonstrated that methanol-gasoline blends show emissions and efficiency closely comparable to gasoline alone and that the blends yield a slight extension of the lean limit of operation. Methanol alone significantly extends the lean limit of operation and permits operation at much higher compression ratios with corresponding improvements in efficiency. Substantial changes to conventional carburction technology would be required to obtain acceptable engine start-up characteristics, however. Studies of the phase stability of methanol-gasoline blends have quantified the tendency for traces of water to cause separation of blends into organic and aqueous phases as temperature drops, and this is shown to be a strong function of methanol content, water content, gasoline composition and added solubilizer for methanol/water. It was found possible to enhance the solvent power of gasoline with addition of various solubilizers such as t-butyl alcohol and benzyl alcohol, although significant quantities of solubilizers were in some cases necessary. Also described are the information and proposal activities of the methanol group of the MIT Energy Laboratory and the development of a proposal for a fleet test program. (NTIS)
Document Type	Report
Citation Number	**80A000398**
Document Title	*Methanol as an Automotive Fuel with Special Emphasis on Methanol-gasoline Blends*
Document Author	Landman, A.
Author Affiliation	Transportation Systems Center, Cambridge, Mass. (USA)
Report Number	DOT-TSC-OST-74-38 DOT-TSC-OST-77-31 PB-270 401/3ST
Publication Date	Apr 1977
Pages	89
Abstract	This report reviews the available information on methanol as related to its potential use as an automotive fuel. Information gaps critical to assessment and future decisions are delineated and suggestions made for necessary R&D efforts. In this context, methanol is characterized and the results of various studies on methanol and methanol-gasoline blends, throughout the United States and elsewhere, are presented and compared. These studies encompass fuels and their use and effects in engines and vehicles. Cost information, although limited, is given as available. The report also describes and summarizes methanol production processes; their promise and expansion possibilities in relation to potential requirements. Various raw material sources are considered in the light of future production potential needs. (NTIS)
Document Type	Report
Citation Number	**80A000399**
Document Title	*Methanol Engine: a Transportation Strategy for the Post-petroleum Era*
Document Author	Vantine, H.C. Chang, J. O'Connell, L.G. Rubin, B. Westbrook, C.
Author Affiliation	California Univ., Livermore (USA). Lawrence Livermore Lab.
Report Number	UCRL-52041 Contract W-7405-Eng-48
Publication Date	25 Mar 1976
Pages	34
Abstract	Several types of heat engines are considered as candidates for a methanol engine. Of those considered, the stratified-charge engine appears to be the most attractive. A stratified-charge engine optimized for methanol fuel is projected to result in an energy economy advantage of 44 to 71 percent (measured in miles per Btu) in comparison to an Otto engine operating on gasoline. This advantage arises from (1) the high octane rating of the fuel, which allows a high compression ratio to be used; (2) methanol's fuel-lean combustion characteristics, which allow efficient lean operation; and (3) the low flame temperature, which

allows effective control of nitrogen oxide emissions. The design and optimization of a methanol engine are examined in terms of an experimental and calculational program. The relevant properties of methanol that should prove desirable in future engines are noted, and the socioeconomic impact of methanol-fueled transportation is discussed. (NTIS)

Document Type	Report

Citation Number	**80A000402**
Document Title	*Use of Methanol in Transportation*
Document Author	Crothers, W.T.
Author Affiliation	California Univ., Livermore (USA). Lawrence Livermore Lab.
Report Number	UCID-16528(Rev. 1) Contract W-7405-eng-48
Publication Date	3 Feb 1975
Pages	37
Notes	See also UCID-16442
Document Type	Report

Citation Number	**80A000403**
Document Title	*Practical Approach to the Introduction of Alternative Automotive Fuels*
Document Author	Crothers, W.T. Anderson, C.J.
Author Affiliation	California Univ., Livermore (USA). Lawrence Livermore Lab.
Report Number	UCRL-51779
Publication Date	14 Mar 1975
Pages	23
Abstract	Current automobiles with minor mechanical changes (including a novel fuel tank) and an advanced closed-loop computer-controlled fuel and ignition management system can facilitate the introduction of alternate fuels, particularly methanol, while simultaneously providing higher efficiency and lower emissions. An economic evaluation is given, and areas needing further research and development are discussed. (NTIS)
Document Type	Report

Citation Number	**80A000404**
Document Title	*Project Plan for Reliability Fleet Testing of Alcohol/Gasoline Blends*
Corporate Author	Aerospace Corp. (USA)
Author Affiliation	Department of Energy, Washington, D.C. (USA). Officc of Transportation
Report Number	HCP/M2184-01 (REV), UC-96
Publication Date	30 Mar 1979
Pages	32
Abstract	The Alternative Fuels Utilization Program of the Office of Transportation Program is sponsoring a series of fleet operations designed to demonstrate the technical feasibility of using 10% blends of ethanol or methanol in current production spark ignition vehicles. The program plans for setting up such an operation are presented. (AFDB)
Document Type	Report

Citation Number	**80A000409**
Document Title	*Study of Decomposed Methanol as a Low Emission Fuel — Final Report*
Document Author	Pefley, R.K. Saad, M.A. Sweeney, M.A. Kilgroe, J.D. Fitch, R.E.
Report Number	PB-202 732
Publication Date	30 Apr 1971
Document Type	Report

Citation Number	**80A000412**
Article Title	*Phase Instability in Methanol-gasoline Blends*
Article Author	Valencia-Chavez, J.A. Donnelly, R.G.
Author Affiliation	Massachusetts Inst. of Tech., Cambridge (USA)
Journal	AIChE Symp. Ser.
Volume	73
Issue	165
Pages	312-318
Publication Date	1975
Abstract	This paper is concerned with the problem of phase stability of methanol-gasoline blends. The tendency for traces of water to cause separation into organic and polar (aqueous) phases at a particular temperature has been shown to be a strong function of methanol content, of water content, of gasoline composition (brand to brand comparison), and of added solubilizer for methanol/water. In general it is possible to find solubilizers which enhance the solvent power of gasoline for methanol and water, with notable effectiveness having been demonstrated for an aromatic alcohol and a branched aliphatic alcohol. Specifically, for a blend of summer formula gasoline, 15% methanol, and 5% benzyl alcohol as solubilizer, it should be possible to tolerate 0.3% to 0.4% water in the northeast during the summer without problems of phase separation. (EI)
Document Type	Journal article

Citation Number	**80A000413**
Article Title	*On-board Sensor for Percent Alcohol*
Article Author	Hile, J.W. Rabe, P.R.
Author Affiliation	General Motors Research Labs., Warren, Mich. (USA)
Journal	IEEE Trans. Veh. Technol.
Volume	VT-27
Issue	3
Pages	142-144
Publication Date	Aug 1978
Abstract	Ethanol additions to the Brazilian fuel supply are seasonal and regionally variable. Thus cars in Brazil must now function with gasoline/alcohol mixtures ranging in alcohol content from 0 percent to 30 percent. A sensor system is described which measures the on-board alcohol concentration so that carburetion and/or spark timing corrections can be made for optimal engine operation. (EI)
Document Type	Journal article

Citation Number	**80A000414**
Article Title	*Other Aspects of MTBE/methanol Use*
Article Author	Dartnell, P.L. Campbell, K.
Author Affiliation	Assoc. Octel Co., Buckinghamshire (UK)
Journal	Oil Gas J.
Volume	76
Issue	46
Pages	205-206, 211-212

Publication Date	13 Nov 1978
Abstract	The high octane qualities of methanol and methyl tertiary butyl ether (MTBE) have focused attention on these compounds as motor gasoline components. However, this article considers other facets of their characteristics and availability, particularly within the context of Western European fuel needs. For example, the use of methanol, even at 10% volume, introduces several undesirable effects connected with air/fuel ratio, volatility, water solubility, and corrosion. The effect of different levels of MTBE addition on a typical gasoline distillation is also discussed. (EI)
Document Type	Journal article

Citation Number	**80A000415**
Article Title	*Performance and NOx Emissions of Spark Ignited Combustion Engines Using Alternative Fuels — Quasi One-dimensional Modeling; Methanol Fueled Engines*
Article Author	Rubin, M.B. McLean, W.J.
Author Affiliation	Cornell Univ., Ithaca, N.Y. (USA). Sibley School of Mechanical and Aerospace Engineering
Journal	Combust. Sci. Technol.
Volume	18
Issue	5-6
Pages	199-206
Publication Date	1978
Abstract	A thermodynamic model employing a one-dimensional semi-empirical flame speed was used to evaluate methanol as a reciprocating engine fuel. The empirical parameters in the flame speed were determined by matching computed combustion durations with experimental values reported in the literature. Satisfactory agreement was obtained between predicted and measured values for power, efficiency and NOx emissions. Improved fuel economy without excessive NOx emissions can be obtained by employing methanol-water blends at high compression ratios. (EI)
Document Type	Journal article

Citation Number	**80A000418**
Article Title	*Use of Methanol as a Motor Vehicle Fuel*
Article Author	Cassady, P.E.
Author Affiliation	Mathematical Sciences Northwest, Inc., Bellevue, Wash. (USA)
Journal	Am. Chem. Soc., Div. Fuel Chem., Prepr.
Volume	20
Issue	2
Pages	59-70
Publication Date	1975
Notes	Meeting was held in Philadelphia, Pa, Apr. 6-11, 1975
Abstract	This is a report prepared for the city of Seattle by Mathematical Sciences Northwest, Inc. on the investigations of the possibility of blending portions of methanol with gasoline to extend the supply of motor vehicle fuel. The sections of this report are summarized, together with pertinent references under the following headings: fuel consumption; power or acceleration; vapor pressure; solubility; separation; octane number; subjective road tests; corrosion and compatibility; modifications and reliability; emissions; carbon monoxide emissions; hydrocarbon emissions; and oxides of nitrogen emissions. The above considerations are discussed separately for blends of methanol and gasoline, and pure methanol. (EI)
Document Type	Journal article

Citation Number	**80A000435**
Document Title	*Methanol Fuel Modification for Highway Vehicle Use*
Document Author	Keller, J.L. Nakaguchi, G.M. Ware, J.C.
Author Affiliation	Union Oil Co. of California, Brea (USA)
Report Number	DOE Report HCP/W3683-18
Publication Date	Jul 1978
Pages	367
Abstract	Thirty-six problems that might occur if methanol were used as a blending stock or replacement for gasoline in present cars are identified and characterized according to the probability of their occurrence and the severity of their consequences. Some problems are responsive to fuel modification, but others require modification of vehicles and the bulk fuel distribution system. Two major problems with blends — fuel separation on exposure to water and increased tendency to vapor lock — can be alleviated by incorporation of cosolvent higher alcohols. Methanol fuels require some modification of gasoline engines. If such modifications were made, starting cars at low temperatures then becomes a major problem. Other problems with blends and methanol-rich fuels can be treated with selected additives. Some observations have been made on differences between methanol and ethanol in gasoline blends. To accelerate progress toward the development of practical alternative fuels, areas for further R&D are recommended. (EL)
Document Type	Report

Citation Number	**80A000436**
Document Title	*Methanol, the Future in Motorized Transportation*
Document Author	Lachmirowicz, M.
Report Number	UCRL-Trans-10926
Publication Date	1975
Pages	16
Notes	Translated from Przem. Chem.
Abstract	The continuous development of motorized transportation demands the development of sources of motor fuels to be used in place of those presently produced from crude oil. Such a replacement fuel may be methanol, which, in many aspects, is better than the currently used fuels. The use of methanol as a motor fuel is discussed with respect to: (1) replacing gasoline; (2) faults and disadvantages; (3) use in high compression engines; (4) current production techniques; (5) raw material bases; (6) price forecasting relative to other fuels; and (7) the specific situation of Poland as a producer of methanol. (NTIS)
Document Type	Report

Citation Number	**80A000441**
Document Title	*Physical Properties of Gasoline/Methanol Mixture*
Document Author	Eccleston, B.H.

	Cox, F.W.
Author Affiliation	Department of Energy, Bartlesville, Okla. (USA). Bartlesville Energy Research Center
Report Number	BERC/RI-76/12
Publication Date	1977
Pages	79
Document Type	Report

Citation Number	**80A000448**
Article Title	*A Fundamental Model Predicting Fuel Consumption, NOx and HC Emissions of the Conventional Spark-ignited Engine*
Article Author	Lavoie, G.A. Blumberg, P.N.
Author Affiliation	Ford Motor Co., Dearborn, Mich. (USA). Engineering and Research Staff
Journal	Combust. Sci. Technol.
Volume	21
Pages	225-258
Publication Date	1980
Abstract	A model of the four-stroke S.I. engine cycle has been developed which predicts fuel consumption, NOx and HC emissions as a function of engine design and operating conditions. The model is primarily thermodynamic in nature containing no formal spatial dependence. The major new features of the model are: first, a treatment of heat transfer which confines heat losses to a boundary layer region surrounding a central adiabatic core; second, an integral boundary-layer analysis of in-cylinder burnup of quenched hydrocarbons; and third, a calculation of exhaust port HC oxidation which considers the temperature history of each element of gas leaving the cylinder. The main adjustable parameters of the model relate to the rate of heat transfer and the ratio of the two-plate quench to the single-wall thickness. An extensive comparison of model predictions with experimental CFR engine data is presented. The results show excellent agreement between predicted and experimental fuel consumption and NOx emissions. Predicted trends of HC emissions were excellent for variations in spark timing, EGR, and A/F ratio for stoichiometric and lean conditions, while under rich conditions, predicted HC levels fell below experiment. Only fair agreement with experiment was obtained for HC predictions under conditions of varying speed and load. The adjusted ratio of initial one-wall to two-plate quench thickness in the present calculations was found to be six times the expected laminar value, suggesting that the actual process of quenching and in-cylinder burnup is more complex than the essentially laminar, single-step kinetics treatment employed or that additional sources of HC are present which have not been taken into account in the model.
Document Type	Journal article

Citation Number	**80A000454**
Document Title	*Status of Alcohol Fuels Utilization Technology for Highway Transportation*
Corporate Author	Mueller Associates, Inc., Baltimore, Md. (USA)
Report Number	HCP/M2923-01 Contract EC-77-X-01-2923
Publication Date	Jun 1978
Pages	143
Notes	Prepared for U.S. Department of Energy, Assistant Secretary for Conservation and Solar Applications, Division of Transportation Energy Conservation.
Abstract	The current status of the technology (ies) of alcohol utilization in highway transportation is reviewed. Methanol, ethanol and certain of their derivatives are treated. The results of engine, vehicle and fuels testing are summarized. The topics of exhaust emissions, performance and fuel economy, vehicle driveability, fuel systems materials compatibility, engine and vehicle design, fuels characterization and environmental considerations are discussed in depth, based upon the most recent data available at the time of this writing. The status of the technology at the time of the last comprehensive surveys (1974) is summarized and discussed in greater detail in an appendix to this report. Significant advances made since that time are delineated, as are remaining information gaps and areas in which more extensive investigation is still needed. An appendix is provided which describes the salient properties of selected alcohols and alcohol-derived fuels. (AUTHOR)
Availability	NTIS
Document Type	Report

Citation Number	**80A000458**
Document Title	*Engine Improvement Possibilities and Environmental Consequences of Alcohol Uses*
Corporate Author	Santa Clara Univ., Calif. (USA)
Report Number	Contract EC-78-C-03-1737
Publication Date	20 Oct 1978
Pages	28
Notes	Prepared for the DOE Contractor's Coordination Meeting, Dearborn, MI, October 17-20, 1978.
Document Type	Report

Citation Number	**80A000461**
Article Title	*Environmental Aspects of Alternative Fuels Utilization for Highway Vehicles*
Document Title	Environmental Control Symposium
Article Author	Anderson, C.J.
Author Affiliation	California Univ., Livermore (USA). Lawrence Livermore Lab.
Conference	Environmental Control Symposium
Conference Place	Washington, DC, USA
Conference Date	28 Nov 1978
Report Number	CONF-781109-22 Contract W-7405-ENG-48
Publication Date	25 Oct 1978
Pages	16
Abstract	DOE programs in alternative fuels utilization for highway vehicles emphasize a shift to non-petroleum-derived transportation fuels. Some of the primary sources being considered are coal, oil shale, and biomass. The resultant synthetic liquid hydrocarbon fuels may or may not be identical to those derived from petroleum; the alcohols and hydrogen are certainly quite different. The paper briefly reviews a number of environmental issues that have arisen in the alternative fuels utilization program. Some concerns are probably real; others are only rumored or feared. Some of the various projects that have been undertaken to resolve these issues are described. The accom-

plishments of these programs to data are emphasized (in some ways some of these fuels may be superior to existing fuels) and needs for further work are identified. (NTIS)

Document Type | Paper from report

Citation Number **80A000464**
Article Title *Constraints and Opportunities: Alcohol Replacement of Petroleum Fuels*
Document Title Proceedings Forest and Field Fuels Symposium
Article Author Osler, C.F.
Author Affiliation InterGroup Consulting Economists Ltd., Winnipeg, Manitoba (Canada)
Conference Forest and field fuels symposium
Conference Place Winnipeg, Manitoba, Canada
Conference Date 13 Oct 1977
Publisher Biomass Energy Institute, Inc.; Winnipeg, Manitoba, CA
Report Number CONF-7710156
Publication Date 1977
Pages 1-15
Abstract A series of charts outlines the constraints and opportunities of alcohol replacement of petroleum fuels in Canada. Information is supplied on several topics, including: alcohol versatility, crude oil supply, liquid fuel policy options, future gasoline prices, alcohol transport markets, alcohol-gasoline blend options, an overview of alcohol transport fuel options giving petroleum replacement impacts, an economic evaluation, and governmental leadership. Alcohol fuel value increases as petroleum prices rise. Problems with alcohol replacement of petroleum fuels include a widespread mobile market, the possible concentration of coal-based methanol instead of biomass methanol, and a lack of clear incentives on the institutional level. (EL)
Document Type Paper from report

Citation Number **80A000465**
Article Title *A Petroleum Industry Overview of the Use of Alcohols as Automotive Fuels*
Document Title Proceedings Forest and Field Fuels Symposium
Article Author Affleck, W.
Author Affiliation Shell Oil Co. (Canada)
Conference Forest and field fuels symposium
Conference Place Winnipeg, Manitoba, Canada
Conference Date 13 Oct 1977
Publisher Biomass Energy Institute, Inc.; Winnipeg, Manitoba, CA
Report Number CONF-7710156
Publication Date 1977
Pages 1-16
Abstract Distinctive features of alcohols used as fuels are reviewed. Stoichiometry, volatility, and octane quality of alcohols affect performance in the engine. Miscibility, phase separation, corrosion, and volatility affect the practicality of alcohol fuel use. The issues of why there has never been an enduring and widespread use of alcohols as motor fuels, and whether the motivation is sufficiently strong for Canada to reverse this trend, are addressed. The numerous and sometimes contradictory results of car and engine tests using alcohol based fuels are summarized. None of the current studies indicate a cost breakthrough that would make methanol cheap enough for the oil industry to use it. The significant differences between alcohols and hydrocarbons are detailed. (EL)
Document Type Paper from report

Citation Number **80A000467**
Article Title *Ethanol as a Petroleum Extender and Additive in Automotive Engines (Alternative Fuels from Plants)*
Document Title Proceedings...53rd Annual Congress, South African Sugar Technologists Association
Article Author Buchanan, E.J.
Author Affiliation South African Sugar Association, Experimental Station, Mount Edgecombe (South Africa)
Conference 53rd annual congress, South African Sugar Technologists' Association
Conference Date 1979
Publication Date 1979
Pages 10-17
Document Type Paper/Chapter from book

Citation Number **80A000469**
Article Title *Present Experience with Stratified Charge Engines Working with Initial Separation of Mixture Components*
Document Title Proceedings, Stratified Charge Engines Conference
Article Author Siegfried, M.J.
Author Affiliation Institute of Mechanical Engineers, London (UK). Division of Automobile and Combustion Group
Conference Stratified charge engines conference
Conference Place London, England
Conference Date 23 Nov 1976
Publication Date 1977
Pages 81-87
Abstract The advantages and disadvantages of charge stratification and charge separation in the modern diesel engine are described. The mechanism of exhaust gas odor is described and control methods are considered. Three possible remedies for odor are 1) heating the air intake, 2) restricting the air intake, and exhaust gas recirculation. These methods, individually, or in combination also reduce levels of unburned hydrocarbons and nitrogen oxides (NOx) levels. Tests with methanol as a fuel revealed an absence of soot, reduced NOx emissions, but higher carbon monoxide (CO) levels than with diesel fuel. (APTIC)
Document Type Paper/Chapter from book

Citation Number **80A000470**
Article Title *Methanol and Methanol-gasoline Blends as Automotive Fuels*
Document Title Combustion Institute, Central States Section: Spring Meeting. Mimeographed Papers
Article Author Most, W.J.
Wigg, E.E.
Author Affiliation Exxon Research and Engineering Co. (USA)
Conference Combustion Institute, Central States Section: Spring meeting
Conference Place Columbus, OH, USA
Conference Date 5 Apr 1976
Publisher Combustion Institute; Pittsburgh, PA, USA
Publication Date 1976
Pages 36
Notes Sponsored by Combustion Institute, Pittsburgh, PA.

Abstract: Methanol gasoline blends offer no technical advantage, but straight methanol does appear to have technical promise as a future fuel. It was found that methanol-water blends showed the most promise. The near-term economics and supply capacity for methanol is not favorable. When viewed against the background of a total energy system utilizing domestic coal to produce liquid fuels, methanol does appear to be competitive with a synthetic-crude-oil-to-gasoline system. More precise definition of the end-use conversion efficiencies are required before a final judgment can be made. Fuel economy comparisons for various blends are given. (EI)

Document Type: Paper/Chapter from book

Citation Number: 80A000471

Article Title: *New S.I. Engine Fuel System's Approach; Performance and Emissions*

Document Title: Combustion Institute, Central States Section: Spring Meeting. Mimeographed Papers

Article Author: Dimitroff, E.
Vitkovits, J.A.

Author Affiliation: Southwest Research Inst., San Antonio, Tex. (USA)

Conference: Combustion Institute, Central States Section: Spring meeting

Conference Place: Columbus, OH, USA

Conference Date: 5 Apr 1976

Publisher: Combustion Institute; Pittsburgh, PA, USA

Publication Date: 1976

Pages: 20

Notes: Sponsored by Combustion Institute, Pittsburgh, PA.

Abstract: Mixing methanol with gasoline would stretch limited petroleum supplies. The use of gasoline-methanol blends in spark-ignited engines is feasible, provided problems of volatility, corrosivity and phase separation, in the presence of moisture, can be satisfactorily resolved. An alternative to the conventional manner, by which methanol-gasoline blends are used in S.I. engines, was investigated. This alternative consisted of a new engine fuel system in which the methanol is first separated from the gasoline in a separator by means of a small amount of water condensed from the engine exhaust. The engine is first started on gasoline and subsequently is operated with part gasoline and part dissociated methanol, which is added directly to the engine intake manifold. The methanol dissociator's operational characteristics, in terms of total combustible gas output, hydrogen gas produced, conversion efficiency, and gas chemical composition, as a function of fuel flow and operating temperature, are illustrated and discussed. Engine test results are expressed, in terms of indicated specific fuel consumption, as a function of engine load. Data on engine exhaust emissions are also presented. (EI)

Document Type: Paper/Chapter from book

Citation Number: 80A000474

Article Title: *Methanol Electric Hybrid Vehicle: a Comprehensive Approach*

Document Title: Technology for Energy Conservation

Conference: Proceedings of the 1979 national conference on technology for energy conversion

Conference Place: Tucson, AZ, USA

Conference Date: 23 Jan 1979

Publisher: Information Transfer, Inc.; Silver Spring, MD, USA

Publication Date: 1979

Pages: 381

Abstract: The methanol electric hybrid vehicle was developed in an attempt to create an automobile that can better meet the transportation needs of people. The hybrid configuration used in this prototype is one with a small charging system supplying a medium-sized storage system in series to the speed controller. The engine is a 10 hp methanol-fueled internal combustion engine. The charging system is a major advantage of this vehicle over an all-electric vehicle. Sources of methanol, such as municipal waste energy, are identified. The use of this hybrid system as a heat and electrical energy producer for utilities is discussed.

Document Type: Paper/Chapter from book

Citation Number: 80A000475

Article Title: *Flame Propagation through Mixtures with Concentration Gradient*

Document Title: Massachusetts Institute of Technology International Combustion Symposium

Article Author: Hirano, T.
Suzuki, T.
Mashiko, I.
Iwai, K.

Author Affiliation: Ibaraki Univ. (Japan)

Conference: Massachusetts Institute of Technology international combustion symposium

Conference Place: Cambridge, MA, USA

Conference Date: 15 Aug 1976

Publisher: Combustion Institute; Pittsburgh, PA, USA

Publication Date: 1976

Pages: 1307-1315

Abstract: The effect of the concentration gradient on the characteristics of flame propagation when the direction of flame propagation is normal to that of the concentration gradient was studied. The velocity of flame propagation through a mixture with a known concentration distribution established over methanol or ethanol was measured by using high-speed schlieren photography. The concentration distributions in the combustion chamber were predicted theoretically and confirmed using gas chromatography.

Document Type: Paper/Chapter from book

Citation Number: 80A000476

Article Title: *In Situ Optical Measurement of Automobile Exhaust Gas Particulate Size Distributions: Regular Fuel and Methanol Mixtures*

Document Title: Massachusetts Institute of Technology International Combustion Symposium

Article Author: Hirleman, E.D., Jr.

Author Affiliation: Purdue Univ., Lafayette, Ind. (USA). School of Mechanical Engineering

Conference: Massachusetts Institute of Technology international combustion symposium

Conference Place: Cambridge, MA, USA

Conference Date: 15 Aug 1976

Publisher: Combustion Institute; Pittsburgh, PA, USA

Publication Date: 1976

Pages: 46-48

Document Type	Paper/Chapter from book

Citation Number	**80A000477**
Article Title	*Alcohol Assisted Hydrocarbon Fuels: a Comparison of Exhaust Emissions and Fuel Consumption Using Steady-state and Dynamic Engine Test Facilities*
Document Title	Proceedings, 2nd UMR-MEC (Univ. of Missouri, Rolla — Missouri Energy Council) Annual Conference on Energy
Article Author	Bushnell, D.J. Simonsen, J.M.
Author Affiliation	Missouri Univ., Rolla (USA)
Conference	2nd annual UMR-MEC conference on energy
Conference Place	Rolla, MO, USA
Conference Date	7 Oct 1975
Publisher	Western Periodical Co.; North Hollywood, CA, USA
Publication Date	1976
Pages	169-181
Abstract	This paper presents experimental data which exemplifies the differences in emission level testing on internal combustion engines when dynamic engine tests are used instead of steady-state engine tests. A comparison of the two test methods is made using hydrocarbon fuels with varying amounts of methanol. Emissions measured include the nitric oxides, unburned hydrocarbons and carbon monoxide. Emission levels and fuel consumption are reported for the various volumetric percentages of methanol in the fuel. (EI)
Document Type	Paper/Chapter from book

Citation Number	**80A000478**
Article Title	*Methanol Gasoline Fuels*
Document Title	Proceedings, 2nd UMR-MEC (Univ. of Missouri, Rolla — Missouri Energy Council) Annual Conference on Energy
Article Author	Bushnell, D.
Conference	2nd annual UMR-MEC conference on energy
Conference Place	Rolla, MO, USA
Conference Date	7 Oct 1975
Publisher	Western Periodical Co.; North Hollywood, CA, USA
Publication Date	1976
Document Type	Paper/Chapter from book

Citation Number	**80A000485**
Article Title	*Thermodynamic Calculations for Otto Cycle Engines Using Methanol as a Fuel*
Document Title	Proceedings of Condensed Papers: 2nd Miami International Conference on Alternative Energy Sources
Article Author	Bardon, M.F.
Author Affiliation	Royal Military Coll. of Canada, Kingston, Ontario
Conference	2nd Miami international conference on alternative energy sources
Conference Place	Miami Beach, FL, USA
Conference Date	10 Dec 1979
Publisher	Univ. of Miami, Clean Energy Research Institute; Coral Gables, FL, USA
Publication Date	1979
Document Type	Paper/Chapter from book

Citation Number	**80A000488**
Article Title	*Kinetics of the Oxidation of Methanol: Experimental Results Semi-global Modeling and Mechanistic Concepts*
Document Title	17th Symposium International Combustion
Article Author	Aronowitz, D. Santoro, R.J. Dryer, F.L. Glassman, I.
Author Affiliation	Princeton Univ., N.J. (USA)
Conference	17th symposium international combustion
Conference Place	Leeds, England
Conference Date	20 Aug 1978
Publisher	Combustion Institute; Pittsburgh, PA, USA
Publication Date	1979
Pages	633-644
Abstract	Several technical and economic studies have established the long term favorability of methanol as a low polluting alternative fuel. In this work, results of a detailed study of the oxidation of methanol were utilized to develop semi-global expressions to describe the fuel disappearance rate. A two step global model to describe the oxidation of methanol to carbon dioxide is presented along with the appropriate semi-global expressions to predict the experimental results. In addition, the semi-global results and detail species profiles are shown to give insight and understanding to a detailed oxidation mechanism. (EI)
Document Type	Paper/Chapter from book

Citation Number	**80A000492**
Article Title	*Fueling Automotive Internal Combustion Engines with Methanol — Historical Development and Current State-of-the-art*
Document Title	Record of the Tenth Intersociety Energy Conversion Engineering Conference
Article Author	Gonnermann, C.H. Moore, J.S. McCallum, P.W.
Author Affiliation	Mueller Associates, Inc., Baltimore, Md. (USA). Department of Energy and Environmental Systems
Conference	10th Intersociety Energy Conversion Engineering Society
Conference Place	Newark, DE, USA
Conference Date	18 Aug 1975
Publication Date	1975
Pages	849-855
Notes	Includes bibliography.
Abstract	The use of methanol as an internal combustion engine fuel is rich in proven potential but has many major obstacles to its widespread use. The work described in this paper was based on two premises: the first was that to obtain a grasp of the issues, it was necessary to place them in an historical perspective. Were most of the current obstacles present in the distant past? Were promising solutions unearthed in the past but not developed to their full potential due to technology limitations? The second objective was to document potential innovations from a previously isolated sector — the automotive specialty equipment and aftermarket sector. It was found that, indeed, many of the current obstacles were present in 1913 and that unfortunately, no concepts of any tangible potential were uncovered. On the other

hand, the aftermarket and specialty equipment sector was found to be one rich in hardware of considerable potential. (AUTHOR)

Document Type: Paper/Chapter from book

Citation Number **80A000508**

Article Title: *Experiences with the Utilization of Ethanol/Gasoline and Pure Ethanol in Brazilian Passenger Cars*

Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology

Article Author: Pischinger, G.
Pinto, N.L.M.

Author Affiliation: Volkswagen do Brasil S.A. (Brazil)

Conference: 3. international symposium on alcohol fuels technology

Conference Place: Asilomar, CA, USA

Conference Date: 29 May 1979

Publisher: U.S. Department of Energy; Washington, DC, USA

Report Number: CONF-790520

Publication Date: Apr 1980

Pages: 9p, Paper I-8

Abstract: The development of the National Alcohol Program in Brazil is described. The increase in ethanol production for addition to gasoline supplies is traced from 1967 to 1978. The development of a neat-ethanol engine is also discussed. (AFDB)

Document Type: Paper from report

Citation Number **80A000509**

Article Title: *Methanol/Gasoline Mixtures in Four Stroke Otto Engines*

Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology

Article Author: Svahn, L.G.G.

Author Affiliation: Swedish Methanol Development Co., Stockholm

Conference: 3. international symposium on alcohol fuels technology

Conference Place: Asilomar, CA, USA

Conference Date: 29 May 1979

Publisher: U.S. Department of Energy; Washington, DC, USA

Report Number: CONF-790520

Publication Date: Apr 1980

Pages: 12p, Paper I-10

Abstract: The Swedish Methanol Development Company has conducted a series of studies to determine the feasibility of using a 15-20% methanol blend in the Swedish automotive population. This paper presents a review of their experimental results from driveability emissions, fuel economy, and end-use tests. (AFDB)

Document Type: Paper from report

Citation Number **80A000510**

Article Title: *Improvement of the Water Tolerability of Methanol-gasoline Blends*

Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology

Article Author: Terzoni, G.
Pea, R.
Ancillotti, F.

Author Affiliation: ASSORENI — Association for Scientific Research of ENI Group Companies (Italy)

Conference: 3. international symposium on alcohol fuels technology

Conference Place: Asilomar, CA, USA

Conference Date: 29 May 1979

Publisher: U.S. Department of Energy; Washington, DC, USA

Report Number: CONF-790520

Publication Date: Apr 1980

Pages: 12p, Paper I-11

Abstract: The study reported in this paper is part of a project on energy saving sponsored by the Italian State Research Council. The behaviour of blends of hydrocarbons and methanol has been examined at different temperatures, with and without water in the system. The solubilizing efficiency of oxygenated compounds has been evaluated, with special regard to the C_2-C_8 alcohols. (AUTHOR)

Document Type: Paper from report

Citation Number **80A000511**

Article Title: *Modeling of Flame Properties of Methanol*

Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology

Article Author: Westbrook, C.K.
Dryer, F.L.

Author Affiliation: California Univ., Livermore (USA). Lawrence Livermore Lab.
Princeton Univ., N.J. (USA)

Conference: 3. international symposium on alcohol fuels technology

Conference Place: Asilomar, CA, USA

Conference Date: 29 May 1979

Publisher: U.S. Department of Energy; Washington, DC, USA

Report Number: CONF-790520

Publication Date: Apr 1980

Pages: 10p, Paper I-12

Abstract: The detailed reaction mechanism and flame model have been used to predict various properties of methanol-air laminar flames. The predicted values agree well with experimentally determined properties in those cases where data are available, and the predicted trends are consistent with measured data for other fuels in those cases where methanol-air flame data are not available. It is important to emphasize that this is a purely predictive study, with no adjustments made to reaction rate data or transport properties to improve agreement with experiment. The model prediction of the pressure dependence of flame speed and structure has shown that the increased dependence of flame speed on pressure above 1 atmosphere is due to competition between radical recombination reactions and chain branching reactions. This result provides a detailed interpretation of a great deal of experimental flame speed data for methanol-air flames and for methane-air flames as well. From the point of view of practical applications for the model, the excellent agreement between these calculated flame parameters and previously measured data indicate that the model is correctly predicting most of the significant properties of these flames. As a result it should be expected that the model could be used reliably in the interpretation of most methanol-air experimental data and as a practical aid in a design capacity. (AUTHOR)

Document Type: Paper from report

Citation Number **80A000512**

Article Title: *Flame Quenching and Exhaust Hydrocarbons in a Combustion Bomb as a Function of Pressure, Temperature and Equivalence Ratio for Methanol and Other Alcohol*

Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology

Article Author: Bergner, P.; Eberius, H.; Pokorny, H.

Author Affiliation: DFVLR — Institute for Phys. Chemie der Verbrennung, Stuttgart (Germany, F.R.)

Conference: 3. international symposium on alcohol fuels technology

Conference Place: Asilomar, CA, USA

Conference Date: 29 May 1979

Publisher: U.S. Department of Energy; Washington, DC, USA

Report Number: CONF-790520

Publication Date: Apr 1980

Pages: 11p, Paper I-13

Abstract: The influence of pressure, temperature and air/fuel ratio on the content of unburnt hydrocarbons in flame gases has been investigated in a combustion bomb. Fuels have been propane, methanol and ethanol. The results show very small HC-concentrations in contrast to previous investigations; a temperature dependence proportional $T^{-1.3}$, a linear pressure dependence with 1/p, and a dependence of the air/fuel ratio proportional 1/lambda. In addition the composition of the exhaust gases has been investigated and the interaction wall-flame, especially the behaviour of an artificial crevice at various pressures. (AUTHOR)

Document Type: Paper from report

Citation Number **80A000513**

Article Title: *Factors Influencing Cold Starting of Engines Operating on Alchool Fuel*

Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology

Article Author: Rajan, S.

Author Affiliation: Southern Illinois Univ., Carbondale (USA)

Conference: 3. international symposium on alcohol fuels technology

Conference Place: Asilomar, CA, USA

Conference Date: 29 May 1979

Report Number: CONF-790520

Publication Date: Apr 1980

Pages: 12p, Paper I-14

Abstract: A common difficulty experienced with the use of pure alcohols or alcohol-gasoline blends in engines is their poor cold starting and warm up driveability characteristics. This paper examines the various fuel, engine and ignition system parameters that influence the problem. In particular, the cold starting problem with alcohol fuel is investigated using a theoretical approach, by examining the sequence of events taking place in a closed volume from the instant of deposition of a given quantity of ignition energy to the establishment of a stable flame. (AUTHOR)

Document Type: Paper from report

Citation Number **80A000514**

Article Title: *Modification of a Ford Pinto for Operation on Methanol*

Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology

Article Author: Nichols, R.J.

Conference: 3. international symposium on alcohol fuels technology

Conference Place: Asilomar, CA, USA

Conference Date: 29 May 1979

Publisher: U.S. Department of Energy; Washington, DC, USA

Report Number: CONF-790520

Publication Date: Apr 1980

Pages: 12p, Paper I-15

Abstract: This report describes the modifications that were made to a 2.3 liter Ford vehicle to enable operation on neat methanol. The compression ratio was raised to 14 to 1. The camshaft was changed to shift the peak torque point to a lower engine speed (2300 RPM). Cold start, driveability, in use fuel economy, and emissions problems are addressed. (AFDB)

Document Type: Paper from report

Citation Number **80A000515**

Article Title: *Thermokinetic Modeling of Methanol Combustion Phenomena with Application to Spark Ignition Engines*

Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology

Article Author: Browning, L.H.; Pefley, R.K.

Author Affiliation: Santa Clara Univ., Calif. (USA)

Conference: 3. international symposium on alcohol fuels technology

Conference Place: Asilomar, CA, USA

Conference Date: 29 May 1979

Publisher: U.S. Department of Energy; Washington, DC, USA

Report Number: CONF-790520

Publication Date: Apr 1980

Pages: 12p, Paper I-16

Abstract: Two variations of a thermokinetic computer model were used to investigate the flame quenching and surface ignition phenomena occurring in methanol fueled SI engines. Both model variations produce reasonable trends when compared to the literature. Use of a detailed reaction mechanism in the quench zone model has shown aldehydes to increase an order of magnitude over bulk gas concentrations as the flame quenches, but this concentration is insufficient to account for measured exhaust aldehydes. A flow reactor study has shown additional aldehydes being formed from the unburned quench layer when it mixes with the hot exhaust gases during the expansion and exhaust strokes. Quenching distance was found to decrease for increasing pressure and increasing wall temperature, while it increased for lean and very rich equivalence ratios and increasing EGR. Water addition showed only a slight increase in quenching distance for up to 30% of the fuel by volume. Use of the detailed kinetic mechanism in the surface ignition model showed that methanol is dissociated at hot surfaces through formaldehyde to carbon monoxide

and hydrogen. The hydrogen then dissociates into various radical species which trigger preignition and early combustion. Sensitivity studies show that hot surface temperature, assumed to be at the spark plug center electrode, is the most dominant physical parameter in the surface ignition process, while cylinder pressure and spark plug tip cooling played somewhat weaker roles. Equivalence ratio and use of diluents such as EGR and water addition had only slight effects on the likelihood of surface ignition. (AUTHOR)

Document Type | Paper from report

Citation Number **80A000516**
Article Title *Emissions from Gasohol Fueled Vehicles*
Document Title Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author Lawrence, R.D.
Author Affiliation Environmental Protection Agency, Ann Arbor, Mich. (USA). Motor Vehicle Emission Lab.
Conference 3. international symposium on alcohol fuels technology
Conference Place Asilomar, CA, USA
Conference Date 29 May 1979
Publisher U.S. Department of Energy; Washington, DC, USA
Report Number CONF-790520
Publication Date Apr 1980
Pages 10p, Paper II-17
Abstract In the EPA test program four three-way and seven oxidation catalyst vehicles were tested using the U.S. Federal Test Procedure. Five fuels were used including two gasolines and three gasohols. All gasohol fuels in this program contained 10% ethyl alcohol by volume. The exhaust emissions, evaporative emissions, and canister weights were measured.
Document Type Paper from report

Citation Number **80A000517**
Article Title *Brazilian Vehicles Calibration for Ethanol Fuels*
Document Title Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author Chui, G.K.
Anderson, R.D.
Baker, R.E.
Pinto, F.B.P.
Author Affiliation Ford Motor Co., Dearborn, Mich. (USA)
Ford Motor Co., Dearborn, Mich. (USA)
Ford Motor Co., Dearborn, Mich. (USA)
Ford Motor Co. (Brazil)
Conference 3. international symposium on alcohol fuels technology
Conference Place Asilomar, CA, USA
Conference Date 29 May 1979
Publisher U.S. Department of Energy; Washington, DC, USA
Report Number CONF-790520
Publication Date Apr 1980
Pages 13p, Paper II-18
Abstract This paper discusses calibration development for 20% and 100% ethanol fuels in two current Brazilian engines. The development was limited to external adjustments. Engine design revisions to resolve problems such as cold start or materials compatibility, or revisions to take advantage of the higher fuel octane were not included in this study. Vehicle tests were conducted on the 1.4L engine in a 1976 and a 1978 vehicle to determine the effects of a 20% ethanol/80% Brazilian gasoline blend as a direct substitute for Brazilian gasoline with no carburetor adjustments. Vehicle performance, fuel economy, driveability and emissions tests were conducted. Carburetor adjustments were then made to obtain an operable equivalence ratio range for neat ethanol and the hot CVS portions of the vehicle tests were repeated. Tests were also conducted with 10-20% gasoline added to the neat ethanol to improve low temperature volatility. Neat ethanol significantly increased the unburned ethanol and aldehydes in the exhaust gas. The analytical methods used to measure these exhaust constituents are described. Engine dynamometer tests were conducted on a 2.3L light truck engine to develop best fuel economy and best power calibrations for neat ethanol. Automatic carburetor and distributor calibrations were developed and compared with the manual calibrations. The engine was installed in a vehicle and confirmation tests were conducted on gasoline, on the 20% blend with no adjustments and on neat ethanol with the developed automatic calibrations. The results of these test programs on the 1.4L and 2.3L engines are presented and discussed. Improvements in efficiency and power were due primarily to differences in equivalence ratio and fuel octane. (AUTHOR)
Document Type Paper from report

Citation Number **80A000518**
Article Title *BP New Zealand Experience with Methanol/Gasoline Blends*
Document Title Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author Cassels, G.R.
Dyer, W.G.
Roles, R.T.
Author Affiliation BP New Zealand Limited (New Zealand)
BP New Zealand Limited (New Zealand)
BP Research Centre, England (UK)
Conference 3. international symposium on alcohol fuels technology
Conference Place Asilomar, CA, USA
Conference Date 29 May 1979
Publisher U.S. Department of Energy; Washington, DC, USA
Report Number CONF-790520
Publication Date Apr 1980
Pages 13p, Paper II-19
Abstract This paper presents results of a fleet study conducted in New Zealand using a 15% methanol gasoline blend in a variety of automobiles. Materials compatibility problems and test track fuel economy figures are presented. In addition, information on the potential for water contamination during commercial fuel distribution was also examined. (AFDB)
Document Type Paper from report

Citation Number **80A000519**
Article Title *Alcohol/Gasoline Reliability Fleet Tests: a U.S. Federal Project*

Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Ecklund, E.E. White, H.M.
Author Affiliation	Department of Energy (USA) Aerospace Corp., El Segundo, Calif. (USA)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	10p, Paper II-20
Abstract	Investigation of alcohol fuels for the past several years has provided a sufficient data base to enable systems engineering to identify optimum fuel/engine/vehicle combinations suitable for large scale proof-of-performance field tests of alcohol/gasoline blends. Stimulated by Congressional funding for planning and initiating alcohol/gasoline fleet tests in government vehicles, the Alternative Fuels Utilization Program (AFUP) is proceeding to conduct these systems and reliability tests in parallel, with the goal of achieving utilization readiness for commercial adoption circa 1982-1983. Formulated fuels and appropriate engines have been specified for comparative testing under the systems-oriented Controlled Fleet Test phase. Based on the results of these tests, two fuels will be selected for the Reliability Fleet Test phase. One fuel will be an ethanol/gasoline blend, and the other will be either a methanol/gasoline blend or a methanol/ethanol/gasoline blend. All fuels involve 10-volume percent alcohol. Fuels and vehicles will be representative of anticipated commercial products. Field tests will involve a variety of climatic conditions over a minimum of two annual cycles. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000520**
Article Title	*Mid-term Prospects for the Use of Alcohols as Motor Vehicle Fuels*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Seiffert, U.
Author Affiliation	Volkswagenwerk A.G., Wolfsburg (Germany, F.R.). Research Division
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	18p, Paper II-21
Abstract	The paper presents a brief discussion of the world energy resource situation and concludes that non-petroleum-based substitute fuels will be needed for automobiles in the foreseeable future. Volkswagenwerk feels that practical substitutes for fossil fuels include methanol that can be obtained from coal, natural gas, and municipal waste; and ethanol from biomass, such as sugar cane, cassave, sweet sorghum, or other plants. The paper reviews various approaches to the production of alcohols and their application in motor-vehicle diesel and spark-ignition engines. The diesel engine development work focused on dual-fuel operation with alcohol and diesel oil and on the use of ignition improving additives. A variety of spark-ignition engines (S.I.E.) concepts was found to be feasible for operation on methanol, ethanol, alcohol/gasoline blends, and other alcohols. A description is presented on the extent and current status of Volkswagenwerk's research and development activities in the area of various S.I. alcohol-powered engines. It was found that fuel blends consisting of gasoline and more than 15-20% methanol or 20% ethanol require redesign and modifications to the base engine concepts because of the properties of alcohols which differ from those of today's automobile fuels. It was found the alcohol fuels are the most readily obtainable alternatives of all substitutes and that they might be made available in substantial quantities within the foreseeable future. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000521**
Article Title	*Development of an On-board Mechanical Fuel Emulsifier for Utilization of Diesel/Methanol and Methanol/Gasoline Fuel Emulsions in Transportation*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Lawson, A. Last, A.J.
Author Affiliation	Ontario Research Foundation, Ontario (Canada)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	13p, Paper II-23
Abstract	A Deutz precombustion chamber diesel engine was used in a series of dynamometer tests to evaluate the effects of using an unstable diesel/methanol/water emulsion of the fuel consumption, exhaust gas emissions, and particulate emissions characteristics. Future program plans are also outlined.
Document Type	Paper from report

Citation Number	**80A000522**
Article Title	*The Influence of Engine Parameters on the Aldehyde Emissions of a Methanol Operated Four-stroke Otto Cycle Engine*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Pischinger, F.F. Kramer, K.
Author Affiliation	Aachen Univ., Institute of Applied Thermodynamics (Germany, F.R.)
Conference	3. international symposium on alcohol fuels technology

Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	11p, Paper II-25
Abstract	The influence of air-fuel ratio, ignition timing, compression ratio and configuration of the combustion chamber on the aldehyde emissions were investigated on a single-cylinder spark ignition engine. The investigations were conducted in gasoline and methanol operation. Also the effect of water content in methanol was ascertained. The results show higher aldehyde emission with methanol than with gasoline over the entire relative air-fuel ratio range. In the case of methanol with 5% and 10% water content the aldehyde emissions lie higher than with straight methanol. Furthermore the influence of a platinum-rhodium catalyst on the aldehyde emissions was determined at various speeds and loads on a four-cylinder four-stroke Otto cycle engine. With that catalyst the aldehyde emissions in methanol operation could be reduced, without supply of secondary air by about 50% in the fuel-rich range and up to about 90% in the lean range. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000523**
Article Title	*A Motor Vehicle Power Plant for Ethanol and Methanol Operation*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Menrad, H.
Author Affiliation	Volkswagenwerk A.G., Wolfsburg (Germany, F.R.). Research Division
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of. Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	13p, Paper II-26
Abstract	A number of chemical and physical characteristics advocate the use of alcohols as alternatives to the present gasoline fuels. A special alcohol-powered engine was developed and showed the particular characteristics of methanol and ethanol. This especially applies to the inclination of methanol to pre-ignition and the necessity of more sophisticated mixture formation. The energy consumption of the alcohol-powered engine is markedly lower than that of the production gasoline engine. Vehicles with alcohol-powered engines produce markedly lower exhaust gas emissions of HC, CO, and NOx than comparable gasoline-powered vehicles. Catalysts may reduce the markedly higher aldehyde emission levels to those of gasoline engines. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000524**
Article Title	*Dual-fueling a Diesel Engine with Carbureted Alcohol*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Cruz, J.M. Chancellor, W.J. Goss, J.R.
Author Affiliation	California Univ., Davis (USA). Department of Agriculture Engineering
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	12p, Paper II-27
Abstract	Alcohol as a motor fuel has been the subject of research over the past few years. The use of this fuel for trucks, as well as for agricultural and industrial equipment having diesel engines, is under consideration in this paper. This investigation was aimed at determining whether the low cost procedure of adding a carburetor to the combustion air intake system of a diesel engine was a feasible method of accomplishing at least partial substitution of alcohol for diesel fuel. It was found, for a duty cycle common to a farm tractor, that approximately 56 percent of the energy for a diesel-engined unit could be supplied by carbureted ethanol or 47 percent by carbureted methanol. Knock, associated with the use of all but the leaner air/alcohol mixtures, limited the extent of substitution of alcohol for diesel fuel to these intermediate levels. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000525**
Article Title	*A New Way of Direct Injection of Methanol in a Diesel Engine*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Pischinger, F.F. Havenith, C.
Author Affiliation	Aachen Univ., Institute of Applied Thermodynamics (Germany, F.R.)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	11p, Paper II-28
Abstract	An ignition spray conception for dual-fuelling a diesel engine with methanol has been developed. In order to optimize this combustion system, important engine parameters such as the amount of gasoil pilot fuel, injection timing and injection rate of gasoil and methanol and the influence of compression ratio were investigated. Over the whole operating range, a good efficiency and low combustion noise are achieved with this new design. Compared with conventional diesel engines there is no visible smoke and the emission of gaseous pollutants is also lower. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000526**
Article Title	*The Utilization of Different Fuels in a Diesel Engine with Two Separate Injection Systems*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Berg, P.S. Holmer, E. Bertilsson, B.I.
Author Affiliation	Volvo Truck Corp., Goteborg (Sweden)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	8p, Paper II-29
Abstract	A six cylinder, turbocharged, direct injection engine was equipped with dual injection systems to allow operation on diesel/alcohol/water fuels. Low cetane fuels can be used when a high cetane fuel is injected and ignited prior to the low cetane fuel injection. (AFDB)
Document Type	Paper from report

Citation Number	**80A000529**
Article Title	*Gasoline/Methanol Fuel Distribution and Handling Trial*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Hooks, R.W. Sagawe, R.
Author Affiliation	Deutsche Shell A.G., Hamburg (Germany, F.R.). PAE-Labor
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	16p, Paper II-32
Document Type	Paper from report

Citation Number	**80A000540**
Article Title	*Research Program "Alcoholic Fuels for Road Traffic" of the German Federal Ministry for Research and Technology during the Period 1979-1982*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Bandel, J. Plassmann, E.
Author Affiliation	German Federal Ministry for Research and Technology (Germany, F.R.)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	16p, Paper II-43
Abstract	The focal point project "alternative energy sources for road traffic" initiated by the German Federal Ministry for Research and Technology for the period 1979-1982 is, in its partial field "alcoholic fuels", the largest known demonstration project in content and scope for this sector. It thus reflects the importance attached to the research and realization of technologies in using alternative energy sources based on alcohols for the motor vehicle sector. The significance is also underlined by the great interest shown by many organizations, both at home and abroad, in participation in the partial programs for which proposals were invited. The involvement of all the notable German mineral oil companies and automobile manufacturers manifests the attractiveness and necessity of such a program and will assist in the detailed investigations being carried out in the depth and intensity required and including manifold knowledge and experience specific to each branch. The technological potential revealed by this research program should come to be an important foundation for decisions taken on future energy supplies. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000543**
Article Title	*Calculations Relevant to the Fueling of Alcohols in Spark Ignited Internal Combustion Engines — Significance for Electrostatic Carburetion*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Hilliard, J.C.
Author Affiliation	Wayne State Univ., Detroit, Mich. (USA). Dept. of Mechanical Engineering
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	13p, Paper III-46
Abstract	Calculation has shown alcohol fuels can improve volumetric efficiencies of spark ignited engines, provided the evaporation is adiabatic. Electrostatic carburation of alcohol fuels is ideally suited to this purpose, offering the potential for high atomization efficiency at low throttle openings as well as overcoming the unique difficulties that low calorific value and high latent heat alcohol fuels present. Increasing awareness of how the constraints of economy and emissions are influenced by burning rate, how size distribution function may effect this, and that optimum spray sizes for propagation rates and pollutant emissions may exist, leads to consideration of electrostatic carburation as an engine research tool. That homogeneous mixtures (on a molecular scale) are not optimal for engine operation has been shown, that advantages may exist with a fuel air mixture that is aerodynamically stratified into a uniform mist are at present under study. If one envisages it as a dust or mist then wider "flammability limits" will certainly exist. The fact that optimum sizes for propagation and emissions may exist

prompts further study for engine research using electrostatic carburation. The detailed electrode configurations and charging criteria for practical application have yet to be established. (AUTHOR)

Document Type — Paper from report

Citation Number — **80A000544**
Article Title — *Combustion and Emission of Gaseous Fuel from Reformed Methanol in Automotive Engine*
Document Title — Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author — Inagaki, T.
Hirota, T.
Ueno, Z.
Author Affiliation — Nissan Motor Co. Ltd., Tokyo (Japan)
Conference — 3. international symposium on alcohol fuels technology
Conference Place — Asilomar, CA, USA
Conference Date — 29 May 1979
Publisher — U.S. Department of Energy; Washington, DC, USA
Report Number — CONF-790520
Publication Date — Apr 1980
Pages — 12p, Paper III-47
Abstract — The properties of the methanol reformed gas and its application in an S.I. engine were investigated. A reformer was developed using the heat of the exhaust gases to dissociate methanol into CO and H_2. The experimental results show advantages in thermal efficiencies and exhaust emissions. (AFDB)
Document Type — Paper from report

Citation Number — **80A000546**
Article Title — *Engine Cold-start with Dissociated Methanol*
Document Title — Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author — Greiner, L.
Likos, W.E.
Author Affiliation — Chemical Energy Specialists (USA)
Santa Clara Univ., Calif. (USA)
Conference — 3. international symposium on alcohol fuels technology
Conference Place — Asilomar, CA, USA
Conference Date — 29 May 1979
Publisher — U.S. Department of Energy; Washington, DC, USA
Report Number — CONF-790520
Publication Date — Apr 1980
Pages — 12p, Paper III-50
Abstract — Preliminary studies are reported on means to thermally decompose methanol to products that include hydrogen in order to start an internal combustion, passenger-car engine using that fuel at very low temperature. Methanol was properly decomposed on passing through tubes heated as shunt to the automobile battery. However, excessive battery current was required to provide sufficient gases for engine start. A small methanol-air combustor has been developed to supply the thermal energy. The related decomposition tubes become coated with carbon after repetitive operation and lesser amounts decompose. Water dissolved in the methanol decreases carbon build-up, but also lessens amounts decomposed. This problem requires further attention. An engine cooled to -13 degrees F was rapidly initiated by a synthetic mixture of the gaseous decomposition products. Transition from this gas mixture to liquid methanol as fuel required excessive times, and needs further study. (AUTHOR)
Document Type — Paper from report

Citation Number — **80A000547**
Article Title — *Engine Experiments with Alcohol/Diesel Fuel Blends*
Document Title — Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author — Moses, C.A
Author Affiliation — Southwest Research Institute (USA).
Conference — 3. international symposium on alcohol fuels technology
Conference Place — Asilomar, CA, USA
Conference Date — 29 May 1979
Publisher — U.S. Department of Energy; Washington, DC, USA
Report Number — CONF-790520
Publication Date — Apr 1980
Pages — 11p, Paper III-51
Abstract — A single-cylinder CLR engine with an open-chamber diesel head has been run on alcohol/diesel fuel blends. Preliminary results are compared on 20% blends of methanol/DF2 as an emulsion and ethanol/DF2 as both a solution and an emulsion. Instabilities in the emulsions made operation erratic and limit the conclusions. Results on higher concentrations of the ethanol/DF2 solution show good combustion on as high as 30% ethanol at all load/speed conditions; 50% concentrations could be used at low speeds. Resultant savings in diesel fuel justify further studies, especially into microemulsions of alcohol and diesel fuel. (AUTHOR)
Document Type — Paper from report

Citation Number — **80A000548**
Article Title — *Hardware/Software Strategies for Fuel Economy Optimization with Exhaust Emission Constraints in Methanol Fueled Automobiles*
Document Title — Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author — McCormack, M.C..
Overbey, J.K.
Pefley, R.K.
Author Affiliation — Santa Clara Univ., Calif. (USA)
Conference — 3. international symposium on alcohol fuels technology
Conference Place — Asilomar, CA, USA
Conference Date — 29 May 1979
Publisher — U.S. Department of Energy; Washington, DC, USA
Report Number — CONF-790520
Publication Date — Apr 1980
Pages — 15p, Paper III-54
Abstract — An experimental investigation of 4-cylinder 2.3L spark ignition engines was undertaken to examine steady-state power, thermal efficiency (fuel economy), and exhaust emissions while operating on methanol at three compression ratios. The effects of camshaft modifications, exhaust system modifications, and fuel type are evaluated in terms of both steady state and simulated driving cycles relative to a "baseline" established at

8.5:1CR on Indolene. Some possibilities for lean engine operation on methanol are discussed in light of possible engine control strategies. Three engine control strategies are introduced for evaluation of current and future engine hardware-carburetion configurations. One of these strategies is based on a constrained mathematical optimization of fuel economy with exhaust emission constraints in an urban driving cycle. (AUTHOR)

Document Type: Paper from report

Citation Number **80A000549**

Article Title: *Characterization of Alcohol/Gasoline Blends as a Stratified-charge Engine Fuel: Performance and Emissions*

Document Title: Proceedings on Third International Symposium on Alcohol Fuels Technology

Article Author: Adt, R.R., Jr.
Chester, K.A.
Kajitani, S.
Rhee, K.T.
Spurney, W.F.

Author Affiliation: Miami Univ., Coral Gables, Fla. (USA). Dept. of Mechanical Engineering

Conference: 3. international symposium on alcohol fuels technology

Conference Place: Asilomar, CA, USA

Conference Date: 29 May 1979

Publisher: U.S. Department of Energy; Washington, DC, USA

Report Number: CONF-790520

Publication Date: Apr 1980

Pages: 10p, Paper III-55

Abstract: Steady state engine tests were conducted with a Honda CVCC engine operating on Indolene and a variety of ethanol and methanol blends. Emissions and efficiency measurements were made with the engine operating at simulated road load conditions for each of the test fuels. (AFDB)

Document Type: Paper from report

Citation Number **80A000551**

Article Title: *Alcohol Blend Use in Stratified Charge Engines*

Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology

Article Author: Vann, L.G., Jr.
MacDonald, J.T.

Author Affiliation: California Energy Commission (USA)
Santa Clara Univ., Calif. (USA)

Conference: 3. international symposium on alcohol fuels technology

Conference Place: Asilomar, CA, USA

Conference Date: 29 May 1979

Publisher: U.S. Department of Energy; Washington, DC, USA

Report Number: CONF-790520

Publication Date: Apr 1980

Pages: 3p, Paper III-57

Document Type: Paper from report

Citation Number **80A000558**

Article Title: *Alcohol Engine Emissions — Emphasis on Unregulated Compounds*

Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology

Article Author: Matsuno, M.
Nakano, Y.
Kachi, H.
Kimura, K.
Tsuruga, F.
Iwai, N.
Suto, H.
Enokido, H.
Itoh, T.

Author Affiliation: Japan Automobile Research Institute, Inc., Ibaraki (Japan)

Conference: 3. international symposium on alcohol fuels technology

Conference Place: Asilomar, CA, USA

Conference Date: 29 May 1979

Publisher: U.S. Department of Energy; Washington, DC, USA

Report Number: CONF-790520

Publication Date: Apr 1980

Pages: 12p, Paper III-64

Abstract: Characteristics of alcohol engine emissions were studied on gasoline-methanol and gasoline-ethanol fuels by changing the ratios of their constituents with main emphasis on such unregulated compounds as hydrocarbons, aldehydes, formic acid, acetic acid, hydrogen cyanide, and ammonia. It was found that nitrogen compound emissions such as NOx, hydrogen cyanide, and ammonia decrease and the photochemical reactivity of hydrocarbons also decrease as a whole as the ratio of alcohol increases. Effects of after-treatment by catalyst were also studied for unburned methanol and formaldehyde, and it was found that they can be eliminated catalytically. The HC analyzer (FID) is not sensitive to formaldehyde, and it must be monitored separately to determine the effect of a catalyst on formaldehyde. (AUTHOR)

Document Type: Paper from report

Citation Number **80A000560**

Article Title: *Formaldehyde Emissions from a Spark Ignition Engine Using Methanol*

Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology

Article Author: Ito, K.
Yano, T.

Author Affiliation: Hokkaido University (Japan)

Conference: 3. international symposium on alcohol fuels technology

Conference Place: Asilomar, CA, USA

Conference Date: 29 May 1979

Publisher: U.S. Department of Energy; Washington, DC, USA

Report Number: CONF-790520

Publication Date: Apr 1980

Pages: 12p, Paper III-66

Abstract: With the aid of derivative spectrophotometry, emission characteristics of formaldehyde from a S.I. engine using methanol were obtained. The single cylinder, water cooled 4 stroke cycle engine was operated with wide open throttle at engine speed of 1500 rpm. Formaldehyde, unburned methanol and other trace species were measured at several distances along the exhaust tube for various equivalence ratios and ignition timings. The results indicate that formation of formaldehyde from unburned methanol already begins in

	the cylinder or within the exhaust port, and then, formaldehyde accumulation occurs at the temperature ranging roughly 400-500 degrees C in the exhaust tube. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000626**
Article Title	*Improved Performance of Internal Combustion Engines Using 5-30% Methanol in Gasoline*
Document Title	9th Intersociety Energy Conversion Engineering Conference
Article Author	Reed, R.B. Lerner, R.M. Hinkley, E.D. Fahey, R.E.
Author Affiliation	Massachusetts Inst. of Tech., Lexington (USA)
Conference	9th intersociety energy conversion engineering conference
Conference Place	San Francisco, CA, USA
Conference Date	26 Aug 1974
Publisher	American Society of Mechanical Engineers; New York, NY, USA
Publication Date	1974
Pages	952-955
Notes	SAE Preprint 749104
Abstract	A number of unmodified cars have been tested over a fixed course using mixtures of methanol and gasoline. It was found that mixtures between 5 and 15% increased the fuel economy and performance, and lowered the CO emissions and exhaust temperatures. In addition, knock was eliminated on one engine and "Diesel operation" ceased with 5% or greater mixtures. The improved performance of methanol mixtures is attributed to chemical leaning plus the dissociation of methanol near 200 degrees C which can absorb energy during the compression stroke of the engine and release up to 40% hydrogen for a 10% mixture.
Document Type	Paper/Chapter from book

Citation Number	**80A000627**
Article Title	*Design and Performance of a Baseline Rankine Cycle Automobile*
Document Title	9th Intersociety Energy Conversion Engineering Conference
Article Author	Burtz, R.D. Schneider, P.H. Burton, R.L. Younger, F.G. Duffy, T.E.
Author Affiliation	Steam Power Systems, Inc., San Diego, Calif. (USA)
Conference	9th intersociety energy conversion engineering conference
Conference Place	San Francisco, CA, USA
Conference Date	26 Aug 1974
Publisher	American Society of Mechanical Engineers; New York, NY, USA
Publication Date	1974
Pages	977-983
Abstract	A 3000 pound, four passenger steam automobile was designed and built to provide a baseline for comparison of the progress of steam propulsion and to demonstrate the potential for very low exhaust emissions. The vehicle is powered by a Rankine cycle powerplant with a four cylinder inline double-acting compound expander, using water as the working fluid. The expander piston valves are driven by a swing eccentric mechanism to achieve variable cutoff and hence control of expander torque. Steam generator output is 650 pounds/hour at 1000 psia and 850 degrees F, at a boiler efficiency of 89% using unleaded gasoline. The combustor can burn any liquid fuel, including non-petroleum based alternatives, and is currently being tested on methanol and coal-derived oil. Current bench test fuel mileage at 40 mph cruise is 15 miles per gallon.
Document Type	Paper/Chapter from book

Citation Number	**80A000628**
Article Title	*Energy Carriers in Space Conditioning and Automotive Applications: a Comparison of Hydrogen, Methane, Methanol and Electricity*
Document Title	9th Intersociety Energy Conversion Engineering Conference
Article Author	Davitian, H.
Author Affiliation	Cornell Univ., Ithaca, N.Y. (USA)
Conference	9th intersociety energy conversion engineering conference
Conference Place	San Francisco, CA, USA
Conference Date	26 Aug 1974
Publisher	American Society of Mechanical Engineers; New York, NY, USA
Publication Date	1974
Pages	454-462
Abstract	Hydrogen, methane, methanol, and electricity are compared as potential future energy carriers supplying automobiles. Several methods of employing each energy carrier in each application are investigated. The comparison is based primarily on the net efficiency of energy use and the operating costs (for energy) for each method of utilization which are computed for technology anticipated to be available in the year 2000. Electricity is found to provide the most efficient overall utilization of energy in virtually all cases considered. Cost and efficiency factors do not appear to favor hydrogen sufficiently to encourage conversion of existing fuel distribution systems to hydrogen unless coal is unavailable for synthetic fuel production and a low cost hydrogen production process is developed. (EI)
Document Type	Paper/Chapter from book

Citation Number	**80A000630**
Article Title	*On Board Steam-reforming of Methanol to Fuel Automotive Hydrogen Engine*
Document Title	Record of the Tenth Intersociety Energy Conversion Engineering Conference
Article Author	Kester, F.L. Konopka, A.J. Camera, E.H.
Conference	10th Intersociety Energy Conversion Engineering Society
Conference Place	Newark, DE, USA
Conference Date	18 Aug 1975
Publisher	Institute of Electrical and Electronics Engineers; New York, NY, USA
Publication Date	1975
Pages	1176-1183
Document Type	Paper/Chapter from book

Citation Number	**80A000632**
Article Title	*Improving Octane Values of Unleaded Gasoline via Gasohol*
Document Title	Proceedings of the 14th Intersociety Energy Conversion Engineering Conference; Volume 1
Article Author	Jawetz, P.
Conference	14th Intersociety Energy Conversion Engineering Society
Conference Place	Boston, MA, USA
Conference Date	5 Aug 1979
Publisher	American Chemical Society; Washington, DC, USA
Publication Date	1979
Pages	301-302
Abstract	Gasohol is defined as a mixture of 10% ethyl alcohol and 90% gasoline. The requirements of the United States in what concerns motor vehicle fuels are: (1) to boost the octane rating of regular unleaded gasoline by 3 points, (2) to keep the price differential between unleaded and leaded gasoline at no more than 3 cents/gallon and (3) to use renewable resources. It will be shown that gasohol answers favorably these needs. A series of utility factors are developed and it is shown that one Btu of ethanol replaces 3.6 Btus of petroleum when viewing the ethanol as an octane boosting additive.
Document Type	Paper/Chapter from book

Citation Number	**80A000635**
Article Title	*Combustion of Methanol in an Automotive Gas Turbine*
Document Title	Future Automotive Fuels: Prospects, Performance, Perspective Symposium Proceedings
Article Author	Huellmantel, L.W. Liddle, S.G. Hammond, D.C., Jr.
Conference	Future automotive fuels: prospects, performance, perspective symposium
Conference Place	Warren, MI, USA
Conference Date	6 Oct 1975
Publication Date	1977
Pages	235-262
Abstract	Analytical and experimental studies were carried out to assess the effects of methanol as fuel for the experimental passenger car gas turbine engine. Thermodynamic analysis indicated that the engine performance would not be significantly different than that with kerosene. Using a conventional diffusion flame combustor, oxides of nitrogen (NOx) emissions were reduced about 70% for all conditions. Carbon emissions were reduced by about 25% over the normal engine operating range, but were increased by up to 165% at high engine load when using methanol. The emissions of hydrocarbons and aldehydes were low for both fuels, but methanol operation produced more of both. The most extensive evaluation of exhaust emissions was based on the steady-state engine dynamometer data. It was determined that atomizing-air pressure drop had a significant effect on emissions of carbon monoxide (CO) when operating on methanol. The effect on nitrogen emissions was slight. For kerosene, an atomizing-air pressure drop of 69 kPa provides the best compromise. It shows a reduction in the CO, and only slightly increased nitrogen oxide emissions. Atomizing-air pressure drops of 138 and 172 kPa were used for methanol operation and a significant drop in CO was realized. Operations with methanol produce slightly less CO than kerosene at low gasifier speeds, but more at higher speeds. Emissions of NOx from methanol operation are about 65-70% lower than those produced from operation with kerosene, due primarily to the lower combustion temperature of methanol. The hydrocarbon emissions of the engine are low for all conditions evaluated. Methanol produced higher hydrocarbon emissions and aldehyde emissions than operation on kerosene. The vehicle emissions of hydrocarbons and CO were less than the 1977 Calif. and the 1978 federal standards for both fuels. (APTIC)
Document Type	Paper/Chapter from book

Citation Number	**80A000638**
Article Title	*Technical Feasibility of Diesohol*
Document Title	1979 Summer Meeting, Joint ASAE/CSAE (72nd ASAE Annual)
Article Author	Wrage, K.E. Goering, C.E.
Author Affiliation	Caterpillar Tractor Co., Peoria, Ill. (USA)
Conference	1979 summer meeting, joint ASAE/CSAE (72nd ASAE annual)
Conference Place	Winnipeg, Manitoba, Canada
Conference Date	24 Jun 1979
Publisher	American Society of Agriculture Engineers; St. Joseph, MI, USA
Publication Date	1979
Pages	14
Abstract	Fuel properties essential to the proper operation of a diesel engine were studied for several ethanol-diesel fuel blends. A blend of 10% ethanol and 90% no. 2 diesel exceeded American Society for Testing and Materials minimum specifications and was given the name diesohol. In engine tests, diesohol gave lower efficiency than no. 2 diesel fuel but also reduced exhaust smoke. A three-cylinder diesel engine with a distributor-type injector pump was used for the engine tests. The fuels used were no. 1 diesel fuel, no. 2 diesel fuel, and diesohol. Load, speed, fuel flow rate, exhaust smoke, exhaust temperature, and engine-coolant temperature were measured and recorded during the test.. (EI)
Document Type	Paper/Chapter from book

Citation Number	**80A000639**
Article Title	*Combustion and Pollutant Kinetic Modeling for Methane, Methanol, Fuel-nitrogen, and Fuel-sulfur*
Document Title	Combustion Institute Western States Section 1975 Fall Meeting
Article Author	Malte, P.C.
Author Affiliation	Washington State Univ., Pullman (USA)
Conference	Combustion Institute, Western States Section: 1975 fall meeting
Conference Place	Menlo Park, CA, USA
Conference Date	20 Oct 1975
Publisher	Combustion Inst., Western States Section, Stanford Univ.; Menlo Park, CA, USA
Publication Date	1975
Document Type	Paper/Chapter from book

Citation Number **80A000640**
Article Title *Analysis of Methanol as a Reciprocating Engine Fuel*
Document Title Combustion Institute Western States Section 1975 Fall Meeting
Article Author Rubin, M.B.
Author Affiliation Cornell Univ., Ithaca, N.Y. (USA)
Conference Combustion Institute, Western States Section: 1975 fall meeting
Conference Place Menlo Park, CA, USA
Conference Date 20 Oct 1975
Publisher Combustion Inst., Western States Section, Stanford Univ.; Menlo Park, CA, USA
Publication Date 1975
Document Type Paper/Chapter from book

Citation Number **80A000641**
Article Title *Exhaust and Evaporative Emissions from a Brazilian Chevrolet Fueled with Ethanol-gasoline Blends*
Document Title Proceedings of the 12th Intersociety Energy Conversion Engineering Conference. Volume I
Document Author Furey, R.L.
Jackson, M.W.
Author Affiliation General Motors Corp., Warren, Mich. (USA)
Conference 12th intersociety energy conversion engineering conference
Conference Place Washington, DC, USA
Conference Date 28 Aug 1977
Publisher American Nuclear Society, Inc.; La Grange, IL, USA
Publication Date 1977
Pages 54-61, Paper 779008
Abstract Exhaust and evaporative emissions from a 1974 Brazilian Chevrolet Opala were measured using gasoline and various ethanol-gasoline mixtures. For this car, which was designed to operate with rich air-fuel mixtures, additions of up to 20% ethanol to gasoline reduced exhaust aldehyde and nitrogen oxide emissions. The leaning of the air-fuel mixture, due to ethanol addition, was the primary cause of the exhaust emission changes. Evaporative emissions were slightly higher with 10% ethanol in gasoline, than with gasoline alone.
Document Type Paper/Chapter from book

Citation Number **80A000642**
Article Title *Computer Predicted Compression Ratio Effects on NOx Emissions from a Methanol Fueled SI Engine*
Document Title Proceedings of the 12th Intersociety Energy Conversion Engineering Conference. Volume I
Document Author Browning, L.H.
Pefley, R.K.
Author Affiliation Santa Clara Univ., Calif. (USA)
Conference 12th intersociety energy conversion engineering conference
Conference Place Washington, DC, USA
Conference Date 28 Aug 1977
Publisher American Nuclear Society, Inc.; La Grange, IL, USA
Publication Date 1977
Pages 37-43
Abstract A combustion kinetics computer model was used to study the compression ratio effects on performance and emissions of a methanol fueled SI engine. The computer model predicted a continual increase in volumetric NOx emissions for increasing compression ratio at MBT spark timing. With only a 3-degree-retard from MBT, the computer predicted volumetric NOx emissions at 14:1 compression ratio was reduced to that at 8.44:1 compression ratio and MBT spark timing. With this spark retard setting, there was a net increase in power and thermal efficiency of 13.7% relative to the MBT values at 8.44:1 compression ratio.
Document Type Paper/Chapter from book

Citation Number **80A000643**
Article Title *Combustion and Emissions Characteristics of Methanol, Methanol-water, and Gasoline-methanol Blends in a Spark Ignition Engine*
Document Title Proceedings 11th Intersociety Energy Conversion Engineering Conference
Article Author LoRusso, J.A.
Tabaczynski, R.J.
Author Affiliation Massachusetts Inst. of Tech., Cambridge (USA)
Conference 11th intersociety energy conversion engineering conference
Conference Place State Line, NV, USA
Conference Date 12 Sept 1976
Publisher American Institute of Chemical Engineers; New York, NY, USA
Publication Date 1976
Pages 122-132
Abstract Combustion characteristics — kernel development, ignition delay, combustion duration, thermal efficiency, energy efficiency and exhaust emissions — are studied using a CFR engine. Indolene clear is used as a base fuel for all comparisons. Ten percent water-90% methanol, 15% methanol-85% indolene and pure methanol are studied. Base operating conditions are at 1600 RPM, 53 psi imep, with MBT spark timing. A large constant temperature fuel-air mixing chamber is used to insure mixture homogeneity and eliminate effects due to varying latent heats of vaporization. At a constant speed and load, equivalence ratio is varied to determine the practical lean limit of each fuel. Also, variation of spark advance relative to MBT, and compression ratio are investigated in the lean region where significant gains in energy efficiency and emissions quality are anticipated. Data presented is an attempt to produce an extended data base on methanol fuel so that trade-offs between consumer costs and efficiency gains can be done in a scientific-rational manner. The results for methanol and methanol-water blends showed distinct NO advantages with improved or equal energy efficiencies. (EI)
Document Type Paper/Chapter from book

Citation Number **80A000644**
Article Title *Alternate Fuel Capability of Rankine Cycle Engines*
Document Title Proceedings 11th Intersociety Energy Conversion Engineering Conference
Article Author Burtz, R.D.
Duffy, T.E.
Author Affiliation Steam Power Systems, Inc., San Diego, Calif. (USA)

Conference	11th intersociety energy conversion engineering conference
Conference Place	State Line, NV, USA
Conference Date	12 Sept 1976
Publisher	American Institute of Chemical Engineers; New York, NY, USA
Publication Date	1976
Pages	1192-1197
Abstract	A combustor developed for use on a modern steam automobile is described. It employs dual radial inflow swirlers to provide low emissions without excessively high air pumping power. Air is proportionate directed to the second swirler after the first is fully open. The combustor has surpassed the ultimate federal emissions standards and demonstrated low emissions characteristics on a wide range of petroleum based and non-petroleum fuels. The combustor has performed successfully with coal-derived fuel oil and methanol. Solid fuel could be injected in slurry or powdered form. There is no octane requirement, and the less refined forms of distillate fuels and even some crude forms could be used. Combustors could be made easily adjustable for several fuel forms by modulating air ratios and fuel pressures. This could be a significant advantage to users subject to fuel shortages. (APTIC)
Document Type	Paper/Chapter from book

Citation Number	**80A000645**
Article Title	*Combustion of Methanol and Methanol Blends in a Stratified Charge Engine*
Document Title	Proceedings 11th Intersociety Energy Conversion Engineering Conference
Article Author	Branch, M.C. Wolfe, K. Ishikawa, N.
Author Affiliation	California Univ., Berkeley (USA). Dept. of Mechanical Engineering
Conference	11th intersociety energy conversion engineering conference
Conference Place	State Line, NV, USA
Conference Date	12 Sept 1976
Publisher	American Institute of Chemical Engineers; New York, NY, USA
Publication Date	1976
Pages	115-121
Abstract	Emissions and fuel economy of a large volume prechamber, fuel injected, stratified charge engine with gasoline and a gasoline/20% methanol blend have been measured. The engine is a modified CFR cetane test engine operating with MBT spark timing and 8.4:1 compression ratio. The effect of both prechamber and main chamber mixture ratio on engine operation and emissions was investigated in some detail. Lowest overall emissions was investied simultaneously with low fuel consumption at a prechamber equivalence ratio of 1.10. The stratified charge engine when operated on the gasoline/methanol blend showed significant improvement over gasoline in nitric oxide (NO) emissions but also with higher exhaust carbon monoxide (CO) and hydrocarbons (HC). Fuel economy was not significantly different for the two fuels so long as the prechamber was not overly rich. The interpretation of the HC emissions measurements was aided by a study of quenching distances of methanol and methanol blends. A constant volume flanged electrode test bomb was used to measure quenching distances of reactive gas mixtures. Experiments were performed with methane, methanol, iso-octane/methanol blends over a range of equivalence ratios for several mixture initial temperatures and pressures. The fuel blends were found to have larger quenching distances than either pure fuel which is consistent with the observation of slightly higher HC emissions in the engine study when using the methanol blend. (AUTHOR)
Document Type	Paper/Chapter from book

Citation Number	**80A000646**
Article Title	*Potential for Methanol-gasoline Blends as Automotive Fuels*
Document Title	Proceedings 11th Intersociety Energy Conversion Engineering Conference
Article Author	Lee, W. Koenig, A. Bernhardt, W.
Author Affiliation	Volkswagenwerk A.G., Wolfsburg (Germany, F.R.). Research Division
Conference	11th intersociety energy conversion engineering conference
Conference Place	State Line, NV, USA
Conference Date	12 Sept 1976
Publisher	American Institute of Chemical Engineers; New York, NY, USA
Publication Date	1976
Pages	105-114
Notes	SAE Prepr. 769020
Abstract	Comparative testing of a methanol-gasoline blend containing 15 vol% of methanol and 85 vol% of conventional gasoline in 4-cylinder engines has demonstrated that the combustion characteristics of gasoline blends have a pronounced effect on the operation characteristics of the engine induction system. This effect influences several engine parameters such as engine output, emissions, fuel consumption, etc. The interrelation between these parameters and the mechanisms occuring in the engine induction system are discussed. In addition to this evaluation, a fleet test program is conducted at VW Research in which 45 test cars are fueled with methanol-gasoline blend. Up to date, the fleet has accumulated nearly 1,500,000 km. Cold start and driveability problems are also discussed. From Volkswagen's methanol test program it is concluded that methanol-gasoline blend may be a very attractive automotive fuel for the future. (EI)
Document Type	Paper/Chapter from book

Citation Number	**80A000647**
Article Title	*A Study on the Automotive Engines for Water-methanol Blends*
Document Title	16th Automobile Technical Congress
Article Author	Yoshida, M. Tsuruga, T. Iwai, N. Kobayashi, S. Suto, H.
Author Affiliation	Sophia Univ., Tokyo (Japan)
Conference	16th international automobile technical congress

Conference Place	Tokyo, Japan
Conference Date	16 May 1976
Publisher	Society of Automobile Engineers of Japan, Inc.; Tokyo, JP
Publication Date	1976
Pages	157-165, Paper no. 2-19
Abstract	Compared with gasoline engines, methanol engines exhibit generally low nitrogen oxides (NOx); a wider lean operating limit, which can be used for reducing NOx; the same carbon monoxide (CO) emissions; high formaldehyde emissions; and very little soot. Water can be dissolved in methanol; NOx decreases as dissolved water increases. Nitrogen oxides can be reduced in a methanol engine without lowering the thermal efficiency. The formaldehyde emission level is increased greatly by adding water to methanol. The unevaporated methanol admitted into the combustion chamber increases the unburned fuel emission and decreases the engine output and the cooling loss. The specific NOx emission would be reduced with a lean mixture of completely vaporized water-added methanol, a high compression ratio, and retarded ignition timing. (APTIC)
Document Type	Paper/Chapter from book

Citation Number	**80A000648**
Article Title	*Alcohols as Gasoline Extenders*
Document Title	Proceedings, 4th International Congress in Scandanavia on Chemical Engineering
Article Author	Cordiner, J.B.
Author Affiliation	Louisiana State Univ., Baton Rouge (USA). Dept. of Chemical Engineering
Conference	4th international congress in Scandanavia on chemical engineering
Conference Place	Copenhagen, Denmark
Conference Date	18 Apr 1977
Publisher	Bella Center A/S; Copenhagen, DK
Publication Date	1977
Pages	69-86
Document Type	Paper/Chapter from book

Citation Number	**80A000649**
Article Title	*Methanol Blended Gasoline as Modern Motor Fuel*
Document Title	Proceedings, 4th National Conference I.C. Engines and Combustion
Article Author	Mathur, H.B. Bakshi, R.K.
Author Affiliation	Indian Inst. of Tech., New Delhi (India). Dept. of Mechanical Engineering
Conference	4th national conference I.C. engines and combustion
Conference Place	Madras, India
Conference Date	9 Dec 1977
Publisher	College of Engineering; Madras, IN
Publication Date	1978
Document Type	Paper/Chapter from book

Citation Number	**80A000650**
Article Title	*Effect of Additives to Alcohol on the Performance of an Alcohol-diesel Oil Dual-fuel Engine*
Document Title	Proceedings, 4th National Conference I.C. Engines and Combustion
Article Author	Panchapakesan, N.R. Nasrullah, M. Gopalakrishnan, K.V. Murthy, B.S.
Author Affiliation	Indian Inst. of Tech., Madras. Dept. of Mechanical Engineering
Conference	4th national conference I.C. engines and combustion
Conference Place	Madras, India
Conference Date	9 Dec 1977
Publisher	College of Engineering; Madras, IN
Publication Date	1978
Pages	E2, 61-71
Document Type	Paper/Chapter from book

Citation Number	**80A000651**
Article Title	*Use of Methanol in the Diesel Engine: an Experimental Study of Engine Performance*
Document Title	Proceedings, 3rd National Conference I.C. Engines and Combustion
Article Author	Saxena, M. Gandhi, K.K.
Author Affiliation	Indian Inst. of Petroleum, Dehra Dun (India). Engines Lab.
Conference	3rd national conference I.C. engines and combustion
Conference Place	Roorkee, India
Publisher	Sarita Prakashan; Meerut, IN
Publication Date	1976
Pages	139-146
Document Type	Paper/Chapter from book

Citation Number	**80A000652**
Article Title	*Investigations into the Suitability of Methanol and Methanol-gasoline Blends as S.I. Engine Fuels*
Document Title	Proceedings, 3rd National Conference I.C. Engines and Combustion
Article Author	Mathur, H.B. Bakshi, R.K.
Author Affiliation	Indian Inst. of Tech., New Delhi (India). Dept. of Mechanical Engineering
Conference	3rd national conference I.C. engines and combustion
Conference Place	Roorkee, India
Publisher	Sarita Prakashan; Meerut, IN
Publication Date	1976
Pages	155-166
Document Type	Paper/Chapter from book

Citation Number	**80A000653**
Article Title	*Investigation of Some Factors Affecting the Performance of an Alcohol-diesel Oil Dual Fuel Engine*
Document Title	Proceedings, 3rd National Conference I.C. Engines and Combustion
Article Author	Panchapakesan, N.R. Rajendran, M. Gopalakrishnan, K.V. Murthy, B.S.
Author Affiliation	Indian Inst. of Tech., Madras. Dept. of Mechanical Engineering
Conference	3rd national conference I.C. engines and combustion
Conference Place	Roorkee, India
Publisher	Sarita Prakashan; Meerut, IN
Publication Date	1976
Pages	167-176
Document Type	Paper/Chapter from book

Citation Number	**80A000654**
Article Title	*Measurement of Nitric Oxide Formation within a Multi-fueled Turbine Combustor*
Document Title	Proceedings, Symposium on Emissions from Continuous Combustion Systems
Article Author	LaPointe, C.W. Schultz, W.L. Cornelius, W. Agnew, W.G.
Author Affiliation	General Motors Research Labs., Warren, Mich. (USA)
Conference	Symposium on emissions from continuous combustion systems
Conference Place	Warren, MI, USA
Conference Date	27 Sept 1971
Publisher	Plenum Press; New York, NY, USA
Publication Date	1972
Pages	211-242
Abstract	Factors affecting the nitric oxide emission level of a regenerative turbine combustor are reviewed. Differences attributable to fuel type are discussed. Temperature and composition measurements obtained with a water-cooled choked sampling probe are presented for a turbine combustor operating on two different fuels, no. 2 diesel oil and methanol. Methods of averaging the discrete data are developed. Temperature is computed from measurement of the choked sample flow rate. Methanol displays lower NO emission because of decreased high temperature residence duration, lower flame temperature, and diminished oxygen and nitrogen availability. The combustion and NO formation zones occupy a small portion of the regenerative combustor, while the CO oxidation zone occupies roughly half of the combustor under investigation. The NO never reaches equilibrium values, whereas CO exceeds equilibrium values throughout most of the combustor. (Author abstract/APTIC)
Document Type	Paper/Chapter from book

Citation Number	**80A000655**
Article Title	*Performance and Emission Characteristics Using Blends of Methanol and Dissociated Methanol as an Automotive Fuel*
Document Title	Proceedings, 6th Intersociety Energy Conversion Engineering Conference
Article Author	Pefley, R.K. Saad, M.A. Sweeney, M.A. Kilgroe, J.D.
Author Affiliation	Santa Clara Univ., Calif. (USA)
Conference	6th intersociety energy conversion engineering conference
Conference Place	Boston, MA, USA
Conference Date	3 Aug 1971
Publisher	Society of Automotive Engineers, Inc.; New York, NY, USA
Publication Date	1971
Pages	36-46
Notes	SAE Paper 719008
Abstract	A modified CRF engine was used in a series of tests to evaluate the use of methanol as an automotive fuel. Blends of CO, H2, and methanol were used at 0, 30, 70, and 100% concentrations to simulate the methanol dissociation effects. Compression ratio, equivalence ratio, spark timing, and inlet mixture temperature were varied. Measurements of aldehydes, unburned methanol, ketones, and efficiences were made. (AFDB)
Document Type	Paper/Chapter from book

Citation Number	**80A000657**
Article Title	*Comparative Studies of Engine Performance with Methanol as a Supplementary Fuel for SI and CI Engines*
Document Title	Proceedings, 5th National Conference I.C. Engines Combustion
Article Author	Bhat, K.P. Thyagarajan, N. Samaga, B.S. Mahadevan, K.
Author Affiliation	Karnataka Reg. Engineering College, Srinivasnagar (India)
Conference	5th national conference I.C. engines combustion
Conference Place	Warangal, India
Conference Date	21 Dec 1978
Publisher	Regional Engineering College; Warangal, IN
Publication Date	1978
Pages	10p, Paper E2-6
Document Type	Paper/Chapter from book

Citation Number	**80A000658**
Article Title	*Some Factors Affecting the Compression and Combustion Processes in Alcohol-diesel Oil Dual Fuel Engines*
Document Title	Proceedings, 5th National Conference I.C. Engines Combustion
Article Author	Nasrullah, M. Panchapakesan, N.R. Gopalakrishnan, K.V. Murthy, B.S.
Author Affiliation	Indian Inst. of Tech., Madras. Dept. of Mechanical Engineering
Conference	5th national conference I.C. engines combustion
Conference Place	Warangal, India
Conference Date	21 Dec 1978
Publisher	Regional Engineering College; Warangal, IN
Publication Date	1978
Pages	10p, Paper E2-3
Document Type	Paper/Chapter from book

Citation Number	**80A000659**
Article Title	*Some Tests with Ethyl Alcohol as S.I. Engine Fuel*
Document Title	Proceedings, 5th National Conference I.C. Engines Combustion
Article Author	Rao, K.S. Gopalakrishnan, K.V. Murthy, B.S.
Author Affiliation	Madras Inst. of Tech., Madras (India). Fac. Automob. Eng.
Conference	5th national conference I.C. engine combustion
Conference Place	Warangal, India
Conference Date	21 Dec 1978
Publisher	Regional Engineering College; Warangal, IN
Publication Date	1978
Pages	10p, Paper E2-5
Document Type	Paper/Chapter from book

Citation Number	**80A000660**
Article Title	*An Investigation of Using Alcohol as a Secondary Fuel in a Multicylinder Automotive Compression Ignition Engine*

Document Title	Proceedings, 5th National Conference I.C. Engines Combustion
Article Author	Namperumal, L. Jagadeesan, T.R.
Author Affiliation	College of Engineering, Guindy (India). Dept. Heat Power Eng.
Conference	5th national conference I.C. engines combustion
Conference Place	Warangal, India
Conference Date	21 Dec 1978
Publisher	Regional Engineering College; Warangal, IN
Publication Date	1978
Pages	9p, Paper E2-9
Document Type	Paper/Chapter from book

Citation Number	**80A000661**
Article Title	*Fuel Droplet Burning Rates at High Pressures*
Document Title	Proceedings 14th Symposium (International) on Combustion
Article Author	Canada, G.S. Faeth, G.M.
Author Affiliation	Pennsylvania State Univ., University Park (USA). Dept. of Mechanical Engineering
Conference	14th symposium (international) on combustion
Conference Place	University Park, PA, USA
Conference Date	20 Aug 1972
Publisher	Combustion Institute; Pittsburgh, PA, USA
Publication Date	1973
Pages	1345-1354
Document Type	Paper/Chapter from book

Citation Number	**80A000662**
Article Title	*Nitric Oxide Formation in Droplet Diffusion Flames*
Document Title	Proceedings 14th Symposium (International) on Combustion
Article Author	Bracco, F.V.
Conference	14th symposium (international) on combustion
Conference Place	University Park, PA, USA
Conference Date	20 Aug 1972
Publisher	Combustion Institute; Pittsburgh, PA, USA
Publication Date	1973
Pages	28
Abstract	Results of a study of nitric oxide formation in ethanol droplet spherical diffusion flames are presented. The Zeldovich chemical kinetic mechanism for NO formation was utilized together with the standard equations for the diffusion flame. It was concluded that diffusion flames around hydrocarbon fuel drops burning in high temperature air could be significant sources of NO. It was also found that NO diffusion must be considered to calculate properly its concentration, that the mass of NO produced/unit mass of fuel burned increased with the droplet radius, that finer fuel sprays produced less NO than coarse ones, and that fuel-bound nitrogen significantly enhanced production of nitric oxide at lower air temperatures.
Document Type	Paper/Chapter from book

Citation Number	**80A000669**
Article Title	*The Use of Ethanol-gasoline Mixtures for Automotive Fuel*
Document Title	Clean Fuels from Biomass and Wastes
Article Author	Scheller, W.A.
Author Affiliation	Nebraska Univ., Lincoln (USA)
Conference	Symposium on clean fuels from biomass and wastes
Conference Place	Orlando, FL, USA
Conference Date	25 Jan 1977
Publisher	Institute of Gas Technology; Chicago, IL, USA
Report Number	CONF-770142
Publication Date	1977
Pages	185
Abstract	The value of ethanol as a blending component in unleaded gasoline ranges from 88 cents/gal of ethanol to $1.20/gal. A mixture of 10% liquid volume ethanol in unleaded gasoline appears to reduce fuel consumption to about 95% of that for unleaded gasoline. Since grain supplies are not adequate to provide sufficient alcohol to blend 10% in all gasoline in the U.S., the use of gasohol, registered and under study in Nebraska, will find regional applications in grain producing areas. (EL)
Document Type	Paper from report

Citation Number	**80A000672**
Article Title	*Alcohol as an Automotive Fuel*
Document Title	Resources Challenge: Technological Thrust, Social Impact
Article Author	Hanks, P.A.
Author Affiliation	CSR Ltd., Sidney (Australia). Miner Chem. Div.
Conference	6th Australian conference on chemical engineering
Publisher	Royal Australian Chemical Inst.; Parkville, Victoria, AU
Publication Date	1978
Pages	141-149
Document Type	Paper/Chapter from book

Citation Number	**80A000674**
Article Title	*Methanol-gasoline Blends as Motor Fuel*
Document Title	Effective Use of Hydrocarbon Resources; Preprints of Papers; Fourth National Conference on Chemical Engineering, Adelaide, Aug. 25-26, 1976
Article Author	Earl, W.B. Graham, E.E.
Author Affiliation	Canterbury Univ., Christchurch (New Zealand)
Conference	4th national conference on chemical engineering: effective use of hydrocarbon resources
Conference Place	Adelaide, Australia
Conference Date	25 Aug 1976
Series	Institution of Engineers, Australia. National Conference Publication, no. 76/6
Publisher	Institution of Engineers; Sydney, AU
Publication Date	1976
Pages	17-21
Notes	Organized for the College of Chemical Engineers, Institution of Engineers, Australia.
Abstract	Methanol-gasoline blends, as possible New Zealand automobile fuel, were investigated as part of a research program suuported by the New Zealand Energy Research and Development Committee. Single-cylinder engine tests have shown that for a compression ratio of 8.5, a 10% to 20% methanol blend could perform as well or better than a straight premium gasoline without any carburetor adjustments. Furthermore, without adjustments the blended fuel would burn cooler, resulting in lower emissions of nitrogen oxides. Finally it was demonstrated that it should be

	possible to make use of the high octane rating of methanol and remove all or some of the lead compounds added to gasoline to improve its knocking characteristics. (EI)
Document Type	Paper/Chapter from book

Citation Number	**80A000675**
Article Title	*Hydrogen and Methanol Fueled — Air Breathing Automobile Engine*
Document Title	Hydrogen Energy; Proceedings of the Hydrogen Economy Miami Energy (Theme) Conference
Article Author	Adt, R.R., Jr. Greenwall, H. Swain, M.R. Veziroglu, T.N. (ed.)
Author Affiliation	Miami Univ., Coral Gables, Fla. (USA)
Conference	Hydrogen economy Miami energy conference
Conference Place	Miami Beach, FL, USA
Conference Date	18 Mar 1974
Publisher	Plenum Press; New York, NY, USA
Publication Date	1975
Pages	727-738
Notes	Conference presented by the Clean Energy Research Institute, School of Engineering and Environmental Design, University of Miami, Coral Gables, FL.
Abstract	Comparisons are made of the efficiency and emission levels of a multicylinder automobile engine operating at part load on hydrogen and methanol. Hydrogen has a higher brake thermal efficiency. At very light loads, however, the efficiencies are the same with the presently used Hydrogen Induction Technique method of load control. An improved method of load control is discussed. Nitric oxide emissions from the hydrogen engine are lower than that from the methanol engine. (EI)
Document Type	Paper/Chapter from book

Citation Number	**80A000677**
Article Title	*A Preliminary Survey of Hydrocarbon-derived Oxygenated Material in Automobile Exhaust Gases*
Article Author	Hughes, K.J. Hurn, R.W.
Conference	53rd Air Pollution Control Association annual meeting
Conference Place	Cincinnati, OH, USA
Conference Date	26 May 1960
Journal	J. Air Pollut. Control Asso.
Volume	10
Issue	5
Pages	367-371
Publication Date	Oct 1960
Abstract	Experiments are reported to outline the types and quantities of oxygenates in auto exhaust gases, using modified gas chromatographic techniques for analysis. Compounds determined in the gas liquid partition chromatographic analytical system included ethylene and propylene oxides, methanol, ethanol, isopropanol, propanol, acetone, methyl ethyl ketone, acetaldehyde, and propionaldehyde. A V-8 engine connected to an absorption dynamometer and to an auxiliary engine was operated in the following modes: simulated cruise, misfired, deceleration, and motored. Exhaust emissions are influenced qualitatively and quantitatively by both mode of engine operation and fuel composition. More than 30 oxygenates in the molecular weight range of ethylene oxide through pentanol were found, with 14 of these positively identified to date. Low concentrations of oxygenates are present in exhaust produced during automotive engine cruise and acceleration operations when ignition is consistently good. However, ignition malfunctions will significantly raise emissions of oxygenates, and during periods of deceleration or motored operation, the amount of oxygenates may approach the quantity of hydrocarbons in the exhaust gases. (APTIC)
Document Type	Journal article

Citation Number	**80A000684**
Article Title	*Optimized Combustion in a Methanol — Fueled Spark — Ignition Engine and Its Effect on Methanol Economy*
Article Author	Pischinger, F.O.
Author Affiliation	Rheinisch-Wastfaelische Techn. Hoch., Aachen (Germany, F.R.)
Conference	Conference on land transport engines — economics versus environment
Conference Place	London, England
Conference Date	18 Jan 1977
Publisher	Institution of Mechanical Engineers
Publication Date	1977
Document Type	Paper/Chapter from book

Citation Number	**80A000693**
Article Title	*Future Fuels for Small Internal-combustion Engines*
Document Title	Design and Development of Small Internal Combustion Engines
Article Author	Hirst, S.L.
Author Affiliation	Shell International Petroleum Co. Ltd., London (UK)
Conference	Design and development of small internal combustion engines
Conference Place	Douglas, Isle of Man
Conference Date	31 May 1978
Publisher	Institution of Mechanical Engineers; London, GB
Publication Date	1978
Pages	59-64
Notes	Sponsored by the Automobile Division and the Combustion Engines Group of the Institution of Mechanical Engineers.
Abstract	Although the description "small internal-combustion engines" covers a wide variety of engines from those driving motorcycles and lawnmowers to low-rated industrial engines, the vast majority are fueled by gasoline or automotive gasoil (diesel). It is anticipated that the demand for these fuels can be met by the oil industry into the next century. However, environmental pressures and the increased use of conversion to meet demand will lead to changes in fuel quality. Gasoline will become a low-lead or even unleaded fuel, and if the refinery and vehicle are considered as an integrated system, optimization of total energy consumption may lead to a lower octane quality. As the availability of crude oil derived fuels diminishes, methanol may become an attractive fuel for internal-combustion engines. (EI)
Document Type	Paper/Chapter from book

Citation Number	**80A000694**
Article Title	*Development of the Nissan Gas Turbine*
Document Title	Symposium on Low Pollution Power Systems Development
Article Author	Kinoshita, K.
Conference	2nd symposium on low pollution power systems development
Conference Place	Duesseldorf, F.R. Germany
Conference Date	4 Nov 1974
Publisher	Committee on the Challenges of Modern Society, North Atlantic Treaty Organization; Brussels, BE
Publication Date	1974
Pages	20.1-20.30, Paper 20
Notes	Sponsored by Federal Republic of Germany, Federal Minister of the Interior, Federal Minister for Research and Technology.
Abstract	Engine developments and exhaust emission control studies are reviewed for a Nissan gas turbine engine which employs a closed loop turbine inlet temperature control system in the fuel control mechanism. Results from the California 13-mode emission test for heavy duty vehicles are as follows: carbon monoxide, 5.1 g/PS-hr; unburned hydrocarbons plus nitrogen oxides, 4.9 g/PS-hr. These values easily meet the 1975 California standards of 25 and 10 g/PS-hr, respectively. Tests with fuels other than kerosene indicate that NOx emissions are reduced fivefold with methanol fuel, though hydrocarbons and CO are greatly increased. Kerosene-water emulsions and mixtures of oil, kerosene, water, and methanol give higher NOx emissions even when CO and hydrocarbon control is loosened. A new combustor with an ultra lean primary combustion zone in which fuel and air are pre-mixed and burned to achieve lean homogenous combustion is currently under development. (APTIC)
Document Type	Paper/Chapter from book

Citation Number	**80A000695**
Article Title	*Alternative Automotive Fuels — Status and Summary of In-progress Research Activities*
Document Title	Symposium on Low Pollution Power Systems Development
Article Author	Hagey, G. Parker, A.J., Jr.
Conference	2nd symposium on low pollution power systems development
Conference Place	Duesseldorf, F.R. Germany
Conference Date	4 Nov 1974
Publisher	Committee on the Challenges of Modern Society, North Atlantic Treaty Organization; Brussels, BE
Publication Date	1974
Pages	32.1-32.13, Paper 32
Notes	Sponsored by Federal Republic of Germany, Federal Minister of the Interior, Federal Minister for Research and Technology.
Abstract	The present state of knowledge regarding alternative motor vehicle fuels as partial or complete substitutes for gasoline and petroleum distillates is reviewed. Alternative fuels considered include: synthetic gasoline and distillate hydrocarbon fuels from sources like coal, oil shale, and organic waste products; pure methanol; methanol-gasoline blends; and hydrogen. Coal (particularly from strip mining processes) is the largest and most probable domestic energy resource for synthetic fuel production, followed by oil shale. The production cost in the post-1985 period for gasoline and distillate hydrocarbon fuels derived from oil shale is estimated to be competitive with current costs of conventional petroleum-based sources. Equivalent liquid hydrocarbon fuels derived from coal are more expensive. Pure methanol which has seen limited success in powering existing spark-ignition engines offers increased efficiency, though fuel economy (in miles per gallon) is half that with gasoline. A greater near-term advantage may be possible with the use of methanol-gasoline blends. Hydrogen promises extremely low exhaust emission levels and a better fuel economy (on an energy-expended-per-mile basis) than gasoline, though maximum engine power output for a given engine size is reduced significantly. (APTIC)
Document Type	Paper/Chapter from book

Citation Number	**80A000696**
Article Title	*The Combustion of Methanol Mixed with Water as an Alternative Fuel*
Document Title	Symposium on Low Pollution Power Systems Development
Article Author	Iwai, N. Tsuruga, T. Kobayashi, S. Sudo, H.
Conference	2nd symposium on low pollution power systems development
Conference Place	Duesseldorf, F.R. Germany
Conference Date	4 Nov 1974
Publisher	Committee on the Challenges on Modern Society, North Atlantic Treaty Organization; Brussels, BE
Publication Date	1974
Pages	36.1-36.15, Paper 36
Notes	Sponsored by Federal Republic of Germany, Federal Minister of the Interior, Federal Minister for Research and Technology.
Abstract	Emission tests and fuel vaporization studies were conducted with test engines from automobiles fueled with methanol-water mixtures. Preliminary bench testing led to the selection of a 0.3 water to methanol ratio. Tests with a commercial four-cylinder (1770 cc) engine equipped with an exhaust catalyst and modified so that the excess air ratio was 1.1 at the water/methanol ratio of 0.3 gave the following 10-mode results: 0.21 g/km hydrocarbons, 0.87 g/km carbon monoxide, and 0.17 g/km nitrogen oxides. The fuel consumption rate was greater than for gasoline, though thermal efficiency was comparable due to the heat of combustion of methanol being half that of gasoline. Some piston corrosion was observed following the tests. Fuel vaporization studies with methanol-water mixtures showed that hydrocarbon emissions increase following a decrease in mixture temperature. Hydrocarbon increases and power decreases were observed at a point where the heat of vaporization of unvaporized fuel reached nearly 5% of the total combustion heat. (APTIC)
Document Type	Paper/Chapter from book

Citation Number	**80A000697**
Article Title	*Alternative Fuels — Methanol*
Document Title	Symposium on Low Pollution Power Systems Development
Article Author	Hurn, R.W.
Author Affiliation	Bureau of Mines, Bartlesville, Okla. (USA). Bartlesville Energy Research Center
Conference	2nd symposium on low pollution power systems development
Conference Place	Deusseldorf, F.R. Germany
Conference Date	4 Nov 1974
Publisher	Committee on the Challenges of Modern Society, North Atlantic Treaty Organization; Brussels, BE
Publication Date	1974
Pages	34.1-34.11, Paper 34
Notes	Sponsored by Federal Republic of Germany, Federal Minister of the Interior, Federal Minister for Research and Technology.
Abstract	Emissions data and fuel economy results from a Bureau of Mines program investigating the use of methanol and methanol-gasoline mixtures as alternative fuels in spark ignition engines are presented. Although attractively low levels of hydrocarbons, carbon monoxide, and nitrogen oxides appear possible from the use of pure methanol, tests with single and multi-cylinder engines indicate that fuel maldistribution problems limit theoretical lean limits. The development of a fuel/air metering and distribution system appears necessary if pure methanol is to be used as a fuel. Tests with methanol-gasoline mixtures indicate that a 20% addition of methanol to gasoline can result in the following emission values for cars over city routes; 15.5 g/mi CO, 2.8 g/mi hydrocarbons, and 3.2 g/mi NOx. Emissions from gasoline during the same testing procedures are: 35.5 g/mi CO, 2.9 g/mi hydrocarbons, and 3.6 g/mi NOx. Possible problems involving the compatibility of methanol with engine and fuel system components include: corrosion, elastometer swelling, and incompatibility with sealing agents. (APTIC)
Document Type	Paper/Chapter from book

Citation Number	**80A000698**
Article Title	*Automotive Engine for Methanol water Mixture*
Document Title	Symposium on Low Pollution Power Systems Development
Article Author	Iwai, N. Tsuruga, T. Kobayashi, S. Sudo, H.
Author Affiliation	Japanese Automobile Research Institute, Tokyo (Japan)
Conference	2nd symposium on low pollution power systems development
Conference Place	Duesseldorf, F.R. Germany
Conference Date	4 Nov 1974
Publisher	Committee on the Challenges on Modern Society, North Atlantic Treaty Organization; Brussels, BE
Publication Date	1974
Pages	395-403
Notes	Sponsored by Federal Republic of Germany, Federal Minister of the Interior, Federal Minister for Research and Technology.
Document Type	Paper/Chapter from book

Citation Number	**80A000700**
Article Title	*Technico Economic Study of the Use of Hydrogen and Methanol for Road Transport*
Document Title	Hydrogen as an Energy Vector: Its Production, Use and Transportation, Seminar
Article Author	Breelle, Y. Chauvel, A. Leprince, P. Meyer, C. Gelin, P. Petit, G.
Author Affiliation	Institut Francais du Petrole (IFP), Rueil Malmaison (France)
Conference	Hydrogen as an energy vector: its production, use and transportation, semina
Conference Place	Brussels, Belgium
Conference Date	3 Oct 1978
Publisher	Commission of the European Communities; Luxembourg, LU
Publication Date	1979
Pages	506-530
Document Type	Paper/Chapter from book

Citation Number	**80A000701**
Article Title	*Methanol/Gasoline Blend — Automotive Manufactures Viewpoint*
Document Title	Methanol as an Alternative Fuel
Article Author	Colucci, J.M.
Author Affiliation	General Motors Research Labs., Warren, Mich. (USA)
Conference	1974 engineering foundation conference
Conference Place	Henniker, NH, USA
Conference Date	7 Jul 1974
Publisher	Engineering Foundation; New York, NY, USA
Publication Date	1974
Availability	Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type	Paper/Chapter from book

Citation Number	**80A000702**
Article Title	*Advantages of Neat and Blended Operation of Methanol Fuel in Vehicles*
Document Title	Methanol as an Alternative Fuel
Article Author	Reed, T.B.
Conference	1974 engineering foundation conference
Conference Place	Henniker, NH, USA
Conference Date	7 Jul 1974
Publisher	Engineering Foundation; New York, NY, USA
Publication Date	1974
Availability	Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type	Paper/Chapter from book

Citation Number	**80A000703**
Article Title	*Methanol-gasoline Blends — University Viewpoint*
Document Title	Methanol as an Alternative Fuel
Article Author	Pefley, R.K. Adelman, H.G. McCormack, M.C.
Author Affiliation	Santa Clara Univ., Calif. (USA)
Conference	1974 engineering foundation conference
Conference Place	Henniker, NH, USA
Conference Date	7 Jul 1974
Publisher	Engineering Foundation; New York, NY, USA

Publication Date	1974
Pages	21
Abstract	This paper presents results of an investigation program in which the use of methanol as an alternative automotive fuel was studied. Initially, emphasis was centered on its possible advantage over gasoline in the reduction of exhaust emissions while maintaining vehicle performance. Subsequently, as a result of national recognition of future energy shortages, the emissions emphasis has been matched in importance by concern for thermal efficiency. Other areas receiving attention include vehicle modification requirements, fuel system and engine compatibility with methanol, and fuels handling ease and safety. The report summarizes the following studies — experiments with blends of pure methanol and dissociated methanol in a CFR engine; experiments with pure methanol in a City of Santa Clara fleet vehicle; experiments with pure methanol in a 1970 Gremlin vehicle; experiments and computer analysis exploring the emissions behavior of a CFR engine for iso-octane, pure methanol, dissociated methanol, and blends of these fuels; methanol-gasoline blend performance experimentation using a City of Santa Clara fleet vehicle. Legislative aspect is also briefly discussed. (EI)
Availability	Engineering Societies Library, 345 E. 47th St., New York NY 10017
Document Type	Paper/Chapter from book

Citation Number	**80A000704**
Article Title	*Comparison of Methanol and Methanol-blends*
Document Title	Methanol as an Alternative Fuel
Article Author	Reed, T.B.
Author Affiliation	Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.
Conference	1974 engineering foundation conference
Conference Place	Henniker, NH, USA
Conference Date	7 Jul 1974
Publisher	Engineering Foundation; New York, NY, USA
Publication Date	1974
Pages	15
Abstract	The behavior of pure methanol and methanol blends with gasoline is reviewed and their relative advantages compared. If fuel methanol becomes available at energy prices competitive with gasoline it can be used in fleets or new cars adapted to methanol. Maximum effectiveness from limited supplies of methanol can be achieved by blending it with gasoline up to 10% since fuel economy, emissions and octane are disproportionately improved in this range and no vehicle modification is necessary. (EI)
Availability	Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type	Paper/Chapter from book

Citation Number	**80A000705**
Article Title	*Physico-chemical Properties of Methanol Related to Fuel Use*
Document Title	Methanol as an Alternative Fuel
Article Author	White, J.R. Rowe, C.N. Koehl, W.J.
Conference	1974 engineering foundation conference
Conference Place	Henniker, NH, USA
Conference Date	7 Jul 1974
Publisher	Engineering Foundation; New York, NY, USA
Publication Date	1974
Pages	36
Abstract	This survey presents the physicochemical properties of methanol from a fuel point-of-view, and makes comparisons with those of gasoline and other hydrocarbon fuels. It is structured around the physical and chemical properties of methanol as they pertain to: combustion and thermal behavior; volatility behavior; transportation and storage; and toxicity and safety. Extensive property data are tabulated, plotted and discussed. Although the heat content of methanol is approximately half of that for liquid hydrocarbon fuels, there are no major differences in the combustion behavior when the fuels are compared on the same equivalence ratio basis. The low heat content requires that twice the volume of fuel must be used to supply the same Btu output, approximately doubling the capacity required in storage and transportation facilities. Methanol's high polarity can introduce several solution problems. Solubility in gasoline is sensitive to both gasoline compositions and temperature, but more important, small amounts of water lead to phase separation. The high polarity can also lead to corrosion of presently used fuel systems. Toxicity and safety characteristics of methanol differ somewhat from those of hydrocarbons, but probably pose no real problems in handling when adequate precautions are taken. (EI)
Availability	Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type	Paper/Chapter from book

Citation Number	**80A000706**
Article Title	*Automotive Uses of Methanol Fuel*
Document Title	Methanol as an Alternative Fuel
Article Author	Jackson, R.G. Tillman, R.M.
Author Affiliation	Continental Oil Co., Ponca City, Okla. (USA)
Conference	1974 engineering foundation conference
Conference Place	Henniker, NH, USA
Conference Date	7 Jul 1974
Publisher	Engineering Foundation; New York, NY, USA
Publication Date	1974
Availability	Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type	Paper/Chapter from book

Citation Number	**80A000707**
Article Title	*Methanol as a Motor Fuel*
Document Title	Methanol as an Alternative Fuel
Article Author	Ingamells, J.C. Lindquist, R.H.
Author Affiliation	Chevron Research Co., Richmond, Calif. (USA)
Conference	1974 engineering foundation conference
Conference Place	Henniker, NH, USA
Conference Date	7 Jul 1974
Publisher	Engineering Foundation; New York, NY, USA
Publication Date	1974
Abstract	A comprehensive evaluation of methanol and methanol/gasoline blends as automotive fuels is presented. Neat methanol and 10% methanol

blends were used in a variety of automobiles (1967-1971 MY) to generate road octane, emissions, fuel economy, driveability, and materials compatability data. A more detailed paper based on the same tests can be found in SAE Paper 750123. (AFDB)

Availability	Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type	Paper/Chapter from book

Citation Number	**80A000709**
Article Title	*Methanol-gasoline Blends; a Fuel Supplier's Viewpoint*
Document Title	Methanol as an Alternative Fuel
Article Author	Lindquist, R.H. Ingamells, J.C.
Author Affiliation	Chevron Research Co., Richmond, Calif. (USA)
Conference	1974 engineering foundation conference
Conference Place	Henniker, NH, USA
Conference Date	7 Jul 1974
Publisher	Engineering Foundation; New York, NY, USA
Publication Date	1974
Pages	25
Abstract	This paper discusses advantages and disadvantages of methanol addition to gasoline. The road octane quality of unleaded gasolines is raised about 3 octane numbers by addition of 10% methanol. However, fuel economy suffers with methanol addition because the heat of combustion of methanol is about half the value for gasoline. In a car tuned correctly for gasoline, driveability is decreased with methanol addition. The water sensitivity of hygroscopic mixtures of methanol and gasoline requires a separate fuel distribution system. Fuel storage in a vehicle must be protected from water absorption both in the tank and the carburetor to prevent separation into two phases, a methanol-rich lower phase and a gasoline-rich upper phase. Corrosion and degradation problems occur where methanol/gasoline mixtures come in contact with lead, magnesium, aluminum, zinc, and some plastics. Reduction in exhaust nitrogen oxides is the principal emissions effect of methanol addition. This results from lowering combustion temperatures because of methanol's high heat of vaporization. However, a cold start problem also arises from this effect. At high methanol concentrations a second fuel system and intake manifold modifications are necessary for cold starting and driving. Methanol is not a useful fuel additive for existing unmodified cars. Methanol could be used effectively in special vehicles designed to handle the corrosion, water absorption, and vaporization characteristics. (EI)
Availability	Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type	Paper/Chapter from book

Citation Number	**80A000710**
Article Title	*Methanol Fuel — Long Range Implication for Petro-chemicals*
Document Title	Methanol as an Alternative Fuel
Article Author	Knox, W.R.
Author Affiliation	Monsanto Co. (USA)
Conference	1974 engineering foundation conference
Conference Place	Henniker, NH, USA
Conference Date	7 Jul 1974
Publisher	Engineering Foundation; New York, NY, USA
Publication Date	1974
Availability	Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type	Paper/Chapter from book

Citation Number	**80A000712**
Article Title	*Environmental Aspects of Methanol as Vehicular Fuel: Health and Environmental Effects*
Document Title	Methanol as an Alternative Fuel
Article Author	Berger, B.J.
Author Affiliation	California Univ., Livermore (USA). Lawrence Livermore Lab.
Conference	1974 engineering foundation conference
Conference Place	Henniker, NH, USA
Conference Date	7 Jul 1974
Publisher	Engineering Foundation; New York, NY, USA
Publication Date	1974
Pages	12
Abstract	This paper is an outgrowth of the Project Independence Study — methanol from coal for the automotive market — completed in January, 1974. An attempt has been made to summarize the environmental and health consequences that can be predicted as a result of the use of methanol as transportation fuel. Attention is directed to those areas that require further research before evaluation of environmental consequences can be completed. This preliminary evaluation of the potential effects of methanol use indicates there are possibilities for health benefits and improved environment as a result of its substitution for gasoline. However, a comprehensive, comparative, in-depth, biological study should go hand-in-hand with any methanol transportation development program so as to economically minimize any adverse effects. (EI)
Availability	Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type	Paper/Chapter from book

Citation Number	**80A000713**
Article Title	*Energy Workshop — Report on the Use of Methanol in Volkswagons*
Document Title	Methanol as an Alternative Fuel
Article Author	Heitland, H.
Conference	1974 engineering foundation conference
Conference Place	Henniker, NH, USA
Conference Date	7 Jul 1974
Publisher	Engineering Foundation; New York, NY, USA
Publication Date	1974
Availability	Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type	Paper/Chapter from book

Citation Number	**80A000714**
Article Title	*Methanol as a Motor Fuel*
Document Title	Power Plants and Future Fuels
Article Author	Banks, F.R. Barker, D.
Author Affiliation	Institute of Mechanical Engineers, London (UK)
Conference	Power plants and future fuels conference
Conference Place	London, England
Conference Date	21 Jan 1975
Series	Institution of Mechanical Engineers. Conference Publications. CP1-1975

Publisher	Institution of Mechanical Engineers; Bury St. Edmunds, GB
Publication Date	1976
Pages	149-158
Abstract	Laboratory and vehicle tests on methanol and methanol/isobutanol mixtures (up to 30% in gasoline) have been carried out. Small changes in vehicle performance and reduced carbon monoxide emission levels resulted. Distribution of such fuel will be difficult. Three test vehicles were used to examine the effect of the presence of methanol in gasoline on exhaust emissions. Carbon monoxide (CO), unburned hydrocarbons (HC), and oxides of nitrogen (NOx) were measured using both European cycle and the California cycle test procedures. Results show a consistent trend of a large reduction in CO level at both the 10% and 20% alcohol concentrations. The greatest CO reduction was at engine idle and, in fact, the improved idling CO level is reflected in the emission test cycle results. Unburned HC emissions as measured by non-dispersive infrared spectrometry, sensitized for hexane, showed a marginal reduction at the 10% methanol level, and an increase at the 20% level. Oxides of nitrogen emission levels were not affected by the use of either methanol or methanol/isobutanol mixtures in blend with gasoline. (APTIC)
Document Type	Paper/Chapter from book

Citation Number	**80A000715**
Article Title	*Performance and Emissions of Spark-ignition Engines Operating with Alcohol-gasoline Mixtures*
Document Title	Power Plants and Future Fuels
Article Author	Janota, M.S. Cooper, J.R. Crookes, R.J. Nazha, M.A.
Author Affiliation	Institute of Mechanical Engineers, London (UK)
Conference	Power plants and future fuels conference
Conference Place	London, England
Conference Date	21 Jan 1975
Series	Institution of Mechanical Engineers. Conference Publications. CP1-1975
Publisher	Institution of Mechanical Engineers; Bury St. Edmunds, GB
Publication Date	1976
Pages	105-118
Abstract	The use of alcohol-gasoline mixtures in the spark-ignition engine presents a favorable approach toward the solution of both the energy and the environmental problems. Addition of methanol and isobutanol to a lead-free low octane gasoline raises the octane number of the fuel. Work carried out on both a single cylinder variable compression ratio Ricardo E6 engine and a B.L.M.C. limited standard production 4-cylinder engine is described. The work on the Ricardo engine illustrates the effect of various methanol isobutanol mixtures with lead-free gasoline on engine performance. The comprehensive study on the 9.0 compression ratio 1.8 Marina engine presents the effect of different alcohol-gasoline mixtures on the performance and exhaust pollutant emissions. The carburetor setting and ignition timing are very important factors affecting engine performance and pollutant concentrations and can give rise to misleading results when comparing different fuel blends. For the fixed carburetor setting and ignition timing suitable for a leaded gasoline, no significant change in engine performance has been found by substituting 15% alcohol blend. In addition, emissions of carbon monoxide and hydrocarbons are appreciably reduced. (APTIC)
Document Type	Paper/Chapter from book

Citation Number	**80A000720**
Article Title	*Methanol-gasoline Blend Fueled Engine — Performance and Emissions*
Document Title	Conference Proceedings: 1st World Hydrogen Energy Conference
Article Author	Adt, R.R. Veziroglu, T.N.
Author Affiliation	Miami Univ., Coral Gables, Fla. (USA). Clean Energy Research Inst.
Conference	1st world hydrogen energy conference
Conference Place	Miami Beach, FL, USA
Conference Date	1 Mar 1976
Publisher	Univ. of Miami; Coral Gables, FL, USA
Publication Date	1976
Notes	Sponsored by Energy Research and Development Administration, the School of Continuing Studies, University of Miami.
Availability	T. Nejat Veziroglu, Clean Energy Research Institute, Univ. of Miami, P.O. Box 248294, Coral Gables, FL 33124
Document Type	Paper/Chapter from book

Citation Number	**80A000721**
Article Title	*Clean Air through Methanol Technology*
Document Title	Proceedings, 4th International Clean Air Congress
Article Author	Bernhardt, W. Koenig, A. Lee, W. Kasuga, S. (ed.)
Author Affiliation	Volkswagenwerk A.G., Wolfsburg (Germany, F.R.). Research Division Volkswagenwerk A.G., Wolfsburg (Germany, F.R.). Research Division Volkswagenwerk A.G., Wolfsburg (Germany, F.R.). Research Division Japanese Union of Air Pollution Prevention Associations, Tokyo (Japan)
Conference	4th international clean air congress
Conference Place	Tokyo, Japan
Conference Date	16 May 1977
Publisher	Japan Union of Air Pollution Prevention Association; Tokyo, JP
Publication Date	1977
Pages	177
Abstract	The present state of technology and the existing fuel-transport facilities and utilization equipment (engines and tanks) give methanol the most advantages as a petroleum substitute. Two routes exist to introduce methanol into the transportation system. Methanol can either be mixed with Pb-free gasoline in concentrations N15% vol and the resulting blend used as fuel for existing cars, or pure methanol can be used in cars that are appropriately modified. Both routes and their environmental aspects are discussed based on re-

	sults of Volkswagen Research's evaluation of vehicles fueled with methanol-gasoline blends, and of pure methanol and its impact on exhaust emission characteristics. (AM)
Document Type	Paper/Chapter from book

Citation Number	**80A000730**
Article Title	*Effect of Methanol Addition to Gasoline on Spark Ignition, Carburetted Engine Performance and Emissions Characteristics*
Document Title	Monograph on Alternate Fuel Resources; Volume 20
Article Author	Adt, R.R., Jr. Chester, K.C. Kurucz, C.N. Pappas, J.M. Swain, M.R. Hendel, F.J.
Author Affiliation	Miami Univ., Coral Gables, Fla. (USA)
Conference	Symposium on alternate fuel resources
Conference Place	Santa Maria, CA, USA
Conference Date	25 Mar 1976
Publisher	Western Periodical Co.; North Hollywood, CA, USA
Publication Date	1976
Pages	273-280
Notes	Based on papers presented at the Symposium on alternate fuel resources, sponsored by AIAA Vandenberg Section and AIAA Student Branch at California Polytechnic State University, San Luis Obispo.
Abstract	In the reported experiments, a multicylinder, carburetted engine was fueled with blends of 0, 20, and 30 volume percent methanol in a base stock representative of unleaded gasoline (viz. Indolene). The engine was operated under steady state conditions at constant speed, manifold vacuum and MBT spark advance over a range of fuel-air equivalence ratios. Comparisons were then made of performance and emissions characteristics for the various blends at equal equivalence ratios. It is concluded that at the same engine speed (2000 RPM) the MBT spark advance was the same for all of the blend levels tested (0, 20, 30% M). The 20 and 30% M blends produced the same torque with the value being approximately 2% greater than the Indolene-fueled torque value. Volumetric efficiency was not affected by the blend level. Carbon monoxide emissions were not affected by the blend level. Nitric oxide (NOx) mass emissions were found to decrease with increasing blend level. (EI)
Document Type	Paper/Chapter from book

Citation Number	**80A000731**
Article Title	*Review of the Use of Methanol as a Motor Vehicle Fuel*
Document Title	Monograph on Alternate Fuel Resources; Volume 20
Article Author	Cassady, P.E. Hendel, F.J.
Author Affiliation	Mathematical Sciences Northeast, Inc., Bellevue, Wash. (USA)
Conference	Symposium on alternate fuel resources
Conference Place	Santa Maria, CA, USA
Conference Date	25 Mar 1976
Publisher	Western Periodical Co.; North Hollywood, CA, USA
Publication Date	1976
Pages	257-272
Notes	Based on papers presented at the Symposium on alternate fuel resources, sponsored by AIAA Vandenberg Section and AIAA Student Branch at California Polytechnic State University, San Luis Obispo.
Abstract	This report summarizes results of researches on the possibility of methanol use as automotive fuel. The blending of methanol with gasoline has been shown to boost the octane number of the gasoline without the use of tetraethyl lead and reduce the emission of air pollutants from unmodified automobile engines. However several difficulties may be associated with the practical distribution and use of such blends as a motor vehicle fuel. The use of pure methanol as a motor vehicle fuel eliminates most of the problems found with the use of blends, however, when this is done, certain vehicle modifications become necessary. Pure methanol is well suited to use as a fuel for fleets of vehicles where these modifications are more easily made. There is a need for a well executed fleet test using pure methanol as a fuel to examine the operation of the vehicles in realistic applications and to uncover any possible compatibility problems. There exist no basic technical obstacles to the application of methanol as a motor vehicle fuel.
Document Type	Paper/Chapter from book

Citation Number	**80A000733**
Article Title	*Alternate Air-fuel Induction Systems Contrasts in Terms of Fuel Economy and Exhaust Emissions for Simulated Driving Cycles with Methanol and Indolene*
Document Title	Proceedings of the International Symposium on Alcohol Fuel Technology: Methanol and Ethanol
Article Author	McCormack, M.C. Pefley, R.K.
Author Affiliation	Santa Clara Univ., Calif. (USA)
Conference	Symposium on alcohol fuel technology
Conference Place	Wolfsburg, F.R. Germany
Conference Date	21 Nov 1977
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-771175
Publication Date	Jul 1978
Pages	7p, Paper 4-2
Notes	Organized by Volkswagenwerk AG in cooperation with the German Federal Ministry for Research and Technology (BMFT).
Abstract	An experimental investigation of a 4-cylinder 2.3L spark ignition engine was undertaken to examine steady-state performance, fuel economy, and exhaust emissions while operating on methanol. Five configurations of intake manifold-fuel induction systems were examined. One provided baseline results using Indolene, while the other four provided comparative results using methanol. The steady-state results were then utilized as inputs to a computer program which predicted fuel economy and emissions for the U.S. The results showed that two of the systems could meet the original U.S. statutory emission

standard of 0.4 g/mi NOx at an equivalence ratio of Phi = 0.7. In addition, gains were seen in fuel economy (energy base) for all the methanol fueled systems ranging between 6 and 30% in the urban cycle and between 10 and 30% in the highway cycle in comparison to the baseline results on Indolene. One novel fuel-air induction system which eliminates cylinder-to-cylinder variations in equivalence ratio is described. In addition, a maldistribution index, which relates cylinder-to-cylinder variations in equivalence ratio to penalties in power and thermal efficiency, is introduced. (EI)

Document Type — Paper from report

Citation Number — **80A000734**

Article Title — *Comparison of Gasoline, Methanol, and Methanol/Water Blend as Spark Ignition Engine Fuels*

Document Title — Proceedings of the International Symposium on Alcohol Fuel Technology: Methanol and Ethanol

Article Author — Johnson, R.T.

