Industrial Innovations

FOR TOMORROW

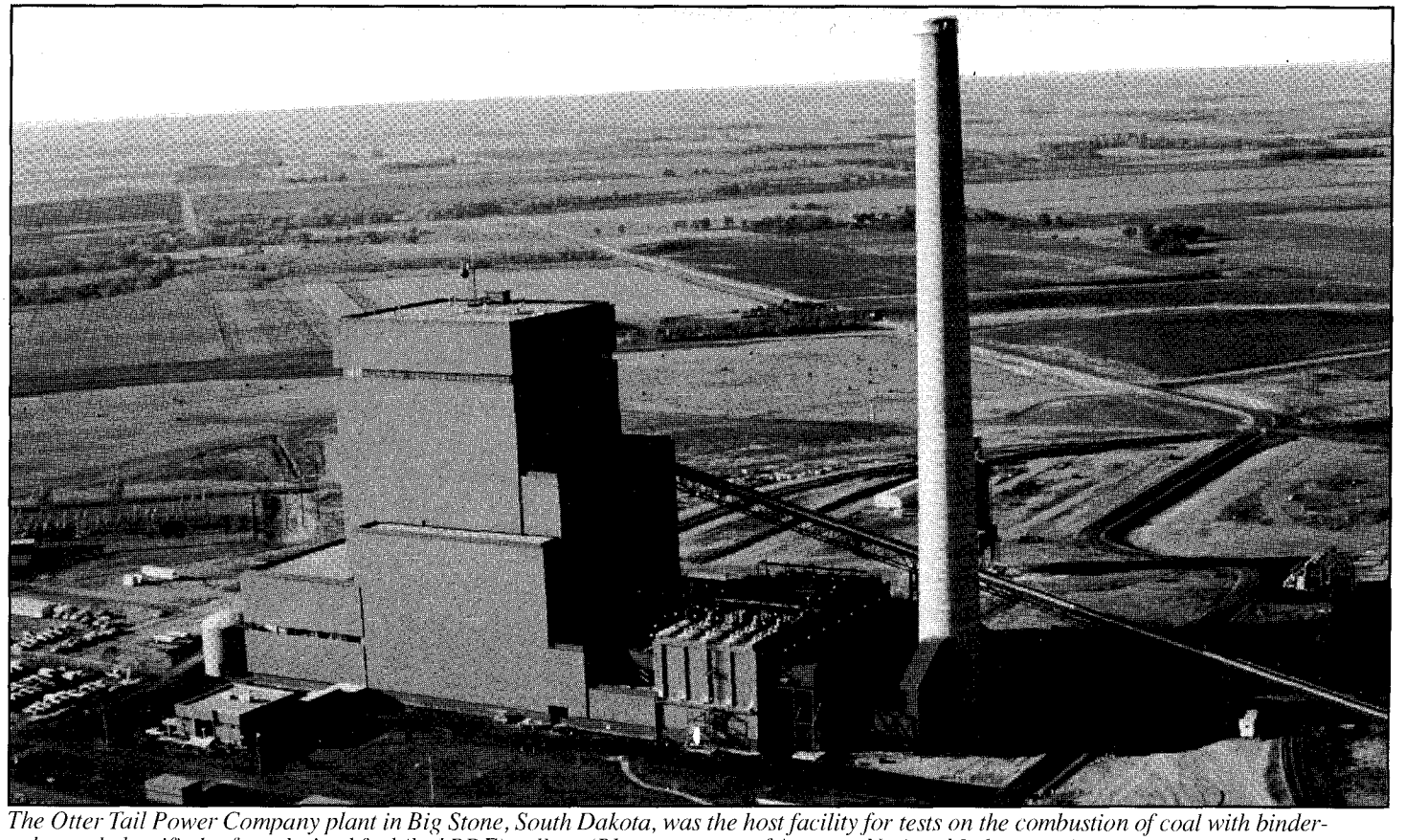
Advances in Industrial Energy-Efficiency Technologies

Commercial Power Plant Tests Blend of Refuse-Derived Fuel and Coal to Generate Electricity

More data on the combustion of municipal solid wastes are needed to promote the use of this alternative fuel.

