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GREENFIELD

Let the chips fall ... and burn

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December 31. 2007 12:01AM

This is one fire you do not want to roast chestnuts over. An 8-million-BTU boiler burned away in the background as Raymond Sebold, project manager, and Michael Redmond, vice president for advancement at the Crotched Mountain Foundation, explained how matchbook-sized wood chips heat the campus of the Crotched Mountain Rehabilitation Center in Greenfield.

The system works on simple principles applied on a large scale with computerized precision. There are two boilers that can produce 12 million BTUs between them. The facility includes storage for 150 tons of wood chips and has a capacity to heat 600,000 square feet with $250,000 in annual savings, said Redmond.

The wood chips are burned in boilers, said Sebold. Water captures the heat and is pumped through three-quarters of a mile of piping that winds its way through the campus. The heated water provides heat for the buildings, as well as domestic hot water. It then returns to the wood chip facility to be heated again by the boilers.

"The boilers are basically very large wood stoves with a very controlled burn," said Sebold of the wood burning boilers.

The wood burned in the boilers is very specific. No trash wood, such as pallets, is burned at the facility, said Redmond. The chips themselves are locally sourced from D.H. Hardwick in Francestown and formed from the entire trunk of a tree, bark and all.

"We chose to go with a product that was much more readily available," said Sebold of choosing these chips over hardwood castoffs from mills, which can be hard to obtain.

There is no drying process needed for the chips, which contain 35 to 40 percent moisture. Completely dry wood could be dangerous in these burners, said Sebold, who explained that dry chips would almost explode in the burners.

"When they're moist like that, it's a much more controlled, even burn," he said.

With proper forestry techniques maintaining the health of the forest, the process is considered carbon-neutral, said Sebold. The carbon that is released in the burning of the wood chips will be reabsorbed by trees, which can be burned again, releasing the sequestered carbon, and so on. The trees and their burning are part of the ebb and flow of a carbon cycle, he said.

The reasoning holds that this carbon will be either floating around in the atmosphere or held within a tree, but either way it is already present within the current environment. Burning fossil

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The reasoning holds that this carbon will be either floating around in the atmosphere or held within a tree, but either way it is already present within the current environment. Burning fossil fuels adds carbon that was not already present in our current environment, he said.

"When you're burning oil, you're adding carbon that was sequestered millions of years ago and you're adding it to our current carbon cycle," said Sebold.

The system also provides savings to Crotched Mountain Foundation. With the current oil prices, the system should pay for itself in five years, down from an estimated seven years when the project was first being explored, said Redmond. The price for the wood chip heat is equivalent to 61 cents a gallon, he said. This could net a savings of $250,000 to $300,000 annually, with the chance for $1,000,000 in savings when future expansions are factored in.

"Not only does it have all of the factors that are good for the economy and good for the environment, it's good for our economy," said Redmond of the various benefits of the wood-powered system.

On a cold December day, the largest boiler was heating water to 207 degrees before it took a trip underground to the campus, eventually returning at 196 degrees. That differential will increase as there is more demand on the system, explained Sebold. Complex computer systems control the size of the fire in each boiler and whether one boiler is in use or both are.

"This can be scaled down to what you need at the time," said Redmond.

To reach the boiler, the wood chips go through an automated system of augurs, sensors and conveyor belts.

"It's a fun Rube Goldberg-looking operation seeing the chips move from the bin to the burner," said Redmond.

Approximately 150 tons of wood chips are stored at the top of the building. The wood chips are then pulled down by a pair of augers onto two conveyor belts. Once the reserves in a storage bin by the boilers are reduced to a certain point, the conveyors automatically fill them. The chips then drop down into the burners as needed, allowing a precise burn in the boiler. At the current temperatures, the boilers are burning through 10 to 15 tons of chips a day, said Redmond, leaving the campus roughly a week's supply of fuel.

"If there's a major disaster, we're OK and we've got oil backup," he said.

The facility uses a double filtering system to ensure clean emissions. An induced draft fan ensures that exhaust is always coming out of the boilers, said Sebold. The exhaust then runs through a multi-cyclone separator, which separates out the larger emissions, he said. The air is then filtered by a four-module bag house. The exhaust gets pumped through large bags, which collect particulates. Anywhere from one to all of the bags can be running, depending on the load. A computer measures the air flow and will cut off exhaust flow to the bag so that it can be blasted with pulses of air to clean off the particulates, so the bag can go back to work.

"You don't smell any smoke outside this building," said Redmond.

In the end, the ash has been separated out and is wetted down and composted on site. The majority of what comes out of the building as a final exhaust is steam with some CO2 and other products of burning wood that cannot be filtered out.

"We're far and above what is required of New Hampshire air quality," said Redmond.

The wood chips are also kind to the environment if there is a fuel spill, said Redmond. A fuel spill on the road up the mountain would be easily cleaned up.

"No hazmat team needed," said Sebold as he showed a "fuel spill" of a few dropped wood chips on the ground outside the building. "You just get out a broom."

The wood chip facility came online a year ago, when it was running at a trial capacity. There have been no issues with the system this year, said Redmond. Despite its success, both Redmond and Sebold say this is not the answer to the world's environmental problems. Crotched Mountain worked with the biomass energy resource center to ensure that this was a viable route for the rehabilitation center.

"It was a very methodical process we went through for a year or two," said Redmond.

The abundance and low cost of trees in New Hampshire makes this viable system for Crotched Mountain, they said.

"In this part of the country, wood can supply the answer for needs," said Redmond.