Ultrasonic Flow Measurement System saves $72,500 annually

City of Reading, PA lowers fuel, labor and maintenance costs

City of Reading, Pennsylvania

City of Reading wastewater treatment plant is owned and operated by the City of Reading, PA. It receives wastewater from the city and 11 surrounding communities. There are four remote pumping stations which pump wastewater to the plant. Plant is designed to process 28.5 million gallons per day (MGD). Overall plant instrumentation consists of 90–95 percent Endress+Hauser equipment, consisting of level, pressure, flow and recorders.

If the wastewater treatment plant serving Reading, PA, and 11 surrounding municipalities has a mission statement for its day-to-day operations, it couldn't be simpler or more critical: "95˚F." That's the optimal temperature at which the anaerobic bacteria in the facility's three 800,000-gallon digesters can most efficiently process the waste stream of up to 28.5 million gallons per day (MGD).

At 95˚F, the digesters generate a wet biogas flow that averages 3,500 standard cubic feet per hour (SCFH), with a methane fraction of 65 to 70 percent. The methane is drawn off to burn in three 70-horsepower boilers. Each boiler is paired with a digester, providing the heat needed to keep the temperature constant, even in subzero winter weather.

These days, the plant can usually maintain a closed-loop system to optimize the digester bacteria processing.

Here's how it works: A steady flow of wastewater sludge is fed to the digester, where it is consumed by bacteria that thrive in an oxygen free environment. The bacteria generate biogas, which consists mainly of methane and carbon dioxide along with a very small fraction of other gases. The methane then fuels the digester's boiler, which heats the digester, keeping the bacteria productive. Not long ago, however, that closed-loop was much more elusive than now, costing the city lots of money.

The Challenge **Lack Of Real-Time Operating Data Leads To Operational Latency And High Costs**

According to John Gerberich, the facility's chief electrical engineer, optimizing the digester cycle requires constant monitoring of the gas flow, temperature, and methane fraction. "That's to ensure all three are within our preset operating parameters," he

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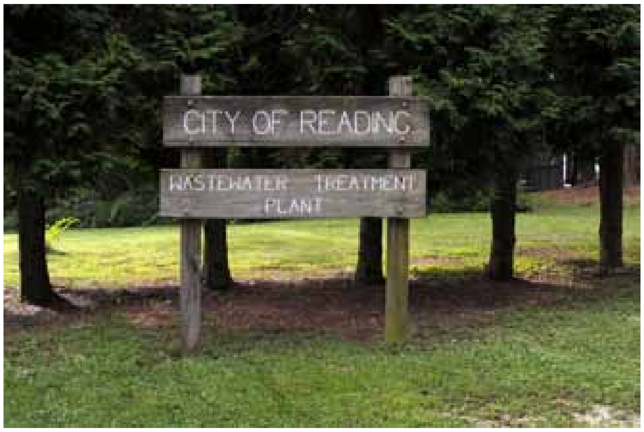


explains. “Based on this data, operators feed sludge to the digesters.”

Not long ago, however, the plant was using an outdated pressure transducer to monitor its biogas flow via its SCADA telemetry network. “Frankly it wasn’t very accurate and we often had false readings,” Gerberich recalls. Temperature was monitored manually, while the facility’s lab had to analyze gas samples to determine the methane fraction. The latter took up to 4 hours a day in technicians’ time.

The daily analysis caused large latencies in adjusting the sludge flows into the digesters. Sometimes the methane fraction would drop below 20 percent and the temperature would fall to 80°F. Not only would this slow the plant’s throughput, but it also would raise costs — a lot.

“When these conditions occur, a digester can sour, causing the bacteria to produce higher levels of other gases that can accelerate the corrosion of all our plumbing’s metal parts — the piping, controls, regulators, and so on,” Gerberich says. “What’s more, if the methane fraction falls too much, we have to tap external sources of natural gas to fuel the boilers. That can cost us up to $16,000 a month.

