



Power Generation

CHP SYSTEM GENERATES SAVINGS FOR OHIO HIGH SCHOOL AND COMMUNITY CENTER

Who Medina High School and Medina Community Recreation Center
What MTU Natural Gas CHP system
Where Medina, Ohio, USA

Forward-thinking Medina City School District—a member of Ohio's Energy Conservation Program—is saving an estimated \$83,000 in annual energy costs following the installation of a natural gas combined heat and power (CHP) system in early 2014. The CHP plant, which boasts 90 percent efficiency for Medina High School and the connected recreational center, is part of a broader effort to realize significant savings through efficiency improvements

Medina High School, the district's only high school, is an important landmark in Medina. One of northern Ohio's largest high schools, it educates a student body of 2,500 and houses the Medina Community Recreation Center, which was added during major renovations in the fall of 2003. The state-of-the-art 110,000-square-foot multi-purpose complex offers area residents everything needed for a healthy and active lifestyle,



A Rolls-Royce solution

including an Olympic-sized competition lap pool and educational nutrition programs facilitated in collaboration with the Cleveland Clinic.

Following the renovations, the district shifted its focus toward energy and efficiency improvements. These efforts were part of a district-wide plan rolled out in 2008 in accordance with Ohio's Energy Conservation Program (House Bill 264), which allows districts to borrow funds to implement energy efficiency projects and pay them back with the money saved during a 15-year period.

In 2009, Medina City School District conducted a study to identify opportunities to increase energy efficiency. Working in partnership with the Brewer-Garrett Company, a leading energy conservation company located in Middleburg Heights, Ohio, the district made several improvements, including lighting retrofits, automation systems upgrades, installing energy-efficient vending machines, and replacing older, less efficient ballasts and bulbs. Through those enhancements, the district saved \$400,000 a year across ten schools.

Driven by success

Building on the success of these enhancements, Medina City School District sought out additional options to expand its efficiency program while reducing costs. To make an informed decision, several efficient energy solutions were evaluated, including wind and solar power. During this fact-finding mission, the district learned that solar and wind technologies remain cost-prohibitive options, and can take up to 20 years for the investment to reach a break-even point. It was then that Brewer-Garrett suggested considering a combined heat and power (CHP) system, which would cost significantly less and offer a shorter break-even point than other technologies, while also

providing the dramatic savings on utility costs sought by the district. Together, they determined that a cogeneration solution was ideal for Medina High School.

In April 2014, an MTU Series 400 CHP system was installed at Medina High School in the existing mechanical room, replacing the boiler system that had recently failed.

“With this solution, the school is able to reach nearly 90 percent efficiency—almost double what they were achieving before.”

Tom Drake
Senior Sales Manager, Gas Power Systems

“Wind and solar power seem like obvious choices when looking for renewable energy solutions. When we dug deeper, we learned that combined heat and power systems have been a proven technology for more than 100 years and are often more cost-effective and long lasting than wind and solar power,” said John Burkhart, director of business affairs, Medina City School District.

The CHP process, also known as cogeneration, is one way businesses and large facilities like Medina High School and Medina Community Recreation Center can control the cost of heating, electricity and cooling. The CHP plant extracts multiple forms of usable energy—electrical power via a generator and thermal power produced by exhaust heat—from a single fuel source. Over the long term, a CHP plant can significantly reduce lifecycle costs, including expenditures for operations, installation and maintenance.



The Series 400 CHP system is supported locally by W.W. Williams, an authorized MTU Gas Systems distributor.

Waste not, want not

Medina High School's compact natural gas-powered Series 400 CHP produces 128 kWe and recovers 747,000 Btu of heat per hour, which is used to heat the facility's aquatic center. By capturing normally wasted heat and producing electric power on site, the CHP unit is expected to offset more than one million kWh of purchased electricity with anticipated savings of nearly \$83,000 in electrical costs. It should double the overall energy efficiency of the facility while significantly decreasing its emissions during its first year of operation alone. The system also came equipped with sound dampening panels to drop the system's noise down to less than 75 dBA, a level at which you can have a conversation next to the unit while it's in operation.

"We've essentially put an electrical power plant on site at Medina High School," said Tom Drake, senior sales manager, gas power systems. "With the solution, the school is able to reach nearly 90 percent efficiency—almost double what they were achieving before."

"The CHP is a sound investment, yielding both economic, operational and environmental benefits."

John Burkhart
Medina City School District

Because schools don't need heat year round, municipalities do not often use CHPs. However, the two swimming pools in Medina High School's community recreational center make it a perfect application for the technology. The pools' constant requirement for heat enables the CHP to use more than 700,000 BTUs of heat energy that would otherwise go to waste. Heat captured through the unit's exhaust and jacket water system is used to preheat the aquatic center's water before it goes into the boilers, providing additional energy efficiency and savings to the school.

"Environmental responsibility is important to us and to our students, and implementing this energy-saving solution reaffirms that commitment," said Burkhart.

Compared to the use of separate heat and power systems, Medina's CHP is beneficial for the environment. In the combustion process, at least half of the energy generated is normally wasted, as it radiates away as heat. However, the CHP process allows Medina to utilize almost all of the energy potential of the natural gas. By consuming less fuel, greenhouse gas emissions, such as carbon dioxide, as well as pollutants like nitrogen oxide are all significantly reduced. In comparison with conventional power generation, MTU CHP systems reduce carbon dioxide emissions up to 50 percent.

Measured performance

At a recent Medina City Schools Board of Education meeting, John Burkhart and Brewer-Garrett reported on the first year performance of the CHP unit. During the first 12-months of operation, the CHP generated 970,553 kWh and delivered 5,736 MMBtu of recovered heat to the HVAC and aquatic center heating loop. As a result, utility bills have decreased more than estimated. The system is now projected to yield a payback term almost two years less than originally anticipated.

Facility staff has also adopted the cogeneration unit as a reliable energy source. For full optimization, the district has made changes to heating system controls to maximize the benefit of the cogeneration thermal output. During the shoulder months, the school relies only on the CHP unit for all heating needs.

"The MTU CHP is a sound investment, yielding both economic, operational and environmental benefits," touted Burkhart.

Proven technology

MTU CHP systems have been a proven technology for cost-efficient power generation for more than 35 years in Europe and Asia. MTU CHP systems are available in the United States, Canada and Mexico through a network of authorized MTU distributors. In addition to natural gas, the compact Series 400 CHP system can also be fueled by biogas, landfill gas or sewage gas, producing 128 to 358 kWe. MTU also offers a larger Series 4000 model fueled by natural gas and biogas, producing 763 to 2,129 kWe. Both models are in use worldwide at over 2,700 installations.

Rolls-Royce provides world-class power solutions and complete lifecycle support under our product and solution brand MTU. Through digitalization and electrification, we strive to develop drive and power generation solutions that are even cleaner and smarter and thus provide answers to the challenges posed by the rapidly growing societal demands for energy and mobility. We deliver and service comprehensive, powerful and reliable systems, based on both gas and diesel engines, as well as electrified hybrid systems. These clean and technologically advanced solutions serve our customers in the marine and infrastructure sectors worldwide.