Big Bale Furnace Shreds As It Burns

By Bill Gergen, Senior Editor

Burning whole uncut big round bales to heat your shop or house is an idea that has come and gone, as far as Dave Goff is concerned.

"We think it's far more efficient to burn loose or chopped material," says the owner of Heatwerks, Inc., Morland, Kansas.

FARM SHOW previously featured Goff's "Bale Burner" which burned big bales to heat farm buildings (Vol. 27, No. 3). He has since redesigned the system to burn any kind of chopped straw, grass, hay, or corn stalks.

"Chopping up the material makes it burn more efficiently than burning the whole bale," says Goff.

In most cases, the farmer comes up with his own equipment to chop the material and feed it into the burner.

"The Big Woody system is far more efficient than the bale burner we sold in the past," says Goff. "With the bale burner, by the time we got a fire hot enough to matter, all the heat was going out the stack. There was no way to control the amount of heat, so you ended up with either a power plant-sized fire or just a smoulder. The Big Woody has multiple water-bearing heat exchangers over the firebox, which makes it much more efficient. A small pump and a loop of hot water can carry more heat than a giant squirrel cage fan. The bale burner was averaging only 3,500 btu's per lb. of material burned, whereas the Big Woody averages 7,000 btu's."

Dairyman Rick Lawrence installed the Big Woody on his farm near Cape Vincent, N.Y. He uses the system to pre-heat hot water that's delivered through underground pipes to his house and dairy barn, including the milking parlor.

Lawrence uses a Krohn Roto multi-cut round baler on native grass. The baler is equipped with knives that slice the grass as they bale it. He uses a 3-pt. mounted Tomahawk bale shredder to further cut the material and blow it into a Badger self-unloading silage wagon. The wagon is equipped with a live floor and is used to unload the material into a modified Badger elevator. The elevator delivers the material into the burner's input auger. The wagon's live floor and conveyor, as well as the elevator, are all operated by an electric gear reduction motor.

The burner is located in a small shed that Lawrence added onto his farm shop. He uses a poly pipe rated for 200 degree water to deliver heated water more than 300 ft. to his house, and to his shop and dairy barn. Lawrence and his neighbor designed an ash stirrer, belt-driven by an electric motor, to stir the ashes and knock them down through grates into a compartment at the bottom of the burner. For now he's using a shovel to remove the ashes, but he plans to install an automatic ash removal auger.

"I think this idea will work for anyone who has excess grass or poor quality hay," says Lawrence. "In some years we have two or three times as much grass hay as we need. If the grass gets rained on, it's too tough and too low in protein to make good quality feed. My total cost for the equipment was less than $25,000. I had been spending about $7,000 per year on oil and propane to heat the same buildings. The burner has reduced that to zero, so the system will pay for itself in only about three years."

The system runs 24 hours a day, with the wagon's live floor and conveyor operating continuously on fractional horsepower, low energy consumption gear reducers. A thermostat is used to turn the burner on and off. Lawrence installed a Radio Shack wireless camera and monitor so that he can observe the conveyor from his house.

To keep the system's cost down, Goff uses as many off-the-shelf parts and components as possible. For example, a rebuilt big block Chevrolet water pump is used to circulate water throughout the system. The water pump, belt-driven by a 1/2 hp electric motor, pulls hot water out of a nearby reservoir and circulates it through the firebox and heat exchanger, then back to the reservoir. "Rebuilt Chevy water pumps are widely available and can be purchased for only about $30. They work as good as $700 commercial water pumps," says Goff.

"If you need more pressure for longer distances, you can feed one pump into another one. And if the pump ever fails, you can buy another one cheap at any junk yard."

The Big Woody is equipped with a shaft-driven stirring mechanism that breaks up free-standing ashes, which fall through a grate into the ash box area. The burner has a Murphy switch for fail-safe operation.

Bales are chopped and carried into furnace by conveyor.

The Big Woody multi-fuel burner (right) is shown with its stacked heat exchanger units. Photo above shows how easy it is to clean the multiple water-bearing heat exchangers.

Goff is setting up a similar system for a Minnesota farmer, who will use 1-in. dia. pellets produced from field residues by a local company to dry his grain. He has also modified a Kelly Ryan mixer box for delivering poultry manure to the burner. "The more we work on the manure burner, the better we like it," says Goff.

One of his burners will be used in a Kansas ethanol plant, with an estimated production of 400,000 gal. per year, using shredded corn stalks to produce steam.

"We don't actually have a steam boiler in operation yet. However, we've achieved the continuous feed of alternate fuels with our firebox and are now forging ahead with adapting our cleanable heat exchangers to be able to take steam pressure," says Goff. "This is fairly straightforward stuff because we're only talking 15 to 20 psi on the steam. Conventional ethanol plants are running about 100 psi or so, but that has more to do with distance requirements, etc. We should have that unit in full production by midsummer."

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Industrial-Sized Big Bale Burner

This big bale burner caught our eye at the recent Ag Days Show in Brandon, Manitoba.

The Vidir Greenhouse Heating System is available in a variety of sizes but it's their biggest system - which can be fitted with a conveyor to feed in a row of big bales - that gets the most attention.

"If your annual heating costs are more than $30,000 and you have access to a supply of straw or other biomass, this system will be cost efficient," says the company. It can be used to heat your barn, shop, greenhouse, home - wherever you can pump hot water. Some small communities have bought systems, purchasing straw from area farmers.

Straw bales are automatically fed into the heating system and shredded in a "disintegration machine". The shredded material is conveyed into a primary combustion chamber with controlled combustion and automatic ash removal. Other components include a secondary combustion chamber, hot water heat exchanger, and sophisticated air flow controls.

Models range in a variety of sizes from 3,000,000 btu's and up. Operating at full capacity, the smallest model requires about 500 lbs. of straw per hour with moisture content from 10 to 15 percent.

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A line of straw bales are fed continuously into heating system on a conveyor.

Vidir biomass greenhouse heating system can be used anywhere hot water can be pumped.

Bridge measures 18 ft. long and is made entirely from roughsawn Douglas fir.

Home-Built Bridge Built For $60

Using roughsawn Douglas fir boards, Wess Cornelius built a wooden bridge in his back yard.

The Winlock, Wash., man has three ponds on his property, and built the bridge over a marsh located at the end of one pond.

The bridge measures 18 ft. long by 4 ft. wide and is made entirely from roughsawn 1 by 4 Douglas fir boards. It angles down at a 22 1/2 degree angle on both sides. The bridge's chassis is screwed together for extra strength, while the decking is nailed down.

He used wooden gussets to reinforce the corners where the bridge angles down. Both ends of the bridge rest on concrete blocks.

"I keep goldfish in the ponds and enjoy standing on the bridge, drinking a cup of coffee while watching the fish. My total cost was only about $60," says Wess.

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