

Muscoda Protein Products: Their New Wood-fired Boiler

CASE STUDY



BIOMASS



GEOTHERMAL



HYDROPOWER



SOLAR



WIND

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Joseph Meister began a small cheese-making business in the beautiful Wisconsin River Valley in 1923. By 1981, the company had added another business, Muscoda Protein Products, and was consolidated in a modern manufacturing facility constructed in the Muscoda Industrial Park. As Meister Cheese, the company produces traditional, high quality natural cheeses. They also make dried whey isolates under the Muscoda Protein Products label. Third generation partners Scott Meister, current president of the company, his brother Mike Meister and sister Vicki Thingvold are preserving their family cheese-making traditions of quality and customer commitment while employing state-of-the-art equipment and technology.

The rising cost of natural gas first prompted the Meisters to consider installing a wood-fired boiler to generate steam for both their cheese and whey manufacturing processes. They also appreciated the environmental benefits of using wood as their boiler fuel. The new boiler, which utilizes 27 tons of hardwood chips and sawdust per day, substantially reduces natural gas purchases for both cheese and whey operations. According to project estimates, enough natural gas will be saved by the wood boiler each year to heat 650 Wisconsin homes.

Wood chips and sawdust are provided by the neighboring Nelson Hardwood Lumber Company. Muscoda Protein Products and Nelson Hardwood had informally discussed working together for a number of years, but when gas prices started rising, the time was right to strike a deal. Muscoda Protein Products now has a five-year agreement with Nelson Hardwood to supply wood chips at the going market rate.

The wood is delivered to an enclosed storage bunker that can hold a four-day supply. Hydraulically-driven scrapers in the bunker automatically move the wood to a conveyor belt, which delivers it to the metering bin. Here the wood is weighed and then pneumatically transported to the furnace. Using an over-fire air system and a partitioned under-grate air system, the wood is burned at 1,700 degrees Fahrenheit. This complete combustion process is controlled by an Allen-Bradley Programmable Logic Controller. The controller includes

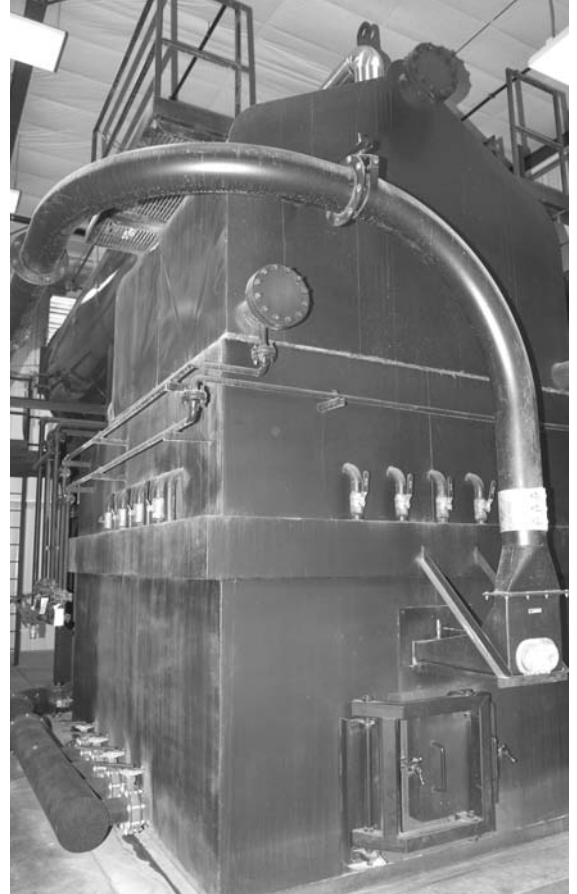


PHOTO COURTESY LARRY KROM

Muscoda Protein Products' wood-fired boiler reduces natural gas use and saves over \$430,000 in annual energy costs.

an oxygen trim system, draft control and modulating master control to deliver a very efficient burn at all firing rates, while minimizing operator intervention. Dual, multi-cyclone flyash collectors capture approximately one drum of flyash per day from the 27 tons of wood. All motors on the system are controlled by variable frequency drives which provide electrical savings while modulating from low to high firing rates.

Funding from federal and state sources provided significant financial support for this project, which had a total cost of approximately \$1.7 million and an estimated payback of approximately 4.0 years. Without grant assistance, the payback would still have been a respectable 5.5 years, making this type of


PHOTO COURTESY INGRID KELLEY



This traditional Wisconsin cheese maker now uses process heat from renewable wood energy.

application an economic success for Muscoda Protein Products as well as providing their neighbor, Nelson Hardwood Lumber Company, with a new customer.

In addition to the existing boiler project, the Meisters are also investigating the possibility of using process wastewater to irrigate switchgrass, a biomass energy crop. Switchgrass would serve as another source of fuel for the boiler. This particular boiler has been designed for alternative fuel firing, which means additional biomass energy feedstocks could be used to create process heat in the future.

	<h2 style="text-align: center;">Project Facts</h2> <p style="text-align: center;">Muscoda Protein Products Wood Fired Boiler Date Completed: System dedicated on September 22, 2006</p>
<h3 style="text-align: center;">Personnel</h3>	<p>Owner: Muscoda Protein Products, Muscoda, Wisconsin Engineering Firm: Strand Associates, Inc. System Installer: AFS Energy Systems, Lemoyne, Pennsylvania</p>
<h3 style="text-align: center;">Building and Site</h3>	<p>Location: Muscoda, Wisconsin Site Description: Muscoda Protein Products and Meister Cheese are located in the Muscoda Industrial Park. Nelson Hardwood Lumber, which provides the hardwood chips and sawdust for the boiler, is also located in the industrial park. Electric Utility: Muscoda Municipal Utilities Natural Gas Utility: Alliant Energy and Wisconsin Public Service</p>
<h3 style="text-align: center;">Renewable Energy Equipment</h3>	<p>System Components:</p> <ul style="list-style-type: none"> ■ 400 HP–150 psig refractory lined water-tube/fire-tube boiler ■ Storage bunker and automatic wood conveyance system ■ Allen-Bradley Programmable Logic Controller ■ Variable frequency motor drives ■ Dual multi-cyclone flyash collectors <p>Manufacturer: AFS Energy Systems Lemoyne, Pennsylvania</p>
<h3 style="text-align: center;">Equipment Costs and Benefits</h3>	<p>Total installed cost: \$1.7 million</p> <p>Grants:</p> <ul style="list-style-type: none"> ■ \$35,000 from Focus on Energy ■ \$420,322 from USDA Renewable Energy and Energy Efficiency Program <p>Other Financing: \$350,000 in subordinate debt financing from CleanTech Partners Inc. to help secure additional financial assistance for this project</p> <p>Natural Gas Savings: 600,000 therms per year, equaling approximately \$480,000 at \$8.00 per MMBtu</p> <p>Percent of Natural Gas Savings: 100 percent</p>