Author Affiliation — Missouri Univ., Rolla (USA)

Conference — Symposium on alcohol fuel technology

Conference Place — Wolfsburg, F.R. Germany

Conference Date — 21 Nov 1977

Publisher — U.S. Department of Energy; Washington, DC, USA

Report Number — CONF-771175

Publication Date — Jul 1978

Pages — 7p, Paper 4-3

Notes — Organized by Volkswagenwerk AG in cooperation with the German Federal Ministry for Research and Technology (BMFT).

Abstract — In the reported experiments, Indolene gasoline, methanol, and methanol + 5% (M5W) were tested in a single cylinder spark ignition engine to determine their influence on power, efficiency, and exhaust emissions. Methanol and M5W fuels exhibited efficiency increases of 2-3% for the range of test conditions. At equal intake mixture temperatures, methanol and M5W produced 5-7% less power output than Indolene. For constant manifold heat conditions (substantially lower mixture temperatures), methanol and M5W produced 5-7% more power than Indolene. Peak NOx emissions were reduced 30-40% with methanol and 45-60% with M5W over the Indolene. Peak NOx emissions were reduced 30-40% with methanol and 45-60% with M5W over the Indolene reference fuel. Mass specific CO emissions were essentially unaffected by fuel type. Mass specific emissions of unburned fuel (UBF) were comparable for Indolene and methanol at all test conditions. Indolene, methanol and M5W exhibited comparable UBF emissions for the constant mixture temperature. For the cooler mixture temperatures at constant manifold heat conditions, the M5W fuel demonstrated substantially increased UBF emissions. (EI)

Document Type — Paper from report

Citation Number — **80A000740**

Article Title — *Development of Methanol and Petrol Carburation Systems in the Netherlands*

Document Title — Proceedings of the International Symposium on Alcohol Fuel Technology: Methanol and Ethanol

Article Author — van der Weide, J.
Ramackers, M.W.A.

Author Affiliation — TNO Res Inst for roadveh, Delft (Netherlands)

Conference — Symposium on alcohol fuel technology

Conference Place — Wolfsburg, F.R. Germany

Conference Date — 21 Nov 1977

Publisher — U.S. Department of Energy; Washington, DC, USA

Report Number — CONF-771175

Publication Date — Jul 1978

Pages — 10p, Paper 6-1

Notes — Organized by Volkswagenwerk AG in cooperation with the German Federal Ministry for Research and Technology (BMFT).

Abstract — Carburation systems for methanol tend to become rather complex due to the fact that a higher amount of the fuel has to be carburated together with the fact that the heat of evaporation is very high. The problems arise particularly with respect to the driveability and the cold start. Also, the storage of a methanol/petrol mixture aboard the vehicle is difficult when the methnol content exceeds 15%. The research and development work in the Netherlands regarding hardware development to meet their problems is presented. Beside a general review of systems, one system with the following characteristics is described in particular: injection system, electronically controlled sensing the air speed in the carburator, capable of handling different methanol/petrol ratios with minimized dimensions, so that retrofit in existing vehicles is possible. (EI)

Document Type — Paper from report

Citation Number — **80A000741**

Article Title — *Fuel Converter with Methanol for Spark-ignition Internal Combustion Engine*

Document Title — Proceedings of the International Symposium on Alcohol Fuel Technology: Methanol and Ethanol

Article Author — Sjostrom, K.

Author Affiliation — R Inst of Technol, Stockholm (Sweden)

Conference — Symposium on alcohol fuel technology

Conference Place — Wolfsburg, F.R. Germany

Conference Date — 21 Nov 1977

Publisher — U.S. Department of Energy; Washington, DC, USA

Report Number — CONF-771175

Publication Date — Jul 1978

Pages — 7p, Paper 6-3

Notes — Organized by Volkswagenwerk AG in cooperation with the German Federal Ministry for Research and Technology (BMFT).

Abstract — A "hydrogen injection" system is presented in which hydrogen is produced in a catalytic steam reforming reactor using methanol or gasoline as fuel. Energy is supplied by heat exchange with the exhaust gas. Catalytic studies with nickel catalyst are presented for the special reactant gas composition in the reactor. Theoretical evaluation of the system shows that methanol is an excellent fuel for the reactor. The system permits very lean air/fuel mixtures with a gain in the fuel consumption and an excellent emission picture. The experimental results show that it is possible to drive the engine with air/fuel rates of 1.4 with emissions of 10 ppm NO. (EI)

Document Type — Paper from report

Citation Number	**80A000750**
Article Title	*Potentials for Early Utilization of Methanol and Hydrogen Fuels*
Document Title	Proceedings of the Cornell International Symposium and Workshop on the Hydrogen Economy
Article Author	Keller, L.J.
Author Affiliation	Keller Corp., Sarasota, Fla. (USA)
Conference	Cornell international symposium and workshop on the hydrogen economy
Conference Place	Ithaca, NY, USA
Conference Date	20 Aug 1973
Report Number	PB-244 394/3ST
Publication Date	Apr 1975
Pages	393-396
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A000752**
Article Title	*Alcohol/Gasoline Blends — Lean Misfire Limits*
Document Title	13th Summary Report: Highway Vehicle Systems Contractors Coordination Meeting
Article Author	Adt, R.R., Jr.
Conference	13th highway vehicle systems contractors coordination meeting
Conference Place	Dearborn, MI, USA
Conference Date	4 Oct 1977
Report Number	CONF-771037
Publication Date	1978
Pages	362-365
Notes	Sponsored by the U.S. Dept. of Energy, Assistant Secretary for Conservation and Solar Applications, Division of Transportation Energy Conservation.
Abstract	An experimental study was conducted to determine the lean mixture operating characteristics of a S.I. engine operating on a methanol/gasoline blend. The results indicate that with a 20% methanol/gasoline blend the lean misfire limit can be extended. (AFDB)
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A001003**
Article Title	*Alcohol Winning Support as Gasoline Supplement*
Article Author	Brigham, L.
Journal	Christian Science Monitor
Volume	71
Pages	10
Publication Date	18 Jun 1979
Document Type	Journal article

Citation Number	**80A001004**
Article Title	*Alcohol as Motor Fuel?*
Article Author	Keller, J.L.
Journal	Hydrocarbon Process.
Volume	58
Pages	127-138
Publication Date	May 1979
Document Type	Journal article

Citation Number	**80A001007**
Article Title	*Alternative Fuels for Automotive Transportation*
Article Author	Gillis, J.C. Pangborn, J.B. Vyas, K.C.
Author Affiliation	Institute of Gas Technology, Chicago, Ill. (USA)
Journal	Automot. Eng. (N.Y.)
Volume	83
Issue	9
Pages	28
Publication Date	Sep 1975
Abstract	Ammonia, solvent refined coal, distillate oils, ethanol, gasolines, hydrogen, methanol, SNG, and synthetic LPG can be considered as possibilities for automotive use. Prospects for these fuels in automotive transportation are discussed. Problem areas of alternative fuel choices are analyzed. (EL)
Document Type	Journal article

Citation Number	**80A001010**
Article Title	*Analyzer for Determining Fuel Vaporization Pressure Curves of Gasoline and Gasoline-alcohol Fuels*
Article Author	Baudino, J.H. Chloupek, F.J. Crowley, A.W.
Journal	Analytical Chemistry
Volume	49
Issue	14
Pages	2368-2371
Publication Date	1977
Document Type	Journal article

Citation Number	**80A001013**
Article Title	*Another Look at Methanol*
Article Author	Ingamells, J.C. Lindquist, R.H.
Author Affiliation	Chevron Research Co., Richmond, Calif. (USA)
Journal	Automot. Eng. (N.Y.)
Volume	83
Issue	4
Pages	38
Publication Date	Apr 1975
Abstract	The effects of methanol on blending properties, octane quality, power output, cold starts, vapor lock, driveability, fuel economy, exhaust emissions, mixtures, automobile modifications, water sensitivity, and system deterioration when methanol is used in cars designed for 100% gasoline fuel are discussed. Methanol is not a useful fuel additive for existing unmodified cars. Methanol could be used effectively in special vehicles designed to handle the corrosion, water absorption, and vaporization characteristics of the fuel. The cost of manufacture and distribution in a separate system that overcomes the water sensitivity problem will determine the extent of methanol's use. (ENV)
Document Type	Journal article

Citation Number	**80A001016**
Article Title	*API to Support Further R&D into Production and Use of Alcohol Fuels*
Journal	Resources
Issue	2
Pages	14
Publication Date	1978
Document Type	Journal article

Citation Number	**80A001039**
Article Title	*Boats and Gasohol: to Use or Not to Use*
Article Author	Fishman, J.A.
Journal	New York Times
Volume	128
Pages	S9
Publication Date	12 Aug 1979
Notes	v. 128, Section 5
Document Type	Journal article

Citation Number	**80A001048**
Article Title	*Gasohol No Help, Says Top GM Engineer*
Article Author	Callahan, J.M.
Journal	Automot. Ind.
Volume	159
Pages	27
Publication Date	Jun 1979
Document Type	Journal article

Citation Number	**80A001049**
Article Title	*Gasohol No Threat to U.S. Carburetors*
Article Author	Callahan, J.M.
Journal	Automot. Ind.
Volume	159
Pages	59-60
Publication Date	Jun 1979
Document Type	Journal article

Citation Number	**80A001050**
Article Title	*Gasohol OK as Substitute for Unleaded Gasoline*
Journal	Christian Science Monitor
Volume	71
Pages	4
Publication Date	14 Feb 1979
Document Type	Journal article

Citation Number	**80A001053**
Article Title	*Ionization in a Methanol-oxygen Flame*
Article Author	Goodings, J.M.
Author Affiliation	York Univ., Downsview, Ontario (Canada). Dept. of Chemistry
Journal	Int. J. Mass Spectrom. Ion Phys. (Netherlands)
Volume	29
Issue	1
Pages	57-75
Publication Date	Jan 1979
Document Type	Journal article

Citation Number	**80A001069**
Article Title	*Mother's Alcohol Fuel Preheater*
Journal	Mother Earth News
Pages	86
Publication Date	Feb 1980
Document Type	Journal article

Citation Number	**80A001070**
Article Title	*Mother's Experimental Alcohol-powered Truck*
Journal	Mother Earth News
Pages	78
Publication Date	Oct 1979
Document Type	Journal article

Citation Number	**80A001071**
Article Title	*Multi-fuel Car Engine Gets New Tests*
Article Author	McElheny, V.K.
Journal	New York Times
Publication Date	12 Sep 1977
Document Type	Journal article

Citation Number	**80A001085**
Article Title	*Use of Methanol as a Fuel*
Article Author	Yamamoto, T.
Author Affiliation	Catal and Chem. Ind. Co. (Japan)
Journal	Int. Chem. Eng.
Volume	14
Issue	3
Pages	593-600
Publication Date	Jul 1974
Abstract	This review article examines the possible uses of methanol as a fuel, including in fuel cells, as a boiler fuel, as a pollution-free automobile fuel, and as source of city gas. (EI)
Document Type	Journal article

Citation Number	**80A001091**
Article Title	*Volkswagenwerk Completes Study on 15% Methanol Gasoline,/Details*
Journal	Chem. Eng. (London)
Pages	115
Publication Date	28 Feb 1977
Document Type	Journal article

Citation Number	**80A001092**
Article Title	*Volkswagenwerk Starts Test with 800 Methanol-fueled Rabbits in West Berlin*
Journal	Frankfurter Allgemeine
Pages	19
Publication Date	27 Nov 1979
Document Type	Journal article

Citation Number	**80A001093**
Article Title	*Volkswagenwerk Summarizes Research in Using Methanol as Auto Fuel*
Journal	Erdoel Kohle
Pages	360
Publication Date	Aug 1978
Document Type	Journal article

Citation Number	**80A001094**
Article Title	*Volvo, Saab Test Dual Fuels Engines*
Article Author	Kerr, J.
Journal	Engineer
Volume	249
Pages	7
Publication Date	9 Aug 1979
Document Type	Journal article

Citation Number	**80A001099**
Article Title	*Feasibility of Methanol/Gasoline Blends for Automotive Use*
Article Author	Johnson, R.T. Riley, R.K.
Author Affiliation	Missouri Univ., Rolla (USA)
Journal	Am. Chem. Soc., Div. Pet. Chem., Prepr.
Volume	22
Issue	1
Pages	152-167
Publication Date	Feb 1977
Notes	Symposium on Evaporation-Combustion of Fuel Droplets, at Am. Chem. Soc. Meet, San Francisco, Calif., Aug 29-Sep 3, 1976.
Abstract	This paper presents experiment-based evaluation of the advantages and disadvantages of methanol/gasoline blends as fuels for spark ignition engines. The emphasis is on the use of these

blends as possible fuels for the existing and near future United States auto population. The evaluation was broken into three basic areas: (1) evaluation of the octane improving characteristics of methanol blended with several gasoline base stocks; (2) fuel research engine evaluation of the performance and emissions of methanol/gasoline blends at equivalent operating conditions to determine any benefits from the slightly altered fuel chemistry; and (3) vehicle tests to evaluate the performance, emissions, and fuel economy of methanol/gasoline blends in current and near future vehicles. (EI)

Document Type	Journal article

Citation Number	**80A001102**
Article Title	*Chrysler, G.M. Put Gasohol in Warranty*
Journal	New York Times
Volume	128
Pages	D5
Publication Date	3 May 1979
Notes	v. 128, Section D
Document Type	Journal article

Citation Number	**80A001104**
Article Title	*Will Autos Go Alcoholic?*
Article Author	Hampton, W. Iammartino, N.R.
Journal	Chem. Eng. (N.Y.)
Volume	82
Issue	15
Pages	58
Publication Date	21 Jul 1975
Abstract	Although methanol production is still more expensive at today's prices than petroleum-derived gasoline production, the abundance and security of supply of the alcohol's feedstocks make it a promising energy alternative. Methanol features a higher octane level and more efficient burning when compared with gasoline, but it poses the problem of high combustibility. Further research is recommended. (ENV)
Document Type	Journal article

Citation Number	**80A001112**
Journal	Automotive News
Pages	8
Publication Date	26 Apr 1976
Abstract	New in-vehicle fuel system mixes methanol and gasoline to extend gas supplies
Document Type	Journal article

Citation Number	**80A001119**
Article Title	*Newest Fuel Saver: "Aquahol" Injection for Diesel Engines*
Journal	Farm J.
Volume	103
Pages	21
Publication Date	Nov 1979
Document Type	Journal article

Citation Number	**80A001120**
Article Title	*Nitric Oxide and Composition Measurements within Diffusion Flames around Simulated Ethanol and Ethanol-pyridine Droplets*
Article Author	Ludwig, D.E. Bracco, F.V. Harrje, D.T.
Author Affiliation	Princeton Univ., N.J. (USA)
Journal	Combust. Flame
Volume	25
Issue	1
Pages	107-120
Publication Date	Aug 1975
Abstract	The composition of major stable species, including nitric oxide, and the temperature were measured within the diffusion flames around simulated ethanol droplets burning in air at atmospheric conditions. Nitric oxide measurements were also made with ethanol seeded with various percentages of a nitrogen containing compound (pyridine). The fuel droplet was simulated by a 1.2 mm porous carbon sphere supported by a fine stainless steel fuel line. Quartz microprobes, quartz coated thermocouples of platinum/platinum-13% rhodium, a gas chromatograph, and a chemiluminescent analyzer were used. The results include documentation of significant oxygen penetration to the simulated droplet surface, and pyrolysis and partial oxidation of ethanol near the surface. The measured nitric oxide concentrations for both pure ethanol and pyridine seeded ethanol were greater than expected in spite of measured flame temperatures considerably lower than predicted. (EI)
Document Type	Journal article

Citation Number	**80A001157**
Article Title	*Methanol: a Versatile Fuel for Immediate Use*
Article Author	Reed, T.B. Lerner, R.M.
Author Affiliation	Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.
Journal	Science
Volume	182
Issue	4119
Pages	1299-1304
Publication Date	28 Dec 1973
Abstract	The article reviews the history of the use of methanol as a motor fuel. Results from on the road vehicles tests run show increases in fuel economy and improved acceleration response. (AFDB)
Document Type	Journal article

Citation Number	**80A001160**
Article Title	*Future Fuels and Mixture Preparation Methods for Spark Ignition Engines*
Article Author	Bernhardt, W.
Journal	Prog. Energy Combust. Sci.
Volume	3
Pages	139-150
Publication Date	1977
Abstract	Given the current petroleum supply situation it appears to this author that alcohol/gasoline blends or alcohol fuels has a good potential for use in the automatic sector. This being the case, different approaches to improved mixture preparation and fuel distribution problems in the engine are suggested. The emissions consequence of using such fuels is also presented. (AFDB)
Document Type	Journal article

Citation Number **80A001161**
Article Title *Gasoline Does, Too, Mix with Alcohol*
Article Author Scheller, W.A.
Mohr, B.J.
Journal CHEMTECH
Volume 7
Issue 10
Pages 616-623
Publication Date Oct 1977
Abstract The results of the APIUC sponsored gasohol road tests are presented. Claims are made suggesting the fleet operation on gasohol reduces fuel consumption by 6.7 percent. Octane values, distillation curves and UA=I pressures are given. The driver evaluations suggests that the driveability is good in both summer and winter driving. Economics are presented for a large scale ethanol production facility. (AFDB)
Document Type Journal article

Citation Number **80A001162**
Article Title *The Use of Gasohol*
Article Author Berger, J.E.
Journal Ecolibrium
Volume 8
Issue 2
Pages 10-13
Publication Date Spr 1979
Abstract A review of Norman Brinkman's 1975 SAE is presented emphasizing the primary differences in the end of using ethanol or methanol gasoline blends and gasoline is primarily a result of the stoichiometry of the blends and the straight gasolines. In addition, the author presents information on the relative costs of gasoline (51 cents/gal) methanol (44 cents/gal) and ethanol (12.5 cents/gal). (AFDB)
Document Type Journal article

Citation Number **80A001164**
Article Title *The Utilization of Alternative Fuels in a Diesel Engine Using Different Methods*
Article Author Holme/air, E.
Berg, P.S.
Bertilsson, B-I
Author Affiliation Volvo Truck Corp., Goteborg (Sweden)
Journal SAE Prepr.
Issue 800544
Abstract Development work has been carried out on a turbo charged direct injection diesel engine with methanol, ethanol and gasoline. Using additives to increase the cetane number, emulsion with diesel fuel, forced ignition with diesel injected prior to the alternative fuel, by a separate injection system and carburetion are the methods which have been investigated. Spark ignited diesel has been studied and is commented on to complete the picture. The intention of the paper is to evaluate these methods. (PAPER CHEM)
Document Type Journal article

Citation Number **80A001165**
Article Title *The Effects of Fuel Structure on the Autoignition of Fuel-air Mixtures*
Article Author Saidaminov, S.S.
Author Affiliation Tashkent Univ., (USSR). Automobile and Road Construction Inst.
Journal SAE Prepr.
Issue 800046
Publication Date 1980
Abstract This paper contains the results of studies of self-ignition of differently-structured hydrocarbons, as well as of different gasolines, under varying rates of compression. Two oxygen-containing compounds, methanol and ether, were also examined. The air-fuel equivalence ratio was held at 1.2 for all tests. The experimental conditions simulate the end-gas state in an engine where compression takes place at different rates when engine speed is changed. Using the modern concept of the gas-phase oxidation of hydrocarbons, and drawing on the experimental data, a new scheme of hydrocarbon oxidation was developed. The activation energy for five individual hydrocarbons was calculated according to this scheme. The experiments with different gasolines have shown that the presence of more than 30% aromatic or olefinic hydrocarbons in gasoline leads to independence of fuel-knock resistance from engine speed. This last fact can promote high-speed knock. (SAE)
Document Type Journal article

Citation Number **80A001166**
Article Title *Investigation of the Octane Rating and Autoignition Temperature of Methanol-gasoline Blends*
Article Author Nichols, R.J.
Author Affiliation Aerospace Corp., El Segundo, Calif. (USA)
Journal SAE Prepr.
Issue 800258
Publication Date 1980
Abstract The octane rating and autoignition temperature of methanol-gasoline blends were measured. Large increases in autoignition temperature and ignition delay time were found for small percentages of added methanol. These increases correlated well with the increases in research octane rating throughout the range of blends. The evaporative cooling effect of the methanol was concluded to be the major mechanism suppressing detonation. (SAE)
Document Type Journal article

Citation Number **80A001167**
Article Title *The Laminar Burning Velocity of Isooctane, N-heptane, Methanol, Methane, and Propane at Elevated Temperature and Pressures in the Presence of a Diluent*
Article Author Ryan, T.W. III
Lestz, S.S.
Author Affiliation Southwest Research Inst., San Antonio, Tex. (USA)
Journal SAE Prepr.
Issue 800103
Publication Date 1980
Abstract A constant volume bomb was used to determine basic combustion characteristics of isooctane, n-heptane, methanol, propane and methane. Results show that the laminar flame velocity of a quiescent homogeneous air/fuel mixture can be derived from pressure-time data in the bomb. The effects of pressure, temperature, and charge dilution on flame velocity and ignition are presented. A thermo-chemical kinetic model accurately pre-

	dicted concentrations of nitric oxide during combustion and in the burned gas. (SAE)
Document Type	Journal article

Citation Number	**80A001170**
Article Title	*Methanol and Ethanol Fuels for Modern Cars*
Article Author	Keller, J.L.
Author Affiliation	Union Oil Co. of California, Brea (USA). Sci. Technol. Div.
Journal	Proc., Am. Pet. Inst.
Volume	58
Pages	67-82
Publication Date	1979
Notes	Series 58, Section 3
Document Type	Journal article

Citation Number	**80A001173**
Article Title	*Alcohol Assisted Hydrocarbon Fuels: a Comparison of Exhaust Emissions and Fuel Consumption Using Steady-state and Dynamic Engine Test Facilities*
Article Author	Bushnell, D.J. Simonsen, J.
Journal	Energy Commun.
Volume	2
Issue	2
Pages	107
Publication Date	1976
Document Type	Journal article

Citation Number	**80A001177**
Article Title	*Methyl Alcohol; a Potential Fuel for Transportation*
Document Title	Energy Technology Handbook
Article Author	Pasternak, A.
Author Affiliation	California Univ., Livermore (USA). Lawrence Livermore Lab.
Publisher	McGraw-Hill; New York, NY, USA
Publication Date	1977
Pages	4/44-4/49
Document Type	Paper/Chapter from book

Citation Number	**80A001182**
Article Title	*Application of New Combustion Analysis Method in the Study of Alternate Fuel, Combustion and Emission Characteristics*
Document Title	Future Automotive Fuels
Article Author	Harrington, J.A. Colucci, J.M. (ed.) Gallopoulos, N.E. (ed.)
Publisher	Plenum Press; New York, NY, USA
Publication Date	1977
Pages	177-213
Abstract	A single cylinder engine was used to demonstrate a cylinder pressure and volume measurement technique in the evaluation of the effects of EGR on the combustion of methanol. The results indicate that methanol has shorter ignition delay intervals and burn durations than gasoline. The ignition delay and combustion intervals for both rules are increased as load increases, EGR increases and A/F increases. A 10% increase in power was found with the methanol fuel. (AFDB)
Document Type	Paper/Chapter from book

Citation Number	**80A001183**
Article Title	*Alternative Fuels for Automotive Diesel Engines*
Document Title	Future Automotive Fuels
Article Author	Scott, W.M. Colucci, J.M. (ed.) Gallopoulos, N.E. (ed.)
Publisher	Plenum Press; New York, NY, USA
Publication Date	1977
Pages	263-292
Abstract	A number of potential alternate fuels for automotive diesel engines were evaluated in a single cylinder Ricardo Comet engine. The candidates examined include, kerosenes, heavy fuel oils, gasoline, methanol, natural gas, hydrogen and coal tars. The fuels that were judged as acceptable alternates for this application were those that have good compression ignition qualities, kerosenes and heavy distillates from any source. (AFDB)
Document Type	Paper/Chapter from book

Citation Number	**80A001184**
Article Title	*Engine Performance and Exhaust Emissions Characteristics of a Methanol Fuel Automobile*
Document Title	Future Automotive Fuels
Article Author	Bernhardt, W.E. Lee, W. Colucci, J.M. (ed.) Gallopoulos, N.E. (ed.)
Publisher	Plenum Press; New York, NY, USA
Publication Date	1977
Pages	214-234
Abstract	A series of engine tests and vehicles tests were run to evaluate the potential of methanol as an automotive fuel. The engine tests (with special intake manifold and carburetor) show increased power, thermal efficiency, reduced NOx emissions and increased aldehyde emissions, with neat methanol compared to gasoline. The compression ratio of the engine was increased from 9.7 to 14 to 1. The results showed increased efficiency but also reduced NOx and aldehyde emissions. (AFDB)
Document Type	Paper/Chapter from book

Citation Number	**80A001193**
Document Title	*Power Alcohol; Its Use as Motor Fuel in the United Provinces*
Document Author	Chatterji, N.G.
Series	Dept. of Industries and Commerce, United Provinces. Bulletin, New Ser., no. 6
Publisher	Supt., Print. and Stationery, United Provinces; Allahabad, IN
Publication Date	1946
Pages	16
Document Type	Book

Citation Number	**80A001197**
Document Title	*Utilization of Methanol Based Fuels in Transportation*
Corporate Author	Ontario Ministry of Energy Advisory Group on Synthetic Liquid Fuels (Canada)
Series	Ontario Ministry of Energy Advisory Group on Synthetic Liquid Fuels Report, v. 5
Publication Date	Apr 1978
Pages	89
Abstract	The potential for widespread use of methanol as a substitute for gasoline to fuel vehicles is as-

sessed. Vehicle performance with methanol-based fuels is reviewed. Strategies for the introduction of methanol fuel in transportation are discussed. Public acceptance, safety and environmental effects, and the economic impact of methanol substitution are gauged. When blended with gasoline, methanol produced acceptable vehicle performance. Vehicle manufacturers will need advance notice of methanol sub stitution because vehicles will have to be modified slightly. Pure methanol use is possible only in specially-designed engines. Further development of methanol-using vehicles and methanol refining techniques is recommended. Data on vehicle performance tests and current fuel demands are provided. (EL)

Document Type: Book

Citation Number **80A001202**
Document Title: *Use of Alcohol and Gasoline in Farm Engines*
Publisher: Rutan Publishing; Minneapolis, MN, USA
Publication Date: 1980
Pages: 100
Notes: Reprint of Farmers' Bulletin no. 277, U.S. Department of Agriculture, issued February 14, 1907 with added notes by the 1980 publisher.
Abstract: This book contains information in understanding the firing characteristics between gasoline and alcohol in internal combustion engines.
Document Type: Book

Citation Number **80A001203**
Document Title: *Methyl Alcohol as Motor Fuel*
Document Author: Davison, R.R.
Harris, W.D.
Series: Texas Engineering Experiment Station. Technical Bulletin 74-2
Publication Date: Apr 1974
Document Type: Book

Citation Number **80A001217**
Document Title: *Identification of Probable Automotive Fuels Composition*
Corporate Author: Southwest Research Inst., San Antonio, Tex. (USA)
Publisher: U.S. Department of Energy. Division of Transportation Energy Conservation; Washington, DC, USA
Report Number: HCP/W3684-01/1
Contract EY-76-C-04-3684
Publication Date: May 1978
Pages: 225
Abstract: The principal factors and activities in the production of automotive fuels which have synthetic hydrocarbon constituents and alcohol fuels derived from coal are traced and discussed in detail. These include selection of reference raw materials, syncrude compositions for a variety of candidate conversion processes, and finished automotive fuels composition based upon domestic fuel demand projections for the time frame 1985 to 2000. In addition, those fuel-engine relationships pertinent to developing optimized automotive systems are discussed in relation to anticipated developments in propulsion systems technology. Projected compositions and performance of finished specification-quality automotive fuels for this time frame are not expected to differ significantly from those for today's fuels since it is anticipated that coal- or shale-derived syncrudes will be blended with dominant petroleum crudes at conventional petroleum refineries rather than at plants dedicated to the exclusive refining of synthetic crudes. Consequently, excessive undesirable compounds can be diluted to acceptable specifications levels by proportionate blending with petroleum feedstocks. (ERA citation 03:048295)
Availability: NTIS
Document Type: Report

Citation Number **80A001227**
Document Title: *Emergency Fuel Substitutes for Spark-ignition Engines*
Document Author: Daly, P.J.
Watson, W.W.
Author Affiliation: Naval Civil Engineering Lab., Port Hueneme, Calif. (USA)
Report Number: AD-835 513
NCEL-TR-589
Publication Date: Jun 1968
Pages: 27
Availability: NTIS
Document Type: Report

Citation Number **80A001228**
Document Title: *Exhaust Emissions and Fuel Economy from Automobiles Using Alcohol/Gasoline Blends under High-altitude Conditions*
Document Author: Richardson, D.
Publisher: Environmental Protection Agency, Technology Assessment and Evaluation Branch; Ann Arbor, MI, USA
Report Number: PB-290 612/1ST
Publication Date: Oct 1978
Pages: 28
Abstract: This report presents the results of chassis dynamometer tests of 10 current production automobiles operating on gasoline and alcohol/gasoline blends. The test fuels included Indolene, 10% ethanol/Indolene blend, 20% ethanol/Indolene blend, and 10% methanol/Indolene blend. Evaporative emissions tests showed increased evaporative losses during the hot-soak portion of the test. (AFDB)
Availability: NTIS
Document Type: Report

Citation Number **80A001229**
Article Title: *A Study on Reformed Fuel for an Automotive Gasoline Engine*
Document Title: Proceedings of the Fourth International Symposium on Automotive Propulsion Systems: Held on April 18-22, 1977; a Report by the Automotive Propulsion Systems Pilot Study
Article Author: Onoda, K.
Author Affiliation: Energy Research and Development Administration, Washington, D.C. (USA). Div. of Transportation Energy Conservation
Conference: 4th international symposium on automotive propulsion systems
Conference Place: Washington, DC, USA
Conference Date: 18 Apr 1977

Publisher	Committee on the Challenges of Modern Society, North Atlantic Treaty Organization; Washington, DC, USA
Report Number	CONF-770430/1
Publication Date	Feb 1978
Pages	759-768
Notes	Cover title: Automotive propulsion
Abstract	By supplying reformed gas to the precombustion chamber of a carburetted three-valve prechamber stratified charge internal combustion engine, a lower nitrogen oxides (NOx) emission level was achieved without hurting fuel economy. The NOx was lowered even further when an exhaust gas recirculation system was employed. Methanol (CH_3OH), as a reforming gas, was found to have the advantages of higher hydrogen generation and higher energy efficiency. It appears that hydrogen supplement by means of CH_3OH reforming can also be applied to a conventional gasoline engine. The disadvantages of an increased exhaust gas recirculation rate such as combustion instability and misfiring can be compensated for by hydrogen supplement. A conventional engine with a higher exhaust gas recirculation rate and hydrogen supplement by means of CH_3OH reforming is a promising approach for low NOx emmissions.
Document Type	Paper from report

Citation Number	**80A001230**
Article Title	*Vehicle Evaluation of Neat Methanol — Compromises among Exhaust Emissions, Fuel Economy, and Driveability*
Document Title	Proceedings of the Fourth International Symposium on Automotive Propulsion Systems: Held on April 18-22, 1977; a Report by the Automotive Propulsion Systems Pilot Study
Article Author	Brinkman, N.D.
Author Affiliation	General Motors Research Labs., Warren, Mich. (USA)
Conference	4th international symposium on automotive propulsion systems
Conference Place	Washington, DC, USA
Conference Date	18 Apr 1977
Publisher	Committee on the Challenges of Modern Society, North Atlantic Treaty Organization; Washington, DC, USA
Report Number	CONF-770430/1
Publication Date	1978
Pages	736-738
Notes	Cover title: Automotive propulsion
Abstract	Two cars, one carbureted and the other fuel-injected, were modified to burn neat methanol. Exhaust emissions, fuel economy, and driveability were measured and compared to those obtained with gasoline in the unmodified (production) cars. Since acceptable driveability and durability were obtained only with the fuel-injected car, it was used to investigate the spark timing and equivalence ratio settings which would give an acceptable compromise among exhaust emissions, fuel economy, and driveability. Average equivalence ratios of 0.96-0.62 and spark timings from best power to 15 degrees retarded were studied. With spark timing set for best power and the average equivalence ratio for maximum fuel economy (0.83), driveability was acceptable and carbon monoxide and nitrogen oxides (NOx) emissions met the 1977 standards. The unburned fuel emissions, however, exceeded the 1977 standards for hydrocarbons, even though the car was equipped with a catalytic converter. At 0.83 average equivalence ratio, NOx emissions were reduced below the statutory standard (0.4) by retarding spark timing; driveability and fuel economy, however, deteriorated. (AM)
Document Type	Paper from report

Citation Number	**80A001231**
Article Title	*Flame Speeds, Performance, and Emissions with Methanol-indolene Blends*
Document Title	Proceedings of the Fourth International Symposium on Automotive Propulsion Systems: Held on April 18-22, 1977; a Report by the Automotive Propulsion Systems Pilot Study
Article Author	Henein, N.A.
Author Affiliation	Wayne State Univ., Detroit, Mich. (USA)
Conference	4th international symposium on automotive propulsion systems
Conference Place	Washington, DC, USA
Conference Date	18 Apr 1977
Publisher	Committee on the Challenges of Modern Society, North Atlantic Treaty Organization; Washington, DC, USA
Report Number	CONF-770430/1
Publication Date	1978
Pages	697-707
Notes	Cover title: Automotive propulsion
Abstract	Methanol added at different ratios to Indolene had various effects on combustion, performance, and emissions in a CFR-spark ignition engine. Flame speed was measured by fixed ionization probes and a newly developed travelling ionization probe. The resulting turbulent flame speeds, computed laminar flame speeds, and the equivalent spherical flame speeds were analyzed to detect the turbulence decay over the cycle. The following effects were noted: increased octane number and brake specific (BS) fuel consumption; improved thermal efficiency; increased flame speed; increased BS carbon monoxide and BS hydrocarbons; and decreased BS nitrogen oxides emissions. (POLL)
Document Type	Paper from report

Citation Number	**80A001232**
Article Title	*Characterization of Methanol as an Automotive Fuel an Experimental Study*
Document Title	10th Summary Report: Highway Systems Contractors Coordination Meeting
Article Author	Allsup, J.R.
Conference	10th annual highway vehicle system contractors coordination meeting, ERDA
Conference Place	Ann Arbor, MI, USA
Conference Date	4 May 1976
Report Number	ERDA-76-136 CONF-760584
Publication Date	1976
Pages	294-297
Abstract	This report presents the project objectives and reviews the results from the experimentation to date. The two projects include: a vehicle/engine test program using 5% and 10% methanol blender

	tolerance, distillation characteristics, vapor pressure and action of cosolvents in methanol/gasoline blends. (AFDB)
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A001238**
Document Title	*Methanol as an Alternative Fuel*
Article Author	Jarvis, P.M.
Author Affiliation	General Electric Co., Schenectady, N.Y. (USA). Gas Turbine Products Div.
Conference	1974 engineering foundation conference
Conference Place	Henniker, NH, USA
Conference Date	7 Jul 1974
Publisher	Engineering Foundation; New York, NY, USA
Publication Date	1974
Availability	Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type	Paper/Chapter from book

Citation Number	**80A001248**
Document Title	*Methanol as a Possible Fuel for Automotive Use*
Document Author	Lucas, G.G. Choi, M.F.
Author Affiliation	Loughborough Univ. of Technology (UK)
Report Number	TT-7708
Publication Date	Jul 1977
Pages	32
Notes	Loughborough University of Technology, Department of Transportation Technology
Abstract	This report reviews the literature on the state-of-the-art of the use of methanol in internal combustion engines. Fuel economy, power output and emission characteristics of methanol-fueled vehicles are reported. Problems associated with automobiles operating with straight methanol and methanol/gasoline blends are also identified. Existing processes for the manufacture of methanol are described. Further raw material sources for methanol production and other possible uses are assessed. (EI)
Availability	NTIS
Document Type	Report

Citation Number	**80A001249**
Document Title	*Investigation of a Substitute Fuel to Control Automotive Air Pollution*
Document Author	Fitch, R.E. Kilgroe, J.D.
Author Affiliation	Consolidated Engineering Technology Corp., Mountain View, Calif. (USA)
Report Number	PB-194 688 CETEC-FR-01800 Contract PHS-CPA-22-69-70
Publication Date	Feb 1970
Pages	77
Abstract	A study was conducted to investigate the feasibility of using methanol as a substitute fuel for gasoline to reduce exhaust pollutants emitted from automotive engines. Work was performed in two phases encompassing both automotive and single cylinder laboratory engine tests. It was concluded that methanol displays significant potential as a pollution control substitute fuel for gasoline. In the automotive tests conducted with a slightly modified, non-optimized engine system, methanol was shown to be a satisfactory fuel from the standpoint of engine operation and to produce methanol emissions as low as 1900 PPM (317 PPM-hexane equivalent). Vehicle mileage was low (7 to 9 mpg) as expected. Suspected high aldehyde emissions were confirmed. It is believed that optimization of the fuel-air ratio, the mixture distribution to the cylinders, and heating of the fuel or fuel-air mixture, will result in improved performance and substantially reduced emissions of all pollutants, except NOx. Laboratory engine operation with blends of reform gases ($CO+2H_2$) and methanol was shown to be successful in improving engine performance (subject to engine knock limitations) and providing major reductions in methanol and formaldehyde emissions. If the reforming technique can be economically implemented in an automotive system, it is highly probable that emission levels can be achieved which are well below those possible with gasoline. (AUTHOR)
Availability	NTIS
Document Type	Report

Citation Number	**80A001250**
Document Title	*Component Relationships within Two-phase Gasoline/Methanol/Water Systems*
Document Author	Cox, F.W.
Author Affiliation	Department of Energy, Bartlesville, Okla. (USA). Bartlesville Energy Research Center
Report Number	BETC/RI-78/6
Publication Date	Feb 1979
Pages	52
Abstract	Experimental data were derived from selected two-phase gasoline/methanol/water systems specifically to gain a better understanding of the phase relationships of these mixtures, to establish more firmly the severity of the phase-separation problem, and to devise a methodology applicable to future studies of gasoline/methanol blends for use as automotive fuels. Two-phase samples were allowed to equilibrate at constant temperature, and the methanol and water content of each phase was determined; thus, phase compositions in terms of solvent, solute, and diluent (gasoline, methanol, and water, respectively) were established. Partition and mutual solubility relationships were then established from these data. The lower "water-rich" phase of a separated gasoline/methanol/water mixture is not usable as a fuel in current-production automobiles without engine adjustments. Generally speaking, increasing mixture temperature or adding the cosolvent, 1-hexanol, produces favorable equilibrium shifts for methanol and water by increasing their solubility in the upper "gasoline-rich" phase. Partition coefficient interrelationships offer a comparatively simple and reliable route to two-phase gasoline/methanol/water systems description. (NTIS)
Availability	NTIS
Document Type	Report

Citation Number	**80A001253**
Document Title	*Study of Decomposed Methanol as a Low Emission Fuel*
Document Author	Pefley, R.K. Saad, M.A.

	Sweeney, M.A.
	Kilgroe, J.D.
	Fitch, R.E.
Author Affiliation	Santa Clara Univ., Calif. (USA). School of Engineering
Report Number	PB-202-732
Publication Date	30 Apr 1971
Pages	106
Notes	Final report
Abstract	Tests were run on a CFR engine to study the feasibility of using dissociated methanol as an automotive fuel. Using simulated decomposed methanol, in the range of 0 to 100%, exhaust emissions were analyzed by gas chromatography and IR sensors, and their trends were determined as functions of compression ratio, air-fuel ratio, spark advance, intake manifold temperature and degree of dissociation of the fuel. The exhaust emission results were also related to engine performance in terms of indicated horsepower and indicated thermal efficiency. A summary of the experimental program and considerations of methods of using exhaust energy for decomposing methanol are presented. (AUTHOR)
Availability	NTIS
Document Type	Report

Citation Number	**80A001254**
Document Title	*Status of Alcohol Fuels Utilization Technology for Highway Transportation*
Corporate Author	Mueller Associates, Inc., Baltimore, Md. (USA)
Publisher	U.S. Government Printing Office; Washington, DC, USA
Report Number	HCP/M2923-01
	Contract EC-77-X-01-2923
Publication Date	Jun 1978
Pages	143
Abstract	A review of the current status of alcohol and ether utilization in vehicles used in highway transportation, exhaust emissions, performance, fuel economy, vehicle driveability, materials compatibility and fuels characterization are discussed. (AFDB)
Document Type	Report

Citation Number	**80A001255**
Document Title	*Nitric Oxide and Composition Profiles around Burning Droplets of Ethanol and Ethanol-pyridine Mixtures*
Document Author	Ludwig, D.E.
	Harrje, D.T.
	Bracco, F.V.
Author Affiliation	Princeton Univ., N.J. (USA). Dept. of Aerospace and Mechanical Sciences
Report Number	PB-253 300/8ST
	AMS-1137
Publication Date	1974
Pages	118
Abstract	Composition profiles for the major species including nitric oxide along with temperature profiles are obtained for simulated ethanol fuel droplets burning at one atmospheric pressure and 300K. Nitric oxide profiles are also obtained for simulated fuel droplets of ethanol seeded with various percentages of a compound containing nitrogen (pyridine). The fuel droplet is simulated by a one millimeter porous carbon sphere supported by a fine stainless steel fuel line. Fuel is fed to the sphere using a motor driven syringe system. Gas samples are collected via a fine quartz microprobe introduced into the flame. The samples are immediately analyzed using a gas chromatograph and a nitric oxide chemiluminescent analyzer. Temperature measurements are made with standard quartz coated platinum/platinum-13% rhodium thermocouples. Comparison of the data is then made with previous theoretical calculations. Composition profiles are in good agreement with the theory, however measured nitric oxide concentrations are somewhat higher than predicted. (NTIS)
Availability	NTIS
Document Type	Report

Citation Number	**80A001256**
Document Title	*Potential for Use of Alternative Fuels in Michigan's Public Transit Systems*
Document Author	Bunch, H.M.
Author Affiliation	Michigan Univ., Ann Arbor (USA). Highway Safety Research Inst.
Report Number	PB-296 301/5ST
	UM-HSRI-78-33
Publication Date	Jul 1978
Pages	38
Notes	Final report
Abstract	Evaluation of specific fuels includes: hydrogen fuel; alcohols; broad-cut fuels; and, gasoline/alcohol blends. (NTIS)
Availability	NTIS
Document Type	Report

Citation Number	**80A001260**
Document Title	*An Evaluation of Methanol, Ethanol, the Propanols, and the Butanols as Ship Propulsion Fuels*
Document Author	Newton, D.O.
Author Affiliation	David W. Taylor Naval Ship Research and Development Center, Annapolis, MD (USA). Dept. of Materials
Report Number	AD-A033 483/9ST
	MAT-75-20
Publication Date	Sep 1976
Pages	13
Abstract	This report evaluates the alkyl monohydric alcohols from methanol through the butanols (C-1 to C-4) as Navy ship propulsion fuels. Properties of the alcohols from the technical literature are compared with the properties of Navy ship propulsion hydrocarbon fuels (diesel fuel marine and JP-5). None of these fuels is suitable as a direct substitute or as an extender for the currently used ship propulsion fuels. The use of methanol with its low volumetric energy content would entail over a 50% reduction in range between refuelings; the use of the other alcohols would result in roughly 25% to 40% loss of range. All the C-1 to C-4 alcohols have flash points below the 60 C minimum considered safe for shipboard fuels. Also, all have low cetane numbers, high water solubility, and problems with toxicity. However, methanol and mixtures of low-boiling alcohols are potentially usable as fuels for new ships specifically designed for their use. (NTIS)
Availability	NTIS
Document Type	Report

Citation Number **80A001261**
Document Title *Emissions from the Methanol Fueled Stanford University Gremlin*
Document Author Ashby, H.A.
Author Affiliation Environmental Protection Agency, Ann Arbor, Mich. (USA). Office of Air Programs
Report Number PB-218 420/8
APTD-1388; 72-4
Publication Date Aug 1971
Pages 10
Abstract An evaluation program was conducted on a methanol-fueled AMC Gremlin which was built by Stanford University students and was named winner in the Liquid Fuel Division of the 1970 Clean Air Car Race. The use of methanol as a fuel is the basic technique used in the Stanford Gremlin for control of pollutant emissions. Carburetor jets were changed to furnish air-fuel ratios slightly on the lean side of stoichiometric. The intake manifold was modified to supply additional heat to the mixture. An Engelhard catalyst was placed about six inches downstream of the exhaust manifold. The test car was an American Motors Gremlin with a 232 cubic-inch six-cylinder engine and standard transmission. The results of the tests indicate that the use of methyl alcohol as fuel can result in very low emissions. The most noticeable change on this car was in the reduction of NO(x), when changing from gasoline to methanol. (NTIS)
Availability NTIS
Document Type Report

Citation Number **80A001262**
Document Title *Clean Air Car Race — 1970. a Summary Report*
Author Affiliation Massachusetts Inst. of Tech., Cambridge (USA)
Report Number PB-199 479
APTD-0680
Contract CPA-70-169
Publication Date Feb 1971
Pages 299
Abstract The 1970 Clean Air Car Race (CACR) is discussed. Sources and health effects of air pollution, current control procedures for internal combustion engines, the events leading to the CACR, and achievements and impacts of the race are mentioned. In the race, seven vehicles out of 43 bettered stringent Federal exhaust emission control standards for hydrocarbons, carbon monoxide, and nitrogen oxides. However, because the CACR test procedure differed from Federal test procedures, there is some question as to whether the vehicles actually bettered the standards. The CACR increased engineering education within universities, increased interaction between participating organizations, had political impact, added to public information, and caused new system design and hardware development. Vehicles tested included internal combustion engines with control devices; Rankine steam engines; Stirling cycle engines; hybrid-electric engines; internal combustion engines burning gaseous fuels (liquefied naturalgas); and internal combustion engines running on leaded and unleaded gasoline, kerosene, methanol, and diesel fuel. Cost and financing of the race are discussed. (APTIC)
Availability NTIS
Document Type Report

Citation Number **80A001263**
Document Title *Characterization and Research Investigation of Methanol and Methyl Fuel*
Document Author Pefley, R.K.
Browning, L.H.
McCormack, M.C.
Hornberger, M.L.
Likos, W.E.
Author Affiliation Santa Clara Univ., Calif. (USA). Dept. of Mechanical Engineering
Report Number PB-271 889/8ST
ME-77-1
Publication Date Aug 1977
Pages 121
Notes Final report
Abstract An automotive engine mounted on a dynamometer is used to generate power, efficiency, and emissions maps which compare methanol with gasoline. This data is also used in conjunction with a computer program to predict vehicle performance and emissions. Methanol is found to offer advantages over gasoline. Two alternatives to the stock fuel preparation system are also evaluated. They show improvements over the stock system. Computer modeling of the thermokinetic predictions of power, efficiency and emissions as functions of compression ratio, spark advance, air-fuel ratio and speed. High compression ratios appear beneficial. The report also considers engine wear; cold start aspects of methanol. It also presents some gas turbine evidence which favors methanol over commercial turbine fuel. (NTIS)
Availability NTIS
Document Type Report

Citation Number **80A001265**
Article Title *Feasibility of Alternative Automotive Fuels*
Document Title Methanol as an Alternative Fuel
Article Author Kant, F.H.
Conference 1974 engineering foundation conference
Conference Place Henniker, NH, USA
Conference Date 7 Jul 1974
Publisher Engineering Foundation; New York, NY, USA
Publication Date 1974
Availability Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type Paper/Chapter from book

Citation Number **80A002001**
Journal Sol. Age
Pages 8
Publication Date Oct 1979
Abstract Debate over nationwide use of 100% alcohol-based transportation system analyzed.
Document Type Journal article

Citation Number **80A002002**
Article Title *Decomposed Methanol as a Low Emission Fuel*
Journal Commerce Business Daily
Volume 2
Publication Date 2 April 1970
Document Type Journal article

Citation Number **80A002013**
Journal: Mach. Des.
Pages: 10
Publication Date: 22 May 1977
Abstract: Details studies on methanol for use as car fuel.
Document Type: Journal article

Citation Number **80A002014**
Article Title: *Determination of Individual Aldehyde Concentrations in the Exhaust of a Spark Ignited Engine Fueled by Alcohol/Gasoline Blends*
Article Author: Harrenstien, M.S.
Rhee, K.T.
Adt, R.R., Jr.
Author Affiliation: New Mexico State Univ., Las Cruces (USA)
Journal: SAE Prepr.
Issue: 790952
Pages: 12
Publication Date: 1979
Notes: Presented at meeting held Oct. 1-4, 1979.
Abstract: Individual aldehyde (and acetone) emissions were measured from the exhaust gas of a premixed multicylinder spark ignition engine fueled with Indolene and blends of Indolene and either methanol or ethanol. The engine was operated at constant speed (2000 RPM) and MBT spark advance with fuel-air equivalence ratios of 0.96, 0.90 and 0.82. Acetone was the only specie measured with the DNPH method that showed a marked increase when the engine was operated in the lean misfire region. The C_3 aldehydes were successfully separated and quantified. It was found that acrolein emissions did not increase when the blends were used; in fact, a slight decrease was observed. Samples taken in the exhaust manifold, upstream of an oxidizing catalyst, and downstream of the catalyst, indicated that aldehydes and acetone are partially destroyed in the exhaust system and virtually completely destroyed by the catalyst.
Document Type: Journal article

Citation Number **80A002016**
Article Title: *Development of a Pure Methanol Fuel Car*
Article Author: Menrad, H.
Lee, W.
Bernhardt, W.
Author Affiliation: Volkswagenwerk A.G., Wolfsburg (Germany, F.R.)
Journal: SAE Prepr.
Issue: 770790
Publication Date: 1977
Notes: Presented at meeting held Sept. 26-30, 1977.
Abstract: The development of a methanol fueled prototype car points out that a passenger car with a spark ignition engine will be a low-emission, high energy-economy and high performance power system of the same usability as modern gasoline vehicles, including cold start and warm up behaviour. Where as the volumetric fuel consumption is higher due to the lower energy content of methanol, the energy-based fuel economy will be considerably better. Low additional production costs are expected, since the vehicle will be very similiar to present day production gasoline cars. (EI)
Document Type: Journal article

Citation Number **80A002021**
Article Title: *Alcohol: a Brazilian Answer to the Energy Crisis*
Article Author: Hammond, A.L.
Journal: Science
Volume: 195
Issue: 4278
Pages: 564
Publication Date: 11 Feb 1977
Abstract: The Brazilian government has launched a bold program to replace much of Brazil's imported oil with ethyl alcohol produced from sugarcane and other crops. Recent experiments have shown that ethyl alcohol is superior to gasoline as a motor fuel; the former delivers liter for liter as much power with much less pollution in a properly tuned engine. Experiments have also shown that a 50-50 mixture of alcohol and diesel fuel in truck and bus engines can be employed through the use of a double carburation system. A high compression engine suitable for pure alcohol is also being tested by Chrysler-Brazil. (EL)
Document Type: Journal article

Citation Number **80A002024**
Article Title: *Alcohol Comes Back to Power Your Car*
Article Author: Ludvigsen, K.
Journal: Mech. Illus.
Volume: 74
Pages: 46
Publication Date: Jan 1978
Document Type: Journal article

Citation Number **80A002027**
Article Title: *Alcohol for Gasoline*
Article Author: Schinto, J.
Journal: Progressive
Volume: 41
Issue: 11
Pages: 46
Publication Date: Nov 1977
Abstract: Such alcohols as ethanol and methanol may be used as a gasoline substitute or as an additive, thus helping to solve America's mobile energy problems without adding significant pollution to the air. Although readily available, and currently in use in many nations, alcohol fuels are virtually ignored by the U.S. government and are fiercely opposed by U.S. oil companies. Alcohol fuels can be produced cheaply from surplus farm products, such as wheat and tobacco, sunflowers, sugar beets, and garbage. The development of alcohol fuels is a question of politics, not of technical feasibility, and will not come about unless aided by federal legislation and accepted by the Carter Administration as a feasible energy alternative. (EL)
Document Type: Journal article

Citation Number **80A002030**
Article Title: *Alcohol Fuel Alternative*
Journal: Mech. Eng.
Volume: 101
Issue: 11
Pages: 52-53
Publication Date: Nov 1979
Abstract: The effects of adding a small percentage (5 percent) of alcohol to gasoline in vehicles designed

for gasoline will vary depending upon whether the vehicle has a two-way catalytic exhaust system and fixed fuel metering or a three-way catalytic system with feedback controlled fuel metering based on signals from an oxygen sensor in the exhaust. Addition of alcohol to the gasoline has a fuel leaning effect. This effect is greater for the two-way catalytic system than for the three-way catalytic system. The conclusion reached by the author's group from their test programs and from a comprehensive study of the literature — which includes fleet test eveidence from the gasohol program, the Environmental Protection Agency, the U.S. Department of Energy, and Volkswagen of Germany — is that legislative action ought to be taken mandating that all new cars sold in the U.S. be able to handle up to 10 percent ethanol or 5 per cent methanol blended into gasoline while still meeting the existing mileage emission specifications. (EI)

Document Type | Journal article

Citation Number **80A002047**
Journal: Chem. Mark. Rep.
Pages: 4
Publication Date: 21 May 1979
Abstract: Ethanol and methanol may not be suitable alternative vehicle fuel sources.
Document Type: Journal article

Citation Number **80A002055**
Journal: Hydrocarbon Process.
Pages: 127
Publication Date: May 1979
Abstract: Evaluates pros and cons of methanol and ethanol as fuel additives for gasoline.
Document Type: Journal article

Citation Number **80A002057**
Article Title: *Exhaust Emissions from a Single-cylinder Engine Fueled with Gasoline, Methanol, and Ethanol*
Article Author: Lowry, S.O.
Devoto, R.S.
Author Affiliation: Georgia Inst. of Tech., Atlanta (USA)
Journal: Combust. Sci. Technol.
Volume: 12
Issue: 4-6
Pages: 177-182
Publication Date: 1976
Abstract: Measurements of the emissions of nitrogen oxide and unburned hydrocarbons, as well as the power output and fuel consumption, have been made for a range of air-fuel ratios with gasoline (indolene), methanol, and ethanol as fuels. Comparison of the results shows that gasoline produces more unburned hydrocarbons than methanol, but about the same as ethanol. Nitrogen oxide emission is about the same for the two alcohols, but less than those for gasoline. (EI)
Document Type: Journal article

Citation Number **80A002058**
Article Title: *Experimental Determination of the Quenching Distance of Methanol and Iso-octane/Methanol Blends*
Article Author: Ishikawa, N.
Branch, M.C.
Author Affiliation: California Univ., Berkeley (USA)
Journal: Combust. Flame
Volume: 27
Issue: 1
Pages: 65-72
Publication Date: Aug 1976
Abstract: An apparatus for determining quenching distances for reactive gas mixtures was divised. The test bomb is operated at constant volume and designed with electrodes flanged by circular quartz disks 2.54 cm in diameter. Experiments were performed with methane, methanol, iso-octane and iso-octane/methanol blends over a range of equivalence ratios for several mixture initial temperatures and pressures. Quenching distances measured for methane agree well with previous data. New data are reported for methanol and iso-octane/methanol blends. The fuel blends were found to have larger quenching distances than either pure fuel. (EI)
Document Type: Journal article

Citation Number **80A002061**
Article Title: *Exxon Research and Eng. Study Finds Methanol Promising Substitute for Gasoline*
Journal: Chem. Eng. (N.Y.)
Pages: 58
Publication Date: 21 July 1975
Document Type: Journal article

Citation Number **80A002063**
Article Title: *A Farm Belt Push for "Gasohol"*
Journal: Bus. Week
Issue: 2523
Pages: 42E
Publication Date: 27 Feb 1978
Abstract: A new Illinois law permits the sale of "gasohol", gasoline which is 10% alcohol by volume, and the state is testing the fuel in its own vehicles. Supporters of the fuel maintain that they get improved performance, better starts, and better mileage, offsetting the fact that it costs more per gallon than regular g soline. The main support for alcohol as a fuel came from the farm belt because alcohol can easily be made by fermentation from grain, a potentially attractive way to make use of surpluses of wheat and corn. Due to the high price of gasoline, the concept is getting fresh attention from Washington. Ethanol can be made from other surplus materials such as old newspapers, distressed crops, and forest residues. Auto companies agree that a workable alcohol-gasoline fuel is technically feasible, but most believe there will be no significant use of gasohol in U.S. cars unless the government intervenes. (ABI)
Document Type: Journal article

Citation Number **80A002073**
Article Title: *Georgia-Pacific Alcohol from Tree Sugars to Be Used as Fuel Component for Test by Nebraska Dept. of Roads*
Journal: Ind. Week
Pages: 26
Publication Date: 27 Jan 1975
Document Type: Journal article

Citation Number	**80A002078**
Article Title	*Goodyear Tire and Rubber Develops Gasoline/ Alcohol/Water Auto Fuel Mixture*
Journal	Wall Street Journal
Pages	15
Publication Date	25 Jun 1974
Document Type	Journal article

Citation Number	**80A002088**
Article Title	*A Highway Test of Gasohol*
Article Author	Kaufman, K.R. Klosterman, H.J.
Journal	Farm Research
Volume	37
Issue	1
Pages	18-27
Publication Date	Aug 1978
Document Type	Journal article

Citation Number	**80A002091**
Journal	Chem. Mark. Rep.
Pages	31
Publication Date	23 Aug 1976
Abstract	Hoechst develops prototype methanol car engine. Hoechst develops prototype methanol-fueled auto engine.
Document Type	Journal article

Citation Number	**80A002092**
Journal	Japan Economic Journal
Pages	17
Publication Date	15 May 1979
Abstract	Honda Motor begins R&D on vehicles to run on gasohol fuel.
Document Type	Journal article

Citation Number	**80A002106**
Journal	Telephony
Pages	84
Publication Date	29 Jan 1979
Abstract	Illinois Bell Telephone to test gasohol for fuel efficiency in company vehicles in Peoria.
Document Type	Journal article

Citation Number	**80A002111**
Article Title	*In Rio, the Taxis Burn Sugarcane (Gasohol)*
Article Author	Myers, N.
Journal	Int. Wildlife
Volume	10
Pages	33
Publication Date	Feb 1980
Document Type	Journal article

Citation Number	**80A002117**
Journal	Eur. Chem. News
Pages	226
Publication Date	16 May 1977
Abstract	Fiat methanol to be mixed with gasoline to produce fuel for Polish cars.
Document Type	Journal article

Citation Number	**80A002119**
Article Title	*Fifty Years of Combustion Research at General Motors*
Article Author	Agnew, W.G.
Journal	Prog. Energy Combust. Sci.
Volume	4
Issue	2
Pages	115-155
Publication Date	1978
Abstract	A review of GMRL's work over the previous 50 years reveals work done with hydrogen and methanol in spark ignition engines; ethanol, methanol and "liquid coal" in continous combustion engines; and gasoline-water emulsions in spark ignition engines. (AFDB)
Document Type	Journal article

Citation Number	**80A002121**
Article Title	*Alcohols in Diesel Engines — a Review*
Article Author	Adelman, H.
Author Affiliation	Santa Clara Univ., Calif. (USA)
Journal	SAE Prepr.
Issue	790956
Pages	11
Publication Date	1979
Abstract	Pure alcohols and alcohol-diesel fuel blends have been compared to diesel fuels in terms of engine power, efficiency and emissions. It is apparent that pure alcohols are poor diesel fuels as their properties are significantly different from the traditional fuels. These differences are examined and in some instances methods of offsetting the deficiencies of alcohols are assessed. Further areas of study are identified since it is possible that some regions of the world will need to use alcohols as diesel fuel extenders. (EI)
Document Type	Journal article

Citation Number	**80A002123**
Article Title	*Alternative Diesel Engine Fuels: an Experimental Investigation of Methanol, Ethanol, Methane and Ammonia in a D. I. Diesel Engine with Pilot Injection*
Article Author	Bro, K. Pedersen, P.S.
Journal	SAE Prepr.
Issue	770794
Pages	16
Publication Date	1977
Abstract	The results of an experimental investigation of methanol, ethanol, methane and ammonia as primary fuels for a high speed direct injection diesel engine are described. The fuels were added to the intake air and ignited by injection of a small amount of pilot diesel fuel (30 percent on energy basis). All of the four fuels were found applicable with methane as the most suitable and ammonia as the least suitable. Experimental data are presented regarding engine power output, efficiency, smoke and gaseous emissions, and the different types of combustion observed during the experiments are discussed. (EI)
Document Type	Journal article

Citation Number	**80A002124**
Article Title	*An Anaytical Method for Estimating the Performance of a Gas Turbine Engine with Water-methanol Injection*
Article Author	Ardans, P.M. Stephenson, D.W.
Author Affiliation	AiResearch Mfg. Co. of Arizona, Phoenix (USA)
Journal	SAE Prepr.
Issue	700208

Publication Date 1970
Notes SAE Trans. Vol.79
Abstract This paper presents an analytical method for the prediction of gas turbine engine performance augmented by water-methanol injection into the compressor, the combustor, or a combination of these injection points. Thus far, the basic method has been successfully applied to estimates of the augmented performance of a single-spool turboprop engine. However, it is general enough that it may be adapted to any type of gas turbine engine, including multispool turbojet, turbofan, and turboshaft engines. In addition to a description of the basic method itself, a comparison of tested and analytical results is included in support of the procedures and conclusions involved. (NNI)
Document Type Journal article

Citation Number **80A002125**
Article Title *Combustion of Methanol and Methanol Blends in a Stratified Charge Engine*
Article Author Branch, M.C.
Wolfe, K.
Ishikawa, N.
Author Affiliation California Univ., Berkeley (USA)
Journal SAE Prepr.
Issue 769021
Pages 7
Publication Date 17 Sep 1976
Abstract Emissions and fuel economy of a large volume prechamber, fuel injected, stratified charge engine with gasoline and with a gasoline/20% — methanol blend are measured. The effect of both prechamber and main chamber mixture ratios on engine operation and emissions is determined. Lowest overall emissions are achieved simultaneously with low fuel consumption at a prechamber equivalence ratio of 1:10. With the blend, the stratified charge engine shows significant improvement over gasoline in nitric oxide emissions, but higher exhaust values for carbon monoxide and hydrocarbons. Fuel economy is not too different for both fuels as long as the prechamber is not overly rich. Quenching distances of methanol and methanol blends are determined. (EL)
Document Type Journal article

Citation Number **80A002127**
Article Title *Direct Injected Methanol Fueling of a Two Stroke Locomotive Engine*
Article Author Storment, J.O.
Wood, C.D.
Author Affiliation Southwest Research Inst., San Antonio, Tex. (USA). Dept. of Engine and Vehicle Research
Journal SAE Prepr.
Issue 800328
Publication Date 1980
Document Type Journal article

Citation Number **80A002128**
Article Title *Driving Cycle Economy, Emissions and Photochemical Reactivity Using Alcohol Fuels and Gasoline*
Article Author Bechtold, R.L.
Pullman, J.B.
Author Affiliation Department of Energy (USA)
Santa Clara Univ., Calif. (USA)
Journal SAE Prepr.
Issue 800260
Publication Date 1980
Abstract An oxidation catalyst equipped vehicle and several three-way-catalyst (TWC) equipped vehicles were modified to operate on the Federal Test Procedure using gasoline or alcohol fuels. Unburned (hydro)carbon emissions were generally lowest when methanol fuel was used. Oxides of nitrogen (NO/dx) were reduced an average of more than 50% by using alcohol fuels in contrast to gasoline. Photochemical reactivity comparisons of unburned fuel emissions were made by calculation and also with a 100 cu. ft. smog chamber. Synthetic reproductions (surrogates) of stoichiometric methanol exhaust were less photochemically reactive than gasoline exhaust surrogates for the 8.5:1 compression ratio engine conditions. This effect was observed even though methanol exhaust surrogates were tested at higher hydrocarbon-to-NO/dx ratios (20:1 vs 13.8:1) than were the gasoline exhaust surrogates. The exhaust form the stoichiometric TWC-equipped vehicles was extremely low in calculated and experimental reactivities for both methanol and gasoline fuels. This was due to their very low mass emissions and low exhaust hydrocarbon-to-NO/dx ratios. (SAE)
Document Type Journal article

Citation Number **80A002129**
Article Title *A Dynamic Test Facility with Motoring Using a Digital Computer*
Article Author Germane, G.J.
Heaton, H.S.
Author Affiliation Brigham Young Univ., Provo, Utah (USA)
Journal SAE Prepr.
Issue 800412
Publication Date 1980
Abstract A computer controlled engine research and testing facility is described which has the capability to motor the engine via a unique hydraulic motoring system. The facility provides a highly reproducible an accurate response to arbitary schedules of engine speed and dynamometer torque versus time. The development of a proportional plus integral plus derivative control scheme for direct digital control of speed and torque is presented in detail, along with a set of vehicle modeling equations which allows test cell simulation of road tests. A simple experimental driving cycle is described, and fuel flow results obtained from tests of alcohol/gasoline blends are compared to actual road and chassis dynamometer tests. The agreement of the various results supports the use of the facility with the simple driving cycle as an alternative to chassis dynamometer or road testing. (SAE)
Document Type Journal article

Citation Number **80A002130**
Article Title *Effect of Compression Ratio on Exhaust Emissions and Performance of a Methanol-fueled Single-cylinder Engine*
Article Author Brinkman, N.D.
Author Affiliation General Motors Research Labs., Warren, Mich. (USA)

Journal	SAE Prepr.
Issue	770791
Pages	16
Publication Date	1977
Abstract	One of the reasons methanol is considered an attractive alternative fuel for automobiles is its high octane quality, which may allow the use of high compression ratio (CR) engines. To evaluate compromises between engine efficiency and exhaust emissions, a methanol-fueled single-cylinder engine was run at CR's from 8 to 18. At each CR, engine speed and airflow were constant at 1200 rpm and about half throttle, respectively; equivalence ratio was varied from 0.7 to 1.1; and spark timing was varied from best power (MBT) to 10 degrees retarded. Knock was observed only at CR = 18 with MBT spark timing. Increasing CR from 8 to 18 while maintaining MBT spark timing increased efficiency about 16 percent, but also increased NOx and unburned fuel (UBF) emissions. Some previous studies have reported decreased NOx emissions with increased CR, possibly because MBT spark timing was not maintained. Results of this study indicate that constant NOx emissions can be maintained by retarding spark timing while increasing CR to improve efficiency. Retarding spark timing, however, only marginally reduced UBF emissions.
Document Type	Journal article

Citation Number	**80A002133**
Article Title	*Gas Turbine Emissions and Performance on Methanol Fuel*
Article Author	Klapatch, R.D.
Author Affiliation	Turbo Power and Mar Syst Inc., Farmington, Conn. (USA)
Journal	Am. Soc. Mech. Eng.
Issue	Paper 75-Pwr-22
Pages	4
Publication Date	1975
Notes	Joint Power Generation Conference (ASME — IEEE — ASCE) Portland, Ore., 28 Sept.-2 Oct. 1975
Abstract	An FT4C-1 LF gas turbine was operated for 10 hours on methanol fuel to determine the exhaust emissions signature and engine performance characteristics. The test also included an identical load data point with No. 2 oil to establish a "back-to-back" correlation. Methanol fuel provided a significant reduction in NOx emissions and a lower turbine inlet temperature compared to No. 2 oil. This test indicated that methanol is an ideal gas turbine fuel because of the clean combustion, lower emissions and predicted longer gas turbine life. (EI)
Document Type	Journal article

Citation Number	**80A002136**
Article Title	*Effect of Water on Nitric Oxide Production in Gas Turbine Combustors*
Article Author	Shaw, H.
Author Affiliation	Exxon Research and Engineering Co., Linden, N.J. (USA)
Journal	Am. Soc. Mech. Eng.
Issue	Paper 75-GT-70
Pages	9
Publication Date	1975
Abstract	The NOx emission index from the combustion of distillate type fuels is a function of the amount of water that is presented in the primary zone. A simple analysis based on modified Zeldovich kinetics was used to predict the magnitude of the NOx reduction due to water. Emission data collected at varying ambient humidities can be corrected to a common reference level. Methanol combustion was used to illustrate a particular application of the semiempirical calculational technique. It was shown that the NOx emissions from methanol combustion are equivalent to those obtained by adding 8.7 percent water to the combustion air of a kerosene type fuel. The NOx emissions from methanol combustion, on an equal space rate basis, are a factor of 4 lower than from kerosene type fuels. Corrections for ambient temperature and pressure are also required. Thus, in addition to the humidity correction, a technique for correcting NOx measurements to commonly accepted reference ambient conditions of temperature and pressure is presented. (EI)
Document Type	Journal article

Citation Number	**80A002138**
Document Title	*Comparative Automotive Engine Operation when Fueled with Ethanol and Methanol*
Document Author	Ecklund, E.E.
Author Affiliation	Department of Energy, Washington, D.C. (USA)
Publication Date	May 1978
Pages	59
Abstract	An experimental investigation of Q spark ignition multicylinder engine operation on pure ethanol was undertaken to contrast the engine performance and exhaust emissions with indolene and pure methanol. Equivalence ratio (normalized F/A ratio) was chosen as the principal independent variable. Fuel economy, the regulated exhaust emissions (NOx, hydrocarbons, and CO) and exhaust aldehydes, and maldistribution were taken as dependent variables. Both steady state engine results and simulated driving cycle (the Federal Emission Test Procedure — FTP and the Highway Fuel Economy Test Procedure HFETP) results are presented and discussed. The findings show, in general, that ethanol gives results in fuel economy on the basis of miles per millions Btu which lie between the results obtained using gasoline and methanol, i.e., better fuel economy than gasoline and poorer fuel economy than methanol. Exhaust emissions show mixed behavior. The oxides of nitrogen emission were found to be between the results obtained on gasoline and methanol, i.e., higher for gasoline and lower for methanol, but closer to the gasoline results. Carbon monoxide emissions from ethanol were found to be less than the indolene and methanol results, however, unburned fuel (hydrocarbons) emissions were higher from ethanol fuel in comparison to both methanol and indolene results. The maldistribution of the fuel-air mixture among the cylinders was found to be worse with ethanol when compared to gasoline, but it was better than the results obtained on methanol. (NTIS)
Document Type	Report

Citation Number **80A002147**
Document Title *Methanol and Other Ways around the Gas Pump*
Document Author Lincoln, J.W.
Publisher Garden Way Publ.; Charlotte, VT, USA
Publication Date 1976
Pages 134
Notes Includes bibliography and index.
Document Type Book

Citation Number **80A002160**
Article Title *Power Alcohol in Tractors and Farm Engines*
Article Author Barger,E.L.
Journal Agric. Eng.
Volume 22
Issue 2
Pages 65-67
Publication Date Feb 1941
Abstract Results of tests of physical properties of alcohol blends with tractor fuels, and performance characteristics of farm engines operating on alcohol blends; physical properties of gasoline-alcohol and distillate-alcohol blends; octane numbers of petroleum fuel-alcohol blends; tractor brake tests; Hercules engine tests on gasoline alcohol; engine tests on distillate-alcohol blends; field tests with gasoline-alcohol blends. (EI)
Document Type Journal article

Citation Number **80A002161**
Article Title *Paris Buses Test Efficiency of Alcohol as Engine Fuel*
Journal Automot. Ind.
Volume 49
Pages 257
Publication Date 9 Aug 1923
Document Type Journal article

Citation Number **80A002168**
Article Title *Engine Performance with Gasoline and Alcohol*
Article Author Lichty, L.C.
Ziury's, E.J.
Journal Ind. Eng. Chem.
Volume 28
Issue 9
Publication Date Sep 1936
Abstract A CFR engine and a 1935 6-cylinder Chevrolet engine were used to evaluate engine operation on neat (190 proof) ethanol against that of leaded gasoline, a range of equivalence ratios, spark timings were used in the engine evaluations. The temperature of the intake mixture in the CFR engine was controlled. (AFDB)
Document Type Journal article

Citation Number **80A002170**
Article Title *Alcohol as Antiknock Agent in Automotive Engines*
Article Author Porter, J.C.
Wiebe, R.
Journal Ind. Eng. Chem.
Volume 44
Issue 5
Pages 1098-1104
Publication Date May 1952
Abstract Primary and sensitive reference fuels give highest octane gain with alcohol, while lowest gain is obtained with highly cracked gasoline; octane gains of commercial gasolines with injection fall between; gain observed in both low and high speed road performance numbers for straignt run, polymer, catalytically cracked, and thermally cracked gasolines. (EI)
Document Type Journal article

Citation Number **80A002171**
Article Title *Octane Ratings of Agricultural Motor Fuels*
Article Author Truby, F.R.
Wiebe, R.
Elder, C.F.
Journal Ind. Eng. Chem.
Volume 39
Pages 508-510
Publication Date Apr 1947
Document Type Journal article

Citation Number **80A002180**
Article Title *Effects of Substitute Fuels on Automotive Engines*
Article Author Bruce, C.S.
Duck, J.T.
Pierce, A.R.
Journal J. Res. Natl. Bur. Stand.
Volume 41
Issue 2
Pages 135-149
Publication Date Aug 1948
Abstract Characteristics of engines with respect to cylinder wear, carbon deposits, life of accessories, and vapor lock; fuels circulating through standard type pumps for period equivalent to 200,000 mi. had no visible effect on pump diaphragms; wear with alcohol was half that with leaded gasoline; carbon deposits also much lower; no indication of dilution of crankcase oil by alcohol. (EI)
Document Type Journal article

Citation Number **80A002184**
Article Title *Water Tolerances of Mixtures of Gasoline with Ethyl Alcohol*
Article Author Bridgeman, O.C.
Aldrich, E.W.
Journal J. Res. Natl. Bur. Stand.
Volume 20
Issue 1
Pages 1-8
Publication Date Jan 1938
Abstract Equations, based on 23 different gasolines, developed for calculating water tolerance of any mixture of gasoline with ethyl alcohol from critical-solution-temperature measurements on few mixtures with particular gasoline solution temperatures of mixtures of known composition. (EI)
Document Type Journal article

Citation Number **80A002185**
Article Title *The Physicochemical Properties of Alcohol-gasoline Blends; II. the Influence of Anhydrous Ethyl Alcohol Concentration upon Water Absorption*
Article Author Christensen, L.M.
Hixon, R.M.
Fulmer, E.I.
Journal Iowa State J. Sci.
Volume 8

Pages 175-179
Publication Date 1933
Document Type Journal article

Citation Number 80A002186
Article Title *Alcohol with Normal Diesel Fuels*
Article Author Havemann, H.A.
Rao, M.R.K.
Natarajan, A.
Narasimhan, T.L.
Journal Gas Oil Power
Volume 50
Issue 596
Pages 15-19
Publication Date Jan 1955
Notes See also Gas Oil Power, v. 50, no. 597, Feb. 1955, p. 45-48, 50.
Abstract Investigations at Indian Inst. of Science on utilization of power alcohol in combination with normal and heavy fuels in high speed diesel engines. (EI)
Document Type Journal article

Citation Number 80A002189
Article Title *Alcohol Motor Fuels*
Article Author Ogston, A.R.
Journal J. Inst. Pet. Technol.
Volume 23
Pages 506-523
Publication Date 1937
Abstract A review and evaluation of alcohol blends. Ogston discusses the manufacture of EtOH and iso-PrOH, the dehydration of ethanol, its effect on cylinder wear, calorific values, applications to aircraft, and the use of higher alcohols, especially isopropyl. Benzene increases water tolerance. Up to 20% EtOH can be used with ordinary choke settings; its lower calorific value can be counteracted by benzene. Ethanol probably aggravates gum formation. Corrosiveness depends on the metals used; alcohol blends corrode zinc slowly. The high antiknock value of alcohol is due to (1) its high spontaneous-ignition temperature, and (2) its high heat of vaporization, which lowers the initial temperature. The addition of a moderate percentage of ethanol thus increases engine efficiency twice enough to compensate for the lowered calorific value, if the engine is designed to take full advantage of the antiknock value. Ogston believes that if ethanol is adopted largely, it will be manufactured from petroleum or coal-tar products. (CA)
Document Type Journal article

Citation Number 80A002199
Article Title *Utilisation of Alcohol as Motor Fuel by Direct, Injection, RETEL*
Journal Eng. Dig. (London)
Volume 6
Issue 10
Pages 256-260
Publication Date Oct 1945
Document Type Journal article

Citation Number 80A002200
Article Title *Alcohol Fuels for Use in Internal Combustion Engines*
Article Author King, J.G.
Manning, A.B.
Journal J. Inst. Pet. Technol.
Volume 15
Issue 74
Pages 350-368
Publication Date Jun 1929
Abstract Results of experiments designed to indicate limiting factors in preparation of fuels, and to show how these fuels would behave in ordinary standard gasoline engine are given. (EI)
Document Type Journal article

Citation Number 80A002207
Article Title *A New Alcohol Fuel*
Journal Chemical Trade Journal and Chemical Engineer (London)
Volume 56
Pages 554
Publication Date 1915
Abstract A test of a new fuel known as "Natalite," said to consist of EtOH about 60%, and ether 40%, showed its consumption to be 1 galper 26.2 ton miles. The engine started easily either from cold or warm and the valve caps and heads were found to be clean after the trial. A trace of NH_3 is added to correct any tendency towards acidity under running conditions. It is to be manufactured in Natal, South Africa, from waste molasses. (CA)
Document Type Journal article

Citation Number 80A002220
Article Title *The Use of Alcohol and Gasoline in Farm Engines*
Article Author Lucke, C.E.
Woodward, S.M.
Journal Scientific American Supplement
Publication Date 27 Apr 1907
Notes Serial, 1st part
Abstract Discusses the cost of power from different sources, the comparative cost of energy in different fuels, thermal efficiency, adaptability of various types of engines and the first use of alcohol engines in the present number. (EI)
Document Type Journal article

Citation Number 80A002221
Article Title *Alcohol Motor Fuels, Production and Use*
Article Author Pleeth, S.J.
Journal J. Inst. Pet.
Volume 38
Issue 346
Pages 805-819
Publication Date Oct 1952
Abstract Production of ethyl alcohol by fermentation and by synthesis; production of anhydrous alcohol; use of ethanol as additive to gasoline and its effect on calorific value; thermal efficiency of engine; octane numbers and road tests; antiknock effects of ethanol compared with that of tetraethyl lead; anomalous vapor pressure of alcohol blends; vapor lock and startability; water tolerance and safety margin of blend. (EI)
Document Type Journal article

Citation Number	**80A002222**
Article Title	*Fuel Mixtures on London Buses*
Article Author	Shave, G.J.
Journal	Motor Traction
Volume	31
Issue	817
Pages	493-494
Publication Date	25 Oct 1920
Abstract	Experiments carried out by London General Omnibus Co. Alcohol benzol, alcohol-ether, and alcohol-ether-benzol mixtures have been investigated. Paper read before Fuels Section of Imperial Motor Transport Conference, London. (EI)
Document Type	Journal article

Citation Number	**80A002224**
Article Title	*Motor Spirits and Light Distillates*
Article Author	Evans, E.B.
Journal	J. Inst. Pet. Technol.
Volume	20
Issue	127
Pages	392-405
Publication Date	May 1934
Abstract	Review of literature; alcohol fuels; alternative fuels composition of gasoline; detonation and anti-knocks; gum formation in gasoline; volatility of motor fuels; miscellaneous work. Bibliography. (EI)
Document Type	Journal article

Citation Number	**80A002233**
Article Title	*Vapour Pressure of Alcohol Gasoline Blends*
Article Author	Mapstone, G.E.
Journal	J. Inst. Pet.
Volume	42
Pages	95-96
Publication Date	Mar 1956
Document Type	Journal article

Citation Number	**80A002238**
Article Title	*Alcohol, Methanol as a Motor Fuel*
Document Title	Encyclopedia of Chemical Processing and Design
Article Author	Davison, R.R. Cunningham, W.A. (ed.) Mcketta, J.J. (ed.)
Author Affiliation	Texas A and M Univ., College Station (USA)
Publisher	Dekker; New York, NY, USA
Publication Date	1977
Pages	340-356
Document Type	Paper/Chapter from book

Citation Number	**80A002242**
Document Title	*Alcohol — a Fuel for Internal Combustion Engines*
Document Author	Pleeth, S.J.W.
Publisher	Chapman & Hall, Ltd.; London, GB
Publication Date	1949
Pages	250
Abstract	Most aspects of using alcohol (primarily ethyl and to a lesser degree methyl alcohol) as a motor fuel are discussed, including water tolerance, wear, corrosion, octane boost, volatility, and engine efficiency. Sources for alcohol production and an excellent historical review of the use of alcohol as a motor fuel are presented. (AFDB)
Document Type	Book

Citation Number	**80A002245**
Article Title	*Performance of an Ethanol-gasoline Blend in Automobiles and Light Trucks*
Article Author	Scheller, W.A. Mohr, B.J.
Author Affiliation	Nebraska Univ., Lincoln (USA). Dept. of Chemical Engineering
Journal	Am. Chem. Soc., Div. Fuel Chem., Prepr.
Volume	20
Issue	2
Pages	71-75
Publication Date	1975
Notes	Meeting held in Philadelphia, PA, Apr. 6-11, 1975.
Abstract	A two million mile ethanol-gasoline road test program is being conducted with 36 vehicles supplied by the Nebraska Department of Roads and is being financed by the Nebraska Agriculture Products Industrial Utilization Committee. The fuel being tested is a mixture of 10% anhydrous ethanol and 90% unleaded regular grade gasoline. This blend is known by the name Gasohol. Based on the results of preliminary testing of about 250,000 miles, a computer program has been developed to process the fuel consumption and mileage data. Through the use of linear regression it has been found that the significant factors in the fuel consumption are the driver, the vehicles, average daily temperature, average relative humidity and maintenance schedule. Tire pressure while known to be significant cannot be accounted for. Normal fluctuations in atmospheric pressure, precipitation, and visibility were not found to be significant. When the significant factors have been accounted for in the fuel consumption the significance of the residuals will be tested for the unleaded gasoline and gasohol fuel. (EI)
Document Type	Journal article

Citation Number	**80A002246**
Article Title	*Alcohol Motor Fuel from Molasses; II. the Use of Alcohol and Alcohol-ether Mixtures as Motor Fuels*
Article Author	Freeland, E.C. Harry, W.G.
Journal	Ind. Eng. Chem.
Volume	17
Pages	717-720
Publication Date	1925
Abstract	For constant-speed engines (stationary or tractors) alcohol with 1.0% gasoline to improve starting and 0.5% aniline or pyridine to combine with acidic combustion products, is satisfactory; the volume of fuel consumed is increased 33-50% but the thermal efficiency is unchanged or slightly increased. For automobiles the addition of 7-15% gasoline and 0.5-0.75% pyridine gives a fairly satisfactory fuel, although the range of speed variation is not as large as with gasoline because of the narrower limits of formation of explosive alcohol-air mixtures. A mixture, alcohol 59.5, ether 39.0, gas oil 1 and pyridine 0.5% is more satisfactory from the operating standpoint, and gave 20.5 miles per gallon as compared to 22.5 for gasoline, the thermal efficiency being somewhat higher for the former; for use in the tropics mix-

	tures containing as low as 20% ether are satisfactory as regards starting and speed flexibility. Miscellaneous road tests, the adjustment and revision of carburetors, and various general considerations are described and discussed. (CA)
Document Type	Journal article
Citation Number	**80A002247**
Article Title	*Discussion on Alcohol-water Injection; Obstacles Seen to a Two-fuel System for General Use on Automobiles*
Article Author	Hunter, H.C.
Journal	Natl. Pet. News
Volume	37
Issue	14
Pages	R249
Publication Date	1945
Abstract	Water injection alone suppressed detonation but excessive rusting was found. (CA)
Document Type	Journal article
Citation Number	**80A002248**
Article Title	*Methanol. Versatile Fuel for Immediate Use*
Article Author	Reed, T.B. Lerner, R.M.
Author Affiliation	Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.
Journal	Science
Volume	182
Issue	4119
Pages	1299-1304
Publication Date	1973
Abstract	MeOH less than 15% added to gasoline could produce improvements in the fuel economy, pollution levels, and performance of cars in use. Production methods and economics are reviewed.
Document Type	Journal article
Citation Number	**80A002251**
Article Title	*Alternative Fuels with Regard to LPG and Methanol*
Document Title	Proceedings of the Fourth International Symposium on Automotive Propulsion Systems: Held on April 18-22, 1977; a Report by the Automotive Propulsion Systems Pilot Study
Article Author	van der Weide, J.
Author Affiliation	Energy Research and Development Administration, Washington, D.C. (USA)
Conference	4th international symposium on automotive propulsion systems
Conference Place	Washington, DC, USA
Conference Date	18 Apr 1977
Publisher	Committee on the Challenges of Modern Society, North Atlantic Treaty Organization; Washington, DC, USA
Publication Date	Feb 1978
Pages	727-730
Notes	Cover title: Automotive propulsion
Abstract	Laboratory tests in the Netherlands on the use of liquefied petroleum gas (LPG), natural gas (NG), and methanol (CH_3OH) as alternative fuels to gasoline in motor vehicles are reported. In driving cycle tests, leaded and unleaded gasoline fuels were compared with LPG and NG in terms of exhaust emissions. With both gaseous fuels, the emissions of total hydrocarbons (HC), carbon monoxide (CO), aromatic hydrocarbons, polycyclic aromatic hydrocarbons, and particulates were 50%, 94%, 95%, 93%, and 75% lower, respectively, than those from gasoline powered engines. There was no decrease in nitrogen oxides (NOx) emissions with LPG, but a 60% decrease was observed with NG. Olefin emissions were reduced by 70% with LPG and by 85% with NG when compared with those from gasoline powered engines. The smog potential of both gaseous fuels was 2.5 times lower than that of the gasolines. Formaldehyde and acetaldehyde emissions were 40-80% higher with both gaseous fuels. The experience with methanol as a fuel is substantially less expensive. However, the application of CH_3OH as a 15% blend in gasoline appears to be economical in the near future from the point of view of energy consumption.
Availability	NTIS
Document Type	Paper from report
Citation Number	**80A002252**
Article Title	*Alternative Fuels — the Outlook and Options within the Next Decade*
Document Title	Proceedings of the Fourth International Symposium on Automotive Propulsion Systems: Held on April 18-22, 1977; a Report by the Automotive Propulsion Systems Pilot Study
Article Author	Hurn, R.W.
Author Affiliation	Department of Energy, Bartlesville, Okla. (USA). Bartlesville Energy Research Center
Conference	4th international symposium on automotive propulsion systems
Conference Place	Washington, DC, USA
Conference Date	18 Apr 1977
Publisher	Committee on the Challenges of Modern Society, North Atlantic Treaty Organization; Washington, DC, USA
Publication Date	1978
Pages	732-735
Notes	Cover title: Automotive propulsion
Availability	NTIS
Document Type	Paper from report
Citation Number	**80A002253**
Article Title	*Automotive Materials Compatibility with Methanol Fuel Blends*
Document Title	Proceedings of the Fourth International Symposium on Automotive Propulsion Systems: Held on April 18-22, 1977; a Report by the Automotive Propulsion Systems Pilot Study
Article Author	Poteat, L.E.
Author Affiliation	Miami Univ., Coral Gables, Fla. (USA)
Conference	4th international symposium on automotive propulsion systems
Conference Place	Washington, DC, USA
Conference Date	18 Apr 1977
Publisher	Committee on the Challenges of Modern Society, North Atlantic Treaty Organization; Washington, DC, USA
Publication Date	1978
Pages	707-711
Notes	Cover title: Automotive propulsion
Availability	NTIS
Document Type	Paper from report

Citation Number **80A002254**
Article Title *The Effect of Blending Methanol with Gasoline on Geometric Distribution*
Document Title Proceedings of the Fourth International Symposium on Automotive Propulsion Systems: Held on April 18-22, 1977; a Report by the Automotive Propulsion Systems Pilot Study
Article Author Adt, R.R., Jr.
Chester, K.A.
Pappas, J.M.
Rajan, S.
Swain, M.R.
Wiesner, C.K.
Conference 4th international symposium on automotive propulsion systems
Conference Place Washington, DC, USA
Conference Date 18 Apr 1977
Publisher Committee on the Challenges of Modern Society, North Atlantic Treaty Organization; Washington, DC, USA
Publication Date 1978
Pages 26
Notes Cover title: Automotive propulsion
Abstract Experiments have been conducted to assess the use of methanol as a vehicle fuel, alone or as a blend, its performance, emissions and practical use characteristics. Indolene and indolene plus methanol were tested on a four cyliner engine with a modified intake manifold and modified carburetor. Various measuring methods were employed during four types of tests carried out under steady state conditions, with the engine connected to a water brake dynamometer to determine the effects of the indolene and blend on geometric distribution. Data from the experimental tests gave the effects on engine speed, manifold vacuum, engine speed influence on methanol, manifold influence on methanol, fuel-air equivalence ratio, fuel-air equivalence ratio on methanol, simulated cruising speed, and simulated cruising speed influence on methanol. These results confirm the validity of extending the usual method of equivalence ratio determination by exhaust gas analysis for gasoline fueled engines to methanol blend fueled engines. (APTIC)
Availability NTIS
Document Type Paper from report

Citation Number **80A002255**
Article Title *The Effect of Methanol Addition to Gasoline on Total and Individual Hydrocarbons, Methanol, and Formaldehyde Emissions from a Carbureted Spark Ignition Engine*
Document Title Proceedings of the Fourth International Symposium on Automotive Propulsion Systems: Held on April 18-22, 1977; a Report by the Automotive Propulsion Systems Pilot Study
Article Author Doepker, R.D.
Author Affiliation Miami Univ., Coral Gables, Fla. (USA)
Conference 4th international symposium on automotive propulsion systems
Conference Place Washington, DC, USA
Conference Date 18 Apr 1977
Publisher Committee on the Challenges of Modern Society, North Atlantic Treaty Organization; Washington, DC, USA
Publication Date 1978
Pages 608-609
Notes Cover title: Automotive propulsion
Abstract A 4-cylinder, spark-ignition engine was filled with gasoline, and with 20% and 30% blends of gasoline-methanol. Reduced pressure sampling followed by vapor phase chromatography was utilized to determine the components of the exhaust emissions, including specific hydrocarbon species, methanol, and formaldehydes. Total hydrocarbon (CxHy) emission was substantially reduced by addition of methanol to the fuel, and its chemical composition is practically independent of the methanol blend level up to 30%. The average molecular weights for CxHy emissions were 43.1, 43.3, and 38.3 mol/Hp-hr for equivalence ratios of 0.9, 1.0, and 1.1, respectively. This suggests that the flame ionization detector data may nearly represent the total CxHy emissions in a practical sense. (POLL)
Availability NTIS
Document Type Paper from report

Citation Number **80A002256**
Article Title *The ERDA/Chrysler Upgraded Automotive Gas Turbine Engine-emission Control System*
Document Title Proceedings of the Fourth International Symposium on Automotive Propulsion Systems: Held on April 18-22, 1977; a Report by the Automotive Propulsion Systems Pilot Study
Article Author Nogle, T.D.
Author Affiliation Chrysler Corp.
Conference 4th international symposium on automotive propulsion systems
Conference Place Washington, DC, USA
Conference Date 18 Apr 1977
Publisher Committee on the Challenges of Modern Society, North Atlantic Treaty Organization; Washington, DC, USA
Publication Date 1978
Pages 54-63
Notes Cover title: Automotive propulsion
Abstract A regenerative, automotive gas turbine engine which will meet stringent nitrogen oxides, hydrocarbons, and carbon monoxide emission standards for a 1585-kg weight class vehicle by utilizing a fixed-geometry combustor is diagrammed and described. The concept was developed on lead-free gasoline, but the engine was tested with diesel, broad cut, methanol, isopropyl alcohol, and ethyl alcohol as well as various mixtures of these fuels. Emission results were similar to those for lead-free gasoline although torch mixture adjustment is required to compensate for major differences in the fuels' stoichiometric ratios. These results suggest compatibility with most fuels. Standards will be achieved by combustion control rather than by exhaust aftertreatment, with no sacrifice in fuel economy or driveability, and with only a small penalty in cost and weight. It has a pressure ratio of 4.1:1, 1050 degrees C turbine inlet temperature, 0.69 kg/sec airflow, and power of 92 kw with use of variable inlet guide vanes and inlet water injection. It will be effective for all normal driving situations, including highway cruise. Realization of this potential in production passenger cars still depends on satisfactory achievement of competitive fuel economy and overall cost. (POLL)

Availability NTIS
Document Type Paper from report

Citation Number **80A002257**
Article Title *Gaseous Emissions Control for Heavy-duty Diesel Engines*
Document Title Proceedings of the Fourth International Symposium on Automotive Propulsion Systems: Held on April 18-22, 1977; a Report by the Automotive Propulsion Systems Pilot Study
Article Author Lombardi, C.
Author Affiliation Fiat, Turin (Italy)
Conference 4th international symposium on automotive propulsion systems
Conference Place Washington, DC, USA
Conference Date 18 Apr 1977
Publisher Committee on the Challenges of Modern Society, North Atlantic Treaty Organization; Washington, DC, USA
Publication Date 1978
Pages 319-329
Notes Cover title: Automotive propulsion
Abstract The emission control methods studied in an attempt to meet California's heavy-duty diesel emission standards of 5 g/hp-hr of nitrogen dioxide (NO_2) + hydrocarbons (HC) are reported. Work was performed on 2 different direct-injection engines. Modulated exhaust gas recirculation (EGR) is an effective method of insuring 4.5 g/hp-hr with the 8060 engine with little loss in performance and fuel consumption. However, remarkable power penalties result if further reductions are demanded. More sophisticated methods are necessary to meet emission levels with the 8210 engine, which shows higher NO_2+HC emissions. Best results are obtained with modulated EGR plus supercharging, although this presents a problem with reliability. A more dependable method is to increase the injection rate in conjunction with modulated injection timing by adopting a pump with electronic control for injection advance. Using the 8210 turbocharged engine with variable compression ratio controlled by the peak combustion pressure, both high specific outputs and low NO_2+HC are obtainable. By using a gasoil-methanol mixture, emission levels J5 g/hp hr were reached without performance losses and with smoke still at acceptable levels. With gasoil only, a minimum of 5.7 g/hp-hr emission level was possible, but with BHP loss of about 15%. (POLL)
Availability NTIS
Document Type Paper from report

Citation Number **80A002258**
Article Title *Recent Progress in Automotive Alcohol Fuel Application*
Document Title Proceedings of the Fourth International Symposium on Automotive Propulsion Systems: Held on April 18-22, 1977; a Report by the Automotive Propulsion Systems Pilot Study
Article Author Menrad, H.
Author Affiliation Volkswagenwerk A.G., Wolfsburg (Germany, F.R.)
Conference 4th international symposium on automotive propulsion systems
Conference Place Washington, DC, USA
Conference Date 18 Apr 1977
Publisher Committee on the Challenges of Modern Society, North Atlantic Treaty Organization; Washington, DC, USA
Publication Date 1978
Pages 712-727
Notes Cover title: Automotive propulsion
Availability NTIS
Document Type Paper from report

Citation Number **80A002264**
Article Title *The State of Development in Germany of the Power-alcohol Question*
Article Author Fritzweiler, R.
Dietrich, K.R.
Journal World Petroleum Congress, London. Proceedings
Volume 2
Pages 784-787
Publication Date 1933
Notes Also in Chemical Industries (New York), v. 33, p. 307-309 and Oil News, v. 34, p. 117
Abstract Tests on the use of alcohol as a motor fuel in Germany show that the use of alcohol alone is uneconomical owing to the difficulty of vaporization and a high fuel consumption. For great efficiency a new type of engine wholly unsuitable for gasoline should be designed. Mixtures of alcohol with gasoline and ether, however, especially those containing 20-30% of alcohol have none of the disadvantages and all of the advantages of alcohol. Mixtures containing alcohol and gasoline alone are unsuitable unless the alcohol is anhydrous. Alcohol-benzene-gasoline mixtures in the proportions 20-30-50 or 10-40-50 make good fuels.
Document Type Journal article

Citation Number **80A002277**
Document Title *Project Plan for Reliability Fleet Testing of Alcohol/Gasoline Blends*
Corporate Author Department of Energy, Washington, D.C. (USA). Office of Conservation and Solar Applications
Publisher U.S. Government Printing Office; Washington, DC, USA
Publication Date 30 Mar 1979
Pages 32
Notes E 1.28-HCP/M 2184-O/rev.
Availability U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402
Document Type Book

Citation Number **80A002281**
Document Title *Gasoline/Alcohol Blends; a Possible Fuel Resource for Minnesota*
Document Author Rankin, S.
Publisher Minnesota, House of Representatives, Research Department; St. Paul, MN, USA
Publication Date Sep 1977
Pages 14
Availability Minnesota House of Representatives, Research Department, Room 17, State Capitol, St. Paul, MN 55155
Document Type Book

Citation Number **80A002288**
Article Title *The Methanol Engine: a Transportation Strategy for Post-petroleum Era*
Article Author Vantine, H.C.
Author Affiliation California Univ., Livermore (USA). Lawrence Livermore Lab.
Journal Sci. Technol.
Pages 6-11
Publication Date 1976
Abstract A comparison of existing technology engines and fuels, and advanced technology engines and fuels, suggests that a stratified charge engine operating on neat methanol would have energy economy advantages over stirling, brayton, diesel, and otto cycle engines. (AFDB)
Document Type Journal article

Citation Number **80A002292**
Document Title *Performance and Knocking Characteristics of Low Octane Fuels Blended with Methanol in an SI Engine*
Document Author Gething, J.A.
Author Affiliation Pennsylvania State Univ., University Park (USA)
Thesis M.S. Thesis
Publication Date May 1977
Pages 107
Notes Funded by Environmental Protection Agency.
Abstract The blending effect of methanol with low octane blends was studied with respect to their knocking and performance characteristics as fuels. Data were obtained from a single-cylinder CRF engine under various operating conditions. Methanol can effectively act as a knock suppressor in primary reference fuels (PRF's) whose octane numbers are as low as 53. Methanol's chemical effects as well as its heat capacity effects lead to this reduction in knock. An increase in efficiency of greater than 6% is indicated from methanol's apparent improvement in combustion phasing for some methanol-PRF blends. Generally, methanol-PRF blends burning under optimized conditions have better efficiency than pure isooctane or pure methanol. Methanol-low octane PRF blends burn with approximately the same emissions as isooctane. (Author abstract modified/APTIC)
Document Type Thesis/Dissertion

Citation Number **80A002293**
Document Title *Ethyl Alcohol as Tractor Fuel in China*
Document Author Wu, C.C-Y.
Author Affiliation Iowa State Univ. of Science and Technology, Ames (USA)
Thesis M.S. Thesis
Publication Date 1947
Pages 103
Document Type Thesis/Dissertion

Citation Number **80A002296**
Document Title *Measurement of Aldehyde Concentrations in the Exhaust of an Internal Combustion Engine Fueled by Alcohol/Gasoline Blends*
Document Author Harrenstien, M.S.
Author Affiliation Miami Univ., Fla. (USA)
Thesis M.S. Thesis
Publication Date 1978
Pages 99
Abstract A series of engine tests were conducted with a 1974 Pontiac four cylinder spark ignition engine operating on methanol and ethanol/indolene blends at the equivalence ratios. Five aldehyde species in the exhaust were measured including: formaldehyde, acetaldehyde, acetone, propionaldehyde, and acrolein. (AFDB)
Document Type Thesis/Dissertion

Citation Number **80A002302**
Document Title *The Gaseous Heat Capacity of Methyl Alcohol and Ethyl Alcohol by Thermal Conductivity at Low Pressures*
Document Author Miller, G.A.
Author Affiliation Michigan Univ., Ann Arbor (USA)
Thesis Ph.D. Dissertation
Publication Date 1955
Pages 83
Availability University Microfilms International, Dissertation Copies, P.O. Box 1764, Ann Arbor, MI 48106, Order no. 00126-21
Document Type Thesis/Dissertion

Citation Number **80A002303**
Document Title *Alcohol Assisted Hydrocarbon Fuels; a Comparison of Exhaust Emissions, Power Output and Fuel Consumption Using Static and Dynamic Engine Test Facilities*
Document Author Bushnell, D.J.
Author Affiliation Brigham Young Univ., Provo, Utah (USA)
Thesis Ph.D. Dissertation
Publication Date 1975
Pages 143
Abstract This dissertation presents experimental data which exemplifies the differences in emission level testing on internal combustion engines when dynamic engine tests are used instead of steady-state engine tests. A comparison of the two test methods is made using hydrocarbon fuels with varying amounts of methanol. Emissions measured include the nitric oxides, unburned hydrocarbons and carbon monoxide. Power output and fuel consumption are reported for the various volumetric percentages of methanol in the fuel. Of special significance are the different trends the emission levels establish when subjected to a dynamic engine test as compared to the results for the steady-state tests. (DA)
Availability University Microfilms International, Dissertation Copies, P.O. Box 1764, Ann Arbor, MI 48106, Order no. 75-11,272
Document Type Thesis/Dissertion

Citation Number **80A002304**
Document Title *Power, Fuel Consumption, and Exhaust Emission Characteristics of an Internal Combustion Engine Using Isooctane and Methanol*
Document Author Ebersole, G.D.
Author Affiliation Tulsa Univ., Okla. (USA)
Thesis Ph.D. Dissertation
Publication Date 1971
Pages 161
Abstract Engine performance characteristics using isooctane and methanol were obtained using a single-cylinder, spark-ignition engine. Engine output, indicated specific fuel consumption, and specific emissions of hydrocarbon, carbon monoxide, ni-

tric oxide, and aldehydes were measured with the two fuels and compared using a unique set of performance maps. The engine output comparisons showed that the lean misfire limits with methanol were approximately 0.2 equivalence ratios leaner than with isooctane. This leaner limit associated with methanol permitted engine operation at considerably lower output levels than with isooctane. The maximum engine output with methanol was approximately equal to that of isooctane. Comparing the specific parameters of each fuel at equivalent power levels obtained with maximum power spark timing provided the following conclusions. Indicated specific fuel consumption with methanol was 2-2.15 times greater than with isooctane, except at low imep levels where the fuel consumption with methanol was 1.5-2.0 times greater than with isooctane. The quantity of unburned fuel in the exhaust with methanol was 0.1-0.3 times that with isooctane. Zero carbon monoxide emissions were preserved over the load range of 35 to 127 imep with methanol by operating the engine at equivalence ratios of one or less; the same was true with isooctane except at the lower imep level. Emissions of nitric oxide with methanol were generally less than with isooctane except at low imep's. At low imep's, nitric oxide emissions with methanol were both greater or less than with isooctane depending on the equivalence ratio of the fuels. Emissions of aldehydes were always equal to or up to six times greater than with isooctane. The effect of spark retardation on performance at stoichiometric mixtures and a constant air flow rate (which yielded low imep's at maximum power spark timing) was the same for both fuels. (DA)

Availability: University Microfilms International, Dissertation Copies, P.O. Box 1764, Ann Arbor, MI 48106, Order no. AAD 71-24260

Document Type: Thesis/Dissertion

Citation Number **80A002305**

Document Title: *Experimental and Analytical Comparisons of the Performance and Combustion Characteristics of Gasoline, Methane, and Methanol in a Wankel Engine*

Document Author: Raut, P.K.

Author Affiliation: Georgia Inst. of Tech., Atlanta (USA)

Thesis: Ph.D. Dissertation

Publication Date: 1977

Pages: 168

Abstract: Experiments were performed on a Toyo Kogyo Wankel engine to obtain engine performance and emission data as well as chamber pressure-time diagrams for gasoline, natural gas, and methanol fuels. A thermodynamic model of a Wankel engine is developed which accounts for apex-seal leakage, heat transfer and wall quenching. The mass fraction burned as a function of crank angle is calculated from a measured pressure-time diagram. The predictions of heat loss to cooling water give good agreement with the measurements for the three fuels. The predictions of oxides of nitrogen also give good agreement with measurements for lean mixtures of gasoline and natural gas fuels. For methanol, the predictions of oxides of nitrogen are about 50% lower than measurements and results show it burns at lower temperatures than gasoline or natural gas. The ignition delay for gasoline and methanol increases as the load decreases. However, this is not true with natural gas. The ignition delay for natural gas is independent of the load and is consistently greater than that for gasoline or methanol. Methanol produces more power with a lower brake specific energy consumption than gasoline or natural gas. The brake specific energy consumption decreases as the load increases. The nitric oxide emissions are significantly less for methanol than that for gasoline or natural gas and natural gas produces less hydrocarbon emissions than gasoline or methanol. At the lean mixtures, methanol produces less hydrocarbon emissions than gasoline. These results give qualitative and quantitative information regarding the performance and combustion characteristics of the alternative fuels in a Wankel engine. In conclusion, methanol as an automotive fuel deserves serious consideration. Low emission potential, and low brake specific energy consumption contribute to make methanol a strong contender for the fuel of the future. (DA)

Availability: University Microfilms International, Dissertation Copies, P.O. Box 1764, Ann Arbor, MI 48106, Order no. AAD77-20597

Document Type: Thesis/Dissertion

Citation Number **80A002307**

Document Title: *The Effects of Oxy:hydrocarbon Fuels on Exhaust from Spark-ignition Engines*

Document Author: Hetrick, S.S.

