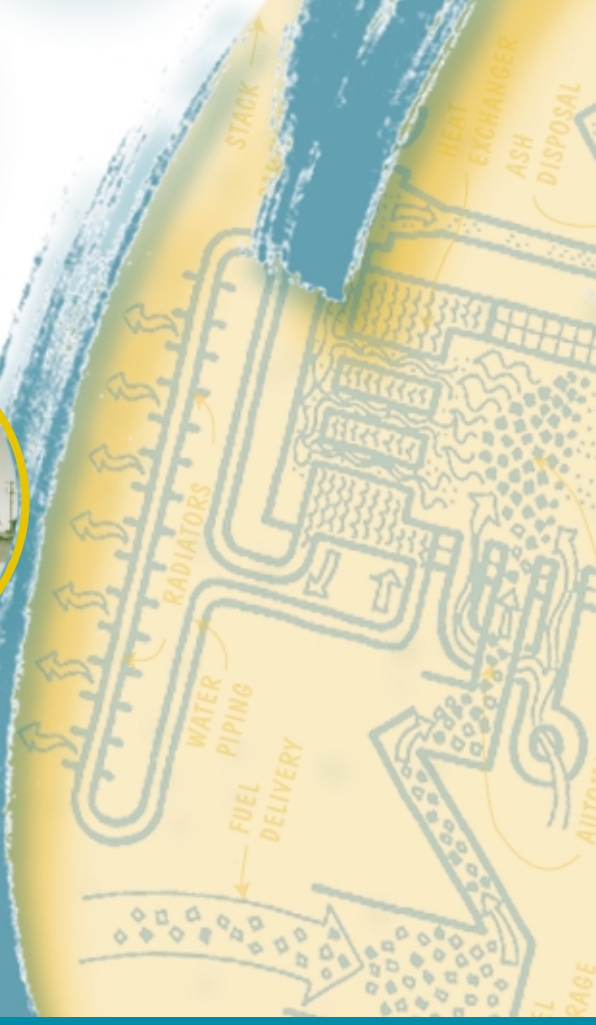
WARM UP TO Biomass Heating

AND IMPROVE YOUR BOTTOM LINE

How 4 successful Canadian businesses have converted bioenergy into big savings



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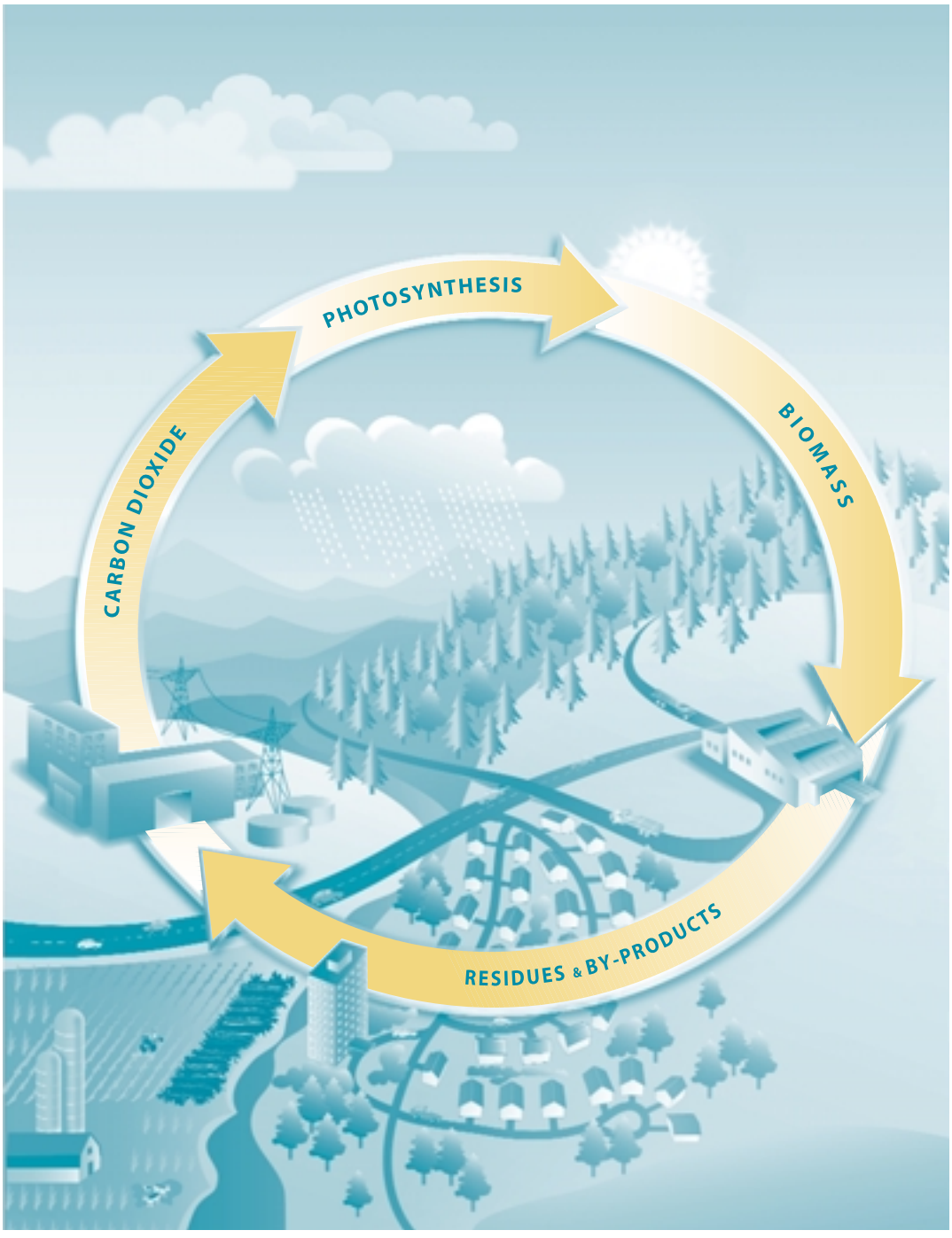


Biomass combustion is considered CO_2 neutral and therefore is not considered a major producer of greenhouse gas linked to climate change.

Warm up to BIOMASS heating

The recent upward trend in oil and gas prices has caused many Canadian business owners to reflect on the finite nature of fossil fuels