Gasifier Kindles Biopower Potential

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The Battelle gasifier in Burlington, Vermont, provides a clean gas fuel for modern power systems that can achieve efficiencies double those of today's biopower industry.

The R&D 100 Award winners are Battelle, the National Renewable Energy Laboratory, Future Energy Resources Company, and the Burlington

An innovative partnership between government and industry has been awarded the prestigious R&D 100 Award for developing a new biomass gasification technology. Based on research sponsored by the U.S. Department of Energy, the technology demonstrates how biomass can be converted into a clean burning gaseous fuel for firing advanced power systems with high efficiencies and low emissions. The award is given yearly by R&D magazine to the 100 most significant technical achievements of the year.

Biomass

Biomass is already this country's leading non-hydro resource of renewable energy. More than 500 electric power plants operate on biomass in the United States, with a combined rated capacity of 7,000 megawatts (MW).

The biomass fuels for these power plants come from a variety of sources. The majority of these fuels consist of residues from the bioprocessing industries—forestry and wood products, agriculture and food processing, and other industries such as construction and transportation that must dispose of large quantities of unused biomass.

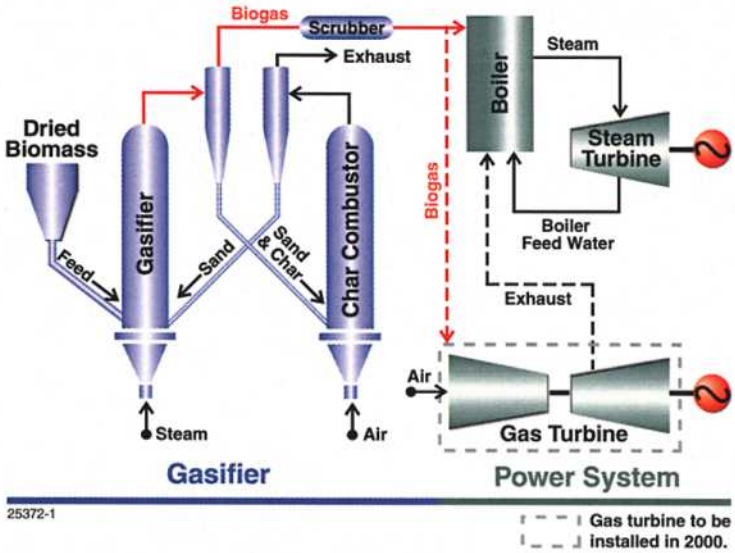
The McNeil Generating Station in Burlington, Vermont, generates 50 MW of electric power for the city's residents using wood from nearby forestry operations—forest thinnings and discarded wood pallets. The gasifier is capable of converting 200 tons of wood chips per day into a gaseous fuel that is currently fed directly into the McNeil Station boiler, enough to generate 8 MW.

The gasifier will significantly improve electrical generating efficiency in a variety of applications. Although the McNeil station is larger and more efficient than average for the biopower industry, it uses the same conventional steam turbine technology as the rest of the industry. These power plants have, on average, a rated capacity of about 20 MW and an electricity generating efficiency of about 20%. The biomass gasifier enables the use of advanced power systems based on gas turbines and combined cycles that will nearly double the efficiency of today's biopower industry.

Clean Energy

The Vermont gasifier heats the wood in a chamber filled with hot sand until the wood breaks into basic chemical components. The solids—sand and char—are separated from the gases, which then flow through a scrubber. The final result is a very clean-burning gas fuel suitable for direct use in modern power systems such as combined-cycle gas turbines.

Because the gas is cleaned before combustion, and because wood has a low nitrogen and sulfur content, the controlled emissions (such as SO_x and NO_x) are extremely low. Furthermore, emissions of greenhouse gases (e.g., CO_2) are greatly reduced. Roughly the same amount of CO_2 that is released during combustion is absorbed by trees and crops when they grow again.



Award-Winning Partnership

Commercial development of this gasifier will increase the number and types of biomass fuels suitable for electric generating systems. These fuels could include residues from agriculture, from bioprocessing industries, or eventually energy crops grown specifically for power production. One very promising market for the gasifier is in combined heat and power systems in the forest products industry, which already generates a substantial amount of electricity from biomass. Several scenarios point to the potential market for gasifier power systems at about 10,000 MW by 2010.

The 1998 R&D 100 Award is shared by Battelle of Columbus, Ohio, for inventing the process and licensing the technology; the National Renewable Energy Laboratory (NREL) of Golden, Colorado, for supporting of gasifier design, engineering, and operation; the Burlington Electric Department, for hosting the demonstration and integrating the gasifier into the McNeil Generating Station; and the Future Energy Resources Company (FERCO) of Atlanta, Georgia, which has licensed the technology from Battelle for commercial production and is leading the commercialization effort. Today, the partners continue research and development of biomass gasifiers for fueling other advanced power systems of the future.

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