Author Affiliation: Pennsylvania State Univ., University Park (USA)

Thesis: Ph.D. Dissertation

Publication Date: 1967

Pages: 330

Abstract: The effects of alcohol addition to hydrocarbon fuels on the composition characteristics of exhaust gases from a spark-ignition engine during over-the-road testing were studied. The addition of methyl alcohol to the reference fuel used reduced both the hydrocarbon and carbon monoxide exhaust gas concentrations, and hourly emissions rates on a weight basis. The methanol fuels require less oxygen for combustion, and at the same air to fuel ratio, burn effectively leaner. Therefore, methanol emission rates and oxides of nitrogen concentrations are increased due to high methanol fuel content and leaner combustion conditions, respectively. The hydrocarbon, nitrogen oxide, and major component concentrations in the exhaust gas are not dependent on the methanol fuel content for the conditions of idle, acceleration, and deceleration, with the same percentage of oxygen being available for the combustion. At cruise, the hydrocarbon concentration is noticeably reduced by increased methanol fuel content, while the concentrations of all other compounds are practically independent of fuel composition. The concentration reduction, which did not significantly reduce hourly emission rates, is dependent upon the hydrocarbon fuel composition. The performance of the engine was not noticeably affected by the use of alcohol-

hydrocarbon fuels. With 25 vol% methanol fuel, about 12% increase in fuel consumption at cruising was observed. The data indicate that the use of alcohol fuel blends in an existing carburetor would probably result in lower hydrocarbon and CO exhaust emissions, but in increased nitrogen oxide concentrations and substantial alcohol emission rates, together with increased fuel consumption. (APTIC)

Availability	University Microfilms International, Dissertation Copies, P.O. Box 1764, Ann Arbor, MI 48106, Order no. AAD 67-15392
Document Type	Thesis/Dissertion

Citation Number	**80A002312**
Article Title	*Use of Alcohol in Motor Gasoline. Review*
Article Author	Keller, J.G. Douthit, W.H. Long, W.C. Taliaferro, H.R.
Author Affiliation	Humble Oil and Refining Co., Houston, Tex. (USA)
Journal	American Petroleum Institute Publication
Issue	4082
Pages	36
Publication Date	1971
Document Type	Journal article

Citation Number	**80A002316**
Article Title	*Engine Performance and Exhaust Emission Characteristics of Spark-ignition Engines Burning Methanol and Methanol-gasoline Mixtures*
Article Author	Wenpo, L. Geffers, W.
Author Affiliation	Volkswagenwerk A.G., Wolfsburg (Germany, F.R.)
Journal	AIChE Symp. Ser.
Volume	73
Issue	165
Pages	328-337
Publication Date	1975
Notes	Title cover: Dispersion and control of atmos. emiss.: New energy-source pollut. potential; Paper from Tech. Sess. held in Houston, TX, Boston, MA and Los Angeles, CA
Abstract	In the reported experiments, engine dynamometer tests and road tests using pure methanol, methanol-gasoline blend (15 vol. % methanol plus 85 vol. % gasoline) called M15 blend and commercial gasoline were made. The results showed that, in principle, from technological aspects it is possible to use methanol as a gasoline extender or as methanol/gasoline blends for automobiles. With regard to energy consumption, methanol and methanol/gasoline blend (M15) lead to interesting results. But the fuel economy benefit of using M15 was found to be just in the part-throttle operation of a 1975 car. The emission characteristics except aldehyde emission and unburnt methanol are improved by using pure methanol, a considerable reduction in NOx by using pure methanol, in CO by using M15, and in PNA by using both found in this paper. The potential problems are, on the one hand; cold start and unacceptable derivability in warm-up phase when using pure methanol and, on the other hand, vapor lock in summer and phase separation in winter when using a methanol/gasoline blend (M15). Some solutions are discussed in this paper. (EL)
Document Type	Journal article

Citation Number	**80A003001**
Document Title	*Utilization of Alternative Fuels for Transportation*
Document Author	Newman, M. Grey, J.
Conference	Utilization of alternative fuels for transportation
Conference Place	Santa Clara, CA, USA
Conference Date	19 Jun 1978
Series	AIAA Aerospace Assessment Series, v. 2
Publisher	American Institute of Aeronautics and Astronautics; New York, NY, USA
Publication Date	15 Apr 1979
Pages	246
Document Type	Book

Citation Number	**80A003010**
Document Title	*Use of Alcohol in Motor Gasoline — a Review*
Corporate Author	American Petroleum Inst., Washington, D.C.
Series	API Publication no. 4082
Publication Date	Aug 1971
Pages	36
Abstract	A bibliographical review of the use of ethyl alcohol in motor gasoline is presented. The octane solubility and emissions characteristics of ethyl alcohol in gasoline used in S.I. engines are given. As a point of reference properties of other alcohols, such as methanol, iso-butanol and iso-propanol are also listed. In general on the basis of economics and technical difficulties the use of ethanol/gasoline blends was not reccommended as a S.I. engine fuel. (AFDB)
Document Type	Book

Citation Number	**80A003013**
Document Title	*Methanol as an Automobile Fuel*
Document Author	Dole, S.H.
Series	Rand Corp. Paper no. 6303
Publication Date	Feb 1979
Pages	8
Abstract	Methanol is frequently suggested as an alternative fuel for automobiles. Methanol has been used for years to fuel racing cars and boats so there is little doubt about its utility as a motor fuel. As far as toxicity and handling properties are concerned, methanol is about on a par with gasoline. Similarly with regard to air pollution; there are differences, although these are by no means universally accepted, e.g., that methanol produces less carbon monoxide and less oxides of nitrogen than gasoline. The main objective of this report is to evaluate the impact of distribution costs on the retail price of methanol as compared with that of gasoline. (EI)
Document Type	Book

Citation Number	**80A003017**
Document Title	*Interpretation of Gas Chromatographic Spectra in Routine Analysis of Exhaust Hydrocarbons*
Document Author	Raible, C.J. Dimitriades, B. Wilson, C.A.

Series	U.S. Bureau of Mines. Report of Investigations. RI 7700
Publication Date	1972
Pages	19
Document Type	Book

Citation Number	**80A003018**
Document Title	*Alcohol Car Conversion*
Document Author	Rutan, A.
Publisher	Rutan Publishing; Minneapolis, MN, USA.
Publication Date	1980
Pages	47
Abstract	Author describes the steps taken by him to convert his car to run on straight alcohol. Includes illustrations.
Availability	Rutan Publishing, Box 3585, Minneapolis, MN 55403
Document Type	Book

Citation Number	**80A003021**
Document Title	*Brown's Alcohol Motor Fuel Cookbook*
Document Author	Brown, M.H.
Publisher	Desert Publications; Cornville, AZ, USA
Publication Date	1979
Pages	140
Abstract	Practical applications of alcohol carburetion, well-illustrated with close-up photos and diagrams. It covers carburetor modification, increasing the compression, ignition, and cold starting.
Availability	Desert Publications, Star Rte., Box 1935, Cornville, AZ 86325 $12.00
Document Type	Book

Citation Number	**80A003024**
Document Title	*Auto Fuels of the 1980's*
Document Author	Frazier, J.
Publisher	Solar Age Press; Indian Mills, WV, USA
Publication Date	1978
Pages	71
Availability	Citizens Energy Project, 1110 6th Street, N.W., Suite 300, Washington, DC 20001 $4.55
Document Type	Book

Citation Number	**80A003027**
Article Title	*Alcohol Gasoline Mixtures as Motor Fuel*
Article Author	Flinner, A.O.
Journal	Kansas Engineering Society Year Book
Pages	87-97
Publication Date	1936
Abstract	Distillation and speed-horsepower curves presented; fuel consumption data, etc. (EI)
Document Type	Journal article

Citation Number	**80A003028**
Article Title	*Agricultural Alcohol in Automotive Fuel: Gasohol*
Article Author	Scheller, W.A.
Author Affiliation	Nebraska Univ., Lincoln (USA). Dept. of Chemical Engineering
Journal	United States, Agricultural Research Service, Western Region, (Report)
Issue	ARS-W-19
Pages	39-42
Publication Date	1974
Document Type	Journal article

Citation Number	**80A003029**
Article Title	*Blending Agents for Gasoline-methanol Mixtures*
Journal	World Petroleum Congress Proceedings
Volume	2
Pages	788-794
Publication Date	1933
Abstract	Neat MeOH is established as a racing fuel, and a 15-20% blend with gasoline shows a slight increase in mileage with most vehicles and has improved antiknock properties in comparison with straight gasoline. A study of various blending agents for use with MeOH-gasoline mixtures is described. Isotherm graphs are given for these ternary mixtures; motor benzene-gasoline-MeOH, EtOH-gasoline-MeOH and sextol-gasoline MeOH. Tables are also presented to show the blending values of various higher alcohols, esters, organic halides, ketones, ethers, phenols, amines, oleic acid, castor oil, pine oil and mixtures of these blending agents. Some of the mixtures proved to be surprisingly effective, although no explanation for this has as yet been found. (CA)
Document Type	Journal article

Citation Number	**80A003030**
Article Title	*Ethyl Alcohol and Alcohol and Gasoline as a Modern Motor Fuel*
Article Author	Lawrason, C.G. Finisgan, P.F.
Journal	SAE Spec. Publ.
Volume	SP-254
Pages	34-40
Publication Date	1964
Abstract	Three multicylinder SI engines with compression ratio ranging from 6:6 to 12 were used to evaluate the potential use of ethanol blends as a motor fuel. Engine efficiency, wear, effects on lubricants, engine deposits, and emissions were measured. (AFDB)
Document Type	Journal article

Citation Number	**80A003031**
Article Title	*Alcohol in Motor-car Operation*
Article Author	Steinitz, E.W.
Journal	Petroleum (London)
Volume	7
Pages	202-203
Publication Date	1944
Abstract	Conditions existing in France, Sweden, and Germany which led to the use of EtOH as a motor fuel are briefly summarized. The properties of alcohol are tabulated and compared with those of gasoline. A special carburetor is required if pure EtOH is used and drawings of the Esoma carburetor are given. A blend of 13-18% of EtOH with gasoline can be used with an ordinary carburetor. It has good antiknock properties, burns with less air than does gasoline and leaves very little carbon deposit. (CA)
Document Type	Journal article

Citation Number	**80A003032**
Article Title	*Alcohol-water Injection*
Article Author	Colwell, A.T. Cummings, R.E.

	Anderson, D.E.
Journal	SAE J.
Volume	53
Pages	358-372
Publication Date	1945
Abstract	The effect of alcohol-water injection on the operating characteristics of gasoline engines, including combustion-chamber deposits, is discussed. An automatic alcohol-water injector is described. (CA)
Document Type	Journal article

Citation Number	**80A003033**
Article Title	*A Comparative Study of Alcohol, Gasoline and Kerosene as Fuels for Tractor Engines*
Journal	Philipp. Agric.
Volume	20
Pages	295-327
Publication Date	1931
Abstract	Water injection into tractors of the McCormick-Deering type reduced the consumption of gasoline and kerosene from beginning half load to the maximum possible load, increased the volumetric efficiency, lowered the radiator temperature, increased the maximum power developed and minimized knocking due to overheating. More water was consumed per brake h.p.hr. when using gasoline than when using kerosene. Injection of water is also recommended for Cletrac K and Fordson tractors from half load to normal capacity when using gasoline or kerosene. Engines designed to run with gasoline or kerosene can be run with Et or denatured alcohol either straight or diluted with 40% water, if the carburetor and ignition are slightly altered. Fuel consumption is greater with alcohol. The most economical point with gasoline and kerosene is between 3/4 and full load but for alcohol it is at the miximum load. The maximum power obtainable is greatest with alcohol. Operation with alcohol gives smoother running, steadier pull, and absence of over-heating, knocking, corrosion or deposition of carbon. (CA)
Document Type	Journal article

Citation Number	**80A003038**
Article Title	*Motor Alcohol: Its Theory and Use*
Article Author	Foster, J.P.
Journal	Sugar News
Volume	2
Pages	521-526
Publication Date	1921
Abstract	Alcohol treated with ether which has been obtained from alcohol by dehydration makes the best motor fuel. The action of corrosive compounds formed by the combustion of such a mixture is a serious problem. Foster has shown that the most suitable basic chemicals for neutralizing the corrosive acids in the mixture are the amines, either primary, secondary, or tertiary. (CA)
Document Type	Journal article

Citation Number	**80A003039**
Article Title	*Fifty Thousand Kilometers on Alcohol as a Motor Fuel*
Article Author	Teodoro, A.L.
Journal	Philipp. Agric.
Volume	28
Pages	99-119
Publication Date	1939
Abstract	Details are given of driving tests involving 5 common motor fuels containing EtOH and 6 mixtures containing varying proportions of EtOH and gasoline. Satisfactory performance of the car was obtained on the various EtOH fuels when proper ignition and carburetor adjustments were made. As much power could be produced with EtOH fuels as with gasoline. Fuel passageways that were made of galvanized iron rusted. Parts made of copper were not affected. The miles obtained per gal increased as the amount of gasoline in the mixture increased. (CA)
Document Type	Journal article

Citation Number	**80A003041**
Article Title	*Alcohol Blend Poor Substitute for Motor Fuel*
Article Author	Reid, G.
Journal	Oil Wkly
Volume	91
Issue	2
Pages	18-20
Publication Date	19 Sep 1938
Abstract	Editorial staff general commentary, referring chiefly to activity of Atchison Agrol Co. in plant at Atchison, Kansas, which became property of National Farm Chemurgic Council, originally sponsored through appropriation of $500,000 by Chemical Foundation; conclusions are that alcohol-gasoline mixtures are not superior motor fuels for ordinary use and that they are in most respects inferior to straight gasoline. (EI)
Document Type	Journal article

Citation Number	**80A003048**
Article Title	*Further Tests on the Use of Denatured Alcohol in Gasoline Engines*
Article Author	Holmes, J.A.
Journal	Eng. News (N.Y.)
Volume	59
Issue	16
Pages	424
Publication Date	16 Apr 1908
Abstract	The comparison was between gasoline of 73 degrees specific gravity and commercial fully denatured alcohol. There were over 2000 individual tests in the series. The principal conclusions are as follows: Fuel consumption. Correspondingly well designed alcohol and gasoline engines, under best conditions, will consume equal volumes of their fuel. Engine builders have not as yet achieved this in practice. The average of the minimum fuel consumption values given by the tests was 0.8 pint per B.h.p.-hr. for both gasoline and alcohol. Thermal efficiency. The heat value of gasoline is higher than for denatured alcohol, the latter being three-fifths that of gasoline. The maximum efficiencies for the two fuels, calculated from the brake horse power and lower calorific value (19,100 Btu per lb. and 10,500 Btu respectively) were 22.2% for gasoline and 34.6% for alcohol. Mixed vapors. Mixtures of gasoline and alcohol gave efficiencies ranging between the preceding figures. Preheated air, etc. The use of special carburetors and with air preheated up to different temperatures was of no particular advantage.

Lower-grade alcohol. The maximum power which a given engine can produce is greatest with the purest alcohol, with the 80% alcohol it was reduced about 1%. The difficulties of starting and regulation were greater with the 80% alcohol. Fuel consumption increased more rapidly than the per cent of alcohol decreased. Effect on cylinders and valves. The alcohol used, regular denatured, had no detrimental effect on cylinder valves or walls. Degree of compression. The lowest fuel consumption was obtained with the highest practical degree of compression (150-180 lbs. per sq. in. above atmosphere for the denatured alcohol). (CA/MS)

Document Type Journal article

Citation Number 80A003049
Article Title *Gasoline-alcohol Blends in Internal-combustion Engines*
Article Author Lichty, L.C.
Phelps, C.W.
Journal Ind. Eng. Chem.
Volume 30
Pages 222-230
Publication Date 1938
Abstract The addition of EtOH to gasoline increases the octane no. of the fuel, and the antiknock effect depends upon the gasoline used. Ten to 20% by volume of EtOH is equivalent to about 1-2 cc. of tetraethyl lead per gallon. Volumetric-efficiency data do not show a consistent increase with EtOH addition either in single-cylinder or multicylinder tests. Power output, thermal efficiency and heat loss to cooling water, with comparable mixture conditions, do not change appreciably with the addition of EtOH to the gasoline, except where this addition induces detonation and permits the use of optimum spark advance. An increase in indicated sp. fuel consumption of 7 and 13% for the single-cylinder engine and an increase in brake sp. fuel consumption of 5 and 9% for the multicylinder engine result from the use of 10 and 20% blends of EtOH compared to gasoline, respectively, at the same compression ratio and with the carburetor adjusted to give air-fuel ratios comparable for each fuel in regard to maximum power or maximum economy. Based on fuel consumption, EtOH should cost less than gasoline to warrant its use in 10 and 20% blends in engines with optimum compression ratios for present "standard" gasolines; it should cost about the same as "standard" gasoline if both the blend and the gasoline are used in engines with optimum compression ratios suitable for each of the fuels; and the blends should cost less than gasoline with sufficient tetraethyl lead to permit operation in engines with optimum compression ratios for the blends. (CA)
Document Type Journal article

Citation Number 80A003050
Article Title *Single-cylinder Engine Tests of Substitute Motor Fuels*
Article Author Brooks, D.B.
Journal J. Res. Natl. Bur. Stand.
Volume 35
Pages 1-37
Publication Date 1945
Abstract By use of a constant-speed CFR test engine, extensive data were obtained on power output, thermal efficiency and cylinder-head temperature as a function of mixture ratio and spark advance for the following fuels: Reference gasoline (CFR octane no. 72); 190-proof EtOH; 200-proof EtOH; 75% EtOH, 25% Et_2O; 50% acetone, 50% BuOH; 27% acetone, 6% EtOH, 67% BuOH; and 28.5% acetone, 71.5% BuOH. Each fuel was studied at the compression ratio which gave incipient knock, and at a standard compression ratio of 5.11 (which gave incipient knock with the reference gasoline). At constant compression ratio, 2-5% more power is obtained from the non-hydrocarbon fuels than from gasoline at any given rate of fuel heat input. At incipient knock, the higher compression ratios, which ranged up to 9.91 for EtOH, allowed higher thermal efficiencies; the permissible power was 25% greater for EtOH than for gasoline. As shown by optimum spark advance, rates of burning at best mixture ratio were the same for all fuels at the standard compression ratio, except that the ether blend burnt slightly faster. A plot of the percentage of maximum power output vs. the fuel heat input per lb. of air was practically identical for all fuels at both compression ratios. Cylinder-head temperatures for any rate of fuel heat input at incipient knock were nearly identical for all fuels. (CA)
Document Type Journal article

Citation Number 80A003059
Article Title *Comparative Performance of Alcohol-gasoline Blends in Gasoline Engine*
Article Author Rogowski, A.R.
Taylor, C.F.
Journal Journal of the Aeronautical Sciences
Volume 8
Issue 10
Pages 384-392
Publication Date Aug 1941
Abstract Object of research was to compare performance of ethyl-alcohol-gasoline blends with performance of gasoline alone, as fuel for internal combustion engines; work confined to steady running conditions with engines fully warmed up; tests made in Sloan Laboratories for Aircraft and Automotive Engines at Massachusetts Institute of Technology. (EI)
Document Type Journal article

Citation Number 80A003061
Article Title *Reid Vapour Pressure of Alcohol Blends*
Article Author Pleeth, S.J.W.
Journal J. Inst. Pet.
Volume 28
Issue 222
Pages 113-114
Publication Date Jun 1942
Abstract In standard method for determination of vapor pressure of motor spirits by Reid method (IP Serial No. G37, ASTM Serial No. D323-32T) certain precautions and modifications are necessary when examining blends containing ethyl alcohol; some precautions and modifications of standard method are suggested. (EI)
Document Type Journal article

Citation Number **80A003062**
Article Title *Alcohol in Diesel Engines*
Article Author Havemann, H.A.
Journal Automob. Eng.
Pages 256
Publication Date Jun 1954
Document Type Journal article

Citation Number **80A003067**
Article Title *Researches on Alcohol as a Motor Fuel*
Article Author Dixon, H.B.
Journal Motor Traction
Volume 31
Issue 817
Pages 478-480
Publication Date 25 Oct 1920
Notes Also in Automotive Industries, v. 44, no. 5, Feb. 3, 1921, p. 211-215. Society of Automotive Engineers Journal, v. 7, no. 6, Dec. 1920, p. 521-524
Abstract Basic data on vapor pressure, ignition temperature, movement of flame through explosive mixtures and detonation of vapor of alcohol, gasoline, benzol and various mixtures of two of these fuels. Authorization of standard alcohol mixtures to be used with present engines is urged. From paper submitted to Fuels Section of Imperial Motor Transport Conference, London. (EI)
Document Type Journal article

Citation Number **80A003068**
Article Title *The Carburetion of Alcohol*
Article Author Scarratt, A.W.
Journal SAE J.
Volume 8
Issue 4
Pages 328-330
Publication Date Apr 1921
Abstract Characteristic curves of four-cylinder engine equipped with special hot-spot manifold for burning alcohol. (EI)
Document Type Journal article

Citation Number **80A003069**
Article Title *Critical Solution Temperatures of Mixtures of Gasoline, Ethyl Alcohol, and Water*
Article Author Bridgeman, O.C.
Querfeld, D.
Journal J. Res. Natl. Bur. Stand.
Volume 10
Pages 693-704
Publication Date May 1933
Document Type Journal article

Citation Number **80A003070**
Article Title *Chassis-dynamometer and Road Tests of Alcohol-gasoline Blends*
Article Author Phelps, C.W.
Lichty, L.C.
Journal Proc., Am. Pet. Inst.
Volume 20M
Issue 3
Pages 53-76
Publication Date May 1939
Document Type Journal article

Citation Number **80A003102**
Article Title *Recalling Those 2 Million Miles on Gasohol*
Article Author Scheller, W.A.
Author Affiliation Nebraska Univ., Lincoln (USA). Dept. of Chemical Engineering
Journal Gasohol U.S.A.
Issue 7
Pages 18-20, 28
Publication Date Dec 1979
Abstract On December 23, 1974, a 2 million mile road test program involving 45 Nebraska owned vehicles was begun to compare an unleaded fuel blend containing 10% anhydrous ethanol with a regular grade unleaded gasoline. Odometer reading and quantity of fuel added were recorded at each fueling stop. Spark plugs were examined and compression measurements were made periodically. The engine heads were also removed from ten cars, the valves and valve seats examined and micrometer measurements of the cylinder diameter were made. Standard emissions tests were conducted at the ERDA Energy Research Center in Bartlesville, Oklahoma. Total emissions from gasohol were about 15.7 gm/mile lower than from unleaded. The gasohol cars obtained up to 5.3% more miles per gallon and 8.7% more miles per Btu than the cars using unleaded fuel. Gasohol performance was satisfactory under all conditions of weather and driving. Although Gasohol U.S.A. has reported on the 2 million mile road test before, this interim paper presented at Wolfsburg belongs in the record. (GAS. USA)
Document Type Journal article

Citation Number **80A003104**
Article Title *Aquahol*
Journal Gasohol U.S.A.
Volume 2
Issue 1
Pages 18-19
Publication Date Jan 1980
Abstract Experiments with the injection of a mixture of water and ethanol into the intake airstream of a diesel engine under load increases horsepower output, reduces intake and exhaust temperatures, promotes cleaner combustion, reduces water and oil temperature, and prolongs engine life. (MS)
Document Type Journal article

Citation Number **80A003112**
Document Title *Tests of Internal Combustion Engines on Alcohol Fuel*
Document Author Lucke, C.E.
Woodward, S.M.
Series U.S. Dept. of Agriculture. Bulletin no. 191
Publication Date 14 Sep 1907
Abstract A report of researches made to determine whether the gasoline and kerosene engines at present on the American market can run on alcohol as fuel; and what improvements might be desirable in the design of engines manufactured especially for alcohol. (EI)
Document Type Book

Citation Number **80A003113**
Document Title *Comparative Fuel Values of Gasoline and Denatured Alcohol, in Internal Combustion Engines*

Document Author: Strong, R.M.
Stone, L.
Series: U.S. Bureau of Mines. Bulletin no. 43
Publication Date: 1912
Pages: 243
Abstract: Gives a detailed statement of the results of 2,000 tests made to determine the comparative value of the two fuels for use in internal-combustion engines. Is a technical report, written for mechanical engineers and persons interested in the utilization of liquid fuels. (Bureau of Mines)
Document Type: Book

Citation Number **80A003115**
Document Title: *Development of Practical Method of Burning Alcohol in Gasoline Tractor and Calculation and Charting of Thermodynamic Properties of Ethyl Alcohol-air Mixture and Its Combustion Products*
Document Author: Meyer, A.J.
Davis, R.E.
Series: Univ. of Kentucky. Engineering Experiment Station. Bulletin no. 8
Publication Date: Jun 1948
Pages: 88
Abstract: Engine can be operated equally well on 95% ethyl alcohol as on gasoline by enriching mixture, advancing ignition timing, increasing compression ratio, adding heat to mixture by means of recycled exhaust gas, and providing gasoline priming equipment or alcohol heater for cold starting. (EI)
Document Type: Book

Citation Number **80A003117**
Article Title: *Use of Motor-fuel Substitutes*
Article Author: Serruys, M.
Journal: SIA Journal
Volume: 14
Pages: 153-180
Publication Date: 1941
Abstract: The principal thermodynamic data, the maximum external work in kg. per 1. of cylinder volume, the minimum theoretical specific consumption of fuel, and the maximum theoretical thermal efficiency calculated therefrom are tabulated for liquid motor fuels (heptane, octane, isooctane, benzene, toluene, o-, m-, and p-xylene, methanol, ethanol, acetone, paraldehyde, methyl ethyl ketone, dimethyl acetal, diethyl acetal, mesityl oxide, ethyl ether, isopropyl ether, and diisopropyl ether) and gaseous fuels (H_2, CH_4, C_2H_6, C_3H_8, C_4H_{10}, C_2H_4, C_2H_2, NH_3, CO; 8 industrial gases; and 5 mixtures of industrial gases with ethane). The ratio of the maximum external work to the minimum theoretical specific consumption of fuel appears to be the simplest criterion of the quality of a fuel, ranging from 0.414 for paraldehyde through 0.91 for ethanol to 1.38 for isooctane. However, such dissimilar motor fuels as Et_2O and MeOH have almost the same rating, 0.436 and 0.59, respectively. The yield of motor fuels obtainable by different industrial processes in terms of horsepower per kg. of coal is estimated to be 0.73 in the Fischer of Bergius processes, 1.91 in the carbonization of coal, 1.98 in gas producers, 0.97 in making methanol from coke, 1.39 in making acetylene via calcium carbide, 0.240-0.577 in making alcohol from beets, cornstalks, etc., and 0.545 in making gas from wood. The results of tests with ternary mixtures of alcohol and gasoline with benzene, acetone, diethyl acetal, and ethyl ether are reported with diagrams. (CA)
Document Type: Journal article

Citation Number **80A003137**
Document Title: *Study of Decomposed Methanol as a Low Emission Fuel*
Document Author: Pefley, R.K.
Saad, M.A.
Sweeney, M.A.
Kilgroe, J.D.
Fitch, R.E.
Author Affiliation: Santa Clara Univ., Calif. (USA). School of Engineering
Report Number: PB-202 732
Publication Date: 30 Apr 1971
Pages: 106
Notes: Final report
Abstract: Tests were run on a CFR engine to study the feasibility of using dissociated methanol as an automotive fuel. Using simulated decomposed methanol, in the range of 0 to 100%, exhaust emissions were analyzed by gas chromatography and IR sensors, and their trends were determined as functions of compression ratio, air-fuel ratio, spark advance, intake manifold temperature and degree of dissociation of the fuel. The exhaust emission results were also related to engine performance in terms of indicated horsepower and indicated thermal efficiency. A summary of the experimental program and considerations of methods of using exhaust energy for decomposing methanol are presented. (AUTHOR)
Availability: NTIS
Document Type: Report

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Government Policies

Citation Number **79:005703**
Document Title *Parameters for Legislative Consideration of Bioconversion Technologies*
Document Author Abeles, T.P.
King, J.R.
Corporate Author Minnesota Legislature Science and Technology Project, St. Paul (USA)
Report Number PB — 284742
MN-61
Publication Date Feb 1978
Pages 45
Abstract Included in this report and the minibrief which accompanies it are conclusions and recommendations that evolved from the examination of various models of biomass production of nonpetroleum fuels. This included the Nebraska Grain and Alcohol Program. It was determined that it was neither economically nor energetically wise at this time for Minnesota to commit itself to a gasohol program modelled after Nebraska's program. Instead of adopting the single-source, large-scale Nebraska model, it was concluded that Minnesota should do the pilot and demonstration plants for the production of ethanol on the small scale (farm or local co-op size), and encourage the utilization of a variety of feedstocks such as sugar beets, grains, and cellulosic residues.
Availability NTIS
Document Type Report

Citation Number **79:007131**
Article Title *Brazil's Gasohol Program*
Article Author Yand, V.
Author Affiliation Centro de Technologia, Rio de Janeiro (Brazil)
Journal Chem. Eng. Prog.
Volume 75
Issue 4
Pages 11-19
Publication Date Apr.1979
Abstract This is a comprehensive report on the program of producing ethanol from sugar cane and some starch-containing plants and its utilization in liquid fuel blends obtained by 20% addition of alcohol to gasoline. Technological details are given. Economic aspect of the program is also discussed. It is concluded that although Brazil's effort to derive more of its fuel and feed-stocks from alcohol faces a number of problems, it holds much promise for providing substantial energy and technological independence to South America's largest country.
Document Type Journal article

Citation Number **80A000001**
Article Title *A Call for Gasohol. (United States Energy Policy)*
Journal Sci. News
Volume 116
Pages 41
Publication Date 21 Jul 1979
Document Type Journal article

Citation Number **80A000013**
Article Title *Carter Gas-from-grain Program Needs Congress, Business Help*
Article Author Yemma, J.
Journal Christian Science Monitor
Volume 72
Pages 3
Publication Date 8 Jan 1980
Document Type Journal article

Citation Number **80A000014**
Article Title *Carter Gasohol Plan Isn't Likely to Create More Demand for Excess Grain This Year*
Journal Wall Street Journal
Volume 102
Pages 5
Publication Date 14 Jan 1980
Document Type Journal article

Citation Number **80A000015**
Article Title *Carter to Announce Gasohol Plan Soon: Grain Diverted from Soviets Will Be Used*
Article Author Mohr, C.
Journal New York Times
Volume 129
Pages D3
Publication Date 7 Jan 1980
Notes v. 129, Section D
Document Type Journal article

Citation Number **80A000044**
Article Title *Congress May Approve Financing for On-farm Alcohol Plants*
Article Author Wennblom, R.D.
Journal Farm J.
Volume 103
Pages 12
Publication Date Nov 1979
Document Type Journal article

Citation Number **80A000063**
Journal Chem. Eng. News
Pages 35

Publication Date	1 Oct 1979
Abstract	Brazil: government energy-via-biomass program concentrates on ethanol and vegetable oils as fuels.
Document Type	Journal article

Citation Number	**80A000070**
Article Title	*Brazil to Close Down Alcohol Technology Project*
Journal	Latin America Economic Report
Volume	7
Issue	36
Pages	286
Publication Date	14 Sep 1979
Abstract	Discontinuance of alcohol engine project set up by the Centro Technologico da Aeronautica. Government industrial technology policy. Car and aircraft engines. New project for conversion of diesel engines to alcohol. Imported technology. (EAI)
Document Type	Journal article

Citation Number	**80A000074**
Journal	Chem. Age (London)
Pages	14
Publication Date	27 Jul 1979
Abstract	Brazil: to produce fuel alcohol from manioc in $5 mil program.
Document Type	Journal article

Citation Number	**80A000116**
Article Title	*DOE Clears Way for Amoco Oil Company to Market Gasohol*
Journal	Barrons
Volume	59
Pages	39
Publication Date	22 Oct 1979
Document Type	Journal article

Citation Number	**80A000117**
Article Title	*DOE Endorses Use of Alcohol Fuels to Reduce Gasoline Consumption; $24.9 Million in FY1980 to R&D*
Journal	Chem. Eng. News
Volume	57
Pages	5
Publication Date	16 Jul 1979
Document Type	Journal article

Citation Number	**80A000118**
Article Title	*DOE Proposes Deregulation of Gasohol Prices*
Journal	Chem. Eng. News
Pages	21
Publication Date	24 Apr 1978
Document Type	Journal article

Citation Number	**80A000119**
Journal	Chem. Week
Pages	14
Publication Date	31 Oct 1979
Abstract	DOE to have Alcohol Fuels Office to run $650 million, 3-year program.
Document Type	Journal article

Citation Number	**80A000123**
Article Title	*Drive to Boost Alcohol Fuels*
Journal	Sci. News
Volume	117
Pages	94
Publication Date	9 Feb 1980
Document Type	Journal article

Citation Number	**80A000137**
Article Title	*Energy and National Security: a Status Report*
Article Author	Bucknell, H., III
Journal	Energy Commun.
Volume	5
Issue	4
Pages	221-256
Publication Date	1979
Abstract	The energy crisis poses a threat to U.S. national security. The U.S. no longer has control over supplies, as in the past. It is imperative that the public realize the true situation of U.S. vulnerability and respond appropriately to the situation. Threats to oil supplies from Iranian cutoffs, the limits of Saudi Arabian production, and dwindling supplies in the U.S.S.R. are further jeopardizing the U.S. position. Energy has become a "public good" requiring that the government act to see that the country has enough in supply at reasonable prices. The government must subsidize research and development for new energy resources while also promoting conservation to enable the U.S. to withstand economic, military, and political sanctions. It must develop a viable gas rationing system to be implemented soon. The administrative particulars should now be publicly debated. The cooperation of the public and private sectors in promoting and producing energy alternatives, like gasohol, is essential. (ABI)
Document Type	Journal article

Citation Number	**80A000138**
Article Title	*Energy Conferees Are Devising a Variety of Subsidy Plans Despite Budget Crunch*
Article Author	Ignatius, D.
Journal	Wall Street Journal
Volume	102
Pages	18
Publication Date	22 Apr 1980
Abstract	United States. Congress-energy policy; solar energy — appropriations and expenditures; energy conservation — appropriations and expenditures; United States. Department of Agriculture — energy policy; synthetic fuels — appropriations and expenditures. (NNI)
Document Type	Journal article

Citation Number	**80A000175**
Journal	Oil Gas J.
Pages	19
Publication Date	3 Mar 1980
Abstract	Gasohol gets government support for 5 billion gallon/year supply by 1981; fuel alcohol output data.
Document Type	Journal article

Citation Number	**80A000227**
Article Title	*The Methanol Age Is Dawning*
Article Author	Flanigan, J.
Journal	Forbes
Volume	124
Issue	3
Pages	27

Publication Date 6 Aug 1979
Document Type Journal article

Citation Number **80A000231**
Article Title *Maryland County Establishes Alcohol Fuels Program*
Journal Sol. Law Rep.
Volume 1
Issue 4
Pages 725
Publication Date Dec 1979
Document Type Journal article

Citation Number **80A000255**
Journal Solar Energy Digest
Pages 4
Publication Date Jul 1979
Abstract Proposed Clean Air Act Amendment to promote use of alcohol as motor fuel or additive.
Document Type Journal article

Citation Number **80A000264**
Article Title *Reporter's Notebook: Georgians Adjust to Iowa's Politics*
Article Author Clines, F.X.
Journal New York Times
Volume 129
Pages 11
Publication Date 19 Jan 1980
Document Type Journal article

Citation Number **80A000278**
Article Title *Second Thoughts on Brazil's Alcohol Plan*
Journal Latin America Economic Report
Volume 7
Issue 40
Pages 315
Publication Date 12 Oct 1979
Abstract Fuel alcohol programme in Brazil. Production of alcohol-fuelled cars in 1980: 250,000 units. Petrol substitution by alcohol. Package of incentives for purchasing of alcohol-fuelled cars. Government's doubts. Production costs related with sugar prices. Substitution of petrol by alternative energy sources, A.O. methanol from wood. (EAI)
Document Type Journal article

Citation Number **80A000289**
Journal Chem. Age (London)
Pages 14
Publication Date 7 Mar 1980
Abstract The South African government has given the green light for ethanol to be used as liquid fuel. The government has indicated that it will be appointing a standing committee to examine the use of ethanol in this way. This committee would process the applications of prospective suppliers and have the powers to issue licenses for companies to market ethanol as a fuel. The members of the committee have not been approved as yet and the first applications are not likely to be considered for two or three months. Sentrachem of South Africa is likely to be an early applicant as it is already manufacturing ethanol for portable and industrial uses. The company has been waiting for the government to make such a decision.
Document Type Journal article

Citation Number **80A000347**
Journal Chem. Eng. (N.Y.)
Pages 73
Publication Date 10 Apr 1978
Abstract The Swedish government is expected to give its approval to a 3-year, $225-million proposal aimed at developing energy from sources such as biomass, the wind and the sun. Renewable energy will receive the biggest chunk — $85 million. Of this, about $27 million will be used for research into replacing imported oil with domestic fuels from such biomass as forest products and peat. Alternative energy sources for space heating — including the sun — will be investigated in a $35-million effort. About $19 million will go into improving energy utilization by industry; $7 million will fund the development of gasoline substitutes such as methanol and ethanol.
Document Type Journal article

Citation Number **80A000348**
Article Title *Sweet Proposition: How to Turn Surplus Sugar into Gasohol — and a Fast Buck*
Article Author Born, R.
Journal Barrons
Volume 59
Issue 34
Pages 9
Publication Date 20 Aug 1979
Document Type Journal article

Citation Number **80A000362**
Document Title *Department of Energy Position Paper on Alcohol Fuels*
Corporate Author Department of Energy, Washington, D.C. (USA). Alcohol Fuels Program.
Report Number DOE/US-0001/1
Publication Date Mar 1978
Pages 6
Abstract The supply, utilization, and economic characteristics of alcohols (methanol and ethanol) and the major issues associated with their implementation are briefly described. The major elements in the current evaluation of alcohol fuels as a candidate for federally-assisted commercialization of a non-petroleum fuel are also described. (NTIS)
Document Type Report

Citation Number **80A000364**
Document Title *Alcohol Fuels Program Plan*
Report Number DOE/US-0001/2
Publication Date Mar 1978
Pages 59
Abstract The Department of Energy has considered the production and use of ethanol and methanol as liquid fuels. The Task Force on Alcohol Fuels has reviewed the status of alcohol-related activities within DOE and elsewhere and has formulated a plan of action to (1) help resolve uncertainties, and (2) provide options supportive of potential national decisions in this area. DOE is currently conducting a fuels Supply Strategy Study which will consider all candidate alternative fuels and emphasize contingency planning to ensure an acceptable balance between supply and demand under future contingency cases. The special studies included in the Immediate Action Ele-

ment will provide analyses of key-issue areas for alcohol fuels to support the fuels Supply Strategy Study. These special studies will examine the following aspects of alcohol fuels use: (1) resource availability, (2) economic, environmental, and social impacts, (3) end-use applications, (4) Federal fiscal consequences, (5) industry incentives, and (6) policy instruments for price control, market assurance, and import control. Background information and the program rationale are discussed and a comprehensive outline of the proposed commercialization studies is presented. (NTIS)

Document Type Report

Citation Number **80A000405**
Document Title *Recommendations for a Synthetic Fuels Commercialization Program. Volume III. Technology and Recommended Incentives*
Corporate Author Interagency Task Force on Synthetic Fuels, Washington, D.C. (USA)
Report Number PB-249 447/4ST
Publication Date Nov 1975
Pages 982
Notes Paper copy also available from NTIS in set of 4 reports as PB-249 444-SET
Abstract This report presents the technology and incentives recommended to establish a commercially viable Synthetic Fuels Commercialization Program (SCP) directed toward achieving the President's goal of one million barrels of crude oil equivalent per day in 1985. Analysis of each incentive considers its ability to meet the following criteria: effectiveness, competitiveness, administrative feasibility, federal involvement, flexibility, breadth of participation, existing authority, and contingency analyses. Availability of energy producing raw materials such as coal, shale, and biomass waste and the market for synthetic fuels are covered. Portions of this report are not fully legible. (NTIS)
Document Type Report

Citation Number **80A000430**
Article Title *New Gasohol Plan Sets High Production Goal*
Article Author Ember, L.R.
Journal Chem. Eng. News
Volume 58
Issue 3
Pages 24-25
Publication Date 21 Jan 1980
Document Type Journal article

Citation Number **80A000462**
Article Title *Alternate Energy Incentives in Oregon*
Document Title Solar 79 Northwest
Article Author Philbrick, D.
Craig, L.
Kiphut, A.
Justus, D.
Author Affiliation Oregon State Dept. of Energy, Salem (USA)
Conference Solar 79 Northwest conference
Conference Place Seattle, WA, USA
Conference Date 12 Aug 1979
Report Number CONF-790845
Publication Date 1979
Pages 103
Abstract Several incentives to alternative energy development, recently enacted by the Oregon legislature, are surveyed. Investment tax credits are awarded to the industrial/commercial sectors for installing equipment or designing structures to utilize renewable resources to meet their energy needs. A 25% tax credit is available for the residential sector for the installation of solar, wind, or geothermal devices on dwellings. Property tax exemptions and economic incentives for the commercialization of gasohol and cogeneration are described.
Availability NTIS
Document Type Paper from report

Citation Number **80A000484**
Article Title *Future of Alcohol Fuels Programs in Brazil*
Document Title Proceedings of Condensed Papers: 2nd Miami International Conference on Alternative Energy Sources
Article Author Carvalho, A.V.
Rechtschaffen, E.
Goldstein, L.
Saddy, M.
Author Affiliation Centro de Technologia Promon-CTP, Rio de Janeiro (Brazil)
Conference 2nd Miami international conference on alternative energy sources
Conference Place Miami Beach, FL, USA
Conference Date 10 Dec 1979
Publisher Univ. of Miami, Clean Energy Research Institute.; Coral Gables, FL, USA
Publication Date 1979
Document Type Paper/Chapter from book

Citation Number **80A000497**
Document Title *Federal Agency Compendium; Federal Agency and Department Alcohol Fuels Programs*
Document Author Bayb, B.
Roe, R.A.
Publisher U.S. National Alcohol Fucls Commission; Washington, DC, USA
Publication Date Mar 1980
Pages 45
Document Type Book

Citation Number **80A000505**
Article Title *Alcohol Fuel Technology and the National Energy Act*
Document Title Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author Grainey, M.W.
Author Affiliation Oregon State Dept. of Energy, Salem (USA)
Conference 3. international symposium on alcohol fuels technology
Conference Place Asilomar, CA, USA
Conference Date 29 May 1979
Publisher U.S. Department of Energy; Washington, DC, USA
Report Number CONF-790520
Publication Date Apr 1980
Pages 12p, Paper I-4
Abstract A review of the economic incentives that are available for the development of alcohol fuels is presented. The National Energy Act, HR5263, HR5146, HR5037, HR5289, and pertinent state legislative action in the State of Oregon are pre-

sented to show the complication of the development of an alternative fuels industry. (AFDB)

Document Type: Paper from report

Citation Number **80A000506**
Article Title: *The Swedish Oil and Fuel Policy in the 1980's*
Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author: Bern, L.A.
Author Affiliation: Swedish Methanol Development Co., Stockholm
Conference: 3. international symposium on alcohol fuels technology
Conference Place: Asilomar, CA, USA
Conference Date: 29 May 1979
Publisher: U.S. Department of Energy; Washington, DC, USA
Report Number: CONF-790520
Publication Date: Apr 1980
Pages: 4p, Paper I-5
Document Type: Paper from report

Citation Number **80A000539**
Article Title: *What Do We Do when the Wells Run Dry?*
Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author: Stone, C.L.
Author Affiliation: California State Legislature (USA). Synthetic Fuels Program
Conference: 3. international symposium on alcohol fuels technology
Conference Place: Asilomar, CA, USA
Conference Date: 29 May 1979
Publisher: U.S. Department of Energy; Washington, DC, USA
Report Number: CONF-790520
Publication Date: Apr 1980
Pages: 11p, Paper II-42
Document Type: Paper from report

Citation Number **80A000541**
Article Title: *Legal and Regulatory Influences on Alcohol Fuels Use in United States*
Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author: Ecklund, E.E.
Author Affiliation: Department of Energy (USA)
Conference: 3. international symposium on alcohol fuels technology
Conference Place: Asilomar, CA, USA
Conference Date: 29 May 1979
Publisher: U.S. Department of Energy; Washington, DC, USA
Report Number: CONF-790520
Publication Date: Apr 1980
Pages: 10p, Paper II-44
Abstract: During the last year, grass-roots interest in gasohol has resulted in commercial sales going from zero to 6 million U.S. gallons (600,000 gallons ethanol) in January 1979. This started in the Midwest United States on the basis of motorist appeal without benefit of incentives, spread with the benefit in some cases of state incentives and was further encouraged by the waiver of 4 cents-per-gallon federal excise tax for fuels with 10-volume percent alcohol from renewable resources. Continuation depended on a favorable ruling under the Clean Air Act by the Environmental Protection Agency, which also acted favorably on use of tertiary butyl alcohol and methyl tertiary butyl ether as octane improvers. Other supportive federal actions include load guarantee for a processing plant to convert bagasse to ethanol, planned initiation of reliability fleet tests on advanced alcohol/gasoline blend compositions, and establishment of a Congressional National Alcohol Fuels Commission to determine what can and should be done to help alcohol fuels find their appropriate levels in replacing petroleum. (AUTHOR)
Document Type: Paper from report

Citation Number **80A000542**
Article Title: *A U.S. Alcohol Fuels Policy and the Political State: Assessing Directions*
Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author: Wiener, D.
Author Affiliation: Wisconsin Division of State Planning and Energy (USA)
Conference: 3. international symposium on alcohol fuels technology
Conference Place: Asilomar, CA, USA
Conference Date: 29 May 1979
Publisher: U.S. Department of Energy; Washington, DC, USA
Report Number: CONF-790520
Publication Date: Apr 1980
Pages: 8p, Paper II-45
Document Type: Paper from report

Citation Number **80A000545**
Article Title: *Congressional Concerns About Alcohol Fuels — a Technical Advisor's Perspective*
Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author: Sokkappa, B.G.
Author Affiliation: Mitre Corp., McLean, Va. (USA)
Conference: 3. international symposium on alcohol fuels technology
Conference Place: Asilomar, CA, USA
Conference Date: 29 May 1979
Publisher: U.S. Department of Energy; Washington, DC, USA
Report Number: CONF-790520
Publication Date: Apr 1980
Pages: 8p, Paper III-49
Abstract: Though there is a vast segment of the public and the Congress that would like to see alcohol fuel replace even a small part of our petroleum consumption, convincing information has not been presented to the U.S. Congress to enact legislation to commercialize alcohol fuels. Much of the promotion of alcohol fuel has been oriented towards ethanol production from grain resources. Unfortunately, this resource seems to be one of the most expensive and least likely to be economically competitive. The objections against alcohol on energy balance seem to be based on misleading analysis and not entirely justified. Most testimonies ignore the fact that the available biomass resources could have more appropriate uses than producing alcohol. Methanol produced from coal appears to have a great immediate potential in terms of cost and supply but this path is overshad-

owed by the enthusiasm for agriculture based ethanol, even though methanol from coal has the greatest possibility of generating public acceptance of alcohol as a motor fuel from the point of view of cost. In order to promote the cause of alcohol fuel several things are necessary. First, the proponents must recognize the issues, particularly the economics and petroleum replacement, as the legislators and the public see them. If satisfactory answers are not available, one must be content with research and developments to solve them and not try to rush into commercialization. Second, the credibility must be enhanced by avoiding exaggerations and by presenting a realistic picture of the issues, problems and potential solutions. Third, the emphasis on problems that are not serious or for which solutions are at hand must be minimized. Only then there can then be a hope of establishing alcohol as a viable alternate fuel. (AUTHOR)

Document Type: Paper from report

Citation Number: 80A000550

Article Title: *New Zealand's Methanol-gasoline Transport Fuel Programme*

Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology

Article Author: Graham, E.E.; Judd, B.T.; Alexander, V.

Author Affiliation: Canterbury Univ., Christchurch (New Zealand); Department of Scientific and Industrial Research, Wellington (New Zealand); Otago Univ., Dunedin (New Zealand)

Conference: 3. international symposium on alcohol fuels technology

Conference Place: Asilomar, CA, USA

Conference Date: 29 May 1979

Publisher: U.S. Department of Energy; Washington, DC, USA

Report Number: CONF-790520

Publication Date: Apr 1980

Pages: 12p, Paper III-56

Abstract: For the fleet in question and with a 10% methanol/petrol blend, fuel consumption on a volumetric basis shows an improvement of about 1% corresponding to an improved energy consumption of about 6-7%. Driveablility problems are minimal. No corrosion or untoward mechanical problems occured during the course of the trial. Based on limited data obtained from this test the toxic hazard is not effectively increased with a 10% blend. Accumulation of water in storage tanks and vehicle fuel tanks is minimal and insufficient to promote phase separation. (AUTHOR)

Document Type: Paper from report

Citation Number: 80A000552

Article Title: *Future Scenarios of Alcohols as Fuels in Brazil*

Document Title: Proceedings of Third International Symposium on Alcohol Fuels Technology

Article Author: de Carvalho, A.V., Jr.; Rechtschaffen, E.E.M.; Saddy, M.

Author Affiliation: Centro de Technologia Promon-CTP, Rio de Janeiro (Brazil)

Conference: 3. international symposium on alcohol fuels technology

Conference Place: Asilomar, CA, USA

Conference Date: 29 May 1979

Publisher: U.S. Department of Energy; Washington, DC, USA

Report Number: CONF-790520

Publication Date: Apr 1980

Pages: 12p, Paper III-58

Abstract: An updated account of the Brazilian National Alcohol Program achievements, both on production and utilization of fuel ethanol, is presented. A recently proposed program on methanol from wood (eucalyptus) is also briefly described. These programs are utilized as a basis for the establishment of scenarios for fuel alcohols production and utilization in Brazil, in the near future, with the overall objective of a gradual displacement of the oil barrel by fuel alcohols. An attempt is then made to evaluate the impact of the scenarios in order to prevent shortages/surpluses of fuels while avoiding possible decreases in alcohol production and consumption. As a result, various coherent and integrated energy mixes may be identified. (AUTHOR)

Document Type: Paper from report

Citation Number: 80A000570

Article Title: *Governmental Responsibility in Energy and Environmental Politics*

Document Title: Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries

Article Author: Fritz, M.

Author Affiliation: Max-Planck-Institute for Energy Policy, Starnberg (Germany, F.R.)

Conference: Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries

Conference Place: Vienna, Austria

Conference Date: 26 Mar 1979

Publisher: United Nations Industrial Development Organization; New York, NY, USA

Report Number: CONF-7903101-1

Publication Date: 1979

Pages: 21p, Paper ID/WG.293/9

Notes: Advice, with emphasis on "appropriate" technology, for developing countries.

Document Type: Paper from report

Citation Number: 80A000572

Article Title: *Power Alcohol Industry for Thailand Potential and Prospect*

Document Title: Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries

Article Author: Vicharangsan, T.

Author Affiliation: Ministry of Industry, Bangkok (Thailand). Dept. of Industrial Works

Conference: Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries

Conference Place: Vienna, Austria

Conference Date: 26 Mar 1979

Publisher: United Nations Industrial Development Organization; New York, NY, USA

Report Number: CONF-7903101-1

Publication Date: 1979

Pages: 18p, Paper ID/WG.293/11

Abstract
The kingdom of Thailand is striving to stabilize her agricultural outputs. Surplus production in agricultural crops is a normal occurrence, and the nation's economy suffers as a consequence. With all of liquid fuel requirements met by importation, this country faces heavier payment deficits as oil price rises. Power alcohol from agricultural materials will help solve this country's plight. Suitable raw materials for alcohol production, e.g., sugar cane, cassava, etc., are abundant and more of these could readily be cultivated for alcohol production should power alcohol industry be established. At present, the government is seeking appropriate measures to promote this new industry, and an official engine and road test program is under way to confirm the compatibility and to ascertain the applicability of the alcohol blended fuel in all areas of the country. An alcohol-gasoline blended fuel containing 20% alcohol for domestic consumption would require 400 million liters of alcohol per year immediately, rising to 1,000 million liters per year in ten years. Further demand might arise should the use of alcohol in diesel engines become practical. The rural economy would improve if power alcohol program could be instituted successfully. Local investors and grower-groups would be ready to invest once they could be convinced of the feasibility of the program. (AUTHOR)

Document Type — Paper from report

Citation Number — **80A000579**
Article Title — *Potential for Fermentation Alcohol Production in Belize*
Document Title — Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author — Ayuso, A.L.
Author Affiliation — Belize Sugar Board, Corozal Town
Conference — Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place — Vienna, Austria
Conference Date — 26 Mar 1979
Publisher — United Nations Industrial Development Organization; New York, NY, USA
Report Number — CONF-7903101-1
Publication Date — 1979
Pages — 4p, Paper ID/WG.293/19

Abstract
Belize is a small English-speaking country in Central America with a population of 150,000. The importation of gasoline for fuel causes a drain on the resources of the country while sugar accounts for about 60 percent of total exports and is the most important dollar earner. The north of Belize has proven over the past quarter of a century to be most suitable for sugar cane production, and the present acreage of 60,000 in the hands of the present 4,000 cane farmers is producing more cane than the two factories can grind. Apart from the present licenced cane farmers there are at least another 1,000 farmers (with at least another 3,000 acres of extra cane) who are hoping to become part of the sugar industry in the event of an expansion. But expansion beyond our export commitments of 110,000 tons to the European Economic Community and International Sugar Association appears to be remote. Our only hope is the possibility of another product. This could well be fermentation alcohol, provided the economics of such production were favourable. Belize also produces an average of about 30,000 long tons of molasses, most of which is exported to the USA. Belize welcomes investors who are willing to work along with the Belizean farmers with a view to the economic development of the country and at the same time meet a world need. (AUTHOR)

Document Type — Paper from report

Citation Number — **80A000603**
Article Title — *Possibilities of Developing a Nation Wide Programme for Power Alcohol in Peru*
Document Title — Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author — Hernandez, P.A.
Author Affiliation — CECOAAP, Lima (Peru)
Conference — Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place — Vienna, Austria
Conference Date — 26 Mar 1979
Publisher — United Nations Industrial Development Organization; New York, NY, USA
Report Number — CONF-7903101-1
Publication Date — 1979
Pages — 10p, Paper ID/WG.293/44
Document Type — Paper from report

Citation Number — **80A000691**
Article Title — *The Brazilian National Alcohol Program*
Document Title — Biomass for Energy: Conference at the Royal Society
Article Author — Gochnarg, I.
Author Affiliation — Cidade Univ. (Brazil)
Conference — Biomass for energy
Conference Place — London, England
Conference Date — 3 Jul 1979
Publisher — International Solar Energy Society, U.K. Section; London, GB
Publication Date — 1979
Pages — 30
Notes — Sponsored by the Commission of the European Communities (Directorate General for Research, Science and Education).

Abstract
The main objective of the Brazilian National Alcohol Program is to reduce Brazil's imported crude oil bill by extending gasoline, blending it with agriculturally produced ethyl alcohol to the extent of 20% in volume. The national energy balance forecast indicates that annual anhydrous alcohol consumption for automotive purposes should increase from 1.73 million cu m in 1978 to 4.7 million cu m in 1987. Problems connected with alcohol production, distribution, and utilization are discussed. Indirect benefits resulting from the implementation of the National Alcohol Program are described, including improvement of national technology in the agricultural and industrial sectors, expansion of capital goods production, reduction in regional and individual income discrepancies, and substantial increase in employment opportunities. (EL)

Document Type — Paper/Chapter from book

Citation Number **80A000723**
Article Title *A General History of the Nebraska Grain Alcohol and Gasohol Program*
Document Title Utilization of Alternative Fuels for Transportation; Proceedings of the Symposium, University of Santa Clara, Santa Clara, California
Article Author Fricke, C.R.
Newman, M. (ed.)
Grey, J. (ed.)
Conference Utilization of alternative fuels for transportation
Conference Place Santa Clara, CA, USA
Conference Date 19 Jun 1978
Publisher American Institute of Aeronautics and Astronautics; New York, NY, USA
Publication Date 1979
Pages 155-162
Notes AIAA Aerospace assessment series, volume 2
Document Type Paper/Chapter from book

Citation Number **80A001001**
Article Title *Alcohol Production for Fuel Is Backed by House Committee*
Journal Wall Street Journal
Volume 101
Pages 8
Publication Date 19 Sep 1979
Document Type Journal article

Citation Number **80A001031**
Article Title *BATF Considers Problem of Approving Tax-free Stills for Fuel Alcohol and Not for Moonshine Whiskey*
Journal Beverage World
Pages 17
Publication Date Nov 1978
Document Type Journal article

Citation Number **80A001055**
Article Title *Is There 'Synfuel' at the End of the Rainbow?*
Article Author Marchese, J.
Journal Wall Street Journal
Volume 102
Pages 16
Publication Date 17 Jan 1980
Document Type Journal article

Citation Number **80A001075**
Article Title *U.S. Details Gasohol Program: Carter's Goal Is Rate of 5 Billion Gallons in 1981*
Article Author Lyons, R.D.
Journal New York Times
Volume 129
Pages 27
Publication Date 12 Jan 1980
Document Type Journal article

Citation Number **80A001077**
Journal Fed. Regist. (Wash., D.C.)
Pages 63515
Publication Date 5 Nov 1979
Abstract The U.S. Economic Regulatory Administration (ERA) of the Department of Energy (DOE) is amending the Mandatory Petroleum Allocation Regulations to permit the automatic inclusion in the crude oil entitlements program of ethyl alcohol derived from domestic biomass when mixed with gasoline for use as fuel in the United States. The purpose of this amendment is to offset the regulatory bias in favor of petroleum and against ethyl alcohol used as a petroleum substitute which would otherwise continue until the total deregulation of crude oil prices on Sept. 30, 1981.
Document Type Journal article

Citation Number **80A001078**
Journal Fed. Regist. (Wash., D.C.)
Pages 20777
Publication Date 6 Apr 1979
Abstract The U.S. Environmental Protection Agency says that notice is given that, effective December 16, 1978, a waiver of the prohibitions and limitations of the Clean Air Act, as amended, was granted for gasohol, a fuel consisting of 90% unleaded gasoline and 10% ethyl alcohol, by operation of the Act.
Document Type Journal article

Citation Number **80A001079**
Journal Oil Gas J.
Pages 54
Publication Date 2 Jul 1979
Abstract The U.S. Government is bent on pushing gasohol in a move designed to extend petroleum supplies. But two Federal Reserve Bank economists say present gasohol production wastes energy. And the nation's largest auto maker finds slight decreases in fuel economy in cars that burn gasohol. However, an Energy Department study concludes that gasohol can help the U.S. stretch its petroleum supplies now and increasingly through the 1980's. DOE's Office of Hearing & Appeals (OHA) tentatively has granted an eastern U.S. based gasoline distributor a 12-month supply of unleaded gasoline to blend into gasohol. And 10 states, seeking to encourage use of gasohol, have moved to reduce or eliminate state taxes on the alcohol-gasoline blend. President Carter proposes to aid gasohol by exempting the fuel permanently from the federal 4 cents/gal gasoline tax, by offering an additional 10% investment tax credit for manufacturing facilities, and by assistance from an $11-million fund for loans, grants, and loan guarantees to help build 100 small plants to produce alcohol fuels.
Document Type Journal article

Citation Number **80A001080**
Article Title *U.S. Presses Drive for Use of Gasohol*
Journal Oil Gas J.
Volume 77
Issue 27
Pages 54
Publication Date 9 Jul 1979
Abstract The government's strategy involves help in commercialization of alcohol fuels and supporting research and development to reduce costs, expand supply sources. Proposals to remove or reduce state motor fuel taxes on gasohol. Opposing views on gasohol. Production and marketing, 1978. (EAI)
Document Type Journal article

Citation Number	**80A001081**
Article Title	*U.S. Struggles for Gasohol Plan*
Article Author	Lyons, R.D.
Journal	New York Times
Volume	129
Pages	D4
Publication Date	8 Jan 1980
Notes	v.129, Section D
Document Type	Journal article

Citation Number	**80A001101**
Journal	Chem. Eng. (N.Y.)
Pages	80, 82, 84
Publication Date	10 Mar 1980
Abstract	When the Administration recently announced a stepped-up grain-alcohol production program to placate farmers angered at the Soviet grain-embargo, it added a crucial link to the extraordinary chain of events that has been turning grain-based ethanol making into one of the most fashionable chemical-process-industries (CPI) activities. Congress is getting ready to approve legislation that will wrap in one package existing incentives for gasohol production together with a bundle of credits and funding for fuel-alcohol manufacturing. The entire incentives plan is expected to provide \$8-\$12 billion over the next ten years. Its goal: a fourfold increase in U.S. ethanol capacity this year (to 320 million gal/yr), another boost to 500 million by late 1981, and 1.5 billion by the mid-1980's.
Document Type	Journal article

Citation Number	**80A001103**
Article Title	*Why the Highway Fund May Run Out of Money*
Journal	Bus. Week
Issue	2624
Pages	65
Publication Date	18 Feb 1980
Document Type	Journal article

Citation Number	**80A001111**
Article Title	*National Organization Created to Promote Use of Gasohol*
Article Author	Healey, J.
Journal	Des Moines Register
Publication Date	25 Jan 1978
Document Type	Journal article

Citation Number	**80A001124**
Article Title	*Pentagon Is Directed to Purchase Alcohol for Gasohol Industry*
Journal	Wall Street Journal
Volume	101
Pages	29
Publication Date	17 Sep 1979
Document Type	Journal article

Citation Number	**80A001174**
Document Title	*Mission Analysis for the Federal Fuels from Biomass Program; Volume IV. Thermochemical Conversion of Biomass to Fuels and Chemicals*
Document Author	Kohan, S.M. Barkhordar, P.M.
Author Affiliation	SRI International, Menlo Park, Calif. (USA)
Report Number	SAN-0115-T3
Publication Date	1979
Pages	179
Availability	NTIS
Document Type	Report

Citation Number	**80A001219**
Document Title	*Fuels from Biomass Program; Program Summary*
Corporate Author	Department of Energy, Washington, D.C. (USA) Div. of Solar Technology
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	DOE/ET-0022/1
Publication Date	Jan 1978
Pages	98
Abstract	The over-all objective of the fuels from biomass program is to develop the capability for converting renewable biomass resources into clean fuels. Petrochemical substitutes, and other energy-intensive products that can supplement similar products made from conventional fossil fuels. The fuels from biomass program concentrates on plant materials grown on land (terrestrial) and in water (aquatic). These materials include forest and crop residues, crops grown on energy farms for their energy content, and animal manures. The program does not include conversion of municipal solid wastes or industrial wastes. This publication is a list of current projects and summaries, with two main areas of concentration and their components — 1) production and collection of biomass, a) residue production, b) silviculture production, c) agricultural production, d) aquatic production, 2) conversion of biomass, a) anaerobic digestion, b) fermentation, c) biophotolysis, d) thermochemical conversions, e) photoelectrolysis.
Availability	U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402
Document Type	Report

Citation Number	**80A001220**
Document Title	*Denaturants for Ethanol/Gasoline Blends*
Corporate Author	Mueller Associates, Inc., Baltimore, Md. (USA)
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	HCP/M2098-1 Contract EX-76-C-01-2098
Publication Date	Apr 1978
Pages	16
Abstract	A major source of revenue for the Federal Government is the tax placed on ethyl alcohol used for human consumption. If ethyl alcohol (ethanol) is used as an automotive fuel, it will be necessary to deter any potential public damage or attempts at avoiding the taxation of potable ethanol, both of which could occur through uncontrolled distribution of bootleg alcohol products. This study assesses: (1) if the ordinary methods of denaturing ethyl alcohol are satisfactory to prevent the recovery of potable ethanol from any future ethanol/gasoline fuel blends; and (2) if there is a need for the development of a more-effective denaturant. This study also considers the effects that any government tax-credit programs (designed to encourage the use of alcohol as a gasoline extender) may have on the possible recovery of potable ethanol from ethanol/gasoline fuel blends.
Document Type	Report

Citation Number **80A001223**
Document Title *A Critique of the Report of the Alcohol Fuels Policy Review*
Document Author Carlson, R.
Commoner, B.
Freedman, D.
Publisher Center for the Biology of Natural Systems, Washington Univ.; St. Louis, MO, USA
Publication Date 20 Sep 1979
Pages 29
Notes Report of the Alcohol Fuels policy review published by the U.S. Department of Energy, Alcohol Fuels Policy Review Group, June 1979, DOE/PE-0012.
Document Type Report

Citation Number **80A002039**
Article Title *EPA Mulls Ban on Two Fuel Additives*
Article Author Hinsberg, P.
Journal Automotive News
Pages 18
Publication Date 2 Oct 1978
Document Type Journal article

Citation Number **80A002042**
Article Title *E.P.A. to Permit Sale of Gasohol as Unleaded-gasoline Substitute*
Journal New York Times
Volume 128
Pages A13
Publication Date 18 Jan 1979
Notes v. 128, Section A
Document Type Journal article

Citation Number **80A002053**
Article Title *The Ethanol Race: Waiting for the Government Plan*
Article Author Remirez, R.
Grover, R.
Marion, L.
Journal Chem. Eng. (N.Y.)
Pages 80
Publication Date 10 Mar 1980
Document Type Journal article

Citation Number **80A002081**
Article Title *Government Impedes Gasohol Progress*
Article Author Haavind, R.C.
Journal Purchasing
Volume 85
Pages 35
Publication Date 12 July 1978
Document Type Journal article

Citation Number **80A002096**
Article Title *House Unit Votes to End Import Tax on Methanol Fuel*
Journal Chem. Week
Pages 14
Publication Date 3 Apr 1974
Document Type Journal article

Citation Number **80A002107**
Article Title *Illinois Governor Orders Gasohol in State Vehicles*
Journal New York Times
Volume 129
Pages 8
Publication Date 3 Nov 1979
Document Type Journal article

Citation Number **80A002114**
Journal Chemical Weekly (India)
Pages 58
Publication Date 26 Feb 1980
Abstract The Indian government has sanctioned Rs. 5 lakhs as seed money to carry out further research on use of ethanol as fuel for motor vehicles. The possibility of using ethyl alcohol as a bi-fuel in automotive diesel engines will also be explored. The Perarignar Anna University road-tested an ethanol car recently. Tests are now on another model of car, also of Indian make.
Document Type Journal article

Citation Number **80A002120**
Article Title *Fill 'Er Up*
Journal Wall Street Journal
Volume 102
Pages 1
Publication Date 18 Jan 1980
Abstract Gasohol in federal vehicles.
Document Type Journal article

Citation Number **80A002234**
Article Title *"Gasohol" — Alcohol Fuels as Gasoline Substitutes*
Document Title Studies in Taxation, Public Finance and Related Subjects; Volume 3
Publisher Fund for Public Policy Research; Washington, DC, USA
Publication Date 1979
Pages 159-168
Document Type Paper/Chapter from book

Citation Number **80A002261**
Article Title *Gasohol Bandwagon Rolling in Congress*
Article Author Livernash, B.
Journal Congressional Quarterly Service. Weekly Report
Volume 37
Pages 2321-2326
Publication Date 20 Oct 1979
Document Type Journal article

Citation Number **80A002262**
Article Title *Made from Grain, Garbage: Congress Looks to Gasohol in Search for Fuel Options*
Article Author Teague, C.
Journal Congressional Quarterly Service. Weekly Report
Volume 36
Pages 1033-1038
Publication Date 29 Apr 1978
Document Type Journal article

Citation Number **80A002273**
Document Title *Use of Alcohol from Farm Products in Motor Fuel; Letter from Secretary of Agriculture Transmitting, in Response to Resolution, Report Pertaining to Practicability and Advantages to Agriculture of Using Alcohol Manufactured from Corn and Other Farm Products in Motor Fuel*
Series U.S. Senate Document 57, 73rd Congress, 1st Session
Publication Date 1933

Pages	59
Notes	Prepared by Bureaus of Agricultural Economics, Chemistry and Soils, and Agricultural Engineering.
Abstract	Summary of the economics of alcohol and productivity yields in 1933.
Document Type	Book

Citation Number	**80A002319**
Journal	Financial Times (Frankfurt)
Pages	4
Publication Date	2 Oct 1979
Abstract	Tanzania could be the first African country to be running its transport on gasohol. The government said it was reviewing a feasibility study into turning sugar cane from Tanzanian plantations into fuel alcohol in an effort to cut its crippling oil import bill. The gasohol (petrol plus alcohol) idea was pioneered in Brazil but recently a Commonwealth African energy conference at the north Tanzania town of Arusha discussed its possibilities for this continent. The government report said that if the idea is approved, plants could be erected early next year in the country's sugar-producing areas and the 8,000 tons of molasses Tanzania produces every year could rapidly be expanded to feed the gasohol industry.
Document Type	Journal article

Citation Number	**80A003002**
Document Title	*Legislative Compendium: Alcohol Fuels; 96th Congress*
Document Author	Bayh, B. Roe, R.A.
Publisher	U.S. National Alcohol Fuels Commission; Washington, DC, USA
Publication Date	14 Apr 1980
Pages	29
Document Type	Book

Citation Number	**80A003042**
Article Title	*Aid of Government Needed in Making Alcohol from Grain*
Article Author	Shipley, J.W.
Journal	Oil Gas J.
Volume	32
Pages	28
Publication Date	12 Oct 1933
Document Type	Journal article

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XI
Environmental Effects; Safety

Citation Number 79:007113
Document Title *Preliminary Environmental Assessment of Biomass Conversion to Synthetic Fuels. Report for July — December 1976*
Document Author DiNovo, S.T.
Ballantyne, W.E.
Curran, L.M.
Baytos, W.C.
Duke, K.M.
Corporate Author Battelle Columbus Labs., Ohio (USA)
Report Number PB — 289775
Contract EPA-68-02-1323
MN-00
Publication Date Oct 1978
Pages 366
Abstract A preliminary evaluation of biomass production and conversion technologies, and their associated environmental consequences is presented. Five categories of biomass production were considered in detail. Thermochemical and biochemical technology were considered for conversion processes. Regionalized scenarios were prepared using commercial scale plants processing appropriate regionalized feedstock. Most processes use heterogeneous solid waste as a feed stock which are believed to pose more severe control requirements for emissions and effluents than other biomass feedstocks. The environmental and socio-economic effects of locating large conversion plants in rural environments need to be studied.
Availability NTIS
Document Type Report

Citation Number 80A000035
Article Title *Chemical Relevance a Heuristic Approach. Part IV: Ethanol*
Article Author Mancott, A.
Journal Chemistry
Volume 50
Pages 26
Publication Date Apr 1977
Abstract Toxicology quiz.
Document Type Journal article

Citation Number 80A000352
Article Title *Occupational Exposure to Methanol*
Article Author Angerer, J.
Lehnert, G.
Journal Acta Pharmacol. Toxicol. Suppl.
Volume 41
Issue 2
Pages 551-556
Publication Date 1977
Document Type Journal article

Citation Number 80A000389
Document Title *Health Hazard Evaluation/Toxicity Determination: Trantex Corporation, Springfield, Massachusetts*
Document Author Larsen, L.B.
Author Affiliation National Institute for Occupational Safety and Health, Cincinnati, Ohio (USA)
Report Number PB-232 739/3WP
Publication Date Mar 1974
Pages 8
Abstract The National Institute for Occupational Safety and Health conducted a health hazard survey on exposure to solvent vapors at Trantex Corp., Springfield, Massachusetts. Ethyl acetate, N-propyl alcohol, ethyl alcohol, and methyl ethyl ketone were not toxic at the concentrations found during the evaluation. This determination was based on employee interviews and environmental sampling.
Document Type Report

Citation Number 80A000437
Document Title *A Modal Economic and Safety Analysis of the Transportation of Hazardous Substances in Bulk*
Report Number COM-74-11271/5WP
Publication Date May 1974
Pages 266
Abstract The movement of hazardous materials through transportation channels creates risks that are not fully understood. Consequently, the question of which was the best mode of transportation for the movement of hazardous substances had to be examined quantitatively. A study was undertaken to quantitatively analyze the economic and safety aspects of overland modes so that comparative costs and risks of the different modes could be assessed. The chemicals studied as examples are acrylonitrile, anhydrous ammonia, benzene, caustic soda, chlorine, ethylene, glycol, methanol, styrene, sugar, and sulfuric acid. (ENV)
Document Type Report

Citation Number 80A000444
Document Title *Methanol as a Transportaion Fuel: Assessment of Environmental and Health Research*
Document Author Timourian, H.
Milanovich. F.

Corporate Author	Department of Energy, Washington, D.C. (USA)
Author Affiliation	California Univ., Livermore (USA). Lawrence Livermore Lab.
Report Number	UCRL-52697
	Contract W-7405-ENG-48
Publication Date	18 Jun 1979
Pages	91
Availability	NTIS
Document Type	Report

Citation Number	**80A000446**
Document Title	*Seminar Proceedings Environmental Evaluation "Gasohol" Production and Health Effects*
Document Author	Mandia, J.W.
	Powers, T.J., III
Author Affiliation	Environmental Protection Agency, Kansas City, Mo. (USA). Region VII
	Environmental Protection Agency, Cincinnati, Ohio (USA). Industrial Environmental Research Lab
Report Number	PB80-146 756
Publication Date	Oct 1979
Pages	32
Document Type	Report

Citation Number	**80A000559**
Article Title	*Toxicity of Methanol/Petrol Mixtures*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Ferry, D.G.
	Temple, W.A.
	McQueen, E.G.
Author Affiliation	Medical Research Council of New Zealand. Toxicity Unit
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	10p, Paper III-65
Abstract	Methanol elimination from levels likely to be attained as a result of occupational exposure has been shown to be a first order process. The sheep has proved to be a useful model for studying respiratory exposure to a 15% methanol/petrol mixture (M15). Blood levels attained by exposure to M15 vapour with methanol content 7000-8000 p.p.m. for up to one hour produced levels well below those likely to be associated with methanol toxicity and no different from those attained with comparable vapour concentrations of methanol alone. M15 was severely irritant to human skin. Studies in rats showed that methanol absorption was some 3 times greater from M15 than from straight methanol. Cumulation of methanol from occupational exposure seems unlikely. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000561**
Article Title	*Methanol Containing Fuels — Evaluation of Environment and Health Constraints*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	Bertilsson, B.M.
Author Affiliation	Swedish Methanol Development Co., Stockholm
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	12p, Paper III-67
Abstract	Methanol production from various raw materials involves known and surmountable problems. Ecological effects of "energy forests" and heavy peat extraction should be studied further. Reliable depositing technique for ash and sludge needs to be developed. Transportation of methanol will pose few specific problems. Effects of large spills should be evaluated to give authorities information how to prevent and cope with accidents. Introcuction of methanol as a fuel should be accompanied by massive information to the public about the hazards. Methanol must not be confused with ethanol. Based on available information methanol may be used straight or blended with gasoline in automobiles, also with catalytic converters, without deterioration of the air quality. However, the exhaust emissions from methanol blends or gasoline are far from being completely characterized. Additional analytical work should be done together with biological testing of the exhaust emissions. The fate of unburnt methanol and formaldehyde in the atmosphere should be further studied. (AUTHOR)
Document Type	Paper from report

Citation Number	**80A000562**
Article Title	*Environmental Consequences of Methanol Spills and Methanol Fuel Emissions on Terrestrial and Freshwater Organisms*
Document Title	Proceedings of Third International Symposium on Alcohol Fuels Technology
Article Author	D'Eliscu, P.N.
Author Affiliation	Santa Clara Univ., Calif. (USA)
Conference	3. international symposium on alcohol fuels technology
Conference Place	Asilomar, CA, USA
Conference Date	29 May 1979
Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-790520
Publication Date	Apr 1980
Pages	6p, Paper III-68
Document Type	Paper from report

Citation Number	**80A000585**
Article Title	*Misuse of Alcohol from Automobile Fuels and Preventive Measures*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Forsander, O.A.
Author Affiliation	Research Laboratories of the State Alcohol Monopoly (ALCO), Helsinki (Finland)

Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	10p, Paper ID/WG.293/25
Document Type	Paper from report

Citation Number	**80A000601**
Article Title	*Vinasses Concentration and Vinasses Utilization*
Document Title	Workshop on Fermentation Alcohol for Use as Fuel and Chemical Feedstock in Developing Countries
Article Author	Melman, T.P.
Author Affiliation	B.V. Zuid-Nederlandse Spiritusfabrier, Bergen op Zoom (Netherlands)
Conference	Workshop on fermentation alcohol for use as fuel and chemical feedstock in developing countries
Conference Place	Vienna, Austria
Conference Date	26 Mar 1979
Publisher	United Nations Industrial Development Organization; New York, NY, USA
Report Number	CONF-7903101-1
Publication Date	1979
Pages	9p, Paper ID/WG.293/42
Document Type	Paper from report

Citation Number	**80A000625**
Article Title	*Risk Assessment of Energy Technology*
Document Title	Proceedings of the 13th Intersociety Energy Conversion Engineering Conference
Article Author	Inhaber, H.
Author Affiliation	Atomic Energy Control Board, Ottawa, Ontario (Canada)
Conference	13th intersociety energy conversion engineering conference
Conference Place	San Diego, CA, USA
Conference Date	20 Aug 1978
Publisher	Society of Automotive Engineers, Inc.; Warrendale, PA, USA
Publication Date	1978
Pages	20-25
Notes	v. 2, p. 20-25
Abstract	By considering the total energy or fuel cycle, rather than just an isolated part, it is shown that non-conventional and renewable energy sources can have substantial risk to human health per unit energy output. In particular, energy systems like solar thermal electric and methanol have risks, as measured in man-days lost per unit energy output, up to 10 or 100 times that of the safest systems. Both occupational and public, catastrophic and non-catastrophic risks are included.
Document Type	Paper/Chapter from book

Citation Number	**80A000673**
Article Title	*Inflammability of Liquid Mixtures with Inflammable and Noninflammable Components*
Document Title	1st International Loss Prevention and Safety Promotion in the Process Industries Symposium
Article Author	Steen, H. Buschmann, C.H. (ed.)
Author Affiliation	Physikalish-Technische Bundesanstalt, Braunschweig (Germany, F.R.)
Conference	1st international loss prevention and safety promotion in the process industries symposium
Conference Place	The Hague/Delft, Netherlands
Conference Date	28 May 1974
Publisher	Elsevier; Amsterdam, NL
Publication Date	1974
Pages	293-297
Document Type	Paper/Chapter from book

Citation Number	**80A000711**
Article Title	*Environmental Aspects of Methanol as Vehicular Fuel: Air Quality Effects*
Document Title	Methanol as an Alternative Fuel
Document Author	Pollack, R.J.
Author Affiliation	California Univ., Livermore (USA). Lawrence Livermore Lab.
Conference	1974 engineering foundation conference
Conference Place	Henniker, NH, USA
Conference Date	7 Jul 1974
Publisher	Engineering Foundation; New York, NY, USA
Publication Date	1974
Pages	6
Abstract	Vehicular sources account for approximately 65% of total hydrocarbon and NOx emissions and approximately 95% of CO emissions in many major cities. As a result they are the major contributors to the formation of photochemical smog, which results from a complex reaction between hydrocarbons and oxides of nitrogen in the presence of sunlight. This is the most serious air pollution problem in cities like Los Angeles and San Francisco where there is sufficient sunlight to drive the reaction efficiently. In order to control these reaction products it is necessary to control the primary reactants. There are two ways to control hydrocarbons with the objective of reducing smog formation. The first is to reduce the overall quantity of hydrocarbon emissions. The second is to reduce the overall photochemical reactivity of these emissions. In order to assess the atmospheric effects of methanol and/or methanol-gasoline mixtures as fuel, it is necessary to determine the composition and volume per vehicle-mile of the tailpipe emissions which would be generated by vehicles using these proposed fuels under conditions comparable to those used in determining emissions from existing fuels. A brief description of the Livermore Regional Air Quality model (LIRAQ) is followed by a presentation of a working version of the model for existing conditions with the use of methanol or methanol-gasoline mixtures as automotive fuels. (EI)
Availability	Engineering Societies Library, 345 E. 47th St., New York, NY 10017
Document Type	Paper/Chapter from book

Citation Number	**80A000742**
Article Title	*Biological Effects of Methanol Spills into Marine, Estuarine, and Freshwater Habitats*
Document Title	Proceedings of the International Symposium on Alcohol Fuel Technology: Methanol and Ethanol
Article Author	D'Eliscu, P.N.
Author Affiliation	Santa Clara Univ., Calif. (USA). Engineering and Applied Research
Conference	Symposium on alcohol fuel technology
Conference Place	Wolfsburg, F.R. Germany
Conference Date	21 Nov 1977

Publisher	U.S. Department of Energy; Washington, DC, USA
Report Number	CONF-771175
Publication Date	Jul 1978
Pages	3p, Paper 8-3
Notes	Organized by Volkswagenwerk AG in cooperation with the German Federal Ministry for Research and Technology (BMFT).
Abstract	The biological impact of methanol spills into aquatic systems is moderated by several factors. Methanol is removed quickly from aquatic habitats by both biological and physical processes. Low initial impact probabilities, in comparison to existing fuels, suggest minimal large habitat consequences from moderate spill situations. Environmental methanol effects are correlated with differential organismic tolerence levels, ciliary narcosis, behavioral disruptions, untimely autotomy, cardiac arrhythmia, premature molting, and reduction of parasite resistance. However, gasoline and related fuels are much more toxic, and lead to more irreversible effects than methanol in comparable concentrations. (EI)
Document Type	Paper from report

Citation Number	**80A000744**
Article Title	*Methyl Alcohol Poisoning*
Document Title	Laboratory Diagnosis of Diseases
Article Author	Roeckel, I.E. Talbert, W.M., Jr. Sunderman, F.W. (ed.) Sunderman, F.W., Jr. (ed.)
Conference	Applied seminar on the laboratory diagnosis of diseases caused by toxic agent
Conference Place	Washington, DC, USA
Conference Date	1970
Publisher	W.H. Green; St. Louis, MO, USA
Publication Date	1970
Pages	343-345
Document Type	Paper/Chapter from book

Citation Number	**80A001037**
Article Title	*Biohazards of Methanol in Proposed New Uses*
Article Author	Posner, H.S.
Author Affiliation	National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. (USA)
Journal	Journal of Toxicology and Environmental Health
Volume	1
Issue	1
Pages	153-171
Publication Date	Sep 1975
Document Type	Journal article

Citation Number	**80A001179**
Article Title	*Alcohols; Chapter 34*
Document Title	Industrial Hygiene and Toxicology; Volume II.
Article Author	Treon, J.F. Patty, F.A. (ed.)
Publisher	Wiley; New York, NY, USA
Publication Date	1973
Pages	1409-1422
Notes	2nd revised edition
Abstract	This article gives a correlation of methanol exposure to effects in animals. The threshold limit value is given as 200ppm. (AFDB)
Document Type	Paper/Chapter from book

Citation Number	**80A001194**
Document Title	*Handbook of Laboratory Safety*
Document Author	Steere, N.V. (ed.)
Publisher	Chemical Rubber Co.; Cleveland, OH, USA
Publication Date	1967
Pages	568
Notes	2nd edition
Document Type	Book

Citation Number	**80A001211**
Document Title	*Occupational Exposure to Methyl Alcohol; Criteria for a Recommended Standard*
Corporate Author	National Inst. for Occupational Safety and Health, Cincinnati, Ohio (USA). Division of Criteria Documentation and Standards Development
Series	DHEW Publication no. (NIOSH) 76-148
Publisher	U.S. Dept. of Health, Education and Welfare; Cincinnati, OH, USA
Publication Date	1976
Pages	136
Document Type	Book

Citation Number	**80A001240**
Article Title	*Data for a Sanitary Assessment of Methanol in Atmospheric Air*
Document Title	Survey of USSR Air Pollution Literature. Volume XI.; a Second Compilation of Technical Reports on the Biological Effects and the Public Health Aspects of Atmospheric Pollutants
Document Author	Nuttonson, M.Y. (ed.)
Publisher	American Institute of Crop Ecology; Silver Spring, MD, USA
Report Number	PB-209 478
Publication Date	Jan 1972
Pages	93-100
Abstract	The contents include the following: maximum permissible concentrations of noxious substances in the atmospheric air of populated areas; basic problems of sanitary protection of atmospheric air; combined effect of hydrogen fluoride and sulfur dioxide on the body of man and animals; new data for the validation of the mean daily maximum permissible concentration of hydrogen fluoride in air; sanitary evaluation of fluorides readily soluble in biological media; biological effect of poorly soluble fluorides; material for standardization of the maximum permissible concentration of hydrogen fluoride in populated areas; reflex effect on the human organism of low concentrations of acetic acid and acetic anhydride; threshold concentrations of paraffins in inhalation; biological effect and hygienic evaluation of pollution of atmospheric air with phthalic anhydride; data for a sanitary assessment of methanol in atmospheric air; data for the validation of the maximum permissible concentration of ammonia; pollution with vapors of hydrolytic ethyl alcohol and its effect on the organism. (AUTHOR)
Availability	NTIS
Document Type	Paper from report

Citation Number	**80A001242**
Document Title	*Symptomatology and Therapy of Toxicoligical Emergencies*
Document Author	Deichmann, W.B. Gerarde, H.W.

Publisher	Academic Press; New York, NY, USA
Publication Date	1964
Pages	181-183, 200-201, 262-263, 535-549
Abstract	Threshold limit values, effects, and symptoms of exposure to ethanol, methanol, and gasoline are given. (AFDB)
Document Type	Paper/Chapter from book

Citation Number	**80A001243**
Article Title	*Methyl Alcohol*
Document Title	Dangerous Properties of Industrial Materials
Document Author	Sax, N.I.
Publisher	Van Nostrand Reinhold Co.; New York, NY, USA
Publication Date	1979
Pages	806
Notes	5th edition
Document Type	Paper/Chapter from book

Citation Number	**80A001246**
Document Title	*Volatile Organic Compound (VOC) Species Data Manual*
Document Author	Bucon, H.W. Macko, J.F. Taback, H.J.
Author Affiliation	KVB, Inc., Tustin, Calif. (USA)
Report Number	PB80-113822 Contract EPA-68-02-3029
Publication Date	Dec 1978
Pages	512
Abstract	This manual contains tables of potential emissions of organic compounds for selected source categories. The species profile table format has been organized to be particularly useful in preparation of emission inventory inputs to photochemical modeling. Accompanying each VOC profile table is a brief narrative that describes process, emissions, controls and basis of source report and data quantification. The chemical classifications include paraffin, olefin, aromatic, carbonyl (aldehydes and ketones), methane, nonreactive other than methane, and miscellaneous. Data confidence levels for each profile table have been assigned. Reference lists for reports, published data and names and titles of personal contacts are provided for each source category. (NTIS)
Availability	NTIS
Document Type	Report

Citation Number	**80A001247**
Document Title	*Storage and Transportation of Synthetic Fuels. a Report to the Synthetic Fuels Panel*
Document Author	Johnson, J.E.
Author Affiliation	Oak Ridge National Lab., Tenn. (USA)
Report Number	ORNL-TM-4307 Contract W-7405-eng-26
Publication Date	Sep 1972
Pages	20
Availability	NTIS
Document Type	Report

Citation Number	**80A001257**
Document Title	*Investigation of Hazards Associated with Using Hydrogen as a Military Fuel*
Document Author	Bowen, T.L.
Report Number	AD-A014 127/5ST NSRDC-4541
Publication Date	Aug 1975
Pages	88
Abstract	This hazards investigation was undertaken as part of an overall exploratory Navy program intended to examine the logistic implications, the engineering problems, and the potential hazards associated with hydrogen as a military fuel. Existing literature which is relevent to the hazards associated with hydrogen was surveyed and summarized. The hazards of certain alternative fuels including hydrogen, ammonia, hydrazine, ethyl and methyl alcohol, and representative conventional fuels including diesel fuel marine, gasoline, JP-5, and methane, were compared. The comparison covered leakage, volatility, dissipation, ignition, flammability, deflagration, radiation, detonation, and health hazards.
Availability	NTIS
Document Type	Report

Citation Number	**80A002041**
Article Title	*EPA Spends $500,000 to Study Environmental Impact of Gasohol Fuel*
Journal	Chem. Eng. News
Pages	29
Publication Date	28 Jan 1980
Document Type	Journal article

Citation Number	**80A002046**
Article Title	*Ethanol and Lead Toxicity*
Journal	Nutr. Rev.
Volume	32
Issue	11
Pages	347
Publication Date	November 1974
Document Type	Journal article

Citation Number	**80A002223**
Article Title	*Bulk Storage of Alcohol*
Article Author	Duggan, J.J.
Journal	National Fire Protection Association, Quarterly
Volume	47
Issue	1
Pages	21-33
Publication Date	Jul 1953
Abstract	Problems involved in economical and safe storage of ethyl alcohol given as typical example; types of storage tanks available and their fire ratings; influence of geographical location; comparable properties of ethyl alcohol, benzene and gasoline. (EI)
Document Type	Journal article

Citation Number	**80A002235**
Article Title	*Alcohols, Chapter 3*
Document Title	Toxicity of Industrial Organic Solvents
Article Author	Browning, E.
Publisher	Chemical Publishing Co., Inc.; New York, NY, USA
Publication Date	1953
Pages	202-244
Abstract	The toxicity of several alcohols by inhalation and ingestion on animals and man are noted. The toxicity of alcohols is observed to increase as the molecular weight increases. (AFDB)
Document Type	Paper/Chapter from book

Citation Number	**80A003093**
Article Title	*Safety Standards in Fuel Alcohol Production*
Journal	Gasohol U.S.A.
Volume	2
Issue	5
Pages	10-11
Publication Date	May 1980
Document Type	Journal article

Citation Number	**80A003101**
Article Title	*Handling and Care of Gasohol*
Article Author	Fogde, C.A.
Journal	Gasohol U.S.A.
Issue	7
Pages	12-15
Publication Date	Dec 1979
Document Type	Journal article

Citation Number	**80A003124**
Document Title	*Standard for Storage of Flammable and Combustible Liquids on Farms and Isolated Construction Projects*
Publisher	National Fire Protection Association; Boston, MA, USA
Publication Date	1977
Pages	6
Notes	NFPA no. 395 is one of the standards in the 16 volume National fire code
Availability	NFPA, 470 Atlantic Ave., Boston, MA 02210
Document Type	Book

Title Keyword Index

Citation Number	Subject Section	Citation Title	Title Keyword
80A000467	IX	*logists Association * Ethanol as a Petroleum Extender and*	***ADDITIVE** in Automotive Engines (Alternative*
80A002039	X	*EPA Mulls Ban on Two Fuel*	***ADDITIVES***
80A000650	IX	*tional Conference I.C. Engines and Combustion * Effect of*	***ADDITIVES** to Alcohol on the Performance of*
80A000674	IX	*Papers; Fourth National Conference on Chemical Engineering,*	***ADELAIDE**, Aug. 25-26, 1976*
80A000264	X	*Reporter's Notebook: Georgians*	***ADJUST** to Iowa's Politics*
79 : 006441	VIII	*Agricultural*	***ADJUSTMENTS** to Brazil's Alcohol Program: a*
80A001200	I	*Gasohol — One Answer to the Energy Crisis * Public*	***ADMINISTRATION** Series Bibliography No. P-31*
80A002017	VI		***ADSORPTION** of Trichoderma Cellulase on Cell*
80A002279	VI	*Extractive and Azeotropic Distillation **	***ADV.** Chem. Ser., No. 115*
80 : 002059	I	*New Fuels and*	***ADVANCES** in Combustion Technologies*
80A000685	I	*New Fuels*	***ADVANCES** in Combustion Technologies. Sympo*
80A000594	I	*as Fuel and Chemical Feedstock in Developing Countries **	***ADVANTAGES** and Limitations of the Use of Al*
80A000193	I	*Gasohol Trickling In, but It's No Panacea:*	***ADVANTAGES** Are There; Big Output Is Elusive*
80A000702	IX	*Methanol as an Alternative Fuel **	***ADVANTAGES** of Neat and Blended Operation of*
80A002273	X	*onse to Resolution, Report Pertaining to Practicability and*	***ADVANTAGES** to Agriculture of Using Alcohol*
80A000545	X	** Congressional Concerns About Alcohol Fuels — a Technical*	***ADVISOR'S** Perspective*
80A001197	IX	*ased Fuels in Transportation * Ontario Ministry of Energy*	***ADVISORY** Group on Synthetic Liquid Fuels Re*
80A001198	VIII	*is of Synthetic Liquid Fuels * Ontario Ministry of Energy*	***ADVISORY** Group on Synthetic Liquid Fuels Re*
80A000392	IX	*Lawrence Livermore Labs Contribution to the*	***AEC** Methanol Report*
80A003001	IX	*tilization of Alternative Fuels for Transportation * AIAA*	***AEROSPACE** Assessment Series, V. 2*
80A001264	V	*Forests for People: a Challenge in World*	***AFFAIRS** * the Role of Forests in Meeting*
80A002102	I	*How the Development of a Gasohol Industry Will*	***AFFECT** Farmers*
80A000658	IX	*ational Conference I.C. Engines Combustion * Some Factors*	***AFFECTING** the Compression and Combustion Pr*
80A000653	IX	*Engines and Combustion * Investigation of Some Factors*	***AFFECTING** the Performance of an Alcohol-die*
80A000467	IX	*Proceedings...53rd Annual Congress, South*	***AFRICAN** Sugar Technologists Association **
80A000468	III	*Proceedings...53rd Annual Congress, South*	***AFRICAN** Sugar Technologists Association **
80A003091	VI	*Continuous Fermentation Comes of*	***AGE***
80A000227	X	*the Methanol*	***AGE** Is Dawning*
80A000497	X	*Federal Agency Compendium * Federal*	***AGENCY** and Department Alcohol Fuels Program*
80A000497	X	*Federal*	***AGENCY** Compendium * Federal Agency and De*
80A002170	IX	*Alcohol as Antiknock*	***AGENT** in Automotive Engines*
80A002194	VI	*Microbial Amylase Preparations Conversion*	***AGENTS** for Alcoholic Fermentation*
80A003029	IX	*Blending*	***AGENTS** for Gasoline-methanol Mixtures*
80A001237	VI	*tic Saccharification of Cellulose in Semi- and Continuously*	***AGITATED** Systems*
79 : 006441	VIII		***AGRICULTURAL** Adjustments to Brazil's Alcoho*
80A003028	IX		***AGRICULTURAL** Alcohol in Automotive Fuel: G*
80A003110	VI		***AGRICULTURAL** Alcohol: Studies of Its Manuf*
80A003015	VIII	*Economics of Gasohol * Minnesota Univ. Dept. of*	***AGRICULTURAL** and Applied Economics. Economi*
80A002020	V		***AGRICULTURAL** and Forest Products as Sources*
80A003007	I	*the Feasibility of Gasohol from Renewable*	***AGRICULTURAL** and Forest Resources for Use a*
80A000500	VI	*the Conversion of*	***AGRICULTURAL** By-products to Sugars **
80A000451	VI	*the Conversion of*	***AGRICULTURAL** By-products to Sugars * Prog*
80A001222	V	*the Conversion of*	***AGRICULTURAL** By-products to Sugars * Prog*
80A000487	VI	** Adaptation of Geothermal Energy to Produce Alcohol from*	***AGRICULTURAL** Commodities*
80A000499	III	*Battelle Memorial Institute BMI-1957 (V. 2) * Volume II:*	***AGRICULTURAL** Considerations Task 77, Final*
80A003133	III	*om Sugarcane, Sweet Sorghum, and Sugar Beets * Volume II,*	***AGRICULTURAL** Considerations, Task 77, Final*
80A001201	V	*Utilization of*	***AGRICULTURAL** Crop Residues * U.S. Agricul*
80A002270	I	*Bibliography on Alcohol Production and Use of*	***AGRICULTURAL** Crops as a Source of Motor Fue*
80A003006	VIII	*In (USA). Coll. of Agriculture and Home Economics. Dept. of*	***AGRICULTURAL** Economics. Report No. 81 * c*
80A003008	I	*In (USA). Coll. of Agriculture and Home Economics. Dept. of*	***AGRICULTURAL** Economics. Staff Paper 1973-1(*
80A003108	VII	*in Colorado * Colorado State Univ., Fort Collins (USA).*	***AGRICULTURAL** Experiment Station. General Se*
80A003007	I	*Forest Resources for Use as a Gasoline Additive * Idaho*	***AGRICULTURAL** Experimental Station. Progress*

Citation Number	Subject Section	Citation Title	Title Keyword
80A002171	IX	*Octane Ratings of*	*AGRICULTURAL Motor Fuels*
80 : 001948	II	*iew. Raw Material Availability Reports * Availability of*	*AGRICULTURAL Processing Wastes for Utilizat*
80 : 001960	II	*Fuels * Compilation of Abstracts on the Fermentation of*	*AGRICULTURAL Products and Wastes to Alcohol*
80A001195	VIII	*asibility of Gasohol * Hearing Before the Subcommittee on*	*AGRICULTURAL Research and General Legislati*
79 : 005180	III	*Sugar Crops as a Source of Fuels. Volume I.*	*AGRICULTURAL Research. Final Report*
79 : 002521	VI	*and Economic Assessment of Methods for Direct Conversion of*	*AGRICULTURAL Residue to Usable Energy. Fi*
80A002048	V	*Ethanol from*	*AGRICULTURAL Residues*
80A002155	VI	*the Saccharification of*	*AGRICULTURAL Residues — a Continuous Proces*
80A000453	V	*an Evaluation of the Use of*	*AGRICULTURAL Residues as an Energy Feedstoc*
80A000455	V	*an Evaluation of the Use of*	*AGRICULTURAL Residues as an Energy Feedstoc*
80A000456	V	*an Evaluation of the Use of*	*AGRICULTURAL Residues as an Energy Feedstoc*
80A000363	VIII		*AGRICULTURAL Sector Impacts of Making Ethan*
80 : 001961	VIII	*Preliminary Report on the*	*AGRICULTURAL Sector Impacts of Obtaining Et*
80A003005	V	*from Renewable Resources: Feasibility Study * Volume D.*	*AGRICULTURAL Studies*
80A000556	I	*Symposium on Alcohol Fuels Technology * Alcohol Fuels and*	*AGRICULTURAL Systems*
80A000636	I	*ce, Middle East (SOLTECH '78) * Integrated Biological and*	*AGRICULTURAL Systems*
78 : 003706	VIII	*duction of Fuel Grade Ethanol by Enzymatic Hydrolysis of an*	*AGRICULTURAL Waste*
80A000410	V	*Synthetic Fuels from Municipal, Industrial, and*	*AGRICULTURAL Wastes (Citations from the*
80A000433	V	*Synthetic Fuels from Municipal, Industrial and*	*AGRICULTURAL Wastes. Volume I. 1975-1977*
80A000434	V	*Synthetic Fuels from Municipal, Industrial and*	*AGRICULTURAL Wastes. Volume II. 1978 — Marc*
80A000346	VI	*Sugar Production from*	*AGRICULTURAL Woody Wastes by Saccharificati*
80A000491	II	*ty Energy Conversion Engineering Conference * Energy from*	*AGRICULTURE*
80A002181	I	*Industrial Alcohol from Crops. Chemical Outlet for British*	*AGRICULTURE*
80A003014	VIII	*Possible Energy-production Alternatives in Crop/Livestock*	*AGRICULTURE*
80A000486	II	*spective, 6th Energy Conference and Exposition * American*	*AGRICULTURE — the Energy Production System*
80A003008	I		*AGRICULTURE and Energy * Nebraska Univ.,*
80A002140	II	*the Potential for Liquid Fuels from*	*AGRICULTURE and Forestry in Australia*
80A003006	VIII	*in Motor Fuels * Nebraska Univ., Lincoln (USA). Coll. of*	*AGRICULTURE and Home Economics. Dept. of Ag*
80A003008	I	*ture and Energy * Nebraska Univ., Lincoln (USA). Coll. of*	*AGRICULTURE and Home Economics. Dept. of Ag*
80A000094	VIII		*AGRICULTURE as a Source of Fluid Energy: G*
80A002148	IV	*anol from Grain in Montana * Montana State Univ., Montana*	*AGRICULTURE Experiment Station, Research Re*
79 : 005694	VI	*Conversion of Biomass from*	*AGRICULTURE into Useful Products. Final R*
80A002273	X	*tion, Report Pertaining to Practicability and Advantages to*	*AGRICULTURE of Using Alcohol Manufactured F*
80A001201	V	*Utilization of Agricultural Crop Residues * U.S.*	*AGRICULTURE Research Service * an Annotat*
80A002273	X	*57, 73rd Congress, 1st Session * Letter from Secretary of*	*AGRICULTURE Transmitting, in Response to Re*
80A000483	VI	*(on) Clean Fuels from Biomass, Sewage, Urban Refuse, (and)*	*AGRICULTURE Wastes * Enzymatic Hydrolysis*
80A003110	VI	*Studies of Its Manufacture in Germany * U.S. Dept. of*	*AGRICULTURE. Bulletin No. 182*
80A003112	IX	*ternal Combustion Engines on Alcohol Fuel * U.S. Dept. of*	*AGRICULTURE. Bulletin No. 191*
80A003111	VI	*ufacture of Ethyl Alcohol from Wood Waste * U.S. Dept. of*	*AGRICULTURE. Bulletin No. 983*
80A003016	V	*Methanol from Wood Waste * U.S. Dept. of*	*AGRICULTURE. Forest Service. General Techni*
80A002271	II	*Motor Fuels from Farm Products * U.S. Dept. of*	*AGRICULTURE. Miscellaneous Publication No.*
80A003109	IV	*lity of Other Wastes * Farmer's Bulletin. (U.S. Dept. of*	*AGRICULTURE) No. 4101*
80A001195	VIII	*ltural Research and General Legislation of the Committee on*	*AGRICULTURE, Nutrition, and Forestry, Unite*
80A003135	III	*Sweet Sorghum, Sugar Beets, and Corn * Volume IV, Corn*	*AGRICULTURE, Task 77, Final Report*
80A000143	I	*Energy from*	*AGRICULTURE: the Brazilian Experiment*
79 : 004655	I	*Energy from Biomass and Wastes **	*AGRO-INDUSTRIAL System for Ethanol and Ethy*
80A000199	VIII	*Gasoholics*	*AGRONOMOUS*
80A003001	IX	*Utilization of Alternative Fuels for Transportation **	*AIAA Aerospace Assessment Series, V. 2*
80A000169	VI	*Fungal Cellulases as an*	*AID for the Saccharification of Cassava*
80A003042	X		*AID of Government Needed in Making Alcohol*
80A002157	VI	*Mold Bran*	*AIDS Production of Grain Alcohol*
80A001240	XI	*Data for a Sanitary Assessment of Methanol in Atmospheric*	*AIR * a Second Compilation of Technical R*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000675	IX	*Hydrogen Energy * Hydrogen and Methanol Fueled —*	***AIR** Breathing Automobile Engine * Proceed*
80A001262	IX	*Clean*	***AIR** Car Race — 1970. a Summary Report*
80A000358	IX	*Clean*	***AIR** Car Race Winners Announced*
80A000721	IX	*Proceedings, 4th International Clean*	***AIR** Congress * Clean Air through Methanol*
80A001041	I	*"Gasohol" Freshens the*	***AIR** over Iowa, but May Rut the Roads, Too*
80A001249	IX	*Investigation of a Substitute Fuel to Control Automotive*	***AIR** Pollution*
80A001240	XI	*Survey of USSR*	***AIR** Pollution Literature. Volume XI * Da*
80A000368	IX	*Automobile*	***AIR** Pollution: Automotive Fuels (A Bibliog*
80A000711	XI	*el * Environmental Aspects of Methanol as Vehicular Fuel:*	***AIR** Quality Effects*
80A000721	IX	*Proceedings, 4th International Clean Air Congress * Clean*	***AIR** through Methanol Technology*
80A000733	IX	*lcohol Fuel Technology: Methanol and Ethanol * Alternate*	***AIR-FUEL** Induction Systems Contrasts in Ter*
80A000513	IX	*Factors Influencing Cold Starting of Engines Operating on*	***ALCHOOL** Fuel*
80A000583	I	*emical Feedstock in Developing Countries * Development of*	***ALCOGAS** Research in the Phillipines*
77 : 001299	VIII	*Capturing the Sun through Bioconversion * Ethyl*	***ALCOHOL***
80A000093	V	*Energy for All: We'll Get Tanked Up on Wood*	***ALCOHOL***
80A000153	IX	*Ford Motor Sets Outlays for Cars Run on*	***ALCOHOL***
80A000187	VIII	*Lowering the Cost of*	***ALCOHOL***
80A000361	VI	*sis of Cellulose in Refuse to Sugar and Its Fermentation to*	***ALCOHOL***
80A000380	IX	*Combustion of Methyl Alcohol and Fuel-nitrogen Doped Methyl*	***ALCOHOL***
80A000413	IX	*On-board Sensor for Percent*	***ALCOHOL***
80A000524	IX	*Technology * Dual-fueling a Diesel Engine with Carbureted*	***ALCOHOL***
80A000537	VI	*hnology * Novel Continuous Fermentation Process for Ethyl*	***ALCOHOL***
80A000581	VIII	** Energy Balance for the Production of Ethyl and Methyl*	***ALCOHOL***
80A001052	IV	*enture with Brazilian Interests to Process Manioc into Fuel*	***ALCOHOL***
80A001088	VI	*the Vacuferm Process: a New Approach to Fermentation*	***ALCOHOL***
80A001161	IX	*Gasoline Does, Too, Mix with*	***ALCOHOL***
80A002004	VI	*Dehydrating*	***ALCOHOL***
80A002034	VI	*ic Hydrolysis of Cellulose and Simultaneous Fermentation to*	***ALCOHOL***
80A002157	VI	*Mold Bran Aids Production of Grain*	***ALCOHOL***
80A002165	VI	*Fermentation of Wood Sugars to Ethyl*	***ALCOHOL***
80A002167	V	*Wood Hydrolysis to Become Source of War*	***ALCOHOL***
80A002168	IX	*Engine Performance with Gasoline and*	***ALCOHOL***
80A002169	VI	*the Manufacture of Anhydrous Ethyl*	***ALCOHOL***
80A002176	VI	*Industrial Dehydration of*	***ALCOHOL***
80A002178	VI	*Improvements in Production of Absolute*	***ALCOHOL***
80A002182	VI	*Industrial*	***ALCOHOL***
80A002184	IX	*Water Tolerances of Mixtures of Gasoline with Ethyl*	***ALCOHOL***
80A002211	III	*Industrial*	***ALCOHOL***
80A002213	VI	*a New Method of Preparation of Absolute*	***ALCOHOL***
80A002223	XI	*Bulk Storage of*	***ALCOHOL***
80A002278	VI	*etc., with Chapters on Alcoholometry and the De-naturing of*	***ALCOHOL***
80A003044	VI	*New Process for Production of Absolute*	***ALCOHOL***
80A003046	I	*Industrial*	***ALCOHOL***
80A003068	IX	*the Carburetion of*	***ALCOHOL***
80A003072	I	*Fermentation Sphinx and Kobold*	***ALCOHOL***
80A003073	VI	*Fermentation Sphinx and Kobold*	***ALCOHOL***
80A003074	VI	*Fermentation Sphinx and Kobold*	***ALCOHOL***
80A003075	VI	*Fermentation Sphinx and Kobold*	***ALCOHOL***
80A003076	III	*Sugar Cane Bagasse as a Source of Industrial*	***ALCOHOL***
80A003077	III	*Sugar Cane Bagasse as a Source of Industrial*	***ALCOHOL***
80A003078	V	*Sugar Cane Bagasse as a Source of Industrial*	***ALCOHOL***
80A003098	I	*Get the Lead Out with*	***ALCOHOL***

Citation Number	Subject Section	Citation Title	Title Keyword
80A002275	I	*Power*	*ALCOHOL * a Brief Analysis to Force Use*
80A001177	IX	*Energy Technology Handbook * Methyl*	*ALCOHOL * a Potential Fuel for Transporta*
80A000427	IV	*Potato*	*ALCOHOL * a Solution to the Energy Crisis*
80A000726	VI	*Conversion of Cellulosic Materials * Fermentation Ethyl*	*ALCOHOL * Biotechnology and Bioengineerin*
80A001193	IX	*Power*	*ALCOHOL * Dept. of Industries and Commerc*
80A001211	XI	*Occupational Exposure to Methyl*	*ALCOHOL * DHEW Publication No. (NIOSH) 76*
80A003126	IV	*Corn as a Raw Material for Ethyl*	*ALCOHOL * Iowa Engineering Experiment Sta*
80A001213	VIII	*Grain Motor Fuel*	*ALCOHOL * Technical and Economic Assessme*
80A002144	I	*Solar*	*ALCOHOL * the Fuel Revolution*
80A000154	V	*Forest and Wood Waste Utilisation: Conversion to Fuel*	*ALCOHOL — a FRI Study*
80A002242	IX		*ALCOHOL — a Fuel for Internal Combustion En*
80A002243	I		*ALCOHOL — Consuming Apparatus. Paris Exhib*
80A000101	I		*ALCOHOL — Permanent Alternative Fuel*
80A003030	IX	*Ethyl*	*ALCOHOL and Alcohol and Gasoline as a Moder*
80A000575	I	*cal Feedstock in Developing Countries * Present Status of*	*ALCOHOL and Alcohol Based Chemicals Industr*
80A002246	IX	*Alcohol Motor Fuel from Molasses, II * II. the Use of*	*ALCOHOL and Alcohol-ether Mixtures as Motor*
80A000532	VII	*ium on Alcohol Fuels.Technology * the Production of Grain*	*ALCOHOL and Electric Power with Cogeneratio*
80A002302	IX	*the Gaseous Heat Capacity of Methyl*	*ALCOHOL and Ethyl Alcohol by Thermal Conduc*
80A000380	IX	*NO and NO_2 in the I.C. Engine Combustion of Methyl*	*ALCOHOL and Fuel-nitrogen Doped Methyl Alco*
80A000723	X	*Transportation * a General History of the Nebraska Grain*	*ALCOHOL and Gasohol Program * Proceedings*
80A003030	IX	*Ethyl Alcohol and*	*ALCOHOL and Gasoline as a Modern Motor Fuel*
80A001202	IX	*Use of*	*ALCOHOL and Gasoline in Farm Engines*
80A002220	IX	*the Use of*	*ALCOHOL and Gasoline in Farm Engines*
80A003071	V	*Utilization of Wood for Production of Foodstuffs,*	*ALCOHOL and Glucose*
80A001031	X	*Considers Problem of Approving Tax-free Stills for Fuel*	*ALCOHOL and Not for Moonshine Whiskey*
80A003100	I		*ALCOHOL and the Cattle Industry*
80A002239	I	*Alcohol, Specially Denatured Alcohol, Completely Denatured*	*ALCOHOL and U.S. * I. Proprietary Solven*
80A002301	VI	*late Fractionating Column When Distilling Mixtures of Ethyl*	*ALCOHOL and Water*
80A000749	VII	*aste Utilization Conference * Feed By-products from Grain*	*ALCOHOL and Whiskey Stillage*
79 : 004127	II	*Conversion of Cellulose (Wood) and Corn Starch to Sugars,*	*ALCOHOL and Yeast. Final Report*
80A003106	I		*ALCOHOL Answers War against Automobile*
80A000743	I	*Energy Primer: Solar, Water, Wind, and Biofuels **	*ALCOHOL as a Biofuel: Coming around Again?*
80A000010	I	*a Canadian Views*	*ALCOHOL as a Farm Fuel*
80A002022	I		*ALCOHOL as a Fuel*
80A000607	III	*in Developing Countries * Potential of Sugar Cane Derived*	*ALCOHOL as a Fuel in Jamaica*
80A000324	IX	*a Survey of*	*ALCOHOL as a Motor Fuel*
80A003039	IX	*Fifty Thousand Kilometers on*	*ALCOHOL as a Motor Fuel*
80A003067	IX	*Researches on*	*ALCOHOL as a Motor Fuel*
80 : 002125	III	*Fuels from Biomass: Alcohol Production;*	*ALCOHOL as a Motor Fuel Supplement * Tech*
80A003127	VII	*Economic Aspects of Using Grain*	*ALCOHOL as a Motor Fuel with Emphasis on by*
80A002313	I	*Production and Use of Grain*	*ALCOHOL as a Motor Fuel — an Evaluation*
75 : 001201	I	*Grow*	*ALCOHOL as a Replacement for Gasoline * F*
80A000660	IX	*rence I.C. Engines Combustion * an Investigation of Using*	*ALCOHOL as a Secondary Fuel in a Multicylin*
80A002286	VIII		*ALCOHOL as a Solution to the Energy Crisis*
80A000376	IX	*Evaluation of Methyl*	*ALCOHOL as a Vehicle Fuel Extender*
80A000672	IX	*esources Challenge: Technological Thrust, Social Impact **	*ALCOHOL as an Automotive Fuel*
80A002170	IX		*ALCOHOL as Antiknock Agent in Automotive En*
80A000566	I	*Chemical Feedstock in Developing Countries * Use of Ethyl*	*ALCOHOL as Chemical Feedstock*
80A002161	IX	*Paris Buses Test Efficiency of*	*ALCOHOL as Engine Fuel*
80A002145	I		*ALCOHOL as Fuel * References Selected*
80A001203	IX	*Methyl*	*ALCOHOL as Motor Fuel * Texas Engineering*
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Citation Number	Subject Section	Citation Title	Title Keyword
80A001004	IX		*ALCOHOL as Motor Fuel?*
80A001014	I	*API Sees*	*ALCOHOL as Negative Factor in Energy Situat*
80A000659	IX	*onference I.C. Engines Combustion * Some Tests with Ethyl*	*ALCOHOL as S.I. Engine Fuel*
80A002293	IX	*Ethyl*	*ALCOHOL as Tractor Fuel in China*
80A002303	IX		*ALCOHOL Assisted Hydrocarbon Fuels * a Co*
80A000477	IX	*Missouri Energy Council) Annual Conference on Energy **	*ALCOHOL Assisted Hydrocarbon Fuels: a Comp*
80A001173	IX		*ALCOHOL Assisted Hydrocarbon Fuels: a Comp*
80A000575	I	*in Developing Countries * Present Status of Alcohol and*	*ALCOHOL Based Chemicals Industry in India*
80A000588	I	*ical Feedstock in Developing Countries * Can Fermentation*	*ALCOHOL Be Substituted for Wood as a Cookin*
80A003041	IX		*ALCOHOL Blend Poor Substitute for Motor Fue*
80A000551	IX	*hird International Symposium on Alcohol Fuels Technology **	*ALCOHOL Blend Use in Stratified Charge Engi*
80A003061	IX	*Reid Vapour Pressure of*	*ALCOHOL Blends*
80A001210	VI	*Industrial*	*ALCOHOL by Continuous Fermentation and Vacu*
80A000591	I	*Developing Countries * Trends in the Production of Ethyl*	*ALCOHOL by Fermentation*
80A002179	VI	*Production of Absolute*	*ALCOHOL by Melle Process*
80A002302	IX	*the Gaseous Heat Capacity of Methyl Alcohol and Ethyl*	*ALCOHOL by Thermal Conductivity at Low Pres*
80A003097	VII	*Recovery of Grain*	*ALCOHOL By-products*
80A003089	VII	*Use of Grain*	*ALCOHOL By-products in Colorado*
80A000062	IX	*Brazil — Gearing Up to Produce the All*	*ALCOHOL Car*
80A003018	IX		*ALCOHOL Car Conversion*
80A002024	IX		*ALCOHOL Comes Back to Power Your Car*
80A002185	IX	*-gasoline Blends * II. the Influence of Anhydrous Ethyl*	*ALCOHOL Concentration upon Water Absorption*
80A000349	III	*Sweet Sorghum — an*	*ALCOHOL Crop for the U.S.*
80A003088	III		*ALCOHOL Crop for the U.S. * Sweet Sorghum*
80 : 002118	VI	*hemicals and Microbial Protein * Method for Production of*	*ALCOHOL Directly from Cellulose Using Cellu*
80A002175	VI	*Instrumentation in*	*ALCOHOL Distillation*
80A002173	VI	*Steam Consumption of Two-column*	*ALCOHOL Distillation Units*
80A001206	VI		*ALCOHOL Distiller's Manual for Gasohol and*
80A003121	VI	*the Motor*	*ALCOHOL Distillery*
80A003107	VIII	*Small Fuel*	*ALCOHOL Distillery * General Description*
80A000558	IX	*hird International Symposium on Alcohol Fuels Technology **	*ALCOHOL Engine Emissions — Emphasis on Unre*
80A001245	VIII	*Prosperity Beckons * the Dawn of the*	*ALCOHOL Era*
80A002193	VI	*Commercial Demonstration to Test Power*	*ALCOHOL Feasibility*
80A002306	VI	*Vacuum*	*ALCOHOL Fermentation*
80A002162	VII	*Amino Acid Composition of Grain*	*ALCOHOL Fermentation By-products*
80A003108	VII	*Grain*	*ALCOHOL Fermentation By-products for Feedin*
80A003052	VII	*Nutrient Content of*	*ALCOHOL Fermentation By-products from Corn*
80A001233	VII	*omputer Blending — the Competitiveness of Proteins from the*	*ALCOHOL Fermentation of Corn and Wheat*
80A002025	VIII		*ALCOHOL for Cars Termed Spur to Rising Food*
80A001192	VI	*Alcohol Series, V. 2 * a Primer on the Efficient Use of*	*ALCOHOL for Food and Fuel*
80A000115	V	*New Process to Convert Recycled Newspapers into Glucose and*	*ALCOHOL for Fuel*
80A002112	VIII	*in Search of*	*ALCOHOL for Gasohol*
80A001124	X	*Pentagon Is Directed to Purchase*	*ALCOHOL for Gasohol Industry*
80A002027	IX		*ALCOHOL for Gasoline*
80A002028	III		*ALCOHOL for Gasoline from Sugarcane*
80A002243	I	*cerning an Exhibition in Paris of Inventions for the Use of*	*ALCOHOL for Illuminating or Heating Purpose*
80A002177	VI	*Production of 95-97 Per Cent*	*ALCOHOL for Motor Fuel*
80A002183	I	*Industrial*	*ALCOHOL for Motor Fuel*
80A002212	II		*ALCOHOL for Power Purposes*
80A002132	VI	*ves for Energy Savings at Plant Level for the Production of*	*ALCOHOL for Use as Automotive Fuel*
80A000564	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000565	VI	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000566	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000567	II	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000568	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000569	VI	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000570	X	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000571	VI	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000572	X	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000573	VIII	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000574	VI	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
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80A000578	III	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000579	X	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000580	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000581	VIII	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000582	VII	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000583	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000584	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000585	XI	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000586	VIII	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000587	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000588	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000589	III	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000590	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000591	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000592	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
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80A000594	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000595	VI	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000596	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000597	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
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80A000600	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000601	XI	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000602	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000603	X	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000604	VI	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000605	I	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A000606	III	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
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80A000608	VII	*Workshop on Fermentation*	*ALCOHOL for Use as Fuel and Chemical Feedst*
80A002227	I		*ALCOHOL for War*
80A000487	VI	*nual Meeting * Adaptation of Geothermal Energy to Produce*	*ALCOHOL from Agricultural Commodities*
80A000585	XI	*nd Chemical Feedstock in Developing Countries * Misuse of*	*ALCOHOL from Automobile Fuels and Preventiv*
78 : 002733	IV	*Production of Ethyl*	*ALCOHOL from Babassu*
80A003096	III	*Power*	*ALCOHOL from Beet*
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80A002198	III	*Feed Yeast and Industrial*	*ALCOHOL from Citrus-waste Press Juice*
80A000567	II	*uel and Chemical Feedstock in Developing Countries * Fuel*	*ALCOHOL from Crops by Continuous Fermentati*

