NEW ENGLAND

CHP Technical Assistance Partnerships

PROJECT PROFILE

Hancock Lumber

300 kW CHP System

Site Description

Established in 1848, Hancock Lumber is the largest producer of Eastern White Pine lumber in the world with 91 million board feet produced per year from 5,000 acres of company-owned timber land. Harvested timber of up to 2,800 logs per day is responsibly processed at 3 Hancock sawmills – Pittsfield, Maine; Casco, Maine; and Bethel, Maine. Responsible processing includes automated sizing of white pine boards to maximize yields, and the collection and use of by-products including shavings for animal bedding, chips for paper making, and sawdust for generating renewable energy.

At Hancock Lumber's 70-acre sawmill located in Bethel, ME, sawdust, bark, and whole tree chips are collected to fuel a combined heat and power (CHP) system, consisting of a 16,000 pound per hour (lb/hr) Hurst hybrid boiler to power a 300 kilowatt (kW) Dresser-Rand backpressure steam turbine. The CHP system produces 1.9 million kilowatt-hours (kWh) of energy per year, accounting for roughly 30% of the facility's annual electricity usage. The thermal energy exiting the turbine is routed to 9 drying kilns and space heating of the operations building when necessary. The CHP system saves Hancock Lumber nearly $200,000 annually and has reduced greenhouse gas (GHG) emissions significantly.

Quick Facts

LOCATION: Bethel, ME
MARKET SECTOR: Forest products
FACILITY SIZE: 70 acres
FACILITY PEAK LOAD: 1900 kilowatts (kW)
EQUIPMENT: 16,000 lb/hr Hurst hybrid boiler & 300 kw Dresser-Rand backpressure steam turbine
FUEL: Sawdust, bark, whole tree chips (biomass)
USE OF THERMAL ENERGY: Drying kiln
ENVIRONMENTAL BENEFITS: Greenhouse Gas (GHG) emissions reduced by 900 tons CO_2 / year[1]
TOTAL PROJECT COST: $1.1M (excluding boiler)
YEARLY ENERGY SAVINGS: ~$200,000
PAYBACK: 3 years after incentives
CHP IN OPERATION SINCE: 2017

Reasons for CHP

Hancock Lumber's sawmill in Bethel, Maine.
PHOTO COURTESY OF HANCOCK LUMBER

CHP made economic sense for Hancock Lumber due to the availability of biomass as a fuel source, consistent thermal demands of drying kilns, and an interest to reduce operational costs. Additionally, CHP is a proven technology that supports Hancock's 172-years of ongoing environmental stewardship objectives.

Prior to implementing CHP, the boilers weren't keeping up with the kiln's thermal demand. The kiln's thermal demand was often reduced to allow the turbine pressure to increase back up to the necessary load, wasting time and money. Installing the CHP system solved this issue by increasing the steam load to meet the kiln's heating requirements.

1. EPA's eGRID emission factors based on 2016 data published in 2018, using the US average electricity source emissions of 0.9884 lbs CO2 per kWh (0.4483 kgs CO2 per kWh).

CHP Equipment & Configuration

The CHP system consumes 42.5 tons of sawdust per day through a 16,000 lb/hr Hurst hybrid high-efficiency boiler generating steam to a target of 225 psi. The high-pressure steam passes through a Dressar-Rand backpressure turbine to generate 300 kW of electricity and reduce steam pressure to 16 psig, which is routed to heat 9 drying kilns.

The CHP system—engineered and maintained by AirClean of Seattle, Washington and installed by a sub-contractor—satisfies Hancock's kiln heating requirements while saving money and reducing GHG emissions. The CHP system received an Efficiency Maine grant covering approximately 50% of the project's $1.1 million total costs, including but not limited to: half of the cost of an initial feasibility study; and purchase and installation costs of the steam turbine, a pressure-reducing valve, and a steam flow meter.

Hancock Lumber's 300 kW backpressure steam turbine
PHOTO COURTESY OF HANCOCK LUMBER WEBSITE

CHP Operation

Since commissioning in October 2017, the CHP system operates continuously to provide all the kiln heating requirements while producing 1.9 million kWh of electricity annually. The increase in pressure from 110 psi to an average of 215-220 psi has allowed Hancock Lumber to increase its dryer output. The increase in pressure came at a great time with the concurrent increase of lumber production. Running the system at a higher pressure reduces the fluctuation in thermal demand, ultimately reducing costs and improving savings.

Bethel, adjacent to Newry (home of Sunday River Ski Resort), is known for its cold and snowy winters. The loss of power for a significant amount of time generally causes major issues for similar facilities. Luckily for Hancock Lumber, since the commissioning of the CHP system there has been only one momentary power outage, which didn't cause any major issues since the facility is connected to the grid's main line. As a result, black start capabilities or "island-mode" is not necessary.

Lessons To Share

Central Maine Power bills customers based on their utilities' "peak-hour" each year. During their peak hour, Hancock Lumber reduced its electrical load significantly in order to decrease its demand charge rate. Now that the CHP system generates 30% of the total load, it is not as necessary for the facility to reduce its peak load as much for that particular hour, increasing net productivity and cost savings.

> ***"It's enjoyable to see real-time kilowatts generated and real-time savings day to day."***
>
> ***- Aaron Schulte, General Manager***

Hancock Lumber was unaware of the potential for build-up in new black-iron steam piping prior to installation. This resulted in many blow-off tests to increase the quality of the steam passing through the pipe, extending the project's timeline. It is recommended that piping is cleaned and inspected prior to implementation for high quality steam flow.

For More Information

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www.nechptap.org

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2. For information regarding Efficiency Maine Grants and Incentives: https://www.efficiencymaine.com/custom-distributed-generation-projects/