

NOVA SCOTIA AGRICULTURAL COLLEGE, TRURO, NOVA SCOTIA, CANADA

A College Draws Key Lessons Learned from Two Decades' Experience with Biomass Heat

Campus Woodchip Heating System

Heating Capacity (output): One 3.6 MW (12 MMBtu/hr) boiler

Emissions Reduction and Combustion Control Equipment: Cyclone

Year Installed: 1988

Thermal Output: Steam

In the late 1980s, a pioneering wood-fueled district energy system in Charlottetown, Prince Edward Island (PEI), caught the attention of the provincial government in nearby Nova Scotia. Interested in replicating what PEI had done, the province turned to a small, public college in Truro.

“The government was looking for a place to put in a facility and explore the concept,” recalls Phil Talbot, who was then, and still is manager of the physical plant at Nova Scotia Agricultural College (NSAC). “We were burning two million liters (530,000 gallons) of oil a year, and we were sitting right in the middle of the province, surrounded by forest.

“When we first heard we were getting a biomass system, I took my chief engineer and a couple of operators that would run our system, jumped into the car and went to PEI,” Talbot recalls. “I wanted them to interact with the operators that were running the system there.

“We learned a lot.”

NSAC’s woodchip-fueled campus central heating system was commissioned in 1988. Today, with more than two decades’ experience in running a biomass system, Talbot says one key lesson he’s learned goes way back to that first car trip.

“A wood energy plant is a lot of work, and one of the challenges you have is to bring your operators on board,” he declares. “There are plants that have failed, just because there was no buy-in” at that level.

From the earliest stages of installing its biomass system, the college involved its system operators. “It worked,” Talbot says of the system—“because they took a lot of pride in making it work.”



With a capacity of 12 MMBtu/hour, the college’s biomass plant, built by KMW Energy, provides heat and hot water to 65,000 square meters (701,000 square feet) of the campus. During the 2008-09 heating season, it used 5,850 tonnes (6,550 US tons) of wood fuel.

“We’ve gone as high as 8,820 tonnes,” Talbot says. “It depends on the weather. And if you have a breakdown for a few days, that’ll affect your total use. If we go down on a cold day and that wood burner has to go off, we can lose over a thousand dollars. The savings are pretty dramatic.”

The college maintains a backup system that uses No. 2 fuel oil. Last year, it burned 721,000 liters (190,000 gallons) of petroleum fuel.

“That was high,” Talbot says. “Last winter was a tough winter.”

Every month, his chief engineer produces a report that breaks down the system’s fuel use, and also indicates what the college would have spent if it were using only petroleum fuel.



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Pictured on front: Nova Scotia Agricultural College's woodchip-fueled campus central heating system was commissioned in 1988. Right: A traveling auger on a track was installed to ensure that chips flowed to the back of the fuel storage bin.

“In 2007-08, when an average liter of oil was 81 cents, we saved \$623,000 CAD (\$654,000 US)—our biggest savings,” Talbot says.

Comparing chip and oil prices for each year of operation, since 1988 the woodchip system has saved the college a total of \$4,244,000 CAD (\$4,460,000 US).

‘Go in With Your Eyes Open’

Another lesson the college has learned, Talbot says, is that biomass fuel quality is key to system reliability.

“What’s your moisture content? What species of wood are you burning this week? How clean is it? Most of the problems that we have are in our fuel transfer system,” where augers deliver the chip fuel to the boiler. “When you’re trying to pass everything through an auger system, it has to be pretty decent.

“Moisture content is what we look for,” he adds. “If the moisture’s right, you can make it work.”

Forty-five percent water content is the ideal number. “We don’t accept anything under 30 percent or over 60. We don’t pay for it, and we have penalties when the moisture goes too high,” Talbot says. The college follows the manufacturer’s specifications in calling for chips no larger than five inches in any dimension, and for the percentage of sawdust it will accept.

“We experimented last year with ground wood, but didn’t get as much heat out of it,” Talbot recalls. With a consistency similar to mulch, ground wood “is more prone to jam in the augers and hoppers; it tends to freeze quicker in the bins,” compared to chips.

When chips failed to flow to the back of their fuel-storage bin, Talbot and his staff modified the bin, installing a traveling auger on a track that pulls the chips back to fill the whole bin.

“It was quite an expensive retrofit, but it works great,” he says.

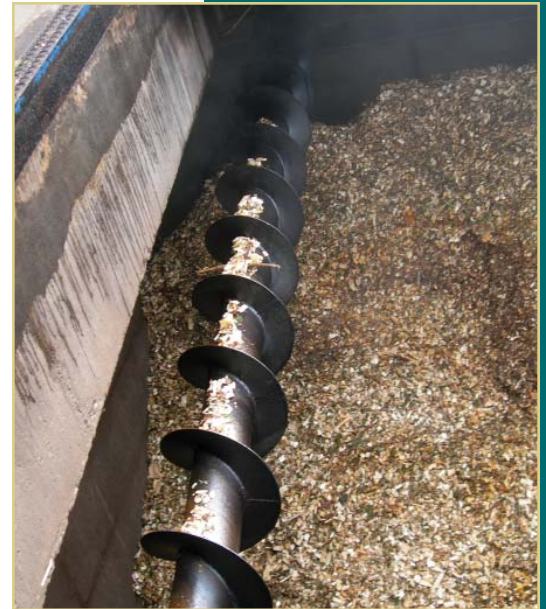
The college also modified its system to allow for variable-intensity firings. The 1980s KMW technology is essentially a cone, made of cast-iron sections: chips are fed to the top of the cone, then tumble down to the fire ring, which is fed with air from below. Originally the system burned on full, heating water to produce steam, until steam pressure hit 110 pounds. The system would then shut off until pressure dropped to 90 pounds.

Having since installed variable-speed fans and fuel augers, “we can slow them down and speed them up in response to the demand of the system,” Talbot says.

With 20-plus years running a biomass system, Talbot and his staff have seen interest in what they’re doing wax and wane, generally alongside the price of oil.

Ten years ago, when oil was relatively cheap, “people were shutting these systems down,” he notes. “It’s been quite a resurgence—but you need to go in with your eyes open.”

To those seeking his advice on adopting biomass technology, he says: “Do your homework. Know what you’re getting into going in, and make an intelligent, informed decision.”



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