

# From Chart Recorders to SCADA

South Carolina city finds value in a unified power and automation system offering.

By Grant Van Hemert

**L**ike many small suburban communities, Easley, SC, experienced steady population growth from 1970 to 2005. By 2004, the city had seen a 67 percent increase in its residents, bringing the total population to more than 18,500 people. In addition to serving the residents of Easley, the city's utility company, Easley Combined Utilities (ECU), also supplied

water to four neighboring water districts, which accounted for about 46 percent of water sales by volume in fiscal year 2006. The bottom line for Easley was that more people meant more water.

In 1970, ECU commissioned a nine-mgd water treatment facility—the Don L. Moore water treatment plant. After 35 years without an upgrade, the city also wanted to make some changes. According to ECU, providing a reliable source of water to its residents and the four area districts was crucial in the decision to expand the existing plant. Not only did ECU need more capacity, it also wanted more accurate data and its equipment to be more accessible. The water treatment plant has five operators. With the plant having to run 24 hours per day, seven days per week, many times there was only one operator per shift. Due to this situation, ECU sought improved monitoring capability.

Knowing it needed to expand and upgrade, ECU embarked on a 20 month-expansion plan to upgrade its facility to 12-mgd and bring the plant from being completely manual to fully automated. The utility also replaced much of its electrical distribution equipment. Using a prequalification process, ECU turned to M/R Systems ([www.mrsystems.com](http://www.mrsystems.com)), an instrumentation and control system integrator with extensive experience in the water and wastewater industries, for an integrated automation and control and power distribution solution. M/R Systems provides state-of-the-art open instrumentation and control systems using off-the-shelf components and industrial monitoring and control software. The company collaborated closely with Design South Professionals

([www.dsouth.com](http://www.dsouth.com)), the consulting engineering firm that designed the system, to provide ECU with a unified, open, and commercially available solution.

## Going Automated

Utilizing a collaborative process, Design South and M/R Systems recommended ECU install a supervisory control and data acquisition (SCADA) system to automate its process for measuring, monitoring, and controlling its water system. Previously, ECU used chart recorders to gather information and manually analyzed it. M/R Systems proposed a control system based on the Telemecanique® brand Modicon® Quantum™ programmable logic controller (PLC) from Schneider Electric ([www.schneider-electric.com](http://www.schneider-electric.com)). The PLCs were programmed with the Concept™ line of development software and were installed throughout the plant to control a variety of processes, including chemical feed, rapid mixing, raw water, finished water, and filters. The easy-to-use Concept software allowed M/R Systems to modularize and repeat some of the programming amongst the PLCs. With PLCs gathering information and a SCADA system analyzing it, the ECU operators have more accurate, up-to-the-minute information that affords them more overall system knowledge and tighter control capability.

“With the automated system, if we have a problem with a chemical feed, a pump, anything, we have almost immediate acknowledgement of it,” said Tate Davis, water plant superintendent, ECU.



*This is a typical Modicon Quantum programmable logic controller (PLC)-based main control system panel. Each control panel has a SCADA terminal inside for local viewing of all data points.*



*This is a sedimentation control panel. The smaller compact Modicon 948 PLC allowed the filter supplier to save cost while still being able to connect to the plant network.*

“Before, we had to run hourly manual checks on everything, including the water itself, and it could be two to three hours before we would catch a problem. We spend a lot less time physically checking on the equipment, monitoring tank levels, or calculating chemicals pumped. Now, the SCADA system tells us all of that.”

To maximize ECU’s use of the SCADA system, M/R Systems installed thin-client, touch screen control panels throughout the plant, allowing operators full access to the SCADA system. ECU personnel interface with the system through the open architecture graphic touch screen terminals. An operator is never far from a control screen and the system, therefore, if an alarm goes off, the operator can respond immediately by easily accessing the system no matter what his location in the plant. All screens in the plant are identical to the one in the control room and allow the operator to perform all the same functions. With a 20-acre plant and a small staff, it was essential for ECU to have constant access to the control system without dedicating an operator to the control room at all times.

The SCADA system also is connected to six remote telemetry unit (RTU) stations that monitor the water distribution network, providing the operators further access to the control system. As is the case with most RTU stations, the Easley units were unmanned. The SCADA system, however, allows the operators to monitor

the activities at the RTUs without visiting them.

