

THINGS ARE HEATING UP FOR GROUND-BREAKING BIOENERGY COMPANY

BSB Installs a First of Its Kind Steam Wood Pellet Boiler in North America

What do you get when you team up one of Canada's leading pellet manufacturers with an industrial heating specialist? Biomass Solutions Biomasse or BSB as its known in its home province of New Brunswick – a company that is charting new frontiers in North America and delivering environmental, social and economic benefits for their customers and local communities.

BSB is the brainchild of two long-time businessmen in New Brunswick: Jean Claude Savoie, owner of Groupe Savoie (GS) in Saint Quentin, and Malcolm Fisher, owner of Compact Appliances, in Sackville. BSB replaces fossil fuels with biomass heating solutions for buildings throughout Eastern Canada including government, institutional, commercial, industrial, greenhouses, churches, poultry farms and other structures.

When the opportunity came in 2018 to provide a carbon-friendly, efficient system to the amalgamated Community College (CCNB) and the Université de Moncton (UDM) at the CCNB-UDM Shippagan Campus in New Brunswick, BSB was a natural solution. In 2014, the company installed a Binder 840 kW hot water pellet boiler at the Grand Falls Hospital which has been heating its facilities with pellets ever since.

Combining the CCNB and UDM buildings required a significant expansion of 36,000 sq. feet to its existing footprint. The project's architect Jacques Boucher Architect (JBA) from Pokemouche needed to replace the three old oil steam boilers with a large enough heating system that would meet the requirements of the expanded footprint while at the same time be cost-efficient and support the university's environmental goals. JBA hired Roy Consultant Ltée from Bathurst as the engineering firm responsible to study the actual steam heating system and advise on renewable fuel sources options that included both wood chips and/or wood pellets.

First of its Kind in North America

"Storage space was an issue so the energy density of the wood pellets and the close proximity of the campus to the Groupe Savoie wood pellet plant in Saint Quentin helped seal the deal," says Théo Losier, Development Officer with BSB.



Serge Mallet, responsible for mechanical/electrical systems and buildings maintenance at the CCNB-UDM Shippagan Campus seen here with colleagues Sebastien Chiasson (left) HVC Mechanical and janitor Maurice Gagnon (right).

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The farm-style silo holds approximately 30 tonnes of pellets and is refilled every 20 days in the height of winter.

While the concept to use pellets was clear; finding the right steam boiler system to heat the campus expansion required more research. Since the team from Roy Consultant had already worked with BSB on the hospital project; it was agreed that it would be good to bring in Binder's engineering team from Austria. Binder Energietechnik has a long and successful history in Europe manufacturing biomass boilers and produces state-of-the-art, cost-efficient and environmentally-friendly boiler combustion systems with a reputation for reliability.

"One of the prime motivators for the project was the Kyoto Protocol at the time and everyone was talking about carbon taxes and taxes on oil of upwards to \$20.00 per tonne," says Serge Mallet, a Fourth Class Power Engineer who led the installation at the campus and today oversees its day-to-day management.

"Pellets are a renewable and responsible source of energy and were already being produced in New Brunswick for international and domestic customers, so why not use the local pellet supplier?"



State of the Art That's Tough Enough for Canada

The objective of the project was to replace three very outdated oil steam boilers with a new low pressure steam biomass boiler that would be environmentally-friendly, reliable and cost efficient.

Most wood pellet boilers in North America work with pressurized hot water. The UDM Shippagan's system is unique in that the Binder boiler was coupled with the campus' original steam system.

First, the combustion chamber produces a hot gas that goes through a heat exchanger. It is fed with pellets by augers. The combustion process is fully automated and equipped with moving grates, primary and secondary air fans and an exhaust gas recirculation. The system has an oxygen regulation and a multi-cyclone that cleans the flue gases.

Second, the boiler has an economiser that preheats the condensate and then generates steam. The steam enters another heat exchanger which is used to raise temperature of hot water that circulates through the campus buildings, heating radiators in each classroom. Both the steam and hot water cycles are closed.

"Our system doesn't use much fresh water – we recycle almost all of the condensate and use steam instead of hot water so we can use a smaller-size boiler," says Serge. "Using our steam boiler for heat and a heat exchanger for heating the water, makes the system more efficient."

The Binder system has also proven itself tough enough to face Canadian winters, where temperatures can dip down to -20 to -30 degrees Celsius at times in Shippagan. While two new back-up oil boilers were installed to replace the old oil boilers; they aren't getting a lot of use.

"The new combustion system is so efficient that we rarely need the back-up oil boilers," says Serge. "When it's too cold like minus 20 degrees Celsius, the oil boilers sometimes start to support the peak demand in the morning, but usually the pellet boilers supply the heat demand in all of our buildings."