and to take another look at renewable sources of energy such as solar, wind, earth and biomass. Many are discovering that renewable energy technologies today are well developed and reliable.

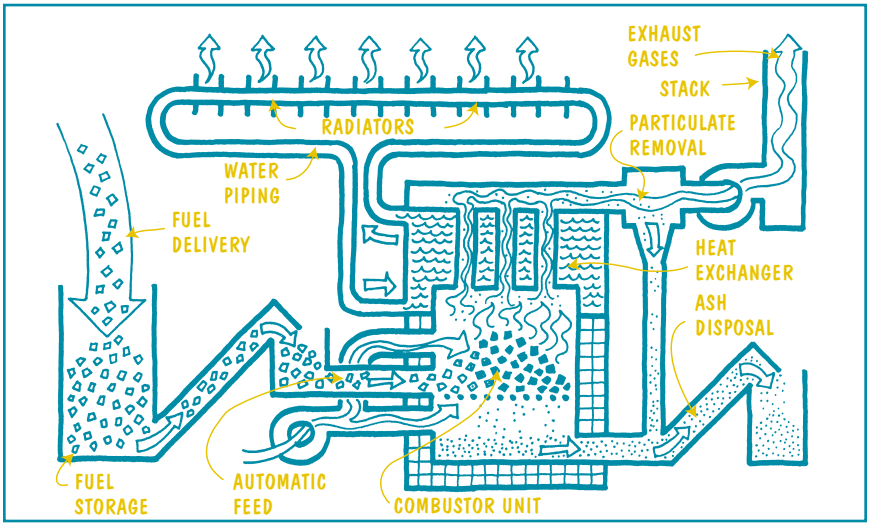
Biomass energy, or bioenergy, refers to all forms of renewable energy that are derived from plant materials produced by photosynthesis. Biomass fuels can be derived from wood, agricultural crops and other organic residues. These fuels can be obtained from many sources in Canada, including sawmills, woodworking shops, forest operations and farms.

