

A change in aeration equipment produces the biggest reduction in power use.

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Slow but Steady Wins the Energy Race

A SERIES OF INCREMENTAL EFFICIENCY IMPROVEMENTS ADD UP TO SUBSTANTIAL SAVINGS FOR A CLEAN-WATER PLANT IN NORTHEASTERN ILLINOIS

By Steve Lund

Cutting electricity usage in Gurnee has been a gradual process. Over time the results have been significant.

The savings have come without diminishing the plant's performance. In 2020, the Gurnee plant (23.9 mgd design, 14 mgd average) received a Gold award from the NACWA, its 18th Gold since 1990, to go with eight Silver and three Platinum awards.

"This is what we work for — zero violations on our permit," says Ted Sowa, manager of the plant in northeastern Illinois. "Now we're trying to reduce our energy costs associated with getting that. We're trying to get better at it, more efficient at it."

BETTER BLOWERS

The energy saving came from an upgrade of the aeration equipment, which included Sulzer HST high-efficiency blowers and membrane fine-bubble diffusers (Sanitaire, a Xylem brand). "We were just using a lot of energy for air," Sowa says. "I think we cut it down by about half."

The new equipment went online in February 2019, and the plant saw an average of 16.5% energy savings for the first two years, according to Steven Waters, director of engineering/special projects for the North Shore Water Reclamation District, which operates the plant. "One blower replaced several old blowers," Waters says. "These new turbo compressor blowers are just phenomenal as far as energy efficiency goes."

At the same time, the plant began biological phosphorus removal, reducing aeration requirements. The district, which also operates treatment plants in nearby Waukegan and Highland Park, converted all of them to biological phosphorus removal in 2017, anticipating effluent permit limits for phosphorus.

"We wanted to get ahead of the game and make sure we understood what was involved instead of just waiting for the permit and trying to do something," Waters says. "We've been working on phosphorus removal for several years. We implemented bio-p almost four years ago, and we just got our permit last year for Gurnee."

The biological process reduces aeration needs because it requires anoxic/anaerobic zones along with the aerated zones. "That contributed to our savings as well, since we need less air," Waters says. "Traditionally, the air would have been on in all of the aeration tanks. Now we actually turn off the air in two of the four passes."

“One blower replaced what was being done by several old blowers. These new turbo compressor blowers are just phenomenal as far as energy efficiency goes.”

STEVEN WATERS

LEDs AND VFDS

Another energy saver was a switch to LED lighting throughout the plant. "The other thing about LEDs is they last so long, so we don't have as much cost for replacements," Waters says. The plant also installed variable-frequency drives wherever possible; variable-frequency drives (VFDs) are included in the plant capital program for the plant every year.

"We're replacing constant-speed pumps with VFDs," Sowa says. "That way we can rotate them and put equal wear on all our pumps. We still use the same number of pumps, but they run more efficiently. It has spread out the operating time on the pumps."



The Gurnee wastewater treatment plant saves energy by operating its UV lamps one bank at a time and by changing the bulbs on a regular schedule (TrojanUV4000 disinfection system).

Another significant savings came from changes to the TrojanUV4000 disinfection system. “We figured out how to optimize it by not running both banks of lights,” Sowa says. “That shaved a lot of energy out of it.” In addition, the plant team began replacing the UV lamps more often, one entire bank at a time, on a schedule.

“I believe output keeps decreasing, even though the controls indicate the lamp is still on,” Sowa says. “By replacing them when the output starts to go down, we end up saving energy.”

UTILITY PARTNERS

Waters says energy efficiency is part of the culture for the entire district. Local utilities have helped. “The gas and electric companies make us aware of incentive programs,” Waters says. “They provide assistance in looking for ideas. We try to take advantage of that.”

The latest example is a heat-recovery project in the biosolids drying process. Years ago the district landfilled its biosolids; now the material is dewatered on gravity belt thickeners and belt presses and then dried into pellets on a site in nearby Zion. The pellets are delivered to area farmers for land application.

The plan is to capture and recycle heat from the dryer’s exhaust stack, with cost assistance from utility incentives. “We are looking to install an economizer that will save us close to \$25,000 a year,” Waters says. “With the incentives, we can recover part of the capital cost and lower the payback period to less than five years.”

The beneficial use of biosolids will continue, but it will be more efficient. That’s the way they do things in Gurnee. **tpo**



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