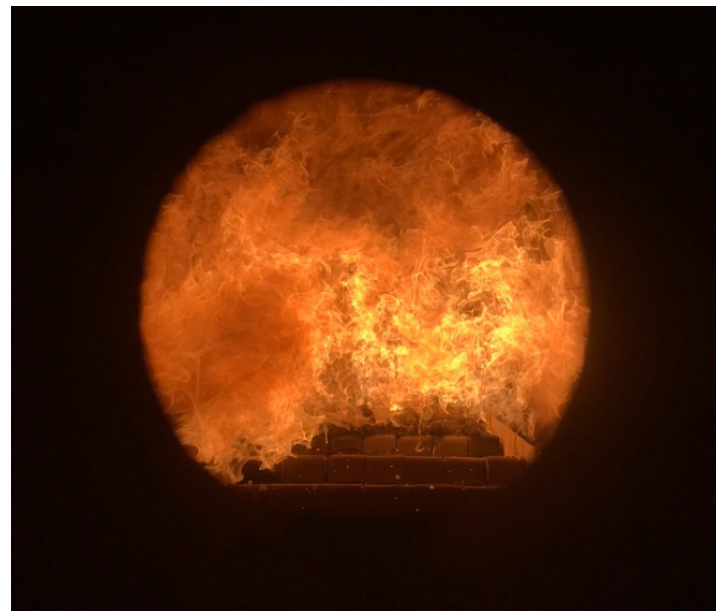
The entire system can be controlled remotely through the main control system. All the controls and alarms are linked to Serge's and his assistant Sebastian's cell phones.

"When I want to reduce the capacity of the boiler I can do it from my computer at home. Every night before going to bed, I check the boiler on my cell phone and I check the weather. And if the weather will get warmer that night I reduce the boiler capacity before I go to bed," explains Serge. "In the morning I increase the boiler capacity early before all the normal daily systems come on – they are scheduled to start 15 minutes apart so there is not too much demand on the system at once."

Pellets: Coming Full Circle

Group Savoie's pellet plant produces 90,000 metric tonnes of pellets every year – comprised almost entirely from the residuals from harvesting or sawmilling – making it a carbon neutral, responsible and renewable energy source. A local trucking company delivers 30 tonnes of pellets at a time to the campus – a 300 km trip one way from the pellet plant. Each delivery is measured by a scale before it leaves the plant. When the campus is down to about 25-30%, usually within 20 days, it calls the dispatcher for more pellets.

The pellets are also benefitting the local greenhouse. After combustion, the ash left from the burning of the pellets is collected in a massive bin that fills up approximately every 20 days. The product is transported to the greenhouse to be used as fertilizer for gardens; coming full circle to start a new cycle.



The combustion chamber heats up to 800 degrees Celsius, heating 36,000 square feet with 100% locally sourced wood biomass.

Unchartered Waters Prove Out the Business Case

Like most innovation there is hesitancy about investing nearly \$1 million in new technology that was untried in the Canadian marketplace.

“Not everyone was convinced it was the right thing to do by having a wood pellet steam boiler instead of oil, because it’s never been done in North America so we had to go through lots of convincing with the engineer, architect and stakeholders,” says Théo. “We focused on saving and reducing emissions and I believe at the end of the day the two goals have been achieved, more than expected actually.”

The location of the combustion chamber next to the heat exchanger was a first not only in North America but for Binder who managed that part of the design.

“Normally we have a boiler that is just one big block, with heat exchanger above the fire. Binder managed that part of design, but it was a bit tricky to fit it in the room because the building was already designed with that boiler room,” says Francis Lamarche, BSB’s Mechanical Engineer.

Boiling it Down

- Heats 36,000 square feet with 100% locally sourced wood biomass
- Combustion chamber heats up to 800 degrees Celsius
- On average uses 30 tonnes of pellets over 20 days or 548 tonnes/year
- Uses 20% less fuel even though footprint grew by 36,000 sq. ft.
- Payback on the project expected 6-7 years
- Emissions reduced by 85% (to 108 tonnes of CO₂ from 752)



After combustion, the ash left from the burning of the pellets is transported to a local greenhouse to be used as fertilizer for gardens; coming full circle to start a new cycle.

“This was ground-breaking stuff and first of its kind in North America and here we were going to use it at the campus in Shippagan,” says Théo. “Not only did we have to win people over with the technology but also on the idea of a farm-styled silo on the campus next to the modern look of the expansion building. But at the end, everyone agrees that it blends in well.”

Local residents were also concerned with potential for emissions from the burning of the pellets, especially since it’s located in the heart of the campus.

“I believe it’s cleaner than burning fuel – we’ve reduced CO₂ emissions by nearly 85%,” says Serge. “There is no particulate and once the boiler is hot you don’t see any smoke.”

And it’s not just the air that’s clear; but also the future for more buildings to adopt this technology. Théo says other New Brunswick public buildings including schools and hospitals are considering using pellets for energy.

“Here we have a carbon-friendly product that is coming from New Brunswick wood waste and turning it into a clean source of energy that is supporting local businesses and jobs while reducing emissions and costs – it is the future of energy. We just have to look to Europe and Asia to see how it’s taken off there – we’ve got a good thing going here.”