

# Year-round Heating with Biomass Boilers

Amherst, Massachusetts

DOER

Massachusetts Department  
of Energy Resources

CASE STUDY

## OVERVIEW

The Bunker in Amherst, MA was originally a strategic air command bunker for the US military during the Cold War. In 1992, Amherst College bought the building for use as a book depository for the Five College Consortium in Amherst.

With approximately 10 employees inhabiting the building daily, the Amherst College bunker building is an off campus book storage facility. An AC unit runs to dehumidify the air and then the air is reheated to control the room temperature year-round in order to maintain the necessary temperature to maintain books of all types. With their two oil boilers approaching the end of life expectancy, Amherst College looked into other alternatives. A pair of wood pellet boilers were selected due to grant availability from the DOER as well as to reduce the building's heating costs and reliance on fossil fuels.

The boilers are now operating successfully and serving as a model for other projects. The new biomass boilers are now saving the facility around \$10,000 each year, almost half of what they spent annually on heating oil in the past.

## AT A GLANCE:

- ◆ 50,000 square foot military bunker repurposed into book storage facility for the Five College Consortium in Amherst.
- ◆ Two new wood pellet boilers provide space heating year-round while an AC unit dehumidifies.
- ◆ DOER grant money funded \$205,000 (75%) of the installation cost.
- ◆ Predicted to save about \$10,000 (47%) annually on heating and cooling costs.

## LEARN MORE:

- ◆ Five College Library Repository Collection:  
<https://www.fivecolleges.edu/libraries/depository>
- ◆ Renewable Massachusetts:  
<http://bit.ly/renewablethermal>



Amherst College Bunker Building

## SYSTEM DESIGN AND INSTALLATION

Two Froling P4 100 boilers were installed to heat water for space heating and domestic hot water. While the boilers heat the water to approximately 180 °F, Amherst College saves energy by only sending 115-120 °F water in to heat the building. The system also improves efficiency by utilizing a 600 gallon thermal storage tank as a heat sink for the extra hot water. The boilers are fueled by wood pellets, which are made by compressing sawdust and wood shavings under high pressure. The pellets are stored in a 26 foot tall metal silo outside the bunker and are pneumatically fed into the boilers automatically whenever needed. Windows on the silo show when the level of pellets is low. Since the new boilers were installed in a new boiler building, Amherst College was able to keep the heat on with the old oil boilers until the wood pellet boilers were fully installed.



Froling P4 100 Wood Pellet Boilers

Amherst College has implemented a number of other changes to the building's climate control system to improve energy efficiency. They've lowered the temperature setpoint in the building from 70 °F to 60 °F and installed infrared heaters over the desks of the few people who work there daily. There are also now motion sensors in some areas to trigger the lights so they don't use as much energy on lighting. This compounds with the improvements from changing over to biomass heating, and increases the energy efficiency of the building even further.

## OPERATIONS

A pellet provider based in Greenfield delivers pellets to the school every 4-5 months on average throughout the year. The boilers are projected to use approximately 47 tons of pellets per year. While Amherst College has only received 2 deliveries so far, they feel very confident in the availability and reliability of pellet supply moving forward. Pellet pricing has remained constant, which insulates the school from oil price spikes. Additionally, ash that results from the combustion process is deposited into a bin near the boiler that must be emptied into the grass or woods nearby every one to two months.

## WORKING WITH EXPERIENCED ENGINEERS

Amherst college had a very good experience working with the engineering firm that installed their new boilers. They have been working with biomass technology for many years now and are considered New England's pioneers in wood pellet burning boilers.

The bunker building's wood pellet boilers have a sophisticated monitoring system built into them, which the engineering firm remotely monitors over the internet. This is very helpful for the maintenance staff at Amherst because it gives them additional security in knowing that the system is functioning correctly while they learn about the system for themselves.

The engineering firm will also help Amherst College maintenance staff do the first annual maintenance on the boilers. This will give Amherst College maintenance staff the necessary knowledge and experience to take care of their system on their own in the future. Thanks to the engineering firm, the system was designed such that one boiler can provide heat to the building; this means that one boiler can be turned off for cleaning and the bunker will still have full heat.

## PROJECT OUTCOMES

Amherst College mechanical shop supervisor reports that the wood pellet boilers have been running very smoothly since the system's installation. The maintenance staff is very pleased with the quality of heat provided to the building and with the system itself. There are no complaints regarding issues with sound, smell, or reliability of the system. In the first four and a half months the boilers have been online, they've used 11.7 tons of pellets, which points toward hitting the predicted mark of saving approximately \$10,000 annually when compared to the price of heating the building with the old oil boilers.

## LESSONS LEARNED

To ensure a smooth startup process for new wood pellet boiler installations, the DOER has some recommendations:

- ♦ Seek an experienced team – Amherst College was fortunate to work with experienced engineers throughout this project which allowed for a relatively smooth project process. Wood pellet boilers are relatively new to the United States, though the industry is well developed in Europe. Because of key differences in operation between wood pellet and fossil fuel systems – such as longer startup and shutdown times and the importance of thermal storage – people with relevant experience should be involved from design through installation. Boiler manufacturers, mostly based in Europe, can be a valuable resource when local expertise is limited.
- ♦ Prepare for a changing timeline – Construction was set to take place between October 2nd-November 26th. Due to delays in the design process, construction began in December. Since construction occurred in the winter, there were weather related setbacks and the biomass system was not placed online until April 1st. However, due to proper planning and preparation, this delay did not affect the school's ability to maintain proper climate for the books. Since the project involved constructing a separate boiler building, the school was able to use their old oil boilers throughout the project installation process.



Boiler Room



8000gl. Thermal Storage Tank