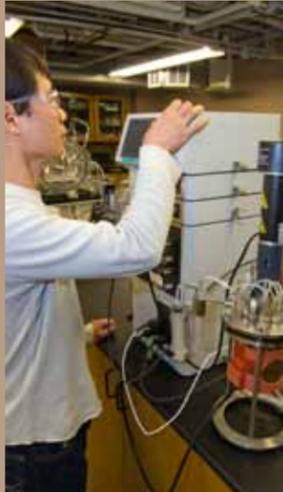


Collaborative innovation for economic development in Wisconsin



Research initiatives in value-added processing



Biofuels research

Moving from laboratory to industrial scale

The pulp and paper industry produces an estimated two million tons of fiber sludge annually. This material is either discarded in landfills or burned, adding millions of dollars to the cost of paper production. However, this sludge is composed of material that can be converted into sugars, which in turn can then be fermented into biobased chemicals and fuels. These value-added co-products could earn pulp and paper companies increased sales and profits and, at the same time, reduce the environmental and fiscal burden of waste disposal.

The key is development of cost-effective processes to make these conversions, and that is what WIST is creating. Technologies already developed include a modified pulping process to separate biomass into component fractions, and engineered microbes that convert sugars into energy-dense chemicals such as isoprene.

A biorefinery could convert waste sludge from pulp and paper mills into valuable industrial chemicals, providing new revenue streams and adding jobs.

Isoprene can be used to manufacture numerous grades of fuel, including jet fuel. It doesn't gel at low temperatures like some other biofuels, and that's why the Department of Defense is supporting this project. Isoprene also serves as a platform chemical for production of polymers and other materials. It is a valuable feedstock used in the production of latex, rubber, plastics and pharmaceuticals.

Our goal, with Wausau-based technology company American Science and Technology, is to develop an isoprene production unit that will integrate with a biorefinery that can be adapted to existing pulp and paper mills.

Photos from top left: WIST researcher Jin Jun Gong works in the laboratory to refine processes for isoprene fermentation; a larger, pilot-scale fermentor at American Science and Technology; a paper mill. A biorefinery could provide new revenue streams for paper and pulp mills and create more jobs. Products made from polyisoprene include, lower right, jet fuel, rubber, latex and oil.



Opportunities in non-food uses of agricultural and forest resources

Many chemicals used in industrial and personal care applications are derived from petroleum sources. Opportunity exists to instead derive these component chemicals from renewable sources, specifically Wisconsin's abundant agricultural and forest resources. Value-added processing of these materials could help grow the state's economy and add jobs. Cranberries, for example, are known to be high in antioxidants.



Cranberry harvest.

Antioxidants receive a tremendous amount of press because of their putative health and wellness benefits. However, it is not common knowledge that there is a high-value market for industrial antioxidants which are used in applications ranging from cosmetics to lubricants, to plastics and polymers. Industrial antioxidants today are largely derived from petroleum sources. Production of antioxidants from cranberries represents an untapped opportunity with significant revenue potential.

Similarly, carbohydrates derived from oats, oils from hazelnuts, and starch from potatoes, all present potential new income sources. Importantly, these materials in many cases can be derived from residual materials, such as potato peels that otherwise must be disposed of, so there is no impact on food supply.



Photos illustrate potential uses of biomaterials extracted from agricultural and forest resources. From left, antioxidants are used as stabilizers in creams and other products; carbohydrates in plant fruits, skins and leaves can be used in personal care products; starch from potatoes is used in plastic packaging; green cleaning products are a growing market for naturally sourced chemicals; whey from dairy processing can be used to make fire-retardant foam.

Investment in Wisconsin's future

We believe innovation fueled by collaborative research will help unlock opportunities in value-added processing and move Wisconsin forward in creating a biobased economy.

WIST is an entrepreneurial group, and has secured support from federal, state and private sources, which has been critical to our success thus far. We have set out to build strong bridges to industry, to use and promote the expertise of University of Wisconsin-Stevens Point faculty and staff far beyond campus borders, to make a real difference in jobs and quality of life.



**WIST offices are in the Science Building
and the Dan Trainer Natural Resources Building
on the UWSP campus.**

Direct mail to:

**Wisconsin Institute for Sustainable Technology
800 Reserve Street
University of Wisconsin-Stevens Point
Stevens Point, WI 54481**

For further information, contact:

Dr. Paul Fowler

Phone: 715-346-3767

Email: Paul.Fowler@uwsp.edu

WIST is online at www.uwsp.edu/wist



**University of Wisconsin
Stevens Point**