



INDUSTRIAL TECHNOLOGIES PROGRAM

Hemicellulose Extraction and Its Integration in Pulp Production

Extraction of Hemicellulose Prior to Pulping Promises to Increase Pulp Production Efficiency

The majority of wood is pulped by the kraft chemical pulping process. This process does a good job of liberating the cellulose fibers from which paper is made, but it is a low-yield process since most of the hemicellulose and almost all of the lignin components of the wood are dissolved into the spent pulping liquor. This “black liquor” is processed downstream in a recovery boiler – which burns the organics in the black liquor to produce process steam and recovers the inorganic

cooking chemicals for re-use. Because lignin has a relatively high heating value, it is cost-effective to recoup the heating value by combustion. The hemicelluloses, however, have a low heating value and are not most cost-effectively used through this process. Extracting the hemicellulose from wood chips prior to pulping could be used to increase pulp yield and production and/or produce higher value chemicals and polymers.



Profiling digester system used for pre-extraction of wood chips.



Benefits for Our Industry and Our Nation

Extracting the hemicellulose from the wood chips prior to pulping and depositing the oligomer portion onto the pulp stream after the digester could increase pulp yield by 2 percent, resulting in approximately \$600 million a year in extra pulp production.

Applications in Our Nation's Industry

Hemicellulose extraction could be used by all U.S. pulp mills using the kraft pulping processes.

Project Description

The goal of this project is to develop processes for extracting hemicelluloses from residual wood chips during pulp production, redepositing the extracted oligomers onto the pulp to improve yield.

Pathways and Milestones

- Completed extraction and cooking of hardwood chips with profiling digester (Completed July 2005)
- Accomplished softwood chips extraction and cooking with profiling digester (Completed September 2006)
- Conducted oxygen delignification of kraft pulp with the deposited hemicelluloses (Completed September 2006)
- Completed bleaching of softwood and hardwood oxygen delignified pulp (Completed September 2006)
- Complete mass balance analysis of optimized and integrated process
- Conduct experimental confirmation of integrated hemicellulose extraction for softwood and hardwood

Commercialization

Successful development and demonstration of these processes will lead to initial implementation at an International Paper Company (IP) mill, using conventional and the newly developed technology.

Project Partners

The University of Maine
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International Paper Company
Tuxedo, NY

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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.



U.S. Department of Energy
Energy Efficiency
and Renewable Energy
Bringing you a prosperous future where energy
is clean, abundant, reliable, and affordable

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