Amherst College Book Depository

Wood Pellet Boilers

CASE STUDY

OVERVIEW

In 1992, Amherst College bought a Cold War era U.S. military bunker five miles south of campus for use as a book depository. The Strategic Air Command built the bunker into the side of a mountain in 1957 to serve as a backup communications center in the case of nuclear attack. The facility is now a remote storage facility for the Amherst College library and home of the Five College Library Repository Collection, a set of lesser-used materials from the libraries of Amherst College, Hampshire College, Mount Holyoke College, Smith College, and the University of Massachusetts Amherst.

When the facility's two oil boilers were approaching their life expectancy, Amherst College looked into alternative heating methods and selected wood pellet boilers to reduce heating costs and reliance on fossil fuels. Early in 2015, two wood pellet boilers were installed with the support of a grant from DOER. The new boilers are operating successfully and are expected to reduce the cost of heating the facility.

AT A GLANCE:

- 50,000 square foot military bunker converted into a book depository
- Two new wood pellet boilers installed in 2015 to replace aging oil boilers for space heating
- Pellets are delivered a few times a year to a silo outside the building and automatically fed in to the boilers as needed
- Successful installation, startup and first year of operation

LEARN MORE:

- Amherst College Library: http://amherst.edu/library/about/branches/
- Renewable heating and cooling in Massachusetts: http://bit.ly/renewablethermal

SYSTEM DESIGN AND OPERATION

Two Froling P4 100 wood pellet boilers were installed to heat the bunker, along with a 600 gallon water storage tank. Sufficient thermal storage is important to the operation and efficiency of wood pellet boiler systems because it allows a boiler to run for longer periods, rather than short-cycling on and off. A new boiler building was built outside the bunker to house this new system. The total project cost was $320,000 ($35,000 for architecture, engineering and commissioning, $285,000 for construction), with the majority funded by a grant from DOER. The previous oil boilers were uninstalled and removed from the site.

The wood pellets that fuel the boilers are made by compressing sawdust and wood shavings under high pressure. They are stored in a 26 foot tall metal silo outside the boiler building and automatically fed into the boilers as needed. Windows on the silo show when the level of pellets is low. A provider based nearby in Greenfield delivers pellets a few times a year, as needed. The new boilers used a total of approximately 40 tons of pellets in their first year of operation. Ash is generated as a byproduct of the combustion process. Approximately every six weeks, maintenance staff remove the ash from the boiler and spread it onto a field on site. Similar to a lime supplement, the ash balances the pH of soil, which is important with the acidic soil in the northeastern United States.

The boilers heat water to 180°F, and a mixing valve on the outlet of the storage tank modulates to supply water to the building at 125°F . The boilers and air conditioning equipment work together year round to maintain temperature and humidity levels appropriate for both the employees and books. The air is cooled to reduce the relative humidity to the necessary level for book storage, and then reheat coils use the hot water to heat the air back up to 60°F. Since most of the space is not occupied on a regular basis, the space heating setpoint was reduced from 70°F and infrared heaters were installed over desks to provide additional heat directly to the areas that are staffed.

The boilers were sized so that one unit can meet the bunker's full heating load throughout the year, while the other is used for backup. Maintenance staff periodically alternate which boiler is operating.

The company that installed the boiler system remotely monitors its performance using built-in monitoring technology. This has given the Amherst College maintenance staff confidence that the new system will function correctly while they grow more familiar with it. The installer is also providing hands-on maintenance training to Amherst College staff, including performing the first annual maintenance procedure on the system together.

RESULTS

Amherst College has had success with its new wood pellet boiler system. Staff are pleased with system performance and report that the required maintenance has been fairly simple. Early data shows a reduction in fuel costs during the first year of operation.

RECOMMENDATION

Seek technology-specific expertise – While the wood pellet boiler industry is well developed in Europe, this technology is less common in the United States. It is important to work with vendors who understand the differences in design and operation between wood pellet and fossil fuel boiler systems. Amherst College hired engineers and installers who have extensive experience with wood pellet boilers, which contributed to the smooth installation, startup and training process.

Amherst College book depository and wood pellet storage silo

Wood pellet boilers

Boiler building

Thermal storage tank