



## Wood Chip Boiler Reduces Heating Costs

*“The propane truck showing up used to make me break out into a cold sweat.” says Tom Trencansky, Executive Director of the Cayuga Nature Center, “Now with our wood chip boiler our heating bills are under control.”*

### Renewable Heating Solution

**T**HE WOOD CHIP GASIFICATION-TYPE BOILER SAVES \$13,000/YR IN HEATING COSTS and the Cayuga Nature Center is proud to heat with renewable, locally-available wood chips.

#### WOOD BOILER PROJECT



In 2009, the Cayuga Nature Center installed a half-million Btu wood chip boiler to heat their 1930's era facility. The building is open year round and heating is required for both animal exhibits and office space. A

half-million Btu/h, gasification-type boiler supplied by ACT Bioenergy of Schenectady, NY replaces heat previously provided by propane boilers. However, the propane boilers remain in place as back-up.

Prior to delivery, the wood chip boiler was pre-installed in a 20' shipping container, that will serve as the permanent boiler room, placed next to the main Nature Center Building. The “containerized” boiler solution was more economical than building a new structure to house the boiler. A 10'x10' chip storage bin was built next to the containerized boiler and will hold 2-3 days of fuel. A larger barn was also built that allows a dump truck to

deliver up to ten ton loads of chips at a time.

#### PROJECT SUPPORT

Funding to support the project was provided by the New York State Energy Research and Development Authority. Independently-verified air emissions monitoring was performed by the Center for Air Resources Engineering and Science at Clarkson University.

#### PERFORMANCE TESTS

According to the Clarkson University team's report, overall the emission rates were significantly lower than comparably sized boilers available in the U.S. These low emissions are due to the boiler's gasification-type design which achieves complete combustion of the fuel and virtually eliminates



Wood Chip Bin



Chip bin auger/stirrer



Combustion chamber

all volatile organic compounds (ie. tars and creosote) in the exhaust and the boiler operates without producing visible smoke; although on cold days it is possible to see white plumes that is water vapor condensing from the stack. The measured heat transfer efficiency ranged between 80-90%, which is comparable with modern oil or gas boilers.

#### FUEL SUPPLY

The wood chips supplied to the boiler are residues from a local sawmill and eventually the site expects to chip wind fallen trees from its own woodlot to supplement the purchased chips. Wood pellets were also considered as a fuel source, but due to the lower cost of chips and the available space for onsite

storage, chip fuel was selected. The facility also has a tractor with a bucket for moving chips, making the chip handling easy.

#### ENVIRONMENTAL

The use of the biomass boiler fits with the Nature Center's vision to reduce environmental impact by using a renewable fuel that is locally available and showcasing environmentally-friendly operations. By replacing propane with renewable wood fuel that is considered carbon-neutral, the boiler is estimated to reduce net carbon dioxide emissions by 45 tons/yr. This reduction is equivalent to the carbon dioxide emissions from eight average-sized cars. Also, by using locally available fuel that includes mill residues, the environmental impacts of fuel transportation is minimized.

#### SYSTEM ECONOMICS

Economic analysis of the boiler installation indicates a 9-year simple payback based on the prices of wood chips vs. propane in November 2010 (See table below). The total system installed cost was approximately \$155,000.

#### BOILER FEATURES

The ACT Bioenergy Boiler includes various user-

friendly features including automatic ignition, automatic ash cleaning that reduces operations and maintenance time for on-site staff.

The gasification-type boiler design achieves high-efficiency and low emissions by monitoring air pressure and oxygen levels in the combustion zone and automatically adjusting the three independently controlled combustion air fans and the exhaust fan to achieve optimal efficiencies and reduce fuel consumption.

Various safety features are also included in the boiler to ensure safe operation and to ensure controlled shut-down in the case of power interruptions or system malfunctions.

The boiler's compact size enables it to be configured in a standard 20' shipping container for cost-effective plug-and-play on-site installation.

#### ABOUT ACT BIOENERGY

ACT Bioenergy, LLC manufactures high-efficiency wood chip and wood pellet boilers in Schenectady, NY. The systems range in size from 0.5-1.7 MMBtu/h and are designed to supplement or fully-replace fossil fuel heating systems.

Boiler Economics Wood Chip and Pellet vs. Propane			
Parameter	Wood chips	Bulk wood pellets	Propane
Fuel cost	\$50/ton	\$200/ton	\$2.50/gal.
Fuel heat content	12.2 MMBtu/ton	16.4 MMBtu/ton	92,000 Btu/gal.
Fuel Consumed	49 tons	37 tons	7,000 gallons
Annual fuel cost (513 MMBtu)	\$2,800	\$7,400	\$17,500
System O&M cost	\$1,500	\$1,500	\$500
First year cost savings	\$13,900	\$9,400	n/a
Simple system payback	8 yrs.	11 yrs.	n/a
Total cost saving over 15 years vs. propane <sup>1</sup> .	\$168,000	\$82,400	n/a

1. Inflation rate trend for propane is 5.25% and wood fuel is 3.25%, existing propane boiler is assumed to be 80% efficient and wood boiler is 85% efficient.