

Peripheral Upgrades Deliver Energy Efficient Heating at Siena Center

CASE STUDY

Finding a way to efficiently heat a facility that covers the equivalent of nearly four-and-a-half football fields is, to put it mildly, a bit of a challenge. But it's a challenge that the Siena Center in Racine WI is meeting with the help of Focus on Energy, Wisconsin's energy efficiency and renewable energy program, and business ally PBBS Equipment Corporation of Menomonee Falls.

Built in 1965, the Siena Center is a nine-building, 250,000 sq. ft. complex that serves as a convent, convention center, and multi-purpose center for the Racine Dominicans and other religious organizations in the area. Operated by the Sisters of St. Dominic, an order of Catholic nuns, the facility has a long history of energy efficiency. "To the sisters' way of thinking, saving energy is just the right thing to do," said Tim Marking, Director of Buildings and Grounds at the Siena Center.



A burner upgrade and new controls saved the Siena Center \$15,813 in energy costs during a one year period.

In 2004, the Siena Center took a big step toward improving their energy efficiency with a heating system upgrade installed by PBBS. The upgrade included a high-turndown burner and an Autoflame

MK6 Evolution microprocessor combustion management system. The update did not include the installation of new boilers, even though the facility's boilers were decades old.

"The boilers have been meticulously maintained, and boiler technology hasn't really advanced that much since they were installed. What have changed are the peripherals, so that's where the Siena Center wisely focused their efforts," said Robert Bedelis, an Energy Advisor with Focus on Energy.

PERIPHERAL UPGRADES

First, the burner.

Boilers are most energy efficient when they're running at peak load. Unfortunately, that rarely happens because equipment is chosen based on worst-case scenario usage—e.g., to guarantee comfortable temperatures at, say, -10° F, even if the temperature only dips that low a few days of the year. Consequently, it's important to find a way to run the system efficiently at less-than-peak loads, and that's just what a high-turndown burner, with a high turndown ratio, does.

Turndown ratio refers to the lowest percentage of total capacity that the boiler can be run at efficiently. With the old burner, which had a 3:1 ratio, the boiler had to run at about 30 percent capacity for optimal efficiency; with the new 10:1 burner, it can run efficiently at roughly 10 percent. And, as additional heat is required, the system can add it in smaller, more energy-efficient increments.

The increased efficiency afforded by the burners is complemented by the new controls system.

Second, the controls

In the past, the building's boilers were controlled by a purely mechanical system which offered limited monitoring/response capabilities. With the new electromechanical controls the system automatically adjusts the fuel/air ratio to reflect changes in a variety of pre-set parameters such as temperature and barometric pressure. "This system automatically finds the 'sweet spot' in the fuel/air ratio—which is critical to optimizing power with a

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minimum amount of fuel—and can maintain it across the load range of the boiler,” said Bedelis.

PBBS engineers calculated that the new peripherals would cost \$28,786 and result in annual energy savings of 7,726 therms, or \$5,022 in gas costs (based on a cost of \$0.65/therm). Focus on Energy offered a \$2,518 incentive on the project, which put the project payback time at just over five years.

Through a measurement and verification (M&V) study, Focus on Energy was able to prove that the savings were actually substantially higher.

FOCUS ON ENERGY’S MEASUREMENT AND VERIFICATION FINDINGS

The new burner and controls were installed in November 2004, and Focus on Energy began to conduct a detailed M&V study in October 2005 to confirm actual savings.

The Focus on Energy M&V team used two methodologies that were compatible with the Department of Energy’s Measurement and Verification Guidelines for Federal Energy Management Projects (FEMP): a review of boiler logs, which indicated savings linked specifically to the boiler (FEMP Option B); and a review of utility bills, which showed savings at the facility level (FEMP Option C). Boiler logs were analyzed for the eight-month (October-May) heating period only, while utility logs were analyzed for the entire year to verify that only heating systems were being powered by the boiler.

“This was an ideal situation for conducting an M&V study,” said Bedelis. “The Siena Center staff kept meticulous daily logs on their boilers, which was critical to our ability to prove the value of their upgrades. Plus, the logs are an excellent tool for the maintenance staff—they can tell immediately if something is wrong with their system.”

The boiler data study compared boiler gas consumption on a month-by-month basis using pre-retrofit data from October 2003 to May 2004 and post-retrofit data from November 2004 to May 2005. Energy savings from this period were 27,562 therms for \$17,915 in energy cost savings (based on a per therm cost of \$0.65).

And the fact that total degree days were nearly identical pre- and post-retrofit—6,365 before the upgrade and 6,362 after—is additional proof of project savings.

Utility bills showed similarly high savings. A comparison of October 2003 to September 2004 energy usage vs. October 2004 to September 2005 energy usage showed annual energy cost savings of \$15,813.

Taking an average of both measurement methodologies the result in energy costs savings is \$16,864 or 25,945 therms.

“The difference between the predicted and actual savings can largely be attributed to the fact that the combustion management system is a relatively new technology in this country, although it’s been used more widely in Europe,” said Bedelis. “There’s a tendency to be more conservative in estimating the benefits of new technology. As the studies show, these upgrades were an excellent choice for the Siena Center.”

SIENA CENTER, RACINE M&V STUDY FINDINGS

ENERGY SAVINGS IN THERMS			
Methodology	Projected	Verified	% Savings Achieved
Option B	7,727	27,562	356.7%
Option C	7,727	24,327	314.8%
Average	7,727	25,945	335.8%

ENERGY SAVINGS IN DOLLARS			
Methodology	Projected	Verified	% Savings Achieved
Option B	\$5,023	\$17,915	356.7%
Option C	\$5,023	\$15,813	314.8%
Average	\$5,023	\$16,864	335.8%

HOW CAN FOCUS ON ENERGY HELP YOU?

“Energy costs will continue to soar. The sooner you upgrade your equipment, the sooner you’ll start saving money. Focus on Energy’s incentives help to cost-justify your upgrades, and their M&V studies are an excellent way to see the true impact of your efforts.”

Tim Marking
Siena Center
Director of Buildings and Grounds

Could heating system upgrades benefit your facility? To learn more contact Focus on Energy. Our energy advisors can offer in-depth, up-to-date knowledge on a variety of new technologies and offer a neutral, third-party perspective that can help you to determine the most effective ways to solve your energy challenges.

For more information, call 800.762.7077 and ask to speak with a member of the Healthcare Team or visit focusonenergy.com.