streamlining with SCADA

Illinois town plagued by chronic I&I finds benefits in its new preventative maintenance tool

By Steve London

Granite City, Ill., recently joined the increasing number of municipalities that have invested in SCADA technology to more effectively manage their community wastewater systems. Improvements in the hardware and software have advanced the technology's capabilities far beyond the limits of first-generation control systems that reached the market in the 1960s and 70s.

In the case of Granite City, the integrated hardware/software and wireless communications applied to the SCADA controlling the town's 24 lift stations will deliver the power, adaptability and ease of use sought to address a number of issues confronting the local public works department. Located approximately 10 miles from downtown St. Louis, on the Illinois side of the Mississippi River, the town's once predominant steel industry became the cornerstone for a now broader industrial base. Many residents also make the daily commute to and from the widely diversified employment opportunities at Missouri-side businesses.

I&I Issues

As is the case with many mature towns with older segments of sewer system, Granite City has stretches within the 19 sq miles of collection that fall short of current design practice. The 200 miles of 8-in. lines, force mains and up to 108-in. trunks comprise the collection system, which includes a high percentage of combined sanitary and storm water sewers. It comes as no surprise, therefore, that chronic inflow and infiltration (I&I) occur despite an ongoing relining program. In addition to routine monitoring and control, the SCADA could help identify and respond to segments with the most chronic I&I during storm events.

"I envision the SCADA as an important tool not only in the operation of the lift stations but in their preventive maintenance program," said Rick Fancher, public works director. "The long-term efficiency improvements and potential savings helped us to justify the investment to our mayor, Ed Hagnauer, and the other elected officials. Some 40% of system, or roughly 100 miles, are concentrated in towns where many are 60 to 100 years old. The SCADA will help us identify immediate problems at pump stations and to prioritize the worst areas thereafter for relining."

I&I presents similar problems in many communities with combined collection infrastructure. In the nation's heartlands, dual collection lines often create unnecessarily high flows to treatment plants during heavy rainfall, according to Fancher. Occasional winter ice storms also can cause power outages due to the vulnerability of the mostly aerial electric distribution grid.

High incidental flows caused by I&I can affect not only individual pump stations but also inevitably reach the 23.5-million-gal-per-day (mgd) regional treatment plant operated by the city. The plant presently handles peak flows up to 34.5 mgd using two 8-million gal concrete retention structures as backup to hold excess inflow until controlled release later into the activated sludge process chain.

"We've had the capacity to handle the overflow when it arrives, but the SCADA will give us a better handle on just when those flows are anticipated so we can handle them the most efficiently," said Terry Kelahan, treatment plant supervisor.

The Typical SCADA Candidate

Granite City presents a typical modern-day SCADA candidate. The Granite City Public Works Department has a small workforce, and opportunities exist for improving manpower efficiency by adopting technology or better equipment. Planning for the SCADA lasted nearly four years to ensure the municipality fully understood the market's offerings and to identify a system "giving the most bang for the buck," Fancher said. Prior to committing to the new SCADA, the city's lift stations had 24 control panels of mixed vintage by different manufacturers; the department wanted standardization. In the past, an outsourced alarm-monitoring service would notify police dispatchers who would then call out the assigned department personnel during off hours.

"The dispatch method didn't work very well," Fancher said. "At that point, we had no way of determining the nature of a pump failure, so the only alternative was to send out two men to the pump site. When it was after hours, the city incurred $240 in the guaranteed four hours of pay at a time-and-a-half rate. We also experienced frequent false alarms, sometimes every other day."

"On a more routine basis, it would take two of our men three or four days to make the full round of onsite inspections of our pump stations," Fancher added. "Given the man-hour costs and a monitoring service contract that ran $20 every month per station, it wasn't difficult to cost-justify SCADA to Mayor Hagnauer and the aldermen. Once we have our entire system connected, we can eliminate or cut in half the monitoring services because we can then self-monitor the network of pumps and remotely troubleshoot the problems. I can even foresee the SCADA increasing our equipment life by improving our preventive maintenance schedules."

A Mission-Specific System

After evaluations, Granite City selected the ITT Flygt FMC pump controller system with AquaView operating software that communicates via wireless telemetry. Vandevanter Engineering, an integrated provider of pumps and support systems based in Fenton, Mo., recommended this SCADA to Granite City because it was developed specifically for pump station control. The city's network of lift stations includes 3-, 5-, 10- and 20-hp pumps, including three dry-pit facilities—one whose pit and wet well are offset under a busy street. The department acquired a new off-the-shelf PC to control the system, although the software does not absorb its total capacity.

After modest training, department personnel can master the AquaView software's comprehensive features because of its easily interpreted touch-screen menu. Furthermore, public works personnel can modify the system without contracting with an outside programmer for any changes, and the system

architecture will readily handle the 40-plus lift stations anticipated with the community's growth.

The complete system, including new and existing remote telemetry units (RTUs), should be in place this year. In some instances, the upgrade also converted single-phase to three-phase power. The department can then fully access a wide variety of remote control over pump functions, diagnostic and report capabilities. Fancher is already confident that procurement of the high-tech system will produce immediate efficiency improvements in man hours committed to routine and emergency service calls. Other operational costs should decline by achieving stable, low-level pump operations.

The distributed system's RTUs at each duplex site will provide precise level measurements via onsite sensors. This enables accurate calculation of incoming and outgoing flow volumes between stations and station capacity. The department can interrupt the flow into a failed station by blocking an upline station and temporarily holding it in the collection lines. Another feature can reduce energy consumption at each site by adjusting the run times.

The user-friendly central station will display in real time the status for each station in simple graphic representations and generate cumulative reports for designated periods. Meanwhile, a redundant log stored in the panel at each site holds an archive of up to 1,000 alarms by date and time for service personnel reference. The operator at the central station also has notification whenever personnel are working at a station.

Collectively, the remote control over such a broad array of pump functions and operational events should reduce the need for station maintenance, including random pump starts and flushing to avoid blockages, and lead to better allocation of resources, according to Fancher. In Granite City's case, public works staff based the investment in this state-of-the-art SCADA on numerous long-term benefits. WWD

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