System Uses Heat From Composted Manure

By Janis Schole, Contributing Editor

An innovative Canadian company says it has come up with a cost-effective way to extract heat from composted cattle manure and bedding and put it to use on the farm. (The compost is a by-product that can be used or sold.)

Aerobic decomposition of the waste produces hot water vapor, and the system extracts the heat energy, transferring it into an insulated bulk storage water tank where the heated water can be directed elsewhere for various hot water applications.

"The system is self-powered, with the exception of a small amount of electricity needed to power four 120-VAC motor-driven, inline air blowers, using 1/8 hp motors," says Acrolab president Joe Ouellette. "The energy output last winter routinely reached 5 million BTUs per 24 hour period."

The company worked with the USDA and the State of Vermont to set up a commercial-scale prototype at a dairy cow replacement farm near Enosburg Falls, Vt. The system provides radiant floor heating in a 49 by 184-ft. calf barn.

"The composting facility consists of a 2-bay barn with an enclosed hallway between the bays. Each of the composting floors (or bays) is about 52 by 60 ft. and will permit active composting of between 700 and 800 tons of materials at one time," Ouellette says. "The four windrows in each bay are mechanically turned regularly. The compost produces temperatures of 120 to 165˚F for four to eight weeks."

The steam that's produced is captured by an array of special "vapor collector" pvc pipes (top slots are cut open along their length), that are recessed into the insulated concrete floor and protected from vehicle traffic by heavy-duty mesh screen.

According to Ouellette, the fans draw the hot vapor from the floor collectors into insulated ducts, which are attached to a collection of "Isobar" superthermal conductors that heat water in a converted 800-gal. bulk milk tank. (The insulated ducts are wrapped with a "TekFoil" material which raises the insulation value around the pipes to approximately R50 or R60.)

The Isobars are 3-in. dia., sealed, stainless steel tubes containing a proprietary "working fluid". They function like a wick to transfer heat, says their inventor, Ouellette. They don't require any outside energy source to work, and they transfer heat about 10,000 times faster than copper.

The "Agrilab Isobars Heat Transfer System" raises the tank water's temperature to 75˚F at the outlet valve and maintains the un-insulated calf barn floor at a comfortable 51˚F. When the water returns to the tank, it's 57˚F.

With the American prototype operating so well, Ouellette is hoping to set one up in Canada for demonstration also, and eventually sell the system to farms everywhere. He says it will be an investment that pays off quickly, with a price tag of roughly $50,000.

Pvc pipes are buried in the insulated concrete floor. When compost is piled on the floor the vapor inside the pipes heats up.

Fans draw hot vapor from floor collectors to insulated ducts, which house a collection of "Isobar" superthermal conductors (left). The Isobars are 3-in. dia., sealed stainless steel tubes containing a proprietary "working fluid". They're inserted into an 800-gal. bulk tank (top) that's filled with water.

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Compost "Furnace" Kept His House Warm

When Richard Morton lived in Alaska more than 30 years ago, he made and used a hot water heating system that was powered by compost.

He built an 8 by 8-ft. concrete room next to his house, with a sealed walk-in door and a grid of plastic hot water pipes in the insulated floor. As he recalls, the 1-in. dia. pipes were spaced 2 in. apart, and fed into a larger, insulated pipe running underground between the composter and the house.

He hooked a solar-powered pump to the grid of floor pipes and also tied it into a thermostat in his home. The pump circulated water from the compact "furnace" to the house where Morton had baseboard heating.

Thanks to an electronic thermometer he set up to read the composting room's interior heat and display it on the outside, he could easily monitor the temperature. Having a detached, concrete composting room means no danger of fire, he points out.

Inside the room, Morton piled material to be composted such as leaves, lawn clippings, branches, and cow manure from the neighbor.

"I would go into the room wearing a paint spray mask each day (to protect myself from fumes), and flip the stuff by hand with a fork, but you could build an automatic turner," Morton says. "I removed the compost once every two weeks and plowed it into the garden where it made tremendous production. I had a huge 4-acre garden plot and this sure gave me beautiful soil."

"I was living in Anchorage at the time and had a 3-bedroom, 40 by 32-ft. home. This system kept it warm when it was 30 below zero outside. I only used the wood stove once when it got to 40 below," the Washingon resident now explains. "I'm an engineer (retired now), so I was able to design this system for myself. It really worked well and I think someone ought to go into business making these things - any heating engineer could figure this out for you."

Big Hoppers Make Grain-Hauling Easy

Jimmy Walker knows the value of time and how much gets wasted when combines have to wait for transport to show up or when drivers have to wait to unload grain at the bin. His solution to both money wasters is the Rol Hopper, a container designed for transporting and temporarily storing grain to keep combines rolling. Best of all, he says it will be less expensive than current grain transport.

"You can spend $100,000 pretty quickly on a couple of hopper trucks, drivers and insurance to move grain," he says. "I figure you could buy four Rol Hoppers for the cost of one hopper grain trailer."

Walker, a farmer and owner of Saf-T-Cart, a manufacturer of welding carts, figures using big containers to move grain just makes sense. He envisions a situation where several containers are dropped alongside a field based on projected yields. A transport driver can pick up containers as they fill, move 'em to the storage facility and drop 'em one at a time. No waiting for the first fill or waiting in line to unload. The tarp-covered Rol Hoppers would keep grain protected until it could be unloaded and neither combine and driver nor transport and driver would suffer down time waiting.

Walker has been testing a prototype for several years and is close to introducing the final design. It has a round bottom, which he says allows it to be built for less cost. Each Rol Hopper holds 1,000 bu. of grain and is expected to sell for right at $7,000. A trailer to move it is projected to be in the $40,000 range.

Fifth wheel dollies available commercially could be used with tractors to haul containers to the field or around the storage facility, notes Walker.

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Roll hoppers park at the edge of the field so combines and grain wagons can quickly unload.

Tarp-protected hoppers are transported by a special-built trailer.