



# THIS IS BIOTECH

## BEYOND MOOSE AND MOUNTAINS: BUILDING CANADA'S BIO-BASED ECONOMY.



### Environment and Economics: Wood Chips to Fuel Pumps

#### Lignol Energy Corporation, Burnaby, B.C.

What do you do with millions of beetle-killed trees? With about 620 million cubic metres of timber being affected in British Columbia alone, the problem is a big one. But, what is a hard hit to the timber industry is a boon to Lignol Energy Corporation, a Burnaby, B.C. based biorefinery.

Lignol is in the business of producing fuel-grade ethanol, but not from conventional raw materials such as corn. Instead, it has developed leading-edge biotechnology that uses leftover wood products, including wood chips, beetle-damaged pine and agricultural residues as raw material sources for ethanol. It also produces other biochemical substances that replace products currently manufactured from crude oil, coal or gas.

But as plentiful as the raw resources are, it's not an easy job. Producing cellulose-based ethanol is tricky because wood, when used as a biomass (biological material that can be used for fuel production), is notoriously difficult to work with because it contains lignin. Lignin, the natural binding material in plant matter, must be removed or treated to get the desired cellulose, which is then converted into ethanol. Unfortunately, removing the lignin is no easy task. Lignol, however, has found a way to efficiently pre-treat wood to extract both the valuable cellulose and isolate the lignin. It's this biotechnology that is setting the company apart from its competitors.

Lignol's cellulosic ethanol from beetle-killed pine and agricultural residues comes out a clear winner. With an abundance of biomass options, turning waste materials into renewable energy sources has the potential to lessen the dependence on fossil fuel-based energy and further advance renewable energy options.

But why use wood as a biomass, when corn-based ethanol is comparatively easy to produce and accounts for 80% of the ethanol produced in North America? The answer, according to Ross MacLachlan, Lignol's president and CEO, is about economics and the environment.

Significant acres of land that can be used for growing and harvesting corn and associated resources are contributing factors to the environmental concerns about corn-based ethanol. Recently, a California low-carbon fuel standard ranked some grain-based ethanol emissions as slightly worse than petroleum because of indirect land use effects.



Biomass fuels, utilizing feedstocks such as beetle-killed pine, also hold the promise of cleaner air. Transportation fuel blended with cellulosic ethanol is more effective in reducing greenhouse gases than conventional grain-based ethanol for the same formulation. The developers of Natural Resources Canada's *GHGenius Life Cycle Model*, a model for lifecycle assessment of transportation fuels, have been modeling and evaluating the energy balance and emissions performance of Lignol's process since the early days of development. According to their tests, improved air quality is just one of the emission benefits from Lignol's process, which is coming in at two to three times that of conventional processes.

The added benefit of using biomass-fuels is it uses recyclable materials that may otherwise make it into landfill sites such as construction material waste or are generally unusable such as dead trees on the forest floor. The potential exists to convert pulp and paper businesses to biorefineries, providing jobs to a beleaguered industry as many timber mills are closed or face closure.

In June 2009, Lignol completed the first end-to-end production of cellulosic ethanol. Made in British Columbia from environmentally sustainable woodchips, this cellulosic ethanol hasn't reached Canadian gas pumps yet, but that day is not far away. Perhaps soon Canadians can thank wood chips instead of drilling rigs when they fill up on fuel.