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000300	VIII	Study Indicates that Producing	ALCOHOL from Crops Would Result in Energy L
80A002181	I	Industrial	ALCOHOL from Crops. Chemical Outlet for Br
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80A003042	X	Aid of Government Needed in Making	ALCOHOL from Grain
80A000536	VIII	Technology * Technical and Economic Assessment Motor Fuel	ALCOHOL from Grain and Other Biomass
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80A002206	IV		ALCOHOL from Granular Wheat Flour
80A002029	III		ALCOHOL from Molasses as a Possible Fuel an
80A002268	III	Fuel	ALCOHOL from Nipa Palm
80A003058	IV	Manufacture of	ALCOHOL from Potatoes
80A000593	II	loping Countries * Potential Availability of Fermentation	ALCOHOL from Sugars and Starches in Develop
80A003040	VIII	Economic and Market Aspects of Ethyl	ALCOHOL from Sulphite Waste Liquor
80A002073	IX	Georgia-Pacific	ALCOHOL from Tree Sugars to Be Used as Fuel
80A002231	V	Ethyl	ALCOHOL from Waste Wood by Modified Scholle
80A002219	V		ALCOHOL from Wood
80A002203	V	Ethyl	ALCOHOL from Wood Waste
80A002226	V	Sugar and	ALCOHOL from Wood Waste
80A003066	V	Manufacture of Ethyl	ALCOHOL from Wood Waste
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80A003111	VI	the Manufacture of Ethyl	ALCOHOL from Wood Waste * U.S. Dept. of Ag
80A001025	I	Australia Plans	ALCOHOL Fuel
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80A001188	VI	Making	ALCOHOL Fuel * Mother's Alcohol Fuel Semi
80A003112	IX	Tests of Internal Combustion Engines on	ALCOHOL Fuel * U.S. Dept. of Agriculture.
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80A002030	IX		ALCOHOL Fuel Alternative
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80A000631	I	rsociety Energy Conversion Engineering Conference * Which	ALCOHOL Fuel for Brasil — Methanol or Ethan
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80A001188	VI	Making Alcohol Fuel * Mother's	ALCOHOL Fuel Seminar
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80A000738	VI	Proceedings of the International Symposium on	ALCOHOL Fuel Technology: Methanol and Etha
80A000739	III	Proceedings of the International Symposium on	ALCOHOL Fuel Technology: Methanol and Etha
80A000740	IX	Proceedings of the International Symposium on	ALCOHOL Fuel Technology: Methanol and Etha
80A000741	IX	Proceedings of the International Symposium on	ALCOHOL Fuel Technology: Methanol and Etha
80A000742	XI	Proceedings of the International Symposium on	ALCOHOL Fuel Technology: Methanol and Etha

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000123	X	*Drive to Boost*	*ALCOHOL Fuels*
80A000128	VIII	*Economic Realities of*	*ALCOHOL Fuels*
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80A002276	I		*ALCOHOL Fuels*
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80A001208	VIII	*Net Energy Analysis of*	*ALCOHOL Fuels * API Publication No. 4312*
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80A003004	I		*ALCOHOL Fuels * Opportunities for Idaho*
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80A000545	X	*Alcohol Fuels Technology * Congressional Concerns About*	*ALCOHOL Fuels — a Technical Advisor's Persp*
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80A000556	I	*hird International Symposium on Alcohol Fuels Technology* *	*ALCOHOL Fuels and Agricultural Systems*
80A002128	IX	*Cycle Economy, Emissions and Photochemical Reactivity Using*	*ALCOHOL Fuels and Gasoline*
80A000095	I		*ALCOHOL Fuels Are No Longer Small Potatoes*
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80:001949	IV	*ility Reports * Availability and Cost of Grain for Use as*	*ALCOHOL Fuels Feedstocks. Final Report, N*
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80A000502	I	*hird International Symposium on Alcohol Fuels Technology* *	*ALCOHOL Fuels from Biomass in New Zealand —*
80A002142	I	*Gasohol — Are*	*ALCOHOL Fuels in Our Future? * Citizen's*
80A000542	X	*ernational Symposium on Alcohol Fuels Technology * a U.S.*	*ALCOHOL Fuels Policy and the Political Stat*
80:001949	IV	*Report of the*	*ALCOHOL Fuels Policy Review. Raw Material*
80A001223	X	*a Critique of the Report of the*	*ALCOHOL Fuels Policy Review*
80:001947	V	*Report of the*	*ALCOHOL Fuels Policy Review. Raw Material*
80:001950	III	*Report of the*	*ALCOHOL Fuels Policy Review. Raw Material*
80:001951	V	*Report of the*	*ALCOHOL Fuels Policy Review. Raw Material*
80:001952	VIII	*Report of the*	*ALCOHOL Fuels Policy Review. Raw Material*
80:001948	II	*Report of the*	*ALCOHOL Fuels Policy Review. Raw Material*
80A000534	VIII	*hol Fuels Technology * a Comparative Economic Analysis of*	*ALCOHOL Fuels Production Options*
80A000231	X	*Maryland County Establishes*	*ALCOHOL Fuels Program*
80A000364	X		*ALCOHOL Fuels Program Plan*
80A000497	X	*Federal Agency Compendium * Federal Agency and Department*	*ALCOHOL Fuels Programs*
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80A000534	VIII	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * a Comparative*
80A000523	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * a Motor Vehicl*
80A000525	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * a New Way of D*
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80A000551	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Alcohol Blend*
80A000558	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Alcohol Engine*

Alcohol • Alcohol

Citation Number	Subject Section	Citation Title	Title Keyword
80A000505	X	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Alcohol Fuel T*
80A000502	I	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Alcohol Fuels*
80A000556	I	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Alcohol Fuels*
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80A000519	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Alcohol/Gasoli*
80A000518	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * BP New Zealand*
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80A000553	VIII	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Canadian Scena*
80A000549	IX	*Proceedings on Third International Symposium on*	*ALCOHOL Fuels Technology * Characterizati*
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80A000545	X	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Congressional*
80A000521	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Development of*
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80A000527	VIII	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Economics of M*
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80A000531	VI	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Engineering of*
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80A000530	V	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Ethanol from M*
80A000508	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Experiences Wi*
80A000513	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Factors Influe*
80A000512	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Flame Quenchin*
80A000560	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Formaldehyde E*
80A000552	X	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Future Scenari*
80A000529	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Gasoline/Metha*
80A000548	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Hardware/Softw*
80A000510	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Improvement of*
80A000541	X	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Legal and Regu*
80A000561	XI	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Methanol Conta*
80A000509	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Methanol/Gasol*
80A000555	I	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Methanol, Its*
80A000554	I	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Methyl Fuel an*
80A000520	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Mid-term Prosp*
80A000511	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Modeling of Fl*
80A000514	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Modification*
80A000550	X	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * New Zealand's*
80A000537	VI	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Novel Continuo*
80A000533	V	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Production of*
80A000538	V	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Production of*
80A000540	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Research Progr*
80A000507	V	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Some Implicati*
80A000536	VIII	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * Technical and*
80A000528	VIII	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * the Energetics*
80A000503	III	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * the Growing of*
80A000522	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * the Influence*
80A000532	VII	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * the Production*
80A000535	V	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * the Production*
80A000506	X	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * the Swedish Oi*
80A000526	IX	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * the Utilizatio*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000539	X	*Proceedings of Third International Symposium on*	*ALCOHOL Fuels Technology * What Do We Do*
80A000117	X	*DOE Endorses Use of*	*ALCOHOL Fuels to Reduce Gasoline Consumptio*
80A000541	X	*hol Fuels Technology * Legal and Regulatory Influences on*	*ALCOHOL Fuels Use in United States*
80A000454	IX	*Status of*	*ALCOHOL Fuels Utilization Technology for Hi*
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80 : 001950	III	*Reports * Availability of Sugar Crops for Production of*	*ALCOHOL Fuels. Final Report*
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80A000557	I	*hird International Symposium on Alcohol Fuels Technology **	*ALCOHOL Fuels: the Most Often Asked Questi*
80A002137	VIII	*Biomass-based*	*ALCOHOL Fuels: the Near-term Potential for*
80A002233	IX	*Vapour Pressure of*	*ALCOHOL Gasoline Blends*
80A003027	IX		*ALCOHOL Gasoline Mixtures as Motor Fuel*
80 : 002043	VI	*Fermentation*	*ALCOHOL Grows in Power*
80A000121	IX	*Does*	*ALCOHOL Have a Place in Your Car's Future?*
80A002241	I	*the Production and Use of Power*	*ALCOHOL in Asia and the Far East; Report*
80A003045	III	*Production of Power*	*ALCOHOL in Australia*
80A003028	IX	*Agricultural*	*ALCOHOL in Automotive Fuel: Gasohol*
80A000689	IV	*ting and Processing, Workshop * Prospects of Cassava Fuel*	*ALCOHOL in Brazil*
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80A003062	IX		*ALCOHOL in Diesel Engines*
80A003048	IX	*Further Tests on the Use of Denatured*	*ALCOHOL in Gasoline Engines*
80A003115	IX	*Development of Practical Method of Burning*	*ALCOHOL in Gasoline Tractor and Calculation*
80A000592	I	*eveloping Countries * Consumption Figures of Fermentation*	*ALCOHOL in Japan*
80A002275	I	*Power Alcohol * a Brief Analysis to Force Use of Farm*	*ALCOHOL in Motor Fuel*
80A003006	VIII	*Grain*	*ALCOHOL in Motor Fuels * Nebraska Univ.;*
80A003010	IX	*Use of*	*ALCOHOL in Motor Gasoline — a Review * Ap*
80A002312	IX	*Use of*	*ALCOHOL in Motor Gasoline. Review*
80A003031	IX		*ALCOHOL in Motor-car Operation*
80A000603	X	*ssibilities of Developing a Nation Wide Programme for Power*	*ALCOHOL in Peru*
80A000587	I	*Chemical Feedstock in Developing Countries * Fermentation*	*ALCOHOL in the Commonwealth Caribbean*
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80A002160	IX	*Power*	*ALCOHOL in Tractors and Farm Engines*
80A000572	X	*el and Chemical Feedstock in Developing Countries * Power*	*ALCOHOL Industry for Thailand Potential and*
80A000576	VI	*Chemical Feedstock in Developing Countries * Fermentation*	*ALCOHOL Industry in Egypt in the Last Three*
80A000578	III	*tock in Developing Countries * Cane Molasses Fermentation*	*ALCOHOL Industry in Fiji*
80A000590	I	*in Developing Countries * Prospects of Developing Power*	*ALCOHOL Industry in Thailand*
80A002273	X	*ng to Practicability and Advantages to Agriculture of Using*	*ALCOHOL Manufactured from Corn and Other Fa*
80A000100	IX		*ALCOHOL May Be Realistic Source of Automobi*
80A003021	IX	*Brown's*	*ALCOHOL Motor Fuel Cookbook*
80A003047	III		*ALCOHOL Motor Fuel from Molasses, I * I.*
80A002246	IX		*ALCOHOL Motor Fuel from Molasses, II * II*
80A002062	I	*Farming for Fuel —*	*ALCOHOL Motor Fuel Movement of the 1930's*
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80A002068	VI	*Ferment in the*	*ALCOHOL Movement*
80A002202	VI		*ALCOHOL on Hoof*
80A000650	IX	*ence I.C. Engines and Combustion * Effect of Additives to*	*ALCOHOL on the Performance of an Alcohol-di*
80A000278	X	*Second Thoughts on Brazil's*	*ALCOHOL Plan*
80A001224	VI	*Indiana Grain Fermentation*	*ALCOHOL Plant*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000744	XI	*Laboratory Diagnosis of Diseases * Methyl*	*ALCOHOL Poisoning*
80A000594	I	*ping Countries * Advantages and Limitations of the Use of*	*ALCOHOL Produced by Fermentation as Fuel in*
80A000274	VI	*Saccharification of Cassava for Ethyl*	*ALCOHOL Production*
80A000459	VIII	*Preliminary Analysis of Economics of Scale in Grain*	*ALCOHOL Production*
80A000483	VI	*Hydrolysis of Cellulosic Wastes to Fermentable Sugars for*	*ALCOHOL Production*
80A000580	I	*edstock in Developing Countries * Aspects of Fermentation*	*ALCOHOL Production*
80A001226	VI	*Small-scale Fuel*	*ALCOHOL Production*
80A002156	II	*Western Wastes as Materials for*	*ALCOHOL Production*
80A002210	VI	*How to Convert Brewery to Industrial*	*ALCOHOL Production*
80A002225	II	*Raw Materials for Industrial*	*ALCOHOL Production*
80A003053	VI	*Saccharification of Wheat by Fungal Amylases for*	*ALCOHOL Production*
80A003057	IV	*Wheat as Raw Material for*	*ALCOHOL Production*
80A003093	XI	*Safety Standards in Fuel*	*ALCOHOL Production*
80A003094	V	*ic Feedstocks with Starch and Sugar-based Raw Materials for*	*ALCOHOL Production*
80A003099	VIII	*Corn Prices and*	*ALCOHOL Production*
80A001205	I	*Ethyl*	*ALCOHOL Production and Use as a Motor Fuel*
80A002270	I	*Bibliography on*	*ALCOHOL Production and Use of Agricultural*
80A003065	I	*Industrial*	*ALCOHOL Production and Uses in the Phillipi*
80A001001	X		*ALCOHOL Production for Fuel Is Backed by Ho*
80A003087	I	*Fuel*	*ALCOHOL Production from American Farm and F*
80A000687	IV	*Cassava Harvesting and Processing, Workshop **	*ALCOHOL Production from Cassava*
80A002201	III		*ALCOHOL Production from Molasses*
80A002208	V		*ALCOHOL Production from Sisal (Agaves)*
80A000579	X	*tock in Developing Countries * Potential for Fermentation*	*ALCOHOL Production in Belize*
80A000671	I	*Ethyl*	*ALCOHOL Production Technique*
80A000130	IV	*the Economics of Ethyl*	*ALCOHOL Production with Particular Referenc*
80 : 002125	III	*Fuels from Biomass:*	*ALCOHOL Production; Alcohol as a Motor Fuel*
80A000691	X	*Conference at the Royal Society * the Brazilian National*	*ALCOHOL Program*
79 : 006441	VIII	*Agricultural Adjustments to Brazil's*	*ALCOHOL Program: a Regional Economic Analy*
80A000112	VII	*Distillery Effluent Treatment in the Brazilian National*	*ALCOHOL Programme*
80A000464	IX	*nd Field Fuels Symposium * Constraints and Opportunities:*	*ALCOHOL Replacement of Petroleum Fuels*
80A001192	VI	*Lore of Still Building **	*ALCOHOL Series, V. 2 * a Primer on the Ef*
80A001061	IV	*Jerusalem Artichoke Gets Attention as Possible Fuel Ethanol*	*ALCOHOL Source*
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80A003125	I	*Grain*	*ALCOHOL Study*
80A000070	X	*Brazil to Close Down*	*ALCOHOL Technology Project*
80A002009	VI	*Design of a Two-bushel Per Day Continuous*	*ALCOHOL Unit*
80A000458	IX	*Improvement Possibilities and Environmental Consequences of*	*ALCOHOL Uses*
80 : 002055	VI	*Biological Conversion of Corn Residue into Ethyl*	*ALCOHOL Using an Immobilized-cell Reactor*
80A001003	IX		*ALCOHOL Winning Support as Gasoline Supplem*
80A002186	IX		*ALCOHOL with Normal Diesel Fuels*
80A002204	IV	*Granular Wheat Flour Increases*	*ALCOHOL Yields*
80A000213	V	*Green Gold (Converting Cellulose into Ethyl*	*ALCOHOL)*
80A003109	IV	*Potato Culls as a Source of Industrial*	*ALCOHOL; with a General Discussion of the*
80A003115	IX	*lculation and Charting of Thermodynamic Properties of Ethyl*	*ALCOHOL-AIR Mixture and Its Combustion Prod*
80A000653	IX	*vestigation of Some Factors Affecting the Performance of an*	*ALCOHOL-DIESEL Oil Dual Fuel Engine*
80A000658	IX	*ctors Affecting the Compression and Combustion Processes in*	*ALCOHOL-DIESEL Oil Dual Fuel Engines*
80A000650	IX	** Effect of Additives to Alcohol on the Performance of an*	*ALCOHOL-DIESEL Oil Dual-fuel Engine*
80A002158	VI	*Making*	*ALCOHOL-ETHER Mixture in Cuba for Motor Fue*
80A002246	IX	*otor Fuel from Molasses, II * II. the Use of Alcohol and*	*ALCOHOL-ETHER Mixtures as Motor Fuels*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000099	I		*ALCOHOL-GASOHOL Fuel Solution*
80A000329	IX	*ons, Fuel Economy, and Driveability of Vehicles Fueled with*	*ALCOHOL-GASOLINE Blends*
80A003070	IX	*Chassis-dynamometer and Road Tests of*	*ALCOHOL-GASOLINE Blends*
80A002185	IX	*the Physicochemical Properties of*	*ALCOHOL-GASOLINE Blends * II. the Influe*
80A003059	IX	*Comparative Performance of*	*ALCOHOL-GASOLINE Blends in Gasoline Engine*
80A000304	IX	*Hydrocarbon and Nitrogen Oxide Concentrations with an Ethyl*	*ALCOHOL-GASOLINE Fuel*
80A000715	IX	*ance and Emissions of Spark-ignition Engines Operating with*	*ALCOHOL-GASOLINE Mixtures * Institution*
80 : 000205	VIII	*Fuels from Biomass * Near Term Potential of Biomass-based*	*ALCOHOL-GASOLINE Transportation Fuels * T*
80A001070	IX	*Mother's Experimental*	*ALCOHOL-POWERED Truck*
80A003032	IX		*ALCOHOL-WATER Injection*
80A002247	IX	*Discussion on*	*ALCOHOL-WATER Injection * Obstacles Seen*
80A000547	IX	*ium on Alcohol Fuels Technology * Engine Experiments with*	*ALCOHOL/DIESEL Fuel Blends*
80A000404	IX	*Project Plan for Reliability Fleet Testing of*	*ALCOHOL/GASOLINE Blends*
80A002014	IX	*trations in the Exhaust of a Spark Ignited Engine Fueled by*	*ALCOHOL/GASOLINE Blends*
80A002277	IX	*Project Plan for Reliability Fleet Testing of*	*ALCOHOL/GASOLINE Blends*
80A002296	IX	*in the Exhaust of an Internal Combustion Engine Fueled by*	*ALCOHOL/GASOLINE Blends*
80A000752	IX	*Highway Vehicle Systems Contractors Coordination Meeting **	*ALCOHOL/GASOLINE Blends — Lean Misfire Limi*
80A000549	IX	*mposium on Alcohol Fuels Technology * Characterization of*	*ALCOHOL/GASOLINE Blends as a Stratified-cha*
80A001228	IX	*Exhaust Emissions and Fuel Economy from Automobiles Using*	*ALCOHOL/GASOLINE Blends under High-altitude*
80A000519	IX	*hird International Symposium on Alcohol Fuels Technology **	*ALCOHOL/GASOLINE Reliability Fleet Tests:*
80A002154	V	*a Fermentation Process for the Production of Acetone,*	*ALCOHOL, and Volatile Acids from Corncobs*
80A003069	IX	*itical Solution Temperatures of Mixtures of Gasoline, Ethyl*	*ALCOHOL, and Water*
80A002239	I	*Ethyl Alcohol, Pure Ethyl Alcohol, Specially Denatured*	*ALCOHOL, Completely Denatured Alcohol and U*
80A003033	IX	*a Comparative Study of*	*ALCOHOL, Gasoline and Kerosene as Fuels for*
80A002274	I	*Power*	*ALCOHOL, History and Analysis*
80A003113	IX	*Comparative Fuel Values of Gasoline and Denatured*	*ALCOHOL, in Internal Combustion Engines **
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80A002238	IX	*Encyclopedia of Chemical Processing and Design **	*ALCOHOL, Methanol as a Motor Fuel*
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80A002194	VI	*Microbial Amylase Preparations Conversion Agents for*	*ALCOHOLIC Fermentation*
80A002228	IV	*Saccharification of Grain Mashes for*	*ALCOHOLIC Fermentation*
80A000569	VI	*in Developing Countries * New Developments in Continuous*	*ALCOHOLIC Fermentation Intensification — Sim*
80A001241	III	*Industrial Fermentations **	*ALCOHOLIC Fermentation of Molasses * Chap*
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80A002197	VI	*Some Unusual*	*ALCOHOLIC Fermentations*
80 : 001948	II	*ng Wastes for Utilization as a Feedstock for the Production*	*ALCOHOLIC Fuels*
80A001104	IX	*Will Autos Go*	*ALCOHOLIC?*
80A002278	VI	*Including the Processes of Malting...etc., with Chapters on*	*ALCOHOLOMETRY and the De-naturing of Alcoho*
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80A001128	I	*Physical and Thermodynamic Properties of Aliphatic*	*ALCOHOLS*
80A001179	XI	*Industrial Hygiene and Toxicology **	*ALCOHOLS * Chapter 34 * Volume II*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A002121	IX		ALCOHOLS in Diesel Engines — a Review
80A000543	IX	uels Technology * Calculations Relevant to the Fueling of	ALCOHOLS in Spark Ignited Internal Combusti
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80A000522	IX	ls Technology * the Influence of Engine Parameters on the	ALDEHYDE Emissions of a Methanol Operated F
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80A001169	VI	the Digestibility of Lignocellulosic Materials with Dilute	ALKALI and Liquid Ammonia
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80A000733	IX	posium on Alcohol Fuel Technology: Methanol and Ethanol *	ALTERNATE Air-fuel Induction Systems Contra
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80A000730	IX	Monograph on	ALTERNATE Fuel Resources * Effect of Meth
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80A001182	IX	plication of New Combustion Analysis Method in the Study of	ALTERNATE Fuel, Combustion and Emission Cha
80A001005	I		ALTERNATE Fuels Vital to Brazil
80A002122	I		ALTERNATE Portable Fuels for Internal Combu
80A002030	IX	Alcohol Fuel	ALTERNATIVE
80A001006	I	an	ALTERNATIVE as Lovely as a Tree?
80A000403	IX	Practical Approach to the Introduction of	ALTERNATIVE Automotive Fuels
80A001265	IX	Methanol as an Alternative Fuel * Feasibility of	ALTERNATIVE Automotive Fuels
80A000695	IX	Symposium on Low Pollution Power Systems Development *	ALTERNATIVE Automotive Fuels — Status and S
80A000373	IX	Current Status of	ALTERNATIVE Automotive Power Systems and Fu
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80A000528	VIII	Symposium on Alcohol Fuels Technology * the Energetics of	ALTERNATIVE Biomass Sources for Ethanol Pro
80A002123	IX		ALTERNATIVE Diesel Engine Fuels: an Experi
80A002284	III	Alcohol Fuel from Sugarcane (for an	ALTERNATIVE Energy Source) — Is It Economi
80A000484	X	of Condensed Papers: 2nd Miami International Conference on	ALTERNATIVE Energy Sources * Future of Al
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78 : 000005	I		ALTERNATIVE Energy Technologies in Brazil
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80A000101	I	Alcohol — Permanent	ALTERNATIVE Fuel
80A000696	IX	pment * the Combustion of Methanol Mixed with Water as an	ALTERNATIVE Fuel
80A001238	IX	Methanol as an	ALTERNATIVE Fuel
80A000702	IX	Methanol as an	ALTERNATIVE Fuel * Advantages of Neat and
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80A000704	IX	Methanol as an	ALTERNATIVE Fuel * Comparison of Methanol
80A000713	IX	Methanol as an	ALTERNATIVE Fuel * Energy Workshop — Repo
80A000711	XI	Methanol as an	ALTERNATIVE Fuel * Environmental Aspects
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000710	IX	*Methanol as an*	*ALTERNATIVE Fuel * Methanol Fuel — Long R*
80A000703	IX	*Methanol as an*	*ALTERNATIVE Fuel * Methanol-gasoline Blen*
80A000709	IX	*Methanol as an*	*ALTERNATIVE Fuel * Methanol-gasoline Blen*
80A000701	IX	*Methanol as an*	*ALTERNATIVE Fuel * Methanol/Gasoline Blen*
80A000705	IX	*Methanol as an*	*ALTERNATIVE Fuel * Physico-chemical Prope*
80A000708	VI	*Methanol as an*	*ALTERNATIVE Fuel * Potential Long Range I*
79 : 000510	I	*Methanol and Ethanol * Use of Ethanol from Biomass as an*	*ALTERNATIVE Fuel in Brazil*
77 : 001297	IX	*Capturing the Sun through Bioconversion * Volkswagen*	*ALTERNATIVE Fuel Programs*
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80A000697	IX	*Symposium on Low Pollution Power Systems Development **	*ALTERNATIVE Fuels — Methanol*
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80A000382	IX	*Feasibility Study of*	*ALTERNATIVE Fuels for Automotive Transporta*
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80A000438	I	*on the Trail of New Fuels:*	*ALTERNATIVE Fuels for Motor Vehicles*
80A000312	IX	*Methanol and Other*	*ALTERNATIVE Fuels for Off-highway Mobile En*
80A000723	X	*Utilization of*	*ALTERNATIVE Fuels for Transportation * a*
80A003001	IX	*Utilization of*	*ALTERNATIVE Fuels for Transportation * Ai*
80A001164	IX	*the Utilization of*	*ALTERNATIVE Fuels in a Diesel Engine Using*
80A001175	VIII	*Use of*	*ALTERNATIVE Fuels in Highway Vehicles: the*
80A001256	IX	*Potential for Use of*	*ALTERNATIVE Fuels in Michigan's Public Tran*
80A000461	IX	*nvironmental Control Symposium * Environmental Aspects of*	*ALTERNATIVE Fuels Utilization for Highway V*
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80A000668	VIII	*Biomass: a Cash Crop for the Future **	*ALTERNATIVE Organizational and Marketing Ar*
80A000586	VIII	*Chemical Feedstock in Developing Countries * Ethanol — an*	*ALTERNATIVE to Its Use as a Fuel*
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80A001089	I	*Valid*	*ALTERNATIVE, A, to Petroleum*
80A000092	I	*the Energy*	*ALTERNATIVES*
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80A002132	VI		*ALTERNATIVES for Energy Savings at Plant Le*
80A003014	VIII	*ms. Report * Interim Report on Possible Energy-production*	*ALTERNATIVES in Crop/Livestock Agriculture*
80A000589	III	** Fuel and Chemical Feedstock from Sugar Cane in Central*	*AMERICA*
80A001029	VIII	*Bank of*	*AMERICA...(CAR-FLEET)*
80A000486	II	*nts in Perspective, 6th Energy Conference and Exposition **	*AMERICAN Agriculture — the Energy Productio*
80A000139	VIII	*Energy Conservation Needs*	*AMERICAN Brains*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000637	I	Public Awareness Workshops and Plenary Sessions, at the 6th	ANNUAL Conference and Exhibition (WATTEC)
80A000477	IX	(Univ. of Missouri, Rolla — Missouri Energy Council)	ANNUAL Conference on Energy * Alcohol Ass
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80A000467	IX	Proceedings...53rd	ANNUAL Congress, South African Sugar Techno
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80 : 000188	I	Second	ANNUAL Symposium on Fuels from Biomass *
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80 : 000191	VI	Second	ANNUAL Symposium on Fuels from Biomass *
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80 : 000213	VI	Second	ANNUAL Symposium on Fuels from Biomass *
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80A002021	IX	Alcohol: a Brazilian	ANSWER to the Energy Crisis
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80A002287	VI	Ethanol Production and Utilization by	APHELENCHUS Avenae and Caenorhabditis Sp.
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80A000582	VII	Chemical Feedstock in Developing Countries * Production,	APPLICATION and Marketing of Concentrated M
80A001244	VI	Methanol Technology and Economics * Development and	APPLICATION of a Mathematical Model of the
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80A000299	VI	Studies on Biomass Production from Methanol.	APPLICATION of Tower Type Fermentor with 2-
80A000316	IX	Modified Fuels for Diesel Engines by	APPLICATION of Unstabilized Emulsions
80A000515	IX	hermokinetic Modeling of Methanol Combustion Phenomena with	APPLICATION to Spark Ignition Engines
80A002033	VI	zymatic Conversion of Cellulosic Materials: Technology and	APPLICATIONS
80A001237	VI	Cellulases and Their	APPLICATIONS * Enzymatic Saccharification
80A001236	VI	Cellulases and Their	APPLICATIONS * the Production of Cellulas
80A000308	IX	Kinetic Wall Quenching of Methanol Flames with	APPLICATIONS to Spark Ignition Engines
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000035	XI	Chemical Relevance — a Heuristic	APPROACH. Part IV: Ethanol
80A000044	X	Congress May	APPROVE Financing for On-farm Alcohol Plant
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80A001229	IX	tional Symposium on Automotive Propulsion Systems: Held on	APRIL 18-22, 1977 * a Study on Reformed F
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80A003104	IX		AQUAHOL
80A001019	VIII		ARCO Says It Test Markets Gasohol in Indian
80A000205	VIII	Gasohol Sales in	AREA Increasing as Gas Prices Rise
80A001020	I		ARGUMENT Clouds Gasohol Issue
80A002090	VI	History of Cellulase Program at U.S.	ARMY Natick Development Center
80A000668	VIII	for the Future * Alternative Organizational and Marketing	ARRANGEMENTS for Marketing Biomass
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80A002295	VIII	Some Economic	ASPECTS of a Corn-alcohol Fuel Program
80A000461	IX	Environmental Control Symposium * Environmental	ASPECTS of Alternative Fuels Utilization for
80A001240	XI	cal Reports on the Biological Effects and the Public Health	ASPECTS of Atmospheric Pollutants
80A000490	VIII	ication, Annual Meeting of ISES American Section * Policy	ASPECTS of Biomass Utilization
80A000736	VI	hnology: Methanol and Ethanol * Economical and Technical	ASPECTS of Ethanol Production from Maniok
80A003040	VIII	Economic and Market	ASPECTS of Ethyl Alcohol from Sulphite Wast
80A000580	I	as Fuel and Chemical Feedstock in Developing Countries *	ASPECTS of Fermentation Alcohol Production
80A000342	IX	Technical and Economical	ASPECTS of Methanol as an Automotive Fuel
80A000711	XI	Methanol as an Alternative Fuel * Environmental	ASPECTS of Methanol as Vehicular Fuel: Air
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80A000414	IX	Other	ASPECTS of MTBE/methanol Use
80A000286	VI	Some	ASPECTS of Structures of Turbulent Pool Fir
80A000722	VIII	on the Potential for Energy Farming in New Zealand * Some	ASPECTS of the Economics of Ethanol Product
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79 : 007113	XI	Preliminary Environmental	ASSESSMENT of Biomass Conversion to Synthe
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000127	VIII	Economic Factors in the	ASSESSMENT of Various Cellulosic Substrates
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80A002303	IX	Alcohol	ASSISTED Hydrocarbon Fuels * a Comparison
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80A000429	VII	Some Problems	ASSOCIATED with the Treatment of Effluents
80A001257	XI	Investigation of Hazards	ASSOCIATED with Using Hydrogen as a Militar
80A000467	IX	s...53rd Annual Congress, South African Sugar Technologists	ASSOCIATION * Ethanol as a Petroleum Exte
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80A000191	IX	Gasohol Tests Are Begun by	AT+T'S Illinois Bell
80A001240	XI	Volume XI * Data for a Sanitary Assessment of Methanol in	ATMOSPHERIC Air * a Second Compilation of
80A001240	XI	on the Biological Effects and the Public Health Aspects of	ATMOSPHERIC Pollutants
80A000111	VI	of Pretreatments to Enhance Enzymatic and Microbiological	ATTACK of Cellulosic Materials
80A001135	VI	atments to Enhance Chemical, Enzymatic, and Microbiological	ATTACK of Cellulosic Materials
80A001061	IV	Jerusalem Artichoke Gets	ATTENTION as Possible Fuel Ethanol Alcohol
80A000674	IX	urth National Conference on Chemical Engineering, Adelaide,	AUG. 25-26, 1976
76 : 001711	I	Strategy for Solar Energy Research in	AUSTRALIA
80A002140	II	Potential for Liquid Fuels from Agriculture and Forestry in	AUSTRALIA
80A003045	III	Production of Power Alcohol in	AUSTRALIA
77 : 001079	I		AUSTRALIA Examines New Routes to Solar Ener
80A001025	I		AUSTRALIA Plans Alcohol Fuel
80A000270	IV	the Roots of Power: the Growing of Manioc in Brazil and	AUSTRALIA Will Lessen Dependency upon Oil I
76 : 001883	V	Engineers 1976 Engineering Conference * Solar Energy for	AUSTRALIA. the Role of Biological Convers
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80A001093	IX	Volkswagenwerk Summarizes Research in Using Methanol as	AUTO Fuel
80A002078	IX	Goodyear Tire and Rubber Develops Gasoline/Alcohol/Water	AUTO Fuel Mixture
80A003024	IX		AUTO Fuels of the 1980's
80A001165	IX	the Effects of Fuel Structure on the	AUTOIGNITION of Fuel-air Mixtures
80A001166	IX	Investigation of the Octane Rating and	AUTOIGNITION Temperature of Methanol-gasoli
80A000252	IX	Ethylnitrite in the Exhaust from a Methanol-gasoline Fueled	AUTOMOBILE
80A000328	IX	Exhaust Emissions from a Methanol-fueled	AUTOMOBILE
80A000627	IX	ence * Design and Performance of a Baseline Rankine Cycle	AUTOMOBILE
80A001184	IX	ce and Exhaust Emissions Characteristics of a Methanol Fuel	AUTOMOBILE
80A002285	I	the Debut of the Alcoholic	AUTOMOBILE
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Citation Number	Subject Section	Citation Title	Title Keyword
80A002247	IX	* Obstacles Seen to a Two-fuel System for General Use on	AUTOMOBILES
80A002245	IX	Performance of an Ethanol-gasoline Blend in	AUTOMOBILES and Light Trucks
80A001228	IX	Exhaust Emissions and Fuel Economy from	AUTOMOBILES Using Alcohol/Gasoline Blends U
80A001249	IX	Investigation of a Substitute Fuel to Control	AUTOMOTIVE Air Pollution
80A002258	IX	Systems: Held on April 18-22, 1977 * Recent Progress in	AUTOMOTIVE Alcohol Fuel Application * a R
80A000375	IX	Energy Carriers in Space Conditioning and	AUTOMOTIVE Applications: a Comparison of H
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80A000660	IX	ion of Using Alcohol as a Secondary Fuel in a Multicylinder	AUTOMOTIVE Compression Ignition Engine
80A001183	IX	Future Automotive Fuels * Alternative Fuels for	AUTOMOTIVE Diesel Engines
80A000544	IX	tion and Emission of Gaseous Fuel from Reformed Methanol in	AUTOMOTIVE Engine
80A000698	IX	Symposium on Low Pollution Power Systems Development *	AUTOMOTIVE Engine for Methanol-water Mixtur
80A000377	IX	ntal Results Using Methanol and Methanol/Gasoline Blends as	AUTOMOTIVE Engine Fuel
80A002138	IX	Comparative	AUTOMOTIVE Engine Operation When Fueled Wit
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78 : 001794	IX	rop for the Future * Use of Ethanol-gasoline Mixtures for	AUTOMOTIVE Fuel
80A000319	IX	Potential for Methanol as an	AUTOMOTIVE Fuel
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80A000342	IX	Technical and Economical Aspects of Methanol as an	AUTOMOTIVE Fuel
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80A001232	IX	Coordination Meeting * Characterization of Methanol as an	AUTOMOTIVE Fuel — an Experimental Study
80A000370	IX	Characterization of Methanol/Gasoline Blends as	AUTOMOTIVE Fuel — Performance and Emissions
80A000334	IX	Methanol as	AUTOMOTIVE Fuel — 1. Straight Methanol
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000493	VIII	ical and Economic Feasibility of Some Alternative Fuels for	AUTOMOTIVE Transportation
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000480	I	*Capturing the Sun through*	***BIOCONVERSION*** ** Liquid Fuels*
77 : 001295	IX	*Capturing the Sun through*	***BIOCONVERSION*** ** Liquid Fuels: Workshop N*
77 : 001298	IX	*Capturing the Sun through*	***BIOCONVERSION*** ** Properties and Characteri*
77 : 001296	I	*Capturing the Sun through*	***BIOCONVERSION*** ** Speech Held in Washington*
77 : 001297	IX	*Capturing the Sun through*	***BIOCONVERSION*** ** Volkswagen Alternative Fu*
80A000481	I	*Capturing the Sun through*	***BIOCONVERSION*** ** When the Oil Runs Out — a*
77 : 001296	I	*rsion * Speech Held in Washington, March 11, 1976, on the*	***BIOCONVERSION*** *Conference "Capturing the Su*
80A000285	VI	*Soluble and Immobilized Enzyme Technology in*	***BIOCONVERSION*** *of Barley Starch*
78 : 002267	VI	*Pilot Plant Studies of the*	***BIOCONVERSION*** *of Cellulose and Production*
79 : 004131	VI	*Process Development Studies on the*	***BIOCONVERSION*** *of Cellulose and Production*
80 : 002077	VI		***BIOCONVERSION*** *of Cellulosic Substances into*
80 : 002118	VI		***BIOCONVERSION*** *of Cellulosic Substances into*
80 : 000191	VI	*Second Annual Symposium on Fuels from Biomass **	***BIOCONVERSION*** *of Plant Biomass to Ethanol*
80 : 001985	VI	*3rd Annual Biomass Energy Systems Conference **	***BIOCONVERSION*** *of Plant Biomass to Ethanol*
79 : 000531	VI		***BIOCONVERSION*** *of Plant Biomass to Ethanol.*
80A000385	VI	*Fuel and Energy Production by*	***BIOCONVERSION*** *of Waste Materials — State-of*
79 : 005703	X	*Parameters for Legislative Consideration of*	***BIOCONVERSION*** *Technologies*
80A000692	I	** Recommendations and Proceedings from Pacific Northwest*	***BIOCONVERSION*** *Workshop*
80A000725	VI	*ic Conversion of Cellulosic Materials * Biotechnology and*	***BIOENGINEERING*** *Symposium No. 6*
80A000726	VI	*erials * Fermentation Ethyl Alcohol * Biotechnology and*	***BIOENGINEERING*** *Symposium No. 6*
80A000727	VI	*Enhancing Cellulose Saccharification * Biotechnology and*	***BIOENGINEERING*** *Symposium No. 6*
80A000728	VI	*arification for Fermentation Industry * Biotechnology and*	***BIOENGINEERING*** *Symposium No. 6*
80A000743	I	*Primer: Solar, Water, Wind, and Biofuels * Alcohol as a*	***BIOFUEL:*** *Coming around Again?*
80A000743	I	*Energy Primer: Solar, Water, Wind, and*	***BIOFUELS*** ** Alcohol as a Biofuel: Coming*
80A001037	XI		***BIOHAZARDS*** *of Methanol in Proposed New Uses*
80A000636	I	*on and Conference, Middle East (SOLTECH '78) * Integrated*	***BIOLOGICAL*** *and Agricultural Systems*
80A000019	VI	*Catalytic Decomposition of Cellulose under*	***BIOLOGICAL*** *Conditions*
76 : 001883	V	*ng Conference * Solar Energy for Australia. the Role of*	***BIOLOGICAL*** *Conversion*
80 : 002055	VI		***BIOLOGICAL*** *Conversion of Corn Residue into*
80A001240	XI	*ic Air * a Second Compilation of Technical Reports on the*	***BIOLOGICAL*** *Effects and the Public Health as*
80A000742	XI	*posium on Alcohol Fuel Technology: Methanol and Ethanol **	***BIOLOGICAL*** *Effects of Methanol Spills into*
80A000577	VIII	*and Cost Accounting in the Production of Liquid Fuels from*	***BIOLOGICAL*** *Materials*
80A001113	V	*New Opportunities for Fuel from*	***BIOLOGICAL*** *Processes*
80A000439	I	*Overseas Research on the*	***BIOLOGICAL*** *Production of Fuels. Report No.*
80 : 002001	I	*3rd Annual Biomass Energy Systems Conference **	***BIOLOGICAL*** *Production of Liquid Fuels from*
79 : 000547	I	*Solar Energy Conversion through*	***BIOLOGY***
80A003014	VIII	*Production Systems * Univ. of Washington. Center for the*	***BIOLOGY*** *of Natural Systems. Report * Inte*
80A000284	I	*Solar Energy Conversion through*	***BIOLOGY:*** *Could It Be a Practical Energy So*
78 : 001830	V	*Biomass and Wastes * Energy and Materials from the Forest*	***BIOMASS***
78 : 002290	I	*ineering Conference. Volume I * Prospects for Fuels from*	***BIOMASS***
79 : 001111	I	** Fuels and Petrochemical Substitutes from Fermentation of*	***BIOMASS***
79 : 002491	VIII	*and Field Fuels Symposium * Ethanol for Motor Fuel from*	***BIOMASS***
79 : 003451	VIII	*Comparative Economic Assessment of Ethanol from*	***BIOMASS***
79 : 007163	VIII	*ectives on the Economic Analysis of Ethanol Production from*	***BIOMASS***
80 : 001983	VI	*Conference * Production of Liquid Fuels from Cellulosic*	***BIOMASS***
80 : 001995	VIII	*ss Energy Systems Conference * Fuels from Fermentation of*	***BIOMASS***
80 : 001996	VI	*Energy Systems Conference * Acid Hydrolysis of Cellulosic*	***BIOMASS***
80 : 002138	VIII	*Energy Relationships of Fuel from*	***BIOMASS***
80A000163	V	*Fuels and Chemicals from*	***BIOMASS***
80A000357	VIII	*ectives on the Economic Analysis of Ethanol Production from*	***BIOMASS***
80A000460	VIII	*Energy from Biomass and Wastes * Economics of Wood*	***BIOMASS***

Citation Number	Subject Section	Citation Title	Title Keyword
80A000507	V	ons of Large-scale Methanol Production from Canadian Forest	BIOMASS
80A000536	VIII	Economic Assessment Motor Fuel Alcohol from Grain and Other	BIOMASS
80A000668	VIII	ive Organizational and Marketing Arrangements for Marketing	BIOMASS
80A000753	I	tive Propulsion Systems * Alcohols and Gaseous Fuels from	BIOMASS
80 : 000214	VI	Second Annual Symposium on Fuels from	BIOMASS * Anaerobic Biomass Degradation
80 : 000191	VI	Second Annual Symposium on Fuels from	BIOMASS * Bioconversion of Plant Biomass
80 : 000223	VI	Second Annual Symposium on Fuels from	BIOMASS * Hypercellulolytic Mutants and T
80 : 000213	VI	Second Annual Symposium on Fuels from	BIOMASS * Low Technology Fermentation
80 : 000205	VIII	Second Annual Symposium on Fuels from	BIOMASS * Near Term Potential of Biomass-
80 : 000188	I	Second Annual Symposium on Fuels from	BIOMASS * Plan for the Introduction of Bi
80 : 000189	V	Second Annual Symposium on Fuels from	BIOMASS * Raw Materials Evaluation and Pr
80 : 000217	VIII	Second Annual Symposium on Fuels from	BIOMASS * Reassessment of Economics of Ce
80 : 000216	VI	Second Annual Symposium on Fuels from	BIOMASS * Thermophilic Degradation of Cel
80A000431	VIII	Fuels from	BIOMASS — Energy Outlay versus Energy Retur
79 : 007133	VI		BIOMASS Allocation Model: Conversion of Bi
79 : 001106	VI	Degradation of Cellulosic	BIOMASS and Its Subsequent Utilization for
79 : 004655	I	Energy from	BIOMASS and Wastes * Agro-industrial Syst
80A000670	I	Clean Fuels from	BIOMASS and Wastes * Biomass and Wastes a
79 : 004656	I	Energy from	BIOMASS and Wastes * Brazilian Gasohol Pr
80A000460	VIII	Energy from	BIOMASS and Wastes * Economics of Wood Bi
78 : 001830	V	Clean Fuel from	BIOMASS and Wastes * Energy and Materials
79 : 004644	I	Energy from	BIOMASS and Wastes * Energy from Biomass
79 : 004665	VIII	Energy from	BIOMASS and Wastes * Ethanol-gasoline Mot
79 : 004654	I	Energy from	BIOMASS and Wastes * Liquid Fuels from Re
79 : 004663	I	Energy from	BIOMASS and Wastes * Study of the Energy
80A000669	IX	Clean Fuels from	BIOMASS and Wastes * the Use of Ethanol-g
78 : 001832	V	Clean Fuel from	BIOMASS and Wastes * Utilization of Waste
80A000670	I	Clean Fuels from Biomass and Wastes *	BIOMASS and Wastes as Energy Resources: Up
79 : 002528	VIII	Energy from	BIOMASS and Wastes: an Overview
79 : 004644	I	Energy from Biomass and Wastes * Energy from	BIOMASS and Wastes: 1978 Update
79 : 000510	I	Technology: Methanol and Ethanol * Use of Ethanol from	BIOMASS as an Alternative Fuel in Brazil
79 : 002535	VIII	Solar Diversification. Vol. 2.1 *	BIOMASS Based Methanol Process
80 : 001987	VIII	3rd Annual Biomass Energy Systems Conference *	BIOMASS Based Methanol Processes
80A001035	V	Big Push for a	BIOMASS Bonanza
79 : 007164	VI	Chemicals from	BIOMASS by Improved Enzyme Technology
78 : 004663	VI	Enzymes Show Promise for	BIOMASS Conversion
79 : 007113	XI	Preliminary Environmental Assessment of	BIOMASS Conversion to Synthetic Fuels. Re
80 : 000214	VI	Second Annual Symposium on Fuels from Biomass * Anaerobic	BIOMASS Degradation to Produce Sugars, Fuel
80A000283	I	Solar	BIOMASS Energy an Overview of USA Potential
79 : 007134	III		BIOMASS Energy for Hawaii
80 : 002045	III	Photosynthetic Pathway and	BIOMASS Energy Production * Pineapple
80A002267	I		BIOMASS Energy Refineries for Production of
80 : 001996	VI	3rd Annual	BIOMASS Energy Systems Conference * Acid
80 : 001985	VI	3rd Annual	BIOMASS Energy Systems Conference * Bioco
80 : 002001	I	3rd Annual	BIOMASS Energy Systems Conference * Biolo
80 : 001987	VIII	3rd Annual	BIOMASS Energy Systems Conference * Bioma
80 : 001988	VI	3rd Annual	BIOMASS Energy Systems Conference * Conce
80 : 002014	VI	3rd Annual	BIOMASS Energy Systems Conference * Direc
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80A000351	I		BIOMASS Ethanol as a Chemical Feedstock in

Citation Number	Subject Section	Citation Title	Title Keyword
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78 : 002268	V	*Silvicultural*	*BIOMASS Farms. Volume V. Conversion Proc*
80 : 001988	VI	*iomass Energy Systems Conference * Conceptual Design of a*	*BIOMASS Fermentation Facility*
80A000690	I		*BIOMASS for Energy: Conference at the Roya*
80A000691	X		*BIOMASS for Energy: Conference at the Roya*
79 : 005694	VI	*Conversion of*	*BIOMASS from Agriculture into Useful Produc*
78 : 001547	I	*Photosynthetic Solar Energy: Rediscovering*	*BIOMASS Fuels * Review of Current Researc*
80A001176	VIII	*neering Costs for Solar-related Technologies * Volume IX.*	*BIOMASS Fuels Production and Conversion Sys*
79 : 004663	I	*Wastes * Study of the Energy Potential of Fuels from Land*	*BIOMASS in Five Countries*
80A000502	I	*ymposium on Alcohol Fuels Technology * Alcohol Fuels from*	*BIOMASS in New Zealand — the Energetics and*
80A000463	V	*Solar 79 Northwest **	*BIOMASS in the Northwest — Available Invent*
80A000164	I	*Fuels from*	*BIOMASS Integration with Food and Materials*
80 : 000226	VIII	*al Analysis for Development of a Data Base for a Fuels from*	*BIOMASS Model). Quarterly Report for Octo*
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80A000299	VI	*Application of Tower Type Fermentor with 2-fluid Nozzle to*	*BIOMASS Production from Methanol*
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80A001219	X	*Fuels from*	*BIOMASS Program * Program Summary*
80A001174	X	*Mission Analysis for the Federal Fuels from*	*BIOMASS Program * Volume IV. Thermochemi*
79 : 005707	VI	*Mission Analysis for the Federal Fuels from*	*BIOMASS Program. Volume VI. Mission Adde*
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80 : 002049	V		*BIOMASS Refinery Turns Crop Wastes into Fue*
80A003105	II		*BIOMASS Research in Idaho*
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80A000528	VIII	*Alcohol Fuels Technology * the Energetics of Alternative*	*BIOMASS Sources for Ethanol Production in B*
79 : 001111	I	*Fuels from*	*BIOMASS Symposium * Fuels and Petrochemic*
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80A000624	V	*ty Energy Conversion Engineering Conference * Energy from*	*BIOMASS through Hydrolysis of Wood*
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79 : 007133	VI	*Biomass Allocation Model: Conversion of*	*BIOMASS to Methanol*
79 : 001713	V	*valuation and Process Development Studies for Conversion of*	*BIOMASS to Sugars and Ethanol*
80 : 000189	V	*valuation and Process Development Studies for Conversion of*	*BIOMASS to Sugars and Ethanol*
80A000490	VIII	*nual Meeting of ISES American Section * Policy Aspects of*	*BIOMASS Utilization*
78 : 001809	VIII	*scale Methanol Fuel Production from Surplus Canadian Forest*	*BIOMASS. Part 1. Summary Report*
78 : 002269	V	*scale Methanol Fuel Production from Surplus Canadian Forest*	*BIOMASS. Part 2. Working Papers*
80 : 002001	I	*Conference * Biological Production of Liquid Fuels from*	*BIOMASS. Summary Report*
80A002137	VIII		*BIOMASS-BASED Alcohol Fuels: the Near-term*
80 : 000205	VIII	*Symposium on Fuels from Biomass * Near Term Potential of*	*BIOMASS-BASED Alcohol-gasoline Transportati*
80 : 000188	I	*sium on Fuels from Biomass * Plan for the Introduction of*	*BIOMASS-BASED Methanol into the Energy Econ*
80A000483	VI	*Symposium Papers (on) Clean Fuels from*	*BIOMASS, Sewage, Urban Refuse, (and) Agricu*
80A000668	VIII		*BIOMASS: a Cash Crop for the Future * Al*
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80A000159	VIII	*Fuel from*	*BIOMASS: a Positive Balance*

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000692	I	Increased Energy from	BIOMASS: 1985 Possibilities and Problems,
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77 : 002070	I		BIOSOLAR Synfuels for Transportation
80A002085	VI	Growth Kinetics and Cellulase	BIOSYNTHESIS in the Continuous Culture of T
80A000725	VI	Enzymatic Conversion of Cellulosic Materials *	BIOTECHNOLOGY and Bioengineering Symposium
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80A000701	IX	Methanol as an Alternative Fuel * Methanol/Gasoline	BLEND — Automotive Manufactures Viewpoint
80A000734	IX	ól * Comparison of Gasoline, Methanol, and Methanol/Water	BLEND as Spark Ignition Engine Fuels
80A000720	IX	1st World Hydrogen Energy Conference * Methanol-gasoline	BLEND Fueled Engine — Performance and Emiss
80A002245	IX	Performance of an Ethanol-gasoline	BLEND in Automobiles and Light Trucks
80A003041	IX	Alcohol	BLEND Poor Substitute for Motor Fuel
80A000551	IX	rnational Symposium on Alcohol Fuels Technology * Alcohol	BLEND Use in Stratified Charge Engines
80A000649	IX	ational Conference I.C. Engines and Combustion * Methanol	BLENDED Gasoline as Modern Motor Fuel
80A000702	IX	Methanol as an Alternative Fuel * Advantages of Neat and	BLENDED Operation of Methanol Fuel in Vehic
80A000309	IX	mance Characteristics of Low Octane Primary Reference Fuels	BLENDED with Methanol
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80A001233	VII	Enhancement of Food Protein Quality through Computer	BLENDING — the Competitiveness of Proteins
80A003029	IX		BLENDING Agents for Gasoline-methanol Mixtu
80A000335	IX	Methanol as a Motor Fuel or a Gasoline	BLENDING Component
80A002254	IX	lsion Systems: Held on April 18-22, 1977 * the Effect of	BLENDING Methanol with Gasoline on Geometri
80A000307	IX	Economy and Emission Characteristics of Methanol-gasoline	BLENDS
80A000321	IX	cing Experiences with Methanol and Ethanol-based Motor-fuel	BLENDS
80A000329	IX	and Driveability of Vehicles Fueled with Alcohol-gasoline	BLENDS
80A000341	IX	ions, and Fuel Economy Characteristics of Methanol-gasoline	BLENDS
80A000398	IX	Automotive Fuel with Special Emphasis on Methanol-gasoline	BLENDS
80A000404	IX	ject Plan for Reliability Fleet Testing of Alcohol/Gasoline	BLENDS
80A000412	IX	Phase Instability in Methanol-gasoline	BLENDS
80A000510	IX	Improvement of the Water Tolerability of Methanol-gasoline	BLENDS
80A000518	IX	nology * BP New Zealand Experience with Methanol/Gasoline	BLENDS
80A000547	IX	Technology * Engine Experiments with Alcohol/Diesel Fuel	BLENDS
80A000647	IX	ss * a Study on the Automotive Engines for Water-methanol	BLENDS
80A001166	IX	ne Rating and Autoignition Temperature of Methanol-gasoline	BLENDS
80A001220	X	Denaturants for Ethanol/Gasoline	BLENDS
80A002058	IX	the Quenching Distance of Methanol and Iso-octane/Methanol	BLENDS
80A002233	IX	Vapour Pressure of Alcohol Gasoline	BLENDS
80A002277	IX	ject Plan for Reliability Fleet Testing of Alcohol/Gasoline	BLENDS
80A002296	IX	of an Internal Combustion Engine Fueled by Alcohol/Gasoline	BLENDS
80A003061	IX	Reid Vapour Pressure of Alcohol	BLENDS
80A003070	IX	Chassis-dynamometer and Road Tests of Alcohol-gasoline	BLENDS
80A000709	IX	Methanol as an Alternative Fuel * Methanol-gasoline	BLENDS * a Fuel Supplier's Viewpoint
80A002281	IX	Gasoline/Alcohol	BLENDS * a Possible Fuel Resource for Min
80A001231	IX	Speeds, Performance, and Emissions with Methanol-indolene	BLENDS * a Report by the Automotive Propu
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A002316	IX	*Exhaust Emission Characteristics of Spark-ignition Engines*	*BURNING Methanol and Methanol-gasoline Mixt*
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80A002222	IX	*Fuel Mixtures on London*	*BUSES*
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80A000225	IX	*Mercedes Benz of Brazil Uses Sugar Byproduct to Fuel*	*BUSES with Modified Fuel Pumps*
80A000013	X	*Carter Gas-from-grain Program Needs Congress,*	*BUSINESS Help*
80A000204	VIII	*Gasohol Pumps Do a Gushing*	*BUSINESS: Drivers Line Up for Fuel, but Ef*
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80A003035	VII		*BY-PRODUCT Recovery — Pollution Control Mea*
80A000678	VII	*ilization Research * Protein Concentrates from Distillers*	*BY-PRODUCTS*
80A002162	VII	*Amino Acid Composition of Grain Alcohol Fermentation*	*BY-PRODUCTS*
80A003097	VII	*Recovery of Grain Alcohol*	*BY-PRODUCTS*
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80A003052	VII	*Nutrient Content of Alcohol Fermentation*	*BY-PRODUCTS from Corn*
80A000749	VII	*edings 1st Industrial Waste Utilization Conference * Feed*	*BY-PRODUCTS from Grain Alcohol and Whiskey*
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80A000608	VII	*oping Countries * Present Situation on the Utilization of*	*BY-PRODUCTS of the Sugar Industry in Maurit*
80A000500	VI	*the Conversion of Agricultural*	*BY-PRODUCTS to Sugars * ISU-ERI-AMES Proj*
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80A000225	IX	*Mercedes Benz of Brazil Uses Sugar*	*BYPRODUCT to Fuel Buses with Modified Fuel*
80A002287	VI	*thanol Production and Utilization by Aphelenchus Avenae and*	*CAENORHABDITIS Sp. Plant Nematodes*
80A000422	VIII	*a New Way to*	*CALCULATE the Savings from Fuels Substitute*
80A003115	IX	*Practical Method of Burning Alcohol in Gasoline Tractor and*	*CALCULATION and Charting of Thermodynamic P*
80A000485	IX	*Conference on Alternative Energy Sources * Thermodynamic*	*CALCULATIONS for Otto Cycle Engines Using M*
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80A000323	IX	*Single-cylinder PROCO Engine Studies — Fuel and Engine*	*CALIBRATION Effects on Emissions, Fuel Econ*
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Citation Number	Subject Section	Citation Title	Title Keyword
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79 : 002502	V	*Proceedings Forest and Field Fuels Symposium **	*CANADIAN Production Potential — Fuel Grade M*
80A003012	I		*CANADIAN Renewable Energy Prospects * Can*
80A000553	VIII	*hird International Symposium on Alcohol Fuels Technology **	*CANADIAN Scenario for Methanol Fuel*
80A000010	I	*a*	*CANADIAN Views Alcohol as a Farm Fuel*
80A000738	VI	*nol and Ethanol * Direct Production of Ethanol from Sugar*	*CANE*
78 : 002289	IV	*nergetics and Economics; Comparison with Ethanol from Sugar*	*CANE and Molasses*
80A003076	III	*Sugar*	*CANE Bagasse as a Source of Industrial Alco*
80A003077	III	*Sugar*	*CANE Bagasse as a Source of Industrial Alco*
80A003078	V	*Sugar*	*CANE Bagasse as a Source of Industrial Alco*
80A000607	III	*al Feedstock in Developing Countries * Potential of Sugar*	*CANE Derived Alcohol as a Fuel in Jamaica*
80A000589	III	*loping Countries * Fuel and Chemical Feedstock from Sugar*	*CANE in Central America*
80A000739	III	*ology: Methanol and Ethanol * Direct Processing of Sugar*	*CANE into Ethanol*
80A000578	III	*as Fuel and Chemical Feedstock in Developing Countries **	*CANE Molasses Fermentation Alcohol Industry*
80A003047	III	*Alcohol Motor Fuel from Molasses, I * I. Use of*	*CANE Molasses for Manufacture of Motor Fuel*
80A000048	III	*Conversion of Sugar*	*CANE Products into Fuels and Chemical Feeds*
79 : 005707	VI	*dendum. Final Report * Tsao-Purdue Process, Tilby Sugar*	*CANE Separation Process, Hydrocarbon Extrac*
80A002152	VII	*By-products of the*	*CANE Sugar Industry*
80A000298	VI	*Studies of Continuous Fermentation of Indian*	*CANE Sugar Molasses by Yeast*
80A000644	IX	*Energy Conversion Engineering Conference * Alternate Fuel*	*CAPABILITY of Rankine Cycle Engines*
80A002301	VI	*the Efficiency and*	*CAPACITY of a Bubble Plate Fractionating Co*
80A002302	IX	*the Gaseous Heat*	*CAPACITY of Methyl Alcohol and Ethyl Alcoho*
80A000686	III	*Using Sugar Crops to*	*CAPTURE Solar Energy*
77 : 001295	IX		*CAPTURING the Sun through Bioconversion **
77 : 001296	I		*CAPTURING the Sun through Bioconversion **
77 : 001297	IX		*CAPTURING the Sun through Bioconversion **
77 : 001298	IX		*CAPTURING the Sun through Bioconversion **
77 : 001299	VIII		*CAPTURING the Sun through Bioconversion **
80A000480	I		*CAPTURING the Sun through Bioconversion **
80A000481	I		*CAPTURING the Sun through Bioconversion **
80A000724	VI		*CAPTURING the Sun through Bioconversion **
80A000062	IX	*Brazil — Gearing Up to Produce the All Alcohol*	*CAR*
80A002016	IX	*Development of a Pure Methanol Fuel*	*CAR*
80A002024	IX	*Alcohol Comes Back to Power Your*	*CAR*
80A003018	IX	*Alcohol*	*CAR Conversion*
80A001071	IX	*Multi-fuel*	*CAR Engine Gets New Tests*
80A001262	IX	*Clean Air*	*CAR Race — 1970. a Summary Report*
80A000358	IX	*Clean Air*	*CAR Race Winners Announced*
80A000121	IX	*Does Alcohol Have a Place in Your*	*CAR'S Future?*
80A000740	IX	*Methanol and Ethanol * Development of Methanol and Petrol*	*CARBURATION Systems in the Netherlands*
80A000524	IX	*ohol Fuels Technology * Dual-fueling a Diesel Engine with*	*CARBURETED Alcohol*
80A000301	IX	*ects of Methanol Injection on Emission and Performance in a*	*CARBURETED SI Engine*
80A000543	IX	*nternal Combustion Engines — Significance for Electrostatic*	*CARBURETION*
°0A003068	IX	*the*	*CARBURETION of Alcohol*
0A001049	IX	*Gasohol No Threat to U.S.*	*CARBURETORS*
80A000730	IX	*Effect of Methanol Addition to Gasoline on Spark Ignition,*	*CARBURETTED Engine Performance and Emission*
80A002255	IX	*Hydrocarbons, Methanol, and Formaldehyde Emissions from a*	*CARBURETTED Spark Ignition Engine * a Rep*

Citation Number	Subject Section	Citation Title	Title Keyword
80A003101	XI	*Handling and*	*CARE of Gasohol*
80A000587	I	*ping Countries * Fermentation Alcohol in the Commonwealth*	*CARIBBEAN*
80A000375	IX	*Energy*	*CARRIERS in Space Conditioning and Automoti*
80A000628	IX	*Society Energy Conversion Engineering Conference * Energy*	*CARRIERS in Space Conditioning and Automoti*
80A000508	IX	*of Ethanol/Gasoline and Pure Ethanol in Brazilian Passenger*	*CARS*
80A001170	IX	*Methanol and Ethanol Fuels for Modern*	*CARS*
80A000305	IX	*Evaporative and Exhaust Emissions from*	*CARS Fueled with Gasoline Containing Ethano*
80A000153	IX	*Ford Motor Sets Outlays for*	*CARS Run on Alcohol*
80A002025	VIII	*Alcohol for*	*CARS Termed Spur to Rising Food Prices*
80A000318	IX	*Performance of the Late Model*	*CARS with Gasoline-methanol Fuel*
80A000016	IX		*CARS, Fuel, and Pollution*
80A000013	X		*CARTER Gas-from-grain Program Needs Congres*
80A000014	X		*CARTER Gasohol Plan Isn't Likely to Create*
80A000015	X		*CARTER to Announce Gasohol Plan Soon: Grai*
80A001075	X	*U.S. Details Gasohol Program:*	*CARTER'S Goal Is Rate of 5 Billion Gallons*
80 : 000772	VIII		*CASE for Solar Energy*
80A000668	VIII	*Biomass: a*	*CASH Crop for the Future * Alternative or*
78 : 001792	VIII	*Biomass: a*	*CASH Crop for the Future * Corn Productio*
78 : 001793	VI	*Biomass: a*	*CASH Crop for the Future * Ethanol and Fu*
78 : 001794	IX	*Biomass: a*	*CASH Crop for the Future * Use of Ethanol*
80A002174	IV	*Fermentative Utilization of*	*CASSAVA*
80A000687	IV	*esting and Processing, Workshop * Alcohol Production from*	*CASSAVA*
80A000017	IV		*CASSAVA — Florida's Future Fuel?*
80A003003	IV		*CASSAVA as an Energy Source*
80A000274	VI	*Saccharification of*	*CASSAVA for Ethyl Alcohol Production*
80A000689	IV	*assava Harvesting and Processing, Workshop * Prospects of*	*CASSAVA Fuel Alcohol in Brazil*
78 : 002289	IV	*iety Energy Conversion Engineering Conference. Volume I **	*CASSAVA Fuel Alcohol in Brazil * Energeti*
80A000687	IV		*CASSAVA Harvesting and Processing, Workshop*
80A000688	IV		*CASSAVA Harvesting and Processing, Workshop*
80A000689	IV		*CASSAVA Harvesting and Processing, Workshop*
80A000565	VI	*in Developing Countries * Direct Hydrolysis of Wet Milled*	*CASSAVA Roots*
80A000688	IV	*Cassava Harvesting and Processing, Workshop * Large-scale*	*CASSAVA Starch Extraction Processes*
80A000571	VI	*stock in Developing Countries * Simplified and Economical*	*CASSAVA Starch Process*
80A000018	IV		*CASSAVA: Its Potential as an Industrial Cr*
80A000019	VI		*CATALYTIC Decomposition of Cellulose under*
80A001234	VII	*Distillers' Feeds as Protein Sources for Beef*	*CATTLE*
80A003100	I	*Alcohol and the*	*CATTLE Industry*
80A002143	I	*Gasoline Crisis Presented to the U.S. Congressional Gasohol*	*CAUCUS*
80A001086	VI	*lysis * Fermentation of Hydrolysate to Ethanol and Single*	*CELL Protein*
80A000257	VI	*Rapid Ethanol Fermentations Using Vacuum and*	*CELL Recycle Saccharomyces Cerevisiae*
80A000297	VI	*Characterization of a Glycoprotein Cellulase, 1, 4-D-GLUCAN*	*CELLOBIOHYDROLASE C from Trichoderma Viride*
80A002069	VI	*Fermentation of Cellulose and*	*CELLOBIOSE by Clostridium Thermocellum in T*
80A000021	VI		*CELLOBIOSE from Trichoderma Viride: Purifi*
80A000224	VI	*Measurement of Saccharifying*	*CELLULASE*
80A000346	VI	*al Woody Wastes by Saccharification with Trichoderma Viride*	*CELLULASE*
80A001065	VI	*cs of Solka Floc Cellulose Hydrolysis by Trichoderma Viride*	*CELLULASE*
80A002003	VI	*Degradation of Cellulosic Materials by Trichoderma Viride*	*CELLULASE*
80 : 002118	VI	*hod for Production of Alcohol Directly from Cellulose Using*	*CELLULASE and Yeast*
80A002085	VI	*Growth Kinetics and*	*CELLULASE Biosynthesis in the Continuous*
80A001142	VI	*Production of*	*CELLULASE by Trichoderma*
80A000664	VI	*Hydrolysis of Cellulose * Action of the Components of the*	*CELLULASE Complex*
80A000134	VI	*Effect of Cultural Conditions on*	*CELLULASE Formation by Trichoderma Viride*

Citation Number	Subject Section	Citation Title	Title Keyword
80A002017	VI	Adsorption of Trichoderma	CELLULASE on Cellulose
80 : 000217	VIII	sium on Fuels from Biomass * Reassessment of Economics of	CELLULASE Process Technology: for Producti
80A000042	VI	Comments on	CELLULASE Production
80A000666	VI	ulose * Kinetic and Dynamic Studies of Trichoderma Viride	CELLULASE Production
80A001129	VI	Pilot Scale Investigations and Economics of	CELLULASE Production
80A000665	VI	mposium on Enzymatic Hydrolysis of Cellulose * Growth and	CELLULASE Production by Trichoderma
80A000022	VI		CELLULASE Production by Trichoderma Viride
80A000251	VI	a Method for Increasing	CELLULASE Production by Trichoderma Viride
80A000023	VI		CELLULASE Production in Semisolid Cultures
80A000024	VI		CELLULASE Production: Summary
80A002090	VI	History of	CELLULASE Program at U.S. Army Natick Devel
80A000297	VI	Structural Characterization of a Glycoprotein	CELLULASE, 1, 4-D-GLUCAN Cellobiohydrolase
80A001236	VI	Cellulases and Their Applications * the Production of	CELLULASES
80A001237	VI		CELLULASES and Their Applications * Enzym
80A001236	VI		CELLULASES and Their Applications * the P
80A000169	VI	Fungal	CELLULASES as an Aid for the Saccharificati
79 : 001110	VI	of Sugars and Ethanol Based on the Enzymatic Hydrolysis of	CELLULOSE
79 : 003453	VI	of Nitrogen Oxide Pretreatments on Enzymatic Hydrolysis of	CELLULOSE
80 : 000217	VIII	llulase Process Technology: for Production of Ethanol from	CELLULOSE
80 : 001986	VI	Systems Conference * Enzymatic Saccharification of Waste	CELLULOSE
80A000031	V	Cheap Alcohol from	CELLULOSE
80A000046	VI	Continuous Cultivation of Trichoderma Viride on	CELLULOSE
80A000367	VI	Anaerobic Mechanisms for the Degradation of	CELLULOSE
80A000663	VI	Symposium on Enzymatic Hydrolysis of	CELLULOSE
80A000682	VI	ghth Cellulose Conference * Enzymatic Hydrolysis of Waste	CELLULOSE
80A000717	VI	rocess Developmental Studies on the Enzymatic Hydrolysis of	CELLULOSE
80A001121	VI	Non-aqueous Solvents of	CELLULOSE
80A001143	VI	Production of Glucose by Enzymatic Hydrolysis of	CELLULOSE
80A002017	VI	Adsorption of Trichoderma Cellulase on	CELLULOSE
80A002020	V	Agricultural and Forest Products as Sources of	CELLULOSE
80A002035	VI	Enzymatic Hydrolysis of Waste	CELLULOSE
80A002076	VI	Microbial Production and Effect on Enzymatic Hydrolysis of	CELLULOSE
80A002163	V	Fermentation Products of	CELLULOSE
80A000664	VI	Symposium on Enzymatic Hydrolysis of	CELLULOSE * Action of the Components of the
77 : 000111	V	duction * Production of Ethanol from Materials Containing	CELLULOSE * Economic Feasibility
80A000665	VI	Symposium on Enzymatic Hydrolysis of	CELLULOSE * Growth and Cellulase Producti
80A000666	VI	Symposium on Enzymatic Hydrolysis of	CELLULOSE * Kinetic and Dynamic Studies
80A000667	VI	Symposium on Enzymatic Hydrolysis of	CELLULOSE * Topological Effects in Enzyma
79 : 004127	II	Technology and Economics of Conversion of	CELLULOSE (Wood) and Corn Starch to Sugars,
80A002069	VI	Fermentation of	CELLULOSE and Cellobiose by Clostridium the
80A002298	V	the Anaerobic Fermentation of	CELLULOSE and Cellulosic Materials
80A002190	V	Kinetics of Wood Saccharification: Hydrolysis of	CELLULOSE and Decomposition of Sugars in Di
80A001127	VI	Physical and Chemical Constraints in the Hydrolysis of	CELLULOSE and Lignocellulosic Materials
80A000254	VI	Properties of	CELLULOSE and Lignocellulosic Materials as
78 : 002267	VI	Pilot Plant Studies of the Bioconversion of	CELLULOSE and Production of Ethanol
79 : 004131	VI	Process Development Studies on the Bioconversion of	CELLULOSE and Production of Ethanol
80A002034	VI	Enzymatic Hydrolysis of	CELLULOSE and Simultaneous Fermentation to
80A000717	VI		CELLULOSE as a Chemical and Energy Resource
80A000718	VI		CELLULOSE as a Chemical and Energy Resource
80A000719	VI		CELLULOSE as a Chemical and Energy Resource
80A000729	VI		CELLULOSE as a Chemical and Energy Resource
80A001100	VI		CELLULOSE as a Chemical and Energy Resource

Citation Number	Subject Section	Citation Title	Title Keyword
80A000679	VI	th Cellulose Conference * Production of Sugars from Waste	CELLULOSE by Enzymatic Hydrolysis. I. Prim
80A002036	VI	Enzymatic Saccharification of	CELLULOSE by Thermophilic Actionmyces
80A000681	VI	Proceedings of the Eighth	CELLULOSE Conference * Acid Hydrolysis an
80A000682	VI	Proceedings of the Eighth	CELLULOSE Conference * Enzymatic Hydrolys
80A000680	VI	Proceedings of the Eighth	CELLULOSE Conference * Process-developmen
80A000679	VI	Proceedings of the Eighth	CELLULOSE Conference * Production of Suga
80A001125	VI	Perspectives on Preparation of	CELLULOSE for Hydrolysis
78 : 001832	V	Clean Fuel from Biomass and Wastes * Utilization of Waste	CELLULOSE for Production of Chemical Feedst
80 : 000216	VI	osium on Fuels from Biomass * Thermophilic Degradation of	CELLULOSE for Production of Liquid Fuels
80A001064	VI	Kinetics of Acid Hydrolysis of	CELLULOSE Found in Paper Refuse
80A000020	VI		CELLULOSE from Sunlight
80 : 002077	VI	and Microbial Protein * Production of Ethyl Alcohol from	CELLULOSE Hydrolysate
79 : 001712	VI	Preliminary Engineering and Cost Analysis of Purdue/Tsao	CELLULOSE Hydrolysis (Solvent) Process
80A001065	VI	Kinetics of Solka Floc	CELLULOSE Hydrolysis by Trichoderma Viride
80A000084	VI	the	CELLULOSE Hydrolysis Pathway to Ethanol
80A000361	VI	Acid Hydrolysis of	CELLULOSE in Refuse to Sugar and Its Fermen
80A001237	VI	es and Their Applications * Enzymatic Saccharification of	CELLULOSE in Semi- and Continuously Agitate
80A001083	VI	the Use of Absorbed	CELLULOSE in the Continuous Conversion of C
80A000213	V	Green Gold (Converting	CELLULOSE into Ethyl Alcohol)
80A002314	V	Production of Liquid Transport Fuel from	CELLULOSE Material (Wood)
80A002310	V	Production of Liquid Transport Fuel from	CELLULOSE Material (Wood) * Laboratory Pr
78 : 002739	VI	Production of Liquid Transport Fuel from	CELLULOSE Material (Wood). II. Energy Co
80A000719	VI	Cellulose as a Chemical and Energy Resource * Continuous	CELLULOSE Production
80A000727	VI	rials * Physical and Chemical Pretreatments for Enhancing	CELLULOSE Saccharification * Biotechnolog
80A000728	VI	Enzymatic Conversion of Cellulosic Materials *	CELLULOSE Saccharification for Fermentation
80A000259	VIII	Remarks on the Process Economics of Enzymatic Conversion of	CELLULOSE to Glucose
80A001083	VI	Use of Absorbed Cellulose in the Continuous Conversion of	CELLULOSE to Glucose
80A000025	V		CELLULOSE to Sugars: Gives Quantitative Yi
80A000019	VI	Catalytic Decomposition of	CELLULOSE under Biological Conditions
80 : 002118	VI	Protein * Method for Production of Alcohol Directly from	CELLULOSE Using Cellulase and Yeast
78 : 002751	V	General Considerations on	CELLULOSE Utilization: an Overview
80A002311	VII	the Recovery of Fermentation Products from	CELLULOSE Wastes via Acid Hydrolysis
80A000047	VI	Continuous Enzymatic Saccharification of	CELLULOSE with Culture Filtrate of Trichode
80A002079	VI	Continous	CELLULOSE-TO-GLUCOSE Process
78 : 002720	V		CELLULOSE, Food and Energy
76 : 000667	V		CELLULOSE: the Ultimate Resource, New Path
80 : 001983	VI	ergy Systems Conference * Production of Liquid Fuels from	CELLULOSIC Biomass
80 : 001996	VI	al Biomass Energy Systems Conference * Acid Hydrolysis of	CELLULOSIC Biomass
79 : 001106	VI	Degradation of	CELLULOSIC Biomass and Its Subsequent Utili
80 : 002014	VI	Systems Conference * Direct Microbiological Conversion of	CELLULOSIC Biomass to Ethanol
80A000003	V	Can There Be Effective Utilization of	CELLULOSIC Feedstock in the Production of F
80A003094	V	Incorporating	CELLULOSIC Feedstocks with Starch and Sugar
80A000034	V	Chemical Breakdown of	CELLULOSIC Materials
80A000111	VI	eatments to Enhance Enzymatic and Microbiological Attack of	CELLULOSIC Materials
80A000472	VI	Microbial Energy Conversion * Enzymatic Hydrolysis of	CELLULOSIC Materials
80A001135	VI	Enhance Chemical, Enzymatic, and Microbiological Attack of	CELLULOSIC Materials
80A002298	V	the Anaerobic Fermentation of Cellulose and	CELLULOSIC Materials
80A000725	VI	Enzymatic Conversion of	CELLULOSIC Materials * Biotechnology and
80A000728	VI	Enzymatic Conversion of	CELLULOSIC Materials * Cellulose Sacchari
80A000726	VI	Enzymatic Conversion of	CELLULOSIC Materials * Fermentation Ethyl
80A000727	VI	Enzymatic Conversion of	CELLULOSIC Materials * Physical and Chemi
80A002003	VI	Degradation of	CELLULOSIC Materials by Trichoderma Viride

Citation Number	Subject Section	Citation Title	Title Keyword
80A000105	VI	*Differential Speed Two Roll Mill Pretreatment of*	***CELLULOSIC** Materials for Enzymatic Hydrolys*
80A000295	VI	*Structural Features of*	***CELLULOSIC** Materials in Relation to Enzymat*
80A001086	VI	*Utilization of*	***CELLULOSIC** Materials through Enzymatic Hydr*
80A001087	VI	*Utilization of*	***CELLULOSIC** Materials through Enzymatic Hydr*
80A000354	V	*Hydrolysis of*	***CELLULOSIC** Materials to Useful Products*
80A002033	VI	*Enzymatic Conversion of*	***CELLULOSIC** Materials: Technology and Appli*
80 : 002077	VI	*Bioconversion of*	***CELLULOSIC** Substances into Energy Chemicals*
80 : 002118	VI	*Bioconversion of*	***CELLULOSIC** Substances into Energy Chemicals*
80A000127	VIII	*Economic Factors in the Assessment of Various*	***CELLULOSIC** Substrates as Chemical and Energ*
80A000026	VI		***CELLULOSIC** Substrates for Enzymatic Sacchar*
80A000049	V	*Costs Prohibit*	***CELLULOSIC** Use as Feedstock*
80A000449	V	*Utilization of*	***CELLULOSIC** Waste for Energy Production*
80A001214	V	*Disposal of*	***CELLULOSIC** Waste Materials by Enzymatic Hyd*
80A000372	V	*Converting*	***CELLULOSIC** Waste to Fuel: a Literature Rev*
80A000530	V	*sium on Alcohol Fuels Technology * Ethanol from Municipal*	***CELLULOSIC** Wastes*
80A000483	VI	*efuse, (and) Agriculture Wastes * Enzymatic Hydrolysis of*	***CELLULOSIC** Wastes to Fermentable Sugars for*
80A000724	VI	*the Sun through Bioconversion * Enzymatic Hydrolysis of*	***CELLULOSIC** Wastes to Glucose*
80A002265	VI	*Enzymic Hydrolysis of*	***CELLULOSIC** Wastes to Glucose*
80A001134	VI	*Pretreatment of*	***CELLULOSIC** Wastes to Increase Enzyme Reacti*
80A000184	VI	*Liquid Chromatography for Monitoring the Conversion of*	***CELLULOSIC** Wastes to Sugars*
80A003086	V	*Properties of Powdered Wood and Isolation of Lignin by*	***CELLULYTIC** Enzymes*
80A002090	VI	*istory of Cellulase Program at U.S. Army Natick Development*	***CENTER***
80A003014	VIII	*On-farm Energy Production Systems * Univ. of Washington.*	***CENTER** for the Biology of Natural Systems.*
80A000589	III	*ountries * Fuel and Chemical Feedstock from Sugar Cane in*	***CENTRAL** America*
80A000470	IX	*Combustion Institute,*	***CENTRAL** States Section: Spring Meeting. M*
80A000471	IX	*Combustion Institute,*	***CENTRAL** States Section: Spring Meeting. M*
80A003064	VI	*ent and Design of Continuous Cooking and Mashing System for*	***CEREAL** Grains*
80A002299	IV	*ethod of Saccarification and Yields of Ethanol from Various*	***CEREALS***
80A000257	VI	*Fermentations Using Vacuum and Cell Recycle Saccharomyces*	***CEREVISIAE***
80A000135	VI	*iscontinuous Feeding on Ethanol Production by Saccharomyces*	***CEREVISIAE** (Yeast)*
80A000087	IX	*Effectiveness of Fuel*	***CETANE** Number for Combustion Control in Bi-*
80A001264	V	*Forests for People: a*	***CHALLENGE** in World Affairs * the Role of*
80A000672	IX	*Resources*	***CHALLENGE**: Technological Thrust, Social Im*
79 : 007143	I	*Energy Technology V:*	***CHALLENGES** to Technology * Petroleum Plan*
80A000306	IX	*Fuel Droplet Size Distribution in Diesel Combustion*	***CHAMBER***
80A000029	VIII		***CHANGING** Targets for the Investor*
80A000181	I	*Gasohol:*	***CHANGING** the Energy Drinking Habit*
80A000370	IX	*oline Blends as Automotive Fuel — Performance and Emissions*	***CHARACTERISTICS***
80A001182	IX	*hod in the Study of Alternate Fuel, Combustion and Emission*	***CHARACTERISTICS***
80A000730	IX	*park Ignition, Carburetted Engine Performance and Emissions*	***CHARACTERISTICS** * Volume 20*
80A001184	IX	*tomotive Fuels * Engine Performance and Exhaust Emissions*	***CHARACTERISTICS** of a Methanol Fuel Automobi*
80A002304	IX	*Power, Fuel Consumption, and Exhaust Emission*	***CHARACTERISTICS** of an Internal Combustion E*
77 : 001298	IX	*Capturing the Sun through Bioconversion * Properties and*	***CHARACTERISTICS** of Gasoline/Methanol Fuel*
80A002305	IX	*nd Analytical Comparisons of the Performance and Combustion*	***CHARACTERISTICS** of Gasoline, Methane, and M*
80A002292	IX	*Performance and Knocking*	***CHARACTERISTICS** of Low Octane Fuels Blended*
80A000309	IX	*Knocking and Performance*	***CHARACTERISTICS** of Low Octane Primary Refer*
80A000326	IX	*Combustion and Emission*	***CHARACTERISTICS** of Methanol*
80A000307	IX	*Fuel Economy and Emission*	***CHARACTERISTICS** of Methanol-gasoline Blends*
80A000341	IX	*ion Engine Study of the Octane, Emissions, and Fuel Economy*	***CHARACTERISTICS** of Methanol-gasoline Blends*
80A000643	IX	*version Engineering Conference * Combustion and Emissions*	***CHARACTERISTICS** of Methanol, Methanol-water*
80A002316	IX	*Engine Performance and Exhaust Emission*	***CHARACTERISTICS** of Spark-ignition Engines B*
80A000141	IX	*Energy-ecological*	***CHARACTERISTICS** of Synthetic Fuels*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000655	IX	*version Engineering Conference * Performance and Emission*	*CHARACTERISTICS Using Blends of Methanol an*
80A001263	IX		*CHARACTERIZATION and Research Investigation*
80A000297	VI	*Structural*	*CHARACTERIZATION of a Glycoprotein Cellulas*
80A000549	IX	*hird International Symposium on Alcohol Fuels Technology **	*CHARACTERIZATION of Alcohol/Gasoline Blends*
80A001232	IX	*eport: Highway Systems Contractors Coordination Meeting **	*CHARACTERIZATION of Methanol as an Automoti*
80A000370	IX		*CHARACTERIZATION of Methanol/Gasoline Blend*
80A000343	IX	*Water-cooled Volkswagen PC1-stratified*	*CHARGE Engine*
80A000645	IX	*Combustion of Methanol and Methanol Blends in a Stratified*	*CHARGE Engine*
80A002125	IX	*Combustion of Methanol and Methanol Blends in a Stratified*	*CHARGE Engine*
80A000338	IX	*Performance of Methanol-gasoline Blends in a Stratified*	*CHARGE Engine Vehicle*
80A000551	IX	*lcohol Fuels Technology * Alcohol Blend Use in Stratified*	*CHARGE Engines*
80A000469	IX	*Proceedings, Stratified*	*CHARGE Engines Conference * Present Exper*
80A000469	IX	*Engines Conference * Present Experience with Stratified*	*CHARGE Engines Working with Initial Separat*
80A003115	IX	*of Burning Alcohol in Gasoline Tractor and Calculation and*	*CHARTING of Thermodynamic Properties of Eth*
80A003070	IX		*CHASSIS-DYNAMOMETER and Road Tests of Alcoh*
80A000201	VIII	*Gasohol Pioneer Shows It Isn't*	*CHEAP*
80A000031	V		*CHEAP Alcohol from Cellulose*
80A000032	I		*CHEAPER Ethanol 'Gas' on Its Way*
80A001106	V	*Will Old Newspapers Make a Good*	*CHEM Brew*
80A000249	I	*Methanol Technology and Economics **	*CHEM. Eng. Prog., Symp. Ser., V. 66, No. 98*
80A000619	I	*Methanol Technology and Economics **	*CHEM. Eng. Prog., Symp. Ser., V. 66, No. 98*
80A001244	VI	*cation of a Mathematical Model of the Methanol Synthesis **	*CHEM. Eng. Prog., Symp. Ser., V. 66, No. 98*
80A002279	VI	*Extractive and Azeotropic Distillation * Adv.*	*CHEM. Ser., No. 115*
80A001100	VI	*Cellulose as a*	*CHEMICAL and Energy Resource*
80A000719	VI	*Cellulose as a*	*CHEMICAL and Energy Resource * Continuous*
80A000729	VI	*Cellulose as a*	*CHEMICAL and Energy Resource * Ethanol Fe*
80A000717	VI	*Cellulose as a*	*CHEMICAL and Energy Resource * Process De*
80A000718	VI	*Cellulose as a*	*CHEMICAL and Energy Resource * the Acid H*
80A000127	VIII	*ctors in the Assessment of Various Cellulosic Substrates as*	*CHEMICAL and Energy Resources*
80A000034	V		*CHEMICAL Breakdown of Cellulosic Materials*
80A001127	VI	*Physical and*	*CHEMICAL Constraints in the Hydrolysis of C*
80A002205	V		*CHEMICAL Economics of Wood Hydrolysis*
80A000648	IX	*Proceedings, 4th International Congress in Scandanavia on*	*CHEMICAL Engineering * Alcohols as Gasoli*
80A000674	IX	*76/6 * Preprints of Papers; Fourth National Conference on*	*CHEMICAL Engineering, Adelaide, Aug. 25-26,*
80A000566	I	*edstock in Developing Countries * Use of Ethyl Alcohol as*	*CHEMICAL Feedstock*
80A000589	III	*and Chemical Feedstock in Developing Countries * Fuel and*	*CHEMICAL Feedstock from Sugar Cane in Centr*
80A000564	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000565	VI	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000566	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000567	II	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000568	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000569	VI	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000570	X	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000571	VI	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000572	X	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000573	VIII	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000574	VI	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000575	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000576	VI	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000577	VIII	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000578	III	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000579	X	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000580	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000581	VIII	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000582	VII	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000583	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000584	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000585	XI	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000586	VIII	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000587	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000588	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000589	III	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000590	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000591	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000592	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000593	II	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000594	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000595	VI	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000596	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000597	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000598	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000600	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000601	XI	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000602	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000603	X	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000604	VI	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000605	I	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000606	III	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000607	III	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000608	VII	*Workshop on Fermentation Alcohol for Use as Fuel and*	*CHEMICAL Feedstock in Developing Countries*
80A000351	I	*Biomass Ethanol as a*	*CHEMICAL Feedstock in the United States*
79:001109	III	*garcane, Sweet Sorghum, Sugar Beets, and Corn for Fuels and*	*CHEMICAL Feedstocks*
80A000048	III	*Conversion of Sugar Cane Products into Fuels and*	*CHEMICAL Feedstocks*
80A001036	VIII	*Biochemical Engineering: Renewable Sources of Energy and*	*CHEMICAL Feedstocks (Food and Energy Crop S*
78:001832	V	*Wastes * Utilization of Waste Cellulose for Production of*	*CHEMICAL Feedstocks via Acid Hydrolysis*
79:001106	VI	*iomass and Its Subsequent Utilization for the Production of*	*CHEMICAL Feedstocks. Progress Report, Mar*
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80A000600	I	*ries * Products of Photosynthesis as Raw Material for the*	*CHEMICAL Industry*
80A002181	I	*Industrial Alcohol from Crops.*	*CHEMICAL Outlet for British Agriculture*
80A000727	VI	*zymatic Conversion of Cellulosic Materials * Physical and*	*CHEMICAL Pretreatments for Enhancing Cellul*
80A000473	VI	*Energy Conversion * the Competition between Microbial and*	*CHEMICAL Processes for the Manufacture of B*
80A002238	IX	*Encyclopedia of*	*CHEMICAL Processing and Design * Alcohol,*
80A000489	V	*Southern Tree Plantations and Its Conversion to Energy or*	*CHEMICAL Products*
80A000035	XI		*CHEMICAL Relevance — a Heuristic Approach.*
80:000244	V	*Technology of Utilizing Bark and Residues as an Energy and*	*CHEMICAL Resource * Mesquite: a Possible*
80A001180	I	*Encyclopedia of*	*CHEMICAL Technology * Methanol * Volume*
80A001205	I	*Ethyl Alcohol Production and Use as a Motor Fuel **	*CHEMICAL Technology Review, No. 144*
80A000494	I	*Encyclopedia of*	*CHEMICAL Technology, V. 9 * Ethanol*
80A001239	I	*Methanol as an Alternative Fuel * Methanol —*	*CHEMICAL Uses Today*
80A001135	VI	*Pretreatments to Enhance*	*CHEMICAL, Enzymatic, and Microbiological at*
79:004141	VI	*Volume V. Biochemical Conversion of Biomass to Fuels and*	*CHEMICALS*
80:000214	VI	*Anaerobic Biomass Degradation to Produce Sugars, Fuels and*	*CHEMICALS*
80A000262	I	*Renewable Resources for the Production of Fuels and*	*CHEMICALS*
80A000379	V	*the Feasibility of Utilizing Forest Residues for Energy and*	*CHEMICALS*

Citation Number	Subject Section	Citation Title	Title Keyword
80A001174	X	lume IV. Thermochemical Conversion of Biomass to Fuels and	CHEMICALS
80A001235	II	versus Ethylene as Sources of Ethanol for Motor Fuels and	CHEMICALS
80A000473	VI	crobial and Chemical Processes for the Manufacture of Basic	CHEMICALS and Intermediates
80 : 002118	VI	Bioconversion of Cellulosic Substances into Energy	CHEMICALS and Microbial Protein * Method
80 : 002077	VI	Bioconversion of Cellulosic Substances into Energy	CHEMICALS and Microbial Protein * Product
80A000584	I	Conditions to Promote and Realize a Policy for Energy and	CHEMICALS Based on "Green Petrol"
80A001105	V	Will	CHEMICALS Build a Base on Wood
80A002065	VI	the Feasibility of Basic	CHEMICALS for Fermentation Processes
80A000163	V	Fuels and	CHEMICALS from Biomass
79 : 007164	VI		CHEMICALS from Biomass by Improved Enzyme T
80A003019	I		CHEMICALS from Fermentation
80A000036	V		CHEMICALS from Lignocellulose
80 : 002047	VI		CHEMICALS from Renewable Raw Materials
80A000037	V		CHEMICALS from Trees
80A002315	V		CHEMICALS from Wood Waste
80A000575	I	Countries * Present Status of Alcohol and Alcohol Based	CHEMICALS Industry in India
80A001152	VII	Treated with	CHEMICALS, Corn Residue as Good Feed as Cor
80A000442	V	otential of Lignocellulosic Materials for the Production of	CHEMICALS, Fuels, and Energy
80A003118	VI	Role of the	CHEMIST in Relation to the Future Supply of
80A001186	VI	Basic Fermentation	CHEMISTRY in a Nut Shell
80A003022	I	Alcohols: Their	CHEMISTRY, Properties, and Manufacture
80A000641	IX	me I * Exhaust and Evaporative Emissions from a Brazilian	CHEVROLET Fueled with Ethanol-gasoline Blen
80A002293	IX	Ethyl Alcohol as Tractor Fuel in	CHINA
80A001044	V	Gasohol from Wood	CHIPS
80A002260	VIII	Gasohol — a Critical	CHOICE (Fuel, Energy Sources)
80A000303	IX	Engineering Options in the	CHOICE of Automotive Fuels in the Next Deca
80A002269	I	Do We Have a	CHOICE?
80A000090	I	Energy	CHOICES that Europe Faces
80A003017	IX	Interpretation of Gas	CHROMATOGRAPHIC Spectra in Routine Analysis
80A000184	VI	Liquid	CHROMATOGRAPHY for Monitoring the Conversio
80A001102	IX		CHRYSLER, G.M. Put Gasohol in Warranty
80A000657	IX	erformance with Methanol as a Supplementary Fuel for SI and	CI Engines
80A002142	I	Gasohol — Are Alcohol Fuels in Our Future? *	CITIZEN'S Energy Project Report Series, No.
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80A000166	I	Fuels from Crops: Renewable and	CLEAN
80A001262	IX		CLEAN Air Car Race — 1970. a Summary Repor
80A000358	IX		CLEAN Air Car Race Winners Announced
80A000721	IX	Proceedings, 4th International	CLEAN Air Congress * Clean Air through Me
80A000721	IX	Proceedings, 4th International Clean Air Congress *	CLEAN Air through Methanol Technology
80A000215	IX	Methanol — a	CLEAN Burning Fuel for Automobile Engines
80A000322	IX	Role of Methanol as a	CLEAN Fuel
78 : 001830	V		CLEAN Fuel from Biomass and Wastes * Ener
78 : 001832	V		CLEAN Fuel from Biomass and Wastes * Util
80A000670	I		CLEAN Fuels from Biomass and Wastes * Bio
80A000669	IX		CLEAN Fuels from Biomass and Wastes * the
80A000483	VI	Symposium Papers (on)	CLEAN Fuels from Biomass, Sewage, Urban Ref
80 : 000950	VIII	California	CLEAN Fuels Study * Availability to Indus
80A000040	I	the	CLEAN Synthetic Fuel That's Already Here
80A000116	X	DOE	CLEARS Way for Amoco Oil Company to Market
80A002050	I	Ethanol: It's a Slow, Uphill	CLIMB

Citation Number	Subject Section	Citation Title	Title Keyword
80A000070	X	Brazil to	CLOSE Down Alcohol Technology Project
80A002069	VI	Fermentation of Cellulose and Cellobiose by	CLOSTRIDIUM Thermocellum in the Absence and
80A001020	I	Argument	CLOUDS Gasohol Issue
80A000088	VI	Efficiencies of Methanol Production from Gas,	COAL, Waste or Wood
80A000532	VII	* the Production of Grain Alcohol and Electric Power with	COGENERATION of Steam
80A000513	IX	mposium on Alcohol Fuels Technology * Factors Influencing	COLD Starting of Engines Operating on Alcho
80A000546	IX	ernational Symposium on Alcohol Fuels Technology * Engine	COLD-START with Dissociated Methanol
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80A003008	I	Agriculture and Energy * Nebraska Univ., Lincoln (USA).	COLL. of Agriculture and Home Economics. De
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80A003108	VII	ucts for Feeding in Colorado * Colorado State Univ., Fort	COLLINS (USA). Agricultural Experiment Stat
80A003089	VII	Use of Grain Alcohol By-products in	COLORADO
80A003108	VII	Grain Alcohol Fermentation By-products for Feeding in	COLORADO * Colorado State Univ., Fort Col
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80A002297	VI	the Erection and Testing of a Methanol Stripping	COLUMN
80A002300	VI	Absorption of Ethanol Vapor in a Packed	COLUMN
80A002301	VI	the Efficiency and Capacity of a Bubble Plate Fractionating	COLUMN When Distilling Mixtures of Ethyl Al
80A003124	XI	Standard for Storage of Flammable and	COMBUSTIBLE Liquids on Farms and Isolated C
80A000660	IX	Proceedings, 5th National Conference I.C. Engines	COMBUSTION * an Investigation of Using Al
80A000657	IX	Proceedings, 5th National Conference I.C. Engines	COMBUSTION * Comparative Studies of Engin
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80A000661	IX	Proceedings 14th Symposium (International) on	COMBUSTION * Fuel Droplet Burning Rates a
80A000653	IX	Proceedings, 3rd National Conference I.C. Engines and	COMBUSTION * Investigation of Some Factor
80A000652	IX	Proceedings, 3rd National Conference I.C. Engines and	COMBUSTION * Investigations into the Suit
80A000488	IX	17th Symposium International	COMBUSTION * Kinetics of the Oxidation of
80A000649	IX	Proceedings, 4th National Conference I.C. Engines and	COMBUSTION * Methanol Blended Gasoline as
80A000662	IX	Proceedings 14th Symposium (International) on	COMBUSTION * Nitric Oxide Formation in Dr
80A000658	IX	Proceedings, 5th National Conference I.C. Engines	COMBUSTION * Some Factors Affecting the C
80A000659	IX	Proceedings, 5th National Conference I.C. Engines	COMBUSTION * Some Tests with Ethyl Alcoho
80A000651	IX	Proceedings, 3rd National Conference I.C. Engines and	COMBUSTION * Use of Methanol in the Diese
80A001182	IX	Future Automotive Fuels * Application of New	COMBUSTION Analysis Method in the Study of
80A001182	IX	Combustion Analysis Method in the Study of Alternate Fuel,	COMBUSTION and Emission Characteristics
80A000326	IX		COMBUSTION and Emission Characteristics of
80A000544	IX	hird International Symposium on Alcohol Fuels Technology *	COMBUSTION and Emission of Gaseous Fuel Fro
80A000643	IX	th Intersociety Energy Conversion Engineering Conference *	COMBUSTION and Emissions Characteristics of
80A000331	IX	Ignition,	COMBUSTION and Exhaust Emissions of Lean Mi
80A000639	IX	stion Institute Western States Section 1975 Fall Meeting *	COMBUSTION and Pollutant Kinetic Modeling F
80A000512	IX	echnology * Flame Quenching and Exhaust Hydrocarbons in a	COMBUSTION Bomb as a Function of Pressure,
80A000306	IX	Fuel Droplet Size Distribution in Diesel	COMBUSTION Chamber
80A002305	IX	erimental and Analytical Comparisons of the Performance and	COMBUSTION Characteristics of Gasoline, Met
80A000087	IX	Effectiveness of Fuel Cetane Number for	COMBUSTION Control in Bi-fuel Diesel Engine
80A000741	IX	* Fuel Converter with Methanol for Spark-ignition Internal	COMBUSTION Engine
80A002296	IX	nt of Aldehyde Concentrations in the Exhaust of an Internal	COMBUSTION Engine Fueled by Alcohol/Gasolin
80A002304	IX	mption, and Exhaust Emission Characteristics of an Internal	COMBUSTION Engine Using Isooctane and Metha
80A002122	I	Alternate Portable Fuels for Internal	COMBUSTION Engines
80A002200	IX	Alcohol Fuels for Use in Internal	COMBUSTION Engines
80A002242	IX	Alcohol — a Fuel for Internal	COMBUSTION Engines
80A000693	IX	Design and Development of Small Internal	COMBUSTION Engines * Future Fuels for Sma
80A003113	IX	Fuel Values of Gasoline and Denatured Alcohol, in Internal	COMBUSTION Engines * U.S. Bureau of Mines
80A000543	IX	levant to the Fueling of Alcohols in Spark Ignited Internal	COMBUSTION Engines — Significance for Elect
80A003112	IX	Tests of Internal	COMBUSTION Engines on Alcohol Fuel * U.S.
80A000415	IX	Performance and NOx Emissions of Spark Ignited	COMBUSTION Engines Using Alternative Fuels

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000492	IX	sion Engineering Conference * Fueling Automotive Internal	COMBUSTION Engines with Methanol — Historic
80A000629	I	sion Engineering Conference * Fueling Automotive Internal	COMBUSTION Engines with Methanol — Historic
80A000684	IX	Optimized	COMBUSTION in a Methanol — Fuelled Spark —
80A000639	IX		COMBUSTION Institute Western States Section
80A000640	IX		COMBUSTION Institute Western States Section
80A000470	IX		COMBUSTION Institute, Central States Sectio
80A000471	IX		COMBUSTION Institute, Central States Sectio
80A000645	IX	th Intersociety Energy Conversion Engineering Conference *	COMBUSTION of Methanol and Methanol Blends
80A002125	IX		COMBUSTION of Methanol and Methanol Blends
80A000635	IX	rospects, Performance, Perspective Symposium Proceedings *	COMBUSTION of Methanol in an Automotive Gas
80A000696	IX	ymposium on Low Pollution Power Systems Development * the	COMBUSTION of Methanol Mixed with Water as
80A000332	IX	Lean	COMBUSTION of Methanol-gasoline Blends in a
80A000380	IX	Formation of NO and NO_2 in the I.C. Engine	COMBUSTION of Methyl Alcohol and Fuel-nitro
80A000515	IX	hol Fuels Technology * Thermokinetic Modeling of Methanol	COMBUSTION Phenomena with Application to Sp
80A000658	IX	s Combustion * Some Factors Affecting the Compression and	COMBUSTION Processes in Alcohol-diesel Oil
80A003115	IX	ermodynamic Properties of Ethyl Alcohol-air Mixture and Its	COMBUSTION Products * Univ. of Kentucky.
80A002119	IX	Fifty Years of	COMBUSTION Research at General Motors
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80A000476	IX	Massachusetts Institute of Technology International	COMBUSTION Symposium * in Situ Optical Me
80A000654	IX	Proceedings, Symposium on Emissions from Continuous	COMBUSTION Systems * Measurement of Nitri
80 : 002059	I	New Fuels and Advances in	COMBUSTION Technologies
80A000685	I	New Fuels Advances in	COMBUSTION Technologies. Symposium Paper
80A000287	IX	Some Examples of	COMBUSTION Tests for Putting New Fuels to P
80A000359	IX	xhaust Emissions from a Methanol and Jet Fueled Gas Turbine	COMBUSTOR
80A000654	IX	ent of Nitric Oxide Formation within a Multi-fueled Turbine	COMBUSTOR
80A002136	IX	Effect of Water on Nitric Oxide Production in Gas Turbine	COMBUSTORS
80A001193	IX	Power Alcohol * Dept. of Industries and	COMMERCE, United Provinces. Bulletin, New S
80A001199	I	Alcohol Fuel in India * Dept. of Industries and	COMMERCE, United Provinces. Bulletin, New S
80A002193	VI		COMMERCIAL Demonstration to Test Power Alco
80A000405	X	Recommendations for a Synthetic Fuels	COMMERCIALIZATION Program. Volume III. Te
80A001001	X	Alcohol Production for Fuel Is Backed by House	COMMITTEE
80A001195	VIII	tee on Agricultural Research and General Legislation of the	COMMITTEE on Agriculture, Nutrition, and Fo
80A000487	VI	of Geothermal Energy to Produce Alcohol from Agricultural	COMMODITIES
80A000573	VIII	as Fuel and Chemical Feedstock in Developing Countries *	COMMON Sense Approach in Developing Fuel Al
80A000587	I	ock in Developing Countries * Fermentation Alcohol in the	COMMONWEALTH Caribbean
80A000116	X	DOE Clears Way for Amoco Oil	COMPANY to Market Gasohol
80A002138	IX		COMPARATIVE Automotive Engine Operation Whe
80A000534	VIII	International Symposium on Alcohol Fuels Technology * a	COMPARATIVE Economic Analysis of Alcohol Fu
79 : 003451	VIII		COMPARATIVE Economic Assessment of Ethanol
80A003113	IX		COMPARATIVE Fuel Values of Gasoline and Den
80A003059	IX		COMPARATIVE Performance of Alcohol-gasoline
80A000657	IX	eedings, 5th National Conference I.C. Engines Combustion *	COMPARATIVE Studies of Engine Performance W
80A003033	IX	a	COMPARATIVE Study of Alcohol, Gasoline and
80A000043	IX		COMPARATIVE Study of Fuel-air Otto Cycle Fo
80A000315	IX	Methanol, Ethanol and Jet Fuel Emissions	COMPARISON from a Small Gas Turbine
80A000477	IX	erence on Energy * Alcohol Assisted Hydrocarbon Fuels: a	COMPARISON of Exhaust Emissions and Fuel Co
80A001173	IX	Alcohol Assisted Hydrocarbon Fuels: a	COMPARISON of Exhaust Emissions and Fuel Co
80A002303	IX	Alcohol Assisted Hydrocarbon Fuels * a	COMPARISON of Exhaust Emissions, Power Outp
80A000734	IX	posium on Alcohol Fuel Technology: Methanol and Ethanol *	COMPARISON of Gasoline, Methanol, and Metha
80A000375	IX	riers in Space Conditioning and Automotive Applications: a	COMPARISON of Hydrogen, Methane, Methanol a

Citation Number	Subject Section	Citation Title	Title Keyword
80A000628	IX	riers in Space Conditioning and Automotive Applications: a	COMPARISON of Hydrogen, Methane, Methanol a
80A000704	IX	Methanol as an Alternative Fuel *	COMPARISON of Methanol and Methanol-blends
78 : 002289	IV	assava Fuel Alcohol in Brazil * Energetics and Economics;	COMPARISON with Ethanol from Sugar Cane and
80A002305	IX	Experimental and Analytical	COMPARISONS of the Performance and Combusti
80A002253	IX	ystems: Held on April 18-22, 1977 * Automotive Materials	COMPATIBILITY with Methanol Fuel Blends *
80A000497	X	Federal Agency	COMPENDIUM * Federal Agency and Departmen
80A003002	X	Legislative	COMPENDIUM: Alcohol Fuels * 96th Congres
80A000473	VI	Microbial Energy Conversion * the	COMPETITION between Microbial and Chemical
80A002139	VIII	Food or Fuel — New	COMPETITION for the World's Cropland * Wo
80A001233	VII	ent of Food Protein Quality through Computer Blending — the	COMPETITIVENESS of Proteins from the Alcoho
80 : 001960	II	ve Search on the Biochemical Production of Alcohol Fuels *	COMPILATION of Abstracts on the Fermentatio
80A001240	XI	tary Assessment of Methanol in Atmospheric Air * a Second	COMPILATION of Technical Reports on the Bio
80A000664	VI	of Cellulose * Action of the Components of the Cellulase	COMPLEX
80A000335	IX	Methanol as a Motor Fuel or a Gasoline Blending	COMPONENT
80A002073	IX	Georgia-Pacific Alcohol from Tree Sugars to Be Used as Fuel	COMPONENT for Test by Nebraska Dept. of Roa
80A001250	IX		COMPONENT Relationships within Two-phase Ga
80A000469	IX	Charge Engines Working with Initial Separation of Mixture	COMPONENTS
80A000673	XI	lity of Liquid Mixtures with Inflammable and Noninflammable	COMPONENTS
80A000664	VI	sium on Enzymatic Hydrolysis of Cellulose * Action of the	COMPONENTS of the Cellulase Complex
80A001217	IX	Identification of Probable Automotive Fuels	COMPOSITION
80A001120	IX	Nitric Oxide and	COMPOSITION Measurements within Diffusion F
80A000136	IX	Effect of Methanol on Exhaust	COMPOSITION of a Fuel Containing Toluene, N
80A003114	VII		COMPOSITION of Concentrate By-products Feed
80A000745	VII	Nutrient	COMPOSITION of Distillers Feeds
80A002162	VII	Amino Acid	COMPOSITION of Grain Alcohol Fermentation B
80A001255	IX	Nitric Oxide and	COMPOSITION Profiles around Burning Droplet
80A001246	XI	Volatile Organic	COMPOUND (VOC) Species Data Manual
80A000558	IX	logy * Alcohol Engine Emissions — Emphasis on Unregulated	COMPOUNDS
80A000474	IX	nergy Conservation * Methanol Electric Hybrid Vehicle: a	COMPREHENSIVE Approach
78 : 000583	III	ugarcane, Sweet Sorghum, Sugar Beets, and Corn. Volume V.	COMPREHENSIVE Evaluation of Corn. Task 77
78 : 000584	III	from Sugarcane, Sweet Sorghum, and Sugar Beets. Volume I.	COMPREHENSIVE Evaluation. Task 77, Final R
80A000658	IX	ence I.C. Engines Combustion * Some Factors Affecting the	COMPRESSION and Combustion Processes in Alc
80A000660	IX	Alcohol as a Secondary Fuel in a Multicylinder Automotive	COMPRESSION Ignition Engine
80A000642	IX	on Engineering Conference. Volume I * Computer Predicted	COMPRESSION Ratio Effects on NOx Emissions
80A002130	IX	Effect of	COMPRESSION Ratio on Exhaust Emissions and
80A001230	IX	April 18-22, 1977 * Vehicle Evaluation of Neat Methanol —	COMPROMISES among Exhaust Emissions, Fuel E
80A002129	IX	a Dynamic Test Facility with Motoring Using a Digital	COMPUTER
80A001233	VII	Enhancement of Food Protein Quality through	COMPUTER Blending — the Competitiveness of
80A000642	IX	iety Energy Conversion Engineering Conference. Volume I *	COMPUTER Predicted Compression Ratio Effect
80A003114	VII	Composition of	CONCENTRATE By-products Feeding Stuffs *
80A000582	VII	ping Countries * Production, Application and Marketing of	CONCENTRATED Molasses — Fermentation — Effluent
80A000678	VII	tional Conference on Wheat Utilization Research * Protein	CONCENTRATES from Distillers By-products
80A000601	XI	and Chemical Feedstock in Developing Countries * Vinasses	CONCENTRATION and Vinasses Utilization
80A000475	IX	stion Symposium * Flame Propagation through Mixtures with	CONCENTRATION Gradient
80A002185	IX	ne Blends * II. the Influence of Anhydrous Ethyl Alcohol	CONCENTRATION upon Water Absorption
80A002014	IX	Determination of Individual Aldehyde	CONCENTRATIONS in the Exhaust of a Spark Ig
80A002296	IX	Measurement of Aldehyde	CONCENTRATIONS in the Exhaust of an Interna
80A000304	IX	Exhaust Hydrocarbon and Nitrogen Oxide	CONCENTRATIONS with an Ethyl Alcohol-gasoli
80 : 001988	VI	3rd Annual Biomass Energy Systems Conference *	CONCEPTUAL Design of a Biomass Fermentation
80A002243	I	Alcohol — Consuming Apparatus. Paris Exhibition *	CONCERNING an Exhibition in Paris of Invent
80A000210	VIII	Government Research	CONCLUDES Methanol-mix Fuels to Reach Marke
79 : 003455	I	ls from Renewable Resources: Feasibility Study Summary and	CONCLUSIONS