Bioenergy is regarded as "green" energy for several reasons. Assuming that biomass resources, such as our forests, are managed properly, biomass fuels are infinitely renewable. They have already proven to be economically stable sources of energy over time. Bioenergy is neutral in terms of carbon dioxide (CO_2) emissions. The burning of biomass fuels merely releases the CO_2 that the plants absorbed over their life spans. In contrast, the combustion of fossil fuels releases large quantities of long-stored CO_2, which contribute directly to global warming. Using bioenergy displaces fossil fuels and helps slow the rate of climate change.

Small commercial wood heating is common in rural areas across Canada. Between 1980 and 1993, many businesses and institutions in the Atlantic provinces installed automated biomass heating plants to stem rising energy costs. Despite relatively low oil prices in the last decade, many businesses have continued to operate – and often expand – their biomass heating plants. They have achieved significant savings and other benefits from low-cost bioenergy.

This publication features several small businesses that have installed biomass combustion systems (BCSs) and consider them a wise choice.

Biomass Combustion System – Typical Layout



Using Your OWN WOOD WASTE for Energy

Valley Truss & Metal Ltd.

One of the most appropriate uses for bioenergy is when a business can use its own wood waste to produce energy for its own needs. This situation applies to Valley Truss & Metal Ltd. of Kensington, Prince Edward Island. This group of companies makes steel roofing and siding, laminated wallboard and wooden roof trusses. In 1994, owner Isaac Schurman installed a 160-kW BCS that currently heats about 1860 m² (20 000 sq. ft.) of working area in three separate buildings.

Valley Truss & Metal's 160-kW BCS with the new prototype round day bin designed for dry fuel.

Isaac Schurman's initial objective was simply to provide low-cost heat for his businesses. At first he bought sawdust and, occasionally, whole-tree wood chips for fuel. Later he discovered that he could use the BCS as a cost-effective way to dispose of growing volumes of wood blocks (by-products of the roof-truss plant). And since Prince Edward Island is putting a waste management system into practice, he is concerned that tippage costs will be higher in the future.

In 1996, Isaac bought a slow-speed wood grinder to process the blocks into a particle fuel that he could use. "The wood grinder works well for all kinds of materials, wood blocks, even paper," says Isaac. However, the new dry fuel did not flow properly in the original fuel feed bin, which was designed for "greener" wood fuels.

To address this problem, the BCS manufacturer developed a new type of round fuel bin. Isaac Schurman is now satisfied with his BCS. "The manufacturer has been very patient, trying to adapt the system to handle our fuel. Considering the fact that we changed fuels, the system works fine," says Isaac.

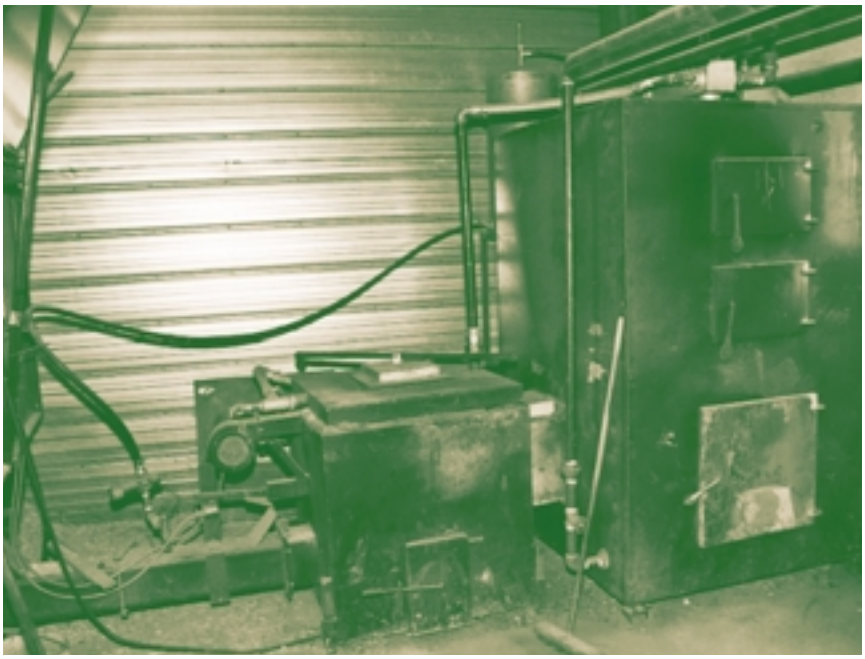
Valley Truss & Metal Ltd.

