Biomass Program

Thermochemical R&D

Pressurized Entrained-Flow Draft Black Liquor Gasification

Black liquor gasification (BLG) has the potential to increase energy efficiency and environmental performance of the black liquor recovery system in pulp mills. However, technical barriers to commercialization remain and there is a lack of information on the conversion behavior of black liquor in high temperature gasification systems from droplet formation to the properties of smelt and syngas.

This project is addressing the lack of data on black liquor conversion behavior in the pressurized, entrained flow BLG process with the goal of enabling commercialization of entrained-flow BLG.

R&D Pathway

Researchers are using a combination of laboratory-scale experiments and a small-scale gasifier to study the conversion of black liquor from the initial droplet to the final smelt and syngas products. The small-scale gasifier is operated under conditions representative of those in a commercial system. The project is composed of five tasks:

- Design and construct the entrained-flow gasifier.
- Characterize the black liquor droplet and particle formation in a pressurized, high temperature environment and correlate the droplet characteristics with the burner and gasifier performance.
- Generate data on the chemical and physical aspects of black liquor conversion in a high temperature gasifier.
- Evaluate the transport properties (viscosity, thermal conductivity) and emissivity of molten kraft black liquor smelt.
- Characterize major and minor components in the syngas product.

Using the data collected, researchers will develop tools for the design, optimization, and troubleshooting of entrained-flow black liquor gasifiers.

Benefits

- **Enable commercialization of entrained-flow black liquor gasification**

Applications

Black liquor gasification systems will help increase the energy efficiency and environmental performance of pulp mills.

Project Participants

Brigham Young University
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Project Period

FY 2004 – FY 2007

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