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000296	IX	*Structure and Extinction of Laminar Diffusion Flames above*	*CONDENSED Fuels with Water and Nitrogen*
80A000484	X	*Proceedings of*	*CONDENSED Papers: 2nd Miami International*
80A000485	IX	*Proceedings of*	*CONDENSED Papers: 2nd Miami International*
80A000375	IX	*Energy Carriers in Space*	*CONDITIONING and Automotive Applications:*
80A000628	IX	*version Engineering Conference * Energy Carriers in Space*	*CONDITIONING and Automotive Applications:*
80A000019	VI	*Catalytic Decomposition of Cellulose under Biological*	*CONDITIONS*
80A001228	IX	*tomobiles Using Alcohol/Gasoline Blends under High-altitude*	*CONDITIONS*
80A000134	VI	*Effect of Cultural*	*CONDITIONS on Cellulase Formation by Tricho*
80A000584	I	*nd Chemical Feedstock in Developing Countries * Necessary*	*CONDITIONS to Promote and Realize a Policy*
80A002302	IX	*eat Capacity of Methyl Alcohol and Ethyl Alcohol by Thermal*	*CONDUCTIVITY at Low Pressures*
80A000138	X	*Energy*	*CONFEREES Are Devising a Variety of Subsidy*
80A000675	IX	** Proceedings of the Hydrogen Economy Miami Energy (Theme)*	*CONFERENCE*
80A000676	I	** Proceedings of the Hydrogen Economy Miami Energy (Theme)*	*CONFERENCE*
80A000681	VI	*Proceedings of the Eighth Cellulose*	*CONFERENCE * Acid Hydrolysis and Dehydrat*
80 : 001996	VI	*3rd Annual Biomass Energy Systems*	*CONFERENCE * Acid Hydrolysis of Cellulosi*
80A000644	IX	*Proceedings 11th Intersociety Energy Conversion Engineering*	*CONFERENCE * Alternate Fuel Capability of*
80 : 001985	VI	*3rd Annual Biomass Energy Systems*	*CONFERENCE * Bioconversion of Plant Bioma*
80 : 002001	I	*3rd Annual Biomass Energy Systems*	*CONFERENCE * Biological Production of Liq*
80 : 001987	VIII	*3rd Annual Biomass Energy Systems*	*CONFERENCE * Biomass Based Methanol Proce*
80A000643	IX	*Proceedings 11th Intersociety Energy Conversion Engineering*	*CONFERENCE * Combustion and Emissions Cha*
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80 : 001988	VI	*3rd Annual Biomass Energy Systems*	*CONFERENCE * Conceptual Design of a Bioma*
80A000627	IX	*9th Intersociety Energy Conversion Engineering*	*CONFERENCE * Design and Performance of a*
80 : 002014	VI	*3rd Annual Biomass Energy Systems*	*CONFERENCE * Direct Microbiological Conve*
80A000628	IX	*9th Intersociety Energy Conversion Engineering*	*CONFERENCE * Energy Carriers in Space Con*
80A000491	II	*ord of the Tenth Intersociety Energy Conversion Engineering*	*CONFERENCE * Energy from Agriculture*
80A000624	V	*ings of the 13th Intersociety Energy Conversion Engineering*	*CONFERENCE * Energy from Biomass through*
80A000682	VI	*Proceedings of the Eighth Cellulose*	*CONFERENCE * Enzymatic Hydrolysis of Wast*
80 : 001986	VI	*3rd Annual Biomass Energy Systems*	*CONFERENCE * Enzymatic Saccharification*
80A000749	VII	*Proceedings 1st Industrial Waste Utilization*	*CONFERENCE * Feed By-products from Grain*
80A002308	IV	*2nd New Zealand Energy*	*CONFERENCE * Fuel from Crops*
80A000492	IX	*ord of the Tenth Intersociety Energy Conversion Engineering*	*CONFERENCE * Fueling Automotive Internal*
80A000629	I	*ord of the Tenth Intersociety Energy Conversion Engineering*	*CONFERENCE * Fueling Automotive Internal*
80 : 001995	VIII	*3rd Annuul Biomass Energy Systems*	*CONFERENCE * Fuels from Fermentation of B*
80A000626	IX	*9th Intersociety Energy Conversion Engineering*	*CONFERENCE * Improved Performance of Inte*
80A000632	IX	*ings of the 14th Intersociety Energy Conversion Engineering*	*CONFERENCE * Improving Octane Values of U*
80A000720	IX	*Conference Proceedings: 1st World Hydrogen Energy*	*CONFERENCE * Methanol-gasoline Blend Fuel*
80A000630	IX	*ord of the Tenth Intersociety Energy Conversion Engineering*	*CONFERENCE * on Board Steam-reforming of*
80A000655	IX	*Proceedings, 6th Intersociety Energy Conversion Engineering*	*CONFERENCE * Performance and Emission Cha*
80A000646	IX	*Proceedings 11th Intersociety Energy Conversion Engineering*	*CONFERENCE * Potential for Methanol-gasol*
80A000469	IX	*Proceedings, Stratified Charge Engines*	*CONFERENCE * Present Experience with Stra*
80A000680	VI	*Proceedings of the Eighth Cellulose*	*CONFERENCE * Process-development Studies*
80 : 001983	VI	*3rd Annual Biomass Energy Systems*	*CONFERENCE * Production of Liquid Fuels F*
80A000679	VI	*Proceedings of the Eighth Cellulose*	*CONFERENCE * Production of Sugars from Wa*
80A002237	VII	*Proceedings 2nd Ontario Waste*	*CONFERENCE * Recovery and Use of Grain Di*
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76 : 001883	V	*Institution of Engineers 1976 Engineering*	*CONFERENCE * Solar Energy for Australia.*
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77 : 001296	I	*ch Held in Washington, March 11, 1976, on the Bioconversion*	*CONFERENCE "Capturing the Sun"*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000690	I	Biomass for Energy:	CONFERENCE at the Royal Society * Canadia
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80A000649	IX	Proceedings, 4th National	CONFERENCE I.C. Engines and Combustion *
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80A000651	IX	Proceedings, 3rd National	CONFERENCE I.C. Engines and Combustion *
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80A000660	IX	Proceedings, 5th National	CONFERENCE I.C. Engines Combustion * an I
80A000657	IX	Proceedings, 5th National	CONFERENCE I.C. Engines Combustion * Comp
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80A000484	X	Proceedings of Condensed Papers: 2nd Miami International	CONFERENCE on Alternative Energy Sources *
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80A000674	IX	lication, No. 76/6 * Preprints of Papers; Fourth National	CONFERENCE on Chemical Engineering, Adelaid
80A000477	IX	(Univ. of Missouri, Rolla — Missouri Energy Council) Annual	CONFERENCE on Energy * Alcohol Assisted H
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80A000636	I	Solar Technology Exhibition and	CONFERENCE, Middle East (SOLTECH '78) * I
80A002261	X	Gasohol Bandwagon Rolling in	CONGRESS
80A003002	X	Legislative Compendium: Alcohol Fuels * 96th	CONGRESS
80A000647	IX	16th Automobile Technical	CONGRESS * a Study on the Automotive Engi
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80A002262	X	Made from Grain, Garbage:	CONGRESS Looks to Gasohol in Search for Fue
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80A002273	X	rm Products in Motor Fuel * U.S. Senate Document 57, 73rd	CONGRESS, 1st Session * Letter from Secre
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80A000045	VI		CONNECTICUT Firms Experiment with Garbage-t
80A000458	IX	Engine Improvement Possibilities and Environmental	CONSEQUENCES of Alcohol Uses
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80A000474	IX	Technology for Energy	CONSERVATION * Methanol Electric Hybrid V
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79 : 005703	X	Parameters for Legislative	CONSIDERATION of Bioconversion Technologies

Citation Number	Subject Section	Citation Title	Title Keyword
78 : 002751	V	*General*	*CONSIDERATIONS on Cellulose Utilization: a*
80A000499	III	*rial Institute BMI-1957 (V. 2) * Volume II: Agricultural*	*CONSIDERATIONS Task 77, Final Report*
80A003133	III	*Sweet Sorghum, and Sugar Beets * Volume II, Agricultural*	*CONSIDERATIONS, Task 77, Final Report*
80 : 002033	VIII	*High-grade Fuels from Biomass Farming: Potentials and*	*CONSTRAINTS*
80A000561	XI	*nol Containing Fuels — Evaluation of Environment and Health*	*CONSTRAINTS*
80A000464	IX	*Proceedings Forest and Field Fuels Symposium **	*CONSTRAINTS and Opportunities: Alcohol Rep*
80A000548	IX	*ategies for Fuel Economy Optimization with Exhaust Emission*	*CONSTRAINTS in Methanol Fueled Automobiles*
80A001127	VI	*Physical and Chemical*	*CONSTRAINTS in the Hydrolysis of Cellulose*
80A000692	I	*ies and Problems, Working Papers for Planners * Barriers,*	*CONSTRAINTS, and Possible Solutions * Rec*
80A000423	VI	*Alcohol Fuels Spark*	*CONSTRUCTION Plans*
80A003124	XI	*of Flammable and Combustible Liquids on Farms and Isolated*	*CONSTRUCTION Projects*
80A000208	VIII	*uce More Problems than Benefits for Petroleum Marketers and*	*CONSUMERS*
80A002243	I	*Alcohol —*	*CONSUMING Apparatus. Paris Exhibition **
80A000554	I	*uels Technology * Methyl Fuel and Its Effect on Crude Oil*	*CONSUMPTION*
80A001210	VI	*inuous Fermentation and Vacuum Distillation with Low Energy*	*CONSUMPTION*
80A000592	I	*as Fuel and Chemical Feedstock in Developing Countries **	*CONSUMPTION Figures of Fermentation Alcohol*
80A002173	VI	*Steam*	*CONSUMPTION of Two-column Alcohol Distillat*
80A002303	IX	** a Comparison of Exhaust Emissions, Power Output and Fuel*	*CONSUMPTION Using Static and Dynamic Engine*
80A000477	IX	*rocarbon Fuels: a Comparison of Exhaust Emissions and Fuel*	*CONSUMPTION Using Steady-state and Dynamic*
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80A000117	X	*DOE Endorses Use of Alcohol Fuels to Reduce Gasoline*	*CONSUMPTION; $24.9 Million in FY1980 to R&D*
80A002304	IX	*Power, Fuel*	*CONSUMPTION, and Exhaust Emission Character*
80A000448	IX	*a Fundamental Model Predicting Fuel*	*CONSUMPTION, NOx and HC Emissions of the Co*
80A000748	VI	*Use of Mycotoxin*	*CONTAMINATED Grain in the Ethanol Fermentat*
80A003052	VII	*Nutrient*	*CONTENT of Alcohol Fermentation By-products*
80A002079	VI		*CONTINOUS Cellulose-to-glucose Process*
80A000057	I	*Brazil*	*CONTINUES Push for Gasohol*
80A002009	VI	*Design of a Two-bushel Per Day*	*CONTINUOUS Alcohol Unit*
80A000569	VI	*Feedstock in Developing Countries * New Developments in*	*CONTINUOUS Alcoholic Fermentation Intensifi*
80A000737	VI	*ol Fuel Technology: Methanol and Ethanol * Basic Data on*	*CONTINUOUS Alcoholic Fermentation of Sugar*
80A000719	VI	*Cellulose as a Chemical and Energy Resource **	*CONTINUOUS Cellulose Production*
80A000654	IX	*Proceedings, Symposium on Emissions from*	*CONTINUOUS Combustion Systems * Measureme*
80A001083	VI	*the Use of Absorbed Cellulose in the*	*CONTINUOUS Conversion of Cellulose to Gluco*
80A003064	VI	*Development and Design of*	*CONTINUOUS Cooking and Mashing System for C*
80A000046	VI		*CONTINUOUS Cultivation of Trichoderma Virid*
80A002085	VI	*Growth Kinetics and Cellulase Biosynthesis in the*	*CONTINUOUS Culture of Trichoderma Viride*
80A000047	VI		*CONTINUOUS Enzymatic Saccharification of Ce*
80A000567	II	*tock in Developing Countries * Fuel Alcohol from Crops by*	*CONTINUOUS Fermentation*
80A002216	VI		*CONTINUOUS Fermentation*
80A002280	VI	*Fuel Alcohol from Crops by*	*CONTINUOUS Fermentation*
80A001210	VI	*Industrial Alcohol by*	*CONTINUOUS Fermentation and Vacuum Distilla*
80A003091	VI		*CONTINUOUS Fermentation Comes of Age*
80A002192	VI	*Mechanical Equipment for*	*CONTINUOUS Fermentation of Fibrous Material*
80A000298	VI	*Studies of*	*CONTINUOUS Fermentation of Indian Cane Suga*
80A000537	VI	*ternational Symposium on Alcohol Fuels Technology * Novel*	*CONTINUOUS Fermentation Process for Ethyl a*
80A002217	III		*CONTINUOUS Fermenting of Beet Juice*
80A002155	VI	*the Saccharification of Agricultural Residues — a*	*CONTINUOUS Process*
80A001237	VI	*ns * Enzymatic Saccharification of Cellulose in Semi- and*	*CONTINUOUSLY Agitated Systems*
80A000752	IX	*13th Summary Report: Highway Vehicle Systems*	*CONTRACTORS Coordination Meeting * Alcoho*
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80A000733	IX	*thanol and Ethanol * Alternate Air-fuel Induction Systems*	*CONTRASTS in Terms of Fuel Economy and Exha*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A002257	IX	*Systems: Held on April 18-22, 1977 * Gaseous Emissions*	*CONTROL for Heavy-duty Diesel Engines * a*
80A000087	IX	*Effectiveness of Fuel Cetane Number for Combustion*	*CONTROL in Bi-fuel Diesel Engine*
80A003035	VII	*By-product Recovery — Pollution*	*CONTROL Measure in the Fermentation Industr*
80A000461	IX	*Environmental*	*CONTROL Symposium * Environmental Aspects*
80A002256	IX	*Chrysler Upgraded Automotive Gas Turbine Engine-emission*	*CONTROL System * a Report by the Automoti*
80A002097	VIII	*the Gasohol*	*CONTROVERSY*
80A000448	IX	*el Predicting Fuel Consumption, NOx and HC Emissions of the*	*CONVENTIONAL Spark-ignited Engine*
76 : 001883	V	*ce * Solar Energy for Australia. the Role of Biological*	*CONVERSION*
78 : 004663	VI	*Enzymes Show Promise for Biomass*	*CONVERSION*
80A003018	IX	*Alcohol Car*	*CONVERSION*
80A000472	VI	*Microbial Energy*	*CONVERSION * Enzymatic Hydrolysis of Cell*
80A001178	II	*Microbial Energy*	*CONVERSION * Feedstocks for Large-scale F*
80A000473	VI	*Microbial Energy*	*CONVERSION * the Competition between Micr*
80A002194	VI	*Microbial Amylase Preparations*	*CONVERSION Agents for Alcoholic Fermentatio*
78 : 002739	VI	*ransport Fuel from Cellulose Material (Wood). II. Energy*	*CONVERSION Efficiencies of the Processes*
80A000644	IX	*Proceedings 11th Intersociety Energy*	*CONVERSION Engineering Conference * Alter*
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80A000627	IX	*9th Intersociety Energy*	*CONVERSION Engineering Conference * Desig*
80A000491	II	*Record of the Tenth Intersociety Energy*	*CONVERSION Engineering Conference * Energ*
80A000624	V	*Proceedings of the 13th Intersociety Energy*	*CONVERSION Engineering Conference * Energ*
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80A000492	IX	*Record of the Tenth Intersociety Energy*	*CONVERSION Engineering Conference * Fueli*
80A000629	I	*Record of the Tenth Intersociety Energy*	*CONVERSION Engineering Conference * Fueli*
80A000626	IX	*9th Intersociety Energy*	*CONVERSION Engineering Conference * Impro*
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80A000630	IX	*Record of the Tenth Intersociety Energy*	*CONVERSION Engineering Conference * on Bo*
80A000655	IX	*Proceedings, 6th Intersociety Energy*	*CONVERSION Engineering Conference * Perfo*
80A000646	IX	*Proceedings 11th Intersociety Energy*	*CONVERSION Engineering Conference * Poten*
80A000625	XI	*Proceedings of the 13th Intersociety Energy*	*CONVERSION Engineering Conference * Risk*
80A000493	VIII	*Record of the Tenth Intersociety Energy*	*CONVERSION Engineering Conference * the T*
80A000631	I	*Proceedings of the 14th Intersociety Energy*	*CONVERSION Engineering Conference * Which*
78 : 002289	IV	*Proceedings of the 12th Intersociety Energy*	*CONVERSION Engineering Conference. Volume*
78 : 002290	I	*Proceedings of the 12th Intersociety Energy*	*CONVERSION Engineering Conference. Volume*
80A000641	IX	*Proceedings of the 12th Intersociety Energy*	*CONVERSION Engineering Conference. Volume*
80A000642	IX	*Proceedings of the 12th Intersociety Energy*	*CONVERSION Engineering Conference. Volume*
80A000451	VI	*the*	*CONVERSION of Agricultural By-products to S*
80A000500	VI	*the*	*CONVERSION of Agricultural By-products to S*
80A001222	V	*the*	*CONVERSION of Agricultural By-products to S*
79 : 002521	VI	*Technical and Economic Assessment of Methods for Direct*	*CONVERSION of Agricultural Residue to Usabl*
79 : 005694	VI		*CONVERSION of Biomass from Agriculture into*
79 : 004141	VI	*Federal Fuels from Biomass Program. Volume V. Biochemical*	*CONVERSION of Biomass to Fuels and Chemical*
80A001174	X	*Fuels from Biomass Program * Volume IV. Thermochemical*	*CONVERSION of Biomass to Fuels and Chemical*
79 : 007133	VI	*Biomass Allocation Model:*	*CONVERSION of Biomass to Methanol*
79 : 001713	V	*aw Materials Evaluation and Process Development Studies for*	*CONVERSION of Biomass to Sugars and Ethanol*
80 : 000189	V	*aw Materials Evaluation and Process Development Studies for*	*CONVERSION of Biomass to Sugars and Ethanol*
79 : 004127	II	*Technology and Economics of*	*CONVERSION of Cellulose (Wood) and Corn Sta*
80A000259	VIII	*Remarks on the Process Economics of Enzymatic*	*CONVERSION of Cellulose to Glucose*
80A001083	VI	*the Use of Absorbed Cellulose in the Continuous*	*CONVERSION of Cellulose to Glucose*
80 : 002014	VI	*iomass Energy Systems Conference * Direct Microbiological*	*CONVERSION of Cellulosic Biomass to Ethanol*
80A000725	VI	*Enzymatic*	*CONVERSION of Cellulosic Materials * Biot*

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000726	VI	*Enzymatic*	***CONVERSION** of Cellulosic Materials * Ferm*
80A000727	VI	*Enzymatic*	***CONVERSION** of Cellulosic Materials * Phys*
80A002033	VI	*Enzymatic*	***CONVERSION** of Cellulosic Materials: Techno*
80A000184	VI	*Liquid Chromatography for Monitoring the*	***CONVERSION** of Cellulosic Wastes to Sugars*
80 : 002055	VI	*Biological*	***CONVERSION** of Corn Residue into Ethyl Alcoh*
80A000048	III		***CONVERSION** of Sugar Cane Products into Fuel*
79 : 004628	III	*Symposium on Energy * Tentative Projection of Costs for*	***CONVERSION** of Sugar Wastes to Ethanol to Be*
80A000254	VI	*and Lignocellulosic Materials as Substrates for Enzymatic*	***CONVERSION** Processes*
80A001189	I	*thetic Oil vs. Methanol as a Liquid Fuel Product from Waste*	***CONVERSION** Processes*
78 : 002268	V	*Silvicultural Biomass Farms. Volume V.*	***CONVERSION** Processes and Costs*
79 : 005181	III	*ar Crops as a Source of Fuels. Volume II. Processing and*	***CONVERSION** Research. Final Report*
79 : 003456	VI	*from Renewable Resources: Feasibility Study. Volume B.*	***CONVERSION** Studies*
80A001176	VIII	*Technologies * Volume IX. Biomass Fuels Production and*	***CONVERSION** Systems*
79 : 000547	I	*Solar Energy*	***CONVERSION** through Biology*
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80A000489	V	** Biomass Production of Southern Tree Plantations and Its*	***CONVERSION** to Energy or Chemical Products*
80A000154	V	*Forest and Wood Waste Utilisation:*	***CONVERSION** to Fuel Alcohol — a FRI Study*
78 : 000585	III	*om Sugarcane, Sweet Sorghum, and Sugar Beets. Volume III.*	***CONVERSION** to Fuels and Chemical Feedstocks*
79 : 007113	XI	*Preliminary Environmental Assessment of Biomass*	***CONVERSION** to Synthetic Fuels. Report for*
80A002086	I	*of New Zealand's Gasoline Needs (Could Be Met by Methanol*	***CONVERSION**)*
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80A000115	V	*Distilling the News' New Process to*	***CONVERT** Recycled Newspapers into Glucose an*
80A000741	IX	*on Alcohol Fuel Technology: Methanol and Ethanol * Fuel*	***CONVERTER** with Methanol for Spark-ignition*
80A000372	V		***CONVERTING** Cellulosic Waste to Fuel: a Lit*
80A003116	VIII	*a Look at the Economic Feasibility of*	***CONVERTING** Wood into Liquid Fuel * Canada*
80A003021	IX	*Brown's Alcohol Motor Fuel*	***COOKBOOK***
80A003064	VI	*Development and Design of Continuous*	***COOKING** and Mashing System for Cereal Grain*
80A000588	I	** Can Fermentation Alcohol Be Substituted for Wood as a*	***COOKING** Fuel*
80A000186	I	*Look What's*	***COOKING** on the Fuel-alcohol Front*
80A003051	VI	*Laboratory*	***COOKING**, Mashing, and Fermentation Procedur*
80A000752	IX	*13th Summary Report: Highway Vehicle Systems Contractors*	***COORDINATION** Meeting * Alcohol/Gasoline B*
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78 : 001793	VI	*a Cash Crop for the Future * Ethanol and Furfural from*	***CORN***
80A002191	VI	*Mashing of*	***CORN***
80A003052	VII	*Nutrient Content of Alcohol Fermentation By-products from*	***CORN***
80A003135	III	*dy of Fuels from Sugarcane, Sweet Sorghum, Sugar Beets, and*	***CORN** * Volume IV, Corn Agriculture, Task*
80A001042	VIII	*Gasohol from*	***CORN** — Good Sense?*
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80A003126	IV		***CORN** as a Raw Material for Ethyl Alcohol **
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80A003009	IV	*Production and Use of Fuel Ethanol from*	***CORN** or Wheat * Sources of Energy*
80A003099	VIII		***CORN** Prices and Alcohol Production*
78 : 001792	VIII	*Biomass: a Cash Crop for the Future **	***CORN** Production Practices*
80A001152	VII	*Treated with Chemicals,*	***CORN** Residue as Good Feed as Corn Silage*
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Citation Number	Subject Section	Citation Title	Title Keyword
80A000574	VI	lcohol for Use as Fuel and Chemical Feedstock in Developing	*COUNTRIES * Interrelationships between Fe*
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80A000584	I	lcohol for Use as Fuel and Chemical Feedstock in Developing	*COUNTRIES * Necessary Conditions to Promo*
80A000569	VI	lcohol for Use as Fuel and Chemical Feedstock in Developing	*COUNTRIES * New Developments in Continuou*
80A000605	I	lcohol for Use as Fuel and Chemical Feedstock in Developing	*COUNTRIES * Perspective of Ethanol Usage*
80A000603	X	lcohol for Use as Fuel and Chemical Feedstock in Developing	*COUNTRIES * Possibilities of Developing a*
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80A000579	X	lcohol for Use as Fuel and Chemical Feedstock in Developing	*COUNTRIES * Potential for Fermentation Al*
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80A000564	I	lcohol for Use as Fuel and Chemical Feedstock in Developing	*COUNTRIES * Power Alcohol in the Sudan*
80A000572	X	lcohol for Use as Fuel and Chemical Feedstock in Developing	*COUNTRIES * Power Alcohol Industry for Th*
80A000608	VII	lcohol for Use as Fuel and Chemical Feedstock in Developing	*COUNTRIES * Present Situation on the Util*
80A000575	I	lcohol for Use as Fuel and Chemical Feedstock in Developing	*COUNTRIES * Present Status of Alcohol and*
80A000582	VII	lcohol for Use as Fuel and Chemical Feedstock in Developing	*COUNTRIES * Production, Application and M*
80A000600	I	lcohol for Use as Fuel and Chemical Feedstock in Developing	*COUNTRIES * Products of Photosynthesis as*
80A000590	I	lcohol for Use as Fuel and Chemical Feedstock in Developing	*COUNTRIES * Prospects of Developing Power*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000373	IX		CURRENT Status of Alternative Automotive Po
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Citation Number	Subject Section	Citation Title	Title Keyword
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000578	III	mentation Alcohol for Use as Fuel and Chemical Feedstock in	DEVELOPING Countries * Cane Molasses Ferm
80A000573	VIII	mentation Alcohol for Use as Fuel and Chemical Feedstock in	DEVELOPING Countries * Common Sense Appro
80A000592	I	mentation Alcohol for Use as Fuel and Chemical Feedstock in	DEVELOPING Countries * Consumption Figure
80A000583	I	mentation Alcohol for Use as Fuel and Chemical Feedstock in	DEVELOPING Countries * Development of Alc
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000567	II	*mentation Alcohol for Use as Fuel and Chemical Feedstock in*	*DEVELOPING Countries * Fuel Alcohol from*
80A000589	III	*mentation Alcohol for Use as Fuel and Chemical Feedstock in*	*DEVELOPING Countries * Fuel and Chemical*
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80A000577	VIII	*mentation Alcohol for Use as Fuel and Chemical Feedstock in*	*DEVELOPING Countries * Interaction Betwee*
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80A000601	XI	*mentation Alcohol for Use as Fuel and Chemical Feedstock in*	*DEVELOPING Countries * Vinasses Concentra*
80A000573	VIII	*dstock in Developing Countries * Common Sense Approach in*	*DEVELOPING Fuel Alcohols*
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80A000698	IX	*Symposium on Low Pollution Power Systems*	*DEVELOPMENT * Automotive Engine for Metha*
80A000694	IX	*Symposium on Low Pollution Power Systems*	*DEVELOPMENT * Development of the Nissan G*
80A000696	IX	*Symposium on Low Pollution Power Systems*	*DEVELOPMENT * the Combustion of Methanol*
80A001244	VI	*Methanol Technology and Economics **	*DEVELOPMENT and Application of a Mathematic*
80A000629	I	*tive Internal Combustion Engines with Methanol — Historical*	*DEVELOPMENT and Current State of the Art*
80A000492	IX	*tive Internal Combustion Engines with Methanol — Historical*	*DEVELOPMENT and Current State-of-the-art*
80A003064	VI		*DEVELOPMENT and Design of Continuous Cookin*
80A002090	VI	*History of Cellulase Program at U.S. Army Natick*	*DEVELOPMENT Center*
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80A002102	I	*How the*	*DEVELOPMENT of a Gasohol Industry Will Affe*
80A002016	IX		*DEVELOPMENT of a Pure Methanol Fuel Car*
80A000583	I	*as Fuel and Chemical Feedstock in Developing Countries **	*DEVELOPMENT of Alcogas Research in the Phil*
80A000521	IX	*hird International Symposium on Alcohol Fuels Technology **	*DEVELOPMENT of an On-board Mechanical Fuel*
80A000555	I	*and/or Derivatives in Different Scenarios, Its Testing and*	*DEVELOPMENT of Hardware Required for Alcohc*
80A000740	IX	*posium on Alcohol Fuel Technology: Methanol and Ethanol **	*DEVELOPMENT of Methanol and Petrol Carbura*
80A003115	IX		*DEVELOPMENT of Practical Method of Burning*
80A000716	VI	*ional Meeting on Biophysics and Biotechnology in Finland **	*DEVELOPMENT of Processes for Industrial Pro*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000693	IX	*Design and*	***DEVELOPMENT** of Small Internal Combustion En*
80A000694	IX	*Symposium on Low Pollution Power Systems Development **	***DEVELOPMENT** of the Nissan Gas Turbine*
79 : 001713	V	*Raw Materials Evaluation and Process*	***DEVELOPMENT** Studies for Conversion of Bioma*
80 : 000189	V	*Fuels from Biomass * Raw Materials Evaluation and Process*	***DEVELOPMENT** Studies for Conversion of Bioma*
79 : 004131	VI	*Process*	***DEVELOPMENT** Studies on the Bioconversion of*
80A000717	VI	*Cellulose as a Chemical and Energy Resource * Process*	***DEVELOPMENTAL** Studies on the Enzymatic Hydr*
80A000569	VI	*Fuel and Chemical Feedstock in Developing Countries * New*	***DEVELOPMENTS** in Continuous Alcoholic Fermen*
80A002078	IX	*Goodyear Tire and Rubber*	***DEVELOPS** Gasoline/Alcohol/Water Auto Fuel M*
80A000138	X	*Energy Conferees Are*	***DEVISING** a Variety of Subsidy Plans Despite*
80A001211	XI	*Occupational Exposure to Methyl Alcohol **	***DHEW** Publication No. (NIOSH) 76-148 * Cri*
80A000744	XI	*Laboratory*	***DIAGNOSIS** of Diseases * Methyl Alcohol Po*
80A000306	IX	*Fuel Droplet Size Distribution in*	***DIESEL** Combustion Chamber*
80A000087	IX	*ess of Fuel Cetane Number for Combustion Control in Bi-fuel*	***DIESEL** Engine*
80A000525	IX	*chnology'* a New Way of Direct Injection of Methanol in a*	***DIESEL** Engine*
80A002123	IX	*Alternative*	***DIESEL** Engine Fuels: an Experimental Inves*
80A001164	IX	*the Utilization of Alternative Fuels in a*	***DIESEL** Engine Using Different Methods*
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80A002123	IX	*gation of Methanol, Ethanol, Methane and Ammonia in a D. I.*	***DIESEL** Engine with Pilot Injection*
80A000526	IX	*uels Technology * the Utilization of Different Fuels in a*	***DIESEL** Engine with Two Separate Injection S*
80A000651	IX	*ence I.C. Engines and Combustion * Use of Methanol in the*	***DIESEL** Engine: an Experimental Study of En*
80A000133	IX	*Effect of Alcohols as Supplemental Fuel for Turbocharged*	***DIESEL** Engines*
80A000378	IX	*Experiments with Novel Fuels for*	***DIESEL** Engines*
80A001119	IX	*Newest Fuel Saver: "Aquahol" Injection for*	***DIESEL** Engines*
80A001183	IX	*uture Automotive Fuels * Alternative Fuels for Automotive*	***DIESEL** Engines*
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80A002121	IX	*Alcohols in*	***DIESEL** Engines — a Review*
80A000316	IX	*Modified Fuels for*	***DIESEL** Engines by Application of Unstabiliz*
80A002103	I	*How to Beat OPEC's Hold on*	***DIESEL** Fuel*
80A002186	IX	*Alcohol with Normal*	***DIESEL** Fuels*
80A000104	IX		***DIESEL** Oil and Ethanol Mixtures for Diesel-*
80A000103	IX		***DIESEL-ETHANOL** Fuel Blends Investigated*
80A000104	IX	*Diesel Oil and Ethanol Mixtures for*	***DIESEL-POWERED** Farm Tractors*
80A000521	IX	*an On-board Mechanical Fuel Emulsifier for Utilization of*	***DIESEL/METHANOL** and Methanol/Gasoline Fuel*
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80A000041	IX	*Coming*	***DIESOHOL?***
80A000043	IX	*Comparative Study of Fuel-air Otto Cycle for Five*	***DIFFERENT** Fuels*
80A000526	IX	*ymposium on Alcohol Fuels Technology * the Utilization of*	***DIFFERENT** Fuels in a Diesel Engine with Two*
80A001164	IX	*Utilization of Alternative Fuels in a Diesel Engine Using*	***DIFFERENT** Methods*
80A000555	I	*chnology * Methanol, Its Precursors and/or Derivatives in*	***DIFFERENT** Scenarios, Its Testing and Develo*
80A000105	VI		***DIFFERENTIAL** Speed Two Roll Mill Pretreatme*
80A000662	IX	*tional) on Combustion * Nitric Oxide Formation in Droplet*	***DIFFUSION** Flames*
80A000296	IX	*Structure and Extinction of Laminar*	***DIFFUSION** Flames above Condensed Fuels with*
80A001120	IX	*Nitric Oxide and Composition Measurements within*	***DIFFUSION** Flames around Simulated Ethanol a*
80A001169	VI	*a Mechanism for Improving the*	***DIGESTIBILITY** of Lignocellulosic Materials*
80A003085	V	*Fine Grinding, Enzyme*	***DIGESTION** and the Lignin-cellulose Bond in*
80A002129	IX	*a Dynamic Test Facility with Motoring Using a*	***DIGITAL** Computer*
80A000174	VIII	*Food or Fuel: the Liquids*	***DILEMMA***
80A001167	IX	*at Elevated Temperature and Pressures in the Presence of a*	***DILUENT***
80A002190	V	*on: Hydrolysis of Cellulose and Decomposition of Sugars in*	***DILUTE** Acid at High Temperature*
80A001169	VI	*Proving the Digestibility of Lignocellulosic Materials with*	***DILUTE** Alkali and Liquid Ammonia*

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000605	I	*g Countries * Perspective of Ethanol Usage as Fuel in the*	***DOMINICAN** Republic*
80A000380	IX	*I.C. Engine Combustion of Methyl Alcohol and Fuel-nitrogen*	***DOPED** Methyl Alcohol*
80A000140	I	*Energy Crisis Raises*	***DOUBTS** over the Prospects for Organic Raw M*
80A003060	V	*Fermentation of*	***DOUGLAS** Fir Hydrolyzate*
80A000746	VII	*the Use of Distillers*	***DRIED** Grains with Solubles in Feeds for Egg*
80A000181	I	*Gasohol: Changing the Energy*	***DRINKING** Habit*
80A001080	X	*U.S. Presses*	***DRIVE** for Use of Gasohol*
80A000123	X		***DRIVE** to Boost Alcohol Fuels*
80A000333	IX	*line Extender-fuel Economy, Emissions, and High Temperature*	***DRIVEABILITY***
80A001230	IX	*ol — Compromises among Exhaust Emissions, Fuel Economy, and*	***DRIVEABILITY** * a Report by the Automotive*
80A000329	IX	*Exhaust Emissions, Fuel Economy, and*	***DRIVEABILITY** of Vehicles Fueled with Alcoho*
80A000204	VIII	*Gasohol Pumps Do a Gushing Business:*	***DRIVERS** Line Up for Fuel, but Efficiency St*
80A002128	IX		***DRIVING** Cycle Economy, Emissions and Photoc*
80A000733	IX	*Terms of Fuel Economy and Exhaust Emissions for Simulated*	***DRIVING** Cycles with Methanol and Indolene*
80A000124	VIII		***DRIVING** on Gasohol in Midwest*
80A000661	IX	*dings 14th Symposium (International) on Combustion * Fuel*	***DROPLET** Burning Rates at High Pressures*
80A000662	IX	*(International) on Combustion * Nitric Oxide Formation in*	***DROPLET** Diffusion Flames*
80A000306	IX	*Fuel*	***DROPLET** Size Distribution in Diesel Combust*
80A001120	IX	*fusion Flames around Simulated Ethanol and Ethanol-pyridine*	***DROPLETS***
80A001255	IX	*Nitric Oxide and Composition Profiles around Burning*	***DROPLETS** of Ethanol and Ethanol-pyridine Mi*
80A000539	X	*cohol Fuels Technology * What Do We Do When the Wells Run*	***DRY?***
80A000653	IX	*Factors Affecting the Performance of an Alcohol-diesel Oil*	***DUAL** Fuel Engine*
80A000658	IX	*Compression and Combustion Processes in Alcohol-diesel Oil*	***DUAL** Fuel Engines*
80A001094	IX	*Volvo, Saab Test*	***DUAL** Fuels Engines*
80A000650	IX	*ives to Alcohol on the Performance of an Alcohol-diesel Oil*	***DUAL-FUEL** Engine*
80A000524	IX	*hird International Symposium on Alcohol Fuels Technology **	***DUAL-FUELING** a Diesel Engine with Carburete*
80A000477	IX	*haust Emissions and Fuel Consumption Using Steady-state and*	***DYNAMIC** Engine Test Facilities*
80A001173	IX	*haust Emissions and Fuel Consumption Using Steady-state and*	***DYNAMIC** Engine Test Facilities*
80A002303	IX	*issions, Power Output and Fuel Consumption Using Static and*	***DYNAMIC** Engine Test Facilities*
80A000666	VI	*posium on Enzymatic Hydrolysis of Cellulose * Kinetic and*	***DYNAMIC** Studies of Trichoderma Viride Cellu*
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80A000534	VIII	*nal Symposium on Alcohol Fuels Technology * a Comparative*	***ECONOMIC** Analysis of Alcohol Fuels Producti*
79 : 007163	VIII	*Perspectives on the*	***ECONOMIC** Analysis of Ethanol Production*
80A000357	VIII	*Perspectives on the*	***ECONOMIC** Analysis of Ethanol Production*
80A001198	VIII		***ECONOMIC** Analysis of Synthetic Liquid Fuels*
80A003040	VIII		***ECONOMIC** and Market Aspects of Ethyl Alcoho*
80A000437	XI	*a Modal*	***ECONOMIC** and Safety Analysis of the Transpo*
80A002295	VIII	*Some*	***ECONOMIC** Aspects of a Corn-alcohol Fuel Pro*
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Citation Number	Subject Section	Citation Title	Title Keyword
80A002205	V	Chemical	ECONOMICS of Wood Hydrolysis
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80A000684	IX	Fuelled Spark — Ignition Engine and Its Effect on Methanol	ECONOMY
80A000751	VIII	the Methanol Economy: a Practical Version of the Hydrogen	ECONOMY
80A000750	IX	ornell International Symposium and Workshop on the Hydrogen	ECONOMY * Potentials for Early Utilizatio
80A000751	VIII	ornell International Symposium and Workshop on the Hydrogen	ECONOMY * the Methanol Economy: a Practi
80A000307	IX	Fuel	ECONOMY and Emission Characteristics of Met
80A000733	IX	rnate Air-fuel Induction Systems Contrasts in Terms of Fuel	ECONOMY and Exhaust Emissions for Simulated
80A000323	IX	es — Fuel and Engine Calibration Effects on Emissions, Fuel	ECONOMY and Octane Number Requirements
80A000396	I	Methanol as a Fuel in the Urban Energy	ECONOMY and Possible Source of Supply
80A000339	IX	le-cylinder Engine Evaluation of Methanol — Improved Energy	ECONOMY and Reduced NOx
80A000341	IX	rk Ignition Engine Study of the Octane, Emissions, and Fuel	ECONOMY Characteristics of Methanol-gasolin
80A001228	IX	Exhaust Emissions and Fuel	ECONOMY from Automobiles Using Alcohol/Gaso
80A000675	IX	Breathing Automobile Engine * Proceedings of the Hydrogen	ECONOMY Miami Energy (Theme) Conference
80A000676	I	ods for Methanol Production * Proceedings of the Hydrogen	ECONOMY Miami Energy (Theme) Conference
80A000548	IX	Fuels Technology * Hardware/Software Strategies for Fuel	ECONOMY Optimization with Exhaust Emission
80A002100	VIII	Gasohol —	ECONOMY or Gluttony
80A001230	IX	Neat Methanol — Compromises among Exhaust Emissions, Fuel	ECONOMY, and Driveability * a Report by the
80A000329	IX	Exhaust Emissions, Fuel	ECONOMY, and Driveability of Vehicles Fuele
80A002128	IX	Driving Cycle	ECONOMY, Emissions and Photochemical Reacti
80A000333	IX	Methanol as a Gasoline Extender-fuel	ECONOMY, Emissions, and High Temperature Dr
80A000751	VIII	osium and Workshop on the Hydrogen Economy * the Methanol	ECONOMY: a Practical Version of the Hydrog
80A000498	IV	Feasibility of Establishing Potato Ethanol Plants on Prince	EDWARD Island * Institute of Man and Reso
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80A000133	IX		EFFECT of Alcohols as Supplemental Fuel for
80A002254	IX	tive Propulsion Systems: Held on April 18-22, 1977 * the	EFFECT of Blending Methanol with Gasoline
80A002130	IX		EFFECT of Compression Ratio on Exhaust Emis
80A000134	VI		EFFECT of Cultural Conditions on Cellulase
80A000135	VI	the	EFFECT of Discontinuous Feeding on Ethanol
80A001171	VI	the	EFFECT of Extracellular Variables on the En
80A000730	IX	Monograph on Alternate Fuel Resources *	EFFECT of Methanol Addition to Gasoline on
80A002255	IX	tive Propulsion Systems: Held on April 18-22, 1977 * the	EFFECT of Methanol Addition to Gasoline on
80A000136	IX		EFFECT of Methanol on Exhaust Composition
79 : 003453	VI		EFFECT of Nitrogen Oxide Pretreatments on E
80A000085	VI		EFFECT of Pretreatment of Molasses and Recy
80A002136	IX		EFFECT of Water on Nitric Oxide Production
80A000554	I	mposium on Alcohol Fuels Technology * Methyl Fuel and Its	EFFECT on Crude Oil Consumption
80A002076	VI	B-Glucosidase: Microbial Production and	EFFECT on Enzymatic Hydrolysis of Cellulose
80A000183	VIII	Gasohol Coming on Strong; Its	EFFECT on Marketing Equipment
80A000684	IX	ion in a Methanol — Fuelled Spark — Ignition Engine and Its	EFFECT on Methanol Economy
80A000674	IX		EFFECTIVE Use of Hydrocarbon Resources *
80A000003	V	Can There Be	EFFECTIVE Utilization of Cellulosic Feedsto
80A000087	IX		EFFECTIVENESS of Fuel Cetane Number for Com

Citation Number	Subject Section	Citation Title	Title Keyword
80A000446	XI	gs Environmental Evaluation "Gasohol" Production and Health	EFFECTS
80A000711	XI	nmental Aspects of Methanol as Vehicular Fuel: Air Quality	EFFECTS
80A000712	IX	ts of Methanol as Vehicular Fuel: Health and Environmental	EFFECTS
80A001240	XI	a Second Compilation of Technical Reports on the Biological	EFFECTS and the Public Health Aspects of
80A000667	VI	posium on Enzymatic Hydrolysis of Cellulose * Topological	EFFECTS in Enzymatic and Microbial Degradat
80A001165	IX	the	EFFECTS of Fuel Structure on the Autoigniti
80A000301	IX		EFFECTS of Methanol Injection on Emission
80A000742	XI	cohol Fuel Technology: Methanol and Ethanol * Biological	EFFECTS of Methanol Spills into Marine, Est
80A002307	IX	the	EFFECTS of Oxy:hydrocarbon Fuels on Exhaust
80A002180	IX		EFFECTS of Substitute Fuels on Automotive E
80A000323	IX	Cylinder PROCO Engine Studies — Fuel and Engine Calibration	EFFECTS on Emissions, Fuel Economy and Octa
80A000642	IX	ference. Volume I * Computer Predicted Compression Ratio	EFFECTS on NOx Emissions from a Methanol Fu
80A002187	VI	Bubble-plate	EFFICIENCIES in Ethanol-water Fractionation
80A000088	VI		EFFICIENCIES of Methanol Production from Ga
78 : 002739	VI	el from Cellulose Material (Wood). II. Energy Conversion	EFFICIENCIES of the Processes
80A001181	VIII	Automotive Fuels * Energy	EFFICIENCY
80A002301	VI	the	EFFICIENCY and Capacity of a Bubble Plate F
80A002161	IX	Paris Buses Test	EFFICIENCY of Alcohol as Engine Fuel
80A000204	VIII	Pumps Do a Gushing Business: Drivers Line Up for Fuel, but	EFFICIENCY Still in Question
80A000113	VI	Distillery Fuel Savings by	EFFICIENT Molasses Processing and Stillage
80A001192	VI	Still Building * Alcohol Series, V. 2 * a Primer on the	EFFICIENT Use of Alcohol for Food and Fuel
80A002029	III	Molasses as a Possible Fuel and the Economics of Distillery	EFFLUENT Treatment
80A000112	VII	Distillery	EFFLUENT Treatment in the Brazilian Nationa
80A000429	VII	Some Problems Associated with the Treatment of	EFFLUENTS from Malt Whisky Distilleries
78 : 001547	I	Rediscovering Biomass Fuels * Review of Current Research	EFFORTS
80A000746	VII	Use of Distillers Dried Grains with Solubles in Feeds for	EGG Production
80A000576	VI	Developing Countries * Fermentation Alcohol Industry in	EGYPT in the Last Three Decades
80A000681	VI	Proceedings of the	EIGHTH Cellulose Conference * Acid Hydrol
80A000682	VI	Proceedings of the	EIGHTH Cellulose Conference * Enzymatic H
80A000680	VI	Proceedings of the	EIGHTH Cellulose Conference * Process-dev
80A000679	VI	Proceedings of the	EIGHTH Cellulose Conference * Production
80A000474	IX	Technology for Energy Conservation * Methanol	ELECTRIC Hybrid Vehicle: a Comprehensive
80A000532	VII	ol Fuels Technology * the Production of Grain Alcohol and	ELECTRIC Power with Cogeneration of Steam
80A000375	IX	lications: a Comparison of Hydrogen, Methane, Methanol and	ELECTRICITY
80A000543	IX	park Ignited Internal Combustion Engines — Significance for	ELECTROSTATIC Carburetion
80A000620	I	echnology and Economics * the PVT Behavior of Methanol at	ELEVATED Pressures and Temperatures
80A001167	IX	of Isooctane, N-heptane, Methanol, Methane, and Propane at	ELEVATED Temperature and Pressures in the P
80A000193	I	but It's No Panacea: Advantages Are There; Big Output Is	ELUSIVE
80A001242	XI	Symptomatology and Therapy of Toxicoligical	EMERGENCIES
80A001227	IX		EMERGENCY Fuel Substitutes for Spark-igniti
80A000301	IX	Effects of Methanol Injection on	EMISSION and Performance in a Carbureted SI
80A001182	IX	lysis Method in the Study of Alternate Fuel, Combustion and	EMISSION Characteristics
80A002304	IX	Power, Fuel Consumption, and Exhaust	EMISSION Characteristics of an Internal Com
80A000326	IX	Combustion and	EMISSION Characteristics of Methanol
80A000307	IX	Fuel Economy and	EMISSION Characteristics of Methanol-gasoli
80A002316	IX	Engine Performance and Exhaust	EMISSION Characteristics of Spark-ignition
80A000655	IX	nergy Conversion Engineering Conference * Performance and	EMISSION Characteristics Using Blends of Me
80A000548	IX	tware Strategies for Fuel Economy Optimization with Exhaust	EMISSION Constraints in Methanol Fueled Aut
80A001253	IX	Study of Decomposed Methanol as a Low	EMISSION Fuel
80A002002	IX	Decomposed Methanol as a Low	EMISSION Fuel
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Citation Number	Subject Section	Citation Title	Title Keyword
80A000544	IX	al Symposium on Alcohol Fuels Technology * Combustion and	EMISSION of Gaseous Fuel from Reformed Meth
80A000247	IX	Methanol-gasoline Blends: Performance and	EMISSIONS
80A000340	IX	-cylinder Engine Study of Methanol Fuel-emphasis on Organic	EMISSIONS
80A000471	IX	New S.I. Engine Fuel System's Approach * Performance and	EMISSIONS
80A000549	IX	Blends as a Stratified-charge Engine Fuel: Performance and	EMISSIONS
80A000720	IX	* Methanol-gasoline Blend Fueled Engine — Performance and	EMISSIONS
80A000558	IX	al Symposium on Alcohol Fuels Technology * Alcohol Engine	EMISSIONS — Emphasis on Unregulated Compoun
80A000330	IX	Fuels and	EMISSIONS — Update and Outlook, 1974
80A000477	IX	lcohol Assisted Hydrocarbon Fuels: a Comparison of Exhaust	EMISSIONS and Fuel Consumption Using Steady
80A001173	IX	lcohol Assisted Hydrocarbon Fuels: a Comparison of Exhaust	EMISSIONS and Fuel Consumption Using Steady
80A001228	IX	Exhaust	EMISSIONS and Fuel Economy from Automobiles
80A002130	IX	Effect of Compression Ratio on Exhaust	EMISSIONS and Performance of a Methanol-fue
80A002133	IX	Gas Turbine	EMISSIONS and Performance on Methanol Fuel
80A002128	IX	Driving Cycle Economy,	EMISSIONS and Photochemical Reactivity Usin
80A000370	IX	thanol/Gasoline Blends as Automotive Fuel — Performance and	EMISSIONS Characteristics
80A000730	IX	oline on Spark Ignition, Carburetted Engine Performance and	EMISSIONS Characteristics * Volume 20
80A001184	IX	Future Automotive Fuels * Engine Performance and Exhaust	EMISSIONS Characteristics of a Methanol Fue
80A000643	IX	Energy Conversion Engineering Conference * Combustion and	EMISSIONS Characteristics of Methanol, Meth
80A000315	IX	Methanol, Ethanol and Jet Fuel	EMISSIONS Comparison from a Small Gas Turbi
80A002257	IX	Propulsion Systems: Held on April 18-22, 1977 * Gaseous	EMISSIONS Control for Heavy-duty Diesel Eng
80A000733	IX	tion Systems Contrasts in Terms of Fuel Economy and Exhaust	EMISSIONS for Simulated Driving Cycles with
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80A002255	IX	tal and Individual Hydrocarbons, Methanol, and Formaldehyde	EMISSIONS from a Carburetted Spark Ignition
80A000359	IX	Predicted Exhaust	EMISSIONS from a Methanol and Jet Fueled Ga
80A000642	IX	I * Computer Predicted Compression Ratio Effects on NOx	EMISSIONS from a Methanol Fueled SI Engine
80A000328	IX	Exhaust	EMISSIONS from a Methanol-fueled Automobile
80A000302	IX		EMISSIONS from a Methanol-fueled Single-cyl
80A002057	IX	Exhaust	EMISSIONS from a Single-cylinder Engine Fue
80A000560	IX	onal Symposium on Alcohol Fuels Technology * Formaldehyde	EMISSIONS from a Spark Ignition Engine Usin
80A000305	IX	Evaporative and Exhaust	EMISSIONS from Cars Fueled with Gasoline Co
80A000654	IX	Proceedings, Symposium on	EMISSIONS from Continuous Combustion System
80A000516	IX	hird International Symposium on Alcohol Fuels Technology *	EMISSIONS from Gasohol Fueled Vehicles
80A001261	IX		EMISSIONS from the Methanol Fueled Stanford
80A000522	IX	logy * the Influence of Engine Parameters on the Aldehyde	EMISSIONS of a Methanol Operated Four-strok
80A000331	IX	Ignition, Combustion and Exhaust	EMISSIONS of Lean Mixtures in Automotive Sp
80A000415	IX	Performance and NOx	EMISSIONS of Spark Ignited Combustion Engin
80A000715	IX	Power Plants and Future Fuels * Performance and	EMISSIONS of Spark-ignition Engines Operati
80A000448	IX	a Fundamental Model Predicting Fuel Consumption, NOx and HC	EMISSIONS of the Conventional Spark-ignited
80A000562	XI	ronmental Consequences of Methanol Spills and Methanol Fuel	EMISSIONS on Terrestrial and Freshwater Org
80A000288	IX	Some Studies on the Performance and Nitrogen-oxides	EMISSIONS Using Gasoline-methanol Blends in
80A001231	IX	eld on April 18-22, 1977 * Flame Speeds, Performance, and	EMISSIONS with Methanol-indolene Blends *
80A000341	IX	Single Cylinder Spark Ignition Engine Study of the Octane,	EMISSIONS, and Fuel Economy Characteristics
80A000333	IX	Methanol as a Gasoline Extender-fuel Economy,	EMISSIONS, and High Temperature Driveabilit
80A000323	IX	oco Engine Studies — Fuel and Engine Calibration Effects on	EMISSIONS, Fuel Economy and Octane Number R
80A001230	IX	cle Evaluation of Neat Methanol — Compromises among Exhaust	EMISSIONS, Fuel Economy, and Driveability
80A000329	IX	Exhaust	EMISSIONS, Fuel Economy, and Driveability
80A002303	IX	ohol Assisted Hydrocarbon Fuels * a Comparison of Exhaust	EMISSIONS, Power Output and Fuel Consumptio
80A000327	IX	Engine Performance and Exhaust	EMISSIONS: Methanol versus Isooctane
80A003127	VII	conomic Aspects of Using Grain Alcohol as a Motor Fuel with	EMPHASIS on By-product Feed Markets
80A000398	IX	Methanol as an Automotive Fuel with Special	EMPHASIS on Methanol-gasoline Blends
80A000558	IX	on Alcohol Fuels Technology * Alcohol Engine Emissions —	EMPHASIS on Unregulated Compounds
80A000521	IX	Technology * Development of an On-board Mechanical Fuel	EMULSIFIER for Utilization of Diesel/Methan

Citation Number	Subject Section	Citation Title	Title Keyword
80A000316	IX	ied Fuels for Diesel Engines by Application of Unstabilized	EMULSIONS
80A000521	IX	Utilization of Diesel/Methanol and Methanol/Gasoline Fuel	EMULSIONS in Transportation
80A001008	VIII	Amoco	ENCOURAGED by Its Gasohol Trial
80A002238	IX		ENCYCLOPEDIA of Chemical Processing and Des
80A001180	I		ENCYCLOPEDIA of Chemical Technology * Met
80A000494	I		ENCYCLOPEDIA of Chemical Technology, V. 9
80A001185	I	International	ENCYCLOPEDIA of Pharmacology and Therapeuti
80A001027	I	the Automobile's	ENDANGERED Future
80A000117	X	DOE	ENDORSES Use of Alcohol Fuels to Reduce Gas
80A000502	I	hnology * Alcohol Fuels from Biomass in New Zealand — the	ENERGETICS and Economics of Production and
78 : 002289	IV	Conference. Volume I * Cassava Fuel Alcohol in Brazil *	ENERGETICS and Economics; Comparison with E
80A000528	VIII	International Symposium on Alcohol Fuels Technology * the	ENERGETICS of Alternative Biomass Sources F
78 : 002720	V	Cellulose, Food and	ENERGY
80 : 000244	V	and Chemical Resource * Mesquite: a Possible Source of	ENERGY
80 : 000772	VIII	Case for Solar	ENERGY
80A000268	V	the Role of Forests as a Source of Solar	ENERGY
80A000442	V	losic Materials for the Production of Chemicals, Fuels, and	ENERGY
80A000503	III	Alcohol Fuels Technology * the Growing of Sugarcane for	ENERGY
80A000683	V	fice Department of Energy in the Use of Forest Residues for	ENERGY
80A000686	III	Using Sugar Crops to Capture Solar	ENERGY
80A001109	V	Wood	ENERGY
80A002093	VI	Hot Bug for	ENERGY
80A003009	IV	and Use of Fuel Ethanol from Corn or Wheat * Sources of	ENERGY
80A000477	IX	ouri, Rolla — Missouri Energy Council) Annual Conference on	ENERGY * Alcohol Assisted Hydrocarbon Fue
80A000675	IX	Hydrogen	ENERGY * Hydrogen and Methanol Fueled —
80A000478	IX	ouri, Rolla — Missouri Energy Council) Annual Conference on	ENERGY * Methanol Gasoline Fuels
80A003008	I	Agriculture and	ENERGY * Nebraska Univ., Lincoln (USA). C
80A000676	I	Hydrogen	ENERGY * Sources and Methods for Methanol
79 : 004628	III	Proceedings of the Symposium on	ENERGY * Tentative Projection of Costs
80A000675	IX	mobile Engine * Proceedings of the Hydrogen Economy Miami	ENERGY (Theme) Conference
80A000676	I	ol Production * Proceedings of the Hydrogen Economy Miami	ENERGY (Theme) Conference
80A000144	II		ENERGY — New Crop Sources
80A000577	VIII	Feedstock in Developing Countries * Interaction between	ENERGY Accounting and Cost Accounting in
80A000505	X	els Technology * Alcohol Fuel Technology and the National	ENERGY Act
80A001197	IX	hanol Based Fuels in Transportation * Ontario Ministry of	ENERGY Advisory Group on Synthetic Liquid F
80A001198	VIII	Analysis of Synthetic Liquid Fuels * Ontario Ministry of	ENERGY Advisory Group on Synthetic Liquid F
80A000092	I	the	ENERGY Alternatives
80A000596	I	and Chemical Feedstock in Developing Countries * Brazil's	ENERGY Alternatives
80A000283	I	Solar Biomass	ENERGY an Overview of USA Potential
79 : 006466	VIII	Symposium Papers: Energy Modeling and Net	ENERGY Analysis * Energy Analysis of Two
80A001208	VIII	Net	ENERGY Analysis of Alcohol Fuels * API Pu
80A001098	VIII	Net	ENERGY Analysis of Ethanol Production
79 : 006466	VIII	mposium Papers: Energy Modeling and Net Energy Analysis *	ENERGY Analysis of Two Technologies: Gasoh
80A001036	VIII	Biochemical Engineering: Renewable Sources of	ENERGY and Chemical Feedstocks (Food and En
80 : 000244	V	Technology of Utilizing Bark and Residues as an	ENERGY and Chemical Resource * Mesquite:
80A000379	V	the Feasibility of Utilizing Forest Residues for	ENERGY and Chemicals
80A000584	I	* Necessary Conditions to Promote and Realize a Policy for	ENERGY and Chemicals Based on "Green Petrol
80A000570	X	in Developing Countries * Governmental Responsibility in	ENERGY and Environmental Politics
78 : 001830	V	Clean Fuel from Biomass and Wastes *	ENERGY and Materials from the Forest Biomas
80A000137	X		ENERGY and National Security: a Status Rep
80A000637	I	and Exhibition (WATTEC) (Welding and Testing Technology) *	ENERGY and the Public * Alternative Fuels
80A000637	I		ENERGY and the Public, Public Awareness Wor

Citation Number	Subject Section	Citation Title	Title Keyword
76:001911	I	*Waste Materials * Review of*	*ENERGY Available and Technology for Energy*
80A001159	VI	*Dehydration of Ethanol: New Approach Gives Positive*	*ENERGY Balance*
80A000581	VIII	*as Fuel and Chemical Feedstock in Developing Countries **	*ENERGY Balance for the Production of Ethyl*
79:004125	VI	*Material and*	*ENERGY Balances in the Production of Ethano*
80A000375	IX		*ENERGY Carriers in Space Conditioning and*
80A000628	IX	*th Intersociety Energy Conversion Engineering Conference **	*ENERGY Carriers in Space Conditioning and*
80:002077	VI	*Bioconversion of Cellulosic Substances into*	*ENERGY Chemicals and Microbial Protein **
80:002118	VI	*Bioconversion of Cellulosic Substances into*	*ENERGY Chemicals and Microbial Protein **
80A000090	I		*ENERGY Choices that Europe Faces*
80A000269	V	*the Role of Wood in Future*	*ENERGY Concerns*
80A000138	X		*ENERGY Conferees Are Devising a Variety of*
80A002308	IV	*2nd New Zealand*	*ENERGY Conference * Fuel from Crops*
80A000720	IX	*Conference Proceedings: 1st World Hydrogen*	*ENERGY Conference * Methanol-gasoline Ble*
80A000486	II	*Energy Technology VI: Achievements in Perspective, 6th*	*ENERGY Conference and Exposition * Americ*
80A000266	VI	*Use of Stillage Water in the Mashing of Grain as a Means of*	*ENERGY Conservation*
80A000474	IX	*Technology for*	*ENERGY Conservation * Methanol Electric H*
80A000139	VIII		*ENERGY Conservation Needs American Brains*
80A001210	VI	*by Continuous Fermentation and Vacuum Distillation with Low*	*ENERGY Consumption*
80A000472	VI	*Microbial*	*ENERGY Conversion * Enzymatic Hydrolysis*
80A001178	II	*Microbial*	*ENERGY Conversion * Feedstocks for Large-*
80A000473	VI	*Microbial*	*ENERGY Conversion * the Competition Betwe*
78:002739	VI	*Liquid Transport Fuel from Cellulose Material (Wood). II.*	*ENERGY Conversion Efficiencies of the Proce*
80A000491	II	*Record of the Tenth Intersociety*	*ENERGY Conversion Engineering Conference **
80A000492	IX	*Record of the Tenth Intersociety*	*ENERGY Conversion Engineering Conference **
80A000493	VIII	*Record of the Tenth Intersociety*	*ENERGY Conversion Engineering Conference **
80A000624	V	*Proceedings of the 13th Intersociety*	*ENERGY Conversion Engineering Conference **
80A000625	XI	*Proceedings of the 13th Intersociety*	*ENERGY Conversion Engineering Conference **
80A000626	IX	*9th Intersociety*	*ENERGY Conversion Engineering Conference **
80A000627	IX	*9th Intersociety*	*ENERGY Conversion Engineering Conference **
80A000628	IX	*9th Intersociety*	*ENERGY Conversion Engineering Conference **
80A000629	I	*Record of the Tenth Intersociety*	*ENERGY Conversion Engineering Conference **
80A000630	IX	*Record of the Tenth Intersociety*	*ENERGY Conversion Engineering Conference **
80A000631	I	*Proceedings of the 14th Intersociety*	*ENERGY Conversion Engineering Conference **
80A000632	IX	*Proceedings of the 14th Intersociety*	*ENERGY Conversion Engineering Conference **
80A000643	IX	*Proceedings 11th Intersociety*	*ENERGY Conversion Engineering Conference **
80A000644	IX	*Proceedings 11th Intersociety*	*ENERGY Conversion Engineering Conference **
80A000645	IX	*Proceedings 11th Intersociety*	*ENERGY Conversion Engineering Conference **
80A000646	IX	*Proceedings 11th Intersociety*	*ENERGY Conversion Engineering Conference **
80A000655	IX	*Proceedings, 6th Intersociety*	*ENERGY Conversion Engineering Conference **
78:002289	IV	*Proceedings of the 12th Intersociety*	*ENERGY Conversion Engineering Conference.*
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80A000641	IX	*Proceedings of the 12th Intersociety*	*ENERGY Conversion Engineering Conference.*
80A000642	IX	*Proceedings of the 12th Intersociety*	*ENERGY Conversion Engineering Conference.*
79:000547	I	*Solar*	*ENERGY Conversion through Biology*
80A000284	I	*Solar*	*ENERGY Conversion through Biology: Could*
80A000477	IX	*oceedings, 2nd UMR-MEC (Univ. of Missouri, Rolla — Missouri*	*ENERGY Council) Annual Conference on Energy*
80A000478	IX	*oceedings, 2nd UMR-MEC (Univ. of Missouri, Rolla — Missouri*	*ENERGY Council) Annual Conference on Energy*
80A002021	IX	*Alcohol: a Brazilian Answer to the*	*ENERGY Crisis*
80A002286	VIII	*Alcohol as a Solution to the*	*ENERGY Crisis*
80A001200	I	*Gasohol — One Answer to the*	*ENERGY Crisis * Public Administration Ser*
80A000427	IV	*Potato Alcohol * a Solution to the*	*ENERGY Crisis and Higher Prices for Spuds?*
80A000140	I		*ENERGY Crisis Raises Doubts over the Prospe*

Citation Number	Subject Section	Citation Title	Title Keyword
80A001036	VIII	*newable Sources of Energy and Chemical Feedstocks (Food and*	*ENERGY Crop System)*
79 : 004017	I	*Renewable*	*ENERGY Crucial for Third World*
80A000181	I	*Gasohol: Changing the*	*ENERGY Drinking Habit*
80 : 000188	I	*lan for the Introduction of Biomass-based Methanol into the*	*ENERGY Economy*
80A000396	I	*Methanol as a Fuel in the Urban*	*ENERGY Economy and Possible Source of Suppl*
80A000339	IX	*Single-cylinder Engine Evaluation of Methanol — Improved*	*ENERGY Economy and Reduced NOx*
80A001181	VIII	*Automotive Fuels **	*ENERGY Efficiency*
80A002290	I	*Prospects for*	*ENERGY Farming*
80A000722	VIII	*Proceedings of a Symposium on the Potential for*	*ENERGY Farming in New Zealand * Some Aspe*
80A000456	V	*an Evaluation of the Use of Agricultural Residues as an*	*ENERGY Feedstock * Volume I*
80A000455	V	*an Evaluation of the Use of Agricultural Residues as an*	*ENERGY Feedstock * Volume II*
80A000453	V	*an Evaluation of the Use of Agricultural Residues as an*	*ENERGY Feedstock — a Ten Site Survey * Vo*
77 : 000111	V	*Solar*	*ENERGY Fixation by Plants and Synthetic Fue*
80A001175	VIII	*ternative Fuels in Highway Vehicles: the Relevance of U.S.*	*ENERGY Flows*
80A000093	V		*ENERGY for All: We'll Get Tanked Up on Woo*
76 : 001883	V	*titution of Engineers 1976 Engineering Conference * Solar*	*ENERGY for Australia. the Role of Biologi*
79 : 007134	III	*Biomass*	*ENERGY for Hawaii*
80A001012	I	*an Ancient Fuel Provides*	*ENERGY for Modern Times*
80A000142	V		*ENERGY Forests and Fuel Plantations*
80A000491	II	*th Intersociety Energy Conversion Engineering Conference **	*ENERGY from Agriculture*
80A000143	I		*ENERGY from Agriculture: the Brazilian Exp*
79 : 004655	I		*ENERGY from Biomass and Wastes * Agro-ind*
79 : 004656	I		*ENERGY from Biomass and Wastes * Brazilia*
80A000460	VIII		*ENERGY from Biomass and Wastes * Economic*
79 : 004644	I		*ENERGY from Biomass and Wastes * Energy F*
79 : 004665	VIII		*ENERGY from Biomass and Wastes * Ethanol-*
79 : 004654	I		*ENERGY from Biomass and Wastes * Liquid F*
79 : 004663	I		*ENERGY from Biomass and Wastes * Study of*
79 : 002528	VIII		*ENERGY from Biomass and Wastes: an Overvie*
79 : 004644	I	*Energy from Biomass and Wastes **	*ENERGY from Biomass and Wastes: 1978 Updat*
80A000624	V	*th Intersociety Energy Conversion Engineering Conference **	*ENERGY from Biomass through Hydrolysis of W*
80A000692	I	*Increased*	*ENERGY from Biomass: 1985 Possibilities an*
80A000265	VIII	*Researchers Accelerate Search for Way to Use Less*	*ENERGY in Making Gasohol*
79 : 004370	I	*Focus on Renewable*	*ENERGY in New Zealand*
80A000683	V	*the Activities of Richland Operations Office Department of*	*ENERGY in the Use of Forest Residues for En*
80A000462	X	*Solar 79 Northwest * Alternate*	*ENERGY Incentives in Oregon*
80A000060	I	*Brazil Exploits All Resources Seeking*	*ENERGY Independence*
80A000397	IX	*as an Automotive Fuel: a Summary of Research in the M.I.T.*	*ENERGY Laboratory*
80A000300	VIII	*Indicates that Producing Alcohol from Crops Would Result in*	*ENERGY Loss*
80A003012	I	*Canadian Renewable Energy Prospects * Canada Dept. of*	*ENERGY Mines and Resources Report*
79 : 006466	VIII	*Symposium Papers:*	*ENERGY Modeling and Net Energy Analysis **
80A002131	VIII	*Gasohol:*	*ENERGY Mountain or Molehill?*
76 : 001878	I	*iew Based on Use of Minnesota Raw Materials and the State's*	*ENERGY Needs*
80A000325	IX	*Synthetic Fuels for Transportation and National*	*ENERGY Needs*
80A000489	V	*oduction of Southern Tree Plantations and Its Conversion to*	*ENERGY or Chemical Products*
80A000431	VIII	*Fuels from Biomass —*	*ENERGY Outlay versus Energy Returns: a Cri*
80A001190	VIII	*Design, Operation and Economics of the*	*ENERGY Plantation (TM)*
80A000479	V	*Solar Technology in the Seventies, V. 7 * Silviculture*	*ENERGY Plantations*
80A002135	III	*Hawaiian Sugarcane*	*ENERGY Plantations*
80A000001	X	*a Call for Gasohol. (United States*	*ENERGY Policy)*
80A000362	X	*Department of*	*ENERGY Position Paper on Alcohol Fuels*
79 : 004663	I	*Energy from Biomass and Wastes * Study of the*	*ENERGY Potential of Fuels from Land Biomass*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000743	I		*ENERGY Primer: Solar, Water, Wind, and Bio*
80A000068	I	*Brazil Points Way to Relieve Australian*	*ENERGY Problem*
80A001264	V	*in World Affairs * the Role of Forests in Meeting World*	*ENERGY Problems*
80A000595	VI	*Developing Countries * Distillation, Rectification, Low*	*ENERGY Processes*
76 : 001911	I	*Materials * Review of Energy Available and Technology for*	*ENERGY Production*
80A000449	V	*Utilization of Cellulosic Waste for*	*ENERGY Production*
80A002146	I	*Gasohol for*	*ENERGY Production * Energy Technology Ser*
80 : 002045	III	*Photosynthetic Pathway and Biomass*	*ENERGY Production * Pineapple*
80A000385	VI	*Fuel and*	*ENERGY Production by Bioconversion of Waste*
80A000486	II	*gy Conference and Exposition * American Agriculture — the*	*ENERGY Production System — Gasohol*
80A003014	VIII	*Studies on the Economic Potential of On-farm*	*ENERGY Production Systems * Univ. of Wash*
80A002142	I	*Gasohol — Are Alcohol Fuels in Our Future? * Citizen's*	*ENERGY Project Report Series, No. 24*
80A003012	I	*Canadian Renewable*	*ENERGY Prospects * Canada Dept. of Energy*
80A000408	I	*Study of the Importance of*	*ENERGY R, D and D for the United States*
80A002267	I	*Biomass*	*ENERGY Refineries for Production of Fuel an*
80 : 002138	VIII		*ENERGY Relationships of Fuel from Biomass*
80A001136	I	*Priorities on*	*ENERGY Research and Development*
76 : 001711	I	*Strategy for Solar*	*ENERGY Research in Australia*
79 : 007129	VIII	*Biomass: the Self-replacing*	*ENERGY Resource*
80A001100	VI	*Cellulose as a Chemical and*	*ENERGY Resource*
80A000719	VI	*Cellulose as a Chemical and*	*ENERGY Resource * Continuous Cellulose Pr*
80A000729	VI	*Cellulose as a Chemical and*	*ENERGY Resource * Ethanol Fermentation an*
80A000717	VI	*Cellulose as a Chemical and*	*ENERGY Resource * Process Developmental S*
80A000718	VI	*Cellulose as a Chemical and*	*ENERGY Resource * the Acid Hydrolysis of*
80A000127	VIII	*Assessment of Various Cellulosic Substrates as Chemical and*	*ENERGY Resources*
80A000670	I	*ean Fuels from Biomass and Wastes * Biomass and Wastes as*	*ENERGY Resources: Update*
80A000431	VIII	*Fuels from Biomass — Energy Outlay versus*	*ENERGY Returns: a Critical Appraisal*
80A000248	VIII	*Methanol Primed for Future*	*ENERGY Role*
80A002132	VI	*Alternatives for*	*ENERGY Savings at Plant Level for the Produ*
80A000417	VIII	*Alcohol Fuels —*	*ENERGY Savior or Wastrel?*
80A001066	I	*Lance Crombie*	*ENERGY Self-sufficiency Now!*
80A001163	VIII	*Methanol and*	*ENERGY Shortage — a Feasibility Study of Ma*
80A001014	I	*API Sees Alcohol as Negative Factor in*	*ENERGY Situation*
80A000284	I	*Energy Conversion through Biology: Could It Be a Practical*	*ENERGY Source*
80A000393	I	*Methanol: a Raw Material for Synthesis and an*	*ENERGY Source*
80A003003	IV	*Cassava as an*	*ENERGY Source*
80A002284	III	*Alcohol Fuel from Sugarcane (for an Alternative*	*ENERGY Source) — Is It Economic?*
80A001163	VIII	*ibility Study of Manufacturing Synthetic Fuel from Available*	*ENERGY Sources*
80A000484	X	*Papers: 2nd Miami International Conference on Alternative*	*ENERGY Sources * Future of Alcohol Fuels*
80A000485	IX	*Papers: 2nd Miami International Conference on Alternative*	*ENERGY Sources * Thermodynamic Calculatio*
80A000481	I	*version * When the Oil Runs Out — a Survey of Our Primary*	*ENERGY Sources and the Fuel We Can Make from*
80A000440	I	*an Overview of Alternative*	*ENERGY Sources for LDCs*
80A001043	III	*Gasohol from Sugarcane (Saccharum Spontaneum,*	*ENERGY Sources)*
80A002260	VIII	*Gasohol — a Critical Choice (Fuel,*	*ENERGY Sources)*
80A000401	V	*Wood Waste for*	*ENERGY Study: Inventory Assessment and Eco*
77 : 001079	I	*Australia Examines New Routes to Solar*	*ENERGY Supply*
80 : 000231	VIII	*Preparation of a Cost Data Bank for DOE/biomass*	*ENERGY Systems Branch. Third Quarterly Pr*
80 : 001996	VI	*3rd Annual Biomass*	*ENERGY Systems Conference * Acid Hydrolys*
80 : 001985	VI	*3rd Annual Biomass*	*ENERGY Systems Conference * Bioconversion*
80 : 002001	I	*3rd Annual Biomass*	*ENERGY Systems Conference * Biological Pr*
80 : 001987	VIII	*3rd Annual Biomass*	*ENERGY Systems Conference * Biomass Based*
80 : 001988	VI	*3rd Annual Biomass*	*ENERGY Systems Conference * Conceptual De*

Citation Number	Subject Section	Citation Title	Title Keyword
80 : 002014	VI	3rd Annual Biomass	ENERGY Systems Conference * Direct Microb
80 : 001986	VI	3rd Annual Biomass	ENERGY Systems Conference * Enzymatic Sac
80 : 001995	VIII	3rd Annual Biomass	ENERGY Systems Conference * Fuels from Fe
80 : 001983	VI	3rd Annual Biomass	ENERGY Systems Conference * Production of
78 : 000005	I	Alternative	ENERGY Technologies in Brazil
80A000445	I	Alternative	ENERGY Technologies in Brazil
80A000625	XI	gy Conversion Engineering Conference * Risk Assessment of	ENERGY Technology
80A001177	IX		ENERGY Technology Handbook * Methyl Alcoh
80A002146	I	Gasohol for Energy Production *	ENERGY Technology Series
79 : 007143	I		ENERGY Technology V: Challenges to Technol
80A000486	II		ENERGY Technology VI: Achievements in Pers
80A000145	VIII	the	ENERGY to Grow Maize
80A000487	VI	sources Council Annual Meeting * Adaptation of Geothermal	ENERGY to Produce Alcohol from Agricultural
80A000167	VIII	Fuels to Replace Oil Would Be Subsidized in	ENERGY Unit's Plan
80A000700	IX	Hydrogen as an	ENERGY Vector: Its Production, Use and Tra
80A000146	I	the	ENERGY War: Brew It Yourself
80A000713	IX	Methanol as an Alternative Fuel *	ENERGY Workshop — Report on the Use of Meth
79 : 002521	VI	ods for Direct Conversion of Agricultural Residue to Usable	ENERGY. Final Report
80A000141	IX		ENERGY-ECOLOGICAL Characteristics of Synthe
80A000045	VI	Connecticut Firms Experiment with Garbage-to-fuel/The	ENERGY-FROM-WOOD Movement
80A003014	VIII	of Natural Systems. Report * Interim Report on Possible	ENERGY-PRODUCTION Alternatives in Crop/Live
80A002098	VIII	Gasohol: Does It or Doesn't It Produce Positive Net	ENERGY?
80A002099	VIII	Gasohol: Does It Save	ENERGY?
80A000690	I	Biomass for	ENERGY: Conference at the Royal Society *
80A000691	X	Biomass for	ENERGY: Conference at the Royal Society *
80A000094	VIII	Agriculture as a Source of Fluid	ENERGY: Gasohol et al.
78 : 001547	I	Photosynthetic Solar	ENERGY: Rediscovering Biomass Fuels * Re
80A000249	I	Methanol Technology and Economics * Chem.	ENG. Prog., Symp. Ser., V. 66, No. 98
80A000619	I	Methanol Technology and Economics * Chem.	ENG. Prog., Symp. Ser., V. 66, No. 98
80A001244	VI	of a Mathematical Model of the Methanol Synthesis * Chem.	ENG. Prog., Symp. Ser., V. 66, No. 98
80A002061	IX	Exxon Research and	ENG. Study Finds Methanol Promising Substit
80A000087	IX	Fuel Cetane Number for Combustion Control in Bi-fuel Diesel	ENGINE
80A000301	IX	ol Injection on Emission and Performance in a Carbureted SI	ENGINE
80A000302	IX	Emissions from a Methanol-fueled Single-cylinder	ENGINE
80A000332	IX	bustion of Methanol-gasoline Blends In a Single Cylinder SI	ENGINE
80A000343	IX	Water-cooled Volkswagen PCI-stratified Charge	ENGINE
80A000448	IX	ion, NOx and HC Emissions of the Conventional Spark-ignited	ENGINE
80A000522	IX	yde Emissions of a Methanol Operated Four-stroke Otto Cycle	ENGINE
80A000525	IX	* a New Way of Direct Injection of Methanol in a Diesel	ENGINE
80A000544	IX	ission of Gaseous Fuel from Reformed Methanol in Automotive	ENGINE
80A000630	IX	ard Steam-reforming of Methanol to Fuel Automotive Hydrogen	ENGINE
80A000642	IX	on Ratio Effects on NOx Emissions from a Methanol Fueled SI	ENGINE
80A000643	IX	nol-water, and Gasoline-methanol Blends in a Spark Ignition	ENGINE
80A000645	IX	tion of Methanol and Methanol Blends in a Stratified Charge	ENGINE
80A000650	IX	cohol on the Performance of an Alcohol-diesel Oil Dual-fuel	ENGINE
80A000653	IX	ffecting the Performance of an Alcohol-diesel Oil Dual Fuel	ENGINE
80A000660	IX	ary Fuel in a Multicylinder Automotive Compression Ignition	ENGINE
80A000741	IX	verter with Methanol for Spark-ignition Internal Combustion	ENGINE
80A002125	IX	tion of Methanol and Methanol Blends in a Stratified Charge	ENGINE
80A002127	IX	Direct Injected Methanol Fueling of a Two Stroke Locomotive	ENGINE
80A002130	IX	ssions and Performance of a Methanol-fueled Single-cylinder	ENGINE
80A002292	IX	eristics of Low Octane Fuels Blended with Methanol in an SI	ENGINE

Citation Number	Subject Section	Citation Title	Title Keyword
80A002305	IX	*racteristics of Gasoline, Methane, and Methanol in a Wankel*	*ENGINE*
80A003059	IX	*parative Performance of Alcohol-gasoline Blends in Gasoline*	*ENGINE*
80A001229	IX	*977 * a Study on Reformed Fuel for an Automotive Gasoline*	*ENGINE * a Report by the Automotive Propu*
80A002255	IX	*nd Formaldehyde Emissions from a Carburetted Spark Ignition*	*ENGINE * a Report by the Automotive Propu*
80A000675	IX	** Hydrogen and Methanol Fueled — Air Breathing Automobile*	*ENGINE * Proceedings of the Hydrogen Econ*
80A000720	IX	*drogen Energy Conference * Methanol-gasoline Blend Fueled*	*ENGINE — Performance and Emissions*
80A000684	IX	*timized Combustion in a Methanol — Fuelled Spark — Ignition*	*ENGINE and Its Effect on Methanol Economy*
80A000323	IX	*Single-cylinder PROCO Engine Studies — Fuel and*	*ENGINE Calibration Effects on Emissions, Fu*
80A000546	IX	*hird International Symposium on Alcohol Fuels Technology **	*ENGINE Cold-start with Dissociated Methanol*
80A000380	IX	*Formation of NO and NO_2 in the I.C.*	*ENGINE Combustion of Methyl Alcohol and Fue*
80A000558	IX	*rnational Symposium on Alcohol Fuels Technology * Alcohol*	*ENGINE Emissions — Emphasis on Unregulated*
80A000339	IX	*Single-cylinder*	*ENGINE Evaluation of Methanol — Improved En*
80A000547	IX	*hird International Symposium on Alcohol Fuels Technology **	*ENGINE Experiments with Alcohol/Diesel Fuel*
80A000698	IX	*on Low Pollution Power Systems Development * Automotive*	*ENGINE for Methanol-water Mixture*
80A000377	IX	*Using Methanol and Methanol/Gasoline Blends as Automotive*	*ENGINE Fuel*
80A000640	IX	*75 Fall Meeting * Analysis of Methanol as a Reciprocating*	*ENGINE Fuel*
80A000659	IX	*ngines Combustion * Some Tests with Ethyl Alcohol as S.I.*	*ENGINE Fuel*
80A002161	IX	*Paris Buses Test Efficiency of Alcohol as*	*ENGINE Fuel*
80A000471	IX	*Section: Spring Meeting. Mimeographed Papers * New S.I.*	*ENGINE Fuel System's Approach. * Performan*
80A000549	IX	*erization of Alcohol/Gasoline Blends as a Stratified-charge*	*ENGINE Fuel: Performance and Emissions*
80A002014	IX	*aldehyde Concentrations in the Exhaust of a Spark Ignited*	*ENGINE Fueled by Alcohol/Gasoline Blends*
80A002296	IX	*yde Concentrations in the Exhaust of an Internal Combustion*	*ENGINE Fueled by Alcohol/Gasoline Blends*
80A002057	IX	*Exhaust Emissions from a Single-cylinder*	*ENGINE Fueled with Gasoline, Methanol, and*
80A000652	IX	*uitability of Methanol and Methanol-gasoline Blends as S.I.*	*ENGINE Fuels*
80A000734	IX	*oline, Methanol, and Methanol/Water Blend as Spark Ignition*	*ENGINE Fuels*
80A002123	IX	*Alternative Diesel*	*ENGINE Fuels: an Experimental Investigatio*
80A001071	IX	*Multi-fuel Car*	*ENGINE Gets New Tests*
80A000458	IX		*ENGINE Improvement Possibilities and Enviro*
80A002138	IX	*Comparative Automotive*	*ENGINE Operation When Fueled with Ethanol*
80A000522	IX	*Symposium on Alcohol Fuels Technology * the Influence of*	*ENGINE Parameters on the Aldehyde Emissions*
80A000651	IX	*of Methanol in the Diesel Engine: an Experimental Study of*	*ENGINE Performance*
80A000730	IX	*ethanol Addition to Gasoline on Spark Ignition, Carburetted*	*ENGINE Performance and Emissions Characteri*
80A002316	IX		*ENGINE Performance and Exhaust Emission Cha*
80A001184	IX	*Future Automotive Fuels **	*ENGINE Performance and Exhaust Emissions Ch*
80A000327	IX		*ENGINE Performance and Exhaust Emissions:*
80A002168	IX		*ENGINE Performance with Gasoline and Alcoho*
80A000657	IX	*nference I.C. Engines Combustion * Comparative Studies of*	*ENGINE Performance with Methanol as a Suppl*
80A000236	IX	*Methanol*	*ENGINE Revs Up for Road Testing*
80A000323	IX	*Single-cylinder PROCO*	*ENGINE Studies — Fuel and Engine Calibratio*
80A000340	IX	*Single-cylinder*	*ENGINE Study of Methanol Fuel-emphasis on O*
80A000341	IX	*Single Cylinder Spark Ignition*	*ENGINE Study of the Octane, Emissions, and*
80A000477	IX	*issions and Fuel Consumption Using Steady-state and Dynamic*	*ENGINE Test Facilities*
80A001173	IX	*issions and Fuel Consumption Using Steady-state and Dynamic*	*ENGINE Test Facilities*
80A002303	IX	*Power Output and Fuel Consumption Using Static and Dynamic*	*ENGINE Test Facilities*
80A003050	IX	*Single-cylinder*	*ENGINE Tests of Substitute Motor Fuels*
80A001164	IX	*the Utilization of Alternative Fuels in a Diesel*	*ENGINE Using Different Methods*
80A002304	IX	*Exhaust Emission Characteristics of an Internal Combustion*	*ENGINE Using Isooctane and Methanol*
80A000560	IX	*Technology * Formaldehyde Emissions from a Spark Ignition*	*ENGINE Using Methanol*
°0A000338	IX	*formance of Methanol-gasoline Blends in a Stratified Charge*	*ENGINE Vehicle*
0A000524	IX	*osium on Alcohol Fuels Technology * Dual-fueling a Diesel*	*ENGINE with Carbureted Alcohol*
80A002123	IX	*of Methanol, Ethanol, Methane and Ammonia in a D. I. Diesel*	*ENGINE with Pilot Injection*
80A000526	IX	*chnology * the Utilization of Different Fuels in a Diesel*	*ENGINE with Two Separate Injection Systems*

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000627	IX	*9th Intersociety Energy Conversion*	*ENGINEERING Conference * Design and Perfo*
80A000628	IX	*9th Intersociety Energy Conversion*	*ENGINEERING Conference * Energy Carriers*
80A000491	II	*Record of the Tenth Intersociety Energy Conversion*	*ENGINEERING Conference * Energy from Agri*
80A000624	V	*Proceedings of the 13th Intersociety Energy Conversion*	*ENGINEERING Conference * Energy from Biom*
80A000492	IX	*Record of the Tenth Intersociety Energy Conversion*	*ENGINEERING Conference * Fueling Automoti*
80A000629	I	*Record of the Tenth Intersociety Energy Conversion*	*ENGINEERING Conference * Fueling Automoti*
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80A000632	IX	*Proceedings of the 14th Intersociety Energy Conversion*	*ENGINEERING Conference * Improving Octane*
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80A000625	XI	*Proceedings of the 13th Intersociety Energy Conversion*	*ENGINEERING Conference * Risk Assessment*
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80A000215	IX	*Methanol — a Clean Burning Fuel for Automobile*	*ENGINES*
80A000288	IX	*rogen-oxides Emissions Using Gasoline-methanol Blends in SI*	*ENGINES*
80A000308	IX	*hing of Methanol Flames with Applications to Spark Ignition*	*ENGINES*
80A000312	IX	*Methanol and Other Alternative Fuels for Off-highway Mobile*	*ENGINES*
80A000331	IX	*ust Emissions of Lean Mixtures in Automotive Spark Ignition*	*ENGINES*
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80A000415	IX	*Fuels — Quasi One-dimensional Modeling * Methanol Fueled*	*ENGINES*

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000657	IX	*ormance with Methanol as a Supplementary Fuel for SI and CI*	*ENGINES*
80A000658	IX	*on and Combustion Processes in Alcohol-diesel Oil Dual Fuel*	*ENGINES*
80A000693	IX	*tion Engines * Future Fuels for Small Internal-combustion*	*ENGINES*
80A001094	IX	*Volvo, Saab Test Dual Fuels*	*ENGINES*
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80A001160	IX	*re Fuels and Mixture Preparation Methods for Spark Ignition*	*ENGINES*
80A001183	IX	*utomotive Fuels * Alternative Fuels for Automotive Diesel*	*ENGINES*
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80A001227	IX	*Emergency Fuel Substitutes for Spark-ignition*	*ENGINES*
80A002122	I	*Alternate Portable Fuels for Internal Combustion*	*ENGINES*
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80A002170	IX	*Alcohol as Antiknock Agent in Automotive*	*ENGINES*
80A002180	IX	*Effects of Substitute Fuels on Automotive*	*ENGINES*
80A002200	IX	*Alcohol Fuels for Use in Internal Combustion*	*ENGINES*
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80A002242	IX	*Alcohol — a Fuel for Internal Combustion*	*ENGINES*
80A002307	IX	*cts of Oxy:hydrocarbon Fuels on Exhaust from Spark-ignition*	*ENGINES*
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80A000149	IX		*ENGINES Set for Brazil Use*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000679	VI	*Conference * Production of Sugars from Waste Cellulose by*	*ENZYMATIC Hydrolysis. I. Primary Evaluatio*
80A000026	VI	*Cellulosic Substrates for*	*ENZYMATIC Saccharification*
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80A001135	VI	*Pretreatments to Enhance Chemical,*	*ENZYMATIC, and Microbiological Attack of Ce*
80A003085	V	*Fine Grinding,*	*ENZYME Digestion and the Lignin-cellulose B*
80A001134	VI	*Pretreatment of Cellulosic Wastes to Increase*	*ENZYME Reactivity*
79 : 007164	VI	*Chemicals from Biomass by Improved*	*ENZYME Technology*
80A000285	VI	*Soluble and Immobilized*	*ENZYME Technology in Bioconversion of Barle*
80A000716	VI	** Development of Processes for Industrial Production of*	*ENZYMES*
80A003086	V	*ties of Powdered Wood and Isolation of Lignin by Cellulytic*	*ENZYMES*
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80A002037	VIII		*EOK Proposes Deregulation of Gasohol Prices*
80A002039	X		*EPA Mulls Ban on Two Fuel Additives*
80A000233	IX	*Methanol as Gasoline Substitute Seen 'Unrealistic' by*	*EPA Scientist*
80A002041	XI		*EPA Spends $500,000 to Study Environmental*
80A000183	VIII	*Gasohol Coming on Strong; Its Effect on Marketing*	*EQUIPMENT*
80A002192	VI	*Mechanical*	*EQUIPMENT for Continuous Fermentation of Fi*
80A000512	IX	*Combustion Bomb as a Function of Pressure, Temperature and*	*EQUIVALENCE Ratio for Methanol and Other Al*
80A000399	IX	*Engine: a Transportation Strategy for the Post-petroleum*	*ERA*
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80A000498	IV	*Feasibility of*	*ESTABLISHING Potato Ethanol Plants on Princ*
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80A000742	XI	*anol * Biological Effects of Methanol Spills into Marine,*	*ESTUARINE, and Freshwater Habitats*
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80A000003	V	*ion of Cellulosic Feedstock in the Production of Fuel Grade*	*ETHANOL*
80A000035	XI	*Chemical Relevance — a Heuristic Approach. Part IV:*	*ETHANOL*
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80A000733	IX	*ational Symposium on Alcohol Fuel Technology: Methanol and*	*ETHANOL * Alternate Air-fuel Induction Sy*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000739	III	*ational Symposium on Alcohol Fuel Technology: Methanol and*	*ETHANOL * Direct Processing of Sugar Cane*
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80A000426	VI	*Low-energy Processes Vie for*	*ETHANOL — Plant Market*
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80A000032	I	*Cheaper*	*ETHANOL 'Gas' on Its Way*
80A001061	IV	*Jerusalem Artichoke Gets Attention as Possible Fuel*	*ETHANOL Alcohol Source*
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80A001255	IX	*Oxide and Composition Profiles around Burning Droplets of*	*ETHANOL and Ethanol-pyridine Mixtures*
79 : 004655	I	*ergy from Biomass and Wastes * Agro-industrial System for*	*ETHANOL and Ethylene Production*
78 : 001793	VI	*Biomass: a Cash Crop for the Future **	*ETHANOL and Furfural from Corn*
80A001209	VI	*a Manual on*	*ETHANOL and Gasohol Production in Louisiana*
80A000315	IX	*Methanol,*	*ETHANOL and Jet Fuel Emissions Comparison*
80A002046	XI		*ETHANOL and Lead Toxicity*
80A002138	IX	*Comparative Automotive Engine Operation When Fueled with*	*ETHANOL and Methanol*
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76 : 001878	I		*ETHANOL and Methanol: Production Schemes*
80A000305	IX	*Exhaust Emissions from Cars Fueled with Gasoline Containing*	*ETHANOL and Methyl Tert-butyl Ether*
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80A000360	VIII	*Production of*	*ETHANOL and Vegetable Protein by Grain Ferm*
80A003090	VI	*Physical Properties of*	*ETHANOL and Water*
80A002310	V	*Laboratory Preparation of Wood Sugars and Fermentation to*	*ETHANOL and Yeast*
80A000351	I	*Biomass*	*ETHANOL as a Chemical Feedstock in the Unit*
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80A000407	VI	*Study of the Fermentation of Xylose to*	*ETHANOL by Fusarium Oxysporum*
80A000735	VIII	*ol Fuel Technology: Methanol and Ethanol * Production of*	*ETHANOL by the Fermentation of Grain*
80A000085	VI	*ffect of Pretreatment of Molasses and Recycling of Yeast on*	*ETHANOL Fermentation*
80A000729	VI	*Cellulose as a Chemical and Energy Resource **	*ETHANOL Fermentation and Potential*
80A002215	III		*ETHANOL Fermentation of Molasses*
80A000748	VI	*Use of Mycotoxin Contaminated Grain in the*	*ETHANOL Fermentation Process*
80A001171	VI	*racellular Variables on the Enriched-lysine Baker's Yeast —*	*ETHANOL Fermentation Process*
80A000257	VI	*Rapid*	*ETHANOL Fermentations Using Vacuum and Cell*
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80A001235	II	*Sugarcane versus Corn versus Ethylene as Sources of*	*ETHANOL for Motor Fuels and Chemicals*
80A002048	V		*ETHANOL from Agricultural Residues*
76 : 001689	V	*Production of Solar*	*ETHANOL from Australian Forests*
79 : 003451	VIII	*Comparative Economic Assessment of*	*ETHANOL from Biomass*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A003009	IV	*Production and Use of Fuel*	*ETHANOL from Corn or Wheat * Sources of E*
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80 : 001961	VIII	*nary Report on the Agricultural Sector Impacts of Obtaining*	*ETHANOL from Grain*
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80A000517	IX	*hol Fuels Technology * Brazilian Vehicles Calibration for*	*ETHANOL Fuels*
80A001170	IX	*Methanol and*	*ETHANOL Fuels for Modern Cars*
80A000508	IX	*periences with the Utilization of Ethanol/Gasoline and Pure*	*ETHANOL in Brazilian Passenger Cars*
80A000104	IX	*Diesel Oil and*	*ETHANOL Mixtures for Diesel-powered Farm Tr*
80A000190	I	*Manufacture, Availability and Cost of Methanol and*	*ETHANOL Motor Fuels*
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80A000498	IV	*Feasibility of Establishing Potato*	*ETHANOL Plants on Prince Edward Island **
80A002051	VIII		*ETHANOL Price to Rise*
80A000261	VI	*Renewable Fuels —*	*ETHANOL Produced by Fermentation*
80A000432	VI	*High Productivity Fermentation for*	*ETHANOL Production*
80A000452	VI	*Fuel from Farms * a Guide to Small Scale*	*ETHANOL Production*
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80A000528	VIII	*ology * the Energetics of Alternative Biomass Sources for*	*ETHANOL Production in Brazil*
80A000722	VIII	*Farming in New Zealand * Some Aspects of the Economics of*	*ETHANOL Production in New Zealand*
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80A000605	I	*emical Feedstock in Developing Countries * Perspective of*	*ETHANOL Usage as Fuel in the Dominican Repu*
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80A002245	IX	*Performance of an*	*ETHANOL-GASOLINE Blend in Automobiles and L*
80A000641	IX	*vaporative Emissions from a Brazilian Chevrolet Fueled with*	*ETHANOL-GASOLINE Blends*
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80A000669	IX	*Clean Fuels from Biomass and Wastes * the Use of*	*ETHANOL-GASOLINE Mixtures for Automotive Fu*
79 : 004665	VIII	*Energy from Biomass and Wastes **	*ETHANOL-GASOLINE Motor-fuel Mixtures: a St*
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80A001255	IX	*Composition Profiles around Burning Droplets of Ethanol and*	*ETHANOL-PYRIDINE Mixtures*
80A002187	VI	*Bubble-plate Efficiencies in*	*ETHANOL-WATER Fractionation*
80A000508	IX	*ol Fuels Technology * Experiences with the Utilization of*	*ETHANOL/GASOLINE and Pure Ethanol in Brazil*

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000537	VI	*ls Technology * Novel Continuous Fermentation Process for*	*ETHYL Alcohol*
80A002165	VI	*Fermentation of Wood Sugars to*	*ETHYL Alcohol*
80A002169	VI	*the Manufacture of Anhydrous*	*ETHYL Alcohol*
80A002184	IX	*Water Tolerances of Mixtures of Gasoline with*	*ETHYL Alcohol*
80A000726	VI	*zymatic Conversion of Cellulosic Materials * Fermentation*	*ETHYL Alcohol * Biotechnology and Bioengi*
80A003126	IV	*Corn as a Raw Material for*	*ETHYL Alcohol * Iowa Engineering Experime*
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80A002203	V		*ETHYL Alcohol from Wood Waste*
80A003066	V	*Manufacture of*	*ETHYL Alcohol from Wood Waste*
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80A003115	IX	*and Calculation and Charting of Thermodynamic Properties of*	*ETHYL Alcohol-air Mixture and Its Combustio*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000733	IX	*el Induction Systems Contrasts in Terms of Fuel Economy and*	*EXHAUST Emissions for Simulated Driving Cyc*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A001070	IX	*Mother's*	***EXPERIMENTAL** Alcohol-powered Truck*
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80A002058	IX		***EXPERIMENTAL** Determination of the Quenching*
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80A000688	IV	*ing and Processing, Workshop * Large-scale Cassava Starch*	***EXTRACTION** Processes*
80A002279	VI		***EXTRACTIVE** and Azeotropic Distillation **
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A001202	IX	*Use of Alcohol and Gasoline in*	*FARM Engines*
80A002160	IX	*Power Alcohol in Tractors and*	*FARM Engines*
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80A000010	I	*a Canadian Views Alcohol as a*	*FARM Fuel*
80A002084	I	*Growing Fuel on the*	*FARM May Help as the Oil Runs Out*
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80A002065	VI	*the*	*FEASIBILITY of Basic Chemicals for Fermenta*
80A003116	VIII	*a Look at the Economic*	*FEASIBILITY of Converting Wood into Liquid*
80A000638	IX	*Meeting, Joint ASAE/CSAE (72nd ASAE Annual) * Technical*	*FEASIBILITY of Diesohol*
80A000498	IV		*FEASIBILITY of Establishing Potato Ethanol*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A001152	VII	*Treated with Chemicals, Corn Residue as Good*	***FEED** as Corn Silage*
80A000749	VII	*Proceedings 1st Industrial Waste Utilization Conference **	***FEED** By-products from Grain Alcohol and Whi*
80A003063	VII	*Distillery Slop as a*	***FEED** for Hogs*
80A002067	IV		***FEED** Grains as Fuel*
80A003127	VII	*Grain Alcohol as a Motor Fuel with Emphasis on By-product*	***FEED** Markets*
80A002198	III		***FEED** Yeast and Industrial Alcohol from Citr*
80A003108	VII	*Grain Alcohol Fermentation By-products for*	***FEEDING** in Colorado * Colorado State Univ*
80A000135	VI	*the Effect of Discontinuous*	***FEEDING** on Ethanol Production by Saccharomy*
80A003114	VII	*Composition of Concentrate By-products*	***FEEDING** Stuffs * National Academy of Scie*
80A002118	V	*Fibrous Material in*	***FEEDLOT** Waste Fermented by Trichoderma Viri*
80A000745	VII	*Nutrient Composition of Distillers*	***FEEDS***
80A003055	VII	*Recovery of Fermentation Residues as*	***FEEDS***
80A001234	VII	*Distillers'*	***FEEDS** as Protein Sources for Beef Cattle*
80A000746	VII	*the Use of Distillers Dried Grains with Solubles in*	***FEEDS** for Egg Production*
80A000049	V	*Costs Prohibit Cellulosic Use as*	***FEEDSTOCK***
80A000566	I	*Developing Countries * Use of Ethyl Alcohol as Chemical*	***FEEDSTOCK***
79 : 004628	III	*ar Wastes to Ethanol to Be Used as Fuel or as an Industrial*	***FEEDSTOCK** * Brief Analysis as Applied to*
80A000456	V	*Evaluation of the Use of Agricultural Residues as an Energy*	***FEEDSTOCK** * Volume I*
80A000455	V	*Evaluation of the Use of Agricultural Residues as an Energy*	***FEEDSTOCK** * Volume II*
80A000453	V	*Evaluation of the Use of Agricultural Residues as an Energy*	***FEEDSTOCK** — a Ten Site Survey * Volume I*
80 : 001951	V	*vailability Reports * Potential Availability of Wood as a*	***FEEDSTOCK** for Methanol Production*
80 : 001948	II	*lity of Agricultural Processing Wastes for Utilization as a*	***FEEDSTOCK** for the Production Alcoholic Fuel*
80A000589	III	*cal Feedstock in Developing Countries * Fuel and Chemical*	***FEEDSTOCK** from Sugar Cane in Central Americ*
80A000594	I	*rkshop on Fermentation Alcohol for Use as Fuel and Chemical*	***FEEDSTOCK** in Developing Countries * Advan*
80A000604	VI	*rkshop on Fermentation Alcohol for Use as Fuel and Chemical*	***FEEDSTOCK** in Developing Countries * Alcoh*
80A000580	I	*rkshop on Fermentation Alcohol for Use as Fuel and Chemical*	***FEEDSTOCK** in Developing Countries * Aspec*
80A000596	I	*rkshop on Fermentation Alcohol for Use as Fuel and Chemical*	***FEEDSTOCK** in Developing Countries * Brazi*
80A000588	I	*rkshop on Fermentation Alcohol for Use as Fuel and Chemical*	***FEEDSTOCK** in Developing Countries * Can F*
80A000578	III	*rkshop on Fermentation Alcohol for Use as Fuel and Chemical*	***FEEDSTOCK** in Developing Countries * Cane*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000573	VIII	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Commo
80A000592	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Consu
80A000583	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Devel
80A000565	VI	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Direc
80A000595	VI	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Disti
80A000581	VIII	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Energ
80A000586	VIII	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Ethan
80A000568	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Exper
80A000576	VI	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Ferme
80A000587	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Ferme
80A000598	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Ferme
80A000567	II	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Fuel
80A000589	III	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Fuel
80A000570	X	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Gover
80A000574	VI	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Inter
80A000577	VIII	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Inter
80A000585	XI	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Misus
80A000606	III	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Molas
80A000584	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Neces
80A000569	VI	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * New D
80A000605	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Persp
80A000603	X	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Possi
80A000579	X	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Poten
80A000593	II	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Poten
80A000607	III	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Poten
80A000564	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Power
80A000572	X	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Power
80A000575	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Prese
80A000608	VII	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Prese
80A000582	VII	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Produ
80A000600	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Produ
80A000590	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Prosp
80A000597	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Provi
80A000602	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Revie
80A000571	VI	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Simpl
80A000591	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Trend
80A000566	I	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Use
80A000601	XI	rkshop on Fermentation Alcohol for Use as Fuel and Chemical	FEEDSTOCK in Developing Countries * Vinas
80A000003	V	Can There Be Effective Utilization of Cellulosic	FEEDSTOCK in the Production of Fuel Grade E
80A000351	I	Biomass Ethanol as a Chemical	FEEDSTOCK in the United States
79 : 001109	III	Sweet Sorghum, Sugar Beets, and Corn for Fuels and Chemical	FEEDSTOCKS
80A000048	III	Conversion of Sugar Cane Products into Fuels and Chemical	FEEDSTOCKS
80A001036	VIII	ical Engineering: Renewable Sources of Energy and Chemical	FEEDSTOCKS (Food and Energy Crop System)
80A001178	II	Microbial Energy Conversion *	FEEDSTOCKS for Large-scale Fermentation Pro
78 : 001832	V	Utilization of Waste Cellulose for Production of Chemical	FEEDSTOCKS via Acid Hydrolysis
80A003094	V	Incorporating Cellulosic	FEEDSTOCKS with Starch and Sugar-based Raw
80 : 001949	IV	* Availability and Cost of Grain for Use as Alcohol Fuels	FEEDSTOCKS. Final Report, November 28, 19
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75 : 001201	I	Grow Alcohol as a Replacement for Gasoline * from	FERMENTABLE-TYPE Crops; 10 Gal. Ethanol/

Citation Number	Subject Section	Citation Title	Title Keyword
80 : 000191	VI	* Bioconversion of Plant Biomass to Ethanol * by Direct	*FERMENTATION*
80 : 000213	VI	Annual Symposium on Fuels from Biomass * Low Technology	*FERMENTATION*
80A000085	VI	Pretreatment of Molasses and Recycling of Yeast on Ethanol	*FERMENTATION*
80A000261	VI	Renewable Fuels — Ethanol Produced by	*FERMENTATION*
80A000360	VIII	Production of Ethanol and Vegetable Protein by Grain	*FERMENTATION*
80A000567	II	eloping Countries * Fuel Alcohol from Crops by Continuous	*FERMENTATION*
80A000591	I	Countries * Trends in the Production of Ethyl Alcohol by	*FERMENTATION*
80A000604	VI	nd Chemical Feedstock in Developing Countries * Alcoholic	*FERMENTATION*
80A002194	VI	robial Amylase Preparations Conversion Agents for Alcoholic	*FERMENTATION*
80A002216	VI	Continuous	*FERMENTATION*
80A002228	IV	Saccharification of Grain Mashes for Alcoholic	*FERMENTATION*
80A002280	VI	Fuel Alcohol from Crops by Continuous	*FERMENTATION*
80A002306	VI	Vacuum Alcohol	*FERMENTATION*
80A003019	I	Chemicals from	*FERMENTATION*
80A000598	I	as Fuel and Chemical Feedstock in Developing Countries *	*FERMENTATION — Second Way for Utilization*
80A001088	VI	the Vacuferm Process: a New Approach to	*FERMENTATION Alcohol*
80A000588	I	Fuel and Chemical Feedstock in Developing Countries * Can	*FERMENTATION Alcohol Be Substituted for Woo*
80A000564	I	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000565	VI	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000566	I	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000567	II	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000568	I	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000569	VI	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000570	X	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000571	VI	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000572	X	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000573	VIII	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000574	VI	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000575	I	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000576	VI	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000577	VIII	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000578	III	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000579	X	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000580	I	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000581	VIII	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000582	VII	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000583	I	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000584	I	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000585	XI	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000586	VIII	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000587	I	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000588	I	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000589	III	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
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80A000592	I	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000593	II	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000594	I	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000595	VI	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000596	I	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Cl*
80A000597	I	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000598	I	Workshop on	*FERMENTATION Alcohol for Use as Fuel and Ch*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000600	I	*Workshop on*	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000601	XI	*Workshop on*	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000602	I	*Workshop on*	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000603	X	*Workshop on*	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000604	VI	*Workshop on*	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000605	I	*Workshop on*	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000606	III	*Workshop on*	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000607	III	*Workshop on*	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000608	VII	*Workshop on*	*FERMENTATION Alcohol for Use as Fuel and Ch*
80A000593	II	*stock in Developing Countries * Potential Availability of*	*FERMENTATION Alcohol from Sugars and Starch*
80 : 002043	VI		*FERMENTATION Alcohol Grows in Power*
80A000592	I	*eedstock in Developing Countries * Consumption Figures of*	*FERMENTATION Alcohol in Japan*
80A000587	I	*as Fuel and Chemical Feedstock in Developing Countries **	*FERMENTATION Alcohol in the Commonwealth Ca*
80A000576	VI	*as Fuel and Chemical Feedstock in Developing Countries **	*FERMENTATION Alcohol Industry in Egypt in T*
80A000578	III	*hemical Feedstock in Developing Countries * Cane Molasses*	*FERMENTATION Alcohol Industry in Fiji*
80A001224	VI	*Indiana Grain*	*FERMENTATION Alcohol Plant*
80A000580	I	*Chemical Feedstock in Developing Countries * Aspects of*	*FERMENTATION Alcohol Production*
80A000579	X	*hemical Feedstock in Developing Countries * Potential for*	*FERMENTATION Alcohol Production in Belize*
80A000729	VI	*Cellulose as a Chemical and Energy Resource * Ethanol*	*FERMENTATION and Potential*
80A001210	VI	*Industrial Alcohol by Continuous*	*FERMENTATION and Vacuum Distillation with L*
80A000594	I	*dvantages and Limitations of the Use of Alcohol Produced by*	*FERMENTATION as Fuel in Developing Countrie*
80A002162	VII	*Amino Acid Composition of Grain Alcohol*	*FERMENTATION By-products*
80A003108	VII	*Grain Alcohol*	*FERMENTATION By-products for Feeding in Col*
80A003052	VII	*Nutrient Content of Alcohol*	*FERMENTATION By-products from Corn*
80A001186	VI	*Basic*	*FERMENTATION Chemistry in a Nut Shell*
80A003091	VI	*Continuous*	*FERMENTATION Comes of Age*
80A000726	VI	*Enzymatic Conversion of Cellulosic Materials **	*FERMENTATION Ethyl Alcohol * Biotechnolog*
80 : 001988	VI	*nergy Systems Conference * Conceptual Design of a Biomass*	*FERMENTATION Facility*
80A000432	VI	*High Productivity*	*FERMENTATION for Ethanol Production*
80A003035	VII	*By-product Recovery — Pollution Control Measure in the*	*FERMENTATION Industry*
80A000728	VI	*of Cellulosic Materials * Cellulose Saccharification for*	*FERMENTATION Industry * Biotechnology and*
80A000569	VI	*ping Countries * New Developments in Continuous Alcoholic*	*FERMENTATION Intensification — Simplificatio*
80A000384	VI		*FERMENTATION Kinetics and Process Economics*
80 : 001960	II	*uction of Alcohol Fuels * Compilation of Abstracts on the*	*FERMENTATION of Agricultural Products and W*
79 : 001111	I	*Mass Symposium * Fuels and Petrochemical Substitutes from*	*FERMENTATION of Biomass*
80 : 001995	VIII	*3rd Annual Biomass Energy Systems Conference * Fuels from*	*FERMENTATION of Biomass*
80A002069	VI		*FERMENTATION of Cellulose and Cellobiose by*
80A002298	V	*the Anaerobic*	*FERMENTATION of Cellulose and Cellulosic Ma*
80A001233	VII	*Blending — the Competitiveness of Proteins from the Alcohol*	*FERMENTATION of Corn and Wheat*
80A003060	V		*FERMENTATION of Douglas Fir Hydrolyzate*
80A002192	VI	*Mechanical Equipment for Continuous*	*FERMENTATION of Fibrous Materials*
80A000735	VIII	*ogy: Methanol and Ethanol * Production of Ethanol by the*	*FERMENTATION of Grain*
80A001086	VI	*ion of Cellulosic Materials through Enzymatic Hydrolysis **	*FERMENTATION of Hydrolysate to Ethanol and*
80A000298	VI	*Studies of Continuous*	*FERMENTATION of Indian Cane Sugar Molasses*
80A002215	III	*Ethanol*	*FERMENTATION of Molasses*
80A002218	III		*FERMENTATION of Molasses*
80A001241	III	*Industrial Fermentations * Alcoholic*	*FERMENTATION of Molasses * Chapter 3*
80A000737	VI	*Methanol and Ethanol * Basic Data on Continuous Alcoholic*	*FERMENTATION of Sugar Solutions and of Mash*
80A002165	VI		*FERMENTATION of Wood Sugars to Ethyl Alcoho*
80A000407	VI	*Study of the*	*FERMENTATION of Xylose to Ethanol by Fusari*
80A000574	VI	*tock in Developing Countries * Interrelationships between*	*FERMENTATION Parameters and Ethanol Product*
80A003051	VI	*Laboratory Cooking, Mashing, and*	*FERMENTATION Procedures*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000748	VI	*Use of Mycotoxin Contaminated Grain in the Ethanol*	***FERMENTATION** Process*
80A001171	VI	*ar Variables on the Enriched-lysine Baker's Yeast — Ethanol*	***FERMENTATION** Process*
80A000537	VI	*Symposium on Alcohol Fuels Technology * Novel Continuous*	***FERMENTATION** Process for Ethyl Alcohol*
80A002154	V	*a*	***FERMENTATION** Process for the Production of*
80A001178	II	*Microbial Energy Conversion * Feedstocks for Large-scale*	***FERMENTATION** Processes*
80A002065	VI	*the Feasibility of Basic Chemicals for*	***FERMENTATION** Processes*
80A002311	VII	*the Recovery of*	***FERMENTATION** Products from Cellulose Wastes*
80A002164	V		***FERMENTATION** Products from Cornstalks*
80A002070	VI		***FERMENTATION** Products from Methanol*
80A002163	V		***FERMENTATION** Products of Cellulose*
80A003055	VII	*Recovery of*	***FERMENTATION** Residues as Feeds*
80A003072	I		***FERMENTATION** Sphinx and Kobold Alcohol*
80A003073	VI		***FERMENTATION** Sphinx and Kobold Alcohol*
80A003074	VI		***FERMENTATION** Sphinx and Kobold Alcohol*
80A003075	VI		***FERMENTATION** Sphinx and Kobold Alcohol*
80A000361	VI	*Acid Hydrolysis of Cellulose in Refuse to Sugar and Its*	***FERMENTATION** to Alcohol*
80A002034	VI	*Enzymatic Hydrolysis of Cellulose and Simultaneous*	***FERMENTATION** to Alcohol*
80A002310	V	*terial (Wood) * Laboratory Preparation of Wood Sugars and*	***FERMENTATION** to Ethanol and Yeast*
80A002197	VI	*Some Unusual Alcoholic*	***FERMENTATIONS***
80A001241	III	*Industrial*	***FERMENTATIONS** * Alcoholic Fermentation of*
80A002236	V	*Industrial*	***FERMENTATIONS** * the Production of Alcohol*
80A000257	VI	*Rapid Ethanol*	***FERMENTATIONS** Using Vacuum and Cell Recycle*
80A002174	IV		***FERMENTATIVE** Utilization of Cassava*
80A002118	V	*Fibrous Material in Feedlot Waste*	***FERMENTED** by Trichoderma Viride*
80A002217	III	*Continuous*	***FERMENTING** of Beet Juice*
80A000299	VI	*iomass Production from Methanol. Application of Tower Type*	***FERMENTOR** with 2-fluid Nozzle to Biomass Pr*
80A002118	V		***FIBROUS** Material in Feedlot Waste Fermented*
80A002192	VI	*Mechanical Equipment for Continuous Fermentation of*	***FIBROUS** Materials*
79 : 002492	V	*Symposium on Forest and*	***FIELD** Fuels * Forest Fuels, USA*
80A000465	IX	*Proceedings Forest and*	***FIELD** Fuels Symposium * a Petroleum Indus*
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80A000464	IX	*Proceedings Forest and*	***FIELD** Fuels Symposium * Constraints and O*
79 : 002491	VIII	*Proceedings Forest and*	***FIELD** Fuels Symposium * Ethanol for Motor*
80A003039	IX		***FIFTY** Thousand Kilometers on Alcohol as a M*
80A002119	IX		***FIFTY** Years of Combustion Research at Gener*
80A000592	I	*Chemical Feedstock in Developing Countries * Consumption*	***FIGURES** of Fermentation Alcohol in Japan*
80A000578	III	*ountries * Cane Molasses Fermentation Alcohol Industry in*	***FIJI***
80A002120	X		***FILL** 'Er Up*
80A000047	VI	*inuous Enzymatic Saccharification of Cellulose with Culture*	***FILTRATE** of Trichoderma Viride QM 6A*
80A002234	X	*Studies in Taxation, Public*	***FINANCE** and Related Subjects * "Gasohol"*
80A001030	VIII	*Banks Are Lining Up a $1 Billion Loan to*	***FINANCE** Brazil's Alcohol-fuel Plans*
80A000044	X	*Congress May Approve*	***FINANCING** for On-farm Alcohol Plants*
80A001032	VIII	*the Best Incentive for*	***FINDING** Fuel Is Plain Greed (Developing New*
80A000212	I	*Grain Belt's "Miracle" Fuel*	***FINDS** Many Obstacles*
80A002061	IX	*Exxon Research and Eng. Study*	***FINDS** Methanol Promising Substitute for Gas*
80A003085	V		***FINE** Grinding, Enzyme Digestion and the Lig*
80A000716	VI	*Second National Meeting on Biophysics and Biotechnology in*	***FINLAND** * Development of Processes for in*
80A003060	V	*Fermentation of Douglas*	***FIR** Hydrolyzate*
80A000286	VI	*Some Aspects of Structures of Turbulent Pool*	***FIRES***
80A000045	VI	*Connecticut*	***FIRMS** Experiment with Garbage-to-fuel/The I*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000043	IX	Comparative Study of Fuel-air Otto Cycle for	FIVE Different Fuels
77 : 000111	V	Solar Energy	FIXATION by Plants and Synthetic Fuel Produ
80A001053	IX	ionization in a Methanol-oxygen	FLAME
80A000475	IX	stitute of Technology International Combustion Symposium *	FLAME Propagation through Mixtures with Con
80A000511	IX	ional Symposium on Alcohol Fuels Technology * Modeling of	FLAME Properties of Methanol
80A000512	IX	hird International Symposium on Alcohol Fuels Technology *	FLAME Quenching and Exhaust Hydrocarbons in
80A001231	IX	utomotive Propulsion Systems: Held on April 18-22, 1977 *	FLAME Speeds, Performance, and Emissions Wi
80A000662	IX	Combustion * Nitric Oxide Formation in Droplet Diffusion	FLAMES
80A000296	IX	Structure and Extinction of Laminar Diffusion	FLAMES above Condensed Fuels with Water and
80A001120	IX	Nitric Oxide and Composition Measurements within Diffusion	FLAMES around Simulated Ethanol and Ethanol
80A000308	IX	Kinetic Wall Quenching of Methanol	FLAMES with Applications to Spark Ignition
80A003124	XI	Standard for Storage of	FLAMMABLE and Combustible Liquids on Farms
80A000404	IX	Project Plan for Reliability	FLEET Testing of Alcohol/Gasoline Blends
80A002277	IX	Project Plan for Reliability	FLEET Testing of Alcohol/Gasoline Blends
80A000519	IX	Alcohol Fuels Technology * Alcohol/Gasoline Reliability	FLEET Tests: a U.S. Federal Project
80A001065	VI	Kinetics of Solka	FLOC Cellulose Hydrolysis by Trichoderma
80A000017	IV	Cassava —	FLORIDA'S Future Fuel?
80A002206	IV	Alcohol from Granular Wheat	FLOUR
80A002204	IV	Granular Wheat	FLOUR Increases Alcohol Yields
80A001175	VIII	ve Fuels in Highway Vehicles: the Relevance of U.S. Energy	FLOWS
80A000094	VIII	Agriculture as a Source of	FLUID Energy: Gasohol et al.
79 : 004370	I		FOCUS on Renewable Energy in New Zealand
78 : 002720	V	Cellulose,	FOOD and Energy
80A001192	VI	ries, V. 2 * a Primer on the Efficient Use of Alcohol for	FOOD and Fuel
80A000164	I	Fuels from Biomass Integration with	FOOD and Materials Systems
80A000198	VIII	Gasohol: Would It Take	FOOD from the Poor?
80A001047	II	Gasohol: New Role for	FOOD Industry
80A002139	VIII		FOOD or Fuel — New Competition for the Worl
80A000174	VIII		FOOD or Fuel: the Liquids Dilemma
80A002025	VIII	Alcohol for Cars Termed Spur to Rising	FOOD Prices
80A001233	VII	Enhancement of	FOOD Protein Quality through Computer Blend
80A003071	V	Utilization of Wood for Production of	FOODSTUFFS, Alcohol and Glucose
80A002275	I	Power Alcohol * a Brief Analysis to	FORCE Use of Farm Alcohol in Motor Fuel
80A000153	IX		FORD Motor Sets Outlays for Cars Run on Alc
80A000514	IX	Symposium on Alcohol Fuels Technology * Modification of a	FORD Pinto for Operation on Methanol
80A000097	I	Alcohol Fuels:	FORD vs. Rockefeller
79 : 002492	V	Symposium on	FOREST and Field Fuels * Forest Fuels,
80A000465	IX	Proceedings	FOREST and Field Fuels Symposium * a Petr
79 : 002502	V	Proceedings	FOREST and Field Fuels Symposium * Canadi
80A000464	IX	Proceedings	FOREST and Field Fuels Symposium * Constr
79 : 002491	VIII	Proceedings	FOREST and Field Fuels Symposium * Ethano
80A000154	V		FOREST and Wood Waste Utilisation: Convers
78 : 001830	V	from Biomass and Wastes * Energy and Materials from the	FOREST Biomass
80A000507	V	plications of Large-scale Methanol Production from Canadian	FOREST Biomass
78 : 001809	VIII	Large-scale Methanol Fuel Production from Surplus Canadian	FOREST Biomass. Part 1. Summary Report
78 : 002269	V	Large-scale Methanol Fuel Production from Surplus Canadian	FOREST Biomass. Part 2. Working Papers
79 : 002492	V	Symposium on Forest and Field Fuels *	FOREST Fuels, USA
80A002020	V	Agricultural and	FOREST Products as Sources of Cellulose
80A000683	V	chland Operations Office Department of Energy in the Use of	FOREST Residues for Energy
80A000379	V	the Feasibility of Utilizing	FOREST Residues for Energy and Chemicals
80A003087	I	Fuel Alcohol Production from American Farm and	FOREST Resources

