Biomass Program

Fuel Chemistry and Bed Performance in a Black Liquor Steam Reformer

In the pulp and paper industry, wood chips are cooked with a mixture of sodium hydroxide and sodium sulfide or sulfite to dissolve the lignin in the wood. After the fibers are separated from the slurry for processing to paper, the spent pulping liquor (black liquor) is concentrated and combusted to recover the chemicals and generate steam for the pulp mill. Black liquor gasification (BLG) is an alternative method of recovering the pulping chemicals and offers reduced capital investment and a higher efficiency for generating electricity.

BLG processes can be divided into low-temperature and high-temperature processes. While low-temperature processes are less susceptible to corrosion than high-temperature processes, they must maintain the right temperature to minimize tar formation and avoid agglomeration of the bed material.

The objective of this research is to address critical issues that inhibit successful commercialization of low-temperature BLG systems, including the steam reforming technology developed by Manufacturing and Technology Conversion International, Inc. (MTCI). Researchers will conduct experiments to replicate conditions that may be encountered in commercial demonstration systems. The end goal is to evaluate proposed process modifications that promise to improve performance and economics of low-temperature BLG systems.

Fluidized bed black liquor gasification test system

R&D Pathway

This project is composed of five tasks: (1) construction of a fluidized bed BLG test system; (2) investigation of bed performance; (3) evaluation of product gas quality; (4) black liquor conversion analysis and modeling; and (5) MTCI process modeling.

Thermochemical R&D

Benefits

- **Improve economics of black liquor gasification and pulping mills**

Applications

The knowledge gained through this research will accelerate the commercialization of the MTCI system and other low-temperature BL gasification systems.

Project Partners

Brigham Young University
Georgia-Pacific Corporation
Manufacturing and Technology Conversion International, Inc.
National Energy Technology Laboratory
Reaction Engineering International
University of Utah

Project Period

FY 2003 – FY 2006

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