



Kyle Cruit, director of sales and marketing for Hi-Tech Agro Projects Pvt. Ltd., examines distillers dried grains with solubles pellets produced by the company's PL500 flat-die pellet mill./PHOTO: RYAN C. CHRISTIANSEN, BBI INTERNATIONAL.

## Researchers demo Hi-Tech Agro pellet mill

By Ryan C. Christiansen

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A handful of biomass pellet manufacturers, agribusiness investment bankers, biomass business consultants and biomass researchers gathered at the Agricultural Utilization Research Institute office in Waseca, Minn., on Dec. 9 to meet with representatives from Hi-Tech Agro Projects Private Ltd., a biomass densification system manufacturer based in New Delhi, India. In addition, AURI researchers demonstrated the Hi-Tech Agro PL500 flat-die pellet mill they are using to test how energy crops in the United States can be made into pellets for combustion and other applications.

The mill pelletized distillers dried grains with solubles (DDGS), a coproduct of ethanol production commonly used as a livestock feed ingredient, and also DDGS mixed with wheat middlings (midds), a byproduct of flour or semolina production, which can also be used for feed. According to AURI, DDGS provides an average of 9,600 British thermal units (Btu) of energy per pound, and wheat midds provide as much as 8,200 Btu per pound. Coal produces between 7,000 and 12,500 Btu per pound, while woody biomass produces between 5,300 and 6,400 Btu per pound.

According to Alan Doering, associate scientist of coproducts at AURI, the research institute has been approached by many companies seeking to pelletize biomass for cofiring with coal to produce electricity. Minnesota has mandated that all utilities produce 25 percent of their energy through renewable resources by 2025.

Because every biomass feedstock is different, Doering said his lab has been testing how each feedstock must be pretreated with water or steam, and at what temperature the lignin in the biomass will form adhesion so that the biomass will pelletize. He said the lab checks the temperature and moisture content of the biomass before and after pelletizing to determine the effect of the pretreatment and milling processes in order to optimize the entire process.

Doering said switchgrass requires some of the highest temperatures for pelletizing. Mixed grasses are easier to pelletize, he said, and corn stover is one of the easiest feedstocks to pelletize. Using a lot of heat and a thick dye, DDGS and switchgrass can be compressed to 12 and 11 times less volume, respectively. While corn stover pelletizes more easily and at lower temperatures, only a 3:1 to 6:1 compression ratio can be achieved, Doering said. Wood fiber compresses in the 7:1 to 9:1 range, he said.

The densification of biomass has become increasingly popular in Europe during the past 15 to 20 years, according to Priya Jain, business development manager for Hi-Tech Agro in the United States. The company has built more than 300 densification plants throughout the world, particularly in Africa and India. In India, pellet mills are commonly used at textile plants to pelletize cotton plant stalks and at natural pharmaceutical companies to pelletize crop residues for combined-heat-and-power applications, she said, adding that organic waste is being pelletized on a large scale and in other municipalities in Mumbai, India. The pellet mills typically run continuously for 24 hours, up to 1,600 to 2,000 hours before a dye must be replaced or refurbished, depending on the hardness of the biomass.

Jain said when the price of fossil fuels began increasing significantly in the United States, her company contacted AURI and offered to provide a pellet mill for testing. AURI acquired the mill in March. She expects that when corn cobs become more valuable in the United States due to increasing gasification and cellulosic ethanol production, more biomass options will be needed, and pelletizing helps to fulfill demand. She said her company expects to have its first pellet mill in commercial operation in the United States in 2009.

According to Doug Root, senior scientist of biomass and renewable products technologies at AURI in Marshall, Minn., companies aren't coming to AURI for pelletizing information to save money. "Companies are doing this out of a desire to be green," he said. Many pelletizing operations are producing pellets that are used by the producer, but he said he would like to see pellets sold in a larger marketplace. However, the cost of transporting biomass to the pellet mill is one of the biggest barriers preventing the commoditization of pellets. Doering said having smaller, distributed pelletizing operations is the most feasible option for developing a pellet market.

Marketed by Performix Business Services LLC in Bloomington, Minn., the one-half-ton-per-hour, 25-horsepower PL500 pellet mill is the smallest of Hi-Tech Agro's pellet mills. The company offers equipment that can densify biomass into 1/4-inch to 5/8-inch pellets at rates up to five tons per hour. A one-ton-per-hour pellet mill with a steam conditioner and pellet cooler typically sells for approximately \$180,000, Jain said. The company also offers briquetting, grinding and drying solutions for biomass.