

Vendor Synergy: Efficient Water and Wastewater Treatment in Effingham, Illinois

The sum of the parts can be greater than the whole... 1+1=3

Abstract

This case study documents how two vendors worked together with the City of Effingham to improve the design, operation and energy efficiency of its water and wastewater treatment facilities.



City of Effingham

The mission of the City of Effingham is to enhance the life of its residents and the regional community it serves by providing essential and efficient public services, by leading through a progressive and effective local government grounded by sound fiscal management, and by seizing opportunities for the community through aggressive economic development.

The Opportunity

Effingham was approached by the University of Illinois' Illinois Sustainable Technology Center (ISTC) to participate in a grant-funded, Illinois Conservation of Resources and Energy (ICORE) project. As a progressive community, Effingham routinely investigates energy efficiency opportunities within its departments and services. At this time, the City expressed interest in reducing energy consumption within its water and wastewater treatment facilities.

ISTC conducted an initial assessment of the water and waste water treatment facilities and distribution systems. ISTC hypothesized that significant energy savings were possible through improved process controls, involving variable frequency drives (VFDs) on select pumps and blowers. To facilitate this, a motor management expert (vendor) was needed to identify VFD feasibility, application, installation and setup. An ICORE vendor stakeholder performed a detailed system assessment.

This vendor identified 34 pumps where the introduction of VFDs would reduce energy consumption by 1,943,000 kWhs, saving \$128,238 annually. When Steve Miller, the City Engineer, reviewed the proposal, he was pleased but concerned. Unknown to the motor vendor, Effingham was also concurrently investigating inclusion of remote monitoring (SCADA) of the wastewater treatment processes with a process automations vendor. Miller wanted to ensure that the remote monitoring equipment and the VFDs would work together without interfering with each other. He wanted these two vendors, with differing expertise, to collaborate with the City.

The Solution

Although reluctant at first because of perceived competition in prior proposals and bids, the two vendors began working together for the benefit of their mutual client. They soon discovered that there were very few areas in which they competed. In fact, they complemented each other's services in many ways. By working together, they could develop more expansive, comprehensive systems than they could by working individually. They cooperated to achieve the goal of developing an automated system that controlled the flow of the pumps and blowers based

upon process monitors and sensors and remote monitoring equipment feedback, which would result in more efficient water and wastewater treatment systems.

An example of this synergy involved changing the way sampling was done in the wastewater treatment facility's oxidation ditches. The ditches are comprised of a series of troughs through which wastewater passes. Large aeration rotors provide air to the water to facilitate microbial growth and breakdown of organic materials. Previously, the level of dissolved oxygen (DO) was manually monitored several times a day. The operators would turn on the rotors to increase oxygen levels, many times this would result in over-oxygenating during the day or through the night, which wasted energy. Seasonal weather conditions also impacted DO levels in the water, resulting in both under-oxygenating and over-oxygenating conditions. Manually-controlled systems typically are labor intensive, are less efficient and more energy-wasteful since operators error on the side of over-oxygenation. Manual sampling is static and not real-time. Information is only as accurate as the last sampling.



Figure 1 : Oxidation ditch with aerators in background

To overcome this inefficiency, improve operational processes, and reduce energy consumption, sampling needed to be automated and the DO probes needed to interface with the aerators remotely via the SCADA system to provide the appropriate oxygen levels 24/7, year- round.

The two vendors combined their resources and technical expertise to devise an operational system. The speed of the electric motors, which turn the aeration rotors, is controlled by VFDs based on inputs received from DO probes installed in the aeration ditches, communicated via SCADA. Because these motors have the real-time ability to turn at slower speeds when lower dissolved oxygen levels are required, the system uses less electricity and improves process control. The aeration process is also more efficient because manual sampling is eliminated, freeing up operators for other duties.

For More Information

Additional ISTC fact sheets covering energy efficiency, water conservation, and pollution prevention are available at www.istc.illinois.edu. You may also contact:

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Steve Miller, City Engineer
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