

October/December 2004, #5

The Sugar Platform Processing Integration Task focuses on integrating the processing steps involved in enzyme-based lignocellulose conversion technology. This project supports the U.S. Department of Energy's efforts to foster development, demonstration, and deployment of "sugar platform" biorefineries that produce inexpensive commodity sugars and fuel ethanol, as well as a variety of other fuel and chemical products, from abundant renewable lignocellulosic biomass.

The National Renewable Energy Laboratory manages this project for DOE's Office of the Biomass Program. Information on the Biomass Program is available at [Biomass Program](#)

To discuss information in this update or for further information on the Sugar Platform Integration Project, contact Dan Schell at NREL, phone (303) 384-6869, email [dan\\_schell@nrel.gov](mailto:dan_schell@nrel.gov)

**Change in Project Structure.** Starting this fiscal year (October 2004), the Sugar Processing Integration Task will have a more focused effort investigating issues and technical barriers bridging the various unit operations. We will continue efforts to understand the impact of corn stover variability on saccharification processes, improve compositional methods for raw and pretreated feedstocks, demonstrate on-line analysis techniques, and investigate integrated process performance. Previous work on enzymatic cellulose saccharification as a stand-alone unit operation has been moved into a different task. However, work in this area will still be reported in the other activities section of this newsletter.

**The 27<sup>th</sup> Symposium on Biotechnology for Fuels and Chemicals is Coming.** The premier conference series on biotechnology for fuels and chemicals continues with the 27<sup>th</sup> Symposium, May 1-4 in Denver, Colorado. Please visit the web site for schedule, registration and hotel information. This year's sessions are listed below:

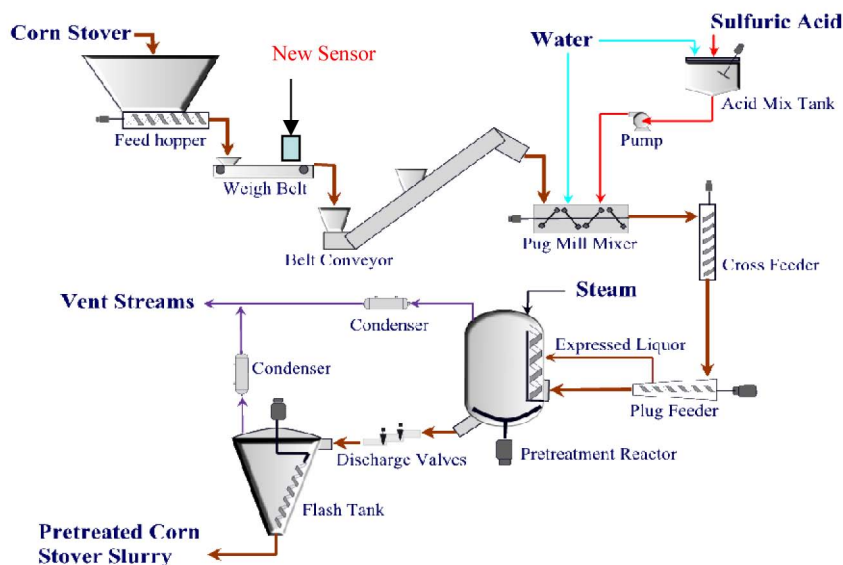
- Session 1A Feedstock Supply and Logistics
- Session 1B Enzyme Catalysis and Engineering
- Session 2 Today's Biorefineries
- Session 3A Plant Biotechnology and Feedstock Genomics
- Session 3B Biomass Pretreatment and Hydrolysis
- Session 4 Industrial Biobased Products
- Session 5 Microbial Catalysis and Metabolic Engineering
- Session 6 Bioprocess R&D
- Special Topic A International Energy Agency Task #39-Liquid Biofuels
- Special Topic B Bioenergy Life-Cycle Analysis/Economics of Sustainability

The Symposium web site can be found at the link provided below.  
[http://www.eere.energy.gov/biomass/biotech\\_symposium/](http://www.eere.energy.gov/biomass/biotech_symposium/)

## R&D Progress

**Direct Light Spectrophotometer Installed in NREL Pilot Plant for On-Line Biomass Compositional Analysis.** We are developing methodologies and demonstrating instruments for on-line compositional analysis of feedstocks and process intermediates. To this end, NREL recently acquired a Foss NIRSystems direct-light spectrophotometer with a reflectance sensor that will be used for dedicated on-line analysis of raw feedstock composition. The first application will be on corn stover, since it is currently being





used in the pilot plant. The sensor was installed above the pilot plant weigh belt (see figure to left) to monitor feedstock composition as the material is being conveyed to the pretreatment reactor. As material passes under the sensor, spectral data is recorded and converted to compositional information using a NIR calibration model. Future work will validate the accuracy of this methodology on corn stover. These efforts are expected to demonstrate the utility of on-line compositional analysis so that industry and others can use these methodologies and instruments to develop the on-line feedstock quality monitoring and control strategies necessary to optimize plant operation.

## New Rapid Analysis Method Developed for Determining Moisture Content of Biomass

**Feedstocks.** In a related development to that reported above, a method to predict moisture content in feedstocks was developed as an adjunct to the current rapid corn stover compositional analysis protocol. The method measures moisture and flags samples with too high of a moisture content to accurately determine composition by NIR. These samples are then dried and re-scanned to obtain an accurate compositional analysis. Ultimately, we also expect to apply this method to on-line analysis of feedstock composition.

## Related Activities Biomass



### Enzymatic Cellulose Hydrolysis Testing Begins Using a High Solids Bioreactor.

Process economic analysis indicates that high solids enzymatic cellulose hydrolysis could significantly reduce operating and capital costs of producing ethanol. The major process challenge posed by high solids operation is the ability to achieve high extents of conversion in a system where heat and mass transfer are a problem. Some of these problems were overcome in a stirred tank reactor (STR) using a fed-batch feeding policy as reported in a recent newsletter (July/September 2004, Vol. 4). More recently we designed and built a high solids bioreactor (HSBR) to overcome mixing and heat transfer limitations associated with high solids biomass slurries. The

HSBR performs batch hydrolysis and is easier to operate than a STR using a fed-batch feeding policy. Testing is underway and results are expected in early 2005.

**Cellulase Subcontracts.** Since mid-2000, the Biomass Program has been working with the two largest global enzyme producers, Genencor International and Novozymes. The objective of this collaboration is to develop low-cost enzymes for biomass conversion. For the latest information, links to press releases provided by the enzyme producers are given below.

<http://www.novozymes.com/cgi-bin/bvisapi.dll/press/press.jsp?id=28895&lang=en>

[http://www.genencor.com/wt/gcor/pr\\_1098313606](http://www.genencor.com/wt/gcor/pr_1098313606)

**Sugar Processing Integration Task Information.** Web-based information on the process integration project, including our recent presentations at the most recent stage gate interim review meeting, can be found at the following link ([Process Integration Project Information](#)). A discussion of how Stage Gate management is used in the Biomass Program is also available at this site ([Stage Gate Management](#)).

Produced for the



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