The volume of wood waste generated by Schurman's truss plant has increased to the point that it now exceeds the annual heating needs for his business operations. So Isaac Schurman is selling surplus waste fuel to his brother, who burns it in a BCS on his farm.

Schurman Farm Ltd.

Schurman Farm Ltd. is a large, farrow-to-finish hog farm owned and operated by Lea Schurman and his son Marc. Lea Schurman first ventured into biomass energy in 1985, when he installed a round-bale straw burner to heat his farm workshop and house. By 1993 he had grown tired of handling round bales, and the farm needed more energy. So he installed an automated sawdust-burning BCS with a larger capacity. This system not only accommodated his original heat load, but also provided under-floor heat to a large, new barn containing 330 sows.

When his son Marc joined the operation in 1998, the sow operation had grown to 700 sows, the farm's heat load increased proportionally. Today, the Schurmans' BCS consists of two 160-kW combustion systems installed in a farm workshop. Each system comprises four major components: a fuel (or day) bin; a combustion cell



One of the two 160-kW BCSs on the Schurman Farm.

(or chamber); a boiler; and a stack (or chimney).

The day bin has an agitator that ensures that the fuel flows continuously to a screw auger at the bottom of the bin. The auger meters a mixture of green sawdust and dry wood waste into the combustion cell. This cell has a steel bar grate upon which the fuel dries and burns. The grate is surrounded by high-temperature firebrick that becomes red hot. A fan provides preheated under-fire and over-fire combustion air to the fire. The combustion cell sends a jet of flame into the boiler. The boiler extracts heat from the hot gases and transfers it to water, which is circulated through the boiler. The cooled gases then pass up the stack. The hot water from the boiler is distributed to the various heating zones on the farm system via insulated underground piping.

Combustion occurs at high temperatures with a controlled under-fire and over-fire air supply. So the combustion efficiency is very high, and the emissions are low. In addition, little smoke and few airborne particulates are produced.

The Schurmans' BCS cost roughly $130,000 in 1993. A significant portion of the capital cost related to the heat-distribution piping and under-floor heating in the pig barn and in a new farm workshop. The incremental cost of the BCS over the cost of oil-fired heating systems for the various buildings was about $70,000.

In 1999 the Schurmans bought about 300 t of green sawdust and about 165 t of dry wood-waste for a net annual fuel cost of about $7,600. As well, diesel fuel, electricity, labour and maintenance cost about $2,000. The biomass should displace about 120 000 L of heating oil (which would cost about $54,000 at 2000 oil prices). Thus, the annual savings from the Schurmans' BCS are substantial.

Twin-burner biomass systems have several advantages. The Schurmans operate both burners during the winter, and these handle 100 percent of the peak heat load with low-cost biomass energy. They do not have an oil-fired backup system. From May to September, they operate a single burner. This approach allows each BCS to operate in its optimum firing range, where efficiencies are high and emissions are low.

The Schurmans are happy with the performance of their BCS. "It requires a little more effort to look after it than an oil system, but it is not so time-consuming that it is not worth the effort," says

Lea. Marc Schurman points out that business owners have to look at the costs and benefits of a BCS over time. "Biomass systems have higher capital costs than oil-fired systems, but you get it back over time with much lower energy costs," he says.

