

## Making paper pellets

By [Lisa Gibson](#) | August 23, 2011

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Despite a decline in its paper product sector, Wisconsin holds the reins to an industry that shows enormous potential for cofiring with fossil fuels: pellets made from industrial paper waste.

With both a comparable price and the ability to be handled just like coal, as well as resistance to weather-related degradation, paper pellet biomass fuel was the only choice for Manitowoc Public Utilities, a small Wisconsin electricity provider.

The ratepayer-owned utility is located in the small city of Manitowoc on the eastern border Wisconsin shares with Lake Michigan. MPU serves about 16,000 customers and cofires around 15 percent paper biomass pellets with petroleum coke and coal in the circulating fluidized bed boilers employed at its main power plant on Columbus Street, according to MPU's Power Production Manager Red Jones.

"The paper pellets have been great for us because they help us handle wet fuel," he says. "When our petroleum coke gets wet, one of the things that makes it a lot easier for us is to put quite a bit of paper pellets in at that time. Not only does it tend to suck up some of the moisture, but it literally makes the product flow better so we have a lot less bridging and blockages."



Because of a Wisconsin incineration rule, MPU is not allowed to use more than 30 percent biomass in its fuel mixture. Still, cofiring paper pellets almost completely meets the utility's obligations under the Midwest Renewable Energy Trading System. "We end up satisfying our renewable energy quotas using this and other sources as well, most of that being purchased," Jones says, adding that the percentage of biomass burned depends completely on the supply.

Fortunately, MPU is in Wisconsin, where a once-booming paper product industry set the stage for an industrial paper waste biomass sector.

## Paper Pushers

"We're in what's called the 'paper valley' here," says Lee Robbert, founder and owner of Pellet America, an Appleton, Wis.-based paper pellet manufacturer. Well, technically Appleton is in Fox Valley, categorized by its position along the Fox River, but the region used to be packed with paper companies, now only boasting about half what it once did, according to Robbert. In fact, Pellet America says Wisconsin fostered the start of the paper pellet industry, beginning with a paper company looking for a way to successfully burn its waste paper for fuel.



The use of the fuel has spread since its invention and other paper pellet manufacturers do exist in the U.S., but Robbert says making a profit and finding customers can be a challenge. Still, Pellet America thrives, producing up to 1,000 tons of paper pellets per week from 1,000 tons of industrial scrap material. That includes waste from paper companies, printing companies, converting companies and label makers, among others.

And it's not the only paper pellet manufacturer in the state. Greenwood Fuels LLC in Green Bay produces 200 tons of pellets per day and is in the process of ramping up to 400 tons per day, according to Ted Hansen, director of operations for Greenwood. The mill just started up in January but business is going so well that the company is looking to build another mill in Ohio, where it is currently sending some pellets for testing, Hansen says. "We're very eager to expand."

Feedstock for Greenwood's pellets is comprised of about one-third each of paper, label material and poly-coated flexible film waste. "We're open to anything that's classified as an industrial waste," Hansen says. The company uses no post-consumer waste, allowing the fuel to qualify as a renewable fuel in the state of Wisconsin. "Anyone who burns our pellets is not considered to be an incinerator," he says.



All the feedstock Greenwood uses is nonrecyclable and would otherwise end up in a landfill. It consists of cellulose, plastics, adhesives and a few other trace clean-burning materials, Hansen says, but mostly polypropylene, polyethylene, polyester, nylon, paper and adhesives from items such as labels. "The U.S. is obsessed with labels," he laughs. All the materials coming in are currently dry, but Greenwood is experimenting with a drying process to expand feedstock capabilities. "Similar to woody biomass, we'll have a drying operation to allow us to take more of those wet materials," Hansen says.

In fact, the process for pelletizing paper is much the same as that for pelletizing wood, both Hansen and Robbert say. "It's fairly simple," Hansen adds, explaining how it begins with sorting of the materials. "We tend to sort them by fiber content, plastic content, moisture content and adhesive content," Hansen says. Then, the sorted material is mixed and chopped, mixed and chopped again, and then pelletized in a mill identical to that of a wood pellet plant. The fresh pellets are then put through a cooler and shaker to get rid of fines, and then stored in silos, he explains.



The fundamental difference between wood and paper pelletisation, as can be deduced from an explanation of the process, is the fact that wood pellets generally are made with a more homogenous feedstock selection. “Whereas we’re dealing with a lot of material that has extreme swings in density,” Hansen explains. That wide array of feedstocks makes the mixing and sorting a fundamental aspect of the manufacturing process.