Our solution Gain real-time, Multipoint Data Via The Endress+Hauser Proline Prosonic Flow B 200.

To stay current professionally, Gerberich keeps watch on advancements in process and instrumentation technology. He knew that a thermal mass flowmeter, also known as a thermal dispersion flowmeter, would be an improvement over the plant’s pressure transducer, but it would not be ideal for his requirements.

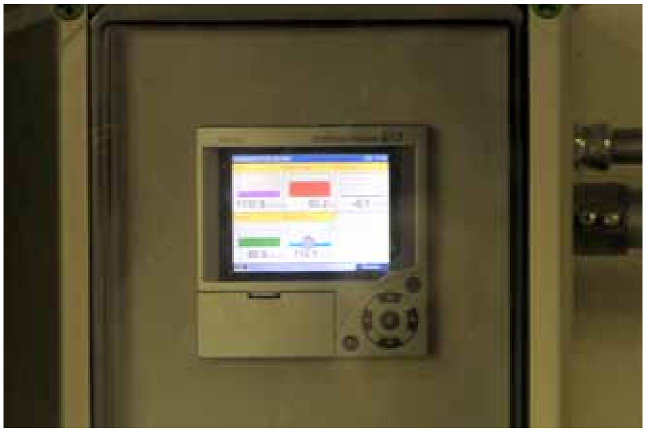
“Thermal mass flowmeters are great for measuring dry gas flows, but not the kind of wet, dirty biogas we get from our anaerobic digesters,” he says. In fact, the plant’s biogas could cause condensation on a thermal mass flowmeter’s two sensors, which measure the flow rate by monitoring the cooling differential between the temperature sensor that’s heated and the other that’s not.

Condensation on the sensors, in turn, could cause inaccurate readings. In addition, the condensation coupled with trace acid vapor and particulate matter could foul and corrode a thermal mass flowmeter’s sensors, requiring periodic maintenance and eventually replacement.

“We also needed more data from our gas flow,” Gerberich says. “I really wanted a way to measure temperature and methane fraction in real time, so we could dispense with lab testing, which took us so much time.”

Then he learned about the Endress+Hauser Proline Prosonic Flow B 200. It’s an ultrasonic flow measuring system specifically designed for his type of application — real-time monitoring of wet, dirty biogas with a variable composition and low flow and pressure. In addition, it features:

- Greater accuracy: ±1.5 percent of reading flow accuracy independent of gas composition
- Continuous calculation: Methane fraction, calorific value, and energy flow
- Maintenance-free: Robust, with no moving parts and “self-cleaning” ultrasonic sensors
- No pressure loss: Flowmeter is obstruction-free
- Energy-efficient: Low energy consumption with two-wire (loop-powered) device
- Flexible and easy to install: Versatile mounting by means of lap joint flanges



Results **Precision Biogas Process Control With $72,500 In Annual Cost Savings.**

With the Proline Prosonic Flow B 200 ultrasonic meter, the plant's operators get real-time measures of the digesters' biogas flow, temperature, and, most importantly, methane fraction. By monitoring the set points of this data in real time, technicians can adjust the sludge they feed the digesters much more precisely—without waiting hours for the lab's test results.

Gerberich figures that by saving hours in sampling and lab testing time, the plant's labor savings are approximately $20,000 a year. That's time the technicians can devote to other tasks. In addition, because the B 200 helps them better gauge and control the methane fraction, corrosion and wear and tear on the boilers is less, so the plant has been able to cut tear-down maintenance in half, saving another $15,000 a year.

The biggest savings, however, come from minimizing, if not eliminating, the need for external natural gas to fuel the boilers. Before, the plant would have to supplement its methane fuel in cold winter months at a cost averaging $37,500 a year.

With total annual savings of $72,500 a year, Gerberich says the B 200 paid for itself several times over in its first year. "The Proline Prosonic Flow B 200 from Endress+Hauser might at first seem expensive," he said, "but with the savings it can generate, it's really a no-brainer."

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