Banking on biomass
Freres Lumber has made a big investment in bioenergy, installing a $20 million co-generation plant and banking on biomass to deliver its energy needs—and hooking the system up to the grid.

By Diane Mettler

As the North American forest industry evolves, so must its mills. Freres Lumber, a family-run business based out of Lyons, Oregon, has been in operation for nearly 90 years and been through countless industry ups and downs. Because it intends to be around for the next 90 years, it recently installed a 10 megawatt (MW) co-generation biomass facility.

Freres Lumber owns and operates two veneer plants, a veneer drying facility, a plywood plant and employs over 400 people. The company continually upgrades its machinery. But when plywood prices were high and the housing market was strong, Freres decided to invest its funds in the largest upgrade they had ever undertaken—a $20 million biomass cogeneration facility.

“At the time, other mills were investing to grow—acquiring other plants and adding capacity,” says Tyler Freres, veneer salesman and company vice-president. “We had an opportunity to invest in something we thought would be a longterm benefit. And we felt like our greatest long-term benefit was increasing the efficiency of our plants.”
Adding to the number of facilities the company has did not appeal to the family, says Freres. “We’re all down-home people. We’re not interested in traveling up to another facility.”

Freres Lumber had used Wellons boilers in the past and knew the company’s boilers were reliable. “Overall, they’ve put in about 1,000 boilers and around 30 generator sets, and we thought they were really bulletproof,” says Rob Freres.

There were other reasons to invest on the energy side as well. The company had a large natural gas bill they wanted to eliminate. Freres Lumber also created a certain amount of hog fuel it could use to fuel the co-gen plant. Additionally, they could avoid purchasing expensive pollution control equipment for their dyers, as the exhaust could be sent to the boiler as combustion air. They could also accumulate green tags and/or carbon credits. The project looked to be a winner on a number of fronts.

“And the tax credit was attractive,” says Rob Freres, vice-president and grandson of the company’s founder. “The State of Oregon passed a law that gave a 50 per cent tax credit on up to $20 million of investment.”

Before any groundbreaking or energy generation could take place, there was a great deal of permitting—air discharge, water discharge, building, among others.

Rob says there was also a lengthy utility connection process, the expense of which was shouldered by Freres Lumber. “The utilities are a bureaucratic organization and challenging as a barrier to entry.” Though the process was tedious, the arrangement they have now works well.

“We have what’s known as ‘buying all and selling all’,“ explains Rob. “We’re buying all the power for our plant use, and we’re selling all of the power that we’re producing here onto the grid. And we’re gambling that the green tags or these renewable energy credits that we accumulate will be worth more in the future.”

The utility company is obligated to buy up to 10 MW (the reason the facility is sized as such) and in turn the utility avoids the cost of building a new facility in the future. And the 10-year contract also has some flexibility.

“We have a minimum and a maximum we can produce—between four and 10 MW,” explains Rob. “So if our wood products markets are very strong and we want to dry more veneer and make less power, we can. Conversely, if we have a weak market, we can use less steam in house and put more to the turbine and create more electricity.”

After more than a year of permitting, the project began in earnest back in January 2006. Freres signed a construction contract with Wellons Inc, a leader in providing wood-fired energy systems to the forest industry. Freres was responsible for everything from the fuel system to silos, and
from the utilities to the boiler, as well as piping and ducting to the plant and site preparation. Wellons provided all the equipment inside the boiler (including the turbine) and related fuel silos.

Log yard debris is picked up and used for biomass fuel for the boiler. Freres Lumber purchased a Peterson 4700B grinder (right) to grind material when necessary.

In April 2006, Freres Lumber broke ground. The 100,000 pound/hour boiler went online in February 2007, and the turbine began generating power in September 2007. To man the co-gen facility, Freres hired 10 people—four teams of two, plus a plant manager and someone to feed the fuel on the weekends to keep things running 24/7.

The entire facility is fairly straightforward. In addition to the boiler, there are two silos (250 units), which contain about 1.5 days of fuel for a fully loaded boiler. There is a fuel storage building with 600-unit capacity—or about four days’ supply—and an extensive network of belt conveyors (about 850 feet) from the truck dump and plant debarkers. There’s a reconditioned GE turbine generator, condenser and exciter, cooling tower and an electrostatic precipitator to remove fine particles from the air.

