

**Notes on Grass Bio-Energy Working Group Field Trip – Sept. 28-29, 2009
(To accompany the PowerPoint Presentation “ Grass Pellet Field Trip- Sept.
28-29, 2009)**

Courtesy of Patricia Greene, Jon Montan

**Enviro-Energy, Unadilla, NY
Interview with Bob Miller, Owner and Farmer**

Business and Equipment

Total investment so far: \$500,000. Made their first pellet in November 08.

The grass and wood pelleting business run by the Miller family is housed in a 40x60, 18' high, insulated metal building with a 12-foot overhang on one side, and a separate greenhouse-like covered storage space for hay bales plus a tractor trailer storage container.

Their business is heated by an outdoor multi-fuel Woodmaster Maxim 175,000 BTU boiler (made by Central Boiler ®) that uses their own pellets. Heat transfer fluid runs through an in-floor radiant heating system. It has a propane igniter and costs \$7,500. On one fill of pellets it runs for three days. They have had a gritty ash and a few clinkers but not many serious problems. They are spreading the ash back on land, using it around plants to stop slugs.

Their 200 HP used Sprout Waldron reconditioned pelleter (\$85,000) weighs 10 tons and has the capacity to produce 1.5-2 tons of pellets per hour under 80,000 lbs per square inch pressure. Grass and soft woods use the same ring die. He feels their business would not be sustainable at under 1.5 tons per hour, and when things are going right, that is what they are producing now (although there is quite a bit of down time fixing and adjusting). It takes two people to operate the entire process train. He found used components for his system on the Internet.

Outside under the extension they have a tractor PTO-driven tub grinder and a chuck wagon, which feeds by conveyer belt to a hammer mill inside. They've found they had to slow the grinding process down, that the grass wads up when exiting the chuck wagon and so they have put a simple 2x6 at the exit of the chuck wagon to hold things back and smooth the feed.

From the 75-hp rotary hammer mill with a 1/4" screen, the grass feeds by pipe to a small cyclone separator atop a storage bin with a variable speed agitator they designed and made themselves. This prevents bridging and supplies feedstock evenly into the auger and then into the pelleter where three rollers keep the flow even. Knives cut the pellets off after extrusion through the ring die. They do have trouble with shear pins breaking off occasionally and with having to stop and unplug. They do not condition the feedstock by adding water or binders. Feedstock goes in at 12% moisture, after pellets are made and cooled they are 5% moisture.

A inclined vibratory screen receives pellets from the pelleter and sifts out any fines that remain. These are recycled back into the feedstock flow via a cleaning cyclone with a dust collector. The transit from the pelleter via conveyor, vibratory screen and conveyance to the pellet storage bin cleans and cools pellets. There is no active cooling system. At the bottom of the storage

tank is a trip-release which can be set to fill 40 lb. or larger bags, which are then heat sealed and stored on pallets.

Because three-phase power is too far down the road at this site and thus too expensive, they are using a 765 hp twin cylinder generator outside the building that they run on biodiesel during the warmer weather, and a blend or pure diesel in cold weather. It uses 7 gallons of fuel per hour when they are operating. It was quite smoky during our visit, but the smoke does smell like French fries.

The one thing he intends to get is a better dust collector attached to the machines. This will cost about \$118,000.

Feedstock

They pellet at 12% moisture going in; 5% moisture after cooling. Pellets they produce each day are slightly different due to variations in hay composition.

The business is not on-farm, and accepts bales from local farms. One farmer brought hay from 40 miles away. There has been an overwhelming amount of interest from farmers. EnviroEnergy are paying \$60 a ton for hay, and soliciting the poorest, weediest hay farmers can supply. They have a weigh scale outside that they use to weigh the bales when they come in. Right now they are only using six producers as they have all the hay they can use.

They also had quite a few bales of switchgrass under cover, but they have not had good luck pelleting it. He said it does not hang together properly and that Sunburst seems to be the worst. Reed canary grass has been good for them.

He's found that grass and softwood have the same BTU value per weight. While wood has about 1% ash, grass and goldenrod have 3.8-4% ash. Switchgrass has 3% ash. However, out of 30,000 samples tested at Cornell, the goldenrod was found to have the lowest chloride ion content. Most grass has .16-.18% Cl, and their goldenrod has .09-.10% Cl. This is potentially good news as it could mean that fields could be harvested without any special planting. In addition, the pellets we saw that were made from mostly goldenrod were very well formed and dense.

