EVALUATING ANALYTICAL INSTRUMENTATION CAN REAP BIG REWARDS FOR WATER PLANTS

By Jaydeep Mukherjee

Liquid analyzers, which measure pH, conductivity, chlorine and other variables, are such an accepted part of both industrial and municipal water plants that busy plant engineers and operators may be tempted to leave well enough alone and use technology that is in place and working well. At the same time, these managers are under heavy pressure to reduce costs and continue operating at peak efficiency with fewer workers and often with personnel who are less experienced in instrumentation. For these reasons, plant managers may want to take a serious look at adopting newer analyzer technologies that have capabilities and functions that can significantly reduce costs in other areas of the plant – savings that more than offset the price of the instruments. Every plant is different, but a review of current analysis instrumentation is a solid investment of time. ☞ **www.emerson.com/rosemount**

Built–in Data Logging

Creating audit trails for the fulfillment of regulatory requirements or to meet internal reporting policies is a growing demand in many plants, and data or event loggers may be purchased to provide this necessary information. A standalone data logger can cost in the range of USD 200 to USD 1,000 USD, plus installation. Liquid analyzers, however, often include a built–in data logger and event logger, which can capture measurement data from the process and the instrument. The integral data logger acts as a local data historian. A dozen or more live values can be captured from both channels every 30 seconds in the analytical instrument for 30 days or more, depending on the scan time. An embedded event logger records every significant process and instrument event as an audit trail. Events such as power–up, calibration, alarms, and alerts are gathered based on the instrument's real–time clock. Onboard data loggers/event loggers allow convenient local device access, save the cost of a separate device and installation, and allow easy methods of data upload/download for reviewing and evaluation.

Whether the logging capabilities of a given instrument satisfy regulatory requirements in a given arena will vary from case to case, but having the function as a built–in capability without additional charge can, at least, satisfy many internal reporting requirements.

Multiparameter Analysis

Many of today's analyzers are multiparameter instruments, meaning they can record more than one input, such as pH and conductivity, chlorine, oxygen, ozone, etc. Plant operations managers can use these instruments for recording not only standard liquid measurements such as pH, but also flow, which has to be reported regularly. This approach saves the cost of additional analyzers. Outfall points are often on the periphery of the plant and liquid analyzers can be set up as wireless devices in order to transmit flow data recorded continuously within the analyzer from these points, saving personnel time and costs.

At the same time, since the transmitters can cover 13 parameters (pH, toroidal and contacting conductivity, dissolved oxygen, dissolved ozone, trace dissolved oxygen, ammonium, fluoride, free and total residual chlorine, monochloramine, turbidity, and oxidation–reduction potential), plant personnel can operate different measurements with instruments that all have the same look and feel. In an era when many workers are new to the field, having the same look and feel assures ease of use of the transmitter and can mitigate risk of any missed operation and configuration.

Control Functionality

Control functions in sophisticated analyzers provide a number of capabilities that can save plant operators time and money. For example:

- **Bleed and Feed:** This supports continuous monitoring of blow–down water conductivity to determine the point of excessive concentration buildup. At a programmable maximum concentration value, dumping (bleeding) of the excessively concentrated cooling tower water is triggered using a contact relay. Subsequently, pumping (feeding) of additional make–up water chemicals is enabled to account for lost blow–down cooling water.
- **Totalizer–based Relay Activation:** This triggers a relay at user–defined intervals based on accumulated totalized flow as volume. A typical application for totalized flow relay activation is controlling chemical dosing in reactors. A totalizer–based timer feeds chemicals for a preset period every time a programmed volume of liquid has been added to or removed from a vessel.

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- **Date and Time Activation:** This relay feature allows programming of one to four relays to activate on an assigned day of the week and time of day or night for an assigned interval. The programmable timeframe is two weeks. For example, dDate and tTime activation is helpful for applications such as daily chlorine dosing required in seawater–cooled condensers.

Other control features of various analyzers include:

Control Feature	Application Example
High/Low Setpoint Alarms	Control cooling water concentration limits
Delay Timer (s)	Prevent overfeeding of neutralization chemical
Interval Timer	Oxygen probe jet spray cleaning in aeration basins
PID (Proportional, Integral, Derivative)	Concentration control
TPC (Time Proportional Control)	Chemical treatment concentration control

Digital Communications

Digital communications capabilities are, of course, no longer optional in plants. Instruments are not isolated islands with little need to communicate or interact with other equipment. Implementing new HARTTM devices in a plant is expensive, so having integrated HART communications within an instrument provides important benefits. It reduces costs for the instrumentation and electrical budget by saving wiring expenses, new installation costs, and startup costs. As an added benefit, a USB hard drive allows instrumentation and controls personnel and OEM staff to copy and upload the configuration to the transmitter, so that they can save the setup time by avoiding configuring several transmitters one by one.

Multiparameter measurements combined with data logging and control functions can produce significant savings for water plants, while simplified interfaces and software plus wireless operation enhance plant efficiency and operations.

Wireless is Here to Stay

Water plant managers are aware of reliable wireless systems for their applications, and many analytical instruments will now operate wirelessly through highly reliable mesh networks. If measurements must be gathered from remote locations or environments that are difficult to access, such as sump points or high towers, the use of a wireless network can save thousands of dollars in infrastructure and reduced maintenance. When compared to installation of copper wire, wireless saves USD 2,000 to USD 3,000 per linear foot. Since wireless makes the integration of plant operations possible without costly trench digging and wires, virtually every water facility is in some stage of wireless consideration. When the additional functions of the high–end instruments are factored in, such as data logging and control, the value of the data being transmitted wirelessly from remote locations immediately justifies the costs of adding wireless.

Ease of Use Saves Time and Money

Many features that come standard on higher end instrumentation can pay for themselves in reduced plant operating costs. For example, an analyzer may have a high–resolution screen which can be clearly read in any lighting environment, which can save personnel time and avoid frustration when attempting to read critical process values on the local screen. A simple–to–use operator interface, which walks the technician easily through set–up and basic functions, helps avoid operator error and allows technicians with minimal training to be able to operate the equipment more easily. Since efficient instrument start–up equates to fast and efficient process start–up, the benefits in productivity are significant.

Overall, the effects of modern liquid analytical instruments can be felt far outside the measurement of pH, conductivity, chlorine, and others. Multiparameter measurements combined with data logging and control functions can produce significant savings for water plants, while simplified interfaces and software plus wireless operation enhance plant efficiency and operations. Evaluating analytical equipment for its plant–wide impact can be a worthwhile enterprise for every instrumentation and electrical manager.

About the Author

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