Citation Number	Subject Section	Citation Title	Title Keyword
80A003007	I	*the Feasibility of Gasohol from Renewable Agricultural and*	***FOREST*** *Resources for Use as a Gasoline Addi*
80A003016	V	*Methanol from Wood Waste * U.S. Dept. of Agriculture.*	***FOREST*** *Service. General Technical Report*
80A000535	V	*nology * the Production of Methanol from Wood, Processes,*	***FORESTING*** *and Economics*
80A002140	II	*the Potential for Liquid Fuels from Agriculture and*	***FORESTRY*** *in Australia*
80A003116	VIII	*Feasibility of Converting Wood into Liquid Fuel * Canada.*	***FORESTRY*** *Service. Information Report, No. E*
80A001195	VIII	*Legislation of the Committee on Agriculture, Nutrition, and*	***FORESTRY,*** *United States Senate, 95th Congre*
76 : 001689	V	*Production of Solar Ethanol from Australian*	***FORESTS***
79 : 002502	V	*ian Production Potential — Fuel Grade Methanol from Canadian*	***FORESTS***
80A000142	V	*Energy*	***FORESTS*** *and Fuel Plantations*
80A000268	V	*the Role of*	***FORESTS*** *as a Source of Solar Energy*
80A001264	V		***FORESTS*** *for People: a Challenge in World a*
80A001264	V	*for People: a Challenge in World Affairs * the Role of*	***FORESTS*** *in Meeting World Energy Problems*
80A002272	VI		***FORGET*** *the Gas Pumps — Make Your Own Fuel*
80A002255	IX	*asoline on Total and Individual Hydrocarbons, Methanol, and*	***FORMALDEHYDE*** *Emissions from a Carburetted S*
80A000560	IX	*hird International Symposium on Alcohol Fuels Technology **	***FORMALDEHYDE*** *Emissions from a Spark Ignitio*
80A000134	VI	*Effect of Cultural Conditions on Cellulase*	***FORMATION*** *by Trichoderma Viride*
80A000662	IX	*th Symposium (International) on Combustion * Nitric Oxide*	***FORMATION*** *in Droplet Diffusion Flames*
80A000380	IX		***FORMATION*** *of NO and NO_2 in the I.*
80A000654	IX	*ntinuous Combustion Systems * Measurement of Nitric Oxide*	***FORMATION*** *within a Multi-fueled Turbine Com*
80A000156	VI		***FORMER*** *Brewery May Soon Be Turning Corn to*
80A003108	VII	*-products for Feeding in Colorado * Colorado State Univ.,*	***FORT*** *Collins (USA). Agricultural Experiment*
80A001064	VI	*Kinetics of Acid Hydrolysis of Cellulose*	***FOUND*** *in Paper Refuse*
80A000509	IX	*Alcohol Fuels Technology * Methanol/Gasoline Mixtures in*	***FOUR*** *Stroke Otto Engines*
80A000522	IX	*Parameters on the Aldehyde Emissions of a Methanol Operated*	***FOUR-STROKE*** *Otto Cycle Engine*
80A000753	I	*Automotive Propulsion: Proceedings of the*	***FOURTH*** *International Symposium on Automotiv*
80A001229	IX	*Proceedings of the*	***FOURTH*** *International Symposium on Automotiv*
80A001230	IX	*Proceedings of the*	***FOURTH*** *International Symposium on Automotiv*
80A001231	IX	*Proceedings of the*	***FOURTH*** *International Symposium on Automotiv*
80A002251	IX	*Proceedings of the*	***FOURTH*** *International Symposium on Automotiv*
80A002252	IX	*Proceedings of the*	***FOURTH*** *International Symposium on Automotiv*
80A002253	IX	*Proceedings of the*	***FOURTH*** *International Symposium on Automotiv*
80A002254	IX	*Proceedings of the*	***FOURTH*** *International Symposium on Automotiv*
80A002255	IX	*Proceedings of the*	***FOURTH*** *International Symposium on Automotiv*
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80A002257	IX	*Proceedings of the*	***FOURTH*** *International Symposium on Automotiv*
80A002258	IX	*Proceedings of the*	***FOURTH*** *International Symposium on Automotiv*
80A000674	IX	*Conference Publication, No. 76/6 * Preprints of Papers;*	***FOURTH*** *National Conference on Chemical Engi*
80 : 002140	VIII	*Decision Making in the Utilization of the Organic*	***FRACTION*** *of Municipal Wastes * New Zealan*
80A002301	VI	*the Efficiency and Capacity of a Bubble Plate*	***FRACTIONATING*** *Column When Distilling Mixtur*
80A002187	VI	*Bubble-plate Efficiencies in Ethanol-water*	***FRACTIONATION***
80A001041	I	*"Gasohol"*	***FRESHENS*** *the Air over Iowa, but May Rut the*
80A000742	XI	*ical Effects of Methanol Spills into Marine, Estuarine, and*	***FRESHWATER*** *Habitats*
80A000562	XI	*.hanol Spills and Methanol Fuel Emissions on Terrestrial and*	***FRESHWATER*** *Organisms*
80A000154	V	*and Wood Waste Utilisation: Conversion to Fuel Alcohol — a*	***FRI*** *Study*
80A000186	I	*Look What's Cooking on the Fuel-alcohol*	***FRONT***
80A003092	V	*Wood, a*	***FRONT*** *Runner as an Alcohol Source*
80A000487	VI	*Expanding the Geothermal*	***FRONTIER:*** *Geothermal Resources Council Ann*
80A001060	IV	*Jerusalem Artichoke, a Potential*	***FRUCTOSE*** *Crop for the Prairies*
80 : 002130	III	*Pithecolobium saman Benth. (Rain Tree)*	***FRUITS*** *as Raw Material for the Production*
77 : 001298	IX	*ion * Properties and Characteristics of Gasoline/Methanol*	***FUEL***
78 : 001794	IX	*Future * Use of Ethanol-gasoline Mixtures for Automotive*	***FUEL***
80 : 002049	V	*Biomass Refinery Turns Crop Wastes into*	***FUEL***

Citation Number	Subject Section	Citation Title	Title Keyword
80A000010	I	*a Canadian Views Alcohol as a Farm*	*FUEL*
80A000100	IX	*Alcohol May Be Realistic Source of Automobile*	*FUEL*
80A000101	I	*Alcohol — Permanent Alternative*	*FUEL*
80A000115	V	*to Convert Recycled Newspapers into Glucose and Alcohol for*	*FUEL*
80A000219	IX	*Methanol as a Motor*	*FUEL*
80A000238	IX	*Methanol Feasible as Auto*	*FUEL*
80A000253	II	*Michigan May Grow Potatoes for*	*FUEL*
80A000304	IX	*itrogen Oxide Concentrations with an Ethyl Alcohol-gasoline*	*FUEL*
80A000318	IX	*Performance of the Late Model Cars with Gasoline-methanol*	*FUEL*
80A000319	IX	*Potential for Methanol as an Automotive*	*FUEL*
80A000320	VIII	*Practicality of Alcohols as Motor*	*FUEL*
80A000322	IX	*Role of Methanol as a Clean*	*FUEL*
80A000324	IX	*a Survey of Alcohol as a Motor*	*FUEL*
80A000336	IX	*Methanol/Gasoline Blends as Automotive*	*FUEL*
80A000342	IX	*chnical and Economical Aspects of Methanol as an Automotive*	*FUEL*
80A000377	IX	*Methanol and Methanol/Gasoline Blends as Automotive Engine*	*FUEL*
80A000395	IX	*Methanol as a*	*FUEL*
80A000418	IX	*Use of Methanol as a Motor Vehicle*	*FUEL*
80A000485	IX	*mic Calculations for Otto Cycle Engines Using Methanol as a*	*FUEL*
80A000513	IX	*Influencing Cold Starting of Engines Operating on Alchool*	*FUEL*
80A000553	VIII	*Alcohol Fuels Technology * Canadian Scenario for Methanol*	*FUEL*
80A000586	VIII	*ping Countries * Ethanol — an Alternative to Its Use as a*	*FUEL*
80A000588	I	*Fermentation Alcohol Be Substituted for Wood as a Cooking*	*FUEL*
80A000640	IX	*Meeting * Analysis of Methanol as a Reciprocating Engine*	*FUEL*
80A000649	IX	*nd Combustion * Methanol Blended Gasoline as Modern Motor*	*FUEL*
80A000655	IX	*lends of Methanol and Dissociated Methanol as an Automotive*	*FUEL*
80A000659	IX	*Combustion * Some Tests with Ethyl Alcohol as S.I. Engine*	*FUEL*
80A000669	IX	*tes * the Use of Ethanol-gasoline Mixtures for Automotive*	*FUEL*
80A000672	IX	*ological Thrust, Social Impact * Alcohol as an Automotive*	*FUEL*
80A000690	I	** Canadian Biomass Perspective: a New Interest in an Old*	*FUEL*
80A000696	IX	*Combustion of Methanol Mixed with Water as an Alternative*	*FUEL*
80A000706	IX	*anol as an Alternative Fuel * Automotive Uses of Methanol*	*FUEL*
80A000707	IX	*Methanol as an Alternative Fuel * Methanol as a Motor*	*FUEL*
80A001025	I	*Australia Plans Alcohol*	*FUEL*
80A001085	IX	*Use of Methanol as a*	*FUEL*
80A001093	IX	*olkswagenwerk Summarizes Research in Using Methanol as Auto*	*FUEL*
80A001192	VI	*2 * a Primer on the Efficient Use of Alcohol for Food and*	*FUEL*
80A001204	I	*Ethanol Production and Utilization for*	*FUEL*
80A001238	IX	*Methanol as an Alternative*	*FUEL*
80A001253	IX	*Study of Decomposed Methanol as a Low Emission*	*FUEL*
80A001257	XI	*ion of Hazards Associated with Using Hydrogen as a Military*	*FUEL*
80A001263	IX	*erization and Research Investigation of Methanol and Methyl*	*FUEL*
80A002002	IX	*Decomposed Methanol as a Low Emission*	*FUEL*
80A002022	I	*Alcohol as a*	*FUEL*
80A002041	XI	*Spends $500,000 to Study Environmental Impact of Gasohol*	*FUEL*
80A002045	I	*Ethanol — an Alternative to Its Use as*	*FUEL*
80A002067	IV	*Feed Grains as*	*FUEL*
80A002089	V	*High-yield Wood: a Promising*	*FUEL*
80A002096	X	*House Unit Votes to End Import Tax on Methanol*	*FUEL*
80A002103	I	*How to Beat OPEC's Hold on Diesel*	*FUEL*
80A002104	VI	*How to Turn Wastes into*	*FUEL*
80A002132	VI	*Level for the Production of Alcohol for Use as Automotive*	*FUEL*

Citation Number	Subject Section	Citation Title	Title Keyword
80A002133	IX	*Gas Turbine Emissions and Performance on Methanol*	*FUEL*
80A002158	VI	*Making Alcohol-ether Mixture in Cuba for Motor*	*FUEL*
80A002161	IX	*Paris Buses Test Efficiency of Alcohol as Engine*	*FUEL*
80A002177	VI	*Production of 95-97 Per Cent Alcohol for Motor*	*FUEL*
80A002183	I	*Industrial Alcohol for Motor*	*FUEL*
80A002196	II	*Growth of the Moist Tropics to Furnish Materials for Liquid*	*FUEL*
80A002207	IX	*a New Alcohol*	*FUEL*
80A002238	IX	*ical Processing and Design * Alcohol, Methanol as a Motor*	*FUEL*
80A002272	VI	*Forget the Gas Pumps — Make Your Own*	*FUEL*
80A002273	X	*hol Manufactured from Corn and Other Farm Products in Motor*	*FUEL*
80A002275	I	** a Brief Analysis to Force Use of Farm Alcohol in Motor*	*FUEL*
80A003027	IX	*Alcohol Gasoline Mixtures as Motor*	*FUEL*
80A003030	IX	*Ethyl Alcohol and Alcohol and Gasoline as a Modern Motor*	*FUEL*
80A003039	IX	*Fifty Thousand Kilometers on Alcohol as a Motor*	*FUEL*
80A003041	IX	*Alcohol Blend Poor Substitute for Motor*	*FUEL*
80A003047	III	*es, I * I. Use of Cane Molasses for Manufacture of Motor*	*FUEL*
80A003067	IX	*Researches on Alcohol as a Motor*	*FUEL*
80A003118	VI	*of the Chemist in Relation to the Future Supply of Liquid*	*FUEL*
80A003137	IX	*Study of Decomposed Methanol as a Low Emission*	*FUEL*
80A000702	IX	*Methanol as an Alternative*	*FUEL * Advantages of Neat and Blended Ope*
80A000706	IX	*Methanol as an Alternative*	*FUEL * Automotive Uses of Methanol Fuel*
80A003116	VIII	*at the Economic Feasibility of Converting Wood into Liquid*	*FUEL * Canada. Forestry Service. Informat*
80A001205	I	*Ethyl Alcohol Production and Use as a Motor*	*FUEL * Chemical Technology Review, No. 14*
80A000704	IX	*Methanol as an Alternative*	*FUEL * Comparison of Methanol and Methano*
80A000713	IX	*Methanol as an Alternative*	*FUEL * Energy Workshop — Report on the*
80A000711	XI	*Methanol as an Alternative*	*FUEL * Environmental Aspects of Methanol*
80A000712	IX	*Methanol as an Alternative*	*FUEL * Environmental Aspects of Methanol*
80A001265	IX	*Methanol as an Alternative*	*FUEL * Feasibility of Alternative Automot*
80A000674	IX	*Hydrocarbon Resources * Methanol-gasoline Blends as Motor*	*FUEL * Institution of Engineers, Australi*
80A000714	IX	*Power Plants and Future Fuels * Methanol as a Motor*	*FUEL * Institution of Mechanical Engineer*
80A001239	I	*Methanol as an Alternative*	*FUEL * Methanol — Chemical Uses Today*
80A000707	IX	*Methanol as an Alternative*	*FUEL * Methanol as a Motor Fuel*
80A000710	IX	*Methanol as an Alternative*	*FUEL * Methanol Fuel — Long Range Implica*
80A000709	IX	*Methanol as an Alternative*	*FUEL * Methanol-gasoline Blends * a Fue*
80A000703	IX	*Methanol as an Alternative*	*FUEL * Methanol-gasoline Blends — Univers*
80A000701	IX	*Methanol as an Alternative*	*FUEL * Methanol/Gasoline Blend — Automoti*
80A001188	VI	*Making Alcohol*	*FUEL * Mother's Alcohol Fuel Seminar*
80A000705	IX	*Methanol as an Alternative*	*FUEL * Physico-chemical Properties of Met*
80A000708	VI	*Methanol as an Alternative*	*FUEL * Potential Long Range Improvements*
80A003013	IX	*Methanol as an Automobile*	*FUEL * Rand Corp. Paper No. 6303*
80A002145	I	*Alcohol as*	*FUEL * References Selected from Current*
80A001203	IX	*Methyl Alcohol as Motor*	*FUEL * Texas Engineering Experiment Stati*
80A003112	IX	*Tests of Internal Combustion Engines on Alcohol*	*FUEL * U.S. Dept. of Agriculture. Bulleti*
80A002273	X	*Use of Alcohol from Farm Products in Motor*	*FUEL * U.S. Senate Document 57, 73rd Cong*
80A000731	IX	*ources * Review of the Use of Methanol as a Motor Vehicle*	*FUEL * Volume 20*
80A002062	I	*Farming for*	*FUEL — Alcohol Motor Fuel Movement of the I*
80A001232	IX	*Meeting * Characterization of Methanol as an Automotive*	*FUEL — an Experimental Study*
80A000409	IX	*Study of Decomposed Methanol as a Low Emission*	*FUEL — Final Report*
80A000710	IX	*Methanol as an Alternative Fuel * Methanol*	*FUEL — Long Range Implication for Petro-che*
80A002139	VIII	*Food or*	*FUEL — New Competition for the World's Crop*
80A000370	IX	*Characterization of Methanol/Gasoline Blends as Automotive*	*FUEL — Performance and Emissions Characteri*
80A002153	VI	*Making Alcohol*	*FUEL — Recipe and Procedure*

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000334	IX	Methanol as Automotive	FUEL — I. Straight Methanol
80A002039	X	EPA Mulls Ban on Two	FUEL Additives
80A001052	IV	int Venture with Brazilian Interests to Process Manioc into	FUEL Alcohol
80A001213	VIII	Grain Motor	FUEL Alcohol * Technical and Economic Ass
80A000154	V	Forest and Wood Waste Utilisation: Conversion to	FUEL Alcohol — a FRI Study
80A001031	X	BATF Considers Problem of Approving Tax-free Stills for	FUEL Alcohol and Not for Moonshine Whiskey
80A003107	VIII	Small	FUEL Alcohol Distillery * General Descrip
80A000567	II	as Fuel and Chemical Feedstock in Developing Countries *	FUEL Alcohol from Crops by Continuous Ferme
80A002280	VI		FUEL Alcohol from Crops by Continuous Ferme
80A000536	VIII	uels Technology * Technical and Economic Assessment Motor	FUEL Alcohol from Grain and Other Biomass
80A002268	III		FUEL Alcohol from Nipa Palm
80A000689	IV	arvesting and Processing, Workshop * Prospects of Cassava	FUEL Alcohol in Brazil
78 : 002289	IV	gy Conversion Engineering Conference. Volume I * Cassava	FUEL Alcohol in Brazil * Energetics and E
80A001226	VI	Small-scale	FUEL Alcohol Production
80A003093	XI	Safety Standards in	FUEL Alcohol Production
80A003087	I		FUEL Alcohol Production from American Farm
80A000573	VIII	eveloping Countries * Common Sense Approach in Developing	FUEL Alcohols
80A002030	IX	Alcohol	FUEL Alternative
80A000589	III	as Fuel and Chemical Feedstock in Developing Countries *	FUEL and Chemical Feedstock from Sugar Cane
80A000564	I	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000565	VI	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000566	I	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000567	II	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000568	I	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000569	VI	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000570	X	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000571	VI	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000572	X	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000573	VIII	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000574	VI	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000575	I	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000576	VI	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000577	VIII	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000578	III	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000579	X	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000580	I	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000581	VIII	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000582	VII	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000583	I	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000584	I	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000585	XI	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000586	VIII	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000587	I	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000588	I	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000589	III	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000590	I	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000591	I	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
0A000592	I	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
0A000593	II	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000594	I	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C
80A000595	VI	Workshop on Fermentation Alcohol for Use as	FUEL and Chemical Feedstock in Developing C

Citation Number	Subject Section	Citation Title	Title Keyword
80A000596	I	*Workshop on Fermentation Alcohol for Use as*	*FUEL and Chemical Feedstock in Developing C*
80A000597	I	*Workshop on Fermentation Alcohol for Use as*	*FUEL and Chemical Feedstock in Developing C*
80A000598	I	*Workshop on Fermentation Alcohol for Use as*	*FUEL and Chemical Feedstock in Developing C*
80A000600	I	*Workshop on Fermentation Alcohol for Use as*	*FUEL and Chemical Feedstock in Developing C*
80A000601	XI	*Workshop on Fermentation Alcohol for Use as*	*FUEL and Chemical Feedstock in Developing C*
80A000602	I	*Workshop on Fermentation Alcohol for Use as*	*FUEL and Chemical Feedstock in Developing C*
80A000603	X	*Workshop on Fermentation Alcohol for Use as*	*FUEL and Chemical Feedstock in Developing C*
80A000604	VI	*Workshop on Fermentation Alcohol for Use as*	*FUEL and Chemical Feedstock in Developing C*
80A000605	I	*Workshop on Fermentation Alcohol for Use as*	*FUEL and Chemical Feedstock in Developing C*
80A000606	III	*Workshop on Fermentation Alcohol for Use as*	*FUEL and Chemical Feedstock in Developing C*
80A000607	III	*Workshop on Fermentation Alcohol for Use as*	*FUEL and Chemical Feedstock in Developing C*
80A000608	VII	*Workshop on Fermentation Alcohol for Use as*	*FUEL and Chemical Feedstock in Developing C*
80A000385	VI		*FUEL and Energy Production by Bioconversion*
80A000323	IX	*Single-cylinder PROCO Engine Studies —*	*FUEL and Engine Calibration Effects on Emis*
80A002267	I	*Biomass Energy Refineries for Production of*	*FUEL and Fertilizer*
80A000554	I	*ernational Symposium on Alcohol Fuels Technology * Methyl*	*FUEL and Its Effect on Crude Oil Consumptio*
80A000476	IX	*Mobile Exhaust Gas Particulate Size Distributions: Regular*	*FUEL and Methanol Mixtures*
80A002029	III	*Alcohol from Molasses as a Possible*	*FUEL and the Economics of Distillery Efflue*
80A002258	IX	*April 18-22, 1977 * Recent Progress in Automotive Alcohol*	*FUEL Application * a Report by the Automo*
80A001184	IX	*ormance and Exhaust Emissions Characteristics of a Methanol*	*FUEL Automobile*
80A000630	IX	*ring Conference * on Board Steam-reforming of Methanol to*	*FUEL Automotive Hydrogen Engine*
80A000547	IX	*Fuels Technology * Engine Experiments with Alcohol/Diesel*	*FUEL Blends*
80A002253	IX	*1977 * Automotive Materials Compatibility with Methanol*	*FUEL Blends * a Report by the Automotive*
80A000158	IX		*FUEL Blends Create Solubility Problems*
80A000103	IX	*Diesel-ethanol*	*FUEL Blends Investigated*
80A002141	I	*Goosen's EtOH*	*FUEL Book*
80A000225	IX	*Mercedes Benz of Brazil Uses Sugar Byproduct to*	*FUEL Buses with Modified Fuel Pumps*
80A002199	IX	*Utilisation of Alcohol as Motor*	*FUEL by Direct Injection, RETEL*
80A000644	IX	*iety Energy Conversion Engineering Conference * Alternate*	*FUEL Capability of Rankine Cycle Engines*
80A002016	IX	*Development of a Pure Methanol*	*FUEL Car*
80A000087	IX	*Effectiveness of*	*FUEL Cetane Number for Combustion Control*
80A002073	IX	*Georgia-Pacific Alcohol from Tree Sugars to Be Used as*	*FUEL Component for Test by Nebraska Dept.*
80A002303	IX	*els * a Comparison of Exhaust Emissions, Power Output and*	*FUEL Consumption Using Static and Dynamic E*
80A000477	IX	*Hydrocarbon Fuels: a Comparison of Exhaust Emissions and*	*FUEL Consumption Using Steady-state and Dyn*
80A001173	IX	*Hydrocarbon Fuels: a Comparison of Exhaust Emissions and*	*FUEL Consumption Using Steady-state and Dyn*
80A002304	IX	*Power,*	*FUEL Consumption, and Exhaust Emission Char*
80A000448	IX	*a Fundamental Model Predicting*	*FUEL Consumption, NOx and HC Emissions of T*
80A000136	IX	*Effect of Methanol on Exhaust Composition of a*	*FUEL Containing Toluene, N-heptane, and Iso*
80A000741	IX	*posium on Alcohol Fuel Technology: Methanol and Ethanol **	*FUEL Converter with Methanol for Spark-igni*
80A003021	IX	*Brown's Alcohol Motor*	*FUEL Cookbook*
80A000529	IX	*Symposium on Alcohol Fuels Technology * Gasoline/Methanol*	*FUEL Distribution and Handling Trial*
80A000661	IX	*Proceedings 14th Symposium (International) on Combustion **	*FUEL Droplet Burning Rates at High Pressure*
80A000306	IX		*FUEL Droplet Size Distribution in Diesel Co*
80A000307	IX		*FUEL Economy and Emission Characteristics*
80A000733	IX	*Alternate Air-fuel Induction Systems Contrasts in Terms of*	*FUEL Economy and Exhaust Emissions for Simu*
80A000323	IX	*Studies — Fuel and Engine Calibration Effects on Emissions,*	*FUEL Economy and Octane Number Requirements*
80A000341	IX	*Spark Ignition Engine Study of the Octane, Emissions, and*	*FUEL Economy Characteristics of Methanol-ga*
80A001228	IX	*Exhaust Emissions and*	*FUEL Economy from Automobiles Using Alcohol*
80A000548	IX	*cohol Fuels Technology * Hardware/Software Strategies for*	*FUEL Economy Optimization with Exhaust Emis*
80A001230	IX	*ion of Neat Methanol — Compromises among Exhaust Emissions,*	*FUEL Economy, and Driveability * a Report*
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80A000315	IX	*Methanol, Ethanol and Jet*	*FUEL Emissions Comparison from a Small Gas*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000562	XI	Environmental Consequences of Methanol Spills and Methanol	FUEL Emissions on Terrestrial and Freshwate
80A000521	IX	Fuels Technology * Development of an On-board Mechanical	FUEL Emulsifier for Utilization of Diesel/M
80A000521	IX	er for Utilization of Diesel/Methanol and Methanol/Gasoline	FUEL Emulsions in Transportation
80A000653	IX	ors Affecting the Performance of an Alcohol-diesel Oil Dual	FUEL Engine
80A000658	IX	resston and Combustion Processes in Alcohol-diesel Oil Dual	FUEL Engines
80A001061	IV	Jerusalem Artichoke Gets Attention as Possible	FUEL Ethanol Alcohol Source
80A003009	IV	Production and Use of	FUEL Ethanol from Corn or Wheat * Sources
80A000376	IX	Evaluation of Methyl Alcohol as a Vehicle	FUEL Extender
80A000212	I	Grain Belt's "Miracle"	FUEL Finds Many Obstacles
80A001229	IX	Systems: Held on April 18-22, 1977 * a Study on Reformed	FUEL for an Automotive Gasoline Engine *
80A000215	IX	Methanol — a Clean Burning	FUEL for Automobile Engines
80A001248	IX	Methanol as a Possible	FUEL for Automotive Use
80A000631	I	Energy Conversion Engineering Conference * Which Alcohol	FUEL for Brasil — Methanol or Ethanol? *
80A001157	IX	Methanol: a Versatile	FUEL for Immediate Use
80A002248	IX	Methanol. Versatile	FUEL for Immediate Use
80A002242	IX	Alcohol — a	FUEL for Internal Combustion Engines
80A000241	IX	Methanol/Gasoline Blends as a Motor	FUEL for New Zealand
80A000657	IX	dies of Engine Performance with Methanol as a Supplementary	FUEL for SI and CI Engines
80A001177	IX	ergy Technology Handbook * Methyl Alcohol * a Potential	FUEL for Transportation
80A000133	IX	Effect of Alcohols as Supplemental	FUEL for Turbocharged Diesel Engines
80A001163	VIII	Shortage — a Feasibility Study of Manufacturing Synthetic	FUEL from Available Energy Sources
80A001113	V	New Opportunities for	FUEL from Biological Processes
79 : 002491	VIII	ings Forest and Field Fuels Symposium * Ethanol for Motor	FUEL from Biomass
80 : 002138	VIII	Energy Relationships of	FUEL from Biomass
78 : 001830	V	Clean	FUEL from Biomass and Wastes * Energy and
78 : 001832	V	Clean	FUEL from Biomass and Wastes * Utilizatio
80A000159	VIII		FUEL from Biomass: a Positive Balance
80A002314	V	Production of Liquid Transport	FUEL from Cellulose Material (Wood)
80A002310	V	Production of Liquid Transport	FUEL from Cellulose Material (Wood) * Lab
78 : 002739	VI	Production of Liquid Transport	FUEL from Cellulose Material (Wood). II.
80A002308	IV	2nd New Zealand Energy Conference *	FUEL from Crops
80A000452	VI		FUEL from Farms * a Guide to Small Scale
80A002214	III	Now, Real Motor	FUEL from Molasses
80A003079	III	Motor	FUEL from Molasses
80A003080	VIII	Motor	FUEL from Molasses
80A003082	III	Motor	FUEL from Molasses
80A003083	III	Motor	FUEL from Molasses
80A003084	III	Motor	FUEL from Molasses
80A003120	III	Motor	FUEL from Molasses
80A003047	III	Alcohol Motor	FUEL from Molasses, I * I. Use of Cane M
80A002246	IX	Alcohol Motor	FUEL from Molasses, II * II. the Use of
80A000544	IX	hol Fuels Technology * Combustion and Emission of Gaseous	FUEL from Reformed Methanol in Automotive E
80A002284	III	Alcohol	FUEL from Sugarcane (for an Alternative Ene
80A003119	III	Motor	FUEL from Waste Molasses
80A003026	V	* Collected Working Papers on the Production of Synthetic	FUEL from Wood
80A000003	V	ve Utilization of Cellulosic Feedstock in the Production of	FUEL Grade Ethanol
78 : 003706	VIII	nary Economic Evaluation of a Process for the Production of	FUEL Grade Ethanol by Enzymatic Hydrolysis
80A000660	IX	ustion * an Investigation of Using Alcohol as a Secondary	FUEL in a Multicylinder Automotive Compress
79 : 000510	I	Ethanol * Use of Ethanol from Biomass as an Alternative	FUEL in Brazil
80A002293	IX	Ethyl Alcohol as Tractor	FUEL in China
80A000594	I	mitations of the Use of Alcohol Produced by Fermentation as	FUEL in Developing Countries
80A003036	IV	Potatoes an Important Source of Motor	FUEL in Germany

Citation Number	Subject Section	Citation Title	Title Keyword
80A001199	I	*Alcohol*	*FUEL in India * Dept. of Industries and C*
80A000607	III	*Countries * Potential of Sugar Cane Derived Alcohol as a*	*FUEL in Jamaica*
80A000605	I	*in Developing Countries * Perspective of Ethanol Usage as*	*FUEL in the Dominican Republic*
80A001193	IX	*Provinces. Bulletin, New Ser., No. 6 * Its Use as Motor*	*FUEL in the United Provinces*
80A000396	I	*Methanol as a*	*FUEL in the Urban Energy Economy and Possib*
80A001056	I	*It May Look Like a 'Sunflower,' but There's*	*FUEL in Those Stalks*
80A000702	IX	*el * Advantages of Neat and Blended Operation of Methanol*	*FUEL in Vehicles*
80A001187	VI	*Making*	*FUEL in Your Back Yard*
80A002150	VI	*Making*	*FUEL in Your Back Yard*
80A001001	X	*Alcohol Production for*	*FUEL Is Backed by House Committee*
80A001032	VIII	*the Best Incentive for Finding*	*FUEL Is Plain Greed (Developing New Sources*
80A002151	VI	*Makin' It on the Farm: Alcohol*	*FUEL Is the Road to Independence*
80A002282	VIII	*Gasohol: Costly Way to Go.*	*FUEL Made from Grain*
80A002078	IX	*odyear Tire and Rubber Develops Gasoline/Alcohol/Water Auto*	*FUEL Mixture*
80A002222	IX		*FUEL Mixtures on London Buses*
80A000435	IX	*Methanol*	*FUEL Modification for Highway Vehicle Use*
80A002062	I	*Farming for Fuel — Alcohol Motor*	*FUEL Movement of the 1930's*
80A000214	IX	*Methanol —*	*FUEL of Future*
80A000162	IX		*FUEL of the Future?*
80A002084	I	*Growing*	*FUEL on the Farm May Help as the Oil Runs O*
80A002262	X	*om Grain, Garbage: Congress Looks to Gasohol in Search for*	*FUEL Options*
80A000335	IX	*Methanol as a Motor*	*FUEL or a Gasoline Blending Component*
79 : 004628	III	*sts for Conversion of Sugar Wastes to Ethanol to Be Used as*	*FUEL or as an Industrial Feedstock * Brie*
80A003043	I	*Use of Alcohol*	*FUEL Outside of United States*
80A001058	I	*Japan-Brazil*	*FUEL Plan*
80A000142	V	*Energy Forests and*	*FUEL Plantations*
80A000506	X	*mposium on Alcohol Fuels Technology * the Swedish Oil and*	*FUEL Policy in the 1980's*
80A001069	IX	*Mother's Alcohol*	*FUEL Preheater*
80A001189	I	*Synthetic Oil vs. Methanol as a Liquid*	*FUEL Product from Waste Conversion Processe*
80 : 001952	VIII	*Raw Material Availability Reports * Cropland Reserve for*	*FUEL Production*
80A003020	VI	*a Learning Guide for Alcohol*	*FUEL Production*
77 : 000111	V	*Solar Energy Fixation by Plants and Synthetic*	*FUEL Production * Production of Ethanol F*
80A001207	VI	*Individual and Group Gasohol-alcohol*	*FUEL Production and Usage*
78 : 001809	VIII	*Economic Pre-feasibility Study: Large-scale Methanol*	*FUEL Production from Surplus Canadian Fores*
78 : 002269	V	*Economic Pre-feasibility Study: Large-scale Methanol*	*FUEL Production from Surplus Canadian Fores*
80A002295	VIII	*Some Economic Aspects of a Corn-alcohol*	*FUEL Program*
80A000550	X	*ls Technology * New Zealand's Methanol-gasoline Transport*	*FUEL Programme*
77 : 001297	IX	*ng the Sun through Bioconversion * Volkswagen Alternative*	*FUEL Programs*
80A001012	I	*an Ancient*	*FUEL Provides Energy for Modern Times*
80A000225	IX	*of Brazil Uses Sugar Byproduct to Fuel Buses with Modified*	*FUEL Pumps*
80A002281	IX	*Gasoline/Alcohol Blends * a Possible*	*FUEL Resource for Minnesota*
80A000730	IX	*Monograph on Alternate*	*FUEL Resources * Effect of Methanol Addit*
80A000731	IX	*Monograph on Alternate*	*FUEL Resources * Review of the Use of Met*
80A002144	I	*Solar Alcohol * the*	*FUEL Revolution*
80A001119	IX	*Newest*	*FUEL Saver: "Aquahol" Injection for Diesel*
80A000113	VI	*Distillery*	*FUEL Savings by Efficient Molasses Processi*
80A000148	VI	*Engineering Methanol Plant on a*	*FUEL Scale*
80A000531	VI	*Symposium on Alcohol Fuels Technology * Engineering of a*	*FUEL Scale Methanol Plant*
80A001188	VI	*Making Alcohol Fuel * Mother's Alcohol*	*FUEL Seminar*
80A000098	I	*the Alcohol-gasohol*	*FUEL Solution*
80A000099	I	*Alcohol-gasohol*	*FUEL Solution*
80A000114	VI	*Distilling a Better*	*FUEL Solution*

Citation Number	Subject Section	Citation Title	Title Keyword
80A001046	I	Gasohol — New	FUEL Source from Mother Nature
80A000216	VIII	Methanol as a	FUEL Still a Big Question
80A001165	IX	the Effects of	FUEL Structure on the Autoignition of Fuel-
80A000310	IX	Methanol and Ethanol as a Motor	FUEL Substitute
80A001227	IX	Emergency	FUEL Substitutes for Spark-ignition Engines
80:002125	III	Fuels from Biomass: Alcohol Production; Alcohol as a Motor	FUEL Supplement * Technical Report No. 5
80A000709	IX	as an Alternative Fuel * Methanol-gasoline Blends * a	FUEL Supplier's Viewpoint
80A000471	IX	Spring Meeting. Mimeographed Papers * New S.I. Engine	FUEL System's Approach * Performance and
80A001251	I	Survey of Alcohol	FUEL Technology * Volume I
80A001252	I	Survey of Alcohol	FUEL Technology * Volume II
80A000505	X	rnational Symposium on Alcohol Fuels Technology * Alcohol	FUEL Technology and the National Energy Act
79:000510	I	Proceedings of the International Symposium on Alcohol	FUEL Technology: Methanol and Ethanol *
80A000732	VI	Proceedings of the International Symposium on Alcohol	FUEL Technology: Methanol and Ethanol *
80A000733	IX	Proceedings of the International Symposium on Alcohol	FUEL Technology: Methanol and Ethanol *
80A000734	IX	Proceedings of the International Symposium on Alcohol	FUEL Technology: Methanol and Ethanol *
80A000735	VIII	Proceedings of the International Symposium on Alcohol	FUEL Technology: Methanol and Ethanol *
80A000736	VI	Proceedings of the International Symposium on Alcohol	FUEL Technology: Methanol and Ethanol *
80A000737	VI	Proceedings of the International Symposium on Alcohol	FUEL Technology: Methanol and Ethanol *
80A000738	VI	Proceedings of the International Symposium on Alcohol	FUEL Technology: Methanol and Ethanol *
80A000739	III	Proceedings of the International Symposium on Alcohol	FUEL Technology: Methanol and Ethanol *
80A000740	IX	Proceedings of the International Symposium on Alcohol	FUEL Technology: Methanol and Ethanol *
80A000741	IX	Proceedings of the International Symposium on Alcohol	FUEL Technology: Methanol and Ethanol *
80A000742	XI	Proceedings of the International Symposium on Alcohol	FUEL Technology: Methanol and Ethanol *
80A000040	I	the Clean Synthetic	FUEL That's Already Here
80A001249	IX	Investigation of a Substitute	FUEL to Control Automotive Air Pollution
80A000705	IX	Fuel * Physico-chemical Properties of Methanol Related to	FUEL Use
80A003113	IX	Comparative	FUEL Values of Gasoline and Denatured Alcoh
80A001010	IX	Analyzer for Determining	FUEL Vaporization Pressure Curves of Gasoli
80A000481	I	Runs Out — a Survey of Our Primary Energy Sources and the	FUEL We Can Make from Them
80A003127	VII	Economic Aspects of Using Grain Alcohol as a Motor	FUEL with Emphasis on By-product Feed Marke
80A000398	IX	Methanol as an Automotive	FUEL with Special Emphasis on Methanol-gaso
80A002313	I	Production and Use of Grain Alcohol as a Motor	FUEL —an Evaluation
80A001165	IX	the Effects of Fuel Structure on the Autoignition of	FUEL-AIR Mixtures
80A000043	IX	Comparative Study of	FUEL-AIR Otto Cycle for Five Different Fuel
80A001212	VIII	the Small	FUEL-ALCOHOL Distillery * General Descrip
80A000186	I	Look What's Cooking on the	FUEL-ALCOHOL Front
80A001221	VIII	On-farm Production of	FUEL-ALCOHOL in mid-America — Technical and
80A000340	IX	Single-cylinder Engine Study of Methanol	FUEL-EMPHASIS on Organic Emissions
80A000732	VI	* Methanol Synthesis and Possibilities for Production of	FUEL-METHYL
80A000380	IX	NO_2 in the I.C. Engine Combustion of Methyl Alcohol and	FUEL-NITROGEN Doped Methyl Alcohol
80A000639	IX	stion and Pollutant Kinetic Modeling for Methane, Methanol,	FUEL-NITROGEN, and Fuel-sulfur
80A000639	IX	Kinetic Modeling for Methane, Methanol, Fuel-nitrogen, and	FUEL-SULFUR
80A000016	IX	Cars,	FUEL, and Pollution
80A000204	VIII	Gasohol Pumps Do a Gushing Business: Drivers Line Up for	FUEL, but Efficiency Still in Question
80A001182	IX	of New Combustion Analysis Method in the Study of Alternate	FUEL, Combustion and Emission Characteristi
80A000400	I	Methanol: Its Synthesis, Use as a	FUEL, Economics, and Hazards
80A000017	IV	Cassava — Florida's Future	FUEL?
80A001004	IX	Alcohol as Motor	FUEL?
80A000372	V	Converting Cellulosic Waste to	FUEL: a Literature Review
80A000313	IX	Methanol as a	FUEL: a Review with Bibliography
80A000397	IX	Methanol as an Automotive	FUEL: a Summary of Research in the M.I.T.
80A000711	XI	ive Fuel * Environmental Aspects of Methanol as Vehicular	FUEL: Air Quality Effects

Citation Number	Subject Section	Citation Title	Title Keyword
80A000444	XI	*Methanol as a Transportaion*	*FUEL: Assessment of Environmental and Heal*
80A003028	IX	*Agricultural Alcohol in Automotive*	*FUEL: Gasohol*
80A000712	IX	*ive Fuel * Environmental Aspects of Methanol as Vehicular*	*FUEL: Health and Environmental Effects*
80A000425	I	*Gasohol * Alcohol*	*FUEL: Likely to Produce More Problems than*
80A000549	IX	*on of Alcohol/Gasoline Blends as a Stratified-charge Engine*	*FUEL: Performance and Emissions*
80A000174	VIII	*Food or*	*FUEL: the Liquids Dilemma*
80A000675	IX	*Hydrogen Energy * Hydrogen and Methanol*	*FUELED — Air Breathing Automobile Engine **
80A000252	IX	*Methylnitrite in the Exhaust from a Methanol-gasoline*	*FUELED Automobile*
80A000548	IX	*Optimization with Exhaust Emission Constraints in Methanol*	*FUELED Automobiles*
80A002014	IX	*yde Concentrations in the Exhaust of a Spark Ignited Engine*	*FUELED by Alcohol/Gasoline Blends*
80A002296	IX	*centrations in the Exhaust of an Internal Combustion Engine*	*FUELED by Alcohol/Gasoline Blends*
80A000720	IX	*orld Hydrogen Energy Conference * Methanol-gasoline Blend*	*FUELED Engine — Performance and Emissions*
80A000415	IX	*rnative Fuels — Quasi One-dimensional Modeling * Methanol*	*FUELED Engines*
80A000359	IX	*Predicted Exhaust Emissions from a Methanol and Jet*	*FUELED Gas Turbine Combustor*
80A000642	IX	*Compression Ratio Effects on NOx Emissions from a Methanol*	*FUELED SI Engine*
80A001261	IX	*Emissions from the Methanol*	*FUELED Stanford University Gremlin*
80A000516	IX	*sium on Alcohol Fuels Technology * Emissions from Gasohol*	*FUELED Vehicles*
80A000329	IX	*haust Emissions, Fuel Economy, and Driveability of Vehicles*	*FUELED with Alcohol-gasoline Blends*
80A002138	IX	*Comparative Automotive Engine Operation When*	*FUELED with Ethanol and Methanol*
80A000641	IX	*xhaust and Evaporative Emissions from a Brazilian Chevrolet*	*FUELED with Ethanol-gasoline Blends*
80A000305	IX	*Evaporative and Exhaust Emissions from Cars*	*FUELED with Gasoline Containing Ethanol and*
80A002057	IX	*Exhaust Emissions from a Single-cylinder Engine*	*FUELED with Gasoline, Methanol, and Ethanol*
80A000492	IX	*th Intersociety Energy Conversion Engineering Conference **	*FUELING Automotive Internal Combustion Engi*
80A000629	I	*th Intersociety Energy Conversion Engineering Conference **	*FUELING Automotive Internal Combustion Engi*
80A002127	IX	*Direct Injected Methanol*	*FUELING of a Two Stroke Locomotive Engine*
80A000543	IX	*Alcohol Fuels Technology * Calculations Relevant to the*	*FUELING of Alcohols in Spark Ignited Intern*
80A000122	VIII	*Don't Be*	*FUELISH: Producing Gasohol Will Be Expensi*
80A000684	IX	*Optimized Combustion in a Methanol —*	*FUELLED Spark — Ignition Engine and Its Eff*
80 : 000216	VI	*rmophilic Degradation of Cellulose for Production of Liquid*	*FUELS*
80 : 001948	II	*for Utilization as a Feedstock for the Production Alcoholic*	*FUELS*
80A000043	IX	*Comparative Study of Fuel-air Otto Cycle for Five Different*	*FUELS*
80A000123	X	*Drive to Boost Alcohol*	*FUELS*
80A000128	VIII	*Economic Realities of Alcohol*	*FUELS*
80A000141	IX	*Energy-ecological Characteristics of Synthetic*	*FUELS*
80A000190	I	*acture, Availability and Cost of Methanol and Ethanol Motor*	*FUELS*
80A000246	IX	*Methanol Gasoline Blends — Future Automotive*	*FUELS*
80A000311	IX	*Methanol and Gasoline/Methanol Blends as Automotive*	*FUELS*
80A000362	X	*Department of Energy Position Paper on Alcohol*	*FUELS*
80A000374	IX	*ems and Fuels. Volume III. Alternative Nonpetroleum-based*	*FUELS*
80A000390	I	*Hydrogen and Exotic*	*FUELS*
80A000403	IX	*ical Approach to the Introduction of Alternative Automotive*	*FUELS*
80A000424	I	*View from Abroad Brazil Grows Its Motor*	*FUELS*
80A000464	IX	*raints and Opportunities: Alcohol Replacement of Petroleum*	*FUELS*
80A000465	IX	*leum Industry Overview of the Use of Alcohols as Automotive*	*FUELS*
80A000470	IX	*ers * Methanol and Methanol-gasoline Blends as Automotive*	*FUELS*
80A000478	IX	*Council) Annual Conference on Energy * Methanol Gasoline*	*FUELS*
80A000480	I	*Capturing the Sun through Bioconversion * Liquid*	*FUELS*
80A000517	IX	*Technology * Brazilian Vehicles Calibration for Ethanol*	*FUELS*
80A000520	IX	*Mid-term Prospects for the Use of Alcohols as Motor Vehicle*	*FUELS*
80A000555	I	*ts Testing and Development of Hardware Required for Alcohol*	*FUELS*
80A000637	I	*sting Technology) * Energy and the Public * Alternative*	*FUELS*
80A000646	IX	*ce * Potential for Methanol-gasoline Blends as Automotive*	*FUELS*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000652	IX	*ity of Methanol and Methanol-gasoline Blends as S.I. Engine*	*FUELS*
80A000685	I	*ustion Technologies. Symposium Paper * Alcohols, the Now*	*FUELS*
80A000734	IX	*Methanol, and Methanol/Water Blend as Spark Ignition Engine*	*FUELS*
80A000750	IX	*Potentials for Early Utilization of Methanol and Hydrogen*	*FUELS*
80A001010	IX	*porization Pressure Curves of Gasoline and Gasoline-alcohol*	*FUELS*
80A001016	IX	*to Support Further R&D into Production and Use of Alcohol*	*FUELS*
80A001123	I	*Paving the Way for Alcohol*	*FUELS*
80A001260	IX	*Ethanol, the Propanols, and the Butanols as Ship Propulsion*	*FUELS*
80A001265	IX	*Alternative Fuel * Feasibility of Alternative Automotive*	*FUELS*
80A002171	IX	*Octane Ratings of Agricultural Motor*	*FUELS*
80A002186	IX	*Alcohol with Normal Diesel*	*FUELS*
80A002189	IX	*Alcohol Motor*	*FUELS*
80A002246	IX	*II. the Use of Alcohol and Alcohol-ether Mixtures as Motor*	*FUELS*
80A002270	I	*oduction and Use of Agricultural Crops as a Source of Motor*	*FUELS*
80A002276	I	*Alcohol*	*FUELS*
80A003023	VI	*Manual for the Home and Farm Production of Alcohol*	*FUELS*
80A003050	IX	*Single-cylinder Engine Tests of Substitute Motor*	*FUELS*
80A002303	IX	*Alcohol Assisted Hydrocarbon*	*FUELS * a Comparison of Exhaust Emissions*
80A001183	IX	*Future Automotive*	*FUELS * Alternative Fuels for Automotive*
80A001208	VIII	*Net Energy Analysis of Alcohol*	*FUELS * API Publication No. 4312*
80A001182	IX	*Future Automotive*	*FUELS * Application of New Combustion Ana*
80:001960	II	*trospective Search on the Biochemical Production of Alcohol*	*FUELS * Compilation of Abstracts on the F*
80A001181	VIII	*Automotive*	*FUELS * Energy Efficiency*
80A001184	IX	*Future Automotive*	*FUELS * Engine Performance and Exhaust Em*
79:002492	V	*Symposium on Forest and Field*	*FUELS * Forest Fuels, USA*
80A000714	IX	*Power Plants and Future*	*FUELS * Methanol as a Motor Fuel * Inst*
80A003006	VIII	*Grain Alcohol in Motor*	*FUELS * Nebraska Univ., Lincoln (USA). Co*
80A001198	VIII	*Economic Analysis of Synthetic Liquid*	*FUELS * Ontario Ministry of Energy Adviso*
80A003004	I	*Alcohol*	*FUELS * Opportunities for Idaho*
80A000715	IX	*Power Plants and Future*	*FUELS * Performance and Emissions of Spar*
76:001878	I	*Ethanol and Methanol: Production Schemes and Use as*	*FUELS * Review Based on Use of Minnesota*
78:001547	I	*Photosynthetic Solar Energy: Rediscovering Biomass*	*FUELS * Review of Current Research Effort*
80:000205	VIII	*Potential of Biomass-based Alcohol-gasoline Transportation*	*FUELS * to 1990*
80A001196	I	*Alcohol*	*FUELS * U.S. Library of Congress. Congres*
80A003002	X	*Legislative Compendium: Alcohol*	*FUELS * 96th Congress*
80A000368	IX	*Automobile Air Pollution: Automotive*	*FUELS (A Bibliography with Abstracts)*
80A003131	I	*Alcohol*	*FUELS (Citations from the American Petroleu*
80A003128	I	*Alcohol*	*FUELS (Citations from the Engineering Index*
80A003129	I	*Alcohol*	*FUELS (Citations from the NTIS Data Base)*
80A003130	I	*Alcohol*	*FUELS (Citations from the NTIS Data Base)*
80A000545	X	*Fuels Technology * Congressional Concerns About Alcohol*	*FUELS — a Technical Advisor's Perspective*
80A000096	IX	*Alcohol*	*FUELS — Can They Replace Gasoline?*
80A000417	VIII	*Alcohol*	*FUELS — Energy Savior or Wastrel?*
80A000261	VI	*Renewable*	*FUELS — Ethanol Produced by Fermentation*
80A000561	XI	*mposium on Alcohol Fuels Technology * Methanol Containing*	*FUELS — Evaluation of Environment and Healt*
80A000344	IX	*Studies on Mixed*	*FUELS — Hydrazine and Ethyl-alcohol System*
80A000179	I	*Gasohol and Other Alternative Vehicle*	*FUELS — in Retrospect*
80A000697	IX	*on Low Pollution Power Systems Development * Alternative*	*FUELS — Methanol*
80A000415	IX	*sions of Spark Ignited Combustion Engines Using Alternative*	*FUELS — Quasi One-dimensional Modeling **
80A000695	IX	*lution Power Systems Development * Alternative Automotive*	*FUELS — Status and Summary of In-progress R*
80A002252	IX	*pulsion Systems: Held on April 18-22, 1977 * Alternative*	*FUELS — the Outlook and Options within the*
80A000685	I	*New*	*FUELS Advances in Combustion Technologies.*

Citation Number	Subject Section	Citation Title	Title Keyword
79 : 004150	IX	*Ethanol Motor*	*FUELS and "Gasohol"*
80 : 002059	I	*New*	*FUELS and Advances in Combustion Technologi*
80A000556	I	*rnational Symposium on Alcohol Fuels Technology * Alcohol*	*FUELS and Agricultural Systems*
80A000383	I	*Feasibility Study of Alternative*	*FUELS and Automotive Transportation. Volum*
79 : 001109	III	*tudy of Sugarcane, Sweet Sorghum, Sugar Beets, and Corn for*	*FUELS and Chemical Feedstocks*
80A000048	III	*Conversion of Sugar Cane Products into*	*FUELS and Chemical Feedstocks*
78 : 000585	III	*weet Sorghum, and Sugar Beets. Volume III. Conversion to*	*FUELS and Chemical Feedstocks. Task 77.*
79 : 004141	VI	*Program. Volume V. Biochemical Conversion of Biomass to*	*FUELS and Chemicals*
80 : 000214	VI	*Iomass * Anaerobic Biomass Degradation to Produce Sugars,*	*FUELS and Chemicals*
80A000262	I	*Renewable Resources for the Production of*	*FUELS and Chemicals*
80A001174	X	*ram * Volume IV. Thermochemical Conversion of Biomass to*	*FUELS and Chemicals*
80A001235	II	*versus Corn versus Ethylene as Sources of Ethanol for Motor*	*FUELS and Chemicals*
80A000163	V		*FUELS and Chemicals from Biomass*
80A000330	IX		*FUELS and Emissions — Update and Outlook, I*
80A002128	IX	*onomy, Emissions and Photochemical Reactivity Using Alcohol*	*FUELS and Gasoline*
80A001160	IX	*Future*	*FUELS and Mixture Preparation Methods for S*
79 : 001111	I	*Fuels from Biomass Symposium **	*FUELS and Petrochemical Substitutes from Fe*
80A000585	XI	*Developing Countries * Misuse of Alcohol from Automobile*	*FUELS and Preventive Measures*
80A000095	I	*Alcohol*	*FUELS Are No Longer Small Potatoes*
80A002234	X	*ublic Finance and Related Subjects * "Gasohol" — Alcohol*	*FUELS as Gasoline Substitutes * Volume 3*
80A000309	IX	*Performance Characteristics of Low Octane Primary Reference*	*FUELS Blended with Methanol*
80A002292	IX	*Performance and Knocking Characteristics of Low Octane*	*FUELS Blended with Methanol in an SI Engine*
80A000405	X	*Recommendations for a Synthetic*	*FUELS Commercialization Program. Volume II*
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80A001094	IX	*Volvo, Saab Test Dual*	*FUELS Engines*
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80A000493	VIII	*the Technical and Economic Feasibility of Some Alternative*	*FUELS for Automotive Transportation*
80A001007	IX	*Alternative*	*FUELS for Automotive Transportation*
80A000381	IX	*Feasibility Study of Alternative*	*FUELS for Automotive Transportation. Volum*
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80A000365	IX	*Alternative*	*FUELS for Automotive Transportation: a Fea*
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80A000378	IX	*Experiments with Novel*	*FUELS for Diesel Engines*
80A000316	IX	*Modified*	*FUELS for Diesel Engines by Application of*
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80A001170	IX	*Methanol and Ethanol*	*FUELS for Modern Cars*
80A000438	I	*on the Trail of New Fuels: Alternative*	*FUELS for Motor Vehicles*
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80A000540	IX	*on Alcohol Fuels Technology * Research Program "Alcoholic*	*FUELS for Road Traffic" of the German Feder*
80A000693	IX	*Development of Small Internal Combustion Engines * Future*	*FUELS for Small Internal-combustion Engines*
80A000391	I	*Hydrogen and Synthetic*	*FUELS for the Future*
80A003033	IX	*a Comparative Study of Alcohol, Gasoline and Kerosene as*	*FUELS for Tractor Engines*
80A000723	X	*Utilization of Alternative*	*FUELS for Transportation * a General Hist*
80A003001	IX	*Utilization of Alternative*	*FUELS for Transportation * AIAA Aerospace*
80A000325	IX	*Synthetic*	*FUELS for Transportation and National Energ*
80A002200	IX	*Alcohol*	*FUELS for Use in Internal Combustion Engine*
80A001218	II	*Sources of Alcohol*	*FUELS for Vehicle Tests*
80A002140	II	*the Potential for Liquid*	*FUELS from Agriculture and Forestry in Aust*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80 : 000191	VI	*Second Annual Symposium on*	***FUELS from Biomass * Bioconversion of Pla***
80 : 000223	VI	*Second Annual Symposium on*	***FUELS from Biomass * Hypercellulolytic Mu***
80 : 000213	VI	*Second Annual Symposium on*	***FUELS from Biomass * Low Technology Ferme***
80 : 000205	VIII	*Second Annual Symposium on*	***FUELS from Biomass * Near Term Potential***
80 : 000188	I	*Second Annual Symposium on*	***FUELS from Biomass * Plan for the Introdu***
80 : 000189	V	*Second Annual Symposium on*	***FUELS from Biomass * Raw Materials Evalua***
80 : 000217	VIII	*Second Annual Symposium on*	***FUELS from Biomass * Reassessment of Econ***
80 : 000216	VI	*Second Annual Symposium on*	***FUELS from Biomass * Thermophilic Degrada***
80A000431	VIII		***FUELS from Biomass — Energy Outlay versus E***
80A000670	I	*Clean*	***FUELS from Biomass and Wastes * Biomass***
80A000669	IX	*Clean*	***FUELS from Biomass and Wastes * the Use***
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80A000502	I	*rnational Symposium on Alcohol Fuels Technology * Alcohol*	***FUELS from Biomass in New Zealand — the Ene***
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80 : 002125	III		***FUELS from Biomass: Alcohol Production; Al***
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80A000166	I		***FUELS from Crops: Renewable and Clean***
80A002271	II	*Motor*	***FUELS from Farm Products * U.S. Dept. of***
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79 : 004663	I	*rom Biomass and Wastes * Study of the Energy Potential of*	***FUELS from Land Biomass in Five Countries***
80A000433	V	*Synthetic*	***FUELS from Municipal, Industrial and Agricu***
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80A000467	IX	*um Extender and Additive in Automotive Engines (Alternative*	***FUELS from Plants)***
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A001164	IX	*the Utilization of Alternative*	*FUELS in a Diesel Engine Using Different Me*
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80A000552	X	*lcohol Fuels Technology * Future Scenarios of Alcohols as*	*FUELS in Brazil*
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80 : 000950	VIII	*California Clean*	*FUELS Study * Availability to Industry an*
80A000422	VIII	*a New Way to Calculate the Savings from*	*FUELS Substituted for Petroleum*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000549	IX	Proceedings on Third International Symposium on Alcohol	FUELS Technology * Characterization of Al
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80A000516	IX	Proceedings of Third International Symposium on Alcohol	FUELS Technology * Emissions from Gasohol
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000317	IX	Other Engines, Other	FUELS: an Overview
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80A002137	VIII	Biomass-based Alcohol	FUELS: the Near-term Potential for Use Wit
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80A000448	IX	a	FUNDAMENTAL Model Predicting Fuel Consumpti
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80A000169	VI		FUNGAL Cellulases as an Aid for the Sacchar
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80A000214	IX	Methanol — Fuel of	FUTURE
80A000391	I	Hydrogen and Synthetic Fuels for the	FUTURE
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80A000668	VIII	Biomass: a Cash Crop for the	FUTURE * Alternative Organizational and M
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000635	IX		FUTURE Automotive Fuels: Prospects, Perfor
80A000269	V	the Role of Wood in	FUTURE Energy Concerns
80A000248	VIII	Methanol Primed for	FUTURE Energy Role
80A000017	IV	Cassava — Florida's	FUTURE Fuel?
80A000714	IX	Power Plants and	FUTURE Fuels * Methanol as a Motor Fuel
80A000715	IX	Power Plants and	FUTURE Fuels * Performance and Emissions
80A001160	IX		FUTURE Fuels and Mixture Preparation Method
80A000693	IX	ign and Development of Small Internal Combustion Engines *	FUTURE Fuels for Small Internal-combustion
80A000436	IX	Methanol, the	FUTURE in Motorized Transportation
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80A000121	IX	Does Alcohol Have a Place in Your Car's	FUTURE?
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80A000476	IX	osium * in Situ Optical Measurement of Automobile Exhaust	GAS Particulate Size Distributions: Regula
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80A002272	VI	Forget the	GAS Pumps — Make Your Own Fuel
80A000207	VIII	Gasohol (Solution to the	GAS Shortage)
80A000217	IX	Methanol as a	GAS Substitute
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80A000544	IX	on Alcohol Fuels Technology * Combustion and Emission of	GASEOUS Fuel from Reformed Methanol in Auto
80A000753	I	Symposium on Automotive Propulsion Systems * Alcohols and	GASEOUS Fuels from Biomass
80A000050	VIII	Technology and Economics for the Production of Liquid and	GASEOUS Fuels from Waste
80A002302	IX	the	GASEOUS Heat Capacity of Methyl Alcohol and
80A000677	IX	drocarbon-derived Oxygenated Material in Automobile Exhaust	GASES
79 : 005707	VI	on Process, Hydrocarbon Extraction from Euphorbia, and Wood	GASIFICATION
80A000051	I	CU Tries	GASOHOL

Gasohol • Gasohol

Citation Number	Subject Section	Citation Title	Title Keyword
80A000057	I	*Brazil Continues Push for*	*GASOHOL*
80A000116	X	*DOE Clears Way for Amoco Oil Company to Market*	*GASOHOL*
80A000156	VI	*Former Brewery May Soon Be Turning Corn to*	*GASOHOL*
80A000176	VIII		*GASOHOL*
80A000265	VIII	*hers Accelerate Search for Way to Use Less Energy in Making*	*GASOHOL*
80A000276	VIII	*a Rubarb over*	*GASOHOL*
80A000292	IV	*Soviet Grain for*	*GASOHOL*
80A000486	II	** American Agriculture — the Energy Production System —*	*GASOHOL*
80A001034	VIII	*Big Oil's 'Inexplicable' Aversion to*	*GASOHOL*
80A001054	I	*Iowa's Boom in*	*GASOHOL*
80A001080	X	*U.S. Presses Drive for Use of*	*GASOHOL*
80A001111	X	*National Organization Created to Promote Use of*	*GASOHOL*
80A001162	IX	*the Use of*	*GASOHOL*
80A001196	I	*nal Research Service. Report IB74087 * Methanol, Ethanol,*	*GASOHOL*
80A002015	I	*Developing*	*GASOHOL*
80A002074	VIII	*Getting Serious About*	*GASOHOL*
80A002077	I	*a Go-ahead for*	*GASOHOL*
80A002088	IX	*a Highway Test of*	*GASOHOL*
80A002112	VIII	*in Search of Alcohol for*	*GASOHOL*
80A003028	IX	*Agricultural Alcohol in Automotive Fuel:*	*GASOHOL*
80A003101	XI	*Handling and Care of*	*GASOHOL*
80A003102	IX	*Recalling Those 2 Million Miles on*	*GASOHOL*
80A003122	VIII	*Economics of Dieselhol — a Supplement to Economics of*	*GASOHOL*
80A003123	VIII	*Economics of*	*GASOHOL*
80A000425	I		*GASOHOL * Alcohol Fuel: Likely to Produc*
80A001195	VIII	*Economic Feasibility of*	*GASOHOL * Hearing Before the Subcommittee*
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80A000632	IX	*erence * Improving Octane Values of Unleaded Gasoline via*	*GASOHOL * Volume I*
80A000207	VIII		*GASOHOL (Solution to the Gas Shortage)*
80A002260	VIII		*GASOHOL — a Critical Choice (Fuel, Energy S*
80A000348	X	*Sweet Proposition: How to Turn Surplus Sugar into*	*GASOHOL — and a Fast Buck*
80A003011	VIII		*GASOHOL — Economic Feasibility Study*
80A002100	VIII		*GASOHOL — Economy or Gluttony*
80A001046	I		*GASOHOL — New Fuel Source from Mother Natur*
80A001200	I		*GASOHOL — One Answer to the Energy Crisis*
80A000200	I		*GASOHOL — Out in Iowa They Can't Pump It Fa*
80A000206	IX		*GASOHOL — Should It Ever Go to Sea?*
80A002142	I		*GASOHOL — Are Alcohol Fuels in Our Future?*
80A000179	I		*GASOHOL and Other Alternative Vehicle Fuels*
79 : 006466	VIII	*et Energy Analysis * Energy Analysis of Two Technologies:*	*GASOHOL and Solar Satellite Power Station*
80A001206	VI	*Alcohol Distiller's Manual for*	*GASOHOL and Spirits*
80A002042	X	*E.P.A. to Permit Sale of*	*GASOHOL as Unleaded-gasoline Substitute*
80A002261	X		*GASOHOL Bandwagon Rolling in Congress*
80A000180	I		*GASOHOL Booming across the Nation*
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80A000183	VIII		*GASOHOL Coming on Strong; Its Effect on Mar*
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80A002146	I		*GASOHOL for Energy Production * Energy T*
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80A003007	I	*the Feasibility of*	*GASOHOL from Renewable Agricultural and for*

Citation Number	Subject Section	Citation Title	Title Keyword
80A001043	III		*GASOHOL from Sugarcane (Saccharum Spontaneu*
80A001044	V		*GASOHOL from Wood Chips*
80A002041	XI	*EPA Spends $500,000 to Study Environmental Impact of*	*GASOHOL Fuel*
80A000516	IX	*al Symposium on Alcohol Fuels Technology * Emissions from*	*GASOHOL Fueled Vehicles*
80A001045	VIII	*the*	*GASOHOL Gambit*
80A002101	I	*How Far Can*	*GASOHOL Go?*
80A000428	I	*Iowa et al. vs OPEC — Corn States Uncork*	*GASOHOL Gusher*
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80A000124	VIII	*Driving on*	*GASOHOL in Midwest*
80A002262	X	*Made from Grain, Garbage: Congress Looks to*	*GASOHOL in Search for Fuel Options*
80A002107	X	*Illinois Governor Orders*	*GASOHOL in State Vehicles*
80A002115	VIII	*Indiana Standard to Sell*	*GASOHOL in the Midwest*
80A000170	I	*Future of*	*GASOHOL in the U.S. Depends on Decisions to*
80A001102	IX	*Chrysler, G.M. Put*	*GASOHOL In Warranty*
80A001147	VIII	*Texaco Inc. Plans to Test*	*GASOHOL in 3 U.S. Markets: Meanwhile, 17 C*
80A001124	X	*Pentagon Is Directed to Purchase Alcohol for*	*GASOHOL Industry*
80A002102	I	*How the Development of a*	*GASOHOL Industry Will Affect Farmers*
80A001020	I	*Argument Clouds*	*GASOHOL Issue*
80A000208	VIII		*GASOHOL Likely to Produce More Problems Tha*
80A001033	VIII	*a Big-league Test of*	*GASOHOL Marketing*
80A001048	IX		*GASOHOL No Help, Says Top GM Engineer*
80A001049	IX		*GASOHOL No Threat to U.S. Carburetors*
80A001050	IX		*GASOHOL OK as Substitute for Unleaded Gasol*
80A000201	VIII		*GASOHOL Pioneer Shows It Isn't Cheap*
80A001081	X	*U.S. Struggles for*	*GASOHOL Plan*
80A000014	X	*Carter*	*GASOHOL Plan Isn't Likely to Create More De*
80A000430	X	*New*	*GASOHOL Plan Sets High Production Goal*
80A000015	X	*Carter to Announce*	*GASOHOL Plan Soon: Grain Diverted from Sov*
80A000203	I		*GASOHOL Poses Major Problems*
80A000118	X	*DOE Proposes Deregulation of*	*GASOHOL Prices*
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80A001209	VI	*a Manual on Ethanol and*	*GASOHOL Production in Louisiana*
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80A000209	VI		*GASOHOL Sparks Study on New Ethanol Plant*
80A000191	IX		*GASOHOL Tests Are Begun by AT+T's Illinois*
80A001008	VIII	*Amoco Encouraged by Its*	*GASOHOL Trial*
80A000193	I		*GASOHOL Trickling In, but It's No Panacea:*
80A000194	VIII		*GASOHOL Use Jumps Despite U.S. Skeptics*
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80A000197	VIII		*GASOHOL Will Be Marketed (by Amoco)*
80A000001	X	*a Call for*	*GASOHOL. (United States Energy Policy)*
80A001207	VI	*Individual and Group*	*GASOHOL-ALCOHOL Fuel Production and Usage*
80A001259	I		*GASOHOL: a Technical Memorandum*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A002098	VIII		*GASOHOL: Does It or Doesn't It Produce Pos*
80A002099	VIII		*GASOHOL: Does It Save Energy?*
80A002131	VIII		*GASOHOL: Energy Mountain or Molehill?*
80A001047	II		*GASOHOL: New Role for Food Industry*
80A000202	I		*GASOHOL: Popular, Yes; Panacea, No*
80A000192	VIII		*GASOHOL: the Issue Is Practicality*
80A001039	IX	*Boats and*	*GASOHOL: to Use or Not to Use*
80A000196	VIII		*GASOHOL: Where's the Payoff?*
80A000198	VIII		*GASOHOL: Would It Take Food from the Poor?*
80A000199	VIII		*GASOHOLICS Agronomous*
80A000220	IX	*Methanol as a Replacement for*	*GASOLINE*
80A000626	IX	*ance of Internal Combustion Engines Using 5-30% Methanol in*	*GASOLINE*
80A001050	IX	*Gasohol OK as Substitute for Unleaded*	*GASOLINE*
80A002027	IX	*Alcohol for*	*GASOLINE*
80A002061	IX	*arch and Eng. Study Finds Methanol Promising Substitute for*	*GASOLINE*
80A002128	IX	*ssions and Photochemical Reactivity Using Alcohol Fuels and*	*GASOLINE*
80A002137	VIII	*-based Alcohol Fuels: the Near-term Potential for Use with*	*GASOLINE*
75:001201	I	*Grow Alcohol as a Replacement for*	*GASOLINE * from Fermentable-type Crops; I*
80A003010	IX	*Use of Alcohol in Motor*	*GASOLINE — a Review * API Publication No.*
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80A002168	IX	*Engine Performance with*	*GASOLINE and Alcohol*
80A003113	IX	*Comparative Fuel Values of*	*GASOLINE and Denatured Alcohol, in Internal*
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80A003033	IX	*a Comparative Study of Alcohol,*	*GASOLINE and Kerosene as Fuels for Tractor*
80A003030	IX	*Ethyl Alcohol and Alcohol and*	*GASOLINE as a Modern Motor Fuel*
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80A002233	IX	*Vapour Pressure of Alcohol*	*GASOLINE Blends*
80A000246	IX	*Methanol*	*GASOLINE Blends — Future Automotive Fuels*
80A000117	X	*DOE Endorses Use of Alcohol Fuels to Reduce*	*GASOLINE Consumption; $24.9 Million in*
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80A001161	IX		*GASOLINE Does, Too, Mix with Alcohol*
80A003059	IX	*Comparative Performance of Alcohol-gasoline Blends in*	*GASOLINE Engine*
80A001229	IX	*18-22, 1977 * a Study on Reformed Fuel for an Automotive*	*GASOLINE Engine * a Report by the Automot*
80A003048	IX	*Further Tests on the Use of Denatured Alcohol in*	*GASOLINE Engines*
80A000333	IX	*Methanol as a*	*GASOLINE Extender-fuel Economy, Emissions,*
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80A002086	I	*Half of New Zealand's*	*GASOLINE Needs (Could Be Met by Methanol Co*
80A002254	IX	*April 18-22, 1977 * the Effect of Blending Methanol with*	*GASOLINE on Geometric Distribution * a Re*
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80A000233	IX	*Methanol as*	*GASOLINE Substitute Seen 'Unrealistic' by E*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A003115	IX	Development of Practical Method of Burning Alcohol in	GASOLINE Tractor and Calculation and Charti
80A000632	IX	ineering Conference * Improving Octane Values of Unleaded	GASOLINE via Gasohol * Volume I
80A002184	IX	Water Tolerances of Mixtures of	GASOLINE with Ethyl Alcohol
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80A003049	IX		GASOLINE-ALCOHOL Blends in Internal-combust
80A001010	IX	termining Fuel Vaporization Pressure Curves of Gasoline and	GASOLINE-ALCOHOL Fuels
80A002072	VIII		GASOLINE-ALCOHOL Mixture Ignites Dispute
80A000643	IX	Emissions Characteristics of Methanol, Methanol-water, and	GASOLINE-METHANOL Blends in a Spark Ignitio
80A000288	IX	Dies on the Performance and Nitrogen-oxides Emissions Using	GASOLINE-METHANOL Blends in SI Engines
80A000318	IX	Performance of the Late Model Cars with	GASOLINE-METHANOL Fuel
80A003029	IX	Blending Agents for	GASOLINE-METHANOL Mixtures
80A002281	IX		GASOLINE/ALCOHOL Blends * a Possible Fuel
80A002078	IX	Goodyear Tire and Rubber Develops	GASOLINE/ALCOHOL/WATER Auto Fuel Mixture
80A000311	IX	Methanol and	GASOLINE/METHANOL Blends as Automotive Fuel
77:001298	IX	through Bioconversion * Properties and Characteristics of	GASOLINE/METHANOL Fuel
80A000529	IX	hird International Symposium on Alcohol Fuels Technology *	GASOLINE/METHANOL Fuel Distribution and Han
80A000441	IX	Physical Properties of	GASOLINE/METHANOL Mixture
80A001250	IX	Component Relationships within Two-phase	GASOLINE/METHANOL/WATER Systems
80A001091	IX	Volkswagenwerk Completes Study on 15% Methanol	GASOLINE, Details
80A003069	IX	Critical Solution Temperatures of Mixtures of	GASOLINE, Ethyl Alcohol, and Water
80A002305	IX	risons of the Performance and Combustion Characteristics of	GASOLINE, Methane, and Methanol in a Wankel
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80A000096	IX	Alcohol Fuels — Can They Replace	GASOLINE?
80A000062	IX	Brazil —	GEARING Up to Produce the All Alcohol Car
78:002751	V		GENERAL Considerations on Cellulose Utiliza
80A001212	VIII	the Small Fuel-alcohol Distillery *	GENERAL Description and Economic Feasibilit
80A003107	VIII	Small Fuel Alcohol Distillery *	GENERAL Description and Economic Feasibilit
80A003109	IV	Potato Culls as a Source of Industrial Alcohol: with a	GENERAL Discussion of the Availability of O
80A000723	X	Utilization of Alternative Fuels for Transportation * a	GENERAL History of the Nebraska Grain Alcoh
80A000453	V	gy Feedstock — a Ten Site Survey * Volume I — Summary and	GENERAL Information
80A001195	VIII	earing Before the Subcommittee on Agricultural Research and	GENERAL Legislation of the Committee on Agr
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80A002254	IX	1977 * the Effect of Blending Methanol with Gasoline on	GEOMETRIC Distribution * a Report by the
80A002073	IX		GEORGIA-PACIFIC Alcohol from Tree Sugars to
80A000264	X	Reporter's Notebook:	GEORGIANS Adjust to Iowa's Politics
80A000487	VI	othermal Resources Council Annual Meeting * Adaptation of	GEOTHERMAL Energy to Produce Alcohol from a
80A000487	VI	Expanding the	GEOTHERMAL Frontier: Geothermal Resources
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80A000540	IX	Research Program "Alcoholic Fuels for Road Traffic" of the	GERMAN Federal Ministry for Research and Te
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A001213	VIII		*GRAIN Motor Fuel Alcohol * Technical and*
80A000014	X	*Gasohol Plan Isn't Likely to Create More Demand for Excess*	*GRAIN This Year*
80A002262	X	*Made from*	*GRAIN, Garbage: Congress Looks to Gasohol*
80A003064	VI	*Design of Continuous Cooking and Mashing System for Cereal*	*GRAINS*
80A002067	IV	*Feed*	*GRAINS as Fuel*
80A000746	VII	*the Use of Distillers Dried*	*GRAINS with Solubles in Feeds for Egg Produ*
80A002206	IV	*Alcohol from*	*GRANULAR Wheat Flour*
80A002204	IV		*GRANULAR Wheat Flour Increases Alcohol Yiel*
80A001032	VIII	*the Best Incentive for Finding Fuel Is Plain*	*GREED (Developing New Sources)*
80A000213	V		*GREEN Gold (Converting Cellulose into Ethyl*
80A001261	IX	*Emissions from the Methanol Fueled Stanford University*	*GREMLIN*
80A003085	V	*Fine*	*GRINDING, Enzyme Digestion and the Lignin-c*
80A001207	VI	*Individual and*	*GROUP Gasohol-alcohol Fuel Production and U*
80A001197	IX	*in Transportation * Ontario Ministry of Energy Advisory*	*GROUP on Synthetic Liquid Fuels Report, V.*
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80A000145	VIII	*the Energy to*	*GROW Maize*
80A000253	II	*Michigan May*	*GROW Potatoes for Fuel*
80A002084	I		*GROWING Fuel on the Farm May Help as the Oi*
80A000270	IV	*the Roots of Power: the*	*GROWING of Manioc in Brazil and Australia W*
80A000503	III	*International Symposium on Alcohol Fuels Technology * the*	*GROWING of Sugarcane for Energy*
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80A000424	I	*View from Abroad Brazil*	*GROWS Its Motor Fuels*
80A000067	I	*Brazil Out to Show Methanol*	*GROWS on Trees*
80A000665	VI	*Symposium on Enzymatic Hydrolysis of Cellulose **	*GROWTH and Cellulase Production by Trichode*
80A002085	VI		*GROWTH Kinetics and Cellulase Biosynthesis*
80A002196	II	*Possibilities of the Plant*	*GROWTH of the Moist Tropics to Furnish Mate*
80A003020	VI	*a Learning*	*GUIDE for Alcohol Fuel Production*
80A000452	VI	*Fuel from Farms * a*	*GUIDE to Small Scale Ethanol Production*
80A000428	I	*Iowa et al. vs OPEC — Corn States Uncork Gasohol*	*GUSHER*
80A000204	VIII	*Gasohol Pumps Do a*	*GUSHING Business: Drivers Line Up for Fuel*
80A000181	I	*Gasohol: Changing the Energy Drinking*	*HABIT*
80A000742	XI	*of Methanol Spills into Marine, Estuarine, and Freshwater*	*HABITATS*
80A002086	I		*HALF of New Zealand's Gasoline Needs (Could*
80A001177	IX	*Energy Technology*	*HANDBOOK * Methyl Alcohol * a Potential*
80A001194	XI		*HANDBOOK of Laboratory Safety*
80A002278	VI	*a Practical*	*HANDBOOK on the Distillation of Alcohol*
80A003101	XI		*HANDLING and Care of Gasohol*
80A000529	IX	*uels Technology * Gasoline/Methanol Fuel Distribution and*	*HANDLING Trial*
80A000555	I	*ives in Different Scenarios, Its Testing and Development of*	*HARDWARE Required for Alcohol Fuels*
80A000548	IX	*hird International Symposium on Alcohol Fuels Technology **	*HARDWARE/SOFTWARE Strategies for Fuel Econo*
80A000687	IV	*Cassava*	*HARVESTING and Processing, Workshop * Alc*
80A000688	IV	*Cassava*	*HARVESTING and Processing, Workshop * Lar*
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79 : 004628	III	*as an Industrial Feedstock * Brief Analysis as Applied to*	*HAWAII*
79 : 007134	III	*Biomass Energy for*	*HAWAII*
80A001019	VIII	*Arco Says It Test Markets Gasohol in Indiana,*	*HAWAII*
0A002135	III		*HAWAIIAN Sugarcane Energy Plantations*
0A000389	XI	*Health*	*HAZARD Evaluation/Toxicity Determination:*
80A000437	XI	*Modal Economic and Safety Analysis of the Transportation of*	*HAZARDOUS Substances in Bulk*
80A001257	XI	*Investigation of*	*HAZARDS Associated with Using Hydrogen as a*

Hc • Hydrocarbon

Citation Number	Subject Section	Citation Title	Title Keyword
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80A002087	I		HEADS Up Down Under
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80A001240	XI	Technical Reports on the Biological Effects and the Public	HEALTH Aspects of Atmospheric Pollutants
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80A000446	XI	oceedings Environmental Evaluation "Gasohol" Production and	HEALTH Effects
80A000389	XI		HEALTH Hazard Evaluation/Toxicity Determina
80A000444	XI	as a Transportaion Fuel: Assessment of Environmental and	HEALTH Research
80A001195	VIII	Economic Feasibility of Gasohol *	HEARING Before the Subcommittee on Agricult
80A002302	IX	the Gaseous	HEAT Capacity of Methyl Alcohol and Ethyl
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80A000013	X	Carter Gas-from-grain Program Needs Congress, Business	HELP
80A002084	I	Growing Fuel on the Farm May	HELP as the Oil Runs Out
80A001048	IX	Gasohol No	HELP, Says Top GM Engineer
80A000035	XI	Chemical Relevance — a	HEURISTIC Approach. Part IV: Ethanol
80A000661	IX	ernational) on Combustion * Fuel Droplet Burning Rates at	HIGH Pressures
80A000430	X	New Gasohol Plan Sets	HIGH Production Goal
80A000432	VI		HIGH Productivity Fermentation for Ethanol
80A002190	V	of Cellulose and Decomposition of Sugars in Dilute Acid at	HIGH Temperature
80A000333	IX	ethanol as a Gasoline Extender-fuel Economy, Emissions, and	HIGH Temperature Driveability
80A001228	IX	conomy from Automobiles Using Alcohol/Gasoline Blends under	HIGH-ALTITUDE Conditions
80 : 002033	VIII		HIGH-GRADE Fuels from Biomass Farming: Pot
80A002089	V		HIGH-YIELD Wood: a Promising Fuel
80A001103	X	Why the	HIGHWAY Fund May Run Out of Money
80A001232	IX	10th Summary Report:	HIGHWAY Systems Contractors Coordination Me
80A002088	IX	a	HIGHWAY Test of Gasohol
80A000454	IX	Status of Alcohol Fuels Utilization Technology for	HIGHWAY Transportation
80A001254	IX	Status of Alcohol Fuels Utilization Technology for	HIGHWAY Transportation
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80A000435	IX	Methanol Fuel Modification for	HIGHWAY Vehicle Use
80A000461	IX	Environmental Aspects of Alternative Fuels Utilization for	HIGHWAY Vehicles
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80A000629	I	ling Automotive Internal Combustion Engines with Methanol —	HISTORICAL Development and Current State of
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80A002274	I	Power Alcohol,	HISTORY and Analysis
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80A003063	VII	Distillery Slop as a Feed for	HOGS
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000105	VI	*oll Mill Pretreatment of Cellulosic Materials for Enzymatic*	*HYDROLYSIS*
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80A001125	VI	*Perspectives on Preparation of Cellulose for*	*HYDROLYSIS*
80A001214	V	*Disposal of Cellulosic Waste Materials by Enzymatic*	*HYDROLYSIS*
80A002205	V	*Chemical Economics of Wood*	*HYDROLYSIS*
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79 : 003453	VI	*Effect of Nitrogen Oxide Pretreatments on Enzymatic*	*HYDROLYSIS of Cellulose*
80A000663	VI	*Symposium on Enzymatic*	*HYDROLYSIS of Cellulose*
80A000717	VI	*Resource * Process Developmental Studies on the Enzymatic*	*HYDROLYSIS of Cellulose*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A002034	VI	Enzymatic	HYDROLYSIS of Cellulose and Simultaneous Fe
80A001064	VI	Kinetics of Acid	HYDROLYSIS of Cellulose Found in Paper Refu
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80A000472	VI	Microbial Energy Conversion * Enzymatic	HYDROLYSIS of Cellulosic Materials
80A000354	V		HYDROLYSIS of Cellulosic Materials to Usefu
80A000483	VI	ewage, Urban Refuse, (and) Agriculture Wastes * Enzymatic	HYDROLYSIS of Cellulosic Wastes to Fermenta
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80A002075	VI	Glucose Production by Biochemical	HYDROLYSIS of Mesquite
80A000680	VI	Conference * Process-development Studies of the Enzymatic	HYDROLYSIS of Newsprint
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80A002195	V	Acid	HYDROLYSIS of Wood
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80A002167	V	Wood	HYDROLYSIS to Become Source of War Alcohol
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80A000543	IX	Calculations Relevant to the Fueling of Alcohols in Spark	IGNITED Internal Combustion Engines — Signi
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80A000643	IX	ol, Methanol-water, and Gasoline-methanol Blends in a Spark	IGNITION Engine
80A000660	IX	a Secondary Fuel in a Multicylinder Automotive Compression	IGNITION Engine
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80A000734	IX	on of Gasoline, Methanol, and Methanol/Water Blend as Spark	IGNITION Engine Fuels
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Citation Number	Subject Section	Citation Title	Title Keyword
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A001179	XI		*INDUSTRIAL Hygiene and Toxicology * Alcoh*
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80A002230	V		*INDUSTRIAL Use of Wood Waste*
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80A000572	X	*hemical Feedstock in Developing Countries * Power Alcohol*	*INDUSTRY for Thailand Potential and Prospec*
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80A000575	I	* *Present Status of Alcohol and Alcohol Based Chemicals*	*INDUSTRY in India*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A002124	IX	the Performance of a Gas Turbine Engine with Water-methanol	*INJECTION*
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80A000470	IX	Combustion	*INSTITUTE, Central States Section: Spring*
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80A000715	IX	gnition Engines Operating with Alcohol-gasoline Mixtures *	*INSTITUTION of Mechanical Engineers. Confe*
80A002175	VI		*INSTRUMENTATION in Alcohol Distillation*
80A000636	I	ogy Exhibition and Conference, Middle East (SOLTECH '78) *	*INTEGRATED Biological and Agricultural Syst*
80A001087	VI	rough Enzymatic Hydrolysis * Preliminary Assessment of an	*INTEGRATED Processing Scheme*
80A000164	I	Fuels from Biomass	*INTEGRATION with Food and Materials Systems*
80A000569	VI	* New Developments in Continuous Alcoholic Fermentation	*INTENSIFICATION —simplification — Economizat*
80A000577	VIII	as Fuel and Chemical Feedstock in Developing Countries *	*INTERACTION between Energy Accounting and C*
80A000690	I	the Royal Society * Canadian Biomass Perspective: a New	*INTEREST in an Old Fuel*
80A001052	IV	Intnl Mandioca Dev to Set Up Joint Venture with Brazilian	*INTERESTS to Process Manioc into Fuel Alcoh*
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80A000741	IX	ethanol * Fuel Converter with Methanol for Spark-ignition	*INTERNAL Combustion Engine*
80A002296	IX	Measurement of Aldehyde Concentrations in the Exhaust of an	*INTERNAL Combustion Engine Fueled by Alcoho*

Citation Number	Subject Section	Citation Title	Title Keyword
80A002304	IX	uel Consumption, and Exhaust Emission Characteristics of an	INTERNAL Combustion Engine Using Isooctane
80A002122	I	Alternate Portable Fuels for	INTERNAL Combustion Engines
80A002200	IX	Alcohol Fuels for Use in	INTERNAL Combustion Engines
80A002242	IX	Alcohol — a Fuel for	INTERNAL Combustion Engines
80A000693	IX	Design and Development of Small	INTERNAL Combustion Engines * Future Fuel
80A003113	IX	mparative Fuel Values of Gasoline and Denatured Alcohol, in	INTERNAL Combustion Engines * U.S. Bureau
80A000543	IX	ations Relevant to the Fueling of Alcohols in Spark Ignited	INTERNAL Combustion Engines — Significance
80A003112	IX	Tests of	INTERNAL Combustion Engines on Alcohol Fuel
80A000626	IX	nversion Engineering Conference * Improved Performance of	INTERNAL Combustion Engines Using 5-30% Met
80A000492	IX	gy Conversion Engineering Conference * Fueling Automotive	INTERNAL Combustion Engines with Methanol —
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80A000693	IX	mall Internal Combustion Engines * Future Fuels for Small	INTERNAL-COMBUSTION Engines
80A003049	IX	Gasoline-alcohol Blends in	INTERNAL-COMBUSTION Engines
80A000721	IX	Proceedings, 4th	INTERNATIONAL Clean Air Congress * Clean
80A000488	IX	17th Symposium	INTERNATIONAL Combustion * Kinetics of the
80A000475	IX	Massachusetts Institute of Technology	INTERNATIONAL Combustion Symposium * Flam
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80A000484	X	Proceedings of Condensed Papers: 2nd Miami	INTERNATIONAL Conference on Alternative Ene
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80A000648	IX	Proceedings, 4th	INTERNATIONAL Congress in Scandanavia on Ch
80A001185	I		INTERNATIONAL Encyclopedia of Pharmacology
80A000673	XI	1st	INTERNATIONAL Loss Prevention and Safety Pr
80A000750	IX	Proceedings of the Cornell	INTERNATIONAL Symposium and Workshop on the
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79:000510	I	Proceedings of the	INTERNATIONAL Symposium on Alcohol Fuel Tec
80A000732	VI	Proceedings of the	INTERNATIONAL Symposium on Alcohol Fuel Tec
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80A000735	VIII	Proceedings of the	INTERNATIONAL Symposium on Alcohol Fuel Tec
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80A000739	III	Proceedings of the	INTERNATIONAL Symposium on Alcohol Fuel Tec
80A000740	IX	Proceedings of the	INTERNATIONAL Symposium on Alcohol Fuel Tec
80A000741	IX	Proceedings of the	INTERNATIONAL Symposium on Alcohol Fuel Tec
80A000742	XI	Proceedings of the	INTERNATIONAL Symposium on Alcohol Fuel Tec
80A000501	I	Proceedings of Third	INTERNATIONAL Symposium on Alcohol Fuels Te
80A000502	I	Proceedings of Third	INTERNATIONAL Symposium on Alcohol Fuels Te
80A000503	III	Proceedings of Third	INTERNATIONAL Symposium on Alcohol Fuels Te
80A000505	X	Proceedings of Third	INTERNATIONAL Symposium on Alcohol Fuels Te
80A000506	X	Proceedings of Third	INTERNATIONAL Symposium on Alcohol Fuels Te
80A000507	V	Proceedings of Third	INTERNATIONAL Symposium on Alcohol Fuels Te
80A000508	IX	Proceedings of Third	INTERNATIONAL Symposium on Alcohol Fuels Te
80A000509	IX	Proceedings of Third	INTERNATIONAL Symposium on Alcohol Fuels Te
80A000510	IX	Proceedings of Third	INTERNATIONAL Symposium on Alcohol Fuels Te
80A000511	IX	Proceedings of Third	INTERNATIONAL Symposium on Alcohol Fuels Te
80A000512	IX	Proceedings of Third	INTERNATIONAL Symposium on Alcohol Fuels Te
80A000513	IX	Proceedings of Third	INTERNATIONAL Symposium on Alcohol Fuels Te
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000519	IX	*Proceedings of Third*	*INTERNATIONAL Symposium on Alcohol Fuels Te*
80A000520	IX	*Proceedings of Third*	*INTERNATIONAL Symposium on Alcohol Fuels Te*
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80A000529	IX	*Proceedings of Third*	*INTERNATIONAL Symposium on Alcohol Fuels Te*
80A000530	V	*Proceedings of Third*	*INTERNATIONAL Symposium on Alcohol Fuels Te*
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80A000532	VII	*Proceedings of Third*	*INTERNATIONAL Symposium on Alcohol Fuels Te*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000574	VI	*as Fuel and Chemical Feedstock in Developing Countries **	***INTERRELATIONSHIPS** between Fermentation Par*
78 : 002289	IV	*Proceedings of the 12th*	***INTERSOCIETY** Energy Conversion Engineering*
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80 : 000188	I	*ond Annual Symposium on Fuels from Biomass * Plan for the*	***INTRODUCTION** of Biomass-based Methanol into*
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80A000103	IX	*Diesel-ethanol Fuel Blends*	***INVESTIGATED***
80A001249	IX		***INVESTIGATION** of a Substitute Fuel to Contr*
80A001257	XI		***INVESTIGATION** of Hazards Associated with*
80A001263	IX	*Characterization and Research*	***INVESTIGATION** of Methanol and Methyl Fuel*
80A002123	IX	*Alternative Diesel Engine Fuels: an Experimental*	***INVESTIGATION** of Methanol, Ethanol, Methane*
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80A001166	IX		***INVESTIGATION** of the Octane Rating and Auto*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A003124	XI	Storage of Flammable and Combustible Liquids on Farms and	ISOLATED Construction Projects
80A003086	V	Properties of Powdered Wood and	ISOLATION of Lignin by Cellulytic Enzymes
80A000136	IX	st Composition of a Fuel Containing Toluene, N-heptane, and	ISOOCTANE
80A000327	IX	Engine Performance and Exhaust Emissions: Methanol versus	ISOOCTANE
80A002304	IX	sion Characteristics of an Internal Combustion Engine Using	ISOOCTANE and Methanol
80A001167	IX	the Laminar Burning Velocity of	ISOOCTANE, N-heptane, Methanol, Methane, an
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80A003033	IX	a Comparative Study of Alcohol, Gasoline and	KEROSENE as Fuels for Tractor Engines
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80A000639	IX	ates Section 1975 Fall Meeting * Combustion and Pollutant	KINETIC Modeling for Methane, Methanol, Fue
80A000308	IX		KINETIC Wall Quenching of Methanol Flames W
80A002085	VI	Growth	KINETICS and Cellulase Biosynthesis in the
80A000384	VI	Fermentation	KINETICS and Process Economics for the Prod
80A001064	VI		KINETICS of Acid Hydrolysis of Cellulose Fo
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80A000021	VI	lobiose from Trichoderma Viride: Purification, Properties,	KINETICS, and Mechanism
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80A003072	I	Fermentation Sphinx and	KOBOLD Alcohol
80A003073	VI	Fermentation Sphinx and	KOBOLD Alcohol
80A003074	VI	Fermentation Sphinx and	KOBOLD Alcohol
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A002310	V	*of Liquid Transport Fuel from Cellulose Material (Wood) **	*LABORATORY Preparation of Wood Sugars and F*
80A001194	XI	*Handbook of*	*LABORATORY Safety*
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80A000392	IX	*Lawrence Livermore*	*LABS Contribution to the AEC Methanol Repor*
80A001167	IX	*the*	*LAMINAR Burning Velocity of Isooctane, N-he*
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80A000688	IV	*Cassava Harvesting and Processing, Workshop **	*LARGE-SCALE Cassava Starch Extraction Proce*
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80A000392	IX		*LAWRENCE Livermore Labs Contribution to the*
80A000440	I	*an Overview of Alternative Energy Sources for*	*LDCS*
80A003098	I	*Get the*	*LEAD Out with Alcohol*
80A002046	XI	*Ethanol and*	*LEAD Toxicity*
80A000332	IX		*LEAN Combustion of Methanol-gasoline Blends*
80A000752	IX	*tractors Coordination Meeting * Alcohol/Gasoline Blends —*	*LEAN Misfire Limits*
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80A003020	VI	*a*	*LEARNING Guide for Alcohol Fuel Production*
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80A002245	IX	*Performance of an Ethanol-gasoline Blend in Automobiles and*	*LIGHT Trucks*
80A003086	V	*Properties of Powdered Wood and Isolation of*	*LIGNIN by Cellulytic Enzymes*
80A003085	V	*Fine Grinding, Enzyme Digestion and the*	*LIGNIN-CELLULOSE Bond in Wood*
80A000036	V	*Chemicals from*	*LIGNOCELLULOSE*
80A000533	V	*on Alcohol Fuels Technology * Production of Ethanol for*	*LIGNOCELLULOSE — Current Status*
80A001127	VI	*and Chemical Constraints in the Hydrolysis of Cellulose and*	*LIGNOCELLULOSIC Materials*
80A000254	VI	*Properties of Cellulose and*	*LIGNOCELLULOSIC Materials as Substrates for*
80A000442	V	*the Potential of*	*LIGNOCELLULOSIC Materials for the Productio*
80A001169	VI	*a Mechanism for Improving the Digestibility of*	*LIGNOCELLULOSIC Materials with Dilute Alkal*
80A000594	I	*emical Feedstock in Developing Countries * Advantages and*	*LIMITATIONS of the Use of Alcohol Produced*
80A000752	IX	*dination Meeting * Alcohol/Gasoline Blends — Lean Misfire*	*LIMITS*
80A002060	VIII	*Exxon Puts*	*LIMITS on Gasohol Sales*
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80A000204	VIII	*Gasohol Pumps Do a Gushing Business: Drivers*	*LINE Up for Fuel, but Efficiency Still in Q*
80A001030	VIII	*Banks Are*	*LINING Up a $1 Billion Loan to Finance Braz*
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80A000050	VIII	*lysis of the Technology and Economics for the Production of*	*LIQUID and Gaseous Fuels from Waste*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A002314	V	Production of	LIQUID Transport Fuel from Cellulose Materi
80A000174	VIII	Food or Fuel: the	LIQUIDS Dilemma
80A003124	XI	Standard for Storage of Flammable and Combustible	LIQUIDS on Farms and Isolated Construction
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80A002222	IX	Fuel Mixtures on	LONDON Buses
80A000710	IX	Methanol as an Alternative Fuel * Methanol Fuel —	LONG Range Implication for Petro-chemicals
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80A001192	VI		LORE of Still Building * Alcohol Series,
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80A000673	XI	1st International	LOSS Prevention and Safety Promotion in the
80A001209	VI	a Manual on Ethanol and Gasohol Production in	LOUISIANA
80A001006	I	an Alternative as	LOVELY as a Tree?
80A001253	IX	Study of Decomposed Methanol as a	LOW Emission Fuel
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80A001210	VI	hol by Continuous Fermentation and Vacuum Distillation with	LOW Energy Consumption
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80A002292	IX	Performance and Knocking Characteristics of	LOW Octane Fuels Blended with Methanol in
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A002232	V		*MADISON Wood Sugar Process*
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80A000145	VIII	*the Energy to Grow*	*MAIZE*
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80A000481	I	*a Survey of Our Primary Energy Sources and the Fuel We Can*	*MAKE from Them*
80A002272	VI	*Forget the Gas Pumps —*	*MAKE Your Own Fuel*
80A002266	VI	*Methanol Process*	*MAKES Production Possible in Small Plants*
80A002151	VI		*MAKIN' It on the Farm: Alcohol Fuel Is the*
80A003042	X	*Aid of Government Needed in*	*MAKING Alcohol from Grain*
80A001188	VI		*MAKING Alcohol Fuel * Mother's Alcohol Fu*
80A002153	VI		*MAKING Alcohol Fuel — Recipe and Procedure*
80A002158	VI		*MAKING Alcohol-ether Mixture in Cuba for Mo*
80A000363	VIII	*Agricultural Sector Impacts of*	*MAKING Ethanol from Grain*
80A001187	VI		*MAKING Fuel in Your Back Yard*
80A002150	VI		*MAKING Fuel in Your Back Yard*
80A000265	VIII	*Researchers Accelerate Search for Way to Use Less Energy in*	*MAKING Gasohol*
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80A000189	VI		*MAKING Sugar and Protein from Trash*
80A000429	VII	*me Problems Associated with the Treatment of Effluents from*	*MALT Whisky Distilleries*
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80A001052	IV	*to Set Up Joint Venture with Brazilian Interests to Process*	*MANIOC into Fuel Alcohol*
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80A001246	XI	*Volatile Organic Compound (VOC) Species Data*	*MANUAL*
80A001206	VI	*Alcohol Distiller's*	*MANUAL for Gasohol and Spirits*
80A003023	VI		*MANUAL for the Home and Farm Production of*
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80A003110	VI	*Agricultural Alcohol: Studies of Its*	*MANUFACTURE in Germany * U.S. Dept. of Ag*
80A003058	IV		*MANUFACTURE of Alcohol from Potatoes*
80A002169	VI	*the*	*MANUFACTURE of Anhydrous Ethyl Alcohol*
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80A003066	V		*MANUFACTURE of Ethyl Alcohol from Wood Wast*
80A003111	VI	*the*	*MANUFACTURE of Ethyl Alcohol from Wood Wast*
80A003047	III	*otor Fuel from Molasses, I * I. Use of Cane Molasses for*	*MANUFACTURE of Motor Fuel*
80A000190	I		*MANUFACTURE, Availability and Cost of Metha*
80A002273	X	*acticability and Advantages to Agriculture of Using Alcohol*	*MANUFACTURED from Corn and Other Farm Produ*
80A000701	IX	*Alternative Fuel * Methanol/Gasoline Blend — Automotive*	*MANUFACTURES Viewpoint*

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000116	X	DOE Clears Way for Amoco Oil Company to	MARKET Gasohol
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80A000208	VIII	Likely to Produce More Problems than Benefits for Petroleum	MARKETERS and Consumers
80A001033	VIII	a Big-league Test of Gasohol	MARKETING
80A000668	VIII	Cash Crop for the Future * Alternative Organizational and	MARKETING Arrangements for Marketing Biomas
80A000668	VIII	Alternative Organizational and Marketing Arrangements for	MARKETING Biomass
80A000183	VIII	Gasohol Coming on Strong; Its Effect on	MARKETING Equipment
80A000582	VII	ock in Developing Countries * Production, Application and	MARKETING of Concentrated Molasses — Ferment
80A000210	VIII	Government Research Concludes Methanol-mix Fuels to Reach	MARKETING Stage after 1982
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80A001019	VIII	Arco Says It Test	MARKETS Gasohol in Indiana, Hawaii
80A001147	VIII	Texaco Inc. Plans to Test Gasohol in 3 U.S.	MARKETS: Meanwhile, 17 Connecticut Dealers
80A000231	X		MARYLAND County Establishes Alcohol Fuels P
80A002228	IV	Saccharification of Grain	MASHES for Alcoholic Fermentation
80A000737	VI	Continuous Alcoholic Fermentation of Sugar Solutions and of	MASHES from Starch Containing Raw Materials
80A002191	VI		MASHING of Corn
80A000266	VI	the Re-use of Stillage Water in the	MASHING of Grain as a Means of Energy Conse
80A003064	VI	Development and Design of Continuous Cooking and	MASHING System for Cereal Grains
80A003051	VI	Laboratory Cooking,	MASHING, and Fermentation Procedures
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80A000475	IX		MASSACHUSETTS Institute of Technology Inter
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80A002314	V	Production of Liquid Transport Fuel from Cellulose	MATERIAL (Wood)
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80A001072	III	Molasses as Raw	MATERIAL for Industry
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0A000677	IX	a Preliminary Survey of Hydrocarbon-derived Oxygenated	MATERIAL in Automobile Exhaust Gases
0A002118	V	Fibrous	MATERIAL in Feedlot Waste Fermented by Tric
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80A000034	V	Chemical Breakdown of Cellulosic	MATERIALS

Citation Number	Subject Section	Citation Title	Title Keyword
80A000111	VI	Enhance Enzymatic and Microbiological Attack of Cellulosic	MATERIALS
80A000140	I	rgy Crisis Raises Doubts over the Prospects for Organic Raw	MATERIALS
80A000472	VI	al Energy Conversion * Enzymatic Hydrolysis of Cellulosic	MATERIALS
80A000577	VIII	ccounting in the Production of Liquid Fuels from Biological	MATERIALS
80A000737	VI	of Sugar Solutions and of Mashes from Starch Containing Raw	MATERIALS
80A001127	VI	straints in the Hydrolysis of Cellulose and Lignocellulosic	MATERIALS
80A001135	VI	emical, Enzymatic, and Microbiological Attack of Cellulosic	MATERIALS
80A002192	VI	Mechanical Equipment for Continuous Fermentation of Fibrous	MATERIALS
80A002298	V	the Anaerobic Fermentation of Cellulose and Cellulosic	MATERIALS
80A000725	VI	Enzymatic Conversion of Cellulosic	MATERIALS * Biotechnology and Bioengineer
80A000728	VI	Enzymatic Conversion of Cellulosic	MATERIALS * Cellulose Saccharification for
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80A001243	XI	Dangerous Properties of Industrial	MATERIALS * Methyl Alcohol
80A000727	VI	Enzymatic Conversion of Cellulosic	MATERIALS * Physical and Chemical Pretrea
76 : 001911	I	Waste	MATERIALS * Review of Energy Available an
80A000385	VI	Fuel and Energy Production by Bioconversion of Waste	MATERIALS — State-of-the-art
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80A000254	VI	Properties of Cellulose and Lignocellulosic	MATERIALS as Substrates for Enzymatic Conve
80A001214	V	Disposal of Cellulosic Waste	MATERIALS by Enzymatic Hydrolysis
80A002003	VI	Degradation of Cellulosic	MATERIALS by Trichoderma Viride Cellulase
80A002253	IX	opulsion Systems: Held on April 18-22, 1977 * Automotive	MATERIALS Compatibility with Methanol Fuel
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80A000105	VI	Differential Speed Two Roll Mill Pretreatment of Cellulosic	MATERIALS for Enzymatic Hydrolysis
80A002225	II	Raw	MATERIALS for Industrial Alcohol Production
80A002196	II	ilities of the Plant Growth of the Moist Tropics to Furnish	MATERIALS for Liquid Fuel
80A000442	V	the Potential of Lignocellulosic	MATERIALS for the Production of Chemicals,
78 : 001830	V	Clean Fuel from Biomass and Wastes * Energy and	MATERIALS from the Forest Biomass
80A000295	VI	Structural Features of Cellulosic	MATERIALS in Relation to Enzymatic Hydrolys
80A000164	I	Fuels from Biomass Integration with Food and	MATERIALS Systems
80A001086	VI	Utilization of Cellulosic	MATERIALS through Enzymatic Hydrolysis *
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80A000354	V	Hydrolysis of Cellulosic	MATERIALS to Useful Products
80A001169	VI	echanism for Improving the Digestibility of Lignocellulosic	MATERIALS with Dilute Alkali and Liquid Amm
80A002033	VI	Enzymatic Conversion of Cellulosic	MATERIALS: Technology and Applications
80A001244	VI	chnology and Economics * Development and Application of a	MATHEMATICAL Model of the Methanol Synthesi
80A000608	VII	on the Utilization of By-products of the Sugar Industry in	MAURITIUS
80A000266	VI	the Re-use of Stillage Water in the Mashing of Grain as a	MEANS of Energy Conservation
80A003035	VII	By-product Recovery — Pollution Control	MEASURE in the Fermentation Industry
80A002296	IX		MEASUREMENT of Aldehyde Concentrations in T
80A000476	IX	logy International Combustion Symposium * in Situ Optical	MEASUREMENT of Automobile Exhaust Gas Parti
80A000654	IX	ymposium on Emissions from Continuous Combustion Systems *	MEASUREMENT of Nitric Oxide Formation Withi
80A000224	VI		MEASUREMENT of Saccharifying Cellulase
80A001120	IX	Nitric Oxide and Composition	MEASUREMENTS within Diffusion Flames around
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000375	IX	ing and Automotive Applications: a Comparison of Hydrogen,	METHANE, Methanol and Electricity
80A000628	IX	ing and Automotive Applications: a Comparison of Hydrogen,	METHANE, Methanol and Electricity
80A000639	IX	Meeting * Combustion and Pollutant Kinetic Modeling for	METHANE, Methanol, Fuel-nitrogen, and Fuel-
80A002069	VI	by Clostridium Thermocellum in the Absence and Presence of	METHANOBACTERIUM Thermoautotrophicum
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80A000052	I	CW Report:	METHANOL
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80A000229	I		METHANOL
80A000299	VI	pe Fermentor with 2-fluid Nozzle to Biomass Production from	METHANOL
80A000309	IX	eristics of Low Octane Primary Reference Fuels Blended with	METHANOL
80A000326	IX	Combustion and Emission Characteristics of	METHANOL
80A000334	IX	Methanol as Automotive Fuel — 1, Straight	METHANOL
80A000352	XI	Occupational Exposure to	METHANOL
80A000511	IX	lcohol Fuels Technology * Modeling of Flame Properties of	METHANOL
80A000514	IX	echnology * Modification of a Ford Pinto for Operation on	METHANOL
80A000546	IX	hol Fuels Technology * Engine Cold-start with Dissociated	METHANOL
80A000560	IX	Formaldehyde Emissions from a Spark Ignition Engine Using	METHANOL
80A000621	I	olumetric, Thermodynamic, and Other Physical Properties for	METHANOL
80A000697	IX	Pollution Power Systems Development * Alternative Fuels —	METHANOL
80A001013	IX	Another Look at	METHANOL
80A002070	VI	Fermentation Products from	METHANOL
80A002138	IX	ve Automotive Engine Operation When Fueled with Ethanol and	METHANOL
80A002304	IX	istics of an Internal Combustion Engine Using Isooctane and	METHANOL
0A002251	IX	il 18-22, 1977 * Alternative Fuels with Regard to LPG and	METHANOL * a Report by the Automotive Pro
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000339	IX	*Single-cylinder Engine Evaluation of*	*METHANOL — Improved Energy Economy and Redu*
80A000730	IX	*Monograph on Alternate Fuel Resources* * *Effect of*	*METHANOL Addition to Gasoline on Spark Igni*
80A002255	IX	*lsion Systems: Held on April 18-22, 1977* * *the Effect of*	*METHANOL Addition to Gasoline on Total and*
80A000227	X	*the*	*METHANOL Age Is Dawning*
80A000228	I	*the*	*METHANOL Alternative Now...or Never?*
80A000655	IX	* *Performance and Emission Characteristics Using Blends of*	*METHANOL and Dissociated Methanol as an Aut*
80A000375	IX	*utomotive Applications: a Comparison of Hydrogen, Methane,*	*METHANOL and Electricity*
80A000628	IX	*utomotive Applications: a Comparison of Hydrogen, Methane,*	*METHANOL and Electricity*
80A001163	VIII		*METHANOL and Energy Shortage — a Feasibili*
80A000733	IX	*of the International Symposium on Alcohol Fuel Technology:*	*METHANOL and Ethanol* * *Alternate Air-fuel*
80A000737	VI	*of the International Symposium on Alcohol Fuel Technology:*	*METHANOL and Ethanol* * *Basic Data on Cont*
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80A000734	IX	*of the International Symposium on Alcohol Fuel Technology:*	*METHANOL and Ethanol* * *Comparison of Gaso*
80A000740	IX	*of the International Symposium on Alcohol Fuel Technology:*	*METHANOL and Ethanol* * *Development of Met*
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80A000736	VI	*of the International Symposium on Alcohol Fuel Technology:*	*METHANOL and Ethanol* * *Economical and Tec*
80A000741	IX	*of the International Symposium on Alcohol Fuel Technology:*	*METHANOL and Ethanol* * *Fuel Converter Wit*
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80A000310	IX		*METHANOL and Ethanol as a Motor Fuel Substi*
80A001170	IX		*METHANOL and Ethanol Fuels for Modern Curs*
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80A000311	IX		*METHANOL and Gasoline/Methanol Blends as Au*
80A000750	IX	*he Hydrogen Economy* * *Potentials for Early Utilization of*	*METHANOL and Hydrogen Fuels*
80A000733	IX	*omy and Exhaust Emissions for Simulated Driving Cycles with*	*METHANOL and Indolene*
80A002058	IX	*Experimental Determination of the Quenching Distance of*	*METHANOL and Iso-octane/Methanol Blends*
80A000359	IX	*Predicted Exhaust Emissions from a*	*METHANOL and Jet Fueled Gas Turbine Combust*
80A000645	IX	*Energy Conversion Engineering Conference* * *Combustion of*	*METHANOL and Methanol Blends in a Stratifie*
80A002125	IX	*Combustion of*	*METHANOL and Methanol Blends in a Stratifie*
80A000704	IX	*Methanol as an Alternative Fuel* * *Comparison of*	*METHANOL and Methanol-blends*
80A000470	IX	*al States Section: Spring Meeting. Mimeographed Papers* *	*METHANOL and Methanol-gasoline Blends as Au*
80A000652	IX	*and Combustion* * *Investigations into the Suitability of*	*METHANOL and Methanol-gasoline Blends as S.*
80A002316	IX	*Emission Characteristics of Spark-ignition Engines Burning*	*METHANOL and Methanol-gasoline Mixtures*
80A000377	IX	*Experimental Results Using*	*METHANOL and Methanol/Gasoline Blends as Au*
80A001263	IX	*Characterization and Research Investigation of*	*METHANOL and Methyl Fuel*
80A000512	IX	*Function of Pressure, Temperature and Equivalence Ratio for*	*METHANOL and Other Alcohols*
80A000312	IX		*METHANOL and Other Alternative Fuels for of*
80A002147	IX		*METHANOL and Other Ways around the Gas Pum*
80A000740	IX	*Fuel Technology: Methanol and Ethanol* * *Development of*	*METHANOL and Petrol Carburation Systems i*
80A000322	IX	*Role of*	*METHANOL as a Clean Fuel*
80A000395	IX		*METHANOL as a Fuel*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000485	IX	* Thermodynamic Calculations for Otto Cycle Engines Using	METHANOL as a Fuel
80A001085	IX	Use of	METHANOL as a Fuel
80A000396	I		METHANOL as a Fuel in the Urban Energy Econ
80A000216	VIII		METHANOL as a Fuel Still a Big Question
80A000313	IX		METHANOL as a Fuel: a Review with Bibliogr
80A000217	IX		METHANOL as a Gas Substitute
80A000333	IX		METHANOL as a Gasoline Extender-fuel Econom
80A000353	IX		METHANOL as a Gasoline Extender: a Critiqu
80A001189	I	Synthetic Oil vs.	METHANOL as a Liquid Fuel Product from Wast
80A001253	IX	• Study of Decomposed	METHANOL as a Low Emission Fuel
80A002002	IX	Decomposed	METHANOL as a Low Emission Fuel
80A003137	IX	Study of Decomposed	METHANOL as a Low Emission Fuel
80A000409	IX	Study of Decomposed	METHANOL as a Low Emission Fuel — Final Rep
80A000219	IX		METHANOL as a Motor Fuel
80A000707	IX	Methanol as an Alternative Fuel *	METHANOL as a Motor Fuel
80A002238	IX	Encyclopedia of Chemical Processing and Design * Alcohol,	METHANOL as a Motor Fuel
80A000714	IX	Power Plants and Future Fuels *	METHANOL as a Motor Fuel * Institution of
80A000335	IX		METHANOL as a Motor Fuel or a Gasoline Blen
80A000418	IX	Use of	METHANOL as a Motor Vehicle Fuel
80A000731	IX	ograph on Alternate Fuel Resources * Review of the Use of	METHANOL as a Motor Vehicle Fuel * Volume
80A001248	IX		METHANOL as a Possible Fuel for Automotive
80A000640	IX	te Western States Section 1975 Fall Meeting * Analysis of	METHANOL as a Reciprocating Engine Fuel
80A000220	IX		METHANOL as a Replacement for Gasoline
80A000657	IX	mbustion * Comparative Studies of Engine Performance with	METHANOL as a Supplementary Fuel for SI and
80A000444	XI		METHANOL as a Transportaion Fuel: Assessme
80A001238	IX		METHANOL as an Alternative Fuel
80A000702	IX		METHANOL as an Alternative Fuel * Advanta
80A000706	IX		METHANOL as an Alternative Fuel * Automot
80A000704	IX		METHANOL as an Alternative Fuel * Compari
80A000713	IX		METHANOL as an Alternative Fuel * Energy
80A000711	XI		METHANOL as an Alternative Fuel * Environ
80A000712	IX		METHANOL as an Alternative Fuel * Environ
80A001265	IX		METHANOL as an Alternative Fuel * Feasibi
80A000701	IX		METHANOL as an Alternative Fuel * Methano
80A000703	IX		METHANOL as an Alternative Fuel * Methano
80A000707	IX		METHANOL as an Alternative Fuel * Methano
80A000709	IX		METHANOL as an Alternative Fuel * Methano
80A000710	IX		METHANOL as an Alternative Fuel * Methano
80A001239	I		METHANOL as an Alternative Fuel * Methano
80A000705	IX		METHANOL as an Alternative Fuel * Physico
80A000708	VI		METHANOL as an Alternative Fuel * Potenti
80A003013	IX		METHANOL as an Automobile Fuel * Rand Cor
80A000319	IX	Potential for	METHANOL as an Automotive Fuel
80A000342	IX	Technical and Economical Aspects of	METHANOL as an Automotive Fuel
80A000655	IX	on Characteristics Using Blends of Methanol and Dissociated	METHANOL as an Automotive Fuel
80A001232	IX	ms Contractors Coordination Meeting * Characterization of	METHANOL as an Automotive Fuel — an Experim
80A000398	IX		METHANOL as an Automotive Fuel with Special
80A000397	IX		METHANOL as an Automotive Fuel: a Summary
80A001093	IX	Volkswagenwerk Summarizes Research in Using	METHANOL as Auto Fuel
80A000334	IX		METHANOL as Automotive Fuel — I. Straight
80A000233	IX		METHANOL as Gasoline Substitute Seen 'Unrea
80A000711	XI	ethanol as an Alternative Fuel * Environmental Aspects of	METHANOL as Vehicular Fuel: Air Quality Ef