Each year Americans discard more than 200 million tons (182 million metric tons) of solid wastes in municipal waste facilities. Roughly 33% of these wastes are used productively to generate energy or produce raw material for recycling into new products. However, the majority of municipal solid wastes (MSW) ends up in increasingly scarce landfills.

The U.S. Department of Energy (DOE) supports the use of MSW to produce energy. While the productive use of MSW is clearly in the national interest, the full potential of converting combustible components in the MSW stream to energy has not been fulfilled. More data are needed on the emissions and discharges from facilities burning these wastes. In addition, more comprehensive information on waste combustion



The Otter Tail Power Company plant in Big Stone, South Dakota, was the host facility for tests on the combustion of coal with binder-enhanced, densified refuse-derived fuel (b-d RDF) pellets. (Photo courtesy of Argonne National Laboratory)

Cocombustion of Coal and b-d RDF

options should be developed and disseminated to appropriate decision makers, as well as to the public, to improve understanding of the effects of alternative waste disposal options.

A power plant was operated using coal and up to 20% refuse-derived fuel by weight.

MSW can be converted to energy in two ways. One involves the direct burning of MSW to produce steam and electricity. The second converts MSW into refuse-derived fuel (RDF) by reducing the size of the MSW and separating metals, glass, and other inorganic materials. RDF can be densified or mixed with binders to form fuel pellets.

As part of a program sponsored by DOE's Office of Industrial Technologies, the National Renewable Energy Laboratory participated in a cooperative research and development agreement to examine combustion of binder-enhanced, densified refuse-derived fuel (b-d RDF) pellets with coal. Pelletized b-d RDF has been burned in coal combustors, but only in quantities of less than 3% in large utility systems. The DOE project involved the use of b-d RDF in quantities up to 20%. A major goal was to quantify the pollutants released during combustion and measure combustion performance.

The industrial partners in this effort included Otter Tail Power Company, Eden Prairie Recycling, and XL Disposal Corporation. Eden Prairie and XL Disposal provided the waste fuel pellets to Otter Tail for testing. Argonne National Laboratory helped Otter Tail analyze the results.

The host facility for the tests was the largest component of the Otter Tail system—a 440-MW_e unit in Big Stone, South Dakota. Using data-gathering instrumentation and other test-specific hardware, researchers analyzed air emissions, ash content, fuel composition, and combustion performance. Operators initially fueled the plant only with coal, which gave them a benchmark for performance. The plant was then operated using a mixture of coal and varying amounts of b-d RDF pellets, up to 20% by weight.

Project results should encourage commercialization of the cocombustion technology.

The tests allowed project participants to develop a thorough understanding of how b-d RDF can reduce acid gas emissions. Private industry and electric utilities will be able to use the project's results to develop operating, technical, and financial data for the use of b-d RDF as an alternative fuel in cyclone, suspension-fired, or small spreader-stoker-fired combustors. These data will also help state regulatory agencies evaluate methods to permit and monitor commercial cocombustion units, as well as provide a data base for manufacturers.

As part of the project, the participants also identified barriers inhibiting commercial implementation of the technology. The project team is currently developing a plan to disseminate project results and encourage utilities to cofire RDF with coal.

As an energy resource, MSW is unique. It can be used to produce energy (thus displacing fossil-fuel-based energy sources), while improving the environment by reducing the amount of solid wastes that must be landfilled. Increasing the percentage of RDF burned in coal combustors will increase these benefits proportionally. The Clean Air Act Amendments of 1990 allow the combustion of up to 30% MSW in coal plants. The results of this project will facilitate commercialization of the cocombustion technology.

For More Information

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