Cathodic Protection: Remote monitoring of pipes, valves, tanks and vaults provides another path toward efficiency

By Curt Goldman

Operations managers in the water and wastewater industry are looking for ways to be more efficient. Wireless remote monitoring can provide one option for corrosion control using existing supervisory control and data acquisition (SCADA) networks and automation.

Corrosion has the potential to affect the integrity of the roughly 2.3 million miles of pipe carrying water and wastewater and their corresponding valves, tanks, vaults, and structures. Many facilities use cathodic protection (CP) systems, but these are often in remote locations, making them difficult to operate and maintain, let alone push to peak performance. They also can be vulnerable to theft, land use disputes, and homeland security. Remote monitoring of critical corrosion-prone infrastructure can help prevent the leaks, lost revenue, groundwater contamination, and other adverse scenarios affecting overall water quality, supply and public safety. Many companies are looking to new technologies and automation for answers. Some companies have tested and used cell phone technologies for remote pipeline monitoring. Unfortunately, ever changing cell phone technologies left companies scrambling to stay ahead of telemetry obsolescence. The same lack of system ownership can be said for remote monitoring using satellite technology. In addition, homeland security issues are leading more companies to reconsider farming out their communication systems outside the firewall. Many have or are considering implementing their own communication system in an effort to boost network protection of vital company assets. Systems using unlicensed frequency hopping spread spectrum (FHSS) wireless CP extend current technology, enabling more facilities to monitor more assets, more efficiently.

FHSS, developed in the 1930s, is based on the concept that most radio frequencies are underutilized. It allows multiple users to simultaneously operate across a spectrum of frequencies. Effective, safe, trouble-free data communications exist when all radios within the network operate at the same frequency and then all hop to new frequencies at the same time and in the same hopping pattern. (www.freewave.com/water) FreeWave Technologies introduced FHSS into cathodic protection in 2007. Its system automatically monitors and reports key corrosion protection, such as pipe-to-soil potential; rectifier output voltage, amperage, and rectifier input power status.

Key advantages of the system include:

- Minimal network interferences
- Maximum network security;
- System flexibility;
- Firewall protection;
- Data ownership;
- Open protocol communication; and
- Infinite repeatability.

- No monthly recurring costs needed to operate the system as in cellular and satellite technology.

These FHSS wireless field-located CP RMUs receive and record voltages, currents, and other IO data, which are then collected by a computer in a central office or through a SCADA system for operator evaluation. This data collection feature alerts operators to system requirements and enables them to keep critical equipment online. In addition to the above, these RMUs track ambient temperature and, if connected to a solar power-generation system, will report back-up battery supply voltage.

Facilities that already own and operate a SCADA network can easily integrate remote monitoring devices through existing remote terminal units, programmable logic controllers, or radio networks. Those that don't have SCADA can deploy, low-cost data logging software (see image, left) readily available for less than the cost of a desktop computer.

Some manufacturers offer no-obligation, demonstrations of their remote monitoring systems. A test drive is easy to implement by first selecting a half dozen test points and a central office location and providing the manufacturer or vendor with site coordinates. For these demonstrations, data can either be collected using the data logger software or coordinated with a CP RMU provider that can help design a plan to integrate the equipment into existing SCADA architecture.
Normal test drive intervals depend on the size and type of system; however, 30/60/90-day demonstrations are not uncommon.

A large municipal water company recently deployed a new advancement in spread spectrum wireless data communication technology, which holds the promise of robust, cost-effective remote monitoring. Leveraging existing SCADA infrastructure, it hopes to extend remote monitoring to critical CP systems as well.

About the author:
Curt Goldman, a business development executive at FreeWave Technologies, Inc., directs activities in multiple vertical markets including, oil and gas, water, and electric power.

What is cathodic protection?
CP retards chemical reactions that produce corrosion in metals. It uses a safe, very low-voltage electrical current to change the environment in the soil surrounding buried pipeline. These changes slow down the corrosion process, protecting the pipeline from deterioration. As a technique, CP controls the corrosion by making it work as a cathode of an electrochemical cell. This is achieved by placing another more easily corroded metal that acts as the anode of the electrochemical cell. A rectifier converts alternating current to direct current. Operators perform remote monitoring at rectifier stations as well as pipe-to-soil test stations and pipelines pressure/scrubbing stations. CP systems are most commonly used to protect steel, water or fuel pipelines and storage tanks, steel pier piles, ships, offshore oil platforms and onshore oil well casings.