By Denise Deveau

Nova Scotia school turns to BIOMASS

When the Annapolis Valley Centre for Education wanted to augment its oil-fired boilers for West Kings High School in Auburn, Nova Scotia, they decided to change things up with a biomass boiler system.

It's a sign of a growing trend in the province. Even though energy costs have been historically low in Nova Scotia, schools are introducing renewable energy systems to existing oil- and propane-powered boilers, to reduce their dependence on fossil fuels.

Educational facilities' interest in biomass has been driven by both environmental and fuel cost concerns, explains Mark Eisnor, principal project mechanical engineer with Dumac Energy Ltd. "Pricing for oil and propane gas hasn't been stable. That's one of the challenges the province is trying to overcome. Because wood pellet pricing is more stable, schools can more accurately predict heating costs, which is important from a budgeting perspective."

Another reason is that many new school projects are engaged in LEED programs, where biomass is a natural fit, says Gerard Doyle, senior mechanical engineer with Dumac.

While Dumac has designed a few systems in recent years, Eisnor says the West Kings High School project was unique in a number of ways.

One particular challenge was space – or lack thereof.

"There wasn't any room in the boiler room to house an additional system so we couldn't install it in the existing space," Eisnor says.

To solve the space issue, they decided to install a fully containerized, 540 KW, 25-foot by 11-and-a-half-foot biomass boiler system from Viessmann adjacent to the existing boiler room.

One of the biggest considerations, Eisnor says, was situating the boiler where connections could be made.

"Access for maintenance and delivering the pellets all had to be considered very carefully before pouring the concrete," he says. "As it turned out, we had to relocate the existing oil tank because it was exactly where we wanted to put the new system. Everything was preplanned based on very detailed shop drawings."

Prior to the installation, Eisnor says there was onsite prep work that needed to be done. "The pad had to be poured exactly where it needed to be, and the connections had to be valved off and ready to go."

The container was installed on the newly poured concrete pad and connected to a silo for the wood pellets. Piping for heating, drain, and cold water lines between the container and boiler room was encased in a sleeve to protect everything from the elements.

THE PROJECT

SCHOOL: West Kings High School

CUSTOMER: Annapolis Valley Regional Centre for Education

LOCATION: Auburn, N.S.

AGE OF BUILDING: 62 years

BOILER: Viessmann Vitoflex 300-RF 540

SILO CAPACITY: 45 tonnes

VENTING: Security CI chimney

CONSULTING ENGINEERS: Dumac Energy Limited

MECHANICAL CONTRACTOR: G.C. Baxter Plumbing & Heating

FUEL PROVIDER: Shaw Resources

DELIVERY: October 2016

COMMISSIONING: February 2017

CUSTOMIZING THE INSTALL

James Graves, an installer with G.C. Baxter Plumbing & Heating Ltd., says while everything about the installation was "pretty basic," the exterior piping was a bit out of the ordinary. "No matter if you use oil, electric or pellets it's all just piping. In this case the odd part was having to connect from the outside in."

Graves adds having a waterline to cool the system down was particularly important. "With oil, when it's off, it's off. But wood has stored energy that stays even after it's turned off."

Another important factor was the chimney. The discharge had to be the right height to avoid any odours making their way into the school building, Doyle explains. To address the problem, they designed and built a standalone 32-foot structure that extended above the height of the school.

Graves describes it as a "typical steel prefabricated chimney" using galvanized square tubing. "It was already insulated and water tight when we installed it."

The system also needed to operate as efficiently as an oil or gas boiler, including automated features, Eisnor explains. "We wanted a boiler that was automated and could operate in a similar way to a conventional fossil-fuelled boiler. This system has the ability start up and shut down automatically and will modulate based on building load."

FAST FACT:

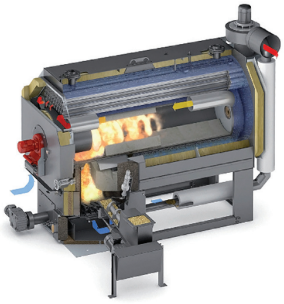
In the first partial winter of operation, the biomass boiler consumed 240 tons of premium grade pellets and displaced the equivalent of 84,000 litres of oil and associated CO_2 emissions.

KEEP IT ROLLING

Sizing of the system was an important consideration. In order to avoid frequent cycling, the system was not sized to handle the entire building load.

As Eisnor explains, "Oversizing a biomass boiler for the building load is not a good idea, especially with solid fuel. It doesn't lend itself to the frequent stops and starts that would happen with an oversized unit. They perform much better if they keep running in the winter months."

The containerized system also features a heat storage accumulating tank that acts as a buffer so the boiler doesn't see rapid changes in load, he adds. "There are multiple sensors tracking temperatures at various levels in the tank that allow the boiler to perform efficiently without having to react to sharp changes in load requirements."



HOW THE BIOMASS BOILER SYSTEM WORKS

1. **Pellets from a delivery tanker are blown into the silo pneumatically twice a year.**
2. **The pellets are conveyed from the silo to the firebox using an auger.**
3. **A control panel manages the various parts of the equipment, turning the system on or shutting it down when required.**

THE WATER DILEMMA

As a rural school, West Kings High School presented one unexpected challenge for the designers.

"The school was not connected to a municipal water supply," Eisnor says. "That meant that if there was a power outage when the boiler was loaded with fuel, there would be no pumping system to carry the heat away."

The answer was to install an emergency generator to run the school's well system. This would provide cooling water for the heat exchanger during an emergency to prevent the boiler from overheating.

"Without it we wouldn't have the water supply to do it. That caught us a bit off guard, because all the other installations we designed had a connection to a municipal water service."