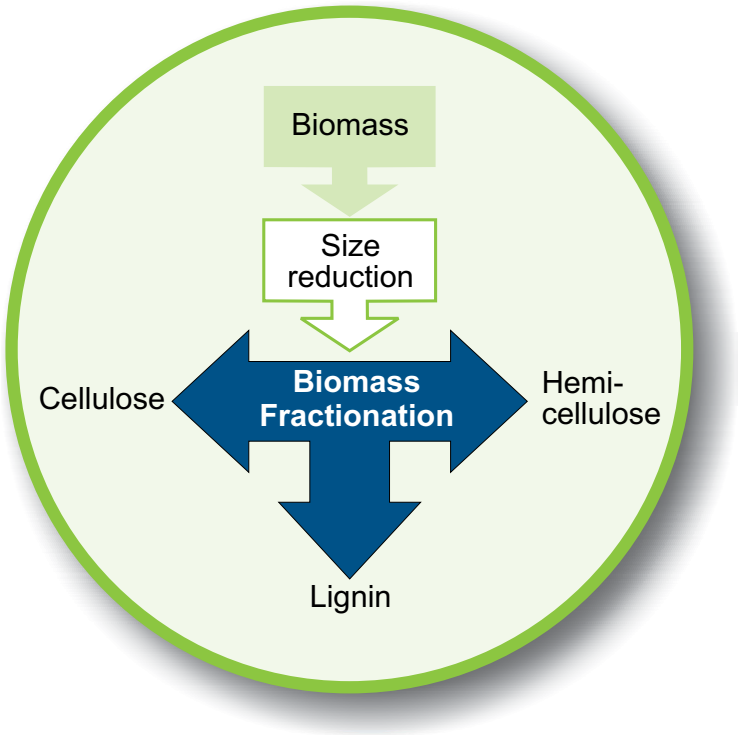
Demonstration of the PureVision Wood-to-Resource Biorefinery

Cleaner Alternative to Kraft Process to Produce Fiber for Pulp and Paper Products

More efficient and environmentally sound technologies for kraft pulping processes are desired within the pulp and paper industry. The kraft pulping process has been employed for approximately 150 years with no significant improvements made to the basic technology. Because of this, the kraft process emits substantial amounts of pollutants, including air and water effluents. In addition, an estimated 2.3 percent of total annual operating costs in the pulp and paper industry are spent on pollution abatement.

A new biomass processing technology known as "reactive fractionation" separates lignin and hemicellulose from cellulose, creating a relatively pure fiber that can be converted into pulp and paper products. Similar to the kraft process, it converts trees and other lignocellulosic materials into fibers for paper manufacturing; however, it does so with decreased reagent consumption and waste by-product generation.



Conceptual representation of PureVision's biomass fractionation process.

Benefits for Our Industry and Our Nation

The reactive fractionation process can reduce reagent costs and improve the overall economics of pulp production by producing higher value products from each recovered component of wood. The lignin produced does not contain sulfur and possess a low molecular weight, rendering it potentially more reactive for conversion into useful products such as resins and fuel additives. Benefits would include (1) enhanced purity and versatility of pulp produced; (2) decreased toxins in other product streams; (3) reduced use of reagents; and (4) reduced environmental impact of the pulp-making industry.

Applications in Our Nation's Industry

A successful reactive fractionation process would replace the current kraft pulping process with a more environmentally friendly technology and help generate higher value products.

Project Description

The goal of this project is to demonstrate a novel biomass processing technology using PureVision's Process Development Unit (PDU) that will fractionate loblolly pine woodchips into cellulose, hemicellulose, and lignin. Successive water- and alkali-based treatments of biomass at elevated temperatures (up to 235°C) in a single, continuous extruder reactor produces the three fractions. The hydrolyzate liquor streams contain lignin and 5- and 6-carbon sugars that can be converted into valuable products, and the cellulose-rich stream can be used for pulp applications.

Pathways

The objectives of this project will be achieved through (1) demonstrating a new process to produce pulp for paper from loblolly pine; (2) recovering hydrolyzed lignin and hemicellulose fractions to produce value-added products; and (3) performing economic modeling to compare the reactive fractionation and kraft processes.

Progress and Milestones

- Fractionated wood chips (Completed June 2006)
- Conducted screening experiments at International Paper (Completed June 2006)
- Complete FQA (Fastener Quality Act) report
- Conduct market assessment

Project Partners

PureVision Technology, Inc.
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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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