Citation Number	Subject Section	Citation Title	Title Keyword
80A000712	IX	*ethanol as an Alternative Fuel * Environmental Aspects of*	***METHANOL** as Vehicular Fuel: Health and Env*
80A000620	I	*Methanol Technology and Economics * the PVT Behavior of*	***METHANOL** at Elevated Pressures and Temperat*
80A001197	IX	*Utilization of*	***METHANOL** Based Fuels in Transportation **
80A000649	IX	*ngs, 4th National Conference I.C. Engines and Combustion **	***METHANOL** Blended Gasoline as Modern Motor F*
80A000645	IX	*rsion Engineering Conference * Combustion of Methanol and*	***METHANOL** Blends in a Stratified Charge Engi*
80A002125	IX	*Combustion of Methanol and*	***METHANOL** Blends in a Stratified Charge Engi*
80A000515	IX	*on Alcohol Fuels Technology * Thermokinetic Modeling of*	***METHANOL** Combustion Phenomena with Applicat*
80A000561	XI	*hird International Symposium on Alcohol Fuels Technology **	***METHANOL** Containing Fuels — Evaluation of E*
80A002086	I	*Half of New Zealand's Gasoline Needs (Could Be Met by*	***METHANOL** Conversion)*
80A000684	IX	*ethanol — Fuelled Spark — Ignition Engine and Its Effect on*	***METHANOL** Economy*
80A000751	VIII	*onal Symposium and Workshop on the Hydrogen Economy * the*	***METHANOL** Economy: a Practical Version of T*
80A000474	IX	*Technology for Energy Conservation **	***METHANOL** Electric Hybrid Vehicle: a Compre*
80A000236	IX		***METHANOL** Engine Revs Up for Road Testing*
80A000399	IX		***METHANOL** Engine: a Transportation Strategy*
80A002288	IX	*the*	***METHANOL** Engine: a Transportation Strategy*
80A000238	IX		***METHANOL** Feasible as Auto Fuel*
80A000308	IX	*Kinetic Wall Quenching of*	***METHANOL** Flames with Applications to Spark*
80A000700	IX	*inar * Technico Economic Study of the Use of Hydrogen and*	***METHANOL** for Road Transport*
80A000741	IX	*Technology: Methanol and Ethanol * Fuel Converter with*	***METHANOL** for Spark-ignition Internal Combus*
79 : 002502	V	*els Symposium * Canadian Production Potential — Fuel Grade*	***METHANOL** from Canadian Forests*
80A000538	V	*nal Symposium on Alcohol Fuels Technology * Production of*	***METHANOL** from Wood*
80A003016	V		***METHANOL** from Wood Waste * U.S. Dept. of*
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80A000553	VIII	*osium on Alcohol Fuels Technology * Canadian Scenario for*	***METHANOL** Fuel*
80A000706	IX	*Methanol as an Alternative Fuel * Automotive Uses of*	***METHANOL** Fuel*
80A002096	X	*House Unit Votes to End Import Tax on*	***METHANOL** Fuel*
80A002133	IX	*Gas Turbine Emissions and Performance on*	***METHANOL** Fuel*
80A000710	IX	*Methanol as an Alternative Fuel **	***METHANOL** Fuel — Long Range Implication for*
80A001184	IX	*gine Performance and Exhaust Emissions Characteristics of a*	***METHANOL** Fuel Automobile*
80A002253	IX	*ril 18-22, 1977 * Automotive Materials Compatibility with*	***METHANOL** Fuel Blends * a Report by the Au*
80A002016	IX	*Development of a Pure*	***METHANOL** Fuel Car*
80A000562	XI	*ology * Environmental Consequences of Methanol Spills and*	***METHANOL** Fuel Emissions on Terrestrial and*
80A000702	IX	*native Fuel * Advantages of Neat and Blended Operation of*	***METHANOL** Fuel in Vehicles*
80A000435	IX		***METHANOL** Fuel Modification for Highway Vehi*
78 : 001809	VIII	*Economic Pre-feasibility Study: Large-scale*	***METHANOL** Fuel Production from Surplus Canad*
78 : 002269	V	*Economic Pre-feasibility Study: Large-scale*	***METHANOL** Fuel Production from Surplus Canad*
80A000340	IX	*Single-cylinder Engine Study of*	***METHANOL** Fuel-emphasis on Organic Emissions*
80A000675	IX	*Hydrogen Energy * Hydrogen and*	***METHANOL** Fueled — Air Breathing Automobile*
80A000548	IX	*Economy Optimization with Exhaust Emission Constraints in*	***METHANOL** Fueled Automobiles*
80A000415	IX	*Using Alternative Fuels — Quasi One-dimensional Modeling **	***METHANOL** Fueled Engines*
80A000642	IX	*Predicted Compression Ratio Effects on NOx Emissions from a*	***METHANOL** Fueled SI Engine*
80A001261	IX	*Emissions from the*	***METHANOL** Fueled Stanford University Gremlin*
80A002127	IX	*Direct Injected*	***METHANOL** Fueling of a Two Stroke Locomotive*
80A000246	IX		***METHANOL** Gasoline Blends — Future Automotiv*
80A000478	IX	*a — Missouri Energy Council) Annual Conference on Energy **	***METHANOL** Gasoline Fuels*
80A001091	IX	*Volkswagenwerk Completes Study on 15%*	***METHANOL** Gasoline, Details*
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80A000525	IX	*cohol Fuels Technology * a New Way of Direct Injection of*	***METHANOL** in a Diesel Engine*
80A002305	IX	*ce and Combustion Characteristics of Gasoline, Methane, and*	***METHANOL** in a Wankel Engine*
80A000635	IX	*rmance, Perspective Symposium Proceedings * Combustion of*	***METHANOL** in an Automotive Gas Turbine*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A001037	XI	Biohazards of	METHANOL in Proposed New Uses
80A000651	IX	National Conference I.C. Engines and Combustion * Use of	METHANOL in the Diesel Engine: an Experime
80A000402	IX	Use of	METHANOL in Transportation
80A000713	IX	Alternative Fuel * Energy Workshop — Report on the Use of	METHANOL in Volkswagons
80A000243	IX		METHANOL Injection Cuts Costs
80A000301	IX	Effects of	METHANOL Injection on Emission and Performa
80 : 000188	I	from Biomass * Plan for the Introduction of Biomass-based	METHANOL into the Energy Economy
80A001133	VIII	Present	METHANOL Manufacturing Costs and Economics
80A000696	IX	Pollution-Power Systems Development * the Combustion of	METHANOL Mixed with Water as an Alternative
80A000476	IX	haust Gas Particulate Size Distributions: Regular Fuel and	METHANOL Mixtures
80A000136	IX	Effect of	METHANOL on Exhaust Composition of a Fuel C
80A000522	IX	fluence of Engine Parameters on the Aldehyde Emissions of a	METHANOL Operated-Four-stroke Otto Cycle En
80A000523	IX	Technology * a Motor Vehicle Power Plant for Ethanol and	METHANOL Operation
80A000631	I	Engineering Conference * Which Alcohol Fuel for Brasil —	METHANOL or Ethanol? * Volume I
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80A000148	VI	Engineering	METHANOL Plant on a Fuel Scale
80A000248	VIII		METHANOL Primed for Future Energy Role
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80A002266	VI		METHANOL Process Makes Production Possible
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80 : 001951	V	ports * Potential Availability of Wood as a Feedstock for	METHANOL Production
80A000708	VI	Alternative Fuel * Potential Long Range Improvements in	METHANOL Production
80A000676	I	Hydrogen Energy * Sources and Methods for	METHANOL Production * Proceedings of the
80A000507	V	cohol Fuels Technology * Some Implications of Large-scale	METHANOL Production from Canadian Forest Bi
80A000088	VI	Efficiencies of	METHANOL Production from Gas, Coal, Waste
80A002061	IX	Exxon Research and Eng. Study Finds	METHANOL Promising Substitute for Gasoline
80A000705	IX	as an Alternative Fuel * Physico-chemical Properties of	METHANOL Related to Fuel Use
80A000392	IX	Lawrence Livermore Labs Contribution to the AEC	METHANOL Report
80A000562	XI	Alcohol Fuels Technology * Environmental Consequences of	METHANOL Spills and Methanol Fuel Emissions
80A000742	XI	Technology: Methanol and Ethanol * Biological Effects of	METHANOL Spills into Marine, Estuarine, and
80A002297	VI	the Erection and Testing of a	METHANOL Stripping Column
80A001244	VI	Development and Application of a Mathematical Model of the	METHANOL Synthesis * Chem. Eng. Prog., Sy
80A000732	VI	posium on Alcohol Fuel Technology: Methanol and Ethanol *	METHANOL Synthesis and Possibilities for Pr
80A000721	IX	4th International Clean Air Congress * Clean Air through	METHANOL Technology
80A000621	I		METHANOL Technology and Economics * a Rev
80A000249	I		METHANOL Technology and Economics * Chem.
80A000619	I		METHANOL Technology and Economics * Chem.
80A001244	VI		METHANOL Technology and Economics * Devel
80A000622	I		METHANOL Technology and Economics * Metha
80A000620	I		METHANOL Technology and Economics * the P
80A000630	IX	sion Engineering Conference * on Board Steam-reforming of	METHANOL to Fuel Automotive Hydrogen Engine
80A000327	IX	Engine Performance and Exhaust Emissions:	METHANOL versus Isooctane
80A002254	IX	tems: Held on April 18-22, 1977 * the Effect of Blending	METHANOL with Gasoline on Geometric Distrib
80A000299	VI	Studies on Biomass Production from	METHANOL. Application of Tower Type Fermen
80A002248	IX		METHANOL. Versatile Fuel for Immediate Use
80A000704	IX	hanol as an Alternative Fuel * Comparison of Methanol and	METHANOL-BLENDS
80A000328	IX	Exhaust Emissions from a	METHANOL-FUELED Automobile
80A001092	IX	Volkswagenwerk Starts Test with 800	METHANOL-FUELED Rabbits in West Berlin
80A000302	IX	Emissions from a	METHANOL-FUELED Single-cylinder Engine

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000307	IX	Fuel Economy and Emission Characteristics of	METHANOL-GASOLINE Blends
80A000341	IX	the Octane, Emissions, and Fuel Economy Characteristics of	METHANOL-GASOLINE Blends
80A000398	IX	Methanol as an Automotive Fuel with Special Emphasis on	METHANOL-GASOLINE Blends
80A000412	IX	Phase Instability in	METHANOL-GASOLINE Blends
80A000510	IX	els Technology * Improvement of the Water Tolerability of	METHANOL-GASOLINE Blends
80A001166	IX	gation of the Octane Rating and Autoignition Temperature of	METHANOL-GASOLINE Blends
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80A000646	IX	Energy Conversion Engineering Conference * Potential for	METHANOL-GASOLINE Blends as Automotive Fuel
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80A000652	IX	ion * Investigations into the Suitability of Methanol and	METHANOL-GASOLINE Blends as S.I. Engine Fue
80A000332	IX	Lean Combustion of	METHANOL-GASOLINE Blends in a Single Cylind
80A000338	IX	Performance of	METHANOL-GASOLINE Blends in a Stratified Ch
80A000337	IX		METHANOL-GASOLINE Blends Performance in Lab
80A000242	IX		METHANOL-GASOLINE Blends: How Promising Ar
80A000247	IX		METHANOL-GASOLINE Blends: Performance and
80A000252	IX	Methylnitrite in the Exhaust from a	METHANOL-GASOLINE Fueled Automobile
80A002316	IX	racteristics of Spark-ignition Engines Burning Methanol and	METHANOL-GASOLINE Mixtures
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80A000210	VIII	Government Research Concludes	METHANOL-MIX Fuels to Reach Marketing Stage
80A001053	IX	Ionization in a	METHANOL-OXYGEN Flame
80A000698	IX	llution Power Systems Development * Automotive Engine for	METHANOL-WATER Mixture
80A000643	IX	* Combustion and Emissions Characteristics of Methanol,	METHANOL-WATER, and Gasoline-methanol Blend
80A000701	IX	Methanol as an Alternative Fuel *	METHANOL/GASOLINE Blend — Automotive Manufa
80A000518	IX	Alcohol Fuels Technology * BP New Zealand Experience with	METHANOL/GASOLINE Blends
80A000241	IX		METHANOL/GASOLINE Blends as a Motor Fuel Fo
80A000377	IX	Experimental Results Using Methanol and	METHANOL/GASOLINE Blends as Automotive Engi
80A000336	IX		METHANOL/GASOLINE Blends as Automotive Fuel
80A000370	IX	Characterization of	METHANOL/GASOLINE Blends as Automotive Fuel
80A001099	IX	Feasibility of	METHANOL/GASOLINE Blends for Automotive Use
80A000521	IX	ical Fuel Emulsifier for Utilization of Diesel/Methanol and	METHANOL/GASOLINE Fuel Emulsions in Transpo
80A000509	IX	hird International Symposium on Alcohol Fuels Technology *	METHANOL/GASOLINE Mixtures in Four Stroke O
80A000559	XI	ional Symposium on Alcohol Fuels Technology * Toxicity of	METHANOL/PETROL Mixtures
80A000734	IX	hanol and Ethanol * Comparison of Gasoline, Methanol, and	METHANOL/WATER Blend as Spark Ignition Engi
80A002057	IX	issions from a Single-cylinder Engine Fueled with Gasoline,	METHANOL, and Ethanol
80A002255	IX	Addition to Gasoline on Total and Individual Hydrocarbons,	METHANOL, and Formaldehyde Emissions from
80A000734	IX	chnology: Methanol and Ethanol * Comparison of Gasoline,	METHANOL, and Methanol/Water Blend as Spark
80A000315	IX		METHANOL, Ethanol and Jet Fuel Emissions Co
80A000237	V		METHANOL, Ethanol, and Acetone in Kraft Pul
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80A002123	IX	tive Diesel Engine Fuels: an Experimental Investigation of	METHANOL, Ethanol, Methane and Ammonia in
80A001260	IX	an Evaluation of	METHANOL, Ethanol, the Propanols, and the B
80A000639	IX	* Combustion and Pollutant Kinetic Modeling for Methane,	METHANOL, Fuel-nitrogen, and Fuel-sulfur
80A000555	I	hird International Symposium on Alcohol Fuels Technology *	METHANOL, Its Precursors and/or Derivatives
80A001167	IX	the Laminar Burning Velocity of Isooctane, N-heptane,	METHANOL, Methane, and Propane at Elevated
80A000643	IX	Conference * Combustion and Emissions Characteristics of	METHANOL, Methanol-water, and Gasoline-meth
80A000436	IX		METHANOL, the Future in Motorized Transport
80A000393	I		METHANOL: a Raw Material for Synthesis and

Citation Number	Subject Section	Citation Title	Title Keyword
80A000457	I		*METHANOL: a Selective Cross-disciplinary B*
80A001157	IX		*METHANOL: a Versatile Fuel for Immediate U*
80A000488	IX	*International Combustion * Kinetics of the Oxidation of*	*METHANOL: Experimental Results Semi-global*
80A002244	I		*METHANOL: How, Where, Who — Future*
80A000400	I		*METHANOL: Its Synthesis, Use as a Fuel, Ec*
80A000622	I	*Methanol Technology and Economics **	*METHANOL: Its Technology and Economics*
76 : 001878	I	*Ethanol and*	*METHANOL: Production Schemes and Use as Fu*
80A002124	IX	*an Anaytical*	*METHOD for Estimating the Performance of*
80A000251	VI	*a*	*METHOD for Increasing Cellulase Production*
80 : 002118	VI	*Substances into Energy Chemicals and Microbial Protein **	*METHOD for Production of Alcohol Directly*
80A001182	IX	*Automotive Fuels * Application of New Combustion Analysis*	*METHOD in the Study of Alternate Fuel, Comb*
80A003115	IX	*Development of Practical*	*METHOD of Burning Alcohol in Gasoline Tract*
80A002213	VI	*a New*	*METHOD of Preparation of Absolute Alcohol*
80A002299	IV	*the Relation between*	*METHOD of Saccarification and Yields of Eth*
80A001164	IX	*ion of Alternative Fuels in a Diesel Engine Using Different*	*METHODS*
79 : 002521	VI	*Technical and Economic Assessment of*	*METHODS for Direct Conversion of Agricultur*
80A000676	I	*Hydrogen Energy * Sources and*	*METHODS for Methanol Production * Proceed*
80A001160	IX	*Future Fuels and Mixture Preparation*	*METHODS for Spark Ignition Engines*
80A002259	VI	*the Barbet*	*METHODS of Distillation and Rectification*
80A000380	IX	*Engine Combustion of Methyl Alcohol and Fuel-nitrogen Doped*	*METHYL Alcohol*
80A000581	VIII	*ountries * Energy Balance for the Production of Ethyl and*	*METHYL Alcohol*
80A001243	XI	*Dangerous Properties of Industrial Materials **	*METHYL Alcohol*
80A001177	IX	*Energy Technology Handbook **	*METHYL Alcohol * a Potential Fuel for Tra*
80A001211	XI	*Occupational Exposure to*	*METHYL Alcohol * DHEW Publication No. (N*
80A002302	IX	*the Gaseous Heat Capacity of*	*METHYL Alcohol and Ethyl Alcohol by Thermal*
80A000380	IX	*on of NO and NO_2 in the I.C. Engine Combustion of*	*METHYL Alcohol and Fuel-nitrogen Doped Meth*
80A000376	IX	*Evaluation of*	*METHYL Alcohol as a Vehicle Fuel Extender*
80A001203	IX		*METHYL Alcohol as Motor Fuel * Texas Engi*
80A003025	I		*METHYL Alcohol from Brazil * USITC Public*
80A000744	XI	*Laboratory Diagnosis of Diseases **	*METHYL Alcohol Poisoning*
80A001263	IX	*Characterization and Research Investigation of Methanol and*	*METHYL Fuel*
80A000554	I	*hird International Symposium on Alcohol Fuels Technology **	*METHYL Fuel and Its Effect on Crude Oil Con*
80A000305	IX	*sions from Cars Fueled with Gasoline Containing Ethanol and*	*METHYL Tert-butyl Ether*
80A000252	IX		*METHYLNITRITE in the Exhaust from a Methano*
80A000675	IX	*Automobile Engine * Proceedings of the Hydrogen Economy*	*MIAMI Energy (Theme) Conference*
80A000676	I	*Methanol Production * Proceedings of the Hydrogen Economy*	*MIAMI Energy (Theme) Conference*
80A000484	X	*Proceedings of Condensed Papers: 2nd*	*MIAMI International Conference on Alternati*
80A000485	IX	*Proceedings of Condensed Papers: 2nd*	*MIAMI International Conference on Alternati*
80A000253	II		*MICHIGAN May Grow Potatoes for Fuel*
80A001256	IX	*Potential for Use of Alternative Fuels in*	*MICHIGAN'S Public Transit Systems*
80A002194	VI		*MICROBIAL Amylase Preparations Conversion*
80A000473	VI	*Microbial Energy Conversion * the Competition between*	*MICROBIAL and Chemical Processes for the Ma*
80A000667	VI	*lysis of Cellulose * Topological Effects in Enzymatic and*	*MICROBIAL Degradation of Highly Ordered Pol*
80A000472	VI		*MICROBIAL Energy Conversion * Enzymatic H*
80A001178	II		*MICROBIAL Energy Conversion * Feedstocks*
80A000473	VI		*MICROBIAL Energy Conversion * the Competi*
80A002076	VI	*B-Glucosidase:*	*MICROBIAL Production and Effect on Enzymati*
80 : 002118	VI	*nversion of Cellulosic Substances into Energy Chemicals and*	*MICROBIAL Protein * Method for Production*
80 : 002077	VI	*nversion of Cellulosic Substances into Energy Chemicals and*	*MICROBIAL Protein * Production of Ethyl*
80A000111	VI	*Discussion of Pretreatments to Enhance Enzymatic and*	*MICROBIOLOGICAL Attack of Cellulosic Materi*
80A001135	VI	*Pretreatments to Enhance Chemical, Enzymatic, and*	*MICROBIOLOGICAL Attack of Cellulosic Materi*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A002246	IX	*Molasses, II * II. the Use of Alcohol and Alcohol-ether*	***MIXTURES** as Motor Fuels*
78 : 001794	IX	*ss: a Cash Crop for the Future * Use of Ethanol-gasoline*	***MIXTURES** for Automotive Fuel*
80A000669	IX	*els from Biomass and Wastes * the Use of Ethanol-gasoline*	***MIXTURES** for Automotive Fuel*
80A000104	IX	*Diesel Oil and Ethanol*	***MIXTURES** for Diesel-powered Farm Tractors*
80A000331	IX	*Ignition, Combustion and Exhaust Emissions of Lean*	***MIXTURES** in Automotive Spark Ignition Engin*
80A000509	IX	*Symposium on Alcohol Fuels Technology * Methanol/Gasoline*	***MIXTURES** in Four Stroke Otto Engines*
80A002301	VI	*city of a Bubble Plate Fractionating Column When Distilling*	***MIXTURES** of Ethyl Alcohol and Water*
80A002184	IX	*Water Tolerances of*	***MIXTURES** of Gasoline with Ethyl Alcohol*
80A003069	IX	*Critical Solution Temperatures of*	***MIXTURES** of Gasoline, Ethyl Alcohol, and Wa*
80A002222	IX	*Fuel*	***MIXTURES** on London Buses*
80A000475	IX	*national Combustion Symposium * Flame Propagation through*	***MIXTURES** with Concentration Gradient*
80A000673	XI	*Process Industries Symposium * Inflammability of Liquid*	***MIXTURES** with Inflammable and Noninflammabl*
79 : 004665	VIII	*rgy from Biomass and Wastes * Ethanol-gasoline Motor-fuel*	***MIXTURES**: a Study in the Use of Simple Log*
80A000312	IX	*Methanol and Other Alternative Fuels for Off-highway*	***MOBILE** Engines*
80A000437	XI	*a*	***MODAL** Economic and Safety Analysis of the T*
80A000318	IX	*Performance of the Late*	***MODEL** Cars with Gasoline-methanol Fuel*
80A001244	VI	*Economics * Development and Application of a Mathematical*	***MODEL** of the Methanol Synthesis * Chem. E*
80A000448	IX	*a Fundamental*	***MODEL** Predicting Fuel Consumption, NOx and*
80 : 000226	VIII	*sis for Development of a Data Base for a Fuels from Biomass*	***MODEL**). Quarterly Report for October 1 — D*
79 : 007133	VI	*Biomass Allocation*	***MODEL**: Conversion of Biomass to Methanol*
80A000415	IX	*ion Engines Using Alternative Fuels — Quasi One-dimensional*	***MODELING** * Methanol Fueled Engines*
80A000488	IX	*he Oxidation of Methanol: Experimental Results Semi-global*	***MODELING** and Mechanistic Concepts*
79 : 006466	VIII	*Symposium Papers: Energy*	***MODELING** and Net Energy Analysis * Energy*
80A000639	IX	*tion 1975 Fall Meeting * Combustion and Pollutant Kinetic*	***MODELING** for Methane, Methanol, Fuel-nitrog*
80A000511	IX	*hird International Symposium on Alcohol Fuels Technology **	***MODELING** of Flame Properties of Methanol*
80A000515	IX	*nal Symposium on Alcohol Fuels Technology * Thermokinetic*	***MODELING** of Methanol Combustion Phenomena W*
80A001170	IX	*Methanol and Ethanol Fuels for*	***MODERN** Cars*
80A002188	III	*Design of*	***MODERN** Molasses Distillery*
80A000649	IX	*I.C. Engines and Combustion * Methanol Blended Gasoline as*	***MODERN** Motor Fuel*
80A003030	IX	*Ethyl Alcohol and Alcohol and Gasoline as a*	***MODERN** Motor Fuel*
80A001012	I	*an Ancient Fuel Provides Energy for*	***MODERN** Times*
80A000435	IX	*Methanol Fuel*	***MODIFICATION** for Highway Vehicle Use*
80A000514	IX	*hird International Symposium on Alcohol Fuels Technology **	***MODIFICATION** of a Ford Pinto for Operation*
80A000225	IX	*edes Benz of Brazil Uses Sugar Byproduct to Fuel Buses with*	***MODIFIED** Fuel Pumps*
80A000316	IX		***MODIFIED** Fuels for Diesel Engines by Applic*
80A002231	V	*Ethyl Alcohol from Waste Wood by*	***MODIFIED** Scholler Process*
80A002196	II	*Possibilities of the Plant Growth of the*	***MOIST** Tropics to Furnish Materials for Liqu*
78 : 002289	IV	*and Economics; Comparison with Ethanol from Sugar Cane and*	***MOLASSES***
80A002201	III	*Alcohol Production from*	***MOLASSES***
80A002214	III	*Now, Real Motor Fuel from*	***MOLASSES***
80A002215	III	*Ethanol Fermentation of*	***MOLASSES***
80A002218	III	*Fermentation of*	***MOLASSES***
80A003079	III	*Motor Fuel from*	***MOLASSES***
80A003080	VIII	*Motor Fuel from*	***MOLASSES***
80A003082	III	*Motor Fuel from*	***MOLASSES***
80A003083	III	*Motor Fuel from*	***MOLASSES***
80A003084	III	*Motor Fuel from*	***MOLASSES***
80A003119	III	*Motor Fuel from Waste*	***MOLASSES***
80A003120	III	*Motor Fuel from*	***MOLASSES***
80A001241	III	*Industrial Fermentations * Alcoholic Fermentation of*	***MOLASSES** * Chapter 3*
80A000085	VI	*Effect of Pretreatment of*	***MOLASSES** and Recycling of Yeast on Ethanol*

Citation Number	Subject Section	Citation Title	Title Keyword
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80A001072	III		MOLASSES as Raw Material for Industry
80A000298	VI	Studies of Continuous Fermentation of Indian Cane Sugar	MOLASSES by Yeast
80A002188	III	Design of Modern	MOLASSES Distillery
80A000578	III	uel and Chemical Feedstock in Developing Countries * Cane	MOLASSES Fermentation Alcohol Industry in F
80A003047	III	Alcohol Motor Fuel from Molasses, I * I. Use of Cane	MOLASSES for Manufacture of Motor Fuel
80A000113	VI	Distillery Fuel Savings by Efficient	MOLASSES Processing and Stillage Utilizatio
80A000606	III	as Fuel and Chemical Feedstock in Developing Countries *	MOLASSES Production and Utilization Potenti
80A003047	III	Alcohol Motor Fuel from	MOLASSES, I * I. Use of Cane Molasses Fo
80A002246	IX	Alcohol Motor Fuel from	MOLASSES, II * II. the Use of Alcohol an
80A002157	VI		MOLD Bran Aids Production of Grain Alcohol
80A002131	VIII	Gasohol: Energy Mountain or	MOLEHILL?
80A001103	X	Why the Highway Fund May Run Out of	MONEY
80A000184	VI	Liquid Chromatography for	MONITORING the Conversion of Cellulosic Was
80A000730	IX		MONOGRAPH on Alternate Fuel Resources * E
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80A002148	IV	Feasibility of Ethanol from Grain in	MONTANA * Montana State Univ., Montana Ag
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80A001046	I	Gasohol — New Fuel Source from	MOTHER Nature
80A001069	IX		MOTHER'S Alcohol Fuel Preheater
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80A001070	IX		MOTHER'S Experimental Alcohol-powered Truck
80A003121	VI	the	MOTOR Alcohol Distillery
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80A003038	IX		MOTOR Alcohol: Its Theory and Use
80A000219	IX	Methanol as a	MOTOR Fuel
80A000320	VIII	Practicality of Alcohols as	MOTOR Fuel
80A000324	IX	a Survey of Alcohol as a	MOTOR Fuel
80A000649	IX	ines and Combustion * Methanol Blended Gasoline as Modern	MOTOR Fuel
80A000707	IX	Methanol as an Alternative Fuel * Methanol as a	MOTOR Fuel
80A002158	VI	Making Alcohol-ether Mixture in Cuba for	MOTOR Fuel
80A002177	VI	Production of 95-97 Per Cent Alcohol for	MOTOR Fuel
80A002183	I	Industrial Alcohol for	MOTOR Fuel
80A002238	IX	Chemical Processing and Design * Alcohol, Methanol as a	MOTOR Fuel
80A002273	X	Alcohol Manufactured from Corn and Other Farm Products in	MOTOR Fuel
80A002275	I	lcohol * a Brief Analysis to Force Use of Farm Alcohol in	MOTOR Fuel
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80A003039	IX	Fifty Thousand Kilometers on Alcohol as a	MOTOR Fuel
80A003041	IX	Alcohol Blend Poor Substitute for	MOTOR Fuel
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000241	IX	*Methanol/Gasoline Blends as a*	*MOTOR Fuel for New Zealand*
79 : 002491	VIII	*roceedings Forest and Field Fuels Symposium * Ethanol for*	*MOTOR Fuel from Biomass*
80A002214	III	*Now, Real*	*MOTOR Fuel from Molasses*
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80A003082	III		*MOTOR Fuel from Molasses*
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80A001193	IX	*United Provinces. Bulletin, New Ser., No. 6 * Its Use as*	*MOTOR Fuel in the United Provinces*
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80A000335	IX	*Methanol as a*	*MOTOR Fuel or a Gasoline Blending Component*
80A000310	IX	*Methanol and Ethanol as a*	*MOTOR Fuel Substitute*
80 : 002125	III	*Fuels from Biomass: Alcohol Production; Alcohol as a*	*MOTOR Fuel Supplement * Technical Report*
80A003127	VII	*Economic Aspects of Using Grain Alcohol as a*	*MOTOR Fuel with Emphasis on By-product Feed*
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80A000424	I	*View from Abroad Brazil Grows Its*	*MOTOR Fuels*
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80A002189	IX	*Alcohol*	*MOTOR Fuels*
80A002246	IX	*I * II. the Use of Alcohol and Alcohol-ether Mixtures as*	*MOTOR Fuels*
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80A003050	IX	*Single-cylinder Engine Tests of Substitute*	*MOTOR Fuels*
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79 : 004150	IX	*Ethanol*	*MOTOR Fuels and "Gasohol"*
80A001235	II	*rcane versus Corn versus Ethylene as Sources of Ethanol for*	*MOTOR Fuels and Chemicals*
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80A002224	IX		*MOTOR Spirits and Light Distillates*
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80A000438	I	*on the Trail of New Fuels: Alternative Fuels for*	*MOTOR Vehicles*
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80A000321	IX	*Racing Experiences with Methanol and Ethanol-based*	*MOTOR-FUEL Blends*
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80A002129	IX	*a Dynamic Test Facility with*	*MOTORING Using a Digital Computer*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000045	VI	Firms Experiment with Garbage-to-fuel/The Energy-from-wood	MOVEMENT
80A002068	VI	Ferment in the Alcohol	MOVEMENT
80A002062	I	Farming for Fuel — Alcohol Motor Fuel	MOVEMENT of the 1930's
80A000414	IX	Other Aspects of	MTBE/METHANOL Use
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80A001071	IX		MULTI-FUEL Car Engine Gets New Tests
80A000654	IX	Systems * Measurement of Nitric Oxide Formation within a	MULTI-FUELED Turbine Combustor
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80A000433	V	Synthetic Fuels from	MUNICIPAL, Industrial and Agricultural Wast
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80A000410	V	Synthetic Fuels from	MUNICIPAL, Industrial, and Agricultural Was
80 : 000223	VI	nnual Symposium on Fuels from Biomass * Hypercellulolytic	MUTANTS and Their Role in Saccharification
80A000748	VI	Use of	MYCOTOXIN Contaminated Grain in the Ethanol
80A000136	IX	thanol on Exhaust Composition of a Fuel Containing Toluene,	N-HEPTANE, and Isooctane
80A001167	IX	the Laminar Burning Velocity of Isooctane,	N-HEPTANE, Methanol, Methane, and Propane
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80A000180	I	Gasohol Booming across the	NATION
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Citation Number	Subject Section	Citation Title	Title Keyword
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76 : 001878	I	*ed on Use of Minnesota Raw Materials and the State's Energy*	*NEEDS*
80A000325	IX	*Synthetic Fuels for Transportation and National Energy*	*NEEDS*
80A002086	I	*Half of New Zealand's Gasoline*	*NEEDS (Could Be Met by Methanol Conversion)*
80A000139	VIII	*Energy Conservation*	*NEEDS American Brains*
80A000013	X	*Carter Gas-from-grain Program*	*NEEDS Congress, Business Help*
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80A002287	VI	*ization by Aphelenchus Avenae and Caenorhabditis Sp. Plant*	*NEMATODES*
79 : 006466	VIII	*Symposium Papers: Energy Modeling and*	*NET Energy Analysis * Energy Analysis of*
80A001208	VIII		*NET Energy Analysis of Alcohol Fuels * Ap*
80A001098	VIII		*NET Energy Analysis of Ethanol Production*
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80A000740	IX	*velopment of Methanol and Petrol Carburation Systems in the*	*NETHERLANDS*
80A002207	IX	*a*	*NEW Alcohol Fuel*
80A001159	VI	*Dehydration of Ethanol:*	*NEW Approach Gives Positive Energy Balance*
80A001088	VI	*the Vacuferm Process: a*	*NEW Approach to Fermentation Alcohol*
78 : 002738	VI	*Building a*	*NEW Base for Methanol*
80A001182	IX	*Future Automotive Fuels * Application of*	*NEW Combustion Analysis Method in the Study*
80A002139	VIII	*Food or Fuel —*	*NEW Competition for the World's Cropland **
80A000144	II	*Energy —*	*NEW Crop Sources*
80A000569	VI	*as Fuel and Chemical Feedstock in Developing Countries **	*NEW Developments in Continuous Alcoholic Fe*
80A000209	VI	*Gasohol Sparks Study on*	*NEW Ethanol Plant*
80A001046	I	*Gasohol —*	*NEW Fuel Source from Mother Nature*
80A000685	I		*NEW Fuels Advances in Combustion Technologi*
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80A002213	VI	*a*	*NEW Method of Preparation of Absolute Alcoh*
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80A001114	III		*NEW Options for Sweet Sorghum*
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80A003044	VI		*NEW Process for Production of Absolute Alco*
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80A001071	IX	*Multi-fuel Car Engine Gets*	*NEW Tests*
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80A000241	IX	*Methanol/Gasoline Blends as a Motor Fuel for*	*NEW Zealand*
80A000722	VIII	** Some Aspects of the Economics of Ethanol Production in*	*NEW Zealand*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A002086	I	*Half of*	*NEW Zealand's Gasoline Needs (Could Be Met*
80A000550	X	*hird International Symposium on Alcohol Fuels Technology **	*NEW Zealand's Methanol-gasoline Transport*
80A001119	IX		*NEWEST Fuel Saver: "Aquahol" Injection for*
80A000115	V	*Distilling the*	*NEWS' New Process to Convert Recycled Newsp*
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80A000680	VI	*Process-development Studies of the Enzymatic Hydrolysis of*	*NEWSPRINT*
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80A000694	IX	*Pollution Power Systems Development * Development of the*	*NISSAN Gas Turbine*
80A001120	IX		*NITRIC Oxide and Composition Measurements W*
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80A000654	IX	*sions from Continuous Combustion Systems * Measurement of*	*NITRIC Oxide Formation within a Multi-fuele*
80A002136	IX	*Effect of Water on*	*NITRIC Oxide Production in Gas Turbine Comb*
80A000296	IX	*minar Diffusion Flames above Condensed Fuels with Water and*	*NITROGEN*
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Citation Number	Subject Section	Citation Title	Title Keyword
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A002196	II	*Possibilities of the*	*PLANT Growth of the Moist Tropics to Furnis*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000396	I	Methanol as a Fuel in the Urban Energy Economy and	POSSIBLE Source of Supply
80A000399	IX	Methanol Engine: a Transportation Strategy for the	POST-PETROLEUM Era
80A002288	IX	the Methanol Engine: a Transportation Strategy for	POST-PETROLEUM Era
80A000427	IV		POTATO Alcohol * a Solution to the Energy
80A003109	IV		POTATO Culls as a Source of Industrial Alco
80A000498	IV	Feasibility of Establishing	POTATO Ethanol Plants on Prince Edward Isla
80A003034	IV		POTATO Products Industry
80A000095	I	Alcohol Fuels Are No Longer Small	POTATOES
80A003058	IV	Manufacture of Alcohol from	POTATOES
80A003036	IV		POTATOES an Important Source of Motor Fuel
30A000130	IV	cs of Ethyl Alcohol Production with Particular Reference to	POTATOES as a Raw Material
30A000253	II	Michigan May Grow	POTATOES for Fuel
80A000283	I	Solar Biomass Energy an Overview of USA	POTENTIAL
80A000729	VI	a Chemical and Energy Resource * Ethanol Fermentation and	POTENTIAL

Citation Number	Subject Section	Citation Title	Title Keyword
80A001221	VIII	ion of Fuel-alcohol in mid-America — Technical and Economic	*POTENTIAL*
80A000572	X	eveloping Countries * Power Alcohol Industry for Thailand	*POTENTIAL and Prospect*
80A000018	IV	Cassava: Its	*POTENTIAL as an Industrial Crop*
80A000593	II	as Fuel and Chemical Feedstock in Developing Countries *	*POTENTIAL Availability of Fermentation Alco*
80 : 001951	V	Fuels Policy Review. Raw Material Availability Reports *	*POTENTIAL Availability of Wood as a Feedsto*
80A000722	VIII	Proceedings of a Symposium on the	*POTENTIAL for Energy Farming in New Zealand*
80A000579	X	as Fuel and Chemical Feedstock in Developing Countries *	*POTENTIAL for Fermentation Alcohol Producti*
80A002140	II	the	*POTENTIAL for Liquid Fuels from Agriculture*
80A000319	IX		*POTENTIAL for Methanol as an Automotive Fue*
80A000646	IX	th Intersociety Energy Conversion Engineering Conference *	*POTENTIAL for Methanol-gasoline Blends as*
80A001256	IX		*POTENTIAL for Use of Alternative Fuels in M*
80A002137	VIII	Biomass-based Alcohol Fuels: the Near-term	*POTENTIAL for Use with Gasoline*
80A001060	IV	Jerusalem Artichoke, a	*POTENTIAL Fructose Crop for the Prairies*
80A001177	IX	Energy Technology Handbook * Methyl Alcohol * a	*POTENTIAL Fuel for Transportation*
80A000606	III	eveloping Countries * Molasses Production and Utilization	*POTENTIAL in Tanzania*
80A000708	VI	Methanol as an Alternative Fuel *	*POTENTIAL Long Range Improvements in Methan*
80 : 000205	VIII	Second Annual Symposium on Fuels from Biomass * Near Term	*POTENTIAL of Biomass-based Alcohol-gasoline*
79 : 004663	I	Energy from Biomass and Wastes * Study of the Energy	*POTENTIAL of Fuels from Land Biomass in*
80A000442	V	the	*POTENTIAL of Lignocellulosic Materials for*
80A003014	VIII	Studies on the Economic	*POTENTIAL of On-farm Energy Production Syst*
80A000607	III	as Fuel and Chemical Feedstock in Developing Countries *	*POTENTIAL of Sugar Cane Derived Alcohol as*
79 : 002502	V	gs Forest and Field Fuels Symposium * Canadian Production	*POTENTIAL — FUEL Grade Methanol from Canadia*
80 : 002033	VIII	High-grade Fuels from Biomass Farming:	*POTENTIALS and Constraints*
80A000750	IX	rnational Symposium and Workshop on the Hydrogen Economy *	*POTENTIALS for Early Utilization of Methano*
80A003086	V	Properties of	*POWDERED Wood and Isolation of Lignin by Ce*
80 : 002043	VI	Fermentation Alcohol Grows in	*POWER*
80A002243	I	Alcohol for Illuminating or Heating Purposes or for Motor	*POWER*
80A002275	I		*POWER Alcohol * a Brief Analysis to Force*
80A001193	IX		*POWER Alcohol * Dept. of Industries and C*
80A002193	VI	Commercial Demonstration to Test	*POWER Alcohol Feasibility*
80A003096	III		*POWER Alcohol from Beet*
80A002241	I	the Production and Use of	*POWER Alcohol in Asia and the Far East; Rep*
80A003045	III	Production of	*POWER Alcohol in Australia*
80A000603	X	* Possibilities of Developing a Nation Wide Programme for	*POWER Alcohol in Peru*
80A000564	I	as Fuel and Chemical Feedstock in Developing Countries *	*POWER Alcohol in the Sudan*
80A002160	IX		*POWER Alcohol in Tractors and Farm Engines*
80A000572	X	as Fuel and Chemical Feedstock in Developing Countries *	*POWER Alcohol Industry for Thailand Potenti*
80A000590	I	edstock in Developing Countries * Prospects of Developing	*POWER Alcohol Industry in Thailand*
80A000568	I	in Developing Countries * Experiences with the Brazilian	*POWER Alcohol Plants*
80A002274	I		*POWER Alcohol, History and Analysis*
80A002240	I		*POWER Alcohol, Its Production and Utilizati*
80A002031	I	Alcohol Fuels: a Major Source of	*POWER Only a Few Years from Here*
80A002303	IX	ed Hydrocarbon Fuels * a Comparison of Exhaust Emissions,	*POWER Output and Fuel Consumption Using Sta*
80A000523	IX	Symposium on Alcohol Fuels Technology * a Motor Vehicle	*POWER Plant for Ethanol and Methanol Operat*
80A000714	IX		*POWER Plants and Future Fuels * Methanol*
80A000715	IX		*POWER Plants and Future Fuels * Performan*
80A002212	II	Alcohol for	*POWER Purposes*
79 : 006466	VIII	Analysis of Two Technologies: Gasohol and Solar Satellite	*POWER Station*
80A000373	IX	Current Status of Alternative Automotive	*POWER Systems and Fuels. Volume I. Execut*
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80A000695	IX	Symposium on Low Pollution	*POWER Systems Development * Alternative*
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Citation Number	Subject Section	Citation Title	Title Keyword
80A000698	IX	*Symposium on Low Pollution*	***POWER** Systems Development * Automotive En*
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80A000696	IX	*Symposium on Low Pollution*	***POWER** Systems Development * the Combustio*
80A000532	VII	*Technology * the Production of Grain Alcohol and Electric*	***POWER** with Cogeneration of Steam*
80A002024	IX	*Alcohol Comes Back to*	***POWER** Your Car*
80A002264	IX	*the State of Development in Germany of the*	***POWER-ALCOHOL** Question*
80A002304	IX		***POWER**, Fuel Consumption, and Exhaust Emissi*
80A000270	IV	*the Roots of*	***POWER**: the Growing of Manioc in Brazil and*
80A002273	X	*ansmitting, in Response to Resolution, Report Pertaining to*	***PRACTICABILITY** and Advantages to Agricultur*
80A000403	IX		***PRACTICAL** Approach to the Introduction of*
80A000284	I	*Solar Energy Conversion through Biology: Could It Be a*	***PRACTICAL** Energy Source*
80A002278	VI	*a*	***PRACTICAL** Handbook on the Distillation of*
80A003115	IX	*Development of*	***PRACTICAL** Method of Burning Alcohol in Gaso*
80A000287	IX	*Some Examples of Combustion Tests for Putting New Fuels to*	***PRACTICAL** Use*
80A000751	VIII	*rkshop on the Hydrogen Economy * the Methanol Economy: a*	***PRACTICAL** Version of the Hydrogen Economy*
80A000192	VIII	*Gasohol: the Issue Is*	***PRACTICALITY***
80A000320	VIII		***PRACTICALITY** of Alcohols as Motor Fuel*
78 : 001792	VIII	*Biomass: a Cash Crop for the Future * Corn Production*	***PRACTICES***
78 : 001809	VIII	*Economic*	***PRE-FEASIBILITY** Study: Large-scale Methano*
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80A000555	I	*nal Symposium on Alcohol Fuels Technology * Methanol, Its*	***PRECURSORS** and/or Derivatives in Different*
80A000642	IX	*Conversion Engineering Conference. Volume I * Computer*	***PREDICTED** Compression Ratio Effects on NOx*
80A000359	IX		***PREDICTED** Exhaust Emissions from a Methanol*
80A000448	IX	*a Fundamental Model*	***PREDICTING** Fuel Consumption, NOx and HC Emi*
80A001069	IX	*Mother's Alcohol Fuel*	***PREHEATER***
80A000459	VIII		***PRELIMINARY** Analysis of Economics of Scale*
80A001087	VI	*ion of Cellulosic Materials through Enzymatic Hydrolysis **	***PRELIMINARY** Assessment of an Integrated Pro*
80A001132	VIII		***PRELIMINARY** Cost Analyses for Enzymatic Hyd*
78 : 003706	VIII		***PRELIMINARY** Economic Evaluation of a Proces*
79 : 001712	VI		***PRELIMINARY** Engineering and Cost Analysis*
79 : 007113	XI		***PRELIMINARY** Environmental Assessment of Bio*
80 : 001961	VIII		***PRELIMINARY** Report on the Agricultural Sect*
80A000677	IX	*a*	***PRELIMINARY** Survey of Hydrocarbon-derived*
80A001160	IX	*Future Fuels and Mixture*	***PREPARATION** Methods for Spark Ignition Engi*
80 : 000231	VIII		***PREPARATION** of a Cost Data Bank for DOE/bio*
80A002213	VI	*a New Method of*	***PREPARATION** of Absolute Alcohol*
80A001125	VI	*Perspectives on*	***PREPARATION** of Cellulose for Hydrolysis*
80A002310	V	*ransport Fuel from Cellulose Material (Wood) * Laboratory*	***PREPARATION** of Wood Sugars and Fermentation*
80A002194	VI	*Microbial Amylase*	***PREPARATIONS** Conversion Agents for Alcoholi*
80A000674	IX	*Australia. National Conference Publication, No. 76/6 **	***PREPRINTS** of Papers; Fourth National Confer*
80A001167	IX	*and Propane at Elevated Temperature and Pressures in the*	***PRESENCE** of a Diluent*
80A002069	VI	*Cellobiose by Clostridium Thermocellum in the Absence and*	***PRESENCE** of Methanobacterium Thermoautotrop*
80A000469	IX	*Proceedings, Stratified Charge Engines Conference **	***PRESENT** Experience with Stratified Charge E*
80A001133	VIII		***PRESENT** Methanol Manufacturing Costs and Ec*
80A000608	VII	*as Fuel and Chemical Feedstock in Developing Countries **	***PRESENT** Situation on the Utilization of By-*
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80A002143	I	*und Report on Ethanol's Role in the Current Gasoline Crisis*	***PRESENTED** to the U.S. Congressional Gasohol*
80A002198	III	*Feed Yeast and Industrial Alcohol from Citrus-waste*	***PRESS** Juice*
80A001080	X	*U.S.*	***PRESSES** Drive for Use of Gasohol*
80A001010	IX	*Analyzer for Determining Fuel Vaporization*	***PRESSURE** Curves of Gasoline and Gasoline-al*
80A003061	IX	*Reid Vapour*	***PRESSURE** of Alcohol Blends*
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Citation Number	Subject Section	Citation Title	Title Keyword
80A000512	IX	*Exhaust Hydrocarbons in a Combustion Bomb as a Function of*	***PRESSURE,** Temperature and Equivalence Ratio*
80A000661	IX	*ional) on Combustion * Fuel Droplet Burning Rates at High*	***PRESSURES***
80A002302	IX	*yl Alcohol and Ethyl Alcohol by Thermal Conductivity at Low*	***PRESSURES***
80A000620	I	*and Economics * the PVT Behavior of Methanol at Elevated*	***PRESSURES** and Temperatures*
80A001167	IX	*Methanol, Methane, and Propane at Elevated Temperature and*	***PRESSURES** in the Presence of a Diluent*
80A000105	VI	*Differential Speed Two Roll Mill*	***PRETREATMENT** of Cellulosic Materials for En*
80A001134	VI		***PRETREATMENT** of Cellulosic Wastes to Increa*
80A000085	VI	*Effect of*	***PRETREATMENT** of Molasses and Recycling of Y*
80A000727	VI	*onversion of Cellulosic Materials * Physical and Chemical*	***PRETREATMENTS** for Enhancing Cellulose Sacch*
79 : 003453	VI	*Effect of Nitrogen Oxide*	***PRETREATMENTS** on Enzymatic Hydrolysis of Ce*
80A001135	VI		***PRETREATMENTS** to Enhance Chemical, Enzymati*
80A000111	VI	*Discussion of*	***PRETREATMENTS** to Enhance Enzymatic and Micr*
80A000673	XI	*1st International Loss*	***PREVENTION** and Safety Promotion in the Proc*
80A000585	XI	*Countries * Misuse of Alcohol from Automobile Fuels and*	***PREVENTIVE** Measures*
80A002051	VIII	*Ethanol*	***PRICE** to Rise*
80A000118	X	*DOE Proposes Deregulation of Gasohol*	***PRICES***
80A002025	VIII	*Alcohol for Cars Termed Spur to Rising Food*	***PRICES***
80A002037	VIII	*EOK Proposes Deregulation of Gasohol*	***PRICES***
80A003099	VIII	*Corn*	***PRICES** and Alcohol Production*
80A000427	IV	*tato Alcohol * a Solution to the Energy Crisis and Higher*	***PRICES** for Spuds?*
80A000205	VIII	*Gasohol Sales in Area Increasing as Gas*	***PRICES** Rise*
80A000481	I	*Bioconversion * When the Oil Runs Out — a Survey of Our*	***PRIMARY** Energy Sources and the Fuel We Can*
80A000679	VI	*of Sugars from Waste Cellulose by Enzymatic Hydrolysis. I.*	***PRIMARY** Evaluation of Substrates*
80A000309	IX	*Knocking and Performance Characteristics of Low Octane*	***PRIMARY** Reference Fuels Blended with Methan*
80A000248	VIII	*Methanol*	***PRIMED** for Future Energy Role*
80A001192	VI	*Lore of Still Building * Alcohol Series, V. 2 * a*	***PRIMER** on the Efficient Use of Alcohol for*
80A000743	I	*Energy*	***PRIMER:** Solar, Water, Wind, and Biofuels*
80A000498	IV	*Feasibility of Establishing Potato Ethanol Plants on*	***PRINCE** Edward Island * Institute of Man*
80A001136	I		***PRIORITIES** on Energy Research and Developme*
80A000069	II	*Brazil Promotes*	***PROALCOOL** for Petroleum Independence*
80A001217	IX	*Identification of*	***PROBABLE** Automotive Fuels Composition*
80A000068	I	*Brazil Points Way to Relieve Australian Energy*	***PROBLEM***
80A001199	I	*es. Bulletin, New Ser., No. 32 * a Critical Survey of the*	***PROBLEM***
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80A000158	IX	*Fuel Blends Create Solubility*	***PROBLEMS***
80A000203	I	*Gasohol Poses Major*	***PROBLEMS***
80A001264	V	*rld Affairs * the Role of Forests in Meeting World Energy*	***PROBLEMS***
80A000429	VII	*Some*	***PROBLEMS** Associated with the Treatment of E*
80A000425	I	*Gasohol * Alcohol Fuel: Likely to Produce More*	***PROBLEMS** than Benefits*
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80A000692	I	*Increased Energy from Biomass: 1985 Possibilities and*	***PROBLEMS,** Working Papers for Planners * B*
80A002153	VI	*Making Alcohol Fuel — Recipe and*	***PROCEDURE***
80A003051	VI	*Laboratory Cooking, Mashing, and Fermentation*	***PROCEDURES***
80A000635	IX	*otive Fuels: Prospects, Performance, Perspective Symposium*	***PROCEEDINGS** * Combustion of Methanol in a*
80A000683	V	*Solar 78 Northwest Conference*	***PROCEEDINGS** * the Activities of Richland*
80A000446	XI	*Seminar*	***PROCEEDINGS** Environmental Evaluation*
79 : 002491	VIII		***PROCEEDINGS** Forest and Field Fuels Symposiu*
79 : 002502	V		***PROCEEDINGS** Forest and Field Fuels Symposiu*
80A000464	IX		***PROCEEDINGS** Forest and Field Fuels Symposiu*
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80A000692	I	*Constraints, and Possible Solutions * Recommendations and*	***PROCEEDINGS** from Pacific Northwest Bioconve*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000699	V	*Crop Residue Management Systems.*	***PROCEEDINGS** of a Symposium * Alternative*
80A000489	V	*Complete Tree Utilization of Southern Pine,*	***PROCEEDINGS** of a Symposium * Biomass Prod*
80A000722	VIII		***PROCEEDINGS** of a Symposium on the Potential*
80A000484	X		***PROCEEDINGS** of Condensed Papers: 2nd Miami*
80A000485	IX		***PROCEEDINGS** of Condensed Papers: 2nd Miami*
80A000750	IX		***PROCEEDINGS** of the Cornell International Sy*
80A000751	VIII		***PROCEEDINGS** of the Cornell International Sy*
80A000679	VI		***PROCEEDINGS** of the Eighth Cellulose Confere*
80A000680	VI		***PROCEEDINGS** of the Eighth Cellulose Confere*
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80A000753	I	*Automotive Propulsion:*	***PROCEEDINGS** of the Fourth International Sym*
80A001229	IX		***PROCEEDINGS** of the Fourth International Sym*
80A001230	IX		***PROCEEDINGS** of the Fourth International Sym*
80A001231	IX		***PROCEEDINGS** of the Fourth International Sym*
80A002251	IX		***PROCEEDINGS** of the Fourth International Sym*
80A002252	IX		***PROCEEDINGS** of the Fourth International Sym*
80A002253	IX		***PROCEEDINGS** of the Fourth International Sym*
80A002254	IX		***PROCEEDINGS** of the Fourth International Sym*
80A002255	IX		***PROCEEDINGS** of the Fourth International Sym*
80A002256	IX		***PROCEEDINGS** of the Fourth International Sym*
80A002257	IX		***PROCEEDINGS** of the Fourth International Sym*
80A002258	IX		***PROCEEDINGS** of the Fourth International Sym*
80A000675	IX	*en and Methanol Fueled — Air Breathing Automobile Engine* *	***PROCEEDINGS** of the Hydrogen Economy Miami E*
80A000676	I	*Energy * Sources and Methods for Methanol Production* *	***PROCEEDINGS** of the Hydrogen Economy Miami E*
79 : 000510	I		***PROCEEDINGS** of the International Symposium*
80A000732	VI		***PROCEEDINGS** of the International Symposium*
80A000733	IX		***PROCEEDINGS** of the International Symposium*
80A000734	IX		***PROCEEDINGS** of the International Symposium*
80A000735	VIII		***PROCEEDINGS** of the International Symposium*
80A000736	VI		***PROCEEDINGS** of the International Symposium*
80A000737	VI		***PROCEEDINGS** of the International Symposium*
80A000738	VI		***PROCEEDINGS** of the International Symposium*
80A000739	III		***PROCEEDINGS** of the International Symposium*
80A000740	IX		***PROCEEDINGS** of the International Symposium*
80A000741	IX		***PROCEEDINGS** of the International Symposium*
80A000742	XI		***PROCEEDINGS** of the International Symposium*
80A000716	VI		***PROCEEDINGS** of the Second National Meeting*
79 : 004628	III		***PROCEEDINGS** of the Symposium on Energy* *
80A000723	X	*istory of the Nebraska Grain Alcohol and Gasohol Program* *	***PROCEEDINGS** of the Symposium, University of*
78 : 002289	IV		***PROCEEDINGS** of the 12th Intersociety Energy*
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80A000641	IX		***PROCEEDINGS** of the 12th Intersociety Energy*
80A000642	IX		***PROCEEDINGS** of the 12th Intersociety Energy*
80A000624	V		***PROCEEDINGS** of the 13th Intersociety Energy*
80A000625	XI		***PROCEEDINGS** of the 13th Intersociety Energy*
80A000631	I		***PROCEEDINGS** of the 14th Intersociety Energy*
80A000632	IX		***PROCEEDINGS** of the 14th Intersociety Energy*
80A000678	VII		***PROCEEDINGS** of the 9th National Conference*
80A000501	I		***PROCEEDINGS** of Third International Symposiu*
80A000502	I		***PROCEEDINGS** of Third International Symposiu*
80A000503	III		***PROCEEDINGS** of Third International Symposiu*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000505	X		*PROCEEDINGS of Third International Symposiu*
80A000506	X		*PROCEEDINGS of Third International Symposiu*
80A000507	V		*PROCEEDINGS of Third International Symposiu*
80A000508	IX		*PROCEEDINGS of Third International Symposiu*
80A000509	IX		*PROCEEDINGS of Third International Symposiu*
80A000510	IX		*PROCEEDINGS of Third International Symposiu*
80A000511	IX		*PROCEEDINGS of Third International Symposiu*
80A000512	IX		*PROCEEDINGS of Third International Symposiu*
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80A000519	IX		*PROCEEDINGS of Third International Symposiu*
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80A000524	IX		*PROCEEDINGS of Third International Symposiu*
80A000525	IX		*PROCEEDINGS of Third International Symposiu*
80A000526	IX		*PROCEEDINGS of Third International Symposiu*
80A000527	VIII		*PROCEEDINGS of Third International Symposiu*
80A000528	VIII		*PROCEEDINGS of Third International Symposiu*
80A000529	IX		*PROCEEDINGS of Third International Symposiu*
80A000530	V		*PROCEEDINGS of Third International Symposiu*
80A000531	VI		*PROCEEDINGS of Third International Symposiu*
80A000532	VII		*PROCEEDINGS of Third International Symposiu*
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80A000534	VIII		*PROCEEDINGS of Third International Symposiu*
80A000535	V		*PROCEEDINGS of Third International Symposiu*
80A000536	VIII		*PROCEEDINGS of Third International Symposiu*
80A000537	VI		*PROCEEDINGS of Third International Symposiu*
80A000538	V		*PROCEEDINGS of Third International Symposiu*
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80A000540	IX		*PROCEEDINGS of Third International Symposiu*
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80A000543	IX		*PROCEEDINGS of Third International Symposiu*
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80A000550	X		*PROCEEDINGS of Third International Symposiu*
80A000551	IX		*PROCEEDINGS of Third International Symposiu*
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Citation Number	Subject Section	Citation Title	Title Keyword
80A000558	IX		*PROCEEDINGS of Third International Symposiu*
80A000559	XI		*PROCEEDINGS of Third International Symposiu*
80A000560	IX		*PROCEEDINGS of Third International Symposiu*
80A000561	XI		*PROCEEDINGS of Third International Symposiu*
80A000562	XI		*PROCEEDINGS of Third International Symposiu*
80A000549	IX		*PROCEEDINGS on Third International Symposiu*
80A000749	VII		*PROCEEDINGS 1st Industrial Waste Utilizatio*
80A000643	IX		*PROCEEDINGS 11th Intersociety Energy Conver*
80A000644	IX		*PROCEEDINGS 11th Intersociety Energy Conver*
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80A000661	IX		*PROCEEDINGS 14th Symposium (International)*
80A000662	IX		*PROCEEDINGS 14th Symposium (International)*
80A002237	VII		*PROCEEDINGS 2nd Ontario Waste Conference **
80A000467	IX		*PROCEEDINGS...53RD Annual Congress, South a*
80A000468	III		*PROCEEDINGS...53RD Annual Congress, South a*
80A000469	IX		*PROCEEDINGS, Stratified Charge Engines Conf*
80A000654	IX		*PROCEEDINGS, Symposium on Emissions from Co*
80A000477	IX		*PROCEEDINGS, 2nd UMR-MEC (Univ. of Missouri*
80A000478	IX		*PROCEEDINGS, 2nd UMR-MEC (Univ. of Missouri*
80A000651	IX		*PROCEEDINGS, 3rd National Conference I.C. E*
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80A000721	IX		*PROCEEDINGS, 4th International Clean Air Co*
80A000648	IX		*PROCEEDINGS, 4th International Congress in*
80A000649	IX		*PROCEEDINGS, 4th National Conference I.C. E*
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80A000657	IX		*PROCEEDINGS, 5th National Conference I.C. E*
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80A000659	IX		*PROCEEDINGS, 5th National Conference I.C. E*
80A000660	IX		*PROCEEDINGS, 5th National Conference I.C. E*
80A000655	IX		*PROCEEDINGS, 6th Intersociety Energy Conver*
80A000720	IX	*Conference*	*PROCEEDINGS: 1st World Hydrogen Energy Con*
79 : 001712	VI	*Cost Analysis of Purdue/Tsao Cellulose Hydrolysis (Solvent)*	*PROCESS*
79 : 002535	VIII	*olar Diversification. Vol. 2.1 * Biomass Based Methanol*	*PROCESS*
80A000571	VI	*ping Countries * Simplified and Economical Cassava Starch*	*PROCESS*
80A000748	VI	*of Mycotoxin Contaminated Grain in the Ethanol Fermentation*	*PROCESS*
80A001133	VIII	*nt Methanol Manufacturing Costs and Economics Using the ICI*	*PROCESS*
80A001171	VI	*on the Enriched-lysine Baker's Yeast — Ethanol Fermentation*	*PROCESS*
80A002079	VI	*Continous Cellulose-to-glucose*	*PROCESS*
80A002155	VI	*he Saccharification of Agricultural Residues — a Continuous*	*PROCESS*
80A002179	VI	*Production of Absolute Alcohol by Melle*	*PROCESS*
80A002231	V	*Ethyl Alcohol from Waste Wood by Modified Scholler*	*PROCESS*
80A002232	V	*Madison Wood Sugar*	*PROCESS*
80A003054	IV	*Production of Industrial Alcohol from Grain by Amylo*	*PROCESS*
79 : 001713	V	*Raw Materials Evaluation and*	*PROCESS Development Studies for Conversion*
80 : 000189	V	*sium on Fuels from Biomass * Raw Materials Evaluation and*	*PROCESS Development Studies for Conversion*
79 : 004131	VI		*PROCESS Development Studies on the Bioconve*
80A000717	VI	*Cellulose as a Chemical and Energy Resource **	*PROCESS Developmental Studies on the Enzyma*
80A000384	VI	*Fermentation Kinetics and*	*PROCESS Economics for the Production of Eth*
80A000259	VIII	*Remarks on the*	*PROCESS Economics of Enzymatic Conversion*
80A000537	VI	*Alcohol Fuels Technology * Novel Continuous Fermentation*	*PROCESS for Ethyl Alcohol*

Citation Number	Subject Section	Citation Title	Title Keyword
80A003044	VI	New	PROCESS for Production of Absolute Alcohol
80A002154	V	a Fermentation	PROCESS for the Production of Acetone, Alco
78 : 003706	VIII	Preliminary Economic Evaluation of a	PROCESS for the Production of Fuel Grade Et
80A000673	XI	International Loss Prevention and Safety Promotion in the	PROCESS Industries Symposium * Inflammabi
80A002266	VI	Methanol	PROCESS Makes Production Possible in Small
80A001052	IV	oca Dev to Set Up Joint Venture with Brazilian Interests to	PROCESS Manioc into Fuel Alcohol
80 : 000217	VIII	els from Biomass * Reassessment of Economics of Cellulase	PROCESS Technology: for Production of Etha
80A000115	V	Distilling the News' New	PROCESS to Convert Recycled Newspapers into
80A000680	VI	Proceedings of the Eighth Cellulose Conference *	PROCESS-DEVELOPMENT Studies of the Enzymati
79 : 005707	VI	Report * Tsao-Purdue Process, Tilby Sugar Cane Separation	PROCESS, Hydrocarbon Extraction from Euphor
79 : 005707	VI	olume VI. Mission Addendum. Final Report * Tsao-Purdue	PROCESS, Tilby Sugar Cane Separation Proces
80A001088	VI	the Vacuferm	PROCESS: a New Approach to Fermentation Al
78 : 002739	VI	terial (Wood). II. Energy Conversion Efficiencies of the	PROCESSES
80 : 001987	VIII	iomass Energy Systems Conference * Biomass Based Methanol	PROCESSES
80A000254	VI	Cellulosic Materials as Substrates for Enzymatic Conversion	PROCESSES
80A000595	VI	oping Countries * Distillation, Rectification, Low Energy	PROCESSES
80A000688	IV	cessing, Workshop * Large-scale Cassava Starch Extraction	PROCESSES
80A001113	V	New Opportunities for Fuel from Biological	PROCESSES
80A001178	II	ergy Conversion * Feedstocks for Large-scale Fermentation	PROCESSES
80A001189	I	vs. Methanol as a Liquid Fuel Product from Waste Conversion	PROCESSES
80A002065	VI	the Feasibility of Basic Chemicals for Fermentation	PROCESSES
78 : 002268	V	Silvicultural Biomass Farms. Volume V. Conversion	PROCESSES and Costs
80A000716	VI	Biophysics and Biotechnology in Finland * Development of	PROCESSES for Industrial Production of Enzy
80A000473	VI	nversion * the Competition between Microbial and Chemical	PROCESSES for the Manufacture of Basic Chem
80A000658	IX	* Some Factors Affecting the Compression and Combustion	PROCESSES in Alcohol-diesel Oil Dual Fuel E
80A002278	VI	Distillation of Alcohol from Farm Products, Including the	PROCESSES of Malting...etc., with Chapters
80A000426	VI	Low-energy	PROCESSES Vie for Ethanol — Plant Market
80A000535	V	Fuels Technology * the Production of Methanol from Wood,	PROCESSES, Foresting and Economics
80A000502	I	ew Zealand — the Energetics and Economics of Production and	PROCESSING
79 : 005181	III	Sugar Crops as a Source of Fuels. Volume II.	PROCESSING and Conversion Research. Final
80A002238	IX	Encyclopedia of Chemical	PROCESSING and Design * Alcohol, Methanol
80A000113	VI	Distillery Fuel Savings by Efficient Molasses	PROCESSING and Stillage Utilization
80A000739	III	Alcohol Fuel Technology: Methanol and Ethanol * Direct	PROCESSING of Sugar Cane into Ethanol
80A001087	VI	atic Hydrolysis * Preliminary Assessment of an Integrated	PROCESSING Scheme
80 : 001948	II	erial Availability Reports * Availability of Agricultural	PROCESSING Wastes for Utilization as a Feed
80A000687	IV	Cassava Harvesting and	PROCESSING, Workshop * Alcohol Production
80A000688	IV	Cassava Harvesting and	PROCESSING, Workshop * Large-scale Cassav
80A000689	IV	Cassava Harvesting and	PROCESSING, Workshop * Prospects of Cassa
80A000419	VI	the Squabble over a Sugarcane	PROCESSOR
80A000323	IX	Single-cylinder	PROCO Engine Studies — Fuel and Engine Cali
80A000487	VI	uncil Annual Meeting * Adaptation of Geothermal Energy to	PRODUCE Alcohol from Agricultural Commoditi
80A000425	I	Gasohol * Alcohol Fuel: Likely to	PRODUCE More Problems than Benefits
80A000208	VIII	Gasohol Likely to	PRODUCE More Problems than Benefits for Pet
80A002098	VIII	Gasohol: Does It or Doesn't It	PRODUCE Positive Net Energy?
80 : 000214	VI	on Fuels from Biomass * Anaerobic Biomass Degradation to	PRODUCE Sugars, Fuels and Chemicals
80A000062	IX	Brazil — Gearing Up to	PRODUCE the All Alcohol Car
80A000261	VI	Renewable Fuels — Ethanol	PRODUCED by Fermentation
80A000594	I	ntries * Advantages and Limitations of the Use of Alcohol	PRODUCED by Fermentation as Fuel in Develop
80A000300	VIII	Study Indicates that	PRODUCING Alcohol from Crops Would Resul
80A000122	VIII	Don't Be Fuelish:	PRODUCING Gasohol Will Be Expensive
80A001189	I	Synthetic Oil vs. Methanol as a Liquid Fuel	PRODUCT from Waste Conversion Processes
76 : 001911	I	ls * Review of Energy Available and Technology for Energy	PRODUCTION

Citation Number	Subject Section	Citation Title	Title Keyword
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80 : 001951	V	Potential Availability of Wood as a Feedstock for Methanol	PRODUCTION
80 : 001952	VIII	Material Availability Reports * Cropland Reserve for Fuel	PRODUCTION
80A000042	VI	Comments on Cellulase	PRODUCTION
80A000274	VI	Saccharification of Cassava for Ethyl Alcohol	PRODUCTION
80A000432	VI	High Productivity Fermentation for Ethanol	PRODUCTION
80A000449	V	Utilization of Cellulosic Waste for Energy	PRODUCTION
80A000452	VI	Fuel from Farms * a Guide to Small Scale Ethanol	PRODUCTION
80A000459	VIII	Preliminary Analysis of Economics of Scale in Grain Alcohol	PRODUCTION
80A000483	VI	ysis of Cellulosic Wastes to Fermentable Sugars for Alcohol	PRODUCTION
80A000527	VIII	* Economics of Methanol in Motor Fuel — Value and Cost of	PRODUCTION
80A000574	VI	errelationships between Fermentation Parameters and Ethanol	PRODUCTION
80A000580	I	in Developing Countries * Aspects of Fermentation Alcohol	PRODUCTION
80A000666	VI	Kinetic and Dynamic Studies of Trichoderma Viride Cellulase	PRODUCTION
80A000708	VI	tive Fuel * Potential Long Range Improvements in Methanol	PRODUCTION
80A000719	VI	as a Chemical and Energy Resource * Continuous Cellulose	PRODUCTION
80A000746	VII	of Distillers Dried Grains with Solubles in Feeds for Egg	PRODUCTION
80A001098	VIII	Net Energy Analysis of Ethanol	PRODUCTION
80A001129	VI	Pilot Scale Investigations and Economics of Cellulase	PRODUCTION
80A001226	VI	Small-scale Fuel Alcohol	PRODUCTION
80A002156	II	Western Wastes as Materials for Alcohol	PRODUCTION
80A002210	VI	How to Convert Brewery to Industrial Alcohol	PRODUCTION
80A002225	II	Raw Materials for Industrial Alcohol	PRODUCTION
80A003020	VI	a Learning Guide for Alcohol Fuel	PRODUCTION
80A003053	VI	Saccharification of Wheat by Fungal Amylases for Alcohol	PRODUCTION
80A003057	IV	Wheat as Raw Material for Alcohol	PRODUCTION
80A003093	XI	Safety Standards in Fuel Alcohol	PRODUCTION
80A003094	V	tocks with Starch and Sugar-based Raw Materials for Alcohol	PRODUCTION
80A003099	VIII	Corn Prices and Alcohol	PRODUCTION
80A002146	I	Gasohol for Energy	PRODUCTION * Energy Technology Series
80 : 002045	III	Photosynthetic Pathway and Biomass Energy	PRODUCTION * Pineapple
80A000676	I	Hydrogen Energy * Sources and Methods for Methanol	PRODUCTION * Proceedings of the Hydrogen
77 : 000111	V	Solar Energy Fixation by Plants and Synthetic Fuel	PRODUCTION * Production of Ethanol from M
80 : 002131	II	Fuels from Biomass: Plants for Ethanol	PRODUCTION * Technical Report No. 4
80 : 001948	II	al Processing Wastes for Utilization as a Feedstock for the	PRODUCTION Alcoholic Fuels
80A001176	VIII	or Solar-related Technologies * Volume IX. Biomass Fuels	PRODUCTION and Conversion Systems
80A002076	VI	B-Glucosidase: Microbial	PRODUCTION and Effect on Enzymatic Hydrolys
80A000446	XI	Seminar Proceedings Environmental Evaluation "Gasohol"	PRODUCTION and Health Effects
80A000502	I	om Biomass in New Zealand — the Energetics and Economics of	PRODUCTION and Processing
80A001207	VI	Individual and Group Gasohol-alcohol Fuel	PRODUCTION and Usage
80A002221	IX	Alcohol Motor Fuels,	PRODUCTION and Use
80A001205	I	Ethyl Alcohol	PRODUCTION and Use as a Motor Fuel * Chem
80A002270	I	Bibliography on Alcohol	PRODUCTION and Use of Agricultural Crops as
80A001016	IX	API to Support Further R&D into	PRODUCTION and Use of Alcohol Fuels
80A003009	IV		PRODUCTION and Use of Fuel Ethanol from Cor
80A002313	I		PRODUCTION and Use of Grain Alcohol as a Mo
80A002241	I	the	PRODUCTION and Use of Power Alcohol in Asia
80A003065	I	Industrial Alcohol	PRODUCTION and Uses in the Phillipines
80A002240	I	Power Alcohol, Its	PRODUCTION and Utilization * Oxford Techn
80A002287	VI	Ethanol	PRODUCTION and Utilization by Aphelenchus
80A001204	I	Ethanol	PRODUCTION and Utilization for Fuel
80A000606	III	and Chemical Feedstock in Developing Countries * Molasses	PRODUCTION and Utilization Potential in Tan

Citation Number	Subject Section	Citation Title	Title Keyword
80A002075	VI	*Glucose*	*PRODUCTION by Biochemical Hydrolysis of Mes*
80A000385	VI	*Fuel and Energy*	*PRODUCTION by Bioconversion of Waste Materi*
80A000135	VI	*the Effect of Discontinuous Feeding on Ethanol*	*PRODUCTION by Saccharomyces Cerevisiae (Yea*
80A000665	VI	*Enzymatic Hydrolysis of Cellulose * Growth and Cellulase*	*PRODUCTION by Trichoderma*
80A000022	VI	*Cellulase*	*PRODUCTION by Trichoderma Viride*
80A000251	VI	*a Method for Increasing Cellulase*	*PRODUCTION by Trichoderma Viride*
80A001001	X	*Alcohol*	*PRODUCTION for Fuel Is Backed by House Comm*
80A000346	VI	*Sugar*	*PRODUCTION from Agricultural Woody Wastes B*
80A003087	I	*Fuel Alcohol*	*PRODUCTION from American Farm and Forest Re*
79 : 007163	VIII	*Perspectives on the Economic Analysis of Ethanol*	*PRODUCTION from Biomass*
80A000357	VIII	*Perspectives on the Economic Analysis of Ethanol*	*PRODUCTION from Biomass*
80A000507	V	*ls Technology * Some Implications of Large-scale Methanol*	*PRODUCTION from Canadian Forest Biomass*
80A000687	IV	*Cassava Harvesting and Processing, Workshop * Alcohol*	*PRODUCTION from Cassava*
80A000088	VI	*Efficiencies of Methanol*	*PRODUCTION from Gas, Coal, Waste or Wood*
80A000736	VI	*and Ethanol * Economical and Technical Aspects of Ethanol*	*PRODUCTION from Maniok*
80A000299	VI	*tion of Tower Type Fermentor with 2-fluid Nozzle to Biomass*	*PRODUCTION from Methanol*
80A000299	VI	*Studies on Biomass*	*PRODUCTION from Methanol. Application of T*
80A002201	III	*Alcohol*	*PRODUCTION from Molasses*
80A002208	V	*Alcohol*	*PRODUCTION from Sisal (Agaves)*
78 : 001809	VIII	*Economic Pre-feasibility Study: Large-scale Methanol Fuel*	*PRODUCTION from Surplus Canadian Forest Bio*
78 : 002269	V	*Economic Pre-feasibility Study: Large-scale Methanol Fuel*	*PRODUCTION from Surplus Canadian Forest Bio*
80A000430	X	*New Gasohol Plan Sets High*	*PRODUCTION Goal*
80A000579	X	*Developing Countries * Potential for Fermentation Alcohol*	*PRODUCTION in Belize*
80A000528	VIII	*the Energetics of Alternative Biomass Sources for Ethanol*	*PRODUCTION in Brazil*
80A002136	IX	*Effect of Water on Nitric Oxide*	*PRODUCTION in Gas Turbine Combustors*
80A001209	VI	*a Manual on Ethanol and Gasohol*	*PRODUCTION in Louisiana*
80A000722	VIII	*in New Zealand * Some Aspects of the Economics of Ethanol*	*PRODUCTION in New Zealand*
80A000023	VI	*Cellulase*	*PRODUCTION in Semisolid Cultures of Trichod*
80A002178	VI	*Improvements in*	*PRODUCTION of Absolute Alcohol*
80A003044	VI	*New Process for*	*PRODUCTION of Absolute Alcohol*
80A002179	VI		*PRODUCTION of Absolute Alcohol by Melle Pro*
80A002154	V	*a Fermentation Process for the*	*PRODUCTION of Acetone, Alcohol, and Volatil*
80 : 002118	VI	*into Energy Chemicals and Microbial Protein * Method for*	*PRODUCTION of Alcohol Directly from Cellulo*
80A002132	VI	*Alternatives for Energy Savings at Plant Level for the*	*PRODUCTION of Alcohol for Use as Automotive*
80A002236	V	*Industrial Fermentations * the*	*PRODUCTION of Alcohol from Wood Waste * C*
80A003023	VI	*Manual for the Home and Farm*	*PRODUCTION of Alcohol Fuels*
80 : 001960	II	*Retrospective Search on the Biochemical*	*PRODUCTION of Alcohol Fuels * Compilation*
80 : 001950	III	*al Availability Reports * Availability of Sugar Crops for*	*PRODUCTION of Alcohol Fuels. Final Report*
80A001142	VI		*PRODUCTION of Cellulase by Trichoderma*
80A001236	VI	*Cellulases and Their Applications * the*	*PRODUCTION of Cellulases*
78 : 001832	V	*Biomass and Wastes * Utilization of Waste Cellulose for*	*PRODUCTION of Chemical Feedstocks via Acid*
79 : 001106	VI	*Cellulosic Biomass and Its Subsequent Utilization for the*	*PRODUCTION of Chemical Feedstocks. Progre*
80A000442	V	*the Potential of Lignocellulosic Materials for the*	*PRODUCTION of Chemicals, Fuels, and Energy*
80A000716	VI	*logy in Finland * Development of Processes for Industrial*	*PRODUCTION of Enzymes*
78 : 002267	VI	*Pilot Plant Studies of the Bioconversion of Cellulose and*	*PRODUCTION of Ethanol*
79 : 004131	VI	*Development Studies on the Bioconversion of Cellulose and*	*PRODUCTION of Ethanol*
80 : 002130	III	*ium saman Benth. (Rain Tree) Fruits as Raw Material for the*	*PRODUCTION of Ethanol*
80A000384	VI	*Fermentation Kinetics and Process Economics for the*	*PRODUCTION of Ethanol*
80A002294	VIII	*Economics of the*	*PRODUCTION of Ethanol*
80A003056	VI		*PRODUCTION of Ethanol*
80A000360	VIII		*PRODUCTION of Ethanol and Vegetable Protein*
80A000735	VIII	*posium on Alcohol Fuel Technology: Methanol and Ethanol **	*PRODUCTION of Ethanol by the Fermentation*

Citation Number	Subject Section	Citation Title	Title Keyword
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80 : 000217	VIII	sessment of Economics of Cellulase Process Technology: for	PRODUCTION of Ethanol from Cellulose
80A002263	VI	the	PRODUCTION of Ethanol from Farm Crops
77 : 000111	V	Energy Fixation by Plants and Synthetic Fuel Production *	PRODUCTION of Ethanol from Materials Contai
80A000738	VI	Alcohol Fuel Technology: Methanol and Ethanol * Direct	PRODUCTION of Ethanol from Sugar Cane
79 : 004125	VI	Material and Energy Balances in the	PRODUCTION of Ethanol from Wood
80A000591	I	hemical Feedstock in Developing Countries * Trends in the	PRODUCTION of Ethyl Alcohol by Fermentation
78 : 002733	IV		PRODUCTION of Ethyl Alcohol from Babassu
80 : 002077	VI	Substances into Energy Chemicals and Microbial Protein *	PRODUCTION of Ethyl Alcohol from Cellulose
80A000581	VIII	eedstock in Developing Countries * Energy Balance for the	PRODUCTION of Ethyl and Methyl Alcohol
80A003071	V	Utilization of Wood for	PRODUCTION of Foodstuffs, Alcohol and Gluco
80A002267	I	Biomass Energy Refineries for	PRODUCTION of Fuel and Fertilizer
80A000003	V	ere Be Effective Utilization of Cellulosic Feedstock in the	PRODUCTION of Fuel Grade Ethanol
78 : 003706	VIII	Preliminary Economic Evaluation of a Process for the	PRODUCTION of Fuel Grade Ethanol by Enzymat
80A001221	VIII	On-farm	PRODUCTION of Fuel-alcohol in mid-America —
80A000732	VI	ol and Ethanol * Methanol Synthesis and Possibilities for	PRODUCTION of Fuel-methyl
80A000262	I	Renewable Resources for the	PRODUCTION of Fuels and Chemicals
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80A001143	VI		PRODUCTION of Glucose by Enzymatic Hydrolys
80A002157	VI	Mold Bran Aids	PRODUCTION of Grain Alcohol
80A000532	VII	International Symposium on Alcohol Fuels Technology * the	PRODUCTION of Grain Alcohol and Electric Po
80A003054	IV		PRODUCTION of Industrial Alcohol from Grain
80A000050	VIII	Critical Analysis of the Technology and Economics for the	PRODUCTION of Liquid and Gaseous Fuels from
80 : 000216	VI	from Biomass * Thermophilic Degradation of Cellulose for	PRODUCTION of Liquid Fuels
80A000577	VIII	Action between Energy Accounting and Cost Accounting in the	PRODUCTION of Liquid Fuels from Biological
80 : 002001	I	3rd Annual Biomass Energy Systems Conference * Biological	PRODUCTION of Liquid Fuels from Biomass.
80 : 001983	VI	3rd Annual Biomass Energy Systems Conference *	PRODUCTION of Liquid Fuels from Cellulosic
78 : 002739	VI		PRODUCTION of Liquid Transport Fuel from Ce
80A002310	V		PRODUCTION of Liquid Transport Fuel from Ce
80A002314	V		PRODUCTION of Liquid Transport Fuel from Ce
80A000538	V	hird International Symposium on Alcohol Fuels Technology *	PRODUCTION of Methanol from Wood
80A000535	V	International Symposium on Alcohol Fuels Technology * the	PRODUCTION of Methanol from Wood, Processes
80A003045	III		PRODUCTION of Power Alcohol in Australia
76 : 001689	V		PRODUCTION of Solar Ethanol from Australian
80A000489	V	on of Southern Pine, Proceedings of a Symposium * Biomass	PRODUCTION of Southern Tree Plantations and
79 : 001110	VI	Fuels from Biomass Symposium *	PRODUCTION of Sugars and Ethanol Based on
80A000679	VI	Proceedings of the Eighth Cellulose Conference *	PRODUCTION of Sugars from Waste Cellulose B
80A003026	V	Maine Methanol * Collected Working Papers on the	PRODUCTION of Synthetic Fuel from Wood
80A002177	VI		PRODUCTION of 95-97 Per Cent Alcohol for Mo
80A000534	VIII	nology * a Comparative Economic Analysis of Alcohol Fuels	PRODUCTION Options
80A002266	VI	Methanol Process Makes	PRODUCTION Possible in Small Plants
79 : 002502	V	Proceedings Forest and Field Fuels Symposium * Canadian	PRODUCTION Potential — Fuel Grade Methanol F
78 : 001792	VIII	Biomass: a Cash Crop for the Future * Corn	PRODUCTION Practices
76 : 001878	I	Ethanol and Methanol:	PRODUCTION Schemes and Use as Fuels *
80A000486	II	erence and Exposition * American Agriculture — the Energy	PRODUCTION System — Gasohol
80A003014	VIII	Studies on the Economic Potential of On-farm Energy	PRODUCTION Systems * Univ. of Washington.
80A000671	I	Ethyl Alcohol	PRODUCTION Technique
80A000130	IV	the Economics of Ethyl Alcohol	PRODUCTION with Particular Reference to Pot
0 : 002125	III	Fuels from Biomass: Alcohol	PRODUCTION; Alcohol as a Motor Fuel Supplem
0A000582	VII	as Fuel and Chemical Feedstock in Developing Countries *	PRODUCTION, Application and Marketing of Co
76 : 001879	I	Methanol and Ethanol: Short History, Current	PRODUCTION, Future and Available Literature
80A000700	IX	Hydrogen as an Energy Vector: Its	PRODUCTION, Use and Transportation, Seminar

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000432	VI	High	PRODUCTIVITY Fermentation for Ethanol Produ
80A000354	V	Hydrolysis of Cellulosic Materials to Useful	PRODUCTS
80A000489	V	Tree Plantations and Its Conversion to Energy or Chemical	PRODUCTS
80A002271	II	Motor Fuels from Farm	PRODUCTS * U.S. Dept. of Agriculture. Mis
80A003115	IX	Properties of Ethyl Alcohol-air Mixture and Its Combustion	PRODUCTS * Univ. of Kentucky. Engineering
80 : 001960	II	ompilation of Abstracts on the Fermentation of Agricultural	PRODUCTS and Wastes to Alcohols
80A002020	V	Agricultural and Forest	PRODUCTS as Sources of Cellulose
80A002311	VII	the Recovery of Fermentation	PRODUCTS from Cellulose Wastes via Acid Hyd
80A002164	V	Fermentation	PRODUCTS from Cornstalks
80A002070	VI	Fermentation	PRODUCTS from Methanol
80A002273	X	ture of Using Alcohol Manufactured from Corn and Other Farm	PRODUCTS in Motor Fuel
80A002273	X	Use of Alcohol from Farm	PRODUCTS in Motor Fuel * U.S. Senate Docu
80A003034	IV	Potato	PRODUCTS Industry
80A000048	III	Conversion of Sugar Cane	PRODUCTS into Fuels and Chemical Feedstocks
80A002163	V	Fermentation	PRODUCTS of Cellulose
80A000600	I	as Fuel and Chemical Feedstock in Developing Countries *	PRODUCTS of Photosynthesis as Raw Material
79 : 005694	VI	Conversion of Biomass from Agriculture into Useful	PRODUCTS. Final Report
80A002278	VI	Practical Handbook on the Distillation of Alcohol from Farm	PRODUCTS, Including the Processes of Maltin
80A001255	IX	Nitric Oxide and Composition	PROFILES around Burning Droplets of Ethanol
80A000249	I	Methanol Technology and Economics * Chem. Eng.	PROG., Symp. Ser., V. 66, No. 98
80A000619	I	Methanol Technology and Economics * Chem. Eng.	PROG., Symp. Ser., V. 66, No. 98
80A001244	VI	Mathematical Model of the Methanol Synthesis * Chem. Eng.	PROG., Symp. Ser., V. 66, No. 98
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79 : 007131	X	Brazil's Gasohol	PROGRAM
80A000231	X	Maryland County Establishes Alcohol Fuels	PROGRAM
80A000691	X	nce at the Royal Society * the Brazilian National Alcohol	PROGRAM
80A002295	VIII	Some Economic Aspects of a Corn-alcohol Fuel	PROGRAM
80A000723	X	a General History of the Nebraska Grain Alcohol and Gasohol	PROGRAM * Proceedings of the Symposium,
80A001219	X	Fuels from Biomass	PROGRAM * Program Summary
80A001174	X	Mission Analysis for the Federal Fuels from Biomass	PROGRAM * Volume IV. Thermochemical Conv
80A000540	IX	national Symposium on Alcohol Fuels Technology * Research	PROGRAM "Alcoholic Fuels for Road Traffic"
77 : 002067	I	Fuels from Biomass Program:	PROGRAM and Project Status
80A002090	VI	History of Cellulase	PROGRAM at U.S. Army Natick Development Cen
80A000013	X	Carter Gas-from-grain	PROGRAM Needs Congress, Business Help
80A000364	X	Alcohol Fuels	PROGRAM Plan
80A001219	X	Fuels from Biomass Program *	PROGRAM Summary
79 : 005707	VI	Mission Analysis for the Federal Fuels from Biomass	PROGRAM. Volume VI. Mission Addendum.
80A000405	X	Recommendations for a Synthetic Fuels Commercialization	PROGRAM. Volume III. Technology and Recom
79 : 004141	VI	Mission Analysis for the Federal Fuels from Biomass	PROGRAM. Volume V. Biochemical Conversion
79 : 006441	VIII	Agricultural Adjustments to Brazil's Alcohol	PROGRAM: a Regional Economic Analysis
80A001075	X	U.S. Details Gasohol	PROGRAM: Carter's Goal Is Rate of 5 Billio
77 : 002067	I	Fuels from Biomass	PROGRAM: Program and Project Status
80A000112	VII	illery Effluent Treatment in the Brazilian National Alcohol	PROGRAMME
80A000550	X	chnology * New Zealand's Methanol-gasoline Transport Fuel	PROGRAMME
80A000603	X	ing Countries * Possibilities of Developing a Nation Wide	PROGRAMME for Power Alcohol in Peru
77 : 001297	IX	Sun through Bioconversion * Volkswagen Alternative Fuel	PROGRAMS
80A000497	X	Compendium * Federal Agency and Department Alcohol Fuels	PROGRAMS
80A000484	X	on Alternative Energy Sources * Future of Alcohol Fuels	PROGRAMS in Brazil
80A002081	X	Government Impedes Gasohol	PROGRESS
80A002258	IX	Propulsion Systems: Held on April 18-22, 1977 * Recent	PROGRESS in Automotive Alcohol Fuel Applica
80A000451	VI	the Conversion of Agricultural By-products to Sugars *	PROGRESS Report

Citation Number	Subject Section	Citation Title	Title Keyword
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80A002254	IX	ne on Geometric Distribution * a Report by the Automotive	PROPULSION Systems Pilot Study
80A002255	IX	retted Spark Ignition Engine * a Report by the Automotive	PROPULSION Systems Pilot Study
80A002256	IX	gine-emission Control System * a Report by the Automotive	PROPULSION Systems Pilot Study
80A002257	IX	or Heavy-duty Diesel Engines * a Report by the Automotive	PROPULSION Systems Pilot Study
80A002258	IX	ive Alcohol Fuel Application * a Report by the Automotive	PROPULSION Systems Pilot Study
80A001229	IX	eedings of the Fourth International Symposium on Automotive	PROPULSION Systems: Held on April 18-22, I
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80A001231	IX	eedings of the Fourth International Symposium on Automotive	PROPULSION Systems: Held on April 18-22, I
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80A003012	I	Canadian Renewable Energy	PROSPECTS * Canada Dept. of Energy Mines
80A002290	I		PROSPECTS for Energy Farming
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80A000140	I	Energy Crisis Raises Doubts over the	PROSPECTS for Organic Raw Materials
80A000520	IX	national Symposium on Alcohol Fuels Technology * Mid-term	PROSPECTS for the Use of Alcohols as Motor
80A000689	IV	Cassava Harvesting and Processing, Workshop *	PROSPECTS of Cassava Fuel Alcohol in Brazil
80A000590	I	as Fuel and Chemical Feedstock in Developing Countries *	PROSPECTS of Developing Power Alcohol Indus
80A000635	IX	Future Automotive Fuels:	PROSPECTS, Performance, Perspective Symposi
80A001245	VIII		PROSPERITY Beckons * the Dawn of the Alco
80A001086	VI	* Fermentation of Hydrolysate to Ethanol and Single Cell	PROTEIN
80 : 002118	VI	Cellulosic Substances into Energy Chemicals and Microbial	PROTEIN * Method for Production of Alcoho
80 : 002077	VI	Cellulosic Substances into Energy Chemicals and Microbial	PROTEIN * Production of Ethyl Alcohol
80A000360	VIII	Production of Ethanol and Vegetable	PROTEIN by Grain Fermentation
80A000678	VII	he 9th National Conference on Wheat Utilization Research *	PROTEIN Concentrates from Distillers By-pro
80A000189	VI	Making Sugar and	PROTEIN from Trash
80A001233	VII	Enhancement of Food	PROTEIN Quality through Computer Blending —
80A001234	VII	Distillers' Feeds as	PROTEIN Sources for Beef Cattle
80A001233	VII	Quality through Computer Blending — the Competitiveness of	PROTEINS from the Alcohol Fermentation of C
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80A000637	I	(WATTEC) (Welding and Testing Technology) * Energy and the	PUBLIC * Alternative Fuels
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80A002234	X	Studies in Taxation,	PUBLIC Finance and Related Subjects *
80A001240	XI	tion of Technical Reports on the Biological Effects and the	PUBLIC Health Aspects of Atmospheric Pollut
80A001256	IX	Potential for Use of Alternative Fuels in Michigan's	PUBLIC Transit Systems
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80A000237	V	Methanol, Ethanol, and Acetone in Kraft	PULP Mill Condensate Streams. (Paper Indust
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A002272	VI	*Forget the Gas*	***PUMPS** — Make Your Own Fuel*
80A000204	VIII	*Gasohol*	***PUMPS** Do a Gushing Business: Drivers Line*
80A001124	X	*Pentagon Is Directed to*	***PURCHASE** Alcohol for Gasohol Industry*
79 : 001712	VI	*Preliminary Engineering and Cost Analysis of*	***PURDUE/TSAO** Cellulose-Hydrolysis (Solvent)*
80A000508	IX	** Experiences with the Utilization of Ethanol/Gasoline and*	***PURE** Ethanol in Brazilian Passenger Cars*
80A002239	I	*Ethyl Alcohol,*	***PURE** Ethyl Alcohol, Specially Denatured Alc*
80A002016	IX	*Development of a*	***PURE** Methanol Fuel Car*
80A000021	VI	*Cellobiose from Trichoderma Viride:*	***PURIFICATION**, Properties, Kinetics, and Mec*
80A002212	II	*Alcohol for Power*	***PURPOSES***
80A002243	I	*ventions for the Use of Alcohol for Illuminating or Heating*	***PURPOSES** or for Motor Power*
80A002063	IX	*a Farm Belt*	***PUSH** for "Gasohol"*
80A001035	V	*Big*	***PUSH** for a Biomass Bonanza*
80A000057	I	*Brazil Continues*	***PUSH** for Gasohol*
80A000620	I	*Methanol Technology and Economics * the*	***PVT** Behavior of Methanol at Elevated Pressu*
80A000047	VI	*on of Cellulose with Culture Filtrate of Trichoderma Viride*	***QM 6A***
80A000711	XI	*Environmental Aspects of Methanol as Vehicular Fuel: Air*	***QUALITY** Effects*
80A001233	VII	*Enhancement of Food Protein*	***QUALITY** through Computer Blending — the Com*
80A000025	V	*Cellulose to Sugars: Gives*	***QUANTITATIVE** Yield*
80A000415	IX	*Spark Ignited Combustion Engines Using Alternative Fuels —*	***QUASI** One-dimensional Modeling * Methanol*
80A000512	IX	*ternational Symposium on Alcohol Fuels Technology * Flame*	***QUENCHING** and Exhaust Hydrocarbons in a Com*
80A002058	IX	*Experimental Determination of the*	***QUENCHING** Distance of Methanol and Iso-octa*
80A000308	IX	*Kinetic Wall*	***QUENCHING** of Methanol Flames with Applicati*
80A000204	VIII	*usiness: Drivers Line Up for Fuel, but Efficiency Still in*	***QUESTION***
80A000216	VIII	*Methanol as a Fuel Still a Big*	***QUESTION***
80A002264	IX	*the State of Development in Germany of the Power-alcohol*	***QUESTION***
80A000557	I	*Fuels Technology * Alcohol Fuels: the Most Often Asked*	***QUESTIONS***
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80A001092	IX	*Volkswagenwerk Starts Test with 800 Methanol-fueled*	***RABBITS** in West Berlin*
80A001262	IX	*Clean Air Car*	***RACE** — 1970, a Summary Report*
80A000358	IX	*Clean Air Car*	***RACE** Winners Announced*
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80A000321	IX		***RACING** Experiences with Methanol and Ethano*
80A001055	X	*Is There 'Synfuel' at the End of the*	***RAINBOW?***
80A000140	I	*Energy Crisis*	***RAISES** Doubts over the Prospects for Organi*
80A003013	IX	*Methanol as an Automobile Fuel **	***RAND** Corp. Paper No. 6303*
80A000710	IX	*Methanol as an Alternative Fuel * Methanol Fuel — Long*	***RANGE** Implication for Petro-chemicals*
80A000708	VI	*Methanol as an Alternative Fuel * Potential Long*	***RANGE** Improvements in Methanol Production*
80A000627	IX	*neering Conference * Design and Performance of a Baseline*	***RANKINE** Cycle Automobile*
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80A000257	VI		***RAPID** Ethanol Fermentations Using Vacuum an*
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80A000661	IX	*sium (International) on Combustion * Fuel Droplet Burning*	***RATES** at High Pressures*
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)A002130	IX	*Effect of Compression*	***RATIO** on Exhaust Emissions and Performance*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000393	I	*Methanol: a*	***RAW** Material for Synthesis and an Energy So*
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80 : 002130	III	*Pithecolobium saman Benth. (Rain Tree) Fruits as*	***RAW** Material for the Production of Ethanol*
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80A000140	I	*Energy Crisis Raises Doubts over the Prospects for Organic*	***RAW** Materials*
80A000737	VI	*ion of Sugar Solutions and of Mashes from Starch Containing*	***RAW** Materials*
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79 : 001713	V		***RAW** Materials Evaluation and Process Develo*
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80A003094	V	*rporating Cellulosic Feedstocks with Starch and Sugar-based*	***RAW** Materials for Alcohol Production*
80A002225	II		***RAW** Materials for Industrial Alcohol Produc*
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80A000681	VI	*th Cellulose Conference * Acid Hydrolysis and Dehydration*	***REACTIONS** for Utilizing Plant Carbohydrates*
80A002128	IX	*Driving Cycle Economy, Emissions and Photochemical*	***REACTIVITY** Using Alcohol Fuels and Gasoline*
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80A000100	IX	*Alcohol May Be*	***REALISTIC** Source of Automobile Fuel*
80A000128	VIII	*Economic*	***REALITIES** of Alcohol Fuels*
80A000584	I	*eveloping Countries * Necessary Conditions to Promote and*	***REALIZE** a Policy for Energy and Chemicals B*
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80A002153	VI	*Making Alcohol Fuel —*	***RECIPE** and Procedure*
80A000640	IX	*tes Section 1975 Fall Meeting * Analysis of Methanol as a*	***RECIPROCATING** Engine Fuel*
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80A000629	I		***RECORD** of the Tenth Intersociety Energy Con*
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80A003035	VII	*By-product*	***RECOVERY** — Pollution Control Measure in the*
80A002237	VII	*Proceedings 2nd Ontario Waste Conference **	***RECOVERY** and Use of Grain Distillery Stilla*
80A002311	VII	*the*	***RECOVERY** of Fermentation Products from Cell*
80A003055	VII		***RECOVERY** of Fermentation Residues as Feeds*
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80A002259	VI	*the Barbet Methods of Distillation and*	***RECTIFICATION***
80A000595	VI	*hemical Feedstock in Developing Countries * Distillation,*	***RECTIFICATION,** Low Energy Processes*
80A000257	VI	*Rapid Ethanol Fermentations Using Vacuum and Cell*	***RECYCLE** Saccharomyces Cerevisiae*
80A000115	V	*Distilling the News' New Process to Convert*	***RECYCLED** Newspapers into Glucose and Alcoh*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000555	I	ifferent Scenarios, Its Testing and Development of Hardware	REQUIRED for Alcohol Fuels
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80A000444	XI	Transportaion Fuel: Assessment of Environmental and Health	RESEARCH
80A000678	VII	eedings of the 9th National Conference on Wheat Utilization	RESEARCH * Protein Concentrates from Dist
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80A000683	V	Operations Office Department of Energy in the Use of Forest	RESIDUES for Energy
80A000379	V	the Feasibility of Utilizing Forest	RESIDUES for Energy and Chemicals
80A002273	X	from Secretary of Agriculture Transmitting, in Response to	RESOLUTION, Report Pertaining to Practicabi
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80A001100	VI	Cellulose as a Chemical and Energy	RESOURCE
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A002281	IX	Gasoline/Alcohol Blends * a Possible Fuel	RESOURCE for Minnesota
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80A000730	IX	Monograph on Alternate Fuel	RESOURCES * Effect of Methanol Addition T
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80A000672	IX		RESOURCES Challenge: Technological Thrust,
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80A000300	VIII	Study Indicates that Producing Alcohol from Crops Would	RESULT in Energy Loss
80A000488	IX	on * Kinetics of the Oxidation of Methanol: Experimental	RESULTS Semi-global Modeling and Mechanisti
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80A000179	I	Gasohol and Other Alternative Vehicle Fuels — in	RETROSPECT
80 : 001960	II		RETROSPECTIVE Search on the Biochemical Pro
80A000431	VIII	Fuels from Biomass — Energy Outlay versus Energy	RETURNS: a Critical Appraisal
80A000372	V	Converting Cellulosic Waste to Fuel: a Literature	REVIEW
80A000388	I	Fuels Technology: a State-of-the-art	REVIEW
80A001223	X	a Critique of the Report of the Alcohol Fuels Policy	REVIEW
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80A000602	I	as Fuel and Chemical Feedstock in Developing Countries *	REVIEW of Papers
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000625	XI	th Intersociety Energy Conversion Engineering Conference *	RISK Assessment of Energy Technology
80A000236	IX	Methanol Engine Revs Up for	ROAD Testing
80A003070	IX	Chassis-dynamometer and	ROAD Tests of Alcohol-gasoline Blends
80A002151	VI	Makin' It on the Farm: Alcohol Fuel Is the	ROAD to Independence
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80A000700	IX	nico Economic Study of the Use of Hydrogen and Methanol for	ROAD Transport
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80A001041	I	"Gasohol" Freshens the Air over Iowa, but May Rut the	ROADS, Too
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80A002143	I	Background Report on Ethanol's	ROLE in the Current Gasoline Crisis Present
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80A000268	V	the	ROLE of Forests as a Source of Solar Energy
80A001264	V	Forests for People: a Challenge in World Affairs * the	ROLE of Forests in Meeting World Energy Pro
80A000322	IX		ROLE of Methanol as a Clean Fuel
80A003118	VI		ROLE of the Chemist in Relation to the Futu
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80A000105	VI	Differential Speed Two	ROLL Mill Pretreatment of Cellulosic Materi
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80A000565	VI	oping Countries * Direct Hydrolysis of Wet Milled Cassava	ROOTS
80A000270	IV	the	ROOTS of Power: the Growing of Manioc in B
80A000271	VI	the	ROTORFERMENTOR
77 : 001079	I	Australia Examines New	ROUTES to Solar Energy Supply
80A003017	IX	Interpretation of Gas Chromatographic Spectra in	ROUTINE Analysis of Exhaust Hydrocarbons *
80A000690	I	Biomass for Energy: Conference at the	ROYAL Society * Canadian Biomass Perspect
80A000691	X	Biomass for Energy: Conference at the	ROYAL Society * the Brazilian National Al
80A000276	VIII	a	RUBARB over Gasohol
80A002078	IX	Goodyear Tire and	RUBBER Develops Gasoline/Alcohol/Water Auto
80A000539	X	n Alcohol Fuels Technology * What Do We Do When the Wells	RUN Dry?
80A000153	IX	Ford Motor Sets Outlays for Cars	RUN on Alcohol
80A001103	X	Why the Highway Fund May	RUN Out of Money
80A003092	V	Wood, a Front	RUNNER as an Alcohol Source
80A002084	I	Growing Fuel on the Farm May Help as the Oil	RUNS Out
80A000481	I	Capturing the Sun through Bioconversion * When the Oil	RUNS Out — a Survey of Our Primary Energy S
80A001041	I	"Gasohol" Freshens the Air over Iowa, but May	RUT the Roads, Too
80A001094	IX	Volvo,	SAAB Test Dual Fuels Engines
80A002299	IV	the Relation between Method of	SACCARIFICATION and Yields of Ethanol from
80 : 000223	VI	rom Biomass * Hypercellulolytic Mutants and Their Role in	SACCHARIFICATION
80A000026	VI	Cellulosic Substrates for Enzymatic	SACCHARIFICATION

Citation Number	Subject Section	Citation Title	Title Keyword
80A000727	VI	Physical and Chemical Pretreatments for Enhancing Cellulose	SACCHARIFICATION * Biotechnology and Bioe
80A000728	VI	Enzymatic Conversion of Cellulosic Materials * Cellulose	SACCHARIFICATION for Fermentation Industry
80A002155	VI	the	SACCHARIFICATION of Agricultural Residues —
80A000169	VI	Fungal Cellulases as an Aid for the	SACCHARIFICATION of Cassava
80A000274	VI		SACCHARIFICATION of Cassava for Ethyl Alcoh
80A002036	VI	Enzymatic	SACCHARIFICATION of Cellulose by Thermophil
80A001237	VI	Cellulases and Their Applications * Enzymatic	SACCHARIFICATION of Cellulose in Semi- and
80A000047	VI	Continuous Enzymatic	SACCHARIFICATION of Cellulose with Culture
80A002228	IV		SACCHARIFICATION of Grain Mashes for Alcoho
80 : 001986	VI	3rd Annual Biomass Energy Systems Conference * Enzymatic	SACCHARIFICATION of Waste Cellulose
80A003053	VI		SACCHARIFICATION of Wheat by Fungal Amylase
80A002250	V		SACCHARIFICATION of Wood
80A000260	VI	Remarks on	SACCHARIFICATION Technology
80A000275	VI		SACCHARIFICATION Technology: Summary
80A000346	VI	Sugar Production from Agricultural Woody Wastes by	SACCHARIFICATION with Trichoderma Viride Ce
80A002190	V	Kinetics of Wood	SACCHARIFICATION: Hydrolysis of Cellulose
80A000224	VI	Measurement of	SACCHARIFYING Cellulase
80A000257	VI	Rapid Ethanol Fermentations Using Vacuum and Cell Recycle	SACCHAROMYCES Cerevisiae
80A000135	VI	he Effect of Discontinuous Feeding on Ethanol Production by	SACCHAROMYCES Cerevisiae (Yeast)
80A001194	XI	Handbook of Laboratory	SAFETY
80A000437	XI	a Modal Economic and	SAFETY Analysis of the Transportation of Ha
80A000673	XI	1st International Loss Prevention and	SAFETY Promotion in the Process Industries
80A003093	XI		SAFETY Standards in Fuel Alcohol Production
80A002042	X	E.P.A. to Permit	SALE of Gasohol as Unleaded-gasoline Substi
80A002060	VIII	Exxon Puts Limits on Gasohol	SALES
80A000205	VIII	Gasohol	SALES in Area Increasing as Gas Prices Rise
80 : 002130	III	Pithecolobium	SAMAN Benth. (Rain Tree) Fruits as Raw Mate
80A001240	XI	of USSR Air Pollution Literature. Volume XI * Data for a	SANITARY Assessment of Methanol in Atmosphe
80A000723	X	* Proceedings of the Symposium, University of Santa Clara,	SANTA Clara, California
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79 : 006466	VIII	* Energy Analysis of Two Technologies: Gasohol and Solar	SATELLITE Power Station
80A002099	VIII	Gasohol: Does It	SAVE Energy?
80A001119	IX	Newest Fuel	SAVER: "Aquahol" Injection for Diesel Engi
80A002132	VI	Alternatives for Energy	SAVINGS at Plant Level for the Production
80A000113	VI	Distillery Fuel	SAVINGS by Efficient Molasses Processing an
80A000422	VIII	a New Way to Calculate the	SAVINGS from Fuels Substituted for Petroleu
80A000417	VIII	Alcohol Fuels — Energy	SAVIOR or Wastrel?
80A001019	VIII	Arco	SAYS It Test Markets Gasohol in Indiana, Ha
80A001048	IX	Gasohol No Help,	SAYS Top GM Engineer
80A000148	VI	Engineering Methanol Plant on a Fuel	SCALE
80A000452	VI	Fuel from Farms * a Guide to Small	SCALE Ethanol Production
80A000459	VIII	Preliminary Analysis of Economics of	SCALE in Grain Alcohol Production
80A001129	VI	Pilot	SCALE Investigations and Economics of Cellu
80A000531	VI	osium on Alcohol Fuels Technology * Engineering of a Fuel	SCALE Methanol Plant
80A000648	IX	Proceedings, 4th International Congress in	SCANDANAVIA on Chemical Engineering * Alc
80A000553	VIII	national Symposium on Alcohol Fuels Technology * Canadian	SCENARIO for Methanol Fuel
80A000552	X	ernational Symposium on Alcohol Fuels Technology * Future	SCENARIOS of Alcohols as Fuels in Brazil
80A000555	I	* Methanol, Its Precursors and/or Derivatives in Different	SCENARIOS, Its Testing and Development of H
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80A002231	V	Ethyl Alcohol from Waste Wood by Modified	SCHOLLER Process
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80A003114	VII	centrate By-products Feeding Stuffs * National Academy of	SCIENCES — National Research Council. Publi

