



Carefully selected locations for remote terminal units are important to the design of a wireless SCADA system.



Wireless SCADA enables control of widely scattered field sites without the costs and limitations of hardwired systems.

Over the Airwaves

Wireless data radio SCADA solutions can offer the advantages of cost savings, flexibility, and reliable, robust performance

BY DANIEL G. STEELE

Water system operators have challenging roles, especially since they work daily with our most critical and valuable resource. Operators must efficiently maintain all system components (source, treatment, storage, and distribution), while complying with all regulations and sustaining relationships with customers, government officials and organization decision makers.

They must also protect critical systems from natural disaster and security threats — all in a day’s work. As part of this, operators need reliable and secure communications technology to get timely and accurate data from numerous input/output (I/O) points scattered throughout a large and often diverse topographical area.

In a time when many water utilities are expected to do more with less, wireless data radio SCADA solutions can offer compelling benefits.

Greater expectations

Many water systems have had to broaden the areas in which they gather and distribute water. At the same time, especially in growing communities, operators must meet higher service demands and stricter regulations with shrinking budgets and smaller staffs.

While many utilities have seen the need for electronic data gathering, until now it has been considered more a want than a need. Several years ago, there were few choices for data gathering and recording. Water system operators had to use a “fits all” unit with set parameters and make their systems adapt to the technology of the day.

Now, a wide variety of equipment is available, including wireless I/O data radios and several Ethernet radio options that have built-in terminal servers to render serial data solutions of varying levels, and to integrate older legacy radio devices into the SCADA network.

Radio communications and their advanced flexibility offer technological benefits in new SCADA deployments and also provide a means to upgrade performance in existing SCADA systems. In the water industry, where treatment plants, lift stations and distribution lines must be built to accommodate growth, more spread spectrum SCADA solutions are deployed each year to help monitor and manage critical infrastructure.

Why wireless?

There are good reasons why wireless data radio SCADA solutions are growing for the water industry. Among the benefits:

- The limitations and cost of wired systems can be eliminated. Improved radio technologies now allow for innovative control and monitoring of SCADA systems, enabling users to monitor and control devices more reliably from a distance.
- Wells, lift stations, storage tanks and other points within a system can be brought to end users’ fingertips without the expense of running wire or fiber.
- Licensed and unlicensed radios can work in coordination, providing speed and security to build robust, professionally designed SCADA networks.
- The addition of radio communications to field-installed devices or newly deployed systems with RF can prolong the usefulness of existing equipment and ensure years of reliable SCADA network operations.
- Radio communications offer the flexibility to expand communications to serve fast-growing, high-data-service areas and SCADA operations.

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Knowing the basics

Whether implementing a new radio SCADA or upgrading an older system, operators need to consider equipment options, among them programmable logic controllers (PLCs), remote terminal units (RTUs) and new radios that might be faster or have Ethernet ports for TCP/IP-based networks. Some operators may understand all the equipment and planning details, while others might need guidance. Much has changed over the years and, in some ways, much has stayed the same. Here are some ideas to consider in deploying a radio communications network:

Network types. Available networks include point-to-point, point-to-multipoint, backhaul, tail-end link and extension, point-to-multipoint with repeaters (serial or parallel) and hybrid networks that may have several types of communication devices: cellular, serial, Ethernet, I/O, and maybe wire replacement or Modbus.

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Site survey. Perform a site survey and a computer-aided network path profile analysis to make sure all the sites will be able to communicate to each other. Do a network plan and design to make sure current and future needs will be met, and perform field tests to identify potential problem sites. Will there need to be tower work or other site work to accommodate the radio and RTU needs? Tower work may require soil testing and permits. If leasing existing tower space, the leases and legal documents will need to be completed.

Choosing the system. Determine what type of system to deploy, what type of RTUs or PLCs will be used, and whether they will be updated. Will the connection speed and data interface change? What type of SCADA polling software will be used, and where will the polling computer reside? Will there be IP cameras for security? If bandwidth requirements demand more speed, will higher-speed microwave technology be required?

Installation. How will the radio SCADA system be installed? By system operators or by contractors? Will the project require civil engineering, site inspections and bid documents? Who will do preventive maintenance and emergency repairs? What training and education will be required to ensure that the SCADA system will work properly and that problems can be fixed when they arise? What equipment and tools will be needed to fix problems or repair damage?

Diagnostics. Will the new or upgraded system be able to provide diagnostic information on the health and working condition of the SCADA network? Can the diagnostic system send text or email messages to employees' smartphones? Can the managers or key employees log into the network to check or acknowledge alarms?

Equipment locations. Where will the host computer be located? How will the master radio antenna system be installed? Will a tower or antenna mast need to be constructed at the SCADA host location? Or can something be installed on or near the building?

Remote sites. How will the antennas be installed on remote sites? Do these sites have good line of sight back to the master, or will repeaters be required?

Revenue opportunities. Can some of the sites be used for other communication devices? And can they be revenue sources for allowing cellular or two-way radio networks to be used? For example, a utility might be able to negotiate a lease-space agreement and receive funds for sharing the infrastructure with a cellular phone company or Internet service provider.

I/O devices. If I/O devices are used, how will they be deployed and the information collected back to the host software? Will the system be wire replacement or Modbus protocol? What will be the default state in case of failure?

A viable option

Clearly, there are many considerations for expanding and improving a SCADA network, and the keys are proper planning, path study analysis and careful review of options to determine which technology best fits a particular water system's needs, today and in the future.

Wireless data radio systems are a viable communication technology option because of their reliable and robust performance, flexibility, and cost savings. The daily information these systems provide can help operators meet the goal of providing a reliable and safe supply of drinking water to consumers.

ABOUT THE AUTHOR

*Daniel G. Steele is a business development executive at FreeWave Technologies, a designer and manufacturer of license-free spread spectrum, licensed band radios, and wireless data solutions for mission-critical applications. He can be reached at dsteale@freewave.com. **wro***



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