They produce both soft wood and grass pellets for bedding and heating. They are charging \$225 a ton for grass pellets and \$260 a ton for wood. He estimates it takes about 2.5 tons to heat an ordinary home for the season. They also sell grass pellets by the 40-lb. bag for \$4.50/bag.

Financing

They at first tried to go to NYSERDA to get grant funding. However, since they were the first in New York State to try grass pelleting as a commercial venture, NYSERDA asked them to do a feasibility study which would have cost \$20,000. So they invested some themselves, and went to a local bank that agreed to loan them the money. While the business is not profitable yet, he hopes it will be soon.

Benton, PA K-12 Schools Flexfuel Biomass Boiler Interview with Superintendent Gary Powlus

(Note: There is a PowerPoint presentation on this project that relates to these notes.)

Benton is located in a very rural area in northeastern Pennsylvania. Their schools are in two buildings a couple of blocks apart, and set between them is a new building, in the back of which is housed a large gasification Advanced Recycling® boiler that can burn regular or briquette grass pellets, corn, and wood pellets or chips. They can burn any of these fuels alone or in combination with the other. As long as the material can fit through an 8 inch auger they can burn it. The new boiler is 80-90% efficient, and reduces greenhouse gas emissions of CO₂ by 80%. The set up is new and they have only done a 7-hour test burn so far, but intend to be completely heating their buildings with the new equipment this winter. The boiler produced very little ash.

They were using 45,000 gallons of fuel oil per heating season in the past. In the next two years they will save about \$183,000 using grass briquettes from Ernst Seeds. The following information is taken from the Benton PowerPoint presentation:

- **Corn:** 461 tons/year @ \$170/ton \$78,370 annual cost: Savings of \$81,943 annually
- **Wood Pellets:** 403 tons/year @ \$215/ton \$86,645 annual cost: Savings of \$73,668 annually
- **Grass Pellets:** 430 tons/year @ \$161/ton \$69,230 annual cost: Savings of \$91,083 annually
- **Wood Chips:** 995 tons/year @ \$40.00/ton \$39,800 annual cost: Savings \$120,513 annually

They had many public meetings to inform people, brought in air quality experts to speak, dealt with concerns about potential smell and trucks using the roads. Their vision is that they will use biomass materials from their local school district to heat the school.

The system is not labor intensive and can be regulated remotely, although it must be checked several times a day. The fuel is dumped into a storage bin, and carried by auger into metering tubes inside the building and from there into the furnace. Bottom ash is removed with augers inside the primary combustion chamber. Fly ash is recovered with a cyclone. The boiler is made by Advanced Recycling Equipment, Inc. of St. Marys, PA. and is a gasification type with primary combustion (gasification), secondary combustion and heat recovery.

Out of a total cost of two million, they were able to get a grant from the PA agency (that is analogous to NYSERDA) for \$350,000 to begin. Since they are the first in the state to do this, an educational component was included and the building was built so that groups could come

through and learn. They also worked with their local RC&D council, and with Ernst Seeds. They were able to get loans from local banks at a good rate.

We also made an unplanned stop to briefly see a large greenhouse operation nearby called Dillon's Florist. They get free shredded wood from clearing along the sides of highways in the state. They store their materials in a Quonset-style structure on site, and bought a grinder to grind the wood finer in order to burn in their boiler. They saved \$200,000 the first year.

Mobile Pelletizer

Interview with Ryan Koch

The Pocono-Northeast RC&D Council has contracted with Buskirk Engineering of Indiana to assemble a mobile pelleter mounted on a 33 ft. trailer. It weighs 16,000 lbs. and requires a Commercial Driver's License to pull it. It cost \$150,000, including the trailer, although could be built for \$135,000 now. The 75-hp engine and two 20 hp flat plate die mills are supposed to do 1.5 tons per hour with no binders, but that rate of production is unproven as yet. The rig has some material handling issues and is going back to the contractor for some more work. One example is that the throat of the hammermill needs to be wider, and the knife gate from the surge tank needs to be metered.

The set up has a tub grinder on the back with a conveyer to a hammer mill. The feedstock is pneumatically fed into a surge tank wherein paddles keep the feedstock agitated until it is gravity fed into two 20-hp mills. The dies are of German design and are the same type that Pellet Pro™ uses. It is built with all off-the-shelf components and is powered by a 75 KW diesel generator.

The Buskirk Engineering mills alone cost \$7,000 each.

They were burning grass pellets successfully in a QuadraFire multi-fuel stove as a demonstration.

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