Both Greenwood Fuels and Pellet America provide paper pellets for companies cofiring with either coal or other forms of biomass, and mostly in Wisconsin. Their customer base includes paper mills and the state of Wisconsin, which cofires the pellets at universities and a prison. They both also provide pellets to MPU.

## Paper Pellet Properties

MPU has cofired paper pellets in its boilers since before Jones was employed there 12 years ago. “We have been offered wood pellets in the past, but they really haven’t been price competitive,” he says. Robbert insists the price of paper pellets is one direct benefit and a main lure for customers. “You have to fit in the niche of cheaper than coal to get anybody’s interest,” he says. He adds that Pellet America’s product has little sulfur. “That makes them a little more attractive,” he says. Coal has a fair amount of sulfur and since paper doesn’t, boiler operators can blend the cheap, low-sulfur paper pellets to offset the coal’s sulfur emissions, he says. With new technologies, though, sulfur is less of an issue than it was when Pellet America got its start in the early ’90s. Hansen would add that the paper pellets bring a reduction in nitrogen oxide, as well, and sometimes even in hydrogen chloride.

As with all power-producing feedstocks, Btu value is always a crucial factor. Hansen says in its mixing process, Greenwood Fuels aims for 11,000 Btu per pound, comparable to most coal products.

And of course, a determining factor when choosing a feedstock to cofire is its ability to handle and store similar to its fellow fuel. It sounds like there are no problems in that arena, either. The densified paper fuel handles almost identically to coal in most moving grate boilers, Hansen says, adding that he has no customers consistently burning in a pulverized coal boiler. But it would be possible, he believes, to cofire a 5 to 10 percent mixture in a pulverized boiler. “Can pulverized coal burn paper?” Jones offers. “Certainly, there is a way to make it happen, but you’re going to have to overcome a couple hurdles with that I think.” Other boilers can handle up to 30 percent blends with

no equipment tailoring. “Basically, the whole process is to try to make a pellet that handles the same as coal,” Robbert says.



MPU stores its paper pellets outdoors and while a small amount of degradation does occur from the elements, Jones says it's not significant. “Even with really heavy rain, the paper pellets usually hold up pretty well.”

And an added benefit is the fact that paper doesn't emit any foul odors. “We are right below a high school, and so they could literally hit us with an orange juice carton, and often do,” Jones says, adding that the school has had no odor complaints. “The paper pellets don't smell.”

The size of the paper pellets MPU accepts varies, but only slightly. Pellet America provides a three-quarter-inch pellet, which blends well with Greenwood Fuels' one-half-inch pellet, Jones explains. MPU has a special blending pit for the paper pellets, but has run them through the normal coal-processing stream as well. The size requirement for MPU is three-quarter-inch minus, putting the utility in what Jones calls “the sweet spot” with regard to paper pellets.

## Endless Possibilities

With so many benefits, it can be a little difficult to come up with explanations why more utilities, paper mills and universities aren't cofiring biomass, whether it's made from paper waste or wood. Jones offers proximity to suppliers as a possible reason, but leans on pricing as the biggest hurdle. “The only other thing I could see is if you've got a pulverized coal unit, [paper pellets] are not going to grind like coal,” he says. “It tends to be more flexible and it's not really going to break up like that.” The paper pellets are better suited for stoker or circulating fluidized bed boilers, he suggests, where fuel sizing is much more coarse.



“When we first started in '92, we thought we had the next best thing to sliced bread,” Robbert says. But to even test burn a biomass product in a fossil fuel-fired boiler, a modification to the existing permit is required and can be a nightmare. “Nobody wants to deal with that,” he says. In addition, confusion arises over what the difference is between burning a manufactured industrial paper waste pellet and burning garbage. “And the difference, of course, is the fact that we’re monitoring everything that goes in, whereas they couldn’t do that with garbage,” Robbert explains.

The paper pellets manufactured at mills like Greenwood and Pellet America offer a way to get power plants “off the starting blocks,” Hansen says, particularly if they want to reduce technical or economic risks in their cofiring endeavors. “I look at us as a bridge technology,” he says. “In many cases, we’re the first step that a customer takes to start moving away from burning coal.” The paper fuel also is a good option for boilers burning wet biomass, as the pellets make igniting easier, thereby improving boiler operation.

“We don’t really look at our materials as being better or worse than others,” Hansen concludes. “It’s just another technology that sometimes bridges the gap between the customer being able to start moving away from coal, or burning wet biomass.”

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**ROLLS OF RAW MATERIAL:** Greenwood's pellets are made from paper, label material and poly-coated flexible film waste.

**PHOTOS BY MIKE ROEMER**