

Welcome to CTTS!

The Center for Transportation Technologies and Systems (CTTS) works toward developing advanced vehicle and fuel technologies; moving them from research and development to the marketplace. Working in partnership with public and private organizations, our Center develops and demonstrates innovative vehicle and fuel technologies that reduce the nation's dependence on imported oil and improve air quality.

Housed at the National Renewable Energy Laboratory (NREL) in Golden, Colorado, our diverse team of engineers and scientists focuses on many aspects of advanced transportation systems, including vehicle components, systems development and optimization, vehicle simulation, fuels research and development, fleet evaluations, and emissions and air quality research. Integrating this technology through CTTS' Web sites, print publications, hotlines, and other outreach efforts provides important information to industry, academia, government agencies, and the public.

Looking at the Parts: Vehicle Components

CTTS experts develop and evaluate automotive technologies that help our industry partners optimize vehicle systems, with a focus on increasing fuel efficiency and reducing emissions. An important part of this work involves helping battery developers and automobile manufacturers improve battery module and pack designs by enhancing performance and extending battery life. We use cutting edge computer engineering tools to accomplish our research.

Much of our testing is conducted at NREL's state-of-the-art laboratory, where researchers focus on battery thermal management systems—from the cell level to the battery pack—for electric, hybrid-electric (HEV), and fuel cell vehicles. The laboratory houses a unique calorimeter that measures battery performance over a wide temperature range and for a variety of battery sizes. Engineers use thermal imaging equipment to capture a battery's infrared fingerprint in order to diagnose its behavior. And, since fuel cells clearly hold promise as a major component in vehicles of the future, we will also assess the thermal and moisture management properties of fuel cell systems.

Assembling the Parts: Systems Development and Optimization

CTTS has worked closely with Ford, DaimlerChrysler, and General Motors on cost-shared projects to develop and optimize HEV technologies. HEVs are significantly more fuel efficient and have fewer emissions than conventional vehicles. Recent production announcements by auto manufacturers marked CTTS' success in helping industry develop HEVs that will soon be available to the public.

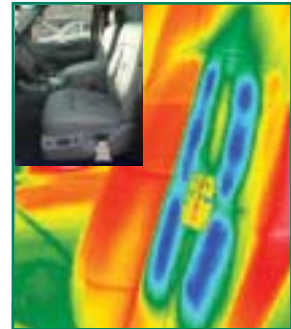
In addition, CTTS initiated the "Cool Car" project to improve vehicle fuel economy and reduce emissions. Its goal is to reduce vehicle auxiliary loads, such as air conditioning (AC), while maintaining passenger comfort. Engineers conduct vehicle tests and develop integrated models to evaluate the impacts of advanced window glazings; cooling heat-pipe systems; parked car ventilation; heated, cooled, and ventilated seats; and direct energy recovery and adsorption cooling systems. CTTS is also developing a life-size thermal manikin to evaluate passenger comfort using advanced climate control concepts.

Modeling for Success: Vehicle Simulation

Energy management strategies depend on accurate vehicle simulation. Our team has developed an effective modeling software package called ADVISOR (ADvanced VehIcle SimulatOR), which provides vital information about vehicle efficiency, performance, and emissions. ADVISOR can simulate HEVs and other advanced and conventional vehicles. Automakers, along with universities and component



Unique battery test laboratory



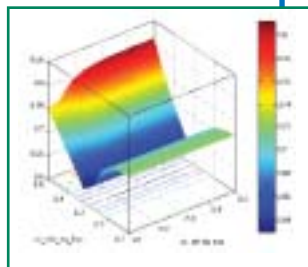
Cooled and ventilated seats to reduce AC load



Manikin limb to test passenger thermal comfort



HEV on-road testing



Motor efficiency map



Graphical user interface screen for ADVISOR

developers, use ADVISOR for virtual testing to evaluate individual components, as well as those integrated into a larger system. CTTS continues to work closely with industry to improve ADVISOR's capabilities.

CTTS is also expanding its efforts to develop the Digital Functional Vehicle, the next step in simulation and modeling software that integrates numerous math-based engineering tools and data to optimize energy efficiency during vehicle design.



Evaluating natural gas vans



Vehicle testing in laboratory



Hydrogen fuel cell buses



Thermal imaging of a battery used in HEVs



Filling up on alternative fuel



Fuel evaluation in fleet vehicles

Filling the Tank: Fuels Research and Development

Partnering with government and industry, CTTS manages a nationwide endeavor to test and develop alternative fuels (such as natural gas, hydrogen, ethanol, and biodiesel) and advanced petroleum-based fuels to improve energy efficiency and reduce emissions.

For example, our team has found that certain combinations of ultra-low sulfur fuels, engines, and catalysts can reduce the prime components of urban smog (particulate matter and nitrogen oxide emissions) by more than 90%. These results have helped pave the way for new EPA regulations for fuel quality and heavy-duty engine emissions, which could significantly reduce air pollution.

CTTS also prides itself on being a driving force in the natural gas arena. Our Center works with key industry members and organizations to develop and analyze technologies that promote natural gas as a transportation fuel. We also lead innovative projects designed to demonstrate ultra-low emission levels in prototype or production engines and vehicles.

Taking a Test Drive: Fleet Evaluations

CTTS works with industry and government to analyze the performance of light-, medium-, and heavy-duty advanced technology and alternative fuel vehicles (AFVs) in fleets across the nation. Test procedures are developed with stakeholders to collect data on vehicle emissions, maintenance, cost, and performance. Based on the analysis of real-world data, we produce unbiased information for key decision makers, including fleet managers, who are considering adding such vehicles to their fleets.

Cleaning the Air: Emissions and Air Quality Research

The transportation sector is a primary source of air pollution in the United States. To better understand the problem, CTTS examines ambient air samples and exhaust emission data from vehicles using traditional and advanced fuels to determine the effects of pollutants on human health, air quality, and visibility. We coordinate our research with automobile and engine manufacturers; petroleum producers; federal, regional, and local environmental agencies; and engine and fuel researchers.

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Getting the Word Out: Technology Integration

To move new technologies into the marketplace and put AFVs onto American roadways, CTTS develops and distributes information and technical resources.

CTTS works with DOE's Clean Cities Program to help build the foundation for a sustainable alternative fuels market in cities across the nation. This voluntary program helps put AFVs on the road by providing information and educational materials to fleets and the public. The program also provides regulatory information related to the Energy Policy Act of 1992.



As part of the Clean Cities Program, our Center maintains the Fleet Buyer's Guide Web site at www.fleets.doe.gov to assist fleet managers with AFV purchase decisions. This site provides information about incentives, regulations, vehicle availability, and cost. Additionally, our Web-based Alternative Fuel Station Locator at <http://afdcmap.nrel.gov/refueling.html> allows users to search for alternative fuel stations across the country.



CTTS also maintains DOE's Alternative Fuels Data Center, the country's most comprehensive, up-to-date resource for information on advanced transportation technologies and programs. The vast collection of more than 3,000 documents is available online at www.afdc.doe.gov or through the National Alternative Fuels Hotline.



Produced for the U.S. Department of Energy (DOE)
by the National Renewable Energy Laboratory,
A DOE national laboratory.

For more information:

On the Web

The CTTS Web site (www.ctts.nrel.gov) contains links to all CTTS programs and information resources.

Personal Service

For information about advanced vehicles and fuels, contact the National Alternative Fuels Hotline at (800) 423-1DOE.

Working with Us

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