The upgraded plant also contains one self-healing fiber optic Ethernet ring network where all of the automation equipment resides, including the SCADA system, PLCs, and an in-plant camera network. The five Ethernet cameras are scattered around the entire treatment plant and allow operators to visually observe everything going on without leaving the control room. The Ethernet ring is able to house all of the equipment, including the cameras, without any bandwidth or communication issues.

In addition, ECU staff can remotely monitor the plant thanks to integration with the Internet through a virtual private network (VPN). A VPN connection creates a secure communication tunnel

through the Internet, allowing operators to access and adjust parameters in the site remotely without exposing the plant to harmful viruses and hacker attacks. In addition, it allows the city to properly monitor all aspects of the plant via both data and visual means by way of a remote location. In addition, the VPN network allows the system integrator to inspect the system before sending a technician to the site for service. Often times, an inspection remotely can solve the problem and prevent the need to send someone. Fewer trips to the facility saves the city maintenance costs and overtime charges by city personnel.

It was especially important to Easley that its automation and control solution be open. M/R Systems felt comfortable recommending a Schneider Electric automation and control system because it was a non-proprietary, open solution with open Ethernet protocols. Special drivers and proprietary software are not needed to see system information. For ECU, complete access to all plant information is easily accessible through off-the-shelf software packages.

## Reliable Power Distribution

ECU also elected to use Square D® brand power distribution equipment from Schneider Electric, ensuring seamless, open communication and system compatibility both now and during future upgrades.

The utility used Square D power distribution products in the plant when it was first built and was pleased with the



*This is how the plant looked prior to the upgrade.*



*These are distribution water pumps controlled by Square D Model 6 motor control centers.*

products' reliability, functionality, and performance. After M/R Systems recommended a Schneider Electric automation and control solution, it made even more sense to have one company offering a unified solution.

The raw water building contains Square D QED switchgear, three Class 8839 drives with Altivar® 58 technology, and a Model 6 motor control center (MCC). The QED switchgear sends power to the four drives, the MCC, and the Square D transformer used to derive 120VAC for the Square D panelboard. The panelboard provides protection for the PLC panel, instruments, and general building power. The drives are used for the four raw water pumps that bring water from the nearby river.

"Using the variable speed drives for our raw water intake is especially valuable because it allows us to control the flow without having to completely start up and shut down a pump every time we need to change loads," said Davis. "We change the plant load about three to four times per day. Now, we can just rotate the speed to accommodate the flow required and we let the system run. This equates to a tremendous time savings in not having to start up and shut down the plant."

The access corridor next to the floccu-

lators consists of Square D QED switchgear that distributes power to two of the company's Model 6 MCCs, and a transformer. Each MCC is located inside a rainproof enclosure. The MCCs house the flocculation drives, unit heaters, and other small motors located in the area. The transformer supplies power to the panelboard. This panelboard provides protection to the lights, instruments, and PLC in the area. The company's safety switches are used throughout the plant for the local disconnect stations when maintenance is required.

## A Unified System

M/R Systems found that the integration of the automation and control and power distribution systems went smoothly and provided a highly coordinated solution that was easy to use. ECU finds great value in having a single manufacturer's equipment for the automation and power distribution systems. Not only has the solution proven to be reliable and user-friendly, but the unified system also is easier to troubleshoot and maintain. More importantly, when support is needed for either system, ECU operators only need to make one call for service.

Easley is assured future cost savings

since both systems are completely open and compatible, ensuring future upgrades will be just as seamless. In addition, all of the equipment communicates openly with other vendors' equipment.

ECU completed its plant upgrade in July 2005. The utility now can properly monitor all aspects of its plant via both data and visual means. The switch to automation also helped Easley handle the plant's increased capacity without needing to hire additional staff, saving the community money. ECU also is saving material costs and realizing electricity savings since it now has the ability to optimize its chemical usage and take advantage of off-peak electricity hours. The utility also has increased its water quality by more than 50 percent thanks to the automated system's tighter control capabilities.

Construction on the second phase of the Don L. Moore water treatment plant expansion is already underway. ECU is expanding the facility to 24 mgd with



*This is a view of a SCADA system in the control room overlooking the sedimentation basins. The SCADA system allows operators a full view into the process. SCADA stations are located throughout the facility for easy access.*

completion expected this year. Current projects underway include a five-MG ground level storage tank and a one-MG elevated storage tank that will provide water for generations to come.



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