GEM ENERGY
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COMBINED HEAT & POWER SYSTEMS

JOHN ADAMS (LEFT), WASTEWATER SUPERVISOR | CHRIS CAMPBELL, PUBLIC WORKS DIRECTOR
TWINSBURG WASTEWATER TREATMENT FACILITY

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Twinsburg, Ohio, is a community that takes pride in the beauty of its natural environment and in its family-friendly atmosphere. So several years ago, when the city's wastewater treatment plant was regularly flaring methane gas from the plant's waste digester into the atmosphere, city leaders sought out a viable alternative to burning off this byproduct of the treatment process. They found a solution with a combined heat and power (CHP) system, which captures the methane and uses it to fuel a Capstone C65 MicroTurbine, generating electricity for the plant's consumption. This CHP, or co-generation system, not only produces 65kW of electricity, it also uses heat from the micro turbine exhaust to heat the digester, increasing its efficiency.

In addition to demonstrating environmental stewardship, the implementation is helping to keep energy spending in check at the Twinsburg facility, which has a processing capacity of 5.8 million gallons per day.

Since implementing a CHP system, the plant has saved approximately $4,300 per month on its electricity and natural gas costs.

GEM ENERGY RESPONDS TO SOS CALL

Unfortunately, the project was not all smooth sailing. Although the CHP concept was sound, the initial execution—by a contractor inexperienced with biogas fuel and micro turbines—was shaky, and the project encountered various installation and start-up issues. The city struggled to coax the system to perform as promised.

"The city was left with a unit that would not run continuously or efficiently," said John Adams, Wastewater Superintendent. "After many months of frustration, monitoring and trying to keep the unit running, we hired GEM Energy to help us remedy our issues." GEM Energy had been recommended to the Twinsburg project managers by their counterparts at the Lima, Ohio, wastewater treatment plant, which had a positive experience with its own GEM Energy-installed CHP system. GEM Energy's engineers responded immediately, meeting with the Twinsburg unit's staff to discuss their system. Together, they identified and corrected the fundamental shortcomings that were hampering its performance.

"GEM Energy listened to the issues that we encountered on the unit's startup and worked collaboratively with us on resolving the issues to obtain optimum performance of our unit and its gas conditioning system," Adams said. He praised the GEM Energy team's vast knowledge of micro turbines and gas conditioning systems, as well as their responsiveness. The main components of the correction plan included modifying the gas conditioning system and reprogramming the micro turbine controls. After these improvements were implemented, the Capstone unit has performed "flawlessly," according to Adams.

SYSTEM ADAPTED TO PLANT OPERATIONS, ENVIRONMENT

Once the unit was placed online, some adjustments were necessary to adapt to the plant's unique operations and physical setting. The biggest challenge was programming the unit to run based on the plant's own gas production via methane waste gas emissions, Adams said. And uncontrollable climate conditions wielded their influence, as the system was forced to contend with some of the subzero temperatures that can accompany northeast Ohio winters.

But with the appropriate tweaks, the system has performed reliably, and Adams is particularly impressed with the micro turbine: "The Capstone unit has proved to be quite a dependable piece of equipment."

The system uses heat from the Capstone MicroTurbine unit's exhaust to heat the waste digester, increasing its efficiency.

MAINTENANCE PLAN KEEPS TURBINE HUMMING

For peace of mind in handling the long-term maintenance and service of its micro turbine, the Twinsburg plant management took advantage of GEM Energy's Capstone Factory Protection Plan (FPP). That service contract allows the plant operators to focus their attention on the conditioning system. Maintenance of the gas conditioning system involves quarterly oil and filter changes for the compressor, as well as periodic replacement of the media filters on some of system's biogas filters.

Plant operators are vigilant in monitoring the system on a daily basis, logging pertinent equipment readings every two hours. If any discrepancies appear, the unit is shut down to protect the equipment. In addition, to protect the micro turbine, the city sends out the biogas each quarter for testing to ensure that it is adequately removing trace amounts of siloxanes, a byproduct found in digester biogas that can degrade equipment.

OUTSIDE SOURCES PROVIDE FINANCIAL SUPPORT

Like many U.S. wastewater treatment facilities that implement CHP technology, Twinsburg reached outside its operating budget to finance its investment. Such facilities typically offset the cost of purchasing and installing a cogeneration system through local or state bonds; partnerships with local utilities or third-party owner/operators; or state/federal loans and grants, according to the U.S. Environmental Protection Agency. The City of Twinsburg received federal funding for its project via the American Recovery and Reinvestment Act of 2009, the economic stimulus program that invested in creating jobs in infrastructure and renewable energy, among other targeted sectors. With that assistance, and by budgeting for the system's maintenance costs, Twinsburg is ensuring its long-term financial stability.

By accessing available funding and seeking out an experienced, knowledgeable and responsive vendor, the City of Twinsburg was able to align the operations of one of its vital municipal services with the community's goals for environmental stewardship and fiscal responsibility.

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