Citation Number	Subject Section	Citation Title	Title Keyword
80A000233	IX	*Methanol as Gasoline Substitute Seen 'Unrealistic' by EPA*	***SCIENTIST***
80A000206	IX	*Gasohol — Should It Ever Go to*	***SEA?***
80A002262	X	*Made from Grain, Garbage: Congress Looks to Gasohol in*	***SEARCH** for Fuel Options*
80A000265	VIII	*Researchers Accelerate*	***SEARCH** for Way to Use Less Energy in Making*
80A002112	VIII	*in*	***SEARCH** of Alcohol for Gasohol*
80 : 001960	II	*Retrospective*	***SEARCH** on the Biochemical Production of Alc*
80 : 000188	I		***SECOND** Annual Symposium on Fuels from Bioma*
80 : 000189	V		***SECOND** Annual Symposium on Fuels from Bioma*
80 : 000191	VI		***SECOND** Annual Symposium on Fuels from Bioma*
80 : 000205	VIII		***SECOND** Annual Symposium on Fuels from Bioma*
80 : 000213	VI		***SECOND** Annual Symposium on Fuels from Bioma*
80 : 000214	VI		***SECOND** Annual Symposium on Fuels from Bioma*
80 : 000216	VI		***SECOND** Annual Symposium on Fuels from Bioma*
80 : 000217	VIII		***SECOND** Annual Symposium on Fuels from Bioma*
80 : 000223	VI		***SECOND** Annual Symposium on Fuels from Bioma*
80A001240	XI	*a Sanitary Assessment of Methanol in Atmospheric Air * a*	***SECOND** Compilation of Technical Reports on*
80A000716	VI	*Proceedings of the*	***SECOND** National Meeting on Biophysics and B*
78 : 002730	III	*Fuels from Sugar Crops.*	***SECOND** Quarterly Report*
80A000278	X		***SECOND** Thoughts on Brazil's Alcohol Plan*
80A000598	I	*emical Feedstock in Developing Countries * Fermentation —*	***SECOND** Way for Utilization of Vegetable Sou*
80A000660	IX	*gines Combustion * an Investigation of Using Alcohol as a*	***SECONDARY** Fuel in a Multicylinder Automotiv*
80A002273	X	*ate Document 57, 73rd Congress, 1st Session * Letter from*	***SECRETARY** of Agriculture Transmitting, in R*
80A000382	IX	*Fuels for Automotive Transportation. Volume II. Technical*	***SECTION***
80A000490	VIII	*Solar Diversification, Annual Meeting of ISES American*	***SECTION** * Policy Aspects of Biomass Utili*
80A000640	IX	*Combustion Institute Western States*	***SECTION** 1975 Fall Meeting * Analysis of M*
80A000639	IX	*Combustion Institute Western States*	***SECTION** 1975 Fall Meeting * Combustion an*
80A000470	IX	*Combustion Institute, Central States*	***SECTION**: Spring Meeting. Mimeographed Pap*
80A000471	IX	*Combustion Institute, Central States*	***SECTION**: Spring Meeting. Mimeographed Pap*
80A000363	VIII	*Agricultural*	***SECTOR** Impacts of Making Ethanol from Grain*
80 : 001961	VIII	*Preliminary Report on the Agricultural*	***SECTOR** Impacts of Obtaining Ethanol from Gr*
80A000137	X	*Energy and National*	***SECURITY**: a Status Report*
80A000060	I	*Brazil Exploits All Resources*	***SEEKING** Energy Independence*
80A001014	I	*API*	***SEES** Alcohol as Negative Factor in Energy S*
80A002145	I	*Alcohol as Fuel * References*	***SELECTED** from Current Awareness, 1977-1979*
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80A000457	I	*Methanol: a*	***SELECTIVE** Cross-disciplinary Bibliography*
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80A001066	I	*Lance Crombie Energy*	***SELF-SUFFICIENCY** Now!*
80A002115	VIII	*Indiana Standard to*	***SELL** Gasohol in the Midwest*
80A001147	VIII	*Meanwhile, 17 Connecticut Dealers Have Already Begun to*	***SELL** the Product*
80A001237	VI	*Applications * Enzymatic Saccharification of Cellulose in*	***SEMI-** and Continuously Agitated Systems*
80A000488	IX	*inetics of the Oxidation of Methanol: Experimental Results*	***SEMI-GLOBAL** Modeling and Mechanistic Concep*
80A001188	VI	*Making Alcohol Fuel * Mother's Alcohol Fuel*	***SEMINAR***
80A000700	IX	*an Energy Vector: Its Production, Use and Transportation,*	***SEMINAR** * Technico Economic Study of the*
80A000446	XI		***SEMINAR** Proceedings Environmental Evaluatio*
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80A002273	X	*Use of Alcohol from Farm Products in Motor Fuel * U.S.*	***SENATE** Document 57, 73rd Congress, 1st Sess*
80A001195	VIII	*ttee on Agriculture, Nutrition, and Forestry, United States*	***SENATE**, 95th Congress, 1st Session, Dec. 12*
80A000573	VIII	*and Chemical Feedstock in Developing Countries * Common*	***SENSE** Approach in Developing Fuel Alcohols*
80A001042	VIII	*Gasohol from Corn — Good*	***SENSE?***
80A000413	IX	*On-board*	***SENSOR** for Percent Alcohol*
80A000526	IX	*Utilization of Different Fuels in a Diesel Engine with Two*	***SEPARATE** Injection Systems*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000469	IX	*erience with Stratified Charge Engines Working with Initial*	***SEPARATION** of Mixture Components*
79 : 005707	VI	*Final Report * Tsao-Purdue Process, Tilby Sugar Cane*	***SEPARATION** Process, Hydrocarbon Extraction*
80A002074	VIII	*Getting*	***SERIOUS** About Gasohol*
80A001201	V	*of Agricultural Crop Residues * U.S. Agriculture Research*	***SERVICE** * an Annotated Bibliography of Se*
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80A000637	I	*ergy and the Public, Public Awareness Workshops and Plenary*	***SESSIONS,** at the 6th Annual Conference and*
80A000479	V	*Sharing the Sun: Solar Technology in the*	***SEVENTIES,** V. 7 * Silviculture Energy Pla*
80A000483	VI	*Symposium Papers (on) Clean Fuels from Biomass,*	***SEWAGE,** Urban Refuse, (and) Agriculture Was*
80A000479	V		***SHARING** the Sun: Solar Technology in the S*
80A001186	VI	*Basic Fermentation Chemistry in a Nut*	***SHELL***
80A001260	IX	*on of Methanol, Ethanol, the Propanols, and the Butanols as*	***SHIP** Propulsion Fuels*
76 : 001879	I	*Methanol and Ethanol:*	***SHORT** History, Current Production, Future*
80A001163	VIII	*Methanol and Energy*	***SHORTAGE** — a Feasibility Study of Manufact*
80A000207	VIII	*Gasohol (Solution to the Gas*	***SHORTAGE)***
80A000657	IX	*ngine Performance with Methanol as a Supplementary Fuel for*	***SI** and CI Engines*
80A000301	IX	*hanol Injection on Emission and Performance in a Carbureted*	***SI** Engine*
80A000332	IX	*Combustion of Methanol-gasoline Blends in a Single Cylinder*	***SI** Engine*
80A000642	IX	*ssion Ratio Effects on NOx Emissions from a Methanol Fueled*	***SI** Engine*
80A002292	IX	*acteristics of Low Octane Fuels Blended with Methanol in an*	***SI** Engine*
80A000288	IX	*Nitrogen-oxides Emissions Using Gasoline-methanol Blends in*	***SI** Engines*
80A000543	IX	*of Alcohols in Spark Ignited Internal Combustion Engines —*	***SIGNIFICANCE** for Electrostatic Carburetion*
80A001152	VII	*Treated with Chemicals, Corn Residue as Good Feed as Corn*	***SILAGE***
80A000272	VII		***SILAGE** Made from Sugarcane Bagasse Treated*
78 : 002268	V		***SILVICULTURAL** Biomass Farms. Volume V. C*
80A000479	V	*haring the Sun: Solar Technology in the Seventies, V. 7 **	***SILVICULTURE** Energy Plantations*
80A003095	VI		***SIMPLE** Batch Still*
79 : 004665	VIII	*thanol-gasoline Motor-fuel Mixtures: a Study in the Use of*	***SIMPLE** Logic*
80A000571	VI	*as Fuel and Chemical Feedstock in Developing Countries **	***SIMPLIFIED** and Economical Cassava Starch Pr*
80A000733	IX	*ontrasts in Terms of Fuel Economy and Exhaust Emissions for*	***SIMULATED** Driving Cycles with Methanol and*
80A001120	IX	*and Composition Measurements within Diffusion Flames around*	***SIMULATED** Ethanol and Ethanol-pyridine Drop*
80A002034	VI	*Enzymatic Hydrolysis of Cellulose and*	***SIMULTANEOUS** Fermentation to Alcohol*
80A001086	VI	*Hydrolysis * Fermentation of Hydrolysate to Ethanol and*	***SINGLE** Cell Protein*
80A000332	IX	*Lean Combustion of Methanol-gasoline Blends in a*	***SINGLE** Cylinder SI Engine*
80A000341	IX		***SINGLE** Cylinder Spark Ignition Engine Study*
80A000302	IX	*Emissions from a Methanol-fueled*	***SINGLE-CYLINDER** Engine*
80A002130	IX	*on Exhaust Emissions and Performance of a Methanol-fueled*	***SINGLE-CYLINDER** Engine*
80A000339	IX		***SINGLE-CYLINDER** Engine Evaluation of Methan*
80A002057	IX	*Exhaust Emissions from a*	***SINGLE-CYLINDER** Engine Fueled with Gasoline*
80A000340	IX		***SINGLE-CYLINDER** Engine Study of Methanol Fu*
80A003050	IX		***SINGLE-CYLINDER** Engine Tests of Substitute*
80A000323	IX		***SINGLE-CYLINDER** PROCO Engine Studies — Fuel*
80A002208	V	*Alcohol Production from*	***SISAL** (Agaves)*
80A000453	V	*Use of Agricultural Residues as an Energy Feedstock — a Ten*	***SITE** Survey * Volume I — Summary and Gene*
80A000476	IX	*ute of Technology International Combustion Symposium * in*	***SITU** Optical Measurement of Automobile Exha*
80A001014	I	*API Sees Alcohol as Negative Factor in Energy*	***SITUATION***
80A000608	VII	*and Chemical Feedstock in Developing Countries * Present*	***SITUATION** on the Utilization of By-products*
80A000306	IX	*Fuel Droplet*	***SIZE** Distribution in Diesel Combustion Cham*
80A000476	IX	*Optical Measurement of Automobile Exhaust Gas Particulate*	***SIZE** Distributions: Regular Fuel and Metha*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000194	VIII	*Gasohol Use Jumps Despite U.S.*	***SKEPTICS***
80A003063	VII	*Distillery*	***SLOP** as a Feed for Hogs*
80A002050	I	*Ethanol: It's a*	***SLOW**, Uphill Climb*
80A003107	VIII		***SMALL** Fuel Alcohol Distillery * General D*
80A001212	VIII	*the*	***SMALL** Fuel-alcohol Distillery * General D*
80A000315	IX	*Methanol, Ethanol and Jet Fuel Emissions Comparison from a*	***SMALL** Gas Turbine*
80A000693	IX	*Design and Development of*	***SMALL** Internal Combustion Engines * Futur*
80A000693	IX	*of Small Internal Combustion Engines * Future Fuels for*	***SMALL** Internal-combustion Engines*
80A002266	VI	*Methanol Process Makes Production Possible in*	***SMALL** Plants*
80A000095	I	*Alcohol Fuels Are No Longer*	***SMALL** Potatoes*
80A000452	VI	*Fuel from Farms * a Guide to*	***SMALL** Scale Ethanol Production*
80A001226	VI		***SMALL-SCALE** Fuel Alcohol Production*
80A000672	IX	*Resources Challenge: Technological Thrust,*	***SOCIAL** Impact * Alcohol as an Automotive*
80A000690	I	*Biomass for Energy: Conference at the Royal*	***SOCIETY** * Canadian Biomass Perspective:*
80A000691	X	*Biomass for Energy: Conference at the Royal*	***SOCIETY** * the Brazilian National Alcohol*
80A000272	VII	*Silage Made from Sugarcane Bagasse Treated with*	***SODIUM** Hydroxide*
80A002144	I		***SOLAR** Alcohol * the Fuel Revolution*
80A000283	I		***SOLAR** Biomass Energy an Overview of USA Pot*
79 : 002535	VIII		***SOLAR** Diversification. Vol. 2.1 * Bioma*
80A000490	VIII		***SOLAR** Diversification, Annual Meeting of*
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80A000268	V	*the Role of Forests as a Source of*	***SOLAR** Energy*
80A000686	III	*Using Sugar Crops to Capture*	***SOLAR** Energy*
79 : 000547	I		***SOLAR** Energy Conversion through Biology*
80A000284	I		***SOLAR** Energy Conversion through Biology: C*
77 : 000111	V		***SOLAR** Energy Fixation by Plants and Synthet*
76 : 001883	V	*Institution of Engineers 1976 Engineering Conference **	***SOLAR** Energy for Australia. the Role of B*
76 : 001711	I	*Strategy for*	***SOLAR** Energy Research in Australia*
77 : 001079	I	*Australia Examines New Routes to*	***SOLAR** Energy Supply*
78 : 001547	I	*Photosynthetic*	***SOLAR** Energy: Rediscovering Biomass Fuels*
76 : 001689	V	*Production of*	***SOLAR** Ethanol from Australian Forests*
79 : 006466	VIII	*lysis * Energy Analysis of Two Technologies: Gasohol and*	***SOLAR** Satellite Power Station*
80A000636	I		***SOLAR** Technology Exhibition and Conference,*
80A000479	V	*Sharing the Sun:*	***SOLAR** Technology in the Seventies, V. 7 **
80A000683	V		***SOLAR** 78 Northwest Conference Proceedings*
80A000462	X		***SOLAR** 79 Northwest * Alternate Energy Inc*
80A000463	V		***SOLAR** 79 Northwest * Biomass in the North*
80A001176	VIII	*Systems Descriptions and Engineering Costs for*	***SOLAR-RELATED** Technologies * Volume IX.*
80A000743	I	*Energy Primer:*	***SOLAR**, Water, Wind, and Biofuels * Alcoho*
80A001065	VI	*Kinetics of*	***SOLKA** Floc Cellulose Hydrolysis by Trichode*
80A000158	IX	*Fuel Blends Create*	***SOLUBILITY** Problems*
80A000285	VI		***SOLUBLE** and Immobilized Enzyme Technology*
80A000746	VII	*the Use of Distillers Dried Grains with*	***SOLUBLES** in Feeds for Egg Production*
80A000098	I	*the Alcohol-gasohol Fuel*	***SOLUTION***
80A000099	I	*Alcohol-gasohol Fuel*	***SOLUTION***
80A000114	VI	*Distilling a Better Fuel*	***SOLUTION***
80A003069	IX	*Critical*	***SOLUTION** Temperatures of Mixtures of Gasoli*
80A002286	VIII	*Alcohol as a*	***SOLUTION** to the Energy Crisis*
80A000427	IV	*Potato Alcohol * a*	***SOLUTION** to the Energy Crisis and Higher Pr*
80A002283	VIII	*Ethanol —*	***SOLUTION** to the Sugar Problem*
80A000692	I	*Papers for Planners * Barriers, Constraints, and Possible*	***SOLUTIONS** * Recommendations and Proceedin*
80A000737	VI	** Basic Data on Continuous Alcoholic Fermentation of Sugar*	***SOLUTIONS** and of Mashes from Starch Contain*

Citation Number	Subject Section	Citation Title	Title Keyword
80A002239	I	*Completely Denatured Alcohol and U.S. * I. Proprietary*	*SOLVENTS*
80A002235	XI	*Toxicity of Industrial Organic*	*SOLVENTS * Alcohols, Chapter*
80A001121	VI	*Non-aqueous*	*SOLVENTS of Cellulose*
80A000156	VI	*Former Brewery May*	*SOON Be Turning Corn to Gasohol*
80A000015	X	*Carter to Announce Gasohol Plan*	*SOON: Grain Diverted from Soviets Will Be*
80A001114	III	*New Options for Sweet*	*SORGHUM*
80A003088	III	*Alcohol Crop for the U.S. * Sweet*	*SORGHUM*
80A000349	III	*Sweet*	*SORGHUM — an Alcohol Crop for the U.S.*
80A000386	III	*ops: Report on System Study of Fuels from Sugarcane, Sweet*	*SORGHUM and Sugar Beets*
79 : 000540	III	*Fuels from Sugar Crops: Systems Study for Sugarcane, Sweet*	*SORGHUM, and Sugar Beets*
80A000499	III	*Systems Study of Fuels from Sugarcane, Sweet*	*SORGHUM, and Sugar Beets * Battelle Memor*
80A003133	III	*Systems Study of Fuels from Sugarcane, Sweet*	*SORGHUM, and Sugar Beets * Volume II, Agr*
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80A003135	III	*Systems Study of Fuels from Sugarcane, Sweet*	*SORGHUM, Sugar Beets, and Corn * Volume I*
79 : 001109	III	*rom Biomass Symposium * Systems Study of Sugarcane, Sweet*	*SORGHUM, Sugar Beets, and Corn for Fuels an*
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80A000284	I	*Conversion through Biology: Could It Be a Practical Energy*	*SOURCE*
80A000393	I	*Methanol: a Raw Material for Synthesis and an Energy*	*SOURCE*
80A001061	IV	*Artichoke Gets Attention as Possible Fuel Ethanol Alcohol*	*SOURCE*
80A003003	IV	*Cassava as an Energy*	*SOURCE*
80A003092	V	*Wood, a Front Runner as an Alcohol*	*SOURCE*
80A001046	I	*Gasohol — New Fuel*	*SOURCE from Mother Nature*
80A000100	IX	*Alcohol May Be Realistic*	*SOURCE of Automobile Fuel*
80 : 000244	V	*an Energy and Chemical Resource * Mesquite: a Possible*	*SOURCE of Energy*
80A000094	VIII	*Agriculture as a*	*SOURCE of Fluid Energy: Gasohol et al.*
79 : 005180	III	*Sugar Crops as a*	*SOURCE of Fuels. Volume I. Agricultural*
79 : 005181	III	*Sugar Crops as a*	*SOURCE of Fuels. Volume II. Processing*
80A003076	III	*Sugar Cane Bagasse as a*	*SOURCE of Industrial Alcohol*
80A003077	III	*Sugar Cane Bagasse as a*	*SOURCE of Industrial Alcohol*
80A003078	V	*Sugar Cane Bagasse as a*	*SOURCE of Industrial Alcohol*
80A003109	IV	*Potato Culls as a*	*SOURCE of Industrial Alcohol; with a Genera*
80A003036	IV	*Potatoes an Important*	*SOURCE of Motor Fuel in Germany*
80A002270	I	*hy on Alcohol Production and Use of Agricultural Crops as a*	*SOURCE of Motor Fuels*
80A002031	I	*Alcohol Fuels: a Major*	*SOURCE of Power Only a Few Years from Here*
80A000268	V	*the Role of Forests as a*	*SOURCE of Solar Energy*
80A000396	I	*Methanol as a Fuel in the Urban Energy Economy and Possible*	*SOURCE of Supply*
80A002167	V	*Wood Hydrolysis to Become*	*SOURCE of War Alcohol*
80A002284	III	*Alcohol Fuel from Sugarcane (for an Alternative Energy*	*SOURCE) — Is It Economic?*
80A000144	II	*Energy — New Crop*	*SOURCES*
80A000598	I	** Fermentation — Second Way for Utilization of Vegetable*	*SOURCES*
80A001163	VIII	*Study of Manufacturing Synthetic Fuel from Available Energy*	*SOURCES*
80A000484	X	*2nd Miami International Conference on Alternative Energy*	*SOURCES * Future of Alcohol Fuels Program*
80A000485	IX	*2nd Miami International Conference on Alternative Energy*	*SOURCES * Thermodynamic Calculations for*
80A000676	I	*Hydrogen Energy **	*SOURCES and Methods for Methanol Production*
80A000481	I	** When the Oil Runs Out — a Survey of Our Primary Energy*	*SOURCES and the Fuel We Can Make from Them*
80A001234	VII	*Distillers' Feeds as Protein*	*SOURCES for Beef Cattle*
80A000528	VIII	*Fuels Technology * the Energetics of Alternative Biomass*	*SOURCES for Ethanol Production in Brazil*
80A000440	I	*an Overview of Alternative Energy*	*SOURCES for LDCs*
80A001218	II		*SOURCES of Alcohol Fuels for Vehicle Tests*
80A002020	V	*Agricultural and Forest Products as*	*SOURCES of Cellulose*

Citation Number	Subject Section	Citation Title	Title Keyword
80A003009	IV	*Production and Use of Fuel Ethanol from Corn or Wheat **	*SOURCES of Energy*
80A001036	VIII	*Biochemical Engineering: Renewable*	*SOURCES of Energy and Chemical Feedstocks*
80A001235	II	*Sugarcane versus Corn versus Ethylene as*	*SOURCES of Ethanol for Motor Fuels and Chem*
80A001032	VIII	*Incentive for Finding Fuel Is Plain Greed (Developing New*	*SOURCES)*
80A001043	III	*Gasohol from Sugarcane (Saccharum Spontaneum, Energy*	*SOURCES)*
80A002260	VIII	*Gasohol — a Critical Choice (Fuel, Energy*	*SOURCES)*
80A000467	IX	*Proceedings...53rd Annual Congress,*	*SOUTH African Sugar Technologists Associati*
80A000468	III	*Proceedings...53rd Annual Congress,*	*SOUTH African Sugar Technologists Associati*
80A000489	V	*Complete Tree Utilization of*	*SOUTHERN Pine, Proceedings of a Symposium*
80A000489	V	*pine, Proceedings of a Symposium * Biomass Production of*	*SOUTHERN Tree Plantations and Its Conversio*
80A000292	IV		*SOVIET Grain for Gasohol*
80A000015	X	*Carter to Announce Gasohol Plan Soon: Grain Diverted from*	*SOVIETS Will Be Used*
80A000375	IX	*Energy Carriers in*	*SPACE Conditioning and Automotive Applicati*
80A000628	IX	*gy Conversion Engineering Conference * Energy Carriers in*	*SPACE Conditioning and Automotive Applicati*
80A000684	IX	*Optimized Combustion in a Methanol — Fuelled*	*SPARK — Ignition Engine and Its Effect on M*
80A000423	VI	*Alcohol Fuels*	*SPARK Construction Plans*
80A000415	IX	*Performance and NOx Emissions of*	*SPARK Ignited Combustion Engines Using Alte*
80A002014	IX	*of Individual Aldehyde Concentrations in the Exhaust of a*	*SPARK Ignited Engine Fueled by Alcohol/Gaso*
80A000543	IX	*ogy * Calculations Relevant to the Fueling of Alcohols in*	*SPARK Ignited Internal Combustion Engines —*
80A000643	IX	*Methanol, Methanol-water, and Gasoline-methanol Blends in u*	*SPARK Ignition Engine*
80A002255	IX	*ns, Methanol, and Formaldehyde Emissions from a Carburetted*	*SPARK Ignition Engine * a Report by the*
80A000734	IX	*mparison of Gasoline, Methanol, and Methanol/Water Blend as*	*SPARK Ignition Engine Fuels*
80A000341	IX	*Single Cylinder*	*SPARK Ignition Engine Study of the Octane,*
80A000560	IX	*Alcohol Fuels Technology * Formaldehyde Emissions from a*	*SPARK Ignition Engine Using Methanol*
80A000308	IX	*etic Wall Quenching of Methanol Flames with Applications to*	*SPARK Ignition Engines*
80A000331	IX	*ustion and Exhaust Emissions of Lean Mixtures in Automotive*	*SPARK Ignition Engines*
80A000515	IX	*deling of Methanol Combustion Phenomena with Application to*	*SPARK Ignition Engines*
80A001160	IX	*Future Fuels and Mixture Preparation Methods for*	*SPARK Ignition Engines*
80A000730	IX	*el Resources * Effect of Methanol Addition to Gasoline on*	*SPARK Ignition, Carburetted Engine Performa*
80A000448	IX	*Fuel Consumption, NOx and HC Emissions of the Conventional*	*SPARK-IGNITED Engine*
80A001227	IX	*Emergency Fuel Substitutes for*	*SPARK-IGNITION Engines*
80A002307	IX	*the Effects of Oxy:hydrocarbon Fuels on Exhaust from*	*SPARK-IGNITION Engines*
80A002316	IX	*Engine Performance and Exhaust Emission Characteristics of*	*SPARK-IGNITION Engines Burning Methanol and*
80A000715	IX	*er Plants and Future Fuels * Performance and Emissions of*	*SPARK-IGNITION Engines Operating with Alcoh*
80A000741	IX	*Methanol and Ethanol * Fuel Converter with Methanol for*	*SPARK-IGNITION Internal Combustion Engine*
80A000209	VI	*Gasohol*	*SPARKS Study on New Ethanol Plant*
80A000398	IX	*Methanol as an Automotive Fuel with*	*SPECIAL Emphasis on Methanol-gasoline Blend*
80A002239	I	*Ethyl Alcohol, Pure Ethyl Alcohol,*	*SPECIALLY Denatured Alcohol, Completely Den*
80A001246	XI	*Volatile Organic Compound (VOC)*	*SPECIES Data Manual*
80A003017	IX	*Interpretation of Gas Chromatographic*	*SPECTRA in Routine Analysis of Exhaust Hydr*
77 : 001296	I	*Capturing the Sun through Bioconversion **	*SPEECH Held in Washington, March 11, 1976,*
80A000105	VI	*Differential*	*SPEED Two Roll Mill Pretreatment of Cellulo*
80A001231	IX	*ve Propulsion Systems: Held on April 18-22, 1977 * Flame*	*SPEEDS, Performance, and Emissions with Met*
80A000071	VIII	*Brazil to*	*SPEND $5 Billion on Alcohol Fuels Project*
80A002041	XI	*EPA*	*SPENDS $500,000 to Study Environmental Impa*
80A003072	I	*Fermentation*	*SPHINX and Kobold Alcohol*
80A003073	VI	*Fermentation*	*SPHINX and Kobold Alcohol*
80A003074	VI	*Fermentation*	*SPHINX and Kobold Alcohol*
80A003075	VI	*Fermentation*	*SPHINX and Kobold Alcohol*
80A000562	XI	*Fuels Technology * Environmental Consequences of Methanol*	*SPILLS and Methanol Fuel Emissions on Terre*
80A000742	XI	*Methanol and Ethanol * Biological Effects of Methanol*	*SPILLS into Marine, Estuarine, and Freshwat*
80A001206	VI	*Alcohol Distiller's Manual for Gasohol and*	*SPIRITS*

Citation Number	Subject Section	Citation Title	Title Keyword
80A002224	IX	*Motor*	*SPIRITS and Light Distillates*
80A001043	III	*Gasohol from Sugarcane (Saccharum*	*SPONTANEUM, Energy Sources)*
80A000470	IX	*Combustion Institute, Central States Section:*	*SPRING Meeting. Mimeographed Papers * Me*
80A000471	IX	*Combustion Institute, Central States Section:*	*SPRING Meeting. Mimeographed Papers * Ne*
80A000389	XI	*rd Evaluation/Toxicity Determination: Trantex Corporation,*	*SPRINGFIELD, Massachusetts*
80A000427	IV	** a Solution to the Energy Crisis and Higher Prices for*	*SPUDS?*
80A002025	VIII	*Alcohol for Cars Termed*	*SPUR to Rising Food Prices*
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80A003008	I	*ulture and Home Economics. Dept. of Agricultural Economics.*	*STAFF Paper 1973-10*
80A000210	VIII	*nt Research Concludes Methanol-mix Fuels to Reach Marketing*	*STAGE after 1982*
80A001056	I	*It May Look Like a 'Sunflower,' but There's Fuel in Those*	*STALKS*
80A001211	XI	*blication No. (NIOSH) 76-148 * Criteria for a Recommended*	*STANDARD*
80A003124	XI		*STANDARD for Storage of Flammable and Combu*
80A002115	VIII	*Indiana*	*STANDARD to Sell Gasohol in the Midwest*
80A003093	XI	*Safety*	*STANDARDS in Fuel Alcohol Production*
80A001261	IX	*Emissions from the Methanol Fueled*	*STANFORD University Gremlin*
80A000285	VI	*nd Immobilized Enzyme Technology in Bioconversion of Barley*	*STARCH*
80A003094	V	*Incorporating Cellulosic Feedstocks with*	*STARCH and Sugar-based Raw Materials for Al*
80A000737	VI	*lcoholic Fermentation of Sugar Solutions and of Mashes from*	*STARCH Containing Raw Materials*
80A000688	IV	*Harvesting and Processing, Workshop * Large-scale Cassava*	*STARCH Extraction Processes*
80A000571	VI	*Developing Countries * Simplified and Economical Cassava*	*STARCH Process*
79 : 004127	II	*gy and Economics of Conversion of Cellulose (Wood) and Corn*	*STARCH to Sugars, Alcohol and Yeast. Fina*
80A000593	II	*ential Availability of Fermentation Alcohol from Sugars and*	*STARCHES in Developing Countries*
80A000513	IX	*um on Alcohol Fuels Technology * Factors Influencing Cold*	*STARTING of Engines Operating on Alchool Fu*
80A001092	IX	*Volkswagenwerk*	*STARTS Test with 800 Methanol-fueled Rabbit*
80A002264	IX	*the*	*STATE of Development in Germany of the Powe*
80A000629	I	*Engines with Methanol — Historical Development and Current*	*STATE of the Art*
80A003108	VII	*rmentation By-products for Feeding in Colorado * Colorado*	*STATE Univ., Fort Collins (USA). Agricultur*
80A002148	IV	*Feasibility of Ethanol from Grain in Montana * Montana*	*STATE Univ., Montana Agriculture Experiment*
80A002107	X	*Illinois Governor Orders Gasohol in*	*STATE Vehicles*
80A000385	VI	*and Energy Production by Bioconversion of Waste Materials —*	*STATE-OF-THE-ART*
80A000492	IX	*Engines with Methanol — Historical Development and Current*	*STATE-OF-THE-ART*
80A000388	I	*Fuels Technology: a*	*STATE-OF-THE-ART Review*
80A001191	VII	*Current*	*STATE-OF-THE-ART Stillage Use and Disposal*
80A000542	X	*echnology * a U.S. Alcohol Fuels Policy and the Political*	*STATE: Assessing Directions*
76 : 001878	I	** Review Based on Use of Minnesota Raw Materials and the*	*STATE'S Energy Needs*
80A000351	I	*Biomass Ethanol as a Chemical Feedstock in the United*	*STATES*
80A000408	I	*Study of the Importance of Energy R, D and D for the United*	*STATES*
80A000541	X	*al and Regulatory Influences on Alcohol Fuels Use in United*	*STATES*
80A003043	I	*Use of Alcohol Fuel Outside of United*	*STATES*
80A000001	X	*a Call for Gasohol. (United*	*STATES Energy Policy)*
80A000640	IX	*Combustion Institute Western*	*STATES Section 1975 Fall Meeting * Analys*
80A000639	IX	*Combustion Institute Western*	*STATES Section 1975 Fall Meeting * Combus*
80A000470	IX	*Combustion Institute, Central*	*STATES Section: Spring Meeting. Mimeograp*
80A000471	IX	*Combustion Institute, Central*	*STATES Section: Spring Meeting. Mimeograp*
80A001195	VIII	*Committee on Agriculture, Nutrition, and Forestry, United*	*STATES Senate, 95th Congress, 1st Session,*
80A000428	I	*Iowa et al. vs OPEC — Corn*	*STATES Uncork Gasohol Gusher*
80A002303	IX	*Exhaust Emissions, Power Output and Fuel Consumption Using*	*STATIC and Dynamic Engine Test Facilities*
79 : 006466	VIII	*sis of Two Technologies: Gasohol and Solar Satellite Power*	*STATION*
0A003115	IX	*tion Products * Univ. of Kentucky. Engineering Experiment*	*STATION. Bulletin No. 8*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A001203	IX	*thyl Alcohol as Motor Fuel * Texas Engineering Experiment*	*STATION. Technical Bulletin 74-2*
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77 : 002067	I	*Fuels from Biomass Program: Program and Project*	*STATUS*
80A000533	V	*logy * Production of Ethanol for Lignocellulose — Current*	*STATUS*
80A000695	IX	*ower Systems Development * Alternative Automotive Fuels —*	*STATUS and Summary of In-progress Research*
80A000575	I	*and Chemical Feedstock in Developing Countries * Present*	*STATUS of Alcohol and Alcohol Based Chemica*
80A000454	IX		*STATUS of Alcohol Fuels Utilization Technol*
80A001254	IX		*STATUS of Alcohol Fuels Utilization Technol*
80A000373	IX	*Current*	*STATUS of Alternative Automotive Power Syst*
80A000374	IX	*Current*	*STATUS of Alternative Automotive Power Syst*
80A000137	X	*Energy and National Security: a*	*STATUS Report*
80A000477	IX	*Comparison of Exhaust Emissions and Fuel Consumption Using*	*STEADY-STATE and Dynamic Engine Test Facili*
80A001173	IX	*Comparison of Exhaust Emissions and Fuel Consumption Using*	*STEADY-STATE and Dynamic Engine Test Facili*
80A000532	VII	*on of Grain Alcohol and Electric Power with Cogeneration of*	*STEAM*
80A002173	VI		*STEAM Consumption of Two-column Alcohol Dis*
80A000630	IX	*ciety Energy Conversion Engineering Conference * on Board*	*STEAM-REFORMING of Methanol to Fuel Automot*
80A003095	VI	*Simple Batch*	*STILL*
80A000216	VIII	*Methanol as a Fuel*	*STILL a Big Question*
80A001192	VI	*Lore of*	*STILL Building * Alcohol Series, V. 2 **
80A000204	VIII	*Gushing Business: Drivers Line Up for Fuel, but Efficiency*	*STILL in Question*
80A000749	VII	*ference * Feed By-products from Grain Alcohol and Whiskey*	*STILLAGE*
80A002237	VII	*Waste Conference * Recovery and Use of Grain Distillery*	*STILLAGE*
80A000447	VII		*STILLAGE Treatment Technologies*
80A001191	VII	*Current State-of-the-art*	*STILLAGE Use and Disposal*
80A000113	VI	*istillery Fuel Savings by Efficient Molasses Processing and*	*STILLAGE Utilization*
80A000266	VI	*the Re-use of*	*STILLAGE Water in the Mashing of Grain as*
80A001031	X	*BATF Considers Problem of Approving Tax-free*	*STILLS for Fuel Alcohol and Not for Moonshi*
80A001247	XI		*STORAGE and Transportation of Synthetic Fue*
80A002223	XI	*Bulk*	*STORAGE of Alcohol*
80A003124	XI	*Standard for*	*STORAGE of Flammable and Combustible Liquid*
79 : 003467	VIII	*Economics of Manufacturing Liquid Fuels from Corn*	*STOVER*
80A000334	IX	*Methanol as Automotive Fuel — 1.*	*STRAIGHT Methanol*
80A000548	IX	*Symposium on Alcohol Fuels Technology * Hardware/Software*	*STRATEGIES for Fuel Economy Optimization*
80A002288	IX	*the Methanol Engine: a Transportation*	*STRATEGY for Post-petroleum Era*
76 : 001711	I		*STRATEGY for Solar Energy Research in Austr*
80A000399	IX	*Methanol Engine: a Transportation*	*STRATEGY for the Post-petroleum Era*
80A000645	IX	*ference * Combustion of Methanol and Methanol Blends in a*	*STRATIFIED Charge Engine*
80A002125	IX	*Combustion of Methanol and Methanol Blends in a*	*STRATIFIED Charge Engine*
80A000338	IX	*Performance of Methanol-gasoline Blends in a*	*STRATIFIED Charge Engine Vehicle*
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80A000469	IX	*Proceedings,*	*STRATIFIED Charge Engines Conference * Pr*
80A000469	IX	*ified Charge Engines Conference * Present Experience with*	*STRATIFIED Charge Engines Working with Init*
80A000549	IX	*nology * Characterization of Alcohol/Gasoline Blends as a*	*STRATIFIED-CHARGE Engine Fuel: Performance*
80A000237	V	*ethanol, Ethanol, and Acetone in Kraft Pulp Mill Condensate*	*STREAMS. (Paper Industry)*
80A002297	VI	*the Erection and Testing of a Methanol*	*STRIPPING Column*
80A002127	IX	*Direct Injected Methanol Fueling of a Two*	*STROKE Locomotive Engine*
80A000509	IX	*hol Fuels Technology * Methanol/Gasoline Mixtures in Four*	*STROKE Otto Engines*
80A000183	VIII	*Gasohol Coming on*	*STRONG; Its Effect on Marketing Equipment*
80A000297	VI		*STRUCTURAL Characterization of a Glycoprot*
80A000295	VI		*STRUCTURAL Features of Cellulosic Materials*
80A000296	IX		*STRUCTURE and Extinction of Laminar Diffusi*

Citation Number	Subject Section	Citation Title	Title Keyword
80A001165	IX	*the Effects of Fuel*	***STRUCTURE** on the Autoignition of Fuel-air M*
80A000286	VI	*Some Aspects of*	***STRUCTURES** of Turbulent Pool Fires*
80A001081	X	*U.S.*	***STRUGGLES** for Gasohol Plan*
79 : 003456	VI	*able Resources: Feasibility Study. Volume B. Conversion*	***STUDIES***
79 : 004132	I	*Renewable Resources: Feasibility Study. Volume A. Demand*	***STUDIES***
79 : 004654	I	*uels from Renewable Resources in Canada: Systems Economics*	***STUDIES***
80A003005	V	*Volume E. Municipal Waste*	***STUDIES***
80A003005	V	*Resources: Feasibility Study * Volume D. Agricultural*	***STUDIES** Volu*
80A000323	IX	*Single-cylinder PROCO Engine*	***STUDIES** — Fuel and Engine Calibration Effec*
79 : 001713	V	*Raw Materials Evaluation and Process Development*	***STUDIES** for Conversion of Biomass to Sugars*
80 : 000189	V	*iomass * Raw Materials Evaluation and Process Development*	***STUDIES** for Conversion of Biomass to Sugars*
80A002234	X		***STUDIES** in Taxation, Public Finance and Rel*
80A000371	IX	*Combustion*	***STUDIES** of Alternative Fuels. Annual Repor*
80A000298	VI		***STUDIES** of Continuous Fermentation of India*
80A000657	IX	*National Conference I.C. Engines Combustion * Comparative*	***STUDIES** of Engine Performance with Methanol*
80A003110	VI	*Agricultural Alcohol:*	***STUDIES** of Its Manufacture in Germany * U*
78 : 002267	VI	*Pilot Plant*	***STUDIES** of the Bioconversion of Cellulose*
80A000680	VI	*of the Eighth Cellulose Conference * Process-development*	***STUDIES** of the Enzymatic Hydrolysis of News*
80A000666	VI	*Enzymatic Hydrolysis of Cellulose * Kinetic and Dynamic*	***STUDIES** of Trichoderma Viride Cellulase Pro*
80A000299	VI		***STUDIES** on Biomass Production from Methanol*
80A000344	IX		***STUDIES** on Mixed Fuels — Hydrazine and Ethy*
79 : 004131	VI	*Process Development*	***STUDIES** on the Bioconversion of Cellulose*
80A003014	VIII		***STUDIES** on the Economic Potential of On-far*
80A000717	VI	*as a Chemical and Energy Resource * Process Developmental*	***STUDIES** on the Enzymatic Hydrolysis of Cell*
80A000288	IX	*Some*	***STUDIES** on the Performance and Nitrogen-oxi*
80A000154	V	*Wood Waste Utilisation: Conversion to Fuel Alcohol — a FRI*	***STUDY***
80A001213	VIII	*in Motor Fuel Alcohol * Technical and Economic Assessment*	***STUDY***
80A001229	IX	*ine * a Report by the Automotive Propulsion Systems Pilot*	***STUDY***
80A001230	IX	*ity * a Report by the Automotive Propulsion Systems Pilot*	***STUDY***
80A001231	IX	*nds * a Report by the Automotive Propulsion Systems Pilot*	***STUDY***
80A001232	IX	*ization of Methanol as an Automotive Fuel — an Experimental*	***STUDY***
80A002251	IX	*nol * a Report by the Automotive Propulsion Systems Pilot*	***STUDY***
80A002252	IX	*ade * a Report by the Automotive Propulsion Systems Pilot*	***STUDY***
80A002253	IX	*nds * a Report by the Automotive Propulsion Systems Pilot*	***STUDY***
80A002254	IX	*ion * a Report by the Automotive Propulsion Systems Pilot*	***STUDY***
80A002255	IX	*ine * a Report by the Automotive Propulsion Systems Pilot*	***STUDY***
80A002256	IX	*tem * a Report by the Automotive Propulsion Systems Pilot*	***STUDY***
80A002257	IX	*nes * a Report by the Automotive Propulsion Systems Pilot*	***STUDY***
80A002258	IX	*ion * a Report by the Automotive Propulsion Systems Pilot*	***STUDY***
80A003011	VIII	*Gasohol — Economic Feasibility*	***STUDY***
80A003125	I	*Grain Alcohol*	***STUDY***
80 : 000950	VIII	*California Clean Fuels*	***STUDY** * Availability to Industry and Util*
80A003005	V	*Liquid Fuels from Renewable Resources: Feasibility*	***STUDY** * Volume D. Agricultural Studies*
80A002041	XI	*EPA Spends $500,000 to*	***STUDY** Environmental Impact of Gasohol Fuel*
80A002061	IX	*Exxon Research and Eng.*	***STUDY** Finds Methanol Promising Substitute F*
79 : 000540	III	*Fuels from Sugar Crops: Systems*	***STUDY** for Sugarcane, Sweet Sorghum, and Sug*
79 : 004665	VIII	*ass and Wastes * Ethanol-gasoline Motor-fuel Mixtures: a*	***STUDY** in the Use of Simple Logic*
80A000300	VIII		***STUDY** Indicates that Producing Alcohol from*
80A003033	IX	*a Comparative*	***STUDY** of Alcohol, Gasoline and Kerosene as*
80A001182	IX	*ls * Application of New Combustion Analysis Method in the*	***STUDY** of Alternate Fuel, Combustion and Emi*
80A000383	I	*Feasibility*	***STUDY** of Alternative Fuels and Automotive T*
80A000381	IX	*Feasibility*	***STUDY** of Alternative Fuels for Automotive T*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000382	IX	*Feasibility*	*STUDY of Alternative Fuels for Automotive T*
80A000409	IX		*STUDY of Decomposed Methanol as a Low Emiss*
80A001253	IX		*STUDY of Decomposed Methanol as a Low Emiss*
80A003137	IX		*STUDY of Decomposed Methanol as a Low Emiss*
80A000651	IX	** Use of Methanol in the Diesel Engine: an Experimental*	*STUDY of Engine Performance*
80A000043	IX	*Comparative*	*STUDY of Fuel-air Otto Cycle for Five Diffe*
76 : 001690	III	*Systems*	*STUDY of Fuels from Sugarcane, Sweet Sorghu*
78 : 000583	III	*Systems*	*STUDY of Fuels from Sugarcane, Sweet Sorghu*
78 : 000584	III	*Systems*	*STUDY of Fuels from Sugarcane, Sweet Sorghu*
78 : 000585	III	*Systems*	*STUDY of Fuels from Sugarcane, Sweet Sorghu*
80A000386	III	*Fuels from Sugar Crops: Report on System*	*STUDY of Fuels from Sugarcane, Sweet Sorghu*
80A000499	III	*Systems*	*STUDY of Fuels from Sugarcane, Sweet Sorghu*
80A003133	III	*Systems*	*STUDY of Fuels from Sugarcane, Sweet Sorghu*
80A003135	III	*Systems*	*STUDY of Fuels from Sugarcane, Sweet Sorghu*
80A001163	VIII	*Methanol and Energy Shortage — a Feasibility*	*STUDY of Manufacturing Synthetic Fuel from*
80A000340	IX	*Single-cylinder Engine*	*STUDY of Methanol Fuel-emphasis on Organic*
79 : 001109	III	*Fuels from Biomass Symposium * Systems*	*STUDY of Sugarcane, Sweet Sorghum, Sugar Be*
79 : 004663	I	*Energy from Biomass and Wastes **	*STUDY of the Energy Potential of Fuels from*
80A000407	VI		*STUDY of the Fermentation of Xylose to Etha*
80A000408	I		*STUDY of the Importance of Energy R, D and*
80A000341	IX	*Single Cylinder Spark Ignition Engine*	*STUDY of the Octane, Emissions, and Fuel Ec*
80A000700	IX	*tion, Use and Transportation, Seminar * Technico Economic*	*STUDY of the Use of Hydrogen and Methanol F*
80A000209	VI	*Gasohol Sparks*	*STUDY on New Ethanol Plant*
80A001229	IX	*motive Propulsion Systems: Held on April 18-22, 1977 * a*	*STUDY on Reformed Fuel for an Automotive Ga*
80A000647	IX	*16th Automobile Technical Congress * a*	*STUDY on the Automotive Engines for Water-m*
80A001091	IX	*Volkswagenwerk Completes*	*STUDY on 15% Methanol Gasoline, Details*
79 : 003455	I	*Liquid Fuels from Renewable Resources: Feasibility*	*STUDY Summary and Conclusions*
79 : 004132	I	*Liquid Fuels from Renewable Resources: Feasibility*	*STUDY. Volume A. Demand Studies*
79 : 003456	VI	*Liquid Fuels from Renewable Resources: Feasibility*	*STUDY. Volume B. Conversion Studies*
80A000365	IX	*rnative Fuels for Automotive Transportation: a Feasibility*	*STUDY. Volume I. Executive Summary*
80A000366	IX	*rnative Fuels for Automotive Transportation: a Feasibility*	*STUDY. Volume III. Appendices*
80A000401	V	*Wood Waste for Energy*	*STUDY: Inventory Assessment and Economic*
78 : 001809	VIII	*Economic Pre-feasibility*	*STUDY: Large-scale Methanol Fuel Productio*
78 : 002269	V	*Economic Pre-feasibility*	*STUDY: Large-scale Methanol Fuel Productio*
80A003114	VII	*Composition of Concentrate By-products Feeding*	*STUFFS * National Academy of Sciences — N*
80A001195	VIII	*Economic Feasibility of Gasohol * Hearing Before the*	*SUBCOMMITTEE on Agricultural Research and G*
80A002234	X	*Studies in Taxation, Public Finance and Related*	*SUBJECTS * "Gasohol" — Alcohol Fuels as*
79 : 001106	VI	*Degradation of Cellulosic Biomass and Its*	*SUBSEQUENT Utilization for the Production*
80A000167	VIII	*Fuels to Replace Oil Would Be*	*SUBSIDIZED in Energy Unit's Plan*
80A000138	X	*Energy Conferees Are Devising a Variety of*	*SUBSIDY Plans Despite Budget Crunch*
80A000437	XI	*omic and Safety Analysis of the Transportation of Hazardous*	*SUBSTANCES in Bulk*
80 : 002077	VI	*Bioconversion of Cellulosic*	*SUBSTANCES into Energy Chemicals and Microb*
80 : 002118	VI	*Bioconversion of Cellulosic*	*SUBSTANCES into Energy Chemicals and Microb*
80A000217	IX	*Methanol as a Gas*	*SUBSTITUTE*
80A000310	IX	*Methanol and Ethanol as a Motor Fuel*	*SUBSTITUTE*
80A002042	X	*E.P.A. to Permit Sale of Gasohol as Unleaded-gasoline*	*SUBSTITUTE*
80A002061	IX	*Exxon Research and Eng. Study Finds Methanol Promising*	*SUBSTITUTE for Gasoline*
80A003041	IX	*Alcohol Blend Poor*	*SUBSTITUTE for Motor Fuel*
80A001050	IX	*Gasohol OK as*	*SUBSTITUTE for Unleaded Gasoline*
80A001249	IX	*Investigation of a*	*SUBSTITUTE Fuel to Control Automotive Air P*
80A002180	IX	*Effects of*	*SUBSTITUTE Fuels on Automotive Engines*
80A003050	IX	*Single-cylinder Engine Tests of*	*SUBSTITUTE Motor Fuels*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000233	IX	Methanol as Gasoline	SUBSTITUTE Seen 'Unrealistic' by EPA Scient
80A000422	VIII	a New Way to Calculate the Savings from Fuels	SUBSTITUTED for Petroleum
80A000588	I	ock in Developing Countries * Can Fermentation Alcohol Be	SUBSTITUTED for Wood as a Cooking Fuel
80A002289	I	Gasoline	SUBSTITUTES
80A003117	IX	Use of Motor-fuel	SUBSTITUTES
80A002234	X	Related Subjects * "Gasohol" — Alcohol Fuels as Gasoline	SUBSTITUTES * Volume 3
80A001227	IX	Emergency Fuel	SUBSTITUTES for Spark-ignition Engines
79 : 001111	I	Fuels from Biomass Symposium * Fuels and Petrochemical	SUBSTITUTES from Fermentation of Biomass
80A000679	VI	ellulose by Enzymatic Hydrolysis. I. Primary Evaluation of	SUBSTRATES
80A000127	VIII	Economic Factors in the Assessment of Various Cellulosic	SUBSTRATES as Chemical and Energy Resources
80A000254	VI	Properties of Cellulose and Lignocellulosic Materials as	SUBSTRATES for Enzymatic Conversion Process
80A000026	VI	Cellulosic	SUBSTRATES for Enzymatic Saccharification
80A002226	V		SUGAR and Alcohol from Wood Waste
80A000361	VI	Acid Hydrolysis of Cellulose in Refuse to	SUGAR and Its Fermentation to Alcohol
80A000189	VI	Making	SUGAR and Protein from Trash
79 : 000540	III	gar Crops: Systems Study for Sugarcane, Sweet Sorghum, and	SUGAR Beets
80A000258	III	Researcher Suggests	SUGAR Beets
80A000386	III	on System Study of Fuels from Sugarcane, Sweet Sorghum and	SUGAR Beets
80A000499	III	Systems Study of Fuels from Sugarcane, Sweet Sorghum, and	SUGAR Beets * Battelle Memorial Institute
80A003133	III	Systems Study of Fuels from Sugarcane, Sweet Sorghum, and	SUGAR Beets * Volume II, Agricultural Con
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78 : 000584	III	Systems Study of Fuels from Sugarcane, Sweet Sorghum, and	SUGAR Beets. Volume I. Comprehensive Eva
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80A003135	III	Systems Study of Fuels from Sugarcane, Sweet Sorghum,	SUGAR Beets, and Corn * Volume IV, Corn
79 : 001109	III	ss Symposium * Systems Study of Sugarcane, Sweet Sorghum,	SUGAR Beets, and Corn for Fuels and Chemica
78 : 000583	III	Systems Study of Fuels from Sugarcane, Sweet Sorghum,	SUGAR Beets, and Corn. Volume V. Compreh
80A000225	IX	Mercedes Benz of Brazil Uses	SUGAR Byproduct to Fuel Buses with Modified
80A000738	VI	Methanol and Ethanol * Direct Production of Ethanol from	SUGAR Cane
78 : 002289	IV	* Energetics and Economics; Comparison with Ethanol from	SUGAR Cane and Molasses
80A003076	III		SUGAR Cane Bagasse as a Source of Industria
80A003077	III		SUGAR Cane Bagasse as a Source of Industria
80A003078	V		SUGAR Cane Bagasse as a Source of Industria
80A000607	III	Chemical Feedstock in Developing Countries * Potential of	SUGAR Cane Derived Alcohol as a Fuel in Jam
80A000589	III	Developing Countries * Fuel and Chemical Feedstock from	SUGAR Cane in Central America
80A000739	III	Technology: Methanol and Ethanol * Direct Processing of	SUGAR Cane into Ethanol
80A000048	III	Conversion of	SUGAR Cane Products into Fuels and Chemical
79 : 005707	VI	ion Addendum. Final Report * Tsao-Purdue Process, Tilby	SUGAR Cane Separation Process, Hydrocarbon
79 : 005180	III		SUGAR Crops as a Source of Fuels. Volume
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80 : 001950	III	ew. Raw Material Availability Reports * Availability of	SUGAR Crops for Production of Alcohol Fuels
80A000686	III	Using	SUGAR Crops to Capture Solar Energy
79 : 000053	III	Fuels from	SUGAR Crops. First Quarterly Report
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80A000386	III	Fuels from	SUGAR Crops: Report on System Study of Fue
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80A002172	V		SUGAR from Wood
80A002152	VII	By-products of the Cane	SUGAR Industry
80A000608	VII	Present Situation on the Utilization of By-products of the	SUGAR Industry in Mauritius
80A000348	X	Sweet Proposition: How to Turn Surplus	SUGAR into Gasohol — and a Fast Buck
80A000298	VI	Studies of Continuous Fermentation of Indian Cane	SUGAR Molasses by Yeast
80A002283	VIII	Ethanol — Solution to the	SUGAR Problem
80A002232	V	Madison Wood	SUGAR Process

Citation Number	Subject Section	Citation Title	Title Keyword
80A000386	III	*gar Crops: Report on System Study of Fuels from Sugarcane,*	***SWEET** Sorghum and Sugar Beets*
79 : 000540	III	*Fuels from Sugar Crops: Systems Study for Sugarcane,*	***SWEET** Sorghum, and Sugar Beets*
80A000499	III	*Systems Study of Fuels from Sugarcane,*	***SWEET** Sorghum, and Sugar Beets * Battelle*
80A003133	III	*Systems Study of Fuels from Sugarcane,*	***SWEET** Sorghum, and Sugar Beets * Volume I*
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80A000465	IX	*Proceedings Forest and Field Fuels*	***SYMPOSIUM** * a Petroleum Industry Overview*
80A000699	V	*Crop Residue Management Systems. Proceedings of a*	***SYMPOSIUM** * Alternative Uses of Excess Cr*
80A000489	V	*omplete Tree Utilization of Southern Pine, Proceedings of a*	***SYMPOSIUM** * Biomass Production of Souther*
79 : 002502	V	*Proceedings Forest and Field Fuels*	***SYMPOSIUM** * Canadian Production Potential*
80A000464	IX	*Proceedings Forest and Field Fuels*	***SYMPOSIUM** * Constraints and Opportunities*
80A000461	IX	*Environmental Control*	***SYMPOSIUM** * Environmental Aspects of Alte*
79 : 002491	VIII	*Proceedings Forest and Field Fuels*	***SYMPOSIUM** * Ethanol for Motor Fuel from B*
80A000475	IX	*sachusetts Institute of Technology International Combustion*	***SYMPOSIUM** * Flame Propagation through Mix*
79 : 001111	I	*Fuels from Biomass*	***SYMPOSIUM** * Fuels and Petrochemical Subst*
80A000476	IX	*sachusetts Institute of Technology International Combustion*	***SYMPOSIUM** * in Situ Optical Measurement*
80A000673	XI	*Prevention and Safety Promotion in the Process Industries*	***SYMPOSIUM** * Inflammability of Liquid Mixt*
79 : 001110	VI	*Fuels from Biomass*	***SYMPOSIUM** * Production of Sugars and Etha*
79 : 001109	III	*Fuels from Biomass*	***SYMPOSIUM** * Systems Study of Sugarcane, S*
80A000661	IX	*Proceedings 14th*	***SYMPOSIUM** (International) on Combustion **
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80A000750	IX	*Proceedings of the Cornell International*	***SYMPOSIUM** and Workshop on the Hydrogen Econ*
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80A000488	IX	*17th*	***SYMPOSIUM** International Combustion * Kine*
80A000725	VI	*Cellulosic Materials * Biotechnology and Bioengineering*	***SYMPOSIUM** No. 6*
80A000726	VI	*entation Ethyl Alcohol * Biotechnology and Bioengineering*	***SYMPOSIUM** No. 6*
80A000727	VI	*ulose Saccharification * Biotechnology and Bioengineering*	***SYMPOSIUM** No. 6*
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79 : 000510	I	*Proceedings of the International*	***SYMPOSIUM** on Alcohol Fuel Technology: Meth*
80A000732	VI	*Proceedings of the International*	***SYMPOSIUM** on Alcohol Fuel Technology: Meth*
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80A000734	IX	*Proceedings of the International*	***SYMPOSIUM** on Alcohol Fuel Technology: Meth*
80A000735	VIII	*Proceedings of the International*	***SYMPOSIUM** on Alcohol Fuel Technology: Meth*
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80A000737	VI	*Proceedings of the International*	***SYMPOSIUM** on Alcohol Fuel Technology: Meth*
80A000738	VI	*Proceedings of the International*	***SYMPOSIUM** on Alcohol Fuel Technology: Meth*
80A000739	III	*Proceedings of the International*	***SYMPOSIUM** on Alcohol Fuel Technology: Meth*
80A000740	IX	*Proceedings of the International*	***SYMPOSIUM** on Alcohol Fuel Technology: Meth*
80A000741	IX	*Proceedings of the International*	***SYMPOSIUM** on Alcohol Fuel Technology: Meth*
80A000742	XI	*Proceedings of the International*	***SYMPOSIUM** on Alcohol Fuel Technology: Meth*
80A000501	I	*Proceedings of Third International*	***SYMPOSIUM** on Alcohol Fuels Technology*
80A000502	I	*Proceedings of Third International*	***SYMPOSIUM** on Alcohol Fuels Technology **
80A000505	X	*Proceedings of Third International*	***SYMPOSIUM** on Alcohol Fuels Technology **
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000551	IX	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *a*
80A000556	I	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *a*
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80A000517	IX	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *B*
80A000518	IX	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *B*
80A000543	IX	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *C*
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80A000545	X	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *C*
80A000549	IX	*Proceedings on Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *C*
80A000553	VIII	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *C*
80A000521	IX	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *D*
80A000524	IX	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *D*
80A000508	IX	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *E*
80A000516	IX	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *E*
80A000527	VIII	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *E*
80A000530	V	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *E*
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80A000562	XI	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *E*
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80A000511	IX	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *M*
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80A000554	I	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *M*
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80A000561	XI	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *M*
80A000537	VI	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *N*
80A000550	X	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *N*
80A000533	V	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *P*
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80A000540	IX	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *R*
80A000507	V	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *S*
80A000503	III	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *T*
80A000506	X	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *T*
80A000515	IX	*Proceedings of Third International*	*SYMPOSIUM on Alcohol Fuels Technology* * *T*
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Citation Number	Subject Section	Citation Title	Title Keyword
77 : 000111	V	*Solar Energy Fixation by Plants and*	*SYNTHETIC Fuel Production * Production of*
80A000040	I	*the Clean*	*SYNTHETIC Fuel That's Already Here*
80A000141	IX	*Energy-ecological Characteristics of*	*SYNTHETIC Fuels*
80A000405	X	*Recommendations for a*	*SYNTHETIC Fuels Commercialization Program.*
80A000391	I	*Hydrogen and*	*SYNTHETIC Fuels for the Future*
80A000325	IX		*SYNTHETIC Fuels for Transportation and Nati*
80A000433	V		*SYNTHETIC Fuels from Municipal, Industrial*
80A000434	V		*SYNTHETIC Fuels from Municipal, Industrial*
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80A001247	XI	*age and Transportation of Synthetic Fuels. a Report to the*	*SYNTHETIC Fuels Panel*
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80A001198	VIII	*Economic Analysis of*	*SYNTHETIC Liquid Fuels * Ontario Ministry*
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80A001197	IX	*sportation * Ontario Ministry of Energy Advisory Group on*	*SYNTHETIC Liquid Fuels Report, V. 5*
80A001189	I		*SYNTHETIC Oil vs. Methanol as a Liquid Fuel*
80A000344	IX	*Studies on Mixed Fuels — Hydrazine and Ethyl-alcohol*	*SYSTEM*
80A002256	IX	*ler Upgraded Automotive Gas Turbine Engine-emission Control*	*SYSTEM * a Report by the Automotive Propu*
80A000486	II	*Exposition * American Agriculture — the Energy Production*	*SYSTEM — Gasohol*
80A003064	VI	*Development and Design of Continuous Cooking and Mashing*	*SYSTEM for Cereal Grains*
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80A002247	IX	*on Alcohol-water Injection * Obstacles Seen to a Two-fuel*	*SYSTEM for General Use on Automobiles*
80A000386	III	*Fuels from Sugar Crops: Report on*	*SYSTEM Study of Fuels from Sugarcane, Sweet*
80A001036	VIII	*ces of Energy and Chemical Feedstocks (Food and Energy Crop*	*SYSTEM)*
80A000471	IX	*ring Meeting. Mimeographed Papers * New S.I. Engine Fuel*	*SYSTEM'S Approach * Performance and Emiss*
80A000164	I	*Fuels from Biomass Integration with Food and Materials*	*SYSTEMS*
80A000526	IX	*ferent Fuels in a Diesel Engine with Two Separate Injection*	*SYSTEMS*
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80A001176	VIII	*les * Volume IX. Biomass Fuels Production and Conversion*	*SYSTEMS*
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80A001256	IX	*for Use of Alternative Fuels in Michigan's Public Transit*	*SYSTEMS*
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80A003014	VIII	*dies on the Economic Potential of On-farm Energy Production*	*SYSTEMS * Univ. of Washington. Center for*
80A000373	IX	*Current Status of Alternative Automotive Power*	*SYSTEMS and Fuels. Volume I. Executive Su*
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80 : 001986	VI	*3rd Annual Biomass Energy*	*SYSTEMS Conference * Enzymatic Saccharifi*
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80A000752	IX	*13th Summary Report: Highway Vehicle*	*SYSTEMS Contractors Coordination Meeting **
80A001232	IX	*10th Summary Report: Highway*	*SYSTEMS Contractors Coordination Meeting **

Citation Number	Subject Section	Citation Title	Title Keyword
80A000733	IX	*ogy: Methanol and Ethanol * Alternate Air-fuel Induction*	*SYSTEMS Contrasts in Terms of Fuel Economy*
80A001176	VIII		*SYSTEMS Descriptions and Engineering Costs*
80A000695	IX	*Symposium on Low Pollution Power*	*SYSTEMS Development * Alternative Automot*
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80A000740	IX	*Ethanol * Development of Methanol and Petrol Carburation*	*SYSTEMS in the Netherlands*
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80A001230	IX	*and Driveability * a Report by the Automotive Propulsion*	*SYSTEMS Pilot Study*
80A001231	IX	*l-indolene Blends * a Report by the Automotive Propulsion*	*SYSTEMS Pilot Study*
80A002251	IX	*LPG and Methanol * a Report by the Automotive Propulsion*	*SYSTEMS Pilot Study*
80A002252	IX	*the Next Decade * a Report by the Automotive Propulsion*	*SYSTEMS Pilot Study*
80A002253	IX	*hanol Fuel Blends * a Report by the Automotive Propulsion*	*SYSTEMS Pilot Study*
80A002254	IX	*tric Distribution * a Report by the Automotive Propulsion*	*SYSTEMS Pilot Study*
80A002255	IX	*Ignition Engine * a Report by the Automotive Propulsion*	*SYSTEMS Pilot Study*
80A002256	IX	*on Control System * a Report by the Automotive Propulsion*	*SYSTEMS Pilot Study*
80A002257	IX	*ty Diesel Engines * a Report by the Automotive Propulsion*	*SYSTEMS Pilot Study*
80A002258	IX	*Fuel Application * a Report by the Automotive Propulsion*	*SYSTEMS Pilot Study*
79 : 000540	III	*Fuels from Sugar Crops:*	*SYSTEMS Study for Sugarcane, Sweet Sorghum,*
76 : 001690	III		*SYSTEMS Study of Fuels from Sugarcane, Swee*
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78 : 000585	III		*SYSTEMS Study of Fuels from Sugarcane, Swee*
80A000499	III		*SYSTEMS Study of Fuels from Sugarcane, Swee*
80A003133	III		*SYSTEMS Study of Fuels from Sugarcane, Swee*
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80A000699	V	*Crop Residue Management*	*SYSTEMS. Proceedings of a Symposium * Al*
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80A001229	IX	*the Fourth International Symposium on Automotive Propulsion*	*SYSTEMS: Held on April 18-22, 1977 * a S*
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80A001230	IX	*the Fourth International Symposium on Automotive Propulsion*	*SYSTEMS: Held on April 18-22, 1977 * Veh*
80A000198	VIII	*Gasohol: Would It*	*TAKE Food from the Poor?*
80A001062	VIII	*Keeping that Tiger in Your*	*TANK*
80A000093	V	*Energy for All: We'll Get*	*TANKED Up on Wood Alcohol*
80A000606	III	*ntries * Molasses Production and Utilization Potential in*	*TANZANIA*
80A000029	VIII	*Changing*	*TARGETS for the Investor*
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Citation Number	Subject Section	Citation Title	Title Keyword
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000553	VIII	*oceedings of Third International Symposium on Alcohol Fuels*	*TECHNOLOGY * Canadian Scenario for Methan*
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80A000546	IX	*oceedings of Third International Symposium on Alcohol Fuels*	*TECHNOLOGY * Engine Cold-start with Disso*
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80A000562	XI	*oceedings of Third International Symposium on Alcohol Fuels*	*TECHNOLOGY * Environmental Consequences*
80A000530	V	*oceedings of Third International Symposium on Alcohol Fuels*	*TECHNOLOGY * Ethanol from Municipal Cellu*
80A000508	IX	*oceedings of Third International Symposium on Alcohol Fuels*	*TECHNOLOGY * Experiences with the Utiliza*
80A000513	IX	*oceedings of Third International Symposium on Alcohol Fuels*	*TECHNOLOGY * Factors Influencing Cold Sta*
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80A000548	IX	*oceedings of Third International Symposium on Alcohol Fuels*	*TECHNOLOGY * Hardware/Software Strategies*
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000636	I	*Solar*	*TECHNOLOGY Exhibition and Conference, Middl*
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80A000454	IX	*Status of Alcohol Fuels Utilization*	*TECHNOLOGY for Highway Transportation*
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80A000285	VI	*Soluble and Immobilized Enzyme*	*TECHNOLOGY in Bioconversion of Barley Starc*
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80 : 000244	V		*TECHNOLOGY of Utilizing Bark and Residues*
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80 : 000217	VIII	*Biomass * Reassessment of Economics of Cellulase Process*	*TECHNOLOGY: for Production of Ethanol from*
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80A000275	VI	*Saccharification*	*TECHNOLOGY: Summary*
80A002190	V	*ellulose and Decomposition of Sugars in Dilute Acid at High*	*TEMPERATURE*
80A000512	IX	*ydrocarbons in a Combustion Bomb as a Function of Pressure,*	*TEMPERATURE and Equivalence Ratio for Metha*
80A001167	IX	*tane, N-heptane, Methanol, Methane, and Propane at Elevated*	*TEMPERATURE and Pressures in the Presence*
80A000333	IX	*ol as a Gasoline Extender-fuel Economy, Emissions, and High*	*TEMPERATURE Driveability*

Citation Number	Subject Section	Citation Title	Title Keyword
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80A000556	I	*Proceedings of*	***THIRD** International Symposium on Alcohol Fu*
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80A001049	IX	*Gasohol No*	***THREAT** to U.S. Carburetors*
80A000576	VI	*ries * Fermentation Alcohol Industry in Egypt in the Last*	***THREE** Decades*
80A000672	IX	*Resources Challenge: Technological*	***THRUST**, Social Impact * Alcohol as an Aut*
80A001062	VIII	*Keeping that*	***TIGER** in Your Tank*
79 : 005707	VI	*Mission Addendum. Final Report * Tsao-Purdue Process,*	***TILBY** Sugar Cane Separation Process, Hydroc*
80A001012	I	*an Ancient Fuel Provides Energy for Modern*	***TIMES***
80A002078	IX	*Goodyear*	***TIRE** and Rubber Develops Gasoline/Alcohol/W*
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80A001239	I	*ethanol as an Alternative Fuel * Methanol — Chemical Uses*	***TODAY***
80A000510	IX	*um on Alcohol Fuels Technology * Improvement of the Water*	***TOLERABILITY** of Methanol-gasoline Blends*
80A002184	IX	*Water*	***TOLERANCES** of Mixtures of Gasoline with Eth*
80A000136	IX	*ect of Methanol on Exhaust Composition of a Fuel Containing*	***TOLUENE**, N-heptane, and Isooctane*
80A001048	IX	*Gasohol No Help, Says*	***TOP** GM Engineer*
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80A002255	IX	*22, 1977 * the Effect of Methanol Addition to Gasoline on*	***TOTAL** and Individual Hydrocarbons, Methanol*
80A000299	VI	*tudies on Biomass Production from Methanol. Application of*	***TOWER** Type Fermentor with 2-fluid Nozzle to*
80A002046	XI	*Ethanol and Lead*	***TOXICITY***
80A002235	XI		***TOXICITY** of Industrial Organic Solvents **
80A000559	XI	*hird International Symposium on Alcohol Fuels Technology **	***TOXICITY** of Methanol/Petrol Mixtures*
80A001242	XI	*Symptomatology and Therapy of*	***TOXICOLIGICAL** Emergencies*
80A001179	XI	*Industrial Hygiene and*	***TOXICOLOGY** * Alcohols * Chapter 34 **
80A003115	IX	*elopment of Practical Method of Burning Alcohol in Gasoline*	***TRACTOR** and Calculation and Charting of the*
80A003033	IX	*rative Study of Alcohol, Gasoline and Kerosene as Fuels for*	***TRACTOR** Engines*
80A002293	IX	*Ethyl Alcohol as*	***TRACTOR** Fuel in China*
80A000104	IX	*Diesel Oil and Ethanol Mixtures for Diesel-powered Farm*	***TRACTORS***
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A001256	IX	*Potential for Use of Alternative Fuels in Michigan's Public*	*TRANSIT Systems*
80A002273	X	*gress, 1st Session * Letter from Secretary of Agriculture*	*TRANSMITTING, in Response to Resolution, Re*
80A000700	IX	*Economic Study of the Use of Hydrogen and Methanol for Road*	*TRANSPORT*
78 : 002739	VI	*Production of Liquid*	*TRANSPORT Fuel from Cellulose Material (Woo*
80A002310	V	*Production of Liquid*	*TRANSPORT Fuel from Cellulose Material (Woo*
80A002314	V	*Production of Liquid*	*TRANSPORT Fuel from Cellulose Material (Woo*
80A000550	X	*lcohol Fuels Technology * New Zealand's Methanol-gasoline*	*TRANSPORT Fuel Programme*
80A000444	XI	*Methanol as a*	*TRANSPORTAION Fuel: Assessment of Environm*
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80A000402	IX	*Use of Methanol in*	*TRANSPORTATION*
80A000436	IX	*Methanol, the Future in Motorized*	*TRANSPORTATION*
80A000454	IX	*Status of Alcohol Fuels Utilization Technology for Highway*	*TRANSPORTATION*
80A000493	VIII	*onomic Feasibility of Some Alternative Fuels for Automotive*	*TRANSPORTATION*
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80A001177	IX	*nology Handbook * Methyl Alcohol * a Potential Fuel for*	*TRANSPORTATION*
80A001254	IX	*Status of Alcohol Fuels Utilization Technology for Highway*	*TRANSPORTATION*
80A000723	X	*Utilization of Alternative Fuels for*	*TRANSPORTATION * a General History of the*
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80A001197	IX	*Utilization of Methanol Based Fuels in*	*TRANSPORTATION * Ontario Ministry of Ener*
80A000325	IX	*Synthetic Fuels for*	*TRANSPORTATION and National Energy Needs*
80 : 000205	VIII	** Near Term Potential of Biomass-based Alcohol-gasoline*	*TRANSPORTATION Fuels * to 1990*
80A000437	XI	*a Modal Economic and Safety Analysis of the*	*TRANSPORTATION of Hazardous Substances in B*
80A001247	XI	*Storage and*	*TRANSPORTATION of Synthetic Fuels. a Repor*
80A002288	IX	*the Methanol Engine: a*	*TRANSPORTATION Strategy for Post-petroleum*
80A000399	IX	*Methanol Engine: a*	*TRANSPORTATION Strategy for the Post-petrol*
80A000381	IX	*Feasibility Study of Alternative Fuels for Automotive*	*TRANSPORTATION. Volume I. Executive Summa*
80A000382	IX	*Feasibility Study of Alternative Fuels for Automotive*	*TRANSPORTATION. Volume II. Technical Sect*
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80A000389	XI	*Health Hazard Evaluation/Toxicity Determination:*	*TRANTEX Corporation, Springfield, Massachus*
80A000189	VI	*Making Sugar and Protein from*	*TRASH*
80A001152	VII		*TREATED with Chemicals, Corn Residue as Goo*
80A000272	VII	*Silage Made from Sugarcane Bagasse*	*TREATED with Sodium Hydroxide*
80A002029	III	*as a Possible Fuel and the Economics of Distillery Effluent*	*TREATMENT*
80A000112	VII	*Distillery Effluent*	*TREATMENT in the Brazilian National Alcohol*
80A000429	VII	*Some Problems Associated with the*	*TREATMENT of Effluents from Malt Whisky Dis*
80A000447	VII	*Stillage*	*TREATMENT Technologies*
80A000489	V	*oceedings of a Symposium * Biomass Production of Southern*	*TREE Plantations and Its Conversion to Ener*
80A002073	IX	*Georgia-Pacific Alcohol from*	*TREE Sugars to Be Used as Fuel Component*
80A000489	V	*Complete*	*TREE Utilization of Southern Pine, Proceedi*
80 : 002130	III	*Pithecolobium saman Benth. (Rain*	*TREE) Fruits as Raw Material for the Produc*
80A001006	I	*an Alternative as Lovely as a*	*TREE?*
80A000037	V	*Chemicals from*	*TREES*
80A000067	I	*Brazil Out to Show Methanol Grows on*	*TREES*
80A000591	I	*as Fuel and Chemical Feedstock in Developing Countries **	*TRENDS in the Production of Ethyl Alcohol B*
80A000529	IX	*nology * Gasoline/Methanol Fuel Distribution and Handling*	*TRIAL*
80A001008	VIII	*Amoco Encouraged by Its Gasohol*	*TRIAL*
80A000665	VI	*rolysis of Cellulose * Growth and Cellulase Production by*	*TRICHODERMA*

Citation Number	Subject Section	Citation Title	Title Keyword
80A001142	VI	*Production of Cellulase by*	***TRICHODERMA***
80A002017	VI	*Adsorption of*	***TRICHODERMA** Cellulase on Cellulose*
80A000022	VI	*Cellulase Production by*	***TRICHODERMA** Viride*
80A000023	VI	*Cellulase Production in Semisolid Cultures of*	***TRICHODERMA** Viride*
80A000134	VI	*Effect of Cultural Conditions on Cellulase Formation by*	***TRICHODERMA** Viride*
80A000251	VI	*a Method for Increasing Cellulase Production by*	***TRICHODERMA** Viride*
80A000297	VI	*coprotein Cellulase, 1, 4-D-GLUCAN Cellobiohydrolase C from*	***TRICHODERMA** Viride*
80A002085	VI	*ics and Cellulase Biosynthesis in the Continuous Culture of*	***TRICHODERMA** Viride*
80A002118	V	*Fibrous Material in Feedlot Waste Fermented by*	***TRICHODERMA** Viride*
80A000346	VI	*ion from Agricultural Woody Wastes by Saccharification with*	***TRICHODERMA** Viride Cellulase*
80A001065	VI	*Kinetics of Solka Floc Cellulose Hydrolysis by*	***TRICHODERMA** Viride Cellulase*
80A002003	VI	*Degradation of Cellulosic Materials by*	***TRICHODERMA** Viride Cellulase*
80A000666	VI	*Hydrolysis of Cellulose * Kinetic and Dynamic Studies of*	***TRICHODERMA** Viride Cellulase Production*
80A000046	VI	*Continuous Cultivation of*	***TRICHODERMA** Viride on Cellulose*
80A000047	VI	*atic Saccharification of Cellulose with Culture Filtrate of*	***TRICHODERMA** Viride QM 6A*
80A000021	VI	*Cellobiose from*	***TRICHODERMA** Viride: Purification, Properti*
80A000193	I	*Gasohol*	***TRICKLING** In, but It's No Panacea: Advanta*
80A002196	II	*Possibilities of the Plant Growth of the Moist*	***TROPICS** to Furnish Materials for Liquid Fue*
80A001070	IX	*Mother's Experimental Alcohol-powered*	***TRUCK***
80A002245	IX	*mance of an Ethanol-gasoline Blend in Automobiles and Light*	***TRUCKS***
79 : 005707	VI	*Program. Volume VI. Mission Addendum. Final Report **	***TSAO-PURDUE** Process, Tilby Sugar Cane Separ*
80A000315	IX	*Ethanol and Jet Fuel Emissions Comparison from a Small Gas*	***TURBINE***
80A000635	IX	*Proceedings * Combustion of Methanol in an Automotive Gas*	***TURBINE***
80A000694	IX	*Power Systems Development * Development of the Nissan Gas*	***TURBINE***
80A000359	IX	*dicted Exhaust Emissions from a Methanol and Jet Fueled Gas*	***TURBINE** Combustor*
80A000654	IX	*Measurement of Nitric Oxide Formation within a Multi-fueled*	***TURBINE** Combustor*
80A002136	IX	*Effect of Water on Nitric Oxide Production in Gas*	***TURBINE** Combustors*
80A002133	IX	*Gas*	***TURBINE** Emissions and Performance on Methan*
80A002124	IX	*an Anaytical Method for Estimating the Performance of a Gas*	***TURBINE** Engine with Water-methanol Injectio*
80A002256	IX	*18-22, 1977 * the ERDA/Chrysler Upgraded Automotive Gas*	***TURBINE** Engine-emission Control System **
80A000133	IX	*Effect of Alcohols as Supplemental Fuel for*	***TURBOCHARGED** Diesel Engines*
80A000286	VI	*Some Aspects of Structures of*	***TURBULENT** Pool Fires*
80A000348	X	*Sweet Proposition: How to*	***TURN** Surplus Sugar into Gasohol — and a Fas*
80A002104	VI	*How to*	***TURN** Wastes into Fuel*
80A000156	VI	*Former Brewery May Soon Be*	***TURNING** Corn to Gasohol*
80 : 002049	V	*Biomass Refinery*	***TURNS** Crop Wastes into Fuel*
80A002039	X	*EPA Mulls Ban on*	***TWO** Fuel Additives*
80A000105	VI	*Differential Speed*	***TWO** Roll Mill Pretreatment of Cellulosic Ma*
80A000526	IX	*the Utilization of Different Fuels in a Diesel Engine with*	***TWO** Separate Injection Systems*
80A002127	IX	*Direct Injected Methanol Fueling of a*	***TWO** Stroke Locomotive Engine*
79 : 006466	VIII	*rgy Modeling and Net Energy Analysis * Energy Analysis of*	***TWO** Technologies: Gasohol and Solar Satell*
80A002009	VI	*Design of a*	***TWO-BUSHEL** Per Day Continuous Alcohol Unit*
80A002173	VI	*Steam Consumption of*	***TWO-COLUMN** Alcohol Distillation Units*
80A002247	IX	*scussion on Alcohol-water Injection * Obstacles Seen to a*	***TWO-FUEL** System for General Use on Automobi*
80A001250	IX	*Component Relationships within*	***TWO-PHASE** Gasoline/Methanol/Water Systems*
80A000299	VI	*on Biomass Production from Methanol. Application of Tower*	***TYPE** Fermentor with 2-fluid Nozzle to Bioma*
76 : 000667	V	*Cellulose: the*	***ULTIMATE** Resource, New Pathways to Its Util*
80A000477	IX	*Proceedings, 2nd*	***UMR-MEC** (Univ. of Missouri, Rolla — Missour*
80A000478	IX	*Proceedings, 2nd*	***UMR-MEC** (Univ. of Missouri, Rolla — Missour*
80A001155	I		***UN** Workshop Urges Wider Use of Ethanol*
80A000428	I	*Iowa et al. vs OPEC — Corn States*	***UNCORK** Gasohol Gusher*
80A002009	VI	*Design of a Two-bushel Per Day Continuous Alcohol*	***UNIT***

Citation Number	Subject Section	Citation Title	Title Keyword
80A002096	X	House	UNIT Votes to End Import Tax on Methanol Fu
80A000167	VIII	Fuels to Replace Oil Would Be Subsidized in Energy	UNIT'S Plan
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80A001199	I	Alcohol Fuel in India * Dept. of Industries and Commerce,	UNITED Provinces. Bulletin, New Ser., No. 3
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80A001195	VIII	of the Committee on Agriculture, Nutrition, and Forestry,	UNITED States Senate, 95th Congress, 1st Se
80A002173	VI	Steam Consumption of Two-column Alcohol Distillation	UNITS
80A003015	VIII	Economics of Gasohol * Minnesota	UNIV. Dept. of Agricultural and Applied Eco
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80A003006	VIII	Grain Alcohol in Motor Fuels * Nebraska	UNIV., Lincoln (USA). Coll. of Agriculture
80A003008	I	Agriculture and Energy * Nebraska	UNIV., Lincoln (USA). Coll. of Agriculture
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80A000703	IX	hanol as an Alternative Fuel * Methanol-gasoline Blends —	UNIVERSITY Viewpoint
80A001050	IX	Gasohol OK as Substitute for	UNLEADED Gasoline
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80A000558	IX	Fuels Technology * Alcohol Engine Emissions — Emphasis on	UNREGULATED Compounds
80A000316	IX	Modified Fuels for Diesel Engines by Application of	UNSTABILIZED Emulsions
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80A000330	IX	Fuels and Emissions —	UPDATE and Outlook, 1974
80A002256	IX	Systems: Held on April 18-22, 1977 * the ERDA/Chrysler	UPGRADED Automotive Gas Turbine Engine-emis
80A002050	I	Ethanol: It's a Slow,	UPHILL Climb
80A000396	I	Methanol as a Fuel in the	URBAN Energy Economy and Possible Source of
80A000483	VI	Symposium Papers (on) Clean Fuels from Biomass, Sewage,	URBAN Refuse, (and) Agriculture Wastes *
80A001155	I	UN Workshop	URGES Wider Use of Ethanol
79 : 002492	V	Symposium on Forest and Field Fuels * Forest Fuels,	USA
80A000283	I	Solar Biomass Energy an Overview of	USA Potential
79 : 002521	VI	of Methods for Direct Conversion of Agricultural Residue to	USABLE Energy. Final Report
80A001207	VI	Individual and Group Gasohol-alcohol Fuel Production and	USAGE
80A000605	I	eedstock in Developing Countries * Perspective of Ethanol	USAGE as Fuel in the Dominican Republic
80A000149	IX	Engines Set for Brazil	USE
80A000287	IX	ples of Combustion Tests for Putting New Fuels to Practical	USE
80A000414	IX	Other Aspects of MTBE/methanol	USE
80A000435	IX	Methanol Fuel Modification for Highway Vehicle	USE
80A000705	IX	* Physico-chemical Properties of Methanol Related to Fuel	USE
80A001039	IX	Boats and Gasohol: to Use or Not to	USE
80A001099	IX	Feasibility of Methanol/Gasoline Blends for Automotive	USE
80A001157	IX	Methanol: a Versatile Fuel for Immediate	USE
80A001248	IX	Methanol as a Possible Fuel for Automotive	USE
0A002221	IX	Alcohol Motor Fuels, Production and	USE
0A002248	IX	Methanol. Versatile Fuel for Immediate	USE
80A003038	IX	Motor Alcohol: Its Theory and	USE
80A001191	VII	Current State-of-the-art Stillage	USE and Disposal

Citation Number	Subject Section	Citation Title	Title Keyword
80A000700	IX	*Hydrogen as an Energy Vector: Its Production,*	*USE and Transportation, Seminar * Technic*
80A000586	VIII	*in Developing Countries * Ethanol — an Alternative to Its*	*USE as a Fuel*
80A000400	I	*Methanol: Its Synthesis,*	*USE as a Fuel, Economics, and Hazards*
80A003007	I	*asohol from Renewable Agricultural and Forest Resources for*	*USE as a Gasoline Additive * Idaho Agricu*
80A001205	I	*Ethyl Alcohol Production and*	*USE as a Motor Fuel * Chemical Technology*
80 : 001949	IV	*Availability Reports * Availability and Cost of Grain for*	*USE as Alcohol Fuels Feedstocks. Final Re*
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80A000049	V	*Costs Prohibit Cellulosic*	*USE as Feedstock*
80A002045	I	*Ethanol — an Alternative to Its*	*USE as Fuel*
80A000564	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000565	VI	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000566	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000567	II	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000568	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000569	VI	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000570	X	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000571	VI	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000572	X	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000573	VIII	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000574	VI	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000575	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000576	VI	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000577	VIII	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000578	III	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000579	X	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000580	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000581	VIII	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000582	VII	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000583	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000584	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000585	XI	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000586	VIII	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000587	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000588	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000589	III	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000590	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000591	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000592	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000593	II	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000594	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000595	VI	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000596	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000597	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000598	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000600	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000601	XI	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000602	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000603	X	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000604	VI	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000605	I	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000606	III	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
80A000607	III	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*

Citation Number	Subject Section	Citation Title	Title Keyword
80A000608	VII	*Workshop on Fermentation Alcohol for*	*USE as Fuel and Chemical Feedstock in Devel*
76 : 001878	I	*Ethanol and Methanol: Production Schemes and*	*USE as Fuels * Review Based on Use of Min*
80A001193	IX	*mmerce, United Provinces. Bulletin, New Ser., No. 6 * Its*	*USE as Motor Fuel in the United Provinces*
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80A000551	IX	*nal Symposium on Alcohol Fuels Technology * Alcohol Blend*	*USE in Stratified Charge Engines*
80A000541	X	*nology * Legal and Regulatory Influences on Alcohol Fuels*	*USE in United States*
80A000194	VIII	*Gasohol*	*USE Jumps Despite U.S. Skeptics*
80A000265	VIII	*Researchers Accelerate Search for Way to*	*USE Less Energy in Making Gasohol*
80A001083	VI	*the*	*USE of Absorbed Cellulose in the Continuous*
80A002270	I	*Bibliography on Alcohol Production and*	*USE of Agricultural Crops as a Source of Mo*
80A000453	V	*an Evaluation of the*	*USE of Agricultural Residues as an Energy F*
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80A000456	V	*an Evaluation of the*	*USE of Agricultural Residues as an Energy F*
80A002246	IX	*Alcohol Motor Fuel from Molasses, II * II. the*	*USE of Alcohol and Alcohol-ether Mixtures*
80A001202	IX		*USE of Alcohol and Gasoline in Farm Engines*
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80A001192	VI	*ding * Alcohol Series, V. 2 * a Primer on the Efficient*	*USE of Alcohol for Food and Fuel*
80A002243	I	** Concerning an Exhibition in Paris of Inventions for the*	*USE of Alcohol for Illuminating or Heating*
80A002273	X		*USE of Alcohol from Farm Products in Motor*
80A003043	I		*USE of Alcohol Fuel Outside of United State*
80A001016	IX	*API to Support Further R&D into Production and*	*USE of Alcohol Fuels*
80A000117	X	*DOE Endorses*	*USE of Alcohol Fuels to Reduce Gasoline Con*
80A003010	IX		*USE of Alcohol in Motor Gasoline — a Review*
80A002312	IX		*USE of Alcohol in Motor Gasoline. Review*
80A000594	I	*Developing Countries * Advantages and Limitations of the*	*USE of Alcohol Produced by Fermentation*
80A000465	IX	*ld Fuels Symposium * a Petroleum Industry Overview of the*	*USE of Alcohols as Automotive Fuels*
80A000520	IX	*on Alcohol Fuels Technology * Mid-term Prospects for the*	*USE of Alcohols as Motor Vehicle Fuels*
80A001175	VIII		*USE of Alternative Fuels in Highway Vehicle*
80A001256	IX	*Potential for*	*USE of Alternative Fuels in Michigan's Publ*
80A003047	III	*Alcohol Motor Fuel from Molasses, I * I.*	*USE of Cane Molasses for Manufacture of Mot*
80A003048	IX	*Further Tests on the*	*USE of Denatured Alcohol in Gasoline Engine*
80A000746	VII	*the*	*USE of Distillers Dried Grains with Soluble*
80A001155	I	*UN Workshop Urges Wider*	*USE of Ethanol*
79 : 000510	I	*posium on Alcohol Fuel Technology: Methanol and Ethanol **	*USE of Ethanol from Biomass as an Alternati*
78 : 001794	IX	*Biomass: a Cash Crop for the Future **	*USE of Ethanol-gasoline Mixtures for Automo*
80A000669	IX	*Clean Fuels from Biomass and Wastes * the*	*USE of Ethanol-gasoline Mixtures for Automo*
80A000566	I	*as Fuel and Chemical Feedstock in Developing Countries **	*USE of Ethyl Alcohol as Chemical Feedstock*
80A002275	I	*Power Alcohol * a Brief Analysis to Force*	*USE of Farm Alcohol in Motor Fuel*
80A000683	V	*of Richland Operations Office Department of Energy in the*	*USE of Forest Residues for Energy*
80A003009	IV	*Production and*	*USE of Fuel Ethanol from Corn or Wheat **
80A001080	X	*U.S. Presses Drive for*	*USE of Gasohol*
80A001111	X	*National Organization Created to Promote*	*USE of Gasohol*
80A001162	IX	*the*	*USE of Gasohol*
80A002313	I	*Production and*	*USE of Grain Alcohol as a Motor Fuel — an Ev*
80A003089	VII		*USE of Grain Alcohol By-products in Colorad*
80A002237	VII	*Proceedings 2nd Ontario Waste Conference * Recovery and*	*USE of Grain Distillery Stillage*
80A000674	IX	*Effective*	*USE of Hydrocarbon Resources * Methanol-g*
80A000700	IX	*Transportation, Seminar * Technico Economic Study of the*	*USE of Hydrogen and Methanol for Road Trans*
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80A000418	IX		*USE of Methanol as a Motor Vehicle Fuel*
80A000731	IX	*Monograph on Alternate Fuel Resources * Review of the*	*USE of Methanol as a Motor Vehicle Fuel **
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Citation Number	Subject Section	Citation Title	Title Keyword
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80A000598	I	in Developing Countries * Fermentation — Second Way for	UTILIZATION of Vegetable Sources
78:001832	V	Clean Fuel from Biomass and Wastes *	UTILIZATION of Waste Cellulose for Producti
80A003071	V		UTILIZATION of Wood for Production of Foods
80A000606	III	edstock in Developing Countries * Molasses Production and	UTILIZATION Potential in Tanzania
80A000678	VII	Proceedings of the 9th National Conference on Wheat	UTILIZATION Research * Protein Concentrat
80A000454	IX	Status of Alcohol Fuels	UTILIZATION Technology for Highway Transpor
80A001254	IX	Status of Alcohol Fuels	UTILIZATION Technology for Highway Transpor
78:002751	V	General Considerations on Cellulose	UTILIZATION: an Overview
80:000244	V	Technology of	UTILIZING Bark and Residues as an Energy an
80A000379	V	the Feasibility of	UTILIZING Forest Residues for Energy and Ch
80A000681	VI	onference * Acid Hydrolysis and Dehydration Reactions for	UTILIZING Plant Carbohydrates
80A001088	VI	the	VACUFERM Process: a New Approach to Fermen
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80A000257	VI	Rapid Ethanol Fermentations Using	VACUUM and Cell Recycle Saccharomyces Cerev
80A001210	VI	Industrial Alcohol by Continuous Fermentation and	VACUUM Distillation with Low Energy Consump
80A001089	I		VALID Alternative, A, to Petroleum
80A000527	VIII	Fuels Technology * Economics of Methanol in Motor Fuel —	VALUE and Cost of Production
80A003113	IX	Comparative Fuel	VALUES of Gasoline and Denatured Alcohol,
80A000632	IX	ergy Conversion Engineering Conference * Improving Octane	VALUES of Unleaded Gasoline via Gasohol *
80A002300	VI	Absorption of Ethanol	VAPOR in a Packed Column
80A001010	IX	Analyzer for Determining Fuel	VAPORIZATION Pressure Curves of Gasoline an
80A003061	IX	Reid	VAPOUR Pressure of Alcohol Blends
80A002233	IX		VAPOUR Pressure of Alcohol Gasoline Blends
80A001171	VI	the Effect of Extracellular	VARIABLES on the Enriched-lysine Baker's Ye
80A000138	X	Energy Conferees Are Devising a	VARIETY of Subsidy Plans Despite Budget Cru
80A000127	VIII	Economic Factors in the Assessment of	VARIOUS Cellulosic Substrates as Chemical
80A002299	IV	etween Method of Saccarification and Yields of Ethanol from	VARIOUS Cereals
80A000700	IX	Hydrogen as an Energy	VECTOR: Its Production, Use and Transporta
80A000360	VIII	Production of Ethanol and	VEGETABLE Protein by Grain Fermentation
80A000598	I	Countries * Fermentation — Second Way for Utilization of	VEGETABLE Sources
80A000338	IX	of Methanol-gasoline Blends in a Stratified Charge Engine	VEHICLE
80A001230	IX	utomotive Propulsion Systems: Held on April 18-22, 1977 *	VEHICLE Evaluation of Neat Methanol — Compr
80A000418	IX	Use of Methanol as a Motor	VEHICLE Fuel
80A000731	IX	Fuel Resources * Review of the Use of Methanol as a Motor	VEHICLE Fuel * Volume 20
80A000376	IX	Evaluation of Methyl Alcohol as a	VEHICLE Fuel Extender
80A000520	IX	ogy * Mid-term Prospects for the Use of Alcohols as Motor	VEHICLE Fuels
80A000179	I	Gasohol and Other Alternative	VEHICLE Fuels — in Retrospect
80A000523	IX	rnational Symposium on Alcohol Fuels Technology * a Motor	VEHICLE Power Plant for Ethanol and Methano
80A000752	IX	13th Summary Report: Highway	VEHICLE Systems Contractors Coordination Me
80A001218	II	Sources of Alcohol Fuels for	VEHICLE Tests
80A000435	IX	Methanol Fuel Modification for Highway	VEHICLE Use
80A000474	IX	nology for Energy Conservation * Methanol Electric Hybrid	VEHICLE: a Comprehensive Approach
80A000337	IX	anol-gasoline Blends Performance in Laboratory Tests and in	VEHICLES
80A000438	I	on the Trail of New Fuels: Alternative Fuels for Motor	VEHICLES
80A000461	IX	mental Aspects of Alternative Fuels Utilization for Highway	VEHICLES
80A000516	IX	Alcohol Fuels Technology * Emissions from Gasohol Fueled	VEHICLES
80A000702	IX	dvantages of Neat and Blended Operation of Methanol Fuel in	VEHICLES
80A002107	X	Illinois Governor Orders Gasohol in State	VEHICLES
80A000517	IX	ational Symposium on Alcohol Fuels Technology * Brazilian	VEHICLES Calibration for Ethanol Fuels
80A000329	IX	Exhaust Emissions, Fuel Economy, and Driveability of	VEHICLES Fueled with Alcohol-gasoline Blend
80A001175	VIII	Use of Alternative Fuels in Highway	VEHICLES: the Relevance of U.S. Energy Flo

Citation Number	Subject Section	Citation Title	Title Keyword
80A000711	XI	*Alternative Fuel * Environmental Aspects of Methanol as*	***VEHICULAR** Fuel: Air Quality Effects*
80A000712	IX	*Alternative Fuel * Environmental Aspects of Methanol as*	***VEHICULAR** Fuel: Health and Environmental E*
80A001167	IX	*the Laminar Burning*	***VELOCITY** of Isooctane, N-heptane, Methanol,*
80A001052	IV	*Intnl Mandioca Dev to Set Up Joint*	***VENTURE** with Brazilian Interests to Process*
80A001157	IX	*Methanol: a*	***VERSATILE** Fuel for Immediate Use*
80A002248	IX	*Methanol.*	***VERSATILE** Fuel for Immediate Use*
80A000751	VIII	*the Hydrogen Economy * the Methanol Economy: a Practical*	***VERSION** of the Hydrogen Economy*
79 : 004146	VIII	*Biomass: Is It*	***VIABLE***
80A000424	I		***VIEW** from Abroad Brazil Grows Its Motor Fue*
80A000701	IX	*Fuel * Methanol/Gasoline Blend — Automotive Manufactures*	***VIEWPOINT***
80A000703	IX	*Alternative Fuel * Methanol-gasoline Blends — University*	***VIEWPOINT***
80A000709	IX	*ive Fuel * Methanol-gasoline Blends * a Fuel Supplier's*	***VIEWPOINT***
80A000010	I	*a Canadian*	***VIEWS** Alcohol as a Farm Fuel*
80A000601	XI	*as Fuel and Chemical Feedstock in Developing Countries **	***VINASSES** Concentration and Vinasses Utiliza*
80A000601	XI	*tock in Developing Countries * Vinasses Concentration and*	***VINASSES** Utilization*
80A000022	VI	*Cellulase Production by Trichoderma*	***VIRIDE***
80A000023	VI	*Cellulase Production in Semisolid Cultures of Trichoderma*	***VIRIDE***
80A000134	VI	*Cultural Conditions on Cellulase Formation by Trichoderma*	***VIRIDE***
80A000251	VI	*a Method for Increasing Cellulase Production by Trichoderma*	***VIRIDE***
80A000297	VI	*llulase, 1, 4-D-GLUCAN Cellobiohydrolase C from Trichoderma*	***VIRIDE***
80A002085	VI	*ulase Biosynthesis in the Continuous Culture of Trichoderma*	***VIRIDE***
80A002118	V	*Fibrous Material in Feedlot Waste Fermented by Trichoderma*	***VIRIDE***
80A000346	VI	*icultural Woody Wastes by Saccharification with Trichoderma*	***VIRIDE** Cellulase*
80A001065	VI	*Kinetics of Solka Floc Cellulose Hydrolysis by Trichoderma*	***VIRIDE** Cellulase*
80A002003	VI	*Degradation of Cellulosic Materials by Trichoderma*	***VIRIDE** Cellulase*
80A000666	VI	*of Cellulose * Kinetic and Dynamic Studies of Trichoderma*	***VIRIDE** Cellulase Production*
80A000046	VI	*Continuous Cultivation of Trichoderma*	***VIRIDE** on Cellulose*
80A000047	VI	*ification of Cellulose with Culture Filtrate of Trichoderma*	***VIRIDE** QM 6A*
80A000021	VI	*Cellobiose from Trichoderma*	***VIRIDE**: Purification, Properties, Kinetics*
80A001005	I	*Alternate Fuels*	***VITAL** to Brazil*
80A002154	V	*ntation Process for the Production of Acetone, Alcohol, and*	***VOLATILE** Acids from Corncobs*
80A001246	XI		***VOLATILE** Organic Compound (VOC) Species Dat*
77 : 001297	IX	*Capturing the Sun through Bioconversion **	***VOLKSWAGEN** Alternative Fuel Programs*
80A000343	IX	*Water-cooled*	***VOLKSWAGEN** PC1-stratified Charge Engine*
80A001091	IX		***VOLKSWAGENWERK** Completes Study on 15% Metha*
80A001092	IX		***VOLKSWAGENWERK** Starts Test with 800 Methano*
80A001093	IX		***VOLKSWAGENWERK** Summarizes Research in Using*
80A000713	IX	*Fuel * Energy Workshop — Report on the Use of Methanol in*	***VOLKSWAGONS***
80A000621	I	*Methanol Technology and Economics * a Review of*	***VOLUMETRIC**, Thermodynamic, and Other Physic*
80A001094	IX		***VOLVO**, Saab Test Dual Fuels Engines*
80A002096	X	*House Unit*	***VOTES** to End Import Tax on Methanol Fuel*
80A002053	X	*the Ethanol Race:*	***WAITING** for the Government Plan*
80A000308	IX	*Kinetic*	***WALL** Quenching of Methanol Flames with Appl*
80A002305	IX	*ion Characteristics of Gasoline, Methane, and Methanol in a*	***WANKEL** Engine*
80A002227	I	*Alcohol for*	***WAR***
80A003106	I	*Alcohol Answers*	***WAR** against Automobile*
80A002167	V	*Wood Hydrolysis to Become Source of*	***WAR** Alcohol*
80A000146	I	*the Energy*	***WAR**: Brew It Yourself*
80A001102	IX	*Chrysler, G.M. Put Gasohol in*	***WARRANTY***
80A003014	VIII	*Potential of On-farm Energy Production Systems * Univ. of*	***WASHINGTON**. Center for the Biology of Natu*
77 : 001296	I	*Capturing the Sun through Bioconversion * Speech Held In*	***WASHINGTON**, March 11, 1976, on the Bioconve*
78 : 003706	VIII	*el Grade Ethanol by Enzymatic Hydrolysis of an Agricultural*	***WASTE***

Citation Number	Subject Section	Citation Title	Title Keyword
80A000050	VIII	onomics for the Production of Liquid and Gaseous Fuels from	WASTE
80A002203	V	Ethyl Alcohol from Wood	WASTE
80A002226	V	Sugar and Alcohol from Wood	WASTE
80A002230	V	Industrial Use of Wood	WASTE
80A002315	V	Chemicals from Wood	WASTE
80A003066	V	Manufacture of Ethyl Alcohol from Wood	WASTE
80A002236	V	trial Fermentations * the Production of Alcohol from Wood	WASTE * Chapter 5
80A003111	VI	the Manufacture of Ethyl Alcohol from Wood	WASTE * U.S. Dept. of Agriculture. Bullet
80A003016	V	Methanol from Wood	WASTE * U.S. Dept. of Agriculture. Forest
80 : 001986	VI	Energy Systems Conference * Enzymatic Saccharification of	WASTE Cellulose
80A000682	VI	the Eighth Cellulose Conference * Enzymatic Hydrolysis of	WASTE Cellulose
80A002035	VI	Enzymatic Hydrolysis of	WASTE Cellulose
80A000679	VI	Eighth Cellulose Conference * Production of Sugars from	WASTE Cellulose by Enzymatic Hydrolysis.
78 : 001832	V	Clean Fuel from Biomass and Wastes * Utilization of	WASTE Cellulose for Production of Chemical
80A002237	VII	Proceedings 2nd Ontario	WASTE Conference * Recovery and Use of Gr
80A001189	I	Synthetic Oil vs. Methanol as a Liquid Fuel Product from	WASTE Conversion Processes
80A002118	V	Fibrous Material in Feedlot	WASTE Fermented by Trichoderma Viride
80A000449	V	Utilization of Cellulosic	WASTE for Energy Production
80A000401	V	Wood	WASTE for Energy Study: Inventory Assessme
80A003040	VIII	Economic and Market Aspects of Ethyl Alcohol from Sulphite	WASTE Liquor
76 : 001911	I		WASTE Materials * Review of Energy Availa
80A000385	VI	Fuel and Energy Production by Bioconversion of	WASTE Materials — State-of-the-art
80A001214	V	Disposal of Cellulosic	WASTE Materials by Enzymatic Hydrolysis
80A003119	III	Motor Fuel from	WASTE Molasses
80A000088	VI	Efficiencies of Methanol Production from Gas, Coal,	WASTE or Wood
80A003005	V	Studies, Volume E. Municipal	WASTE Studies
80A000372	V	Converting Cellulosic	WASTE to Fuel: a Literature Review
80A000154	V	Forest and Wood	WASTE Utilisation: Conversion to Fuel Alco
80A000749	VII	Proceedings 1st Industrial	WASTE Utilization Conference * Feed By-pr
80A002231	V	Ethyl Alcohol from	WASTE Wood by Modified Scholler Process
80A000530	V	ohol Fuels Technology * Ethanol from Municipal Cellulosic	WASTES
79 : 004655	I	Energy from Biomass and	WASTES * Agro-industrial System for Ethan
80A000670	I	Clean Fuels from Biomass and	WASTES * Biomass and Wastes as Energy Res
79 : 004656	I	Energy from Biomass and	WASTES * Brazilian Gasohol Program
80A000460	VIII	Energy from Biomass and	WASTES * Economics of Wood Biomass
78 : 001830	V	Clean Fuel from Biomass and	WASTES * Energy and Materials from the Fo
79 : 004644	I	Energy from Biomass and	WASTES * Energy from Biomass and Wastes:
80A000483	VI	Fuels from Biomass, Sewage, Urban Refuse, (and) Agriculture	WASTES * Enzymatic Hydrolysis of Cellulos
79 : 004665	VIII	Energy from Biomass and	WASTES * Ethanol-gasoline Motor-fuel Mixt
80A003109	IV	hol; with a General Discussion of the Availability of Other	WASTES * Farmer's Bulletin. (U.S. Dept.
79 : 004654	I	Energy from Biomass and	WASTES * Liquid Fuels from Renewable Reso
80 : 002140	VIII	ing in the Utilization of the Organic Fraction of Municipal	WASTES * New Zealand
79 : 004663	I	Energy from Biomass and	WASTES * Study of the Energy Potential of
80A000669	IX	Clean Fuels from Biomass and	WASTES * the Use of Ethanol-gasoline Mixt
78 : 001832	V	Clean Fuel from Biomass and	WASTES * Utilization of Waste Cellulose
80A000410	V	ynthetic Fuels from Municipal, Industrial, and Agricultural	WASTES (Citations from the NTIS Data Base)
80A000670	I	Clean Fuels from Biomass and Wastes * Biomass and	WASTES as Energy Resources: Update
80A002156	II	Western	WASTES as Materials for Alcohol Production
80A000346	VI	Sugar Production from Agricultural Woody	WASTES by Saccharification with Trichoderma
80 : 001948	II	ability Reports * Availability of Agricultural Processing	WASTES for Utilization as a Feedstock for
80 : 002049	V	Biomass Refinery Turns Crop	WASTES into Fuel
80A002104	VI	How to Turn	WASTES into Fuel

Citation Number	Subject Section	Citation Title	Title Keyword
80A000713	IX	*Methanol as an Alternative Fuel * Energy*	*WORKSHOP — Report on the Use of Methanol in*
77 : 001295	IX	*Capturing the Sun through Bioconversion * Liquid Fuels:*	*WORKSHOP No. 6*
80A000564	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000565	VI		*WORKSHOP on Fermentation Alcohol for Use as*
80A000566	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000567	II		*WORKSHOP on Fermentation Alcohol for Use as*
80A000568	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000569	VI		*WORKSHOP on Fermentation Alcohol for Use as*
80A000570	X		*WORKSHOP on Fermentation Alcohol for Use as*
80A000571	VI		*WORKSHOP on Fermentation Alcohol for Use as*
80A000572	X		*WORKSHOP on Fermentation Alcohol for Use as*
80A000573	VIII		*WORKSHOP on Fermentation Alcohol for Use as*
80A000574	VI		*WORKSHOP on Fermentation Alcohol for Use as*
80A000575	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000576	VI		*WORKSHOP on Fermentation Alcohol for Use as*
80A000577	VIII		*WORKSHOP on Fermentation Alcohol for Use as*
80A000578	III		*WORKSHOP on Fermentation Alcohol for Use as*
80A000579	X		*WORKSHOP on Fermentation Alcohol for Use as*
80A000580	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000581	VIII		*WORKSHOP on Fermentation Alcohol for Use as*
80A000582	VII		*WORKSHOP on Fermentation Alcohol for Use as*
80A000583	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000584	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000585	XI		*WORKSHOP on Fermentation Alcohol for Use as*
80A000586	VIII		*WORKSHOP on Fermentation Alcohol for Use as*
80A000587	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000588	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000589	III		*WORKSHOP on Fermentation Alcohol for Use as*
80A000590	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000591	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000592	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000593	II		*WORKSHOP on Fermentation Alcohol for Use as*
80A000594	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000595	VI		*WORKSHOP on Fermentation Alcohol for Use as*
80A000596	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000597	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000598	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000600	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000601	XI		*WORKSHOP on Fermentation Alcohol for Use as*
80A000602	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000603	X		*WORKSHOP on Fermentation Alcohol for Use as*
80A000604	VI		*WORKSHOP on Fermentation Alcohol for Use as*
80A000605	I		*WORKSHOP on Fermentation Alcohol for Use as*
80A000606	III		*WORKSHOP on Fermentation Alcohol for Use as*
80A000607	III		*WORKSHOP on Fermentation Alcohol for Use as*
80A000608	VII		*WORKSHOP on Fermentation Alcohol for Use as*
80A000750	IX	*Proceedings of the Cornell International Symposium and*	*WORKSHOP on the Hydrogen Economy * Potent*
80A000751	VIII	*Proceedings of the Cornell International Symposium and*	*WORKSHOP on the Hydrogen Economy * the Me*
80A001155	I	*UN*	*WORKSHOP Urges Wider Use of Ethanol*
80A000637	I	*Energy and the Public, Public Awareness*	*WORKSHOPS and Plenary Sessions, at the 6t*
79 : 004017	I	*Renewable Energy Crucial for Third*	*WORLD*
80A001264	V	*Forests for People: a Challenge in*	*WORLD Affairs * the Role of Forests in Me*

Citation Number	Subject Section	Citation Title	Title Keyword
80A001264	V	*allenge in World Affairs * the Role of Forests in Meeting*	***WORLD** Energy Problems*
80A000720	IX	*Conference Proceedings: 1st*	***WORLD** Hydrogen Energy Conference * Methan*
80A002139	VIII	*Food or Fuel — New Competition for the*	***WORLD'S** Cropland * Worldwatch Paper 35*
80A002139	VIII	*Food or Fuel — New Competition for the World's Cropland **	***WORLDWATCH** Paper 35*
80A000407	VI	*Study of the Fermentation of*	***XYLOSE** to Ethanol by Fusarium Oxysporum*
80A001187	VI	*Making Fuel in Your Back*	***YARD***
80A002150	VI	*Making Fuel in Your Back*	***YARD***
80A000014	X	*an Isn't Likely to Create More Demand for Excess Grain This*	***YEAR***
80A000371	IX	*ustion Studies of Alternative Fuels. Annual Report. Fiscal*	***YEAR** 1975*
80 : 000950	VIII	*Fuels Study * Availability to Industry and Utilities to*	***YEAR** 2000*
80A002031	I	*Alcohol Fuels: a Major Source of Power Only a Few*	***YEARS** from Here*
80A002119	IX	*Fifty*	***YEARS** of Combustion Research at General Mot*
80 : 002118	VI	*tion of Alcohol Directly from Cellulose Using Cellulase and*	***YEAST***
80A000298	VI	*of Continuous Fermentation of Indian Cane Sugar Molasses by*	***YEAST***
80A002310	V	*Preparation of Wood Sugars and Fermentation to Ethanol and*	***YEAST***
80A001171	VI	*of Extracellular Variables on the Enriched-lysine Baker's*	***YEAST** — Ethanol Fermentation Process*
80A002198	III	*Feed*	***YEAST** and Industrial Alcohol from Citrus-wa*
80A000085	VI	*Effect of Pretreatment of Molasses and Recycling of*	***YEAST** on Ethanol Fermentation*
79 : 004127	II	*of Cellulose (Wood) and Corn Starch to Sugars, Alcohol and*	***YEAST**. Final Report*
80A000025	V	*Cellulose to Sugars: Gives Quantitative*	***YIELD***
80A002204	IV	*Granular Wheat Flour Increases Alcohol*	***YIELDS***
80A002299	IV	*the Relation between Method of Saccarification and*	***YIELDS** of Ethanol from Various Cereals*
79 : 004370	I	*Focus on Renewable Energy in New*	***ZEALAND***
80 : 002140	VIII	*ization of the Organic Fraction of Municipal Wastes * New*	***ZEALAND***
80A000241	IX	*Methanol/Gasoline Blends as a Motor Fuel for New*	***ZEALAND***
80A000722	VIII	*Some Aspects of the Economics of Ethanol Production in New*	***ZEALAND***
80A000722	VIII	*of a Symposium on the Potential for Energy Farming in New*	***ZEALAND** * Some Aspects of the Economics*
80A000502	I	*ohol Fuels Technology * Alcohol Fuels from Biomass in New*	***ZEALAND** — the Energetics and Economics of P*
80A002308	IV	*2nd New*	***ZEALAND** Energy Conference * Fuel from Cro*
80A000518	IX	*ernational Symposium on Alcohol Fuels Technology * BP New*	***ZEALAND** Experience with Methanol/Gasoline B*
80A002086	I	*Half of New*	***ZEALAND'S** Gasoline Needs (Could Be Met by M*
80A000550	X	*International Symposium on Alcohol Fuels Technology * New*	***ZEALAND'S** Methanol-gasoline Transport Fuel*

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Author Index

Author	Subject Section	Citation Number
LoRusso, J.A.	IX	80A000643
Lucas, G.G.	IX	80A001248
Luchi, N.R.	I	79 : 004655
Lucke, C.E.	IX	80A002220
	IX	80A003112
Ludvigsen, K.	IX	80A002024
Ludwig, D.E.	IX	80A001120
	IX	80A001255
Luke, D.L.	V	80A000269
Lunt, R.S.	IX	80A000333
Lyons, R.D.	X	80A001075
	X	80A001081
Macko, J.F.	XI	80A001246
MacDonald, J.T.	IX	80A000551
Madi, A.G.	VI	80A000256
	VI	80A000576
Mahadevan, K.	IX	80A000657
Malik, K.A.	IX	80A000043
Malte, P.C.	IX	80A000639
Mancott, A.	XI	80A000035
Mandels, M.	VIII	80 : 000217
	VI	80A000224
	VI	80A000275
	VI	80A000724
	V	80A001214
	VI	80A001236
	VI	80 : 001986
	VI	80A002017
	VI	80A002035
	VI	80A002265
Mandels, M.H.	VI	80A000665
	VI	80A000679
	VI	80A000682
Mandels, M.H. (ed.)	VI	80A000725
Mandeville, M.W.	I	80A002144
Mandia, J.W.	XI	80A000446
Mann, W.C.	V	80 : 002049
Manning, A.B.	IX	80A002200
Manning, F.S.	IX	80A000327
Manowitz, B.	I	80A000396
Mapstone, G.E.	IX	80A002233
Marchese, J.	X	80A001055
Margaritis, A.	VI	80A000271
Marion, L.	X	80A002053
Mariotte, P.	I	80A000584
Marroquin, F.	VI	80A002132
Marshall, J.E.	V	79 : 002502
	I	80A000690
	VIII	80A003116
Marshall, J.F.	VIII	80A001156
	VIII	80 : 002033
Marshall, W.F.	IX	80A000378
Marzola, D.L.	III	80 : 002045
Mashiko, I.	IX	80A000475
Mashima K.I.	III	80A002135
Mason, D.	I	80A000556
Massa, C.O.	IV	78 : 002289
Mater, J.	V	80 : 000244
Mater, M.H. (eds.)	V	80 : 000244
Mathewson, S.W.	VI	80A003023
Mathur, H.B.	IX	80A000215
	IX	80A000649
	IX	80A000652
Matsuno, M.	IX	80A000558
Maurel, H.	I	80A000594
Mavis, A.	I	80A003100
Mcketta, J.J. (ed.)	IX	80A002238
McCallum, P.W.	IX	80A000492
	I	80A000629
	I	80A000753
McCann, D.J.	II	80A000567
	VI	80A002280
McCloskey, J.P.	I	75 : 001201
	IX	80A000220
McClure, T.A.	III	76 : 001690
	III	78 : 000583
	III	78 : 000584
	VIII	78 : 001792
	III	78 : 002730
	III	79 : 000053
	III	79 : 005180
	III	79 : 005181
	II	80A000144
	III	80A000499
	III	80A000686
	VIII	80A001208
	III	80 : 001950
	III	80A003133
	III	80A003135
McCormack, M.C.	IX	80A000548
	IX	80A000703
	IX	80A000733
	IX	80A001263
McElheny, V.K.	IX	80A001071
McGauhey, P.H.	I	76 : 001911
McGovern, J.P.	IV	80A002209
McHard, D.R.	I	80A003087
McIndoe, W.C.	II	80A002156
McKay, R.	VII	80A000429
McLean, W.J.	IX	80A000415
McQueen, E.G.	XI	80A000559
McQuiston, J.T.	VIII	80A000192
	VIII	80A000205
McWaters, D.F.	I	80A000232
Mears, L.G.	I	80A000143
Medeiros, J.	VI	80A000724
	VI	80A00201
	VI	80A00226
Medeiros, J.E.	VI	80A00067y
Melchior, W.	VI	80A002197
Melman, T.P.	XI	80A000601

Author	Subject Section	Citation Number
Meltzer, J.	IX	80A000373
	IX	80A000374
Menezes, T.J.B. de	VI	80A000169
	VI	80A000274
Menrad, H.	IX	80A000523
	IX	80A002016
	IX	80A002258
Merrill, R.	I	80A000743
Merrill, R. (ed.)	I	80A000743
Messick, J.R.	VIII	80A000536
Meyer, A.J.	IX	80A003115
Meyer, C.	IX	80A000700
Meyer, W.E.	IX	80A000332
Meyrath, J.	VI	80A000569
Miccolis, J.M.F.	I	78 : 000005
	I	80A000445
Michel, J.W.	I	80A000390
	I	80A000391
Milanovich, F.	XI	80A000444
Miles, T.R.	V	80A000463
Milfont, W.N., Jr.	IV	78 : 002289
	IV	80A000689
Miller, D.L.	VIII	77 : 001299
	VI	80A000726
	VI	80A000729
Miller, D.R.	I	80A000685
	V	80A003094
Miller, G.A.	IX	80A002302
Miller, I.J.	VIII	80 : 002140
Miller, J.A.	VI	80A002093
Miller, K.A.	V	80A000453
Miller, S.F.	V	80A000003
	V	80A000533
Miller, T.	IV	80A002148
Millett, M.A.	VI	80A000727
	VI	80A001135
Mishra, C.	V	80A000449
Miskell, J.T.	VIII	79 : 004146
Mitra, G.	VI	80A000717
	VI	80A000719
Mitsui, A. (ed.)	III	80A000686
Moeller, F.W.	VI	80A000732
Mohr, B.J.	VIII	80A000360
	VIII	80A001098
	IX	80A001161
	IX	80A002245
Mohr, C.	X	80A000015
Monick, J.A.	I	80A003022
Monier-Williams, G.W.	I	80A002240
Montenecourt, B.S.	VI	80 : 000223
Moon, G.D., Jr.	VIII	80A000536
Moore, J.S.	IX	80A000492
	I	80A000629
Moreira, J.R.	VIII	80A000528
	VIII	80A000581
Morris, H.	I	80A000146
Morris, W.	V	80A001113
Morse, R.N.	I	76 : 001711
	V	76 : 001883
	V	80A000268
Moseley, J.W.	I	80A003043
Moses, C.A	IX	80A000547
Most, W.J.	IX	80A000339
	IX	80A000470
Mouat, L.	I	80A000200
Moundlic, J.	I	80A000588
Mulcock, A.P.	VIII	80A000722
	VI	80A002263
	IV	80A002308
Mulloney, J.A., Jr.	V	80A000530
Mundo, K.-J.	V	80A000535
Mungai, J.J.	III	80A000606
Murata, D.	III	79 : 007134
	III	80 : 002125
Murphy, T.E.	IX	80A000133
Murray, P.J.	VIII	80A003006
Murthy, B.S.	IX	80A000087
	IX	80A000650
	IX	80A000653
	IX	80A000658
	IX	80A000659
Murthy, V.S.	III	80 : 002130
Myers, N.	IX	80A002111
Nagodawithana, T.W.	VI	80A002116
Nakaguchi, G.M.	IX	80A000435
Nakano, Y.	IX	80A000558
Namperumal, L.	IX	80A000660
Nand, K.	III	80 : 002130
Narasimhan, T.L.	IX	80A002186
Nasrullah, M.	IX	80A000650
	IX	80A000658
Natarajan, A.	IX	80A002186
Nathan, F.	II	80A002212
Nathan, R.A.	III	76 : 001690
	III	78 : 000584
	III	78 : 000585
	III	80A000499
	III	80A003133
Nathan, R.A. (ed.)	III	79 : 000540
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Nelson, M.J.	I	80A002103
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Nevans, R.	VIII	80A000196
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Newman, M. (ed.)	X	80A000723

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	VI	80A000682
	VI	80A002035
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Okamoto, R.	VI	80A000299
Oki, T.	VI	80A002070
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Ormandy, W.R.	V	80A002172
Oschwald, W.R. (ed.)	V	80A000699
Osianowski, R.P.	VI	80A000738
Osler, C.F.	I	79 : 004654
	IX	80A000464
	VIII	80A000553
Othmer, D.F.	I	80A002227
Otis, J.L.	III	76 : 001690
	III	78 : 000583
	III	78 : 000584
	III	78 : 000585
	III	80A003135
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Overend, R.	I	80A003012

Author	Subject Section	Citation Number
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	III	80A002218
	IV	80A003054
	III	80A003076
	III	80A003077
	V	80A003078
	III	80A003079
	VIII	80A003080
	III	80A003082
	III	80A003083
	III	80A003084
	III	80A003120
Pain, B.	VIII	80A000145
Palmer, J.K.	VI	80A000184
Panchapakesan, N.R.	IX	80A000650
	IX	80A000653
	IX	80A000658
Pangborn, J.	IX	80A000365
	IX	80A000366
Pangborn, J.B.	VIII	80A000493
	IX	80A001007
Panuschka, G.	VI	80A000604
Pape, M.	VI	80A000473
Pappas, J.	IX	80A000247
	IX	80A000370
Pappas, J.M.	IX	80A000730
	IX	80A002254
Parisi, A.J.	VIII	80A002072
Park, W.	I	80A001251
	I	80A001252
	VIII	80A002137
Park, W.R.	VIII	80 : 000205
Parker, A.J., Jr.	V	80A000530
	IX	80A000695
Parker, F.A.	II	80A001218
Parks, F.B.	IX	80A000340
Parsly, L.F., Jr.	VI	80A002300
Paskin, M.	I	80A002142
Pasternack, A.	IX	80A000392
Pasternak, A.	IX	80A001177
Pathak, A.N.	VI	80A000666
Patty, F.A. (ed.)	XI	80A001179
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Paulavicius, I.	VI	80A002036
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Pearson, G.G.	IV	80A000130
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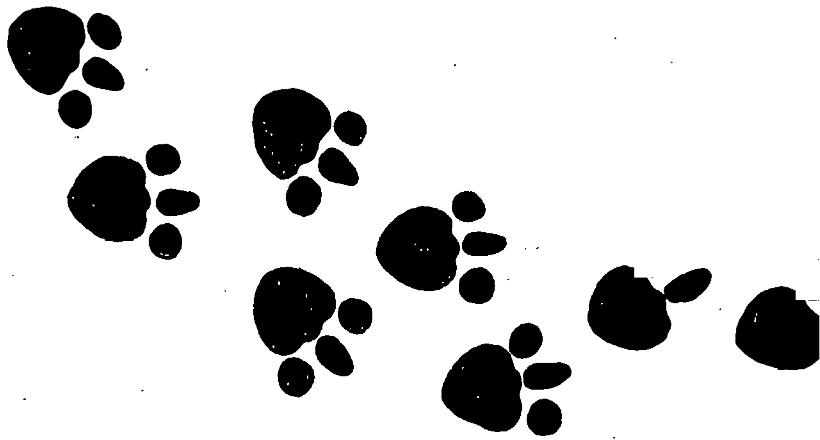

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