INDUSTRIAL TECHNOLOGIES PROGRAM

Engineering Study for a Full Scale Demonstration of Steam Reforming Black Liquor Gasification

Georgia-Pacific will Study and Demonstrate Steam Reforming Black Liquor Gasification at Big Island, VA Containerboard Mill

Black liquor is a waste product of the chemical pulping process and a potential source of energy for the paper making industry. Black liquor gasification, the conversion of left over black liquor into a clean-burning fuel for mill use, is a promising new technology for reducing air emissions and increasing energy efficiency in the pulping process. A PulseEnhanced™ technology, demonstrated and patented by Manufacturing & Technology Conversion International, Inc. (MTCI), uses medium temperature, atmospheric pressure exposure to steam in the absence of air or oxygen for gasification.

Georgia-Pacific (G-P), in an agreement with the Department of Energy (DOE)/Office of Industrial Technologies (OIT), conducted an engineering study to define the scope of a full-scale demonstration of the PulseEnhanced™ steam reforming black liquor chemical recovery technology. More recently, the Big Island mill signed an agreement with the Environmental Protection Agency (EPA) and DOE/OIT to install and demonstrate the system. This demonstration project will install a steam reformer to process all of the black liquor in (400,000 pounds of black liquor solids per day) from the pulping process at G-P’s Big Island, Virginia mill. It will be the first full-scale gasification system used in the commercial pulp and paper industry.

Benefits for Our Industry and Our Nation

- Reduces NOx, SO2, CO, VOC, and particulate emissions
- Expected air emission reduction of 90%
- Replaces existing smelters, eliminating threat of smelt-water explosions
- Reduces use of non-renewable (fossil) fuels
- Increases energy efficiency
- Decreases capital and operating costs
- Provides hydrogen-rich, clean-burning fuel

Applications in Our Nation’s Industry

The system will replace two 50-year old smelters and provides the entire chemical recovery capacity for the G-P mill. It has potential for industry-wide applications to replace Tomlinson recovery boilers and is suitable for all pulping processes (carbonate, kraft, sulfite, non-wood, etc.). Although the technology requires a high capital investment, it will provide capital returns from energy input reductions and help industry meet increasingly stringent EPA regulations.

Future applications include adaption to fuel a gas turbine in combined cycle or a fuel cell to produce more electricity.

Boosting the productivity and competitiveness of U.S. industry through improvements and environmental performance
Project Description

Goal: Define the scope of a full-scale demonstration of a black liquor gasification project for construction and demonstration at G-P’s Big Island, VA mill.

The PulseEnhanced™ process differs from other technologies because it does not require partial oxidation of the liquor inside the gasifier. This lower temperature allows the gasifier to convert black liquor organic to gas at temperatures well below those required for smelt formation, eliminating the danger of smelt-water explosions in the recovery boiler. This equipment will maximize the recovery of energy and chemicals while producing a medium Btu fuel gas (450-500 Btu/scf).

Researchers have extended the scope of the original nine-month engineering study and will continue work with government and industry partners to install and demonstrate the system.

Results

- The installation of the first steam reforming chemical recovery system was higher cost than an equivalent recovery boiler system. Researchers expect that as technology gaps are eliminated, future installations will be possible at approximately the same cost as a conventional recovery boiler system.
- Improved energy efficiency and environmental performance in the reformer system than that of the recovery system.
- Higher technological and project risk associated with the reformer system installation.
- Georgia-Pacific elected to go forward with a project for the technology demonstration. This decision was contingent on a commitment from DOE to co-fund the demonstration project. In 2001, Georgia-Pacific submitted a proposal to DOE for the implementation of the demonstration project.

Project Partners

Georgia-Pacific
Atlanta, GA

Industra, Inc.
Portland, OR

StoneChem, Inc.
Baltimore, MD

Fluor Daniels, Inc.
Greenville, SC

AGRA Simons, Inc.
Atlanta, GA

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A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

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