

PROJECT UPDATE

NYSERDA

New York State
Energy Research and
Development Authority

PRINCIPAL RESEARCHER

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PROJECT LOCATION



Schenectady

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[http://www.nyserra.org/Programs/
Research_Development/biomass.asp](http://www.nyserra.org/Programs/Research_Development/biomass.asp)

KEYWORDS

- Biomass
- Emissions
- Efficiency
- Boiler
- Wood Pellet
- Wood Chip
- PM 2.5

Commercialization of a European-style High-Efficiency, Low-Emission, Wood-Fired Boiler (10744)

ACTbioenergy™
clean, green heating solutions

PROJECT FOCUS

This project supports the market development and manufacturing of state-of-the-art high-efficiency commercial-scale wood chip and wood pellet boiler systems in New York State.

Advanced Climate Technologies (ACT) has secured exclusive rights from a leading European manufacturer to produce commercial size wood boilers in Schenectady, NY. Through this project,

ACT will modify the boiler design to meet North American safety standards and certifications such as UL (Underwriters Laboratory) and ASME (American Society of Mechanical Engineers). The project will also include a field demonstration and emissions and energy performance monitoring of the first made-in-the-USA unit at the State University of New York School of Environmental Science and Forestry.

CONTEXT

Wood heating for commercial-scale buildings has recently gained increased interest as a way to achieve the following goals:

- Reduce heating costs compared with fossil fuels
- Reduce greenhouse gas emissions by using renewable fuel
- Reduce imports of foreign fossil fuel
- Create local jobs in the forest industry

Typically, available wood boiler technology in the U.S. achieves 40-75% efficiency, but European wood boiler systems typically achieve 80-92% efficiency, which is similar to modern oil systems. Emissions from high-efficiency wood boilers are also significantly less than current U.S. wood boilers and are at a level comparable with oil systems. However, the introduction of the state-of-the-art European systems to the U.S. has been slow due to differing safety and inspection requirements, as well as historically available inexpensive fossil fuel in the U.S.



Photos courtesy of ACT

OPERATION PERFORMANCE

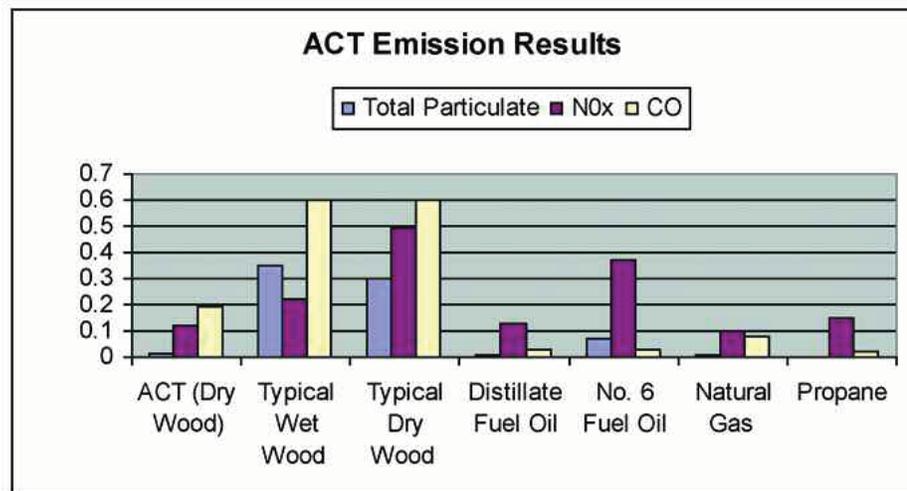


Photos courtesy of ACT

Since 1975, the New York State Energy Research and Development Authority (NYSERDA) has developed and implemented innovative products and processes to enhance the States energy efficiency, economic growth, and environmental protection.

Ultimately, wood combustion systems should have similar performance characteristics to oil-fired systems. The Europeans have shown that this is possible through the use of advanced designs. These designs involve two-stage combustion, advanced control systems, increased heat-transfer surface area, and heavy insulation. Two-stage combustion promotes a more complete combustion that increases the amount of energy extracted from the wood. In the first stage, wood is combusted at relatively low temperatures under oxygen-starved conditions to release all of the volatile components in the wood. In the second stage, excess air is injected with

the volatiles, which leads to complete, high-temperature combustion. The control system constantly monitors and adjusts operational parameters such as fuel feed rates, oxygen levels, combustion temperature, and water temperature to continuously optimize the boiler's performance. A large heat-transfer surface area ensures that the energy from combustion is transferred efficiently to the heating water. The heavy insulation minimizes heat losses through the boiler shell. ACT engineers have incorporated all of these technologies in their design. The system is expected to have an efficiency rating of 85-92% and emissions comparable to oil-fired systems.



Notes: ACT data for burning 10% moisture content wood fuel, Wet wood fuel is >30% moisture, Dry wood fuel is <30% moisture content. (Source: US-EPA Website: AP-42 Standard Emission Factors, 2007)

METHODOLOGY

The project included the following components:

- Review of relevant U.S. standards
- Adaptation of the boiler design to meet ASME and UL standards;
- Manufacturing of prototype unit
- Boiler testing and certification
- Demonstration and testing of a 0.5 MMBtu/h chip boiler at the State University of New York School of Environmental Science and Forestry

PROJECT IMPLICATIONS

This project will result in the first made-in-USA high-efficiency, commercial-scale wood-chip boiler system. In doing so, it will help establish NYS as a leader in the high-efficiency renewable biomass heating industry. Wood pellet stove use is already growing rapidly in New York, and these larger boilers will enable larger institutional

and commercial buildings to simultaneously reduce heating costs, reliance on fossil fuel imports, and greenhouse gas emissions. As a follow-on to this project, ACT expects to make a significant investment to expand its manufacturing capabilities so it can supply advanced wood boiler systems to customers throughout North America.