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JULY 2015

Tech Talk:
Unraveling a mystery
around CBOD readings

PAGE 32

Clearly in *Control*

**FRANK MILLER AND HIS TEAM MEET
CHALLENGES WITH PROCESS ENHANCEMENTS
AND EXTENSIVE AUTOMATION**

PAGE 44

In My Words:
Nutrient trading in
North Carolina

PAGE 50

Frank Miller
Water Utility Superintendent
Cudahy, Wis.

Technology Deep Dive:
A new generation of drives

PAGE 34

Target: Self-Sufficiency

ITHACA'S CLEAN-WATER PLANT HAS BOOSTED BIOGAS PRODUCTION AND ENERGY GENERATION IN A PROJECT THAT WILL YIELD \$9 MILLION IN GUARANTEED SAVINGS OVER A 20-YEAR CONTRACT

By Doug Day

The Ithaca (New York) Area Wastewater Treatment Facility now generates nearly half its electricity on site, and the plant team hopes a new biogas system can eventually meet most if not all power needs.

The plant (13 mgd design, 7 mgd average) has used biogas generation since it went online in 1987, says Dan Ramer, chief operator. It serves a population of 40,000 in Ithaca and two neighboring townships. In 2011, the plant team chose Johnson Controls for a performance contract to upgrade the biogas system and replace the generation system to improve efficiency and sustainability. The project went online in 2013.

In a performance contract, efficiency measures are installed and then paid for over time from contractually guaranteed energy savings. Ithaca's performance contract for the treatment plant included \$8.2 million in projects and guarantees \$9 million in savings over 20 years.

"We replaced our digester mixing system, added biogas storage and a new gas cleanup system (Unison Solutions), and replaced the original cogeneration engines with microturbines," says Ramer. The engines had a total 200 kW capacity; the four 65 kW Capstone microturbines increased the on-site generating capacity to 260 kW.

Keeping with the theme of sustainability, the old engines were repurposed rather than scrapped. An area farmer bought them for use with his manure digester. "He's probably going to get another 10 years out of them and didn't have to spend a lot of money — around \$7,000," says Ramer. "And it saved me all the labor of trying to scrap them and paying someone to haul them away."

BETTER GAS SYSTEM

While the microturbines produce cleaner power, Ramer says what the plant really needed was improved digester mixing to improve treatment and biogas generation. A rotary lance system was replaced with a linear motion

The 35,000-cubic-foot Ovivo Ultrastore membrane gas storage system ensures a good supply of biogas and maintains the proper pressure.



A new Unison gas cleanup skid protects the equipment from siloxanes and condensation.



Two 1987-era engines were replaced by four energy-efficient Capstone microturbines.

DOWN WITH PHOSPHORUS

A performance contract to improve sustainability at the Ithaca Area Wastewater Treatment Facility follows a 2006 plant renovation aimed at cleaning up Cayuga Lake, the plant's receiving water.

The activated sludge secondary treatment system was updated to include tertiary treatment using the Actiflo ballasted clarification system (Veolia Water Technologies) for phosphorus removal.

The plant's phosphorus releases have been reduced from 33.7 to 11 pounds per day, helping to reduce levels in Cayuga Lake from 40 µg/L to 29 µg/L. This in turn reduced the plant's contribution to the lake's total phosphorus load from about 31 percent to about 10 percent.

The upgrade, along with improvements to the city's collections system, was funded with a \$25 million grant from New York's Clean Air – Clean Water Bond Act.

mixer (Ovivo). “We’re using less than 10 hp to mix 1.4 million gallons in the digester, so now we have a much better mix, and gas production is much more stable,” says Ramer.

Because the old biogas metering system was unreliable, Ramer doesn’t have good comparative data, but he does know the digester now consistently produces about 130,000 cubic feet of biogas per day for the microturbines and digester heating.

Gas is stored in a 35,000-cubic-foot Ultrastore dual-membrane gas holder (Ovivo), designed by Ecomembrane Environmental Technology. An inner membrane holds the gas, while an outer membrane is pressurized to maintain a constant system pressure.

The new digester configuration has improved the plant’s ability to treat trucked waste, for which the receiving facility was improved as part of the project. “The old receiving facility was a wooden pole barn,” says Ramer. “We put in a \$3 million high-bay facility with a third storage tank, a Honey Monster from JWC Environmental to remove gar-

NEW BIOSOLIDS SOLUTIONS

Biosolids handling has been on Ramer’s mind for a while. The 4,500 wet tons of biosolids produced every year are landfilled. It’s not the best option environmentally, and it’s expensive, since the nearest landfill is 60 miles away. “That’s our big hole, and we’re working on some things,” Ramer says. “We did a limited experimental land application of 90 wet tons of Class B biosolids in 2014. We took a very small step toward finding an alternative to landfilling.”

Other options include biodiesel production and enhanced treatment to create Class A biosolids that could be sold commercially. But the options are limited by the size of the plant: Biosolids volume is too small to make more complex solutions economical.

Whatever decision is made, it will be just another step for the Ithaca facility. Ramer would like to continue making sustainability improvements every year. **tpo**

“Hopefully I’ll have a new chapter to this story in 2015. If we can bring the food scraps in, we could become potentially 100 percent self-sufficient, or even have excess biogas that we can sell.”

DAN RAMER

bage and a Vaughan chopper recirculation pump system to mix the tanks. We’re grinding and separating out as much of the garbage as we can.”

The plant accepts about 500,000 gallons of trucked waste monthly: septage, grease trap waste, yogurt, whey, dairy processing waste, municipal biosolids and high-strength waste from an animal carcass digester at Cornell University. “We also added provisions to accept food scrap waste,” says Ramer. “We’re working with Cornell to have them haul their food waste here.”

ROOM FOR MORE GAS

The new digester equipment and biogas generation system provide up to 120,000 kWh per month, 40 percent of the plant’s electricity usage. New Turblex aeration blowers (Siemens Energy Inc.) and dissolved oxygen controls are being added to get that number up to 60 percent.

“Hopefully I’ll have a new chapter to this story in 2015,” says Ramer. “If we can bring the food scraps in, we could become potentially 100 percent self-sufficient, or even have excess biogas that we can sell. The reduction in aeration energy use makes it even more possible. We’re hoping to get to that point. It’s always a complicated process.”

Also on tap for 2015 is the replacement of the old, inefficient cable-drive bar screen system with modern equipment that will save energy and remove more debris. For biosolids dewatering, a new Volute Dewatering Press from PWTech will be added to supplement the single belt press now in use. The Volute press’s 10,000 hour service cycle will make taking the belt press out of service for maintenance much easier.