

New Savings from an Old Boiler: Barron Area School District Wood Boiler Automation Project

CASE STUDY



BIOMASS



GEOTHERMAL



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WIND

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In these days of rising fossil fuel costs, schools and other institutions are beginning to realize savings by using an old-fashioned renewable energy source—wood. Some facilities are installing new wood-fired boilers while others are finding that their existing wood boilers can perform even better through installation of modern, efficient automation technologies.

The Barron Area School District installed a wood boiler system in 1980 to provide steam heat for the town's high school, elementary school, hospital and medical center, and the Maple Crofts Senior Rest Home. For fuel, the town has contracted to purchase green chipped wood from Priem Forest Products in Solon Springs, about 70 miles away. During the 2002–03 heating season they used 2,570 tons of wood at an average cost of \$28.37 per ton or \$0.323 per therm. Natural gas is also used in the system's two back-up gas-fired boilers.

The Barron Area School District boiler has been saving the town up to 30 percent of its heating fuel costs or about \$100,000 every year. However, after almost twenty-five years, the original manual mode control system had become unreliable. While exploring alternatives for replacement, District Administrator Monti Hallberg discovered that although the boiler continued to save costs by burning mostly wood rather than natural gas, there were opportunities to increase savings by reducing natural gas use even further. Through automatically monitoring and controlling the heat delivered to meet the various needs among the different buildings, it appeared that almost all use of natural gas might be eliminated.

In 2004, the Barron Area School District selected Johnson Controls, Inc. as its contractor to automate the controls of the boiler system. Johnson Controls recommended their DX9100 Automated Control with Network Controller to interface with the boiler system. The controller's primary function is to increase the efficiency of the boiler's combustion and heat delivery. The installation included sensors to integrate the wood boiler with the back-up gas boilers, and



PHOTO COURTESY OF JOHN KATERS

Boiler plant maintenance supervisor, Stacy Hom shows the new Johnson Controls DX9100 control panel to Terry Stebor of the Focus on Energy Program. Maintenance staff can easily monitor the boiler's operation from the displays on the panel.

digital controls for boiler start and stop, fuel firing rate, induction draft fan and stoker speed. The system incorporates multiple monitoring functions, and provides alarms to notify on-duty personnel via telephone of operational problems.

This project has been in full operation since its successful completion in early 2005. The Barron Area School District realizes both annual energy cost savings and the efficient use of renewable resources. The boiler's new control system will assure its use of renewable wood energy for the next 20 years and beyond.

I would like to take this opportunity to thank you for the \$15,000 grant for our wood boiler automation project. The project was a great success and our wood boiler is running more efficiently than ever before.

Monti J. Hallberg, District Administrator
Letter dated July 26, 2005



Case Study Facts

Barron Area School District Wood Boiler Automation Project

Date Completed: Spring 2005

Personnel

Owner: Barron Area School District

System Contractor/Installer: Aaron Rittenhouse, Johnson Controls, Inc., Controls Group, Onalaska, WI

Building and Site

Location: Barron, WI, population 3,300, located in northwest Wisconsin.

Buildings: The School District operates the boiler system to provide heat for the elementary and high schools, hospital, medical center and nursing home.

Wood resources for fuel come primarily from Priem Forest Products in Solon Springs, about 70 miles north.

Equipment

EXISTING SYSTEM

- Swedish made ANGA VARME stoker wood boiler (installed in 1981 with a major refractory overhaul in 2001). Overall capacity of 16.1 MMBTU/HR
- Two natural gas boilers used as back-up to the wood boiler

NEW AUTOMATION EQUIPMENT

- Johnson Controls DX9100 Automated control with Network Controller to interface with the boiler system
- Sensors for the stoker wood boiler and the back-up gas boilers
- Digital control of boiler start/stop, firing rate, I.D. fan via variable frequency drive and stoker speed with a new stoker speed actuator
- Monitoring of oxygen levels in emissions, steam pressure, under-fire air flow, over-fire airflow, ambient temperature, stack draft, over-fire draft and stack temperature
- Alarms to notify on-duty personnel via telephone of operational problems, monitor stoker auger temperature, steam pressure and back-up boiler operation

Equipment Costs and Benefits

ECONOMIC COSTS AND BENEFITS

- Total cost of the Wood Boiler Automation Project: \$55,000
- Focus on Energy Implementation Grant: \$15,000

Updated control systems will allow for efficient year round operation of the wood boiler system, as opposed to previous operation during the heating season only. This will result in nearly 100 percent of heating needs being provided by the wood boiler system.

ENERGY AND ENVIRONMENTAL BENEFITS

Estimated annual savings: 75,000 therms (year round operation)