

LIGNOL PROJECT



Project Proponent:

Lignol Innovations Ltd.

Project Description:

To develop proprietary biorefinery technology to convert cellulosic biomass into fuel ethanol, lignin-based products and other specialty biochemicals through the functional utilization of Lignol's High Purity Lignin (HP-L™).

Project Benefits:

Successful commercialization of Lignol's cellulosic ethanol and biorefining technologies will:

- Reduce greenhouse gas emissions by replacing fossil fuels with low carbon ethanol;
- Utilize mountain pine beetle fibre and other softwood residues to produce low-carbon transportation fuel and other biochemical co-products, such as HP-L™;
- Leverage world class centres of excellence at British Columbia universities and research institutions;
- Develop BC based technologies that have strong potential for export; and
- Create 25 direct jobs within the province with the potential for significantly more at full commercial scale.

BCBN Funding:

Total \$3.0 million*

Total Project Costs:

\$20.38M for Phase 1 and \$1.98M for Phase 2

Partners:

- Sustainable Development Technologies Canada
- BC Innovative Clean Energy Fund
- Simon Fraser University, NMR laboratory
- FPInnovations, Forintek Division
- UBC Faculty of Forestry and UBC Alex Fraser Research Forest

Bioenergy Value Stream:

Underutilized Woody Biomass — Solid Wood Residues

Bioenergy Feedstock:

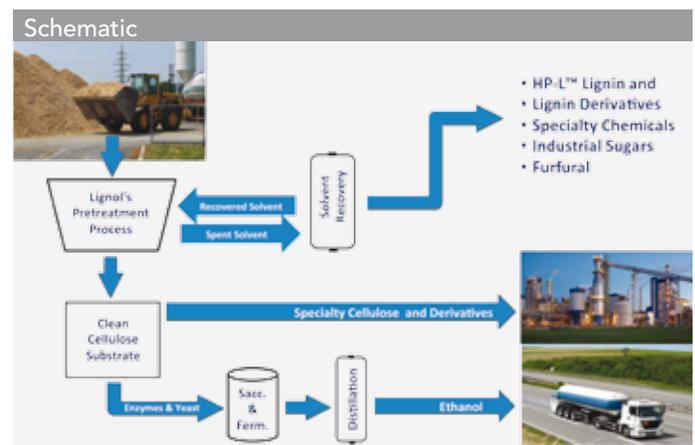
Woody biomass residues

Bioenergy Application:

Biochemical conversion

Bioenergy End Product:

Cellulosic ethanol and specialty chemicals



Lignol’s process technology for refining cellulosic biomass into fuel-grade ethanol and other biochemicals has positioned the company as one of the world’s most promising “Cellulose to Ethanol” solutions. With governments around the world implementing regulations for renewable fuel use, demand is growing for ethanol and in particular ethanol that can be processed from biomass cellulose rather than from grain. Cellulosic ethanol can become economically sustainable without ongoing government subsidies provided additional revenues from various biochemical co-products can be realized. Most competing technologies simply produce only ethanol and choose to burn their residuals for power. Lignol’s technology utilizes readily-available, low-cost feedstocks generated in the forest products and agricultural industries; and produces valuable co-products with the potential to displace a wide range of products currently produced from fossil fuels.

The goal of the two projects is to develop the groundwork for a renewable fuels and chemicals industry within the Province of British Columbia (BC) and to support a biorefining industry. Following the establishment of the 1 Tonne Per Day Lignol Demonstration Plant, which equates to about 100,000 litres/year of fuel grade ethanol, Lignol has focused on the production and functional utilization of High Purity Technical Lignins, (HP-L™), derived from locally available hardwood and softwoods, as well as other cellulosic feedstock such as switch grass, corn stover, and wheat straw. The project further leverages established world renowned centers of excellence

at BC universities and other research institutions such as FP Innovations, allowing them to further create a world class knowledge cluster in the province.

One of the major obstacles deterring the broad commercialization of technical lignins has been the variability and poorly characterized chemistries of such lignins, because they are typically produced as by-product wastes in the pulp industry; it contains high levels of impurities, particularly sulphur and ash, and demonstrate low levels of reactivity. Lignol’s HP-L™ can be produced to specification for chemistry and functionality. Many useful applications have been identified and demonstrated for HP-L™ including active ingredients in adhesives, resins, rubber products, plastics, asphalt, casting resins, and as feedstocks for the production of specialty chemicals and carbon fibre.

In addition to exciting commercial applications for phenol formaldehyde resins that have been developed in cooperation with FP Innovations, Lignol is working on joint development activities with a number of major corporations to incorporate HP-L™ technical lignins into very large market applications. Some of the most exciting work has been around the conversion of HP-L™ Lignin to carbon fibre as well as utilizing it as a renewable component in polyurethane based insulating products. Better understanding of the chemistry of HP-L™ is critical to quality control, technical assessment, refining, and development of commercially accepted lignin-based chemical products.



Distillation



Fermentation

About the BC Bioenergy Network

Established in April 2008 with a \$25 million grant from the BC government, the BC Bioenergy Network is an industry-led association that acts as a catalyst for deploying near-term bioenergy technologies and organizing mission-driven research for the development and demonstration of sustainable technologies to build a world class bioenergy capability in BC. For more information about the BCBN, visit www.bcbioenergy.ca

Major Value-Streams for Collaboration and Development

FOREST	Solid Wood Residues
	Pulp and Paper Residues
	Harvesting and Pelleting (Local Use or Export)
MUNICIPAL	Small and Large Community Heating Systems
	Municipal Wastewater
	Municipal Existing Landfill Waste
	Municipal Solid Waste
AGRICULTURE	Agriculture Residues (Crop Residues and Animal Waste)

About Lignol

Lignol (TSX-V: LEC) is a Canadian company undertaking the development of biorefining technologies for the production of fuel-grade ethanol and other biochemical co-products from non-food cellulosic biomass feedstocks. Lignol’s modified solvent-based pre-treatment technology facilitates the rapid, high-yield conversion of cellulose to ethanol and the production of value-added biochemical co-products, including HP-L™ Lignin. Lignol is executing on its development plan through strategic partnerships to further develop and integrate the core technologies on a commercial scale. Lignol also intends to invest in, or otherwise obtain, equity interests in energy-related projects that have synergies with its biorefining technology.

For more information about Lignol, visit www.lignol.ca