BIOMASS

CASE STUDIES SERIES

ALL SOULS INTERFAITH GATHERING, SHELBURNE, VERMONT

A Sanctuary's Modest Pellet Boiler Will Help Test Local Field Grasses

Wood Pellet Heating System

Heating Capacity (output): 145 kW (0.5 MMBtu/hr)

Annual Wood Pellet Use: 30-40 tons

Year Installed: 2007

Thermal Output: Hot water

BERC

Renewable • Reliable • Resourceful

Biomass Energy Resource Center

The handsome sanctuary of the All Souls Interfaith Gathering, an ecumenical worship and meditation center in Shelburne, Vermont, is surrounded by gently rolling fields and woods that slope to the shore of nearby Lake Champlain. If a current experiment goes well, those fields may soon supply fuel for the biomass hot-water boiler that heats the sanctuary—and that could help to open up new vistas for locally produced biomass fuel.

All Souls installed a 145 kW thermal (500,000 Btu/hour) pellet boiler, produced by Solagen of Oregon, in 2007. The simple, high-temperature system has been burning 34-40 tons of wood pellets each Vermont heating season to heat the 14,000-square-foot sanctuary.

"It burns very cleanly," says project supervisor Christopher Davis of the pellet boiler. "The idea here was for something that was efficient and that could use renewable fuel—preferably something we could grow locally, like right on the site."

Davis managed the project that rebuilt and expanded a former residence into the All Souls Sanctuary (www.allsoulsinterfaith.org), remaking its one-time garage into a heating plant downstairs and a program space above. Davis also manages the Meach Cove Trust, which runs a scenic former 19th-century estate, a 1,000-acre property, that surrounds All Souls.

In the summer of 2009, Meach Cove's fields hosted the experiment that grew various grasses to test their potential as alternative sources of pellet fuel.

"Can we grow it here?" Davis asks of grass fuel for biomass boilers.

To answer that question, All Souls is collaborating with several other Vermont groups: the University of Vermont Extension Service, the Vermont Sustainable Jobs Fund, nearby

Shelburne Farms, and the Biomass Energy Resource Center (BERC), author of this article.

In June, Meach Cove planted a multi-variety crop of potential fuel grasses. After the harvest, Davis says, "We'll work with these other groups to figure out, 'Can we pelletize it?' This boiler will be one of the test sites."

Meach Cove Trust will work with BERC and the Sustainable Jobs Fund to find a processor to press the grass into pellets, to test the system, and to monitor results.

"We have a boiler here that's working really well, and will be part of this testing," Davis says. "We'll be able to adjust it to burn whatever we need."

"It's Just a Concrete Cave"

As he speaks, Davis pulls several plastic jars off of shelves in the small boiler room that houses the pellet boiler. One jar holds pellets compressed of blended sawdust and hay. Another has inch-thick rounds made of chopped, compressed hay.

All Souls researched pellet burners and settled on the Solagen unit, which is designed to burn fuel at very high temperatures and "allows us to burn any type of combustible fuel that fits into its four-inch opening," Davis says.

over

Pictured on front: The pellet boiler plant and storage bin at All Souls Interfaith Gathering in Shelburne, Vermont. The sanctuary it heats can be seen in the left background. Right: The pellet boiler's burn chamber, showing the auger that draws out ash to the base of the firebox.

The pellet boiler has two adjoining chambers. First is a stoker, with air holes through which fans force air while an auger pushes in fuel pellets. Ignition in the stoker creates a very hot fire that is blown into the second chamber, the firebox. In high-fire mode, the boiler runs at 900-1,200 degrees Fahrenheit, with a surrounding water jacket regulating the temperature.

"There are no moving parts in there," Davis says, shining a light into the burn chamber, now cooled down for the summer. "It's just a concrete cave, with a smooth bottom."

As new fuel moves into the stoker, it pushes ash to the base of the firebox, where another auger draws it out. An induced draft fan pulls the heated air up and into the triple-pass boiler, or heat exchanger, where it heats water to 170-180 degrees.

"What we have learned is that the boiler knows two things," Davis says. "It maintains a temperature to supply hot water to the building: It gets called to produce more hot water, and it does that very efficiently. When that is satisfied, it goes from high-fire mode into standby mode."

The system runs at high-fire just about 25 percent of the time, burning about 58 pounds of pellets per hour and filling a 30-gallon ash barrel about every five days.

"We haven't burned [alternative fuels] in large quantities yet," Davis concludes. "This is our second season. What we know is that we've worked out the operating issues, and made the adjustments for air and fuel-feed rates. Now we have a clean-burning system that is saving us, [compared to] $2.50-per-gallon number-two fuel oil, about 20 percent.

"Last year, when oil went to $4, that would have paid for this boiler in less than two seasons."

Will this little boiler be part of opening up new fields of fuel-cost savings for the future? The answer to that question will start to become clearer after this year's grass harvest is all in.

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