Marc also refers to better living conditions for the pigs. "Our low-cost biomass heat allows us to heat the pig barn more extensively and increase the ventilation rates, compared to what we would do with oil heat," says Marc. "The increased ventilation improves the health of the animals and the comfort of the staff working in the barn."

The recently filled day bins of the Schurman Farms BCS. The fuel reserve is located on the left.

The Schurmans' 320-kW twin BCS is now being pushed to its limits. Furthermore, Lea Schurman would like to heat his new 930 m^2 (10 000 sq. ft.) concrete fabrication plant, adjacent to the farm, with biomass. And Marc would like to connect his home to the system. So they are planning to increase the capacity of their BCS to meet the new demands.

Koughan Auto Body

Bioenergy can also be used to heat many other types of businesses. Dave Koughan owns an auto body shop near Charlottetown, Prince Edward Island. When he expanded the shop in 1992, he needed a new heating system. "I wanted a cost-effective system that would allow me to heat the building around the clock," says Dave. He elected to install a biomass heating system to heat both the shop and his father's nearby 110 m^2 (1200 sq. ft.) home.

The initial cost of Koughan's BCS was about $50,000. This covered the burner and boiler, the heating-plant building, the entire heat distribution system and a used skid-steer loader to fill the day bin.

A separate fuel-storage building was constructed near the heating plant in 1994. In 1996 Dave bought a used tractor-powered chipper to produce his own wood chips.

Dave's father, Bill Koughan, is retired, but he still manages the woodland on the farm. Each year, he and some hired help harvest a block of woodland. This produces about 75 t (50 cords) of sawlogs for sale and a similar volume of wood that they chip for fuel. Bill also operates the BCS. He uses the skid-steer loader to fill the day bin in the morning and to top it up at the end of the day during very cold weather. The Koughans keep it running at a low level in the summer to provide hot water for Bill's home and for washing cars in the body shop.

Dave Koughan's tractor-powered chipper.

Both Dave Koughan and his father are satisfied with the BCS. Dave estimates that his biomass system paid for itself in six or seven years. "I consider that the payback was reasonable," says Dave. "Of course it would be much better with today's oil prices." Dave also likes having the heating plant in a separate building. "It's very safe for an auto body shop," he says. "The under-floor heating is also very good, compared to hot-air oil furnaces that blow dust and fumes around the shop."

Filling dry bin at Koughan Auto Body.

Denco Enterprises

Heating greenhouses is another practical use of bioenergy. Denco Enterprises is a small greenhouse operation in Whites Cove, New Brunswick, near Fredericton. The owner, Roger Hyatt, looked at various energy options – including oil, propane and wood – when he got into the bedding-plant business. He concluded that an automated wood-chip system was the most attractive option, so he installed a 130-kW BCS in 1992 at a cost of $16,000. That covered only the burner, the boiler and the stack. The building that houses the BCS is integrated with the greenhouses. A separate low-cost fuel-storage building was added in 1994.

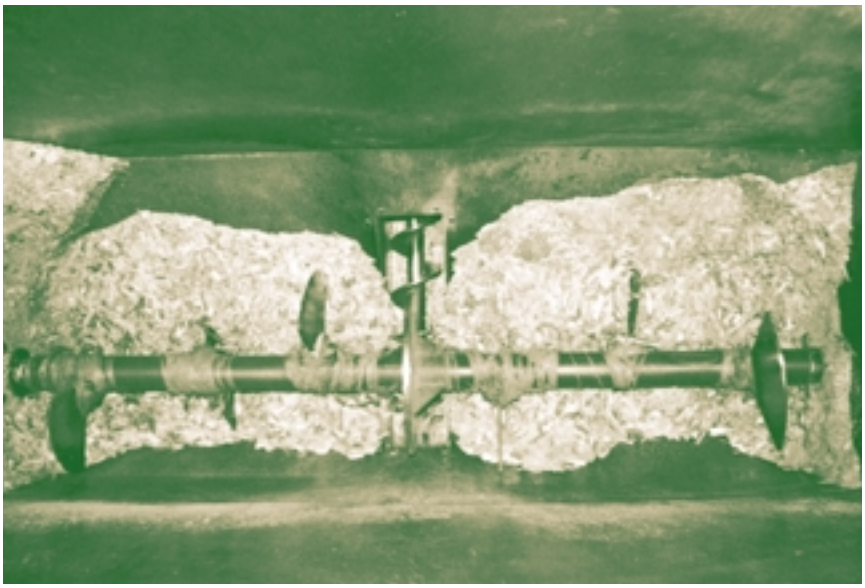
Roger Hyatt has integrated his BCS with several other heat loads to optimize its use. His system provides space heat and domestic hot water for his home and that of his father. During the summer, he also heats an above-ground swimming pool.

