NORTHWEST

U.S. DOE

CHP TECHNICAL ASSISTANCE PARTNERSHIPS

Freres Lumber

10.5 MW Woody Biomass CHP System

Site Description

Freres Lumber, located in Lyons, Oregon is a family-owned mill founded more than 85 years ago. The company owns and operates two veneer plants, a veneer drying facility, one plywood plant on 200 acres at two plant sites, and a smaller lumber facility. Total production exceeds 550 million surface feet of plywood and veneer, and 10 million board feet per year of lumber (studs).

In 2007, Freres installed a 10.5 MW CHP plant to save on natural gas costs to dry their veneer producing enough power to light 6000 homes. Wood waste residuals from sites at two different milling operations partially feed their steam boilers.

Quick Facts

LOCATION: Lyons, Oregon
MARKET SECTOR: Forest products
CHP SYSTEM SIZE: 10.5 MW
FACILITY PEAK LOAD: 9.25 MW
EQUPMENT: GE condensing turbine generator
FUEL: Wood by-products and wood waste material
USE OF THERMAL ENERGY: Steam for veneer dryers and log conditioning tunnels
ENVIRONMENTAL BENEFITS: Use of wood waste eliminates fossil fuel consumption
CHP TOTAL EFFICIENCY: 75%
TOTAL PROJECT COST: $24 million
YEARLY ENERGY SAVINGS: $500,000
PAYBACK: 7 years realized in 2014
CHP IN OPERATION SINCE: 2007

Reasons for CHP

- High natural gas cost in 2007
- The Oregon Public Utilities Commission made improvements to PURPA* implementation to enable CHP;
  - Standby rates'
  - Terms and conditions for utility purchases;
  - Return on Investments and;
  - Treatment of distributed generation in Integrated Resource Planning (IRP)
- State and federal incentives created additional cost offsets

Although natural gas prices have dropped since Freres Lumber installed its boiler system, the company doesn't regret switching to wood waste as a fuel. They feel this will position them well into the future as fossil fuel prices increase.

* PURPA - Public Utility Regulatory Policies Act. A law passed in 1978 by the U.S. Congress as part of the National Energy Act.

Freres Lumber Mill – aerial view

CHP Equipment & Operation

Main components of the CHP Biomass Plant

- Steam turbine: GE 10.5 MW double-extraction condensing; 100,000 PPH @ 850 psig and 875°F; 0.87 psia
- Generator: GE synchronous, direct-drive @ 3600 rpm; 22,500 KVa, 13.8 Kv
- Steam boiler: Wellons, 4-cell rotating grate, natural circulation; 100,000 PPH at 850 psi (875°F).

GE 10 MW Turbine Generator

Wellons Steam Boiler

Use of thermal energy

Steam enters the turbine at 875°F and is extracted at 300 psig and 65 psig:

- 300 psig for drying the veneer (30,000 – 40,000 PPH)
- 65 psig for log conditioning (20,000 PPH)

The CHP plant is operational 24/7 and powers veneer production on weekdays. During veneer production, 30 percent of the energy produced is used on-site; the remainder is sent to the power grid. On weekends, 100 percent of the power produced goes to the grid.

The 100,000 PPH wood boiler generates steam for two veneer dryers, 23 log-conditioning tunnels, and power generation. Steam is used to heat water, which softens the logs before peeling for veneer manufacturing. Heat needed to dry the veneer is also derived from steam. Flash steam from the dryers is used to augment steam supply to the tunnels. Veneer dryer exhaust is captured and rerouted to the boiler to be used as combustion air. The boiler runs at 20 – 30 percent capacity. Veneer driers typically use about 30 – 40 percent of the boilers' capacity and the remaining steam is used to generate power.

"We never quit updating our plants. We plan to continue to invest in them."
- Rob Freres
Exec. Vice President

The plant consumes 360 tons (131,400 tons/year) of woody biomass each day, half of which comes from their own milling operations from two sites.

Project Benefits

- Creation of approximately 30 temporary construction jobs and 9 permanent full-time jobs, in addition to jobs created from harvesting, processing, and transport of the biomass.
- Energy savings – average of $500,000 annually

"The CHP system gives us more control over our own destiny."
- Rob Freres,
Exec. Vice President

Economics

Fuel costs

The main incentive initially for installing the CHP plant was escalating natural gas prices used to fuel veneer drying equipment. Prior to 2008 Freres consumed on average 2 million therms per year of natural gas ($1.5 million/yr). The cost to Freres increased to nearly $2.5 million in 2008. Although natural gas prices continue to drop, they still sit 'breakeven' with biomass pricing when supplemental purchases are needed. The total costs for biomass that Freres' has to purchase from outside suppliers remains stable at around $1,000,000/yr

Economics Cont'd

TOTAL PROJECT COST: $24 million

Initial Projected Payback period: 5 to 7 years; realized in 7 years (2014). The main variability in the initial projected payback period was the result of instability in the pricing of supplemental biomass and decreases in natural gas pricing.

Incentives

- $11,965,075 - Oregon Department of Energy BETC (Business Energy Tax Credit)
- $30,000 (approx.) - Energy Trust of Oregon Production Efficiency Incentive for fuel storage buildings ($.12/kWh)
- $400,000/year - Federal Production Tax Credit ($.012/kWh)
- Additionally, because their CHP plant is located in an Enterprise Zone* in Oregon, they received property tax relief for three years after project completion (2007 – 2010).

Energy savings

- $500,000/year - $1.5 million in natural gas costs replaced with $1 million of biomass costs
- Offset of two million therms of natural gas with 131,400 tons/year of biomass

Power Purchase Agreement

- Pacific Power – 10 years
  - Evergreen BioPower LLC, a partner of Freres Lumber, was created to sell the power to Pacific Power; they purchase excess steam from Freres to generate power and the power is sold to Pacific Power.

Revenue streams (other than lumber)

- Power sales to Pacific Power - $2.5 million/year (Based on generation of 40,000 MWh/yr)
- RECs - $100,000/year (Based on sales of 40,000/yr @ $2.50 each)

* In exchange for locating or expanding in an enterprise zone, businesses receive exemption from local property taxes on new plant and equipment for at least three years (but up to five years) in the standard program. For more information go to: http://www.oregon4biz.com/Oregon-Business/Tax-Incentives/Enterprise-Zones/

Lessons to Share

- Utility Transmission Interconnection Agreements can be a lengthy process with deposits that you may not get back should the project not come to full fruition, be prepared for the costs to be written off as losses if this occurs.
- If your facility is a Qualified Facility (under PURPA based on system size) you may be eligible to receive a standard contract; these are often more closely regulated by state utility commissions which can help dictate more positive PPA's and streamline the contract processing side of the project.
- Additional local regulatory agency permitting may be required: Conditional Use, Building Permits, Air Discharge, Water Discharge, and Water Supply, etc. Research and work with all permitting entities as the project is in the planning stages.

For More Information

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