

## University of Idaho Heats with Wood!

By Mike Tennery, Idaho Fuels for Schools Coordinator, January 2006

“Why hasn’t wood chip fueled heating been done before?” is a frequent question we hear as we talk to people about the Forest Service’s Fuels For Schools Program. The answer is they have been used for 20 years by the U of Idaho at their Moscow, Idaho campus.



University of Idaho Campus – Moscow, Idaho

In 1978 Latah County, where Moscow and the University of Idaho are located, started looking for a new landfill site. Several studies were done which included information from the University. Proposals for a co-generation plant using land fill material for fuel did not develop but the University was also looking for a back up boiler for their campus heating system. The studies indicated a biomass fueled heating plant would be economical. In 1986 the University contracted to have a biomass fueled boiler constructed. Wood chips, hog fuel, were selected as the primary fuel for the new boiler.



University of Idaho Boiler Plant

As the new boiler was brought on line to produce high pressure steam to heat seventy percent (three million square feet) of campus building space and provide hot water it was found the biomass operation was very economical. Instead of being used as a back up boiler as planned, the biomass boiler became the lead boiler. It is run 95% of the time. Currently the University estimates heating costs, using the biomass fueled boiler, are between one quarter to one third the costs of heating with natural gas. They also have three natural gas fired boilers in their Steam Plant. Two years after construction of the biomass boiler they “mothballed” one of the gas fired boilers. That was eighteen years ago and it’s still mothballed. In 2003, the wood fired boiler was shut down for a week to do routine cleaning and maintenance. Up to shutdown the University was burning \$1700 per day in cedar chips. While the wood boiler was down, natural gas for the backup boiler cost \$7000 per day.

Steam is used to provide hot water as well as to heat and air condition buildings. The Steam Plant generates steam at 150psi in its boilers. Valves reduce the pressure to 60psi for distribution to the campus. The lower 60psi pressure provides safety in the tunnel system that connects the steam plant to the buildings on campus. The higher pressure at the boiler functions as a sort of heat storage to cover demand on campus; for example, the increased load generated by 4000 dormitory residents all taking morning showers. A by-product of central heating is snow-free campus sidewalks that lie above the steam tunnels.

In the 1990's the University installed eight water chillers to provide summer air conditioning. Steam powers five of these system chillers. The remaining three operate on electricity. With chilling capacity, summer steam loads are almost as high as winter heating loads.

Using cedar chips they burn about 70 tons during an average winter day and 100 tons a day during a cold snap. During the last fiscal year, June 30, 2004 to July 1, 2005, they burned 23,000 bone dry tons or 1660 truck loads of wood chips. For fuel, the system can use "any thing that burns". They have burned wood pellets, a variety of different types of wood waste and shredded paper. They are currently are using cedar chips, preferred fuel, from mill waste. They can burn material with moisture content up to 60% (above that the fire goes out) but prefer material with a moisture content between 30 to 40%. Wood ash volume is very small. On average the volume of ash is equal to .48% of the volume of dry wood burned. The wood ash is used on campus as a soil PH modifier.



Cedar wood chip fuel

The steam plant is proud of its environmental record. The plant passed emissions testing in 2005 with the stack emitting less than one half the allowable particulates. Stack gasses are usually invisible. Replacing water-cooled equipment reduced waste water output. Electrical consumptions in the plant fell by one third in 2005 with addition of electronic motor controls. About 90% of steam is condensed, collected and returned to the plant for reheating saving heat, water and chemicals

The University has a stock pile, which currently has seven thousand tons of wood chips, adjacent to the campus and is hauled to the on campus boiler plant using their own truck.



Chip Mountain storage area north of main campus

At the boiler plant and the storage yard there are hydraulic lifts, called “tippers” which tilt chip trailers to an almost vertical position to empty the trailer. This eliminates the need to have chip trailers with self unloading capabilities and reduces costs. Chips are then transported using an auger system adapted from grain storage silo systems. This system uses agricultural components which are readily available in the local area making repair inexpensive and parts readily available.



Chip Truck on “Tipper”



Tipper/trailer in vertical (unload) position

The biomass system has an Idaho Air Quality Permit and emissions/operations are continuously monitored using a combination of electronic sensors and television monitors. Effectiveness of this gasification burning system can be seen in the next photo through the upper fire chamber viewing port and the blue/purplish color of the burning gas.



Upper fire chamber viewing port



Portion of boiler Monitor panel

The University of Idaho is very proud of their biomass fueled environmentally sound heating system. “We burn wood to save the State and University money and to use a renewable resource.”

This report was written with the full cooperation of the University. Additional information can be obtained by contacting Michael Lyngholm, Steam Plant Manager, at 208-885-5247, email: [lygholm@uidaho.edu](mailto:lygholm@uidaho.edu) or Scott Smith, Steam Plant Maintenance & Operations, at 208-885-6271, email: [scsmith@uidaho.edu](mailto:scsmith@uidaho.edu) .