FOREST PRODUCTS
Project Fact Sheet

BLACK LIQUOR STEAM REFORMING/PULSED COMBUSTION

BENEFITS

- Electricity generation with a conversion efficiency of greater than 40 percent
- Regeneration of split sulfidity green liquor for return to the pulping process
- Recovery of more than 99 percent of the gas-phase sulfur in the raw product gas, yielding a clean synthesis gas
- Reduction in SO2 emissions of 50 percent and in NOx emissions of more than 65 percent
- Elimination of particulate emissions
- Lowering of the paper making industry's capital and operating costs
- Removal of the danger of smelt water explosions

APPLICATIONS

The forest products industry has identified the commercialization of gasification technologies as a priority in the agenda for its research and development (R&D) program.

If advanced gasifiers are available to prepare and process black liquor as an energy feedstock, the electric output will increase by at least 50 percent at many pulp and paper installations.

New Process Will Recover More Energy from Black Liquor and Improve Environmental Performance and Safety of Paper Making

Black liquor is a waste product of the chemical pulping process and a potential source of energy for the paper making industry. This chemical by-product can be burned in recovery boilers to generate about 40 percent of the energy required for paper making if certain limitations of the system are overcome. A new black liquor steam reforming process is close to commercialization that will help recover more of the energy contained in black liquor. It will also reduce the potential for hazardous smelt-water explosions, the inefficient loss of heat from molten smelt, and a relatively high level of harmful environmental emissions.

The U.S. Department of Energy (DOE) is working with Manufacturing & Technology Conversion International, Inc. (MTCI), and others to improve the process of black liquor gasification for the industry. A successful outcome will lower costs for industry, ensure its environmental compliance, and increase the ability of its products to compete in global markets.

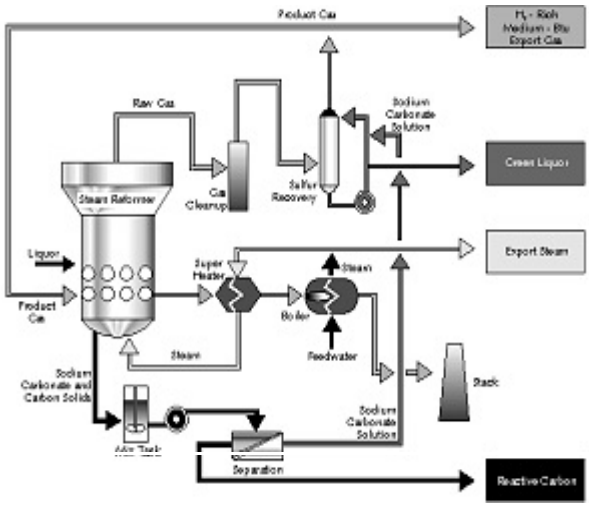

Figure 1. StoneChem's (licensee of MTCI) PulseEnhanced™ Steam Reformer: PulseEnhanced™ fluid-bed steam reforming is an innovative solution to the spent liquor recovery problem, and provides a superior alternative to conventional chemical recovery systems that employ direct combustion.

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ENERGY EFFICIENCY AND RENEWABLE ENERGY • U.S. DEPARTMENT OF ENERGY

PROJECT DESCRIPTION

Goal: Demonstration of black liquor steam reforming to Improve the efficiency of recovering energy from black liquor, reduce the environmental impacts and safety hazards of conventional recovery boilers, and lower the capital and operating costs associated with energy recovery.

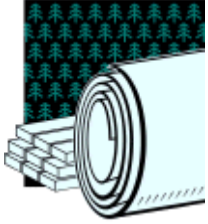
During the black liquor steam reforming process, liquor is not burned in a recovery boiler but heated indirectly in a steam-fluidized bed of sodium carbonate solids to form a medium-Btu gas and inorganic salts. The steam reformer consists of multiple resonance-tube pulse combusters with the tubes immersed in a bubbling fluidized-bed reactor. Heat for steam reforming is provided by burning a portion of the product gas in the pulse combuster and transferring the heat through the resonance tubes into the fluidized bed.

PROGRESS & MILESTONES

- A 25 ton/day demonstration has been completed at the Inland Container Corporation's mill in Ontario, Canada.
- A 50 ton/day system for processing black liquor has been demonstrated at the Weyerhaeuser mill in New Bern, North Carolina; a 500-hour, continuous test was completed successfully at this facility in mid-1995.
- The PulseEnhanced™ Steam Reforming technology is available in North America from StoneChem, a subsidiary of TRI and Stone & Webster.
- A commercial-scale (500 ton/day) unit is available for incremental capacity additions to existing chemical recovery units.
- The technology was selected as the liquor recovery technology for Georgia - Pacific's Big Island AGENDA 2020 gasification program.
- It was also selected as the liquor recovery technology for Sappi South Africa's Stanger Mill.

AWARDS, PATENTS, AND INVENTION RECORDS

- MTCI has patented the PulseEnhanced™ Steam Reforming technology.



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