

## Case Study

# Modulex Boilers Cut University's Heating Costs with De-centralized System

Customer	<b>Concordia University</b>
Location	<b>Michigan</b>
Industry	<b>Education</b>
Sales Representative	<b>R. L. Deppmann</b>
AERCO Product Installed	<b>Modulex 1060</b>



### What the Client Needed

In September 2006, Concordia University, a 187-acre campus nestled on the banks of the Huron River in Ann Arbor, Michigan, began a project to reduce energy use and strive for a greener campus. To help accomplish this goal, the school's engineering and management team knew the existing centralized steam heating system would have to be replaced. What they didn't immediately realize was that the best option would prove to be a de-centralized system that utilizes AERCO Modulex boilers in various buildings. The condensing and fully modulating boilers and de-centralized design of the new system are helping the university decrease natural gas use by 39% on an annual basis. Over 7 years later they are still pleased with a product that surpassed their expectations for cost savings, reliability, and ease of use.

The original centralized heating system featured three Cleaver Brooks steam boilers and an underground piping distribution system which Jerry Novak, director of buildings and grounds for Concordia, had to repair on more than a few occasions. A campus audit revealed the old underground hot water distribution system was responsible for 20-25% of Concordia's water usage, and was leaking heated water undetected into the sandy soil. "Over the course of its lifespan, the underground piping distribution system had become rotted. We were losing a lot of water each day," said Novak. The leaks led to high maintenance costs, elevated water and sewer bills, and a higher monthly heating bill.

### AERCO's Solution

Philip Leege, a semiretired engineer, volunteered to help Concordia develop the Energy Savings Project with Honeywell International, and to help evaluate systems and equipment recommendations. He realized that upgrading the underground piping network would be expensive, but necessary, if he wanted to reap the full benefits of new high-efficiency equipment. To further complicate matters, a deep valley in the middle of the campus would make it difficult to effectively lay replacement piping to the gymnasium. Honeywell engineers and its supplier the Dale Prentice Company, proposed the idea of having a split system, whereby the gymnasium would have its own boiler and the remaining campus buildings would continue to be served by the centralized boiler plant.

Leege was still undecided if Concordia should design a centralized, de-centralized or combination system when he visited AERCO's headquarters. What he was certain of was that he needed high-efficiency boilers and that any one of AERCO's products, with their condensing, fully-modulating designs, high turndown and excellent efficiency, would fit the bill.

"I was very impressed with AERCO, not just the boilers but the presentations given, their applications engineering knowledge and experience, their manufacturing and quality control accountability process, and customer service," says Leege. "With capacities from 300,000 to 3 million BTU/hr. [now to 6000 MBTU], their equipment could have supported any of the system designs being considered. In the end, we went with their smallest capacity line, AERCO Modulex boilers, to support a fully de-centralized system." Concordia ordered 18 AERCO Modulex units, which have been installed in eight campus buildings. Due to the different building sizes and heating demands, the project used a mix of MLX-606, MLX-757, MLX-909 and MLX-1060 boilers, which range in capacity from 600,000 to 1 million BTUs/hr.

## **Boilers for Every Building**

The move to a de-centralized system rendered the existing underground piping system obsolete and significantly reduced the overall cost of the project. Old piping could be drained and left in place instead of being dug up, repaired, and covered at a high expense. Equally important, the de-centralized system enabled the engineering team to create an operating expense management control program. As part of the program, meters were installed in all the buildings so that the heating, electrical, and water usage can be monitored individually rather than being allocated from central metering.

"Such a program would have been impossible with a centralized system," said Leege. "The feedback from the meters enables us to monitor and adjust output for each building. This will help us to increase energy and utilities use accountability and reduce costs on an on-going basis."

Before recommending the AERCO Modulex units, Leege had to make sure the challenges associated with a de-centralized system could be overcome. For one, most of the campus buildings did not have space designated for boilers when they were constructed, so installing the boilers was a crucial concern during the evaluation process. Secondly, multiple boilers would be chosen for each building with minimum redundancy to defend against downtime if one boiler in a building was taken down for service during the peak heating season. Thirdly, the plan would increase the number of campus heating boilers from three to 18, potentially adding to the service requirements placed on Novak's team.

AERCO's Modulex boilers more than met these challenges. All AERCO Modulex units have a compact footprint, with the largest for Concordia measuring a mere 49"W x 27"D x 42"H. Even when installed in pairs and/or groups of three, they were an easy fit into all the buildings. The ability to vent with PVC through either a ceiling or sidewall, and the ability to change service connection points (gas, water, intake air, and venting) from the left to right, also simplified installation.

Each Modulex boiler combines up to seven independent, 151,500 BTU/hr., pre-assembled thermal modules housed in a common enclosure. Each module has its own controller, fan, modulating gas valve, electronic ignition, modulating burner, and flow temperature sensor. If a single module requires maintenance or repair, the other modules in the unit continue operating to maintain the system load requirements. Not only is this built-in redundancy a plus, but all of the units in the line, regardless of capacity, utilize the same modular design, which is beneficial from Novak's perspective.

"Even though I have 18 boilers in six different sizes, my staff only needs to learn one piece of equipment and keep just one set of spare parts on hand," said Novak. Other Modulex features keep maintenance simple. Its snap-off enclosure panels don't require tools for removal and each waist-high unit provides top-lift access for fireside inspection and easy cleaning.

"My crew has gone through the first round of training and already understands the capabilities," says Novak. "The units are working perfectly so we haven't had to do any maintenance but I'm confident we'll be able to handle whatever might arise."

In seven years of operation, the 18 units have required a total of 3 replacement parts, and none have been down for service during that time due to the modular design. The gymnasium and student services building, each with two units, were operational for the 2006-2007 heating season. Installation in the remaining buildings was

completed in the summer of 2007, and have been saving the University money ever since. This includes the Student Union and Cafeteria, Sciences Building, Chapel, Kreft Center for the Arts, Zimmerman Library, and Krieger Hall (classrooms). Leege's ongoing energy audits have demonstrated that the decentralized heating system has achieved overall efficiency of 94%, with some buildings operating at 99%. This is a far cry from the old centralized system that operated at only 70% efficiency. The improved efficiency is driven by both the system design and the high efficiency Modulex equipment.

By moving to a de-centralized system design, Concordia reduced the electrical expense for pumping throughout the underground piping system. And the new condensing boilers feature very high turndown, from 13:1 to 23:1 depending upon unit, to minimize cycling and prevent wasteful temperature overshoot. "I had never seen such high turndown before, and honestly would not have expected it," said Leege.

### **Further Expansion**

As the University comes up on a new improvement project, they have already requested AERCO Modulex specifically and are excited to install the new Modulex EXT. The Modulex EXT, which replaces the Modulex line, offers the same space saving, high efficiency, reliable performance but with improvements that make installation and maintenance a snap.



Heating and Hot Water Solutions

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