In 1999 Roger added a small dry kiln to his building complex. He now dries cedar lumber for a local sawmill, where he is also an employee.

These combined heat loads allow him to operate his BCS year-round and provide him with options that are not available to other greenhouse owners. "I can start my bedding plants much earlier in the season," Roger says. "I also run one greenhouse throughout the winter and overwinter plants for the next year."

Each year, Roger Hyatt burns about 275 t of barky wood chips, which he obtains from the nearby sawmill. He calculates that his BCS paid for itself in three and a half years, starting in 1992. But at today's higher oil prices, he believes that the payback period would be considerably shorter. "I estimate that wood chips currently cost me about one quarter of the price of heating oil or propane," says Roger.

Although Roger Hyatt is positive about his BCS, he acknowledges that having a basic understanding of mechanical systems and a good attitude are important. "You have to understand how the system works and you have to want to make it work, but it's not that hard," he says.



The agitator located in the day bin of Roger Hyatt's BCS.

Roger knows that he has a very favourable situation, with a sawmill producing chips so close. "But I think that there are more good opportunities for bioenergy heating systems out there than people tend to realize," he says.

Roger Hyatt's 130-kW burner is being pushed to its limits by the various heat loads that he has connected to it. He plans to buy a burner that is one or two sizes larger than his current one.

Denco Enterprises' dry kiln and greenhouse complex. Biomass fuel is being stored outside on the right.

Conclusion

The steady expansion of the heat loads in the businesses of the Schurman brothers and of Roger Hyatt is common among owners of biomass combustion systems. Once a BCS is in place, it makes sense to get the best possible use from it. And businesses that find an economic advantage in using low-cost renewable energy frequently want to expand that use to achieve even more benefits. This often leads to investments in new and larger biomass heating plants that use greater volumes of renewable biomass fuels.

All the biomass combustion systems described in this article were installed and amortized at energy prices current in the 1990s. Their owners continue to achieve significant annual savings. They also do not have to worry about dramatic increases in their heating costs, which threaten the viability of many businesses. Several other small businesses will likely follow the lead of these pathfinders and move to low-cost, renewable biomass energy in the coming decade.

Natural Resources Canada's (NRCan's) Renewable Energy Deployment Initiative (REDI) promotes investments in renewable energy technologies. These include biomass combustion systems that produce space heat and water heat for businesses.

REDI for Business will refund 25 percent of the purchase and installation costs of a qualifying (i.e., high-efficiency with low emissions) BCS for a business, to a maximum of $80,000. The program is in effect until March 2004. REDI serves to stimulate market demand for renewable energy systems and ensure that industry infrastructures are developed to meet consumer demand.

Find out more about how you can benefit from biomass combustion systems or other types of renewable energy technologies by visiting NRCan's Canadian Renewable Energy Network (CanREN) Web site at http://www.canren.gc.ca

A buyers' guide to small commercial biomass combustion systems is available from NRCan.

To receive a complete case study of any business heating with bioenergy mentioned in this summary, contact NRCan at the following:

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Web site: http://www.nrcan.gc.ca/redi

For more information on biomass combustion systems or other types of renewable energy technologies, visit NRCan's Canadian Renewable Energy Network (CanREN) Web site at **http://www.canren.gc.ca**.

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