Oneida Wastewater Treatment Plant

Government/Municipal

The Challenge

The Oneida County Water Pollution Control Plant (WPCP) in Utica, New York processes approximately 14,000 wet tons of municipal wastewater sludge annually. In 2012, the county it serves received a regulatory mandate to eliminate sewer overflows at its Sauquoit Creek Pump Station. A plan was developed to construct a new 5-mile-long force main that would increase the pumping capacity from 18 MGD (millions of gallons/day) to 38 MGD. To handle the increased flow from the pumping station, as well as help the City of Utica meet their Combined Sewer Overflow Long Term Control Plan, the WPCP embarked on a $380 million upgrade of the site, which included the implementation of a new power system.

Based on a long-term financial analysis conducted to inform the design of the upgrades, the utility decided to shift from the expensive process of incinerating its biosolids to treating them via anaerobic digestion, while adding 10-12% capacity to its new digesters to accommodate codigestion. In this way, the methane byproduct of the digestion process could be used as a fuel source for a combined heat and power (CHP) system. The new system would reduce energy consumption, lower utility costs, and lower environmental impact.

To best serve the objectives of the initiative, WPCP selected a Capstone C600S microturbine-based CHP system with hot water heat recovery.

Power Profile

Customer
Oneida County Water Pollution Control Plant

Location
Utica, New York, U.S.

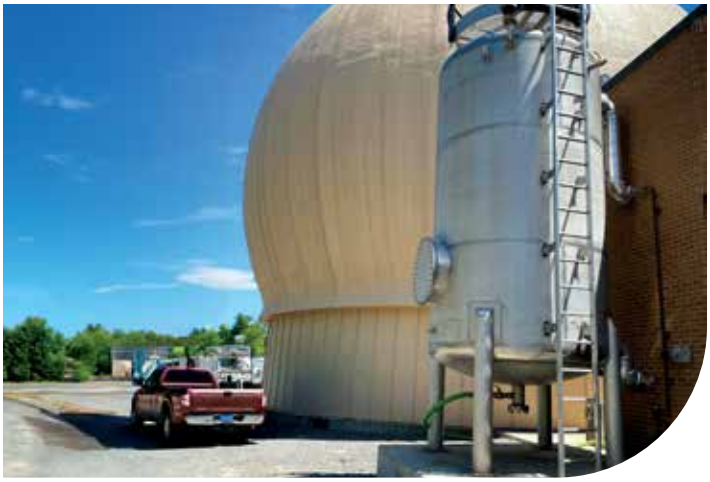
Commissioned
2019; upgraded in 2022

Fuel
Biogas

Technologies
- (1) 5-bay C600S Microturbine

Capstone Green Energy Distributor
RSP Systems

> **The Water Pollution Control Plant system is an excellent, well-proven model of the ways in which Capstone microturbines offer a green energy solution that allows customers to meet their environmental, energy savings, and resiliency goals while complying with the most stringent emissions standards."**
>
> — Cory Glick
> Principal, RSP Systems



A 1MW microturbine system at Oneida County Water Pollution Control Plant uses the methane byproduct of the digestion process to reduce energy consumption, lower utility costs, and lower environmental impact.

The Solution

The CHP system's original design, which began operating in April 2019, featured a 600kW 5-bay power package capable of providing between 400 and 600 kW of continuous power. The modular design left two bays open to accommodate growing wastewater demands, and two years later, the district expanded the system, adding two 200 kW microturbine units, which increased the total generation capacity to 1 MW.

To help with reduction of solid waste, the site installed an anaerobic digester which generates renewable methane. This "free" methane gas is recovered and used by the microturbines to generate electricity. Additionally, the useful thermal energy from the microturbines is recovered via a hot water closed loop system and recirculated back to the anaerobic digester. This recovered thermal energy helps maintain the digester's proper operating temperature and also optimizes overall methane production.

Another feature of the modular design is that it allows the system to run efficiently under dynamic plant electric loads and digester gas flow rates. The system's output delivers power to on-site electric loads at 50-60% of the plant's overall needs, while the microturbine's thermal energy is used to heat the digester and buildings.

The Results

This CHP system represents one of the most efficient uses of gaseous fuels, and since the biogas produced from the wastewater treatment process is a waste product, the fuel is essentially free.

As of June 2023, the WPCP system generated 12,857 MWh of electricity and operated with a capacity factor of 69.6%, delivering significant benefits:

- Lower energy costs (both electric and natural gas)
- Enhanced reliability and resilience
- Effective re-use of methane that is naturally generated by the process
- Environmental compliance of using methane instead of flaring or venting

The plant was able to reduce facility fuel oil consumption by switching from fuel oil-fired sludge incinerators to anaerobic digestion for handling wastewater sludge. This also allowed for significant emissions reductions, specifically sulfur dioxide and mercury, which had previously been approaching unacceptable levels. In addition to the digester and CHP system installation, the facility implemented major energy efficiency upgrades, resulting in facility energy consumption reductions estimated at 270,000 kWh annually.

Since startup, the biogas fueled CHP system has served approximately 25% of the facility's electric loads. Compared to the baseline alternative of purchasing electricity from the grid and fossil natural gas from the pipeline for combustion in onsite gas boilers, the installed CHP provides significant CO2e savings.

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