



# CASE STUDY 2

## DYNAMOTIVE ENERGY SYSTEMS CORPORATION



Liquid biofuels derived from cellulosic biomass are coming to Missouri. Dynamotive Energy Systems Corporation recently announced plans to build a commercial biofuels plant in Willow Springs, approximately 180 miles southwest of St. Louis.

The Missouri site was chosen for its ready access to rail transport, proximity to biomass resources and its potential for expansion of up to four additional facilities. The facility will use the company's patented "fast pyrolysis" process to convert forest residues such as bark, sawdust, and shavings and agricultural residues such as sugar cane, cornhusks, bagasse, and wheat straw into liquid BioOil® and char. Each day, the Willow Springs facility will convert 200 tons of residues into 34,000 gallons of BioOil®. Local wood-based feedstock providers have signed supply contracts with Dynamotive to ensure a constant supply to the plant. Opportunities abound for a significant expansion of operations, with more than 1.1 million dry long tons of biomass available per year in Missouri alone.

The pyrolysis process used is relatively simple in theory (Figure 1). Feedstock is fed into a fluid-bed reactor, which is heated to between 840-930 degrees Fahrenheit in the absence of oxygen. This system uses lower temperatures than conventional pyrolysis systems creating higher overall energy conversion efficiency. The feedstock flashes and vaporizes. It is similar to what happens when water droplets are placed in a hot frying pan. The resulting gases pass into a cyclone where solid char particles are extracted. The gases then enter a quench tower where they are quickly cooled using BioOil® already made in the process. The gases condense into BioOil®, which then falls into the product tank. Non-condensable gases are returned to the reactor to maintain process heating.

The entire reaction takes only two seconds, and this highly efficient process utilizes 100% of the bio-feedstock. Three primary products are: BioOil® (60-75% by weight), char (15-20% wt.) and non-condensable gases (10-20% wt.). A fourth product, BioOil Plus™, can be

produced by adding a finely ground form of the separated char, about 8 microns in size, back into the BioOil®.

BioOil® is a clean burning, greenhouse gas-neutral fuel with excellent combustion properties. BioOil® and BioOil Plus™ are price competitive alternatives to #2 and #6 heating oils, which are widely used in industrial boilers and furnaces. BioOil® can be further converted into transportation fuels and industrial chemicals. When combusted, BioOil® produces substantially less nitrous oxide (NO<sub>x</sub>) emissions than conventional oil as well as little or no sulfur oxide (SO<sub>x</sub>) emissions, a prime contributor to acid rain. The fuels are technologically viable, environmentally sound, and economically competitive with fossil fuels. The char produced by this process is a high BTU (heating value) solid fuel that can be used in kilns, boilers, the briquette industry, and activated char applications.

The current feedstock needs of the Missouri plant should be met by sawdust from the 40-50 mile radius around the plant. Should the plant's need increase, the company will use logging residues from the local area, according to John Tuttle, wood utilization specialist with the Missouri Department of Conservation.

In its early stages, the establishment of the Dynamotive facility has created some good, friendly competition among local users of wood products. Local sawmills now have another option for marketing their sawdust.

Still, the local forest industry is concerned about forest sustainability. According to Tuttle, the main concern about the plant is that procedures are "done in a sustainable manner." Dynamotive has assured those concerned that sustainable practices will be followed. To do their part, the Missouri Department of Conservation has begun development of

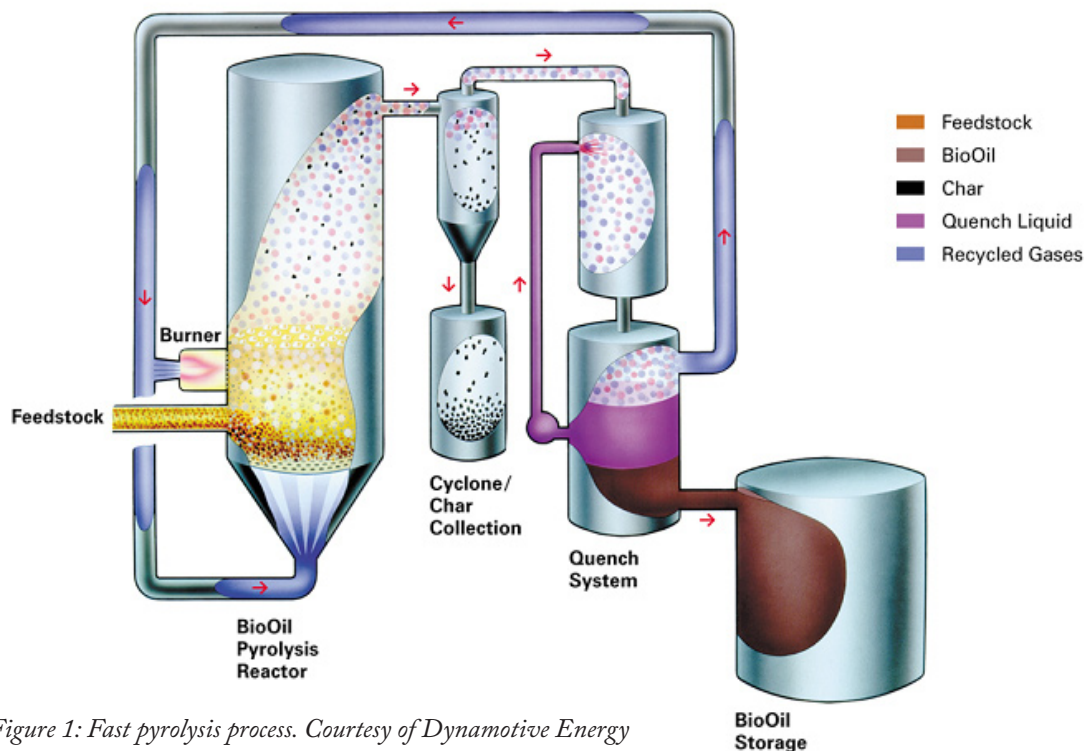


Figure 1: Fast pyrolysis process. Courtesy of Dynamotive Energy Systems Corporation.



a set of Best Management Practices created specifically for biomass harvesting using a model formed in Minnesota.

According to the Associated Press, the Missouri plant is scheduled for completion in 2009. The plant will employ 27 workers.

Dynamotive Energy Systems Corporation is an energy solutions provider headquartered in



*Dynamotive Energy Systems Corporation facility, West Lorne, Ontario, Canada. Courtesy of Dynamotive Energy Systems Corporation.*

Vancouver, Canada, with offices in the United States, United Kingdom, and Argentina. The Missouri facility will be based on proven designs currently in use at two operational facilities in Canada. One facility is located in West Lorne, Ontario, Canada at Erie Flooring and Woody Products and the other is located in Guelph, Ontario, Canada. Initial negotiations are also underway for a facility in Webster Parish, Louisiana.