

High Tech in the Low Country

By John Collings

Mixing cellular and traditional SCADA reduces operations costs and improves environmental protection



Area utilities in Beaufort, S.C., are provided primarily by the Beaufort Jasper Water and Sewer Authority (BJWSA). The authority's service area includes Beaufort and Jasper counties, which encompass more than 1,200 sq miles and 125,000 customers of their own, plus a number of other utilities within the counties.

ARTICLE SUMMARY

Challenge: Beaufort, S.C.'s water and sewer authority knew it needed SCADA to keep up with expansion and regulations, but it needed to implement the technology cost-effectively.

Solution: Working with Mission Communications to obtain a tailored, cost-effective cellular SCADA system, the authority agreed to purchase 154 units of cellular RTUs at a low cost.

Conclusion: The units have been deployed for a year with minimal failures and have provided the authority better monitoring capabilities to detect little problems before they become big.

This quiet, historic area seems an unlikely place for a five-year-long search for cutting-edge SCADA technologies. BJWSA knew it could reduce increasing fuel, field and administrative costs while ensuring the safety of customers and the environment with SCADA. The question was, could it be done at a price the utility could live with—up front and over 20 years?

The Traditional SCADA Dilemma

More than 20 years ago, BJWSA implemented a complex control system for its water production plants and distribution system. Work on the massive wastewater collection system started with major interceptor pump stations that vary their speed to better regulate flow to the wastewater treatment plants. BJWSA had to balance the substantial increase in land development with the rightful state mandates to reduce the

number of septic tanks. To address these issues, the utility built hundreds of miles of sewer lines and installed hundreds of wastewater pump stations.

On major wastewater pumping stations, BJWSA installed full-featured PLCs with licensed and spread-spectrum radios. The wastewater remote SCADA sites piggybacked on the water system SCADA backbone, as its footprint tended to reflect the needs of the wastewater master stations. As development increased, so did the U.S. Environmental Protection Agency's (EPA) guidelines for unauthorized discharges. This mandated more inspections and maintenance, which increased administrative and field labor expenses.

Remote site SCADA provided an answer, but at a significant cost. The geography of the South Carolina coastal area is conducive to traditional SCADA private radio networks; it is flat, and radio

coverage could be achieved without too many excessively large antenna poles and repeaters. The problem was the upfront and ongoing expense. BJWSA had multiple vendors bidding, so prices were competitive, but designing, building and maintaining a private radio network with radios, PLCs, power supplies, installation and maintenance was expensive.

Analyzing Risks & Rewards

BJWSA set out to quantify the value of SCADA automation on all its lift stations and other remote sites. What the authority suspected intuitively proved elusive to quantify financially: Lower flow sites just did not warrant the investment. BJWSA made a list of deliverables for the SCADA project: lower catastrophic failure costs; prolonged equipment life; lower EPA fines; reduced or eliminated unauthorized discharges from pumping stations; reduced field maintenance labor costs; reduced compliance administration costs; provided collection system flow data; backward compatibility with existing SCADA; predictable ongoing operations costs; long-term vendor relationship; and open architecture.

The ongoing cost of inspections also was high, with field personnel spending a lot of time driving to and from inspections. BJWSA estimated the average cost of inspecting a site to be \$12 to \$15, or more if the inspection was not routine. South Carolina regulations recommend daily inspections. With SCADA, the recommendations dropped to weekly, as real-time SCADA essentially allows for automatic and continuous verification of pump station operations. With a predicted 450 lift stations by 2010, the savings on inspections alone became compelling.

"Without a full SCADA deployment, we were looking at tripling the size of our field operations team in five years. That alone would cost more than the traditional SCADA system" said Joe DeVito, director of field operations.

BJWSA General Manager Dean Moss dictated that the utility would use technology to address the operational efficiencies needed by the expanding system, but this mandate did not exclude people; it dictated that the right kind of people be hired to implement and maintain the

SCADA system. Additionally, most utilities do not budget for the ongoing expense of keeping the system running.

"On average, 1% to 2% of a system's sites have an RTU [remote telemetry unit], network or sensor failure every month. If you don't keep up with that, pretty soon the operators either don't have or don't trust the data, and you might as well turn the whole thing off because you'll be back to manual operations," Moss said.

Exploring the Options

In 2002, cellular-based SCADA was emerging, but traditional private radio-based remote SCADA was still the tried and true communications backbone for the water utility industry. BJWSA requested bids for bulk installation of approximately 200 RTUs using traditional SCADA methods. The estimates came in at about \$2.5 million and required an 18- to 24-month deployment. Additionally, the traditional methodology meant using numerous 40- to 60-ft antenna masts in high-end residential areas and the need for two or three more full-time technicians to maintain the network and equipment.

BJWSA has 12 wastewater treatment facilities. Regional master stations pace the flow to the facilities by means of variable frequency drive pumps. These need continuous monitoring and control and their status must be visible to numerous facilities, as flow can be diverted to alternate treatment plants. These stations were mandated to have continuous traditional SCADA monitoring and controls, but the remaining stations did not demand the same level of performance.

It was determined that the utility needed real-time data on flow, levels and pump status from the master lift stations, but only needed alarms and general station operation verification from the bulk of the regular lift stations. The deployment price for the master and regular stations was high given their data needs. BJWSA considered developing its own SCADA RTUs, but in the end, the effort would still be a temporary project and would require the addition of numerous electronics technicians plus UL listings for the assembly process.

