CASE STUDY:
Bridgewater State University

Industry:
Education

BRIDGEWATER STATE UNIVERSITY

LOCATION
Bridgewater, Massachusetts

PROFILE
Convert steam plant from #6 oil to natural gas to reduce fuel costs and decrease emissions

CHALLENGE
Prove that the investment needed to make the conversion was fiscally responsible

SOLUTION
Replace old watertube boilers with 4WG firetube boilers with low NOx burners and a Hawk advanced control system

RESULTS
Increased fuel-to-steam efficiency by 10%, saving the university more than $800,000 in fuel costs annually

Boiler Conversion Pays for Itself in 27 Months

Bridgewater State University, located in Bridgewater, Mass., is regarded as the "birthplace of teacher education in America." The school started in 1840 with 28 students. Today, the public liberal arts university educates more than 11,000 students on its 278-acre campus.

Over the past decade, Bridgewater State University has made a number of sustainability improvements. Among its initiatives was converting its central steam plant from #6 oil to natural gas.

Built in 1964, the steam plant was running three Erie City watertube boilers powered by #6 oil, which provided high-pressure steam to 10 buildings on campus.

"The main reason for converting to natural gas was the cost of #6 oil at the time with the environmental emissions of burning oil a very close second," said Greg Folsom, assistant chief engineer at Bridgewater State University.

In addition, the university's watertube boilers were nearing 50 years old and the availability of parts was decreasing and the costs to properly maintain them were escalating. They realized the need to replace the deaerator tank as well as some fuel handling equipment in order to continue the operation of the plant.

In 2011, the university conducted a cost analysis of converting their steam plant from #6 oil to natural gas. The study showed that the conversion would pay for itself in five to seven years.

Bridgewater State University consulted with an engineering firm to write the specifications for the project. The firm wrote a spec for two new 800 HP gas-fired, high pressure steam boilers and accessories with the Best Available Control Technology (BACT), which would enable the university to take advantage of available rebate dollars.

Shawn O'Connor, senior sales engineer for Frank I. Rounds Company, based in Randolph, Mass., recommended Cleaver-Brooks 4WG wetback firetube boilers with low-NOx burners, stack economizers and a Hawk 4000 PLC-based control system with O2 Trim, variable speed drive and parallel positioning.

Bridgewater State University installed the two boiler systems in April 2013 along with a new deaerator system, new feedwater pumps, steam flow meters, exhaust fans and a UL-approved, pre-fabricated boiler flue gas stack.

"A unique point about this installation is that the economizers were taken into the boiler room early and supported off of the boiler room ceiling," said O'Connor. "The two economizers were attached to a steel structure in mid-air. They looked like big chandeliers hanging from the ceiling.

"Two weeks later, they slid the boilers underneath the structures and lowered the economizers onto the stacks," he added. "They positioned the flue outlets underneath the economizers, dropped the plumb bob to make sure they were level and then cranked the economizer chain claws onto each boiler's outlet."

Bridgewater State University had decommissioned one of its three watertube boilers in advance of installing the new firetube boilers, which made the unique installation possible. About a year after the new boilers were in place, the university decommissioned its remaining two watertube boilers.

In addition to the boilers being user-friendly, easy to maintain and reliable, they are also low-NOx and achieve sub-30 parts per million, which meets the permanent requirement for Massachusetts.

According to the university, the fuel-to-steam efficiency of the boilers with economizers is about 84 percent. When the Erie City boilers were perfectly tuned, their efficiency was only in the mid-70s.

The first year of operation, despite having a really cold winter, the university's fuel cost was $800,000 less than the prior year. The following year, the university's cost savings increased to $850,000.

Bridgewater State University presumes that it saved enough to pay for this project in only 27 months from the start of its operation. In regard to energy savings and emissions, the university's expectations were definitely met.

Bridgewater State University realized an additional perk of converting its central boiler plant to 100% natural gas. It was able to decommission and tear down a 150-foot-tall radial stack, which university officials said was the last visible trace of dirty energy production at the school.

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