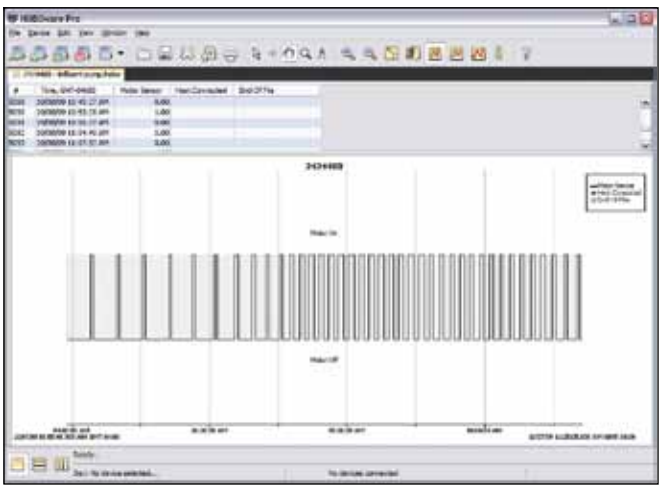
Data Loggers Gauge WASTEWATER PLANT'S MOTOR EFFICIENCY

Evan Lubofsky, Onset Computer Corporation

In keeping with a national push to bring greater energy efficiency to wastewater treatment plants, a Pennsylvania facility used data loggers to analyze motor utilization, a first step toward cutting energy costs and meeting environmental rules.

Upper Allen Township conducted an audit of motor run times on existing equipment at its wastewater facilities with data loggers manufactured by Massachusetts-based Onset Computer Corporation. The goal was to gather information that would help the facility choose new technologies and processes that reduce energy intensity and nutrient flow.



The *HOBOware* software system downloaded, graphed and analyzed the information gathered from the wastewater treatment plant's motors (All photos courtesy Onset Computer Corporation).

This article explains why the Cumberland County wastewater facility needed to improve its efficiency, and how its contractor, Reynolds Energy Services, employed data loggers to gather preliminary information.

Importance of Upgrades

The decision to improve the plant's efficiency reflects a national movement to reduce consumption at energy-hungry wastewater facilities. After labor, energy is the highest expense at the 15,000 publicly-owned wastewater treatment plants, which serve about 70 percent of the U.S. population, according to the Consortium for Energy Efficiency (CEE). The facilities account for as much as 35 percent of the energy used by some municipalities.

As a result, several towns and cities are directing funds from the American Recovery and Reinvestment Act (ARRA) toward wastewater treatment improvement. Upper Allen Township applied for a portion of the $2.2 million in ARRA funds received by Cumberland County, but the town was unsuccessful due to the overwhelming number of requests the county received for funding.

In addition to reducing energy, planned improvements at Upper Allen Township's Grantham wastewater treatment plant will help Pennsylvania meet federal standards estab-

Onset's HOBO U9 Motor On/Off data loggers were attached to the motors to conduct a detailed energy audit. The focus was on the aeration process, which is comprised of motors and fans and is the plant's biggest energy thief.

lished to protect the Chesapeake Bay. Located about two hours west of Philadelphia, the Upper Allen Township wastewater system daily treats between 500 and 700 thousand gallons of wastewater on average. The treatment plant was most recently expanded and upgraded in 1990 and uses a sequencing batch reactor system with aerobic digesters. The facility is scheduled for additional improvements in 2010–11 to meet anticipated changes to the National Pollutant Discharge Elimination System (NPDES) permit's requirements in connection with the Chesapeake Bay Tributary Strategy, which designates river-specific cleanup strategies needed to reduce the amount of nutrients and sediment flowing into the bay.

Streams in Cumberland County flow into the Susquehanna River, which in turn feeds into the Chesapeake Bay. The river has been deemed a major source of nitrogen, phosphorous and sediment found in the bay. As a result, the U.S. Environmental Protection Agency has devised a "pollution diet," known as a Total Maximum Daily Load (TMDL), intended to drive actions for cleaning local waters and the Chesapeake Bay. This policy requires Pennsylvania wastewater treatment plants to cap their nutrient flow into Susquehanna tributaries in order to win approval as permits come up for renewal.

Data Loggers Reveal Inefficiencies

Studies estimate that potential exists to reduce energy use 15 percent to 30 percent at U.S. wastewater plants. The extent of savings depends upon the facility size, type, technology and regional operating conditions. While motor replacement might reduce energy use about two percent, modifications in process control might cut consumption 30 percent, according to CEE.

The aeration process, which uses fans and motors, consumes the most energy. Gaining maximum efficiency in the aeration process is particularly important because it is a peak load operation, meaning the plant consumes large amounts of power when electricity prices are highest. Reynolds Energy Services, of Harrisburg, PA, conducted a detailed audit of the Upper Allen facility with an eye toward installing improved aeration technology that reduces energy use and meets environmental permitting requirements.

Equipment does not always perform as efficiently as manufacturers estimate for a variety of reasons. This is why the auditors attached Onset's HOBO U9 Motor On/Off data loggers on existing equipment at the treatment plant and pumping stations to "see how equipment is actually operating," says Michael Conchilla, Reynolds' project development manager.

The project focused on motor loads, particularly for the larger equipment—aerators and pumps at pumping stations. "We had a dozen different motors being logged," Conchilla says. "We were looking for runtime patterns, and how many hours per day they're being used. Many of the motors cycle on and off in small intervals. We wanted to see what those patterns are, what the collective hours are and extrapolate that out on an annual basis," he said.

Reynolds left the data loggers onsite for about four weeks.

continued

This was easy since the loggers are portable, rugged standalone devices that operate independent of any other apparatus or connection. The data loggers monitor the alternating current field generated by the motors.

"I got great results from tying the loggers to feeders in electrical cabinets rather than deploying them only on the motors. Some of the motor casings were too large to get a good field reading. I'll probably do this more in the future," Conchilla says.

After retrieving the data loggers, Reynolds downloaded the information and graphed and analyzed the data using *HOBOware* software, which allows quick information readout and plotting with export to spreadsheets.

"We needed to understand the run time patterns for each individual motor. If you can extrapolate that out for a year, you know how many kilowatt hours each motor is using," Conchilla says. "The township collects amp readings on a regular basis. This is used to estimate electrical draw on the motors. We use this and the runtime data to estimate actual kilowatt hour usage for each motor."

He added: "As long as you have the amperage data and run time, you can make the calculation. We used Microsoft Excel to do those calculations. I would export all the run time data from *HOBOware* to an Excel file, tabulate hours based on the period and extrapolate that out for the year."

Reynolds will use the information to help Upper Allen determine where upgrades to the system are necessary and where the expense can be avoided. After the new equipment is installed, the energy services company will continue to use data loggers to confirm results; a necessity because Reynolds is operating under an energy services performance contract.

Thanks to the data loggers, Upper Allen now can move forward with its efficiency improvements, assured that any guesswork has been removed. "You can't argue with the data," Conchilla says. "They tell you what's going on 24 hours a day."

For more information:

Onset Computer Corporation
470 MacArthur Blvd.
Bourne, MA 02532
Phone: (800) 564-4377 or
(508) 759-9500
Fax: (508) 759-9100
www.onsetcomp.com
sales@onsetcomp.com

Evan Lubofsky *is director of marketing for Onset. He has been writing about sensor technologies for over 12 years and has had hundreds of articles published in trade magazines and newspapers around the world.*

The data loggers were deployed on the motors (as pictured above), although some of the casings were too large to produce a good field reading, so they were also tied to feeders in the electrical cabinets.