Testing the Options

In late 2004, BJWSA started evaluating various cellular-based SCADA systems. The first to be installed was a system from Mission Communications. Over recent years, Mission had pioneered the cellular-to-Web SCADA concept in the water industry. A close neighbor to BJWSA, Hilton Head Public Service District One had recently deployed almost 100 of the Mission RTUs on its lift stations, and the system appeared to be working well. BJWSA ordered 30 Mission RTUs to begin its own test of concept for its master and regular lift stations.

While tests proved successful for regular pump stations, it became apparent that the use of two separate systems was cumbersome. Additionally, the Mission RTU did not provide the amount of data that was needed for the master stations. A local cellular carrier offered the utility a flat \$10-per-month unlimited data usage plan. In conjunction with a local system integrator, the utility deployed a dozen or so cellular-based traditional RTUs. While the basic system worked, BJWSA discovered that the traditional RTU cost was not reduced much by switching to cellular.

In late 2005, yet another cellular-to-Web system provider began tests with BJWSA. The utility felt that multiple vendors would only help to bring down deployment and ongoing costs. The other cellular RTU provider's system primarily worked but had the same shortcomings of being separate and not providing enough data for the master stations. Shortly thereafter, Mission proposed two improvements to accommodate the utility's issues with separate systems and inadequate master station data.

Mission proposed producing a direct data link from its system to the existing BJWSA SCADA system. Mission produced and deployed an OPC-compliant software program that allowed the utility to receive real-time Mission RTU data. The utility then simply linked the RTUs data tags to its existing SCADA screens. With this advancement, the cellular system and traditional system were married. The next development was to increase the data throughput for the cellular RTU so that it could reliably send near-continuous data from the master stations.

In the end, Mission proved to BJWSA

that cellular provided all the data the traditional private radio RTUs did at a fraction of the cost while maintaining a greater than 99.5% connectivity rate throughout the year. A 154-unit deployment was budgeted for 2008 at approximately one-tenth the cost of the original 2003 traditional SCADA quotes.

Ongoing Maintenance

The cellular SCADA RTUs have been operating for more than a year. The weekly average connectivity is more than 99.8% systemwide. The entire SCADA system (water and wastewater, traditional and cellular) is maintained by the same two field instrumentation technicians and full-time software contractor used prior to the addition of the Mission units. BJWSA has a contract with a local system integrator for maintenance of the traditional radio network and RTUs. Less than five cellular RTUs have failed since installation, and most failures are attributed to near or direct lightning strikes at the station.

"The increased monitoring of pump station performance has revealed dozens of problems, yet these problems were addressed before they became catastrophic failures and mostly resolved during normal maintenance visits," DeVito said. "The diagnostics these systems provide are really quite remarkable. We typically know what the problem is before we get to the site. I couldn't begin to guess at how many man hours that's saved us." **WWD**

John Collings is president of Mission Communications. Collings can be reached at 678.969.0021 or by e-mail at johnc@123mc.com.

WATER & WASTES DIGEST

© Copyrighted
Scranton Gillette Communication, Inc.
Reprinted with permission from
Water & Wastes Digest, February 2010

10070

MISSION SCADA Systems COMMUNICATIONS

SCADA - For Less Than An Autodialer

- Get more than just alarms
- Runtimes, Starts, Pressures, Flows
- Web access alarm response, call out lists, even records alarm call!
- Less than phone lines, yet get full SCADA
- Fully supervised every 2 minutes (M-800) or every hour (M-110)
- Call one number, get status for ALL units. Easier!

M-110

- Alarms
- Runtimes
- Diagnostics

M-800

- All 110 Features
- Runtimes Pump Run Status
- Live Level, Pressure, Chlorine, Etc.

M-80

- Alarms
- Battery Powered, 5 + Years
- Waterproof - Ideal for Manholes and Storm Drains



(877) 993-1911 • www.123mc.com

MISSION

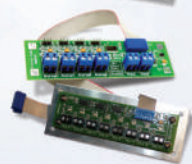
2010



M-8
Ultra low cost SCADA for residential grinder market



2nd Gen Wet Well Module
Reliable high level alarm and pump run sensing. Class 1, Div 2



Analog and Digital Expansion Boards
Up to 6 analog or 16 digital inputs



2nd Gen M-80
+5 year battery. High level flood alarms



Accessories
Single point of responsibility



M-800
Real-Time system



M-110
Wireless monitoring and alarm system



M-100 RTU
First to utilize cellular for water/wastewater industry

1999

Software as Service - Continuous Real-Time Enhancements



Voice SCADA
Simply call it up!



1000th Customer
Customer and tech support doubled

Volumetric Flow Calculations

Tank and Well Controller
Web set levels, controls wells, no infrastructure to maintain



SmartPhone Support
Mission in the palm of your hand



Interactive Map
See all levels and pump run status on one map



Intertie Site-to-Site Control of Relays

Real-Time Viewer
First to continuously stream data

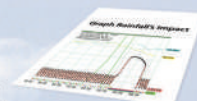


Run-Time Variance
Auto analysis of pump run-time variance



OPC Support
Data links to custom SCADA HMI

SuperGraph
Incredible diagnostic tool



Mission Management
Pioneers cellular transport technologies with Bell South

(877) 993-1911 • www.123mc.com