They also purchased a new AKI steam veneer dryer and converted the Westmill Industries natural gas dryer to a steam dryer, which eliminated the need for approximately two million therms of natural gas a year. (One therm is equivalent to 100,000 BTUs.)

“It’s been the biggest investment, the most time-consuming and complicated project that we’ve ever undertaken,” says Rob Freres.

Because Freres Lumber was responsible for the truck dump and storage building, they got started on that piece of the project early. They purchased a rail car dump at an auction out of Olympia. It was the right price and double the capacity needed.

They also installed an asphalt slab to store biomass, like small treetops they were never able to use before. They also purchased a Peterson 4700B grinder to grind the material when necessary. The boiler requires approximately 12 truckloads of material a day. And going into the project Freres estimated it could generate half of the fuel needed. “We’re picking up our log yard debris and using it for biomass,” says Rob. “Because the only cost effective way to bring biomass from the woods is in conjunction with logging operations.”

The company also sells between 250 and 300 truckloads of wood chips a month to paper mills in five different locations. “We felt we would have an opportunity to bring back the fuel on a backhaul from our chip hauling,” says Rob. The fuel costs and supply were the biggest wildcard with this project. And unfortunately, the market hasn’t been kind to them. “With the reduction of the sawmills providing residuals, the fuel price has gone up beyond our expectations,” says Rob.
The GE condensing turbine for the Freres project was purchased out of Louisiana. By buying it used, Wellons was able to bring the cost of the project down by several million dollars.

They are definitely in this for the long haul, though, and believe the industry will eventually move toward thinning and capturing more biomass from the woods. But until then, Freres Lumber must compete for the limited amount of fuel on the market.

One of the challenges for Freres is keeping the boilers fed with about 50 per cent moisture material—a challenge in the wet Pacific Northwest, especially in the winter. “If it gets up to 55 or 60 per cent, we start to have some real trouble making enough steam for the turbine,” says Rob. “We use about 30,000 to 40,000 pounds of steam for our plant and then the balance can be used for electricity generation.”

The Wellons turnkey installation included, among other things, support to fine-tune the operation. And they are working closely with Freres to ensure it works exactly as intended. That was only one of the reasons Freres selected Wellons for the job.

“We had used Wellons boilers in the past and knew their boilers were reliable. Overall, they’ve put in about 1,000 boilers and around 30 generator sets and we thought they were really bulletproof,” says Rob. “And they are also located in Vancouver, Washington.”

The GE condensing turbine was purchased out of Louisiana. The turbine, only 20-years-old (relatively young for a turbine) was sitting idle. By purchasing it used, Wellons was able to bring the cost of the project down by several million dollars.

The way the turbine generator has been set up is both efficient and ideal for the mill. Bill Carlson, independent contractor for Wellons, explains: “They send high-pressure steam to the turbine and generate all the electricity they can. Then they discharge the steam at 300 psi and take it over to dry the veneer. They then bring it back—in the form of what is now pressurized water, since it is no longer steam once it leaves the veneer dryers—and flash it back to steam at a lower pressure (60 psi) to heat the blocks. Then they condense it and bring it back to the boiler again.”

“We’re trying to get every dollar and cent out of every single psi we provide,” says Tyler. “This system allows us to use it every step of the way. If we don’t use it, the turbine uses it. It’s a closed loop system. Also we’re never wasting any water, which is a very valuable commodity because you’ve already spent money to treat it.”

The condensing turbine also allows them to run more profitably. “If they had a back pressure turbine, the boiler would have to shut down when the veneer plant wasn’t running,” say Bill. “But with this turbine, Freres can run the veneer side, which is a five- to six-day-a-week operation, but run the boiler and turbine seven days a week because there is always revenue from the steam.”
With the state-of-the-art biomass cogen facility in place and everything running smoothly, Freres Lumber is now just waiting for the industry to catch up with them.

“We’ve always looked at ourselves as a very environmentally minded company. We have residuals that we can use. We have an interest in making sure that our forests are managed correctly,” says Tyler. “And from that standpoint, we’re interested in encouraging the US Forest Service and Bureau of Land Management and other state and federal agencies to look at altering fire behaviour within our forests by thinning the forests. And this is an avenue that makes it cost effective for them to take biomass from the woods.”