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The Rosemount Analytical Water Quality System from Emerson Process Management offers multiple instrument platform choices and measures pH, ORP, Conductivity, Temperature, Free Chlorine, Monochloramine, DO, and Turbidity.

Raising early alarm bells

Rosemount Analytical's Emerson highlights the importance of continuous, online water quality monitoring technologies and processes that can greatly increase water safety and security

Ensuring that the water being delivered to communities is safe, free of contaminants, and of the highest quality are top priorities for water utilities around the world. Now more than ever, the focus on safety is an international priority. Utilities must put into place effective security policies and procedures to ensure water quality and safety, and that job is more complex than ever before. In many parts of the world, water suppliers are required to provide test results to their customers annually. Meeting and reporting the water quality requirements of in-country environmental agencies, coping with infrastructure issues and costs, and dealing with lack of personnel or sufficient training and experience can exacerbate points

of vulnerability throughout the water distribution system.

Utilities must be equipped to identify points of security vulnerability, and take steps to secure the water distribution system as much as possible. However, in striving for security, it is not feasible for plants to turn the whole operation upside down. No plant can test for every possible variable in the water at any given time. There are no tests for some contaminants, and it would be beyond the scope and resources of any drinking water facility to test for every possible situation. In addition, the number of potential points of vulnerability in any distribution network could also be very large. However, there are reasonable precautions operators can take that will ensure water quality and safety.

The only way utilities can detect a problem in the water is to identify changes in the water composition and understand what various changes could indicate. In order to detect any change, utilities must continuously monitor on-line both the raw and processed water throughout the system to get a baseline for the normal water composition. It's best to have baseline data for at least a year in order to understand, monitor and detect patterns. Once that baseline is determined, operators can then make informed judgments when changes beyond the normal patterns emerge that could be cause for concern. This kind of continuous, on-line, systematised monitoring makes up a critical early warning system that can often detect chemical or microbial risks, indicating to the plant the need for further water quality analysis at a particular point in the water system.

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The goal of an early warning monitoring system is to reliably identify low-probability, but high-impact contamination events in source water or distribution systems. An early warning system will include a variety of critical water quality measurements monitored continuously to provide real-time water quality data. Among the measurements are pH, ORP, conductivity, free chlorine, monochloramine, dissolved oxygen and turbidity.

- Early warning systems monitor pH to detect changes that impact the potential corrosion of the distribution network.
- pH is also important as it determines the solubility and biological availability.
- ORP is continuously measured to determine the level of chemical reactivity.
- Conductivity provides an indication of the total dissolved solids.
- Turbidity indicates biological growth in suspended matter.
- Free chlorine and/or monochloramine are tracked to ensure the maintenance of optimum residual disinfection levels.
- In addition, dissolved oxygen is an important indicator of whether there is a healthy environment being maintained in the water distribution network.

The continuous monitoring of all of these measurements is critical to understanding the proper composition of the water system at each stage of the distribution network, so that plant operators are more likely to detect changes that could indicate a contamination event has taken place.

An ideal early warning system must provide continuous measurements of the given parameter and warn the operator in sufficient time for the plant to take action. Plant operators should perform assessments of the areas of vulnerability within the water distribution system. Analysers should be placed at each area of vulnerability. The system must be affordable, require low skill and minimal training to operate, and incorporate robust, long-life sensors that require low maintenance. The early warning system should also provide for remote operation and offer sensor and instrument diagnostics to minimise false responses.

Fortunately, advances in liquid analytical technology are making these requirements easier to meet. One significant step is the shift to wireless. New advanced wireless technologies make remote continuous on-line monitoring affordable for more water treatment plants. New device adapters allow wireless to be enabled for any existing HART communications analysers. These adapters, such as the Smart Wireless THUM adapter from Emerson, can be retrofitted onto any two- or four-wire HART device and enables wireless transmission of measurement and diagnostic information.

This solution doesn't require additional hardware, software upgrades or batteries. The upgrade to a wireless system is simple, scalable, cost-effective, and can reduce field maintenance requirements and personnel costs. Wireless adapter technology can help cost effectively address the issues associated with remote monitoring. Water quality monitoring solutions that include Smart instruments eliminate

The Rosemount Analytical 56 Advanced Dual-Input Analyzer from Emerson Process Management supports continuous measurement of one or two sensor inputs. The THUM adapter extends wireless capabilities to any measurement point.

Photos: Rosemount Analytical

false alarms caused by instrument or sensor failures by providing predictive diagnostic information that can be accessed by the operator. With the instrument providing this diagnostic information in advance of a problem, plant operators can make minor maintenance adjustments without any unexpected breakdowns or process disruptions.

While wireless technology is convenient for many water quality measurements taken in the plant, it becomes a real time and money saver when considering measurements that must be taken in the field. Throughout the pre-filter, filtration and effluent water treatment stages, there are several points where chlorine must be measured to meet quality assurance requirements. However, many of these locations can be remote and difficult for plants to install analytical instrumentation. Traditionally, these areas have been connected through a wired system to the central SCADA or DCS network and asset management system, but a wired installation is costly and complex. For these situations, a wireless solution that includes an advanced intelligent analyser, chlorine analysis system and a wireless adaptor is a good solution since it enables the wireless transmission of measurement data and advanced diagnostic information through the WirelessHART protocol.

When evaluating water quality monitoring technologies for use in an early warning system, there are several factors plant operators and managers should keep in mind. The plant should first understand that there is not a one-size-fits-all water quality monitoring system that will work for each plant. Each plant has its own individual network with its own specific areas of weakness, and each plant requires a solution that's flexible enough to be customised to its needs.

Drinking water plants today understand the risks posed against their systems. Driven by both the security concerns and new environmental requirements, they are developing systems to help ensure water quality and safety. By monitoring a variety of measurements throughout the water treatment and water distribution system, plants can better understand normal patterns and detect unusual and potentially dangerous changes in the water quality. Continuous, on-line water quality monitoring technologies and processes can greatly reduce the risk that contamination events will be missed, enabling plants of all sizes to better protect the water quality in the communities they serve. **WWA**

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