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Flexible co-gen plant

Seneca Sawmill's new $45 million co-gen plant is not only energy efficient and profitable, but offers the company and its mills flexibility in future addional kiln drying of its lumber.

By Diane Mettler

The Seneca Sawmill, based in Eugene, Oregon, has been around for over 50 years. It may look the same from the outside. It may still produce dimensional and stud lumber. And it may still have three sawmills that produce up to 350 million board feet a year. But some things have changed.

What's new is their state-of-the-art co-generation facility, fueled with Seneca's byproducts from both its sawmills and bark and shaving products.

The power plant, which sits next door to the sawmills, was sized based on the amount of raw material Seneca controlled internally—75 per cent of the raw material comes from the sawmills in the form of bark, shavings and sawdust and the other 25 per cent from their 165,000-acre, sustainably managed tree farm.

"We've been looking at this for quite a while, and about three or four years ago it became apparent that it was a viable project," says Todd Payne, vice-president of timberlands and project manager. "One of the things that made it possible was the plant's ability to dry a much larger portion of our lumber."

At the moment, Seneca mills a lot of green Douglas fir for the market, but they anticipate consumers will want a larger percentage of dry lumber in the future. Although Seneca does dry a small portion right now, they wanted the steam supply to dry up to 100 per cent of their lumber production should the market dictate.

"It only made sense—being in the wood products business—to look at utilizing our raw materials to generate that steam and in doing that, why not look at producing green electricity," says Payne.

The first step was to narrow down the list of contractors and to look at existing facilities those contractors had built. In the end, they chose Wellons to build the power plant—from the boiler on out through the turbine generator and all the emission control equipment. Seneca also hired O&S Contractors of Springfield, Oregon, to help design and install the fuel-handling and storage equipment, such as the conveyors taking the fuel to the fuel building.

Seneca alleviated a lot of potential issues by putting together an internal team to handle permitting, siting, design and, ultimately, operation. After siting and ten months of permitting, construction got underway in October 2009 and finished up in March 2011. At the peak of construction there were 90 to 100 people on site.

Payne says that the site is ideally located, just north of the sawmills. "We blow all of our byproducts from the sawmills out to a series of truck bins where we would normally pick it up and take it offsite. It also provided a very easy tie-in to Eugene Water and Electric Board's utility distribution lines, who we sell 100 percent of our power to."

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Although Seneca made a large investment in the project, tax incentives helped make it possible. Seneca qualified for both the state's Business Energy Tax Credit as well as the Federal Production Tax Credit, and anticipates the plant will pay for itself in less than 10 years.

The operation is extremely efficient. "Raw material comes in from two sources: from the sawmills and from outside trucks," says Payne. "That material is then screened for size. Anything larger than our spec size of 3" minus goes into a hog and gets re-ground into the right particle size."

Even though Seneca prefers 3", they will take 5" from outside sources. "We screen it and then grind anything between 3" and 5". We know that grinding in the woods is difficult and really reduces their production.

"We've got a number of contractors that go out, collect, grind and transport the raw materials," Payne added. "So the plant has really helped from a job creation standpoint, not just the direct jobs we added at Seneca, but the indirect jobs that are being created out there to support the collection and transportation of this material."

The internal and external fuel streams are fed by conveyor into the fuel building, which is divided into two halves. "We've got a green half, where we put material with a higher moisture content, and then the dryer half," says Payne.

There is no one in the fuel building—inside, everything is done automatically, including mixing the correct amount of the green and dry materials to create the right moisture content (45 per cent). And that mixture is carried by conveyor to feed the boiler.

"From the boiler side of it, we have six individual fuel cells, 8 feet in diameter, capable of handling the boiler capacity of 200,000 lbs. per hour," says Jim Munyon, operations supervisor. "These are rotating grates, which are also somewhat self cleaning."

"Everything from the fuel house to the boiler has redundancy built-in, so we have two of everything, although we're only running one at any one time. That's to allow us to keep running the plant should we have a problem with one of the conveyors," explains Munyon.

"The fuel building also has a smart lighting system," adds Payne. "We put translucent panels on all four sides of the fuel building and it allows us to pick up the natural ambient light during the day, which allows us to turn lights off during the day to save on electricity."

It takes two people to run the system—a shift operator and the assistant shift operator. And Seneca runs four crews who work rotating shifts.

"We hired four people from outside, experienced operators, and then we brought up a younger, internal group, and trained them—they are the assistants," explains Munson.

The steam produced from the boiler flows to the turbine-generated unit which is rated at 19.7 MW. "It's a double extraction GE turbine, which means that we can extract off of two different ports of the turbine," explains Munyon. "While steam is being put through the turbine, we're also extracting steam to send to the dry kilns and into the process.

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"We've also got several VFD's (variable frequency drives) that we've used throughout the systems. That allows us to ramp things up or down, depending on the demand."

That flexibility is crucial, as not only do the kilns demand various levels of steam in the drying cycle, but as more kilns are brought online, Seneca will need the ability to send more steam their way.

To save Seneca money, Wellons found a "used" turbine and Seneca sent it to Turbo Care, in Calgary, Canada, to not only recondition it, but to also have more features added for efficiency.

The system went online this past spring without a hitch, in part because of the four experienced operators that were hired, the training of the internal staff, and Munyon's leadership.

"One of the things that we set out to do was have our lead supervisor, Jim Munyon, as part of the construction project," says Payne. "He came to us in August of 2009, and was here from the time we broke ground. He added quite a bit of experience in how these plants function, as we went through the construction process."

Seneca spared no expense on emission control. In fact, approximately 25 per cent of the project cost, or $12.5 million, went into emission control technology.

"We basically spent twice as much money on emission control equipment than a normal plant would," says Payne. "Our company philosophy has always been to be on the leading edge and to be the most efficient. That's just a paradigm that's come from the company president, Aaron Jones, in the construction and the operation of his three saw mills and the balance of the plant."

Some of the equipment allows Seneca to continually monitor emissions like NOx and CO, in real time and operators can make adjustments when needed.

"It all comes down to good quality, dry fuel and an efficient combustion boiler," says Munyon. "With a consistent fuel coming into the system, we're able to adjust the fuel and air ratio perfectly. And our ash removal system has different zones so you have very little particulate to be collected."

And even the ash, a byproduct, will soon be generating revenue. Seneca is already talking to sources interested in purchasing the remaining ash for agricultural use and soil amendments. "Our air permit does not allow us to burn any woody biomass that's been painted, stained, or in anyway treated," says Payne. "We basically can only take in what I like to call virgin or organic wood fibre, so the ash output basically is an organic ash."

Munyon, who has worked at other facilities, speaks highly of this project. "Based on our investment and the design and the operation, this is probably going to be one of the most efficient and cleanest plants, as far as co-generation, that we've seen in the Western U.S., if not the U.S. in general.

"I've managed two of the best plants in the state," says Munyon. "This one supersedes them by far. I really think that we've set a standard here for the rest of the industry to follow.

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Payne added: “A lot of people don’t really understand that co-generation is a firm power source. We control both the input and output. That is different than the other two renewable energy sources in the form of wind and solar. Biomass provides a great complement to the other renewable energy sources, to fill in the peaks and valleys when they’re not producing.”