Reprinted with permission from EverythingAboutWater, January 2015 issue

REDUCING COSTS AND IMPROVING EFFICIENCY WITH ANALYTICAL INSTRUMENTS

By Snehal Shah

IMPROVING AERATION EFFICIENCY CAN ACHIEVE SIGNIFICANT COST SAVINGS.

Analytical instruments like pH and conductivity meters are such staples of water treatment plants that they're often taken for granted. Just commodities, we think. But in fact, the observant Plant Manager knows that advances in analytical technology are so significant that these instruments can be used in ways that offset the loss of budget and personnel 'brain trust' suffered by many water processing installations. Predictive diagnostics, low power consumption, wireless installation, re-buildable components, and more save plants money, time, and maintenance, and help offset the knowledge long preserved by personnel who are retiring every year.

Predictive Diagnostics

Today's instrumentation offers sophisticated diagnostic data, including pH slope, reference offset, glass impedance, and reference impedance, which alerts operators to when a sensor is performing inadequately or failing. This allows plants to estimate probe life and plan maintenance schedules based on accurate, real-time information on the sensor's status and performance, rather than relying on standardized schedules that would mandate replacing or cleaning sensors more frequently than is actually required by the application. In this way, predictive diagnostics reduce maintenance time and requirements, freeing up time for technicians to manage more critical jobs.

Wireless Installations

New wireless technologies coupled with today's diagnostics further maximize the advantages and overall effectiveness of predictive diagnostic capabilities. Traditionally, analyzers located in critical processes have often been connected to the plant's central network and asset management systems through expensive wired connections that are costly to install. However, many liquid analyzers are installed in remote or hazardous locations where wiring them into a central network is inconvenient and expensive, so they often aren't integrated at all. As a result, measurement data and diagnostics are stranded by being isolated from the plant network and not accessible directly from the control system. The data and internal diagnostics on these isolated instruments must instead be accessed on-site by an operator, increasing costs and reducing efficiency. Many personnel hours are spent in trips for data collection and to conduct what could be unnecessary maintenance. Worse still, when process data is not being monitored on an ongoing, real-time basis, it can result in unexpected regulatory violations.

In addition, when these instruments are isolated, the vital operational information within them must be collected manually in logbooks by personnel who could be performing other more critical functions elsewhere in the plant. Once collected, this data must then be manually recorded with other operational data for the operators, management, and government reports, requiring more personnel time and increasing the chances for data entry errors. With tighter budgets and fewer employees, the manual collection and recording of data places an even greater burden on the plant operations.

Wireless technologies can address these issues to dramatically improve plant operations, and as a result, the increasing adoption of wireless technologies is one of the most significant trends in the treatment of wastewater, both

at municipal and industrial plants. Wireless analyzers communicate sensor diagnostic data and multiple process variables via WirelessHART digital protocol to the plant process control system, enabling operators to monitor the sensor condition and detect abnormal conditions from the control system, reducing maintenance costs, increasing productivity, and improving compliance. ☞ **www.emersonprocess.com**

Multiple wireless analytical instruments can be integrated together and connected to the plant's existing network and asset management systems, so that vital data can be captured continuously and automatically without the risk of human error. As more plants embark on extensive wastewater treatment plant expansions and renovations, there's an opportunity to introduce wireless into plant networks inexpensively and conveniently. In addition, current wireless technology can be enabled on existing non-wireless devices with easily installed wireless adaptors that connect to the plant network and do not require additional software or major systems integrations or batteries. In this way, plants with aging infrastructure can upgrade legacy systems with wireless capabilities efficiently and cost effectively.

Advanced Longer Life Sensor Technologies

One of the most costly challenges for plants is expensive sensor repairs and replacement, especially since many of the applications in wastewater treatment are harsh environments that substantially reduce the average life of the sensor. New sophisticated coating-resistant and re-buildable sensor technologies enable longer sensor life and reduce maintenance requirements, even in harsh process applications.

For example, during primary treatment processes, it's common that lime can gradually coat the pH sensor surface, damaging its performance capability and requiring maintenance or replacement. Now advanced coating-resistant pH sensors are designed to overcome this issue by incorporating a large reference junction. A large surface area and high porosity provide a stable contact to the process to help prevent coating.

If coating does occur, new sensor designs today allow plants to opt for more cost-effective repair rather than having to replace the sensor. Re-buildable technologies in advanced sensors allow the reference electrode to be rebuilt quickly, easily, and cost effectively by simply replacing a clogged reference junction and recharging the electrolyte, instead of having to replace the entire sensor. This improves process uptime, while significantly reducing repair and replacement costs. ☞ **www.rosemountanalytical.com**

Tried and true toroidal conductivity sensors feature a large-bore sensor design to resist plugging and fouling in treatment processes as well as a metal frame that reinforces the mounting shaft to withstand harsh conditions. These robust design enhancements lower maintenance requirements substantially.

Reduce Energy Costs

In addition to critical upgrade and process demands and shrinking resources, plants are also driven by requirements to reduce costs and meet sustainability goals. Toward this end, plants are actively seeking ways to reduce energy consumption. One area where this is most evident is in the biological treatment stage of the process that takes place in aeration basins.

Aeration is a biological process in which sewage micro-organisms are added to the wastewater in an aeration basin. These micro-organisms remove up to 85% of the remaining organic material. Dissolved oxygen (DO) is added to the aeration basin to provide oxygen to aerobic micro-organisms so they can successfully turn organic wastes into inorganic byproducts, specifically carbon dioxide and water. Maintaining an environment conducive to keeping these micro-organisms alive and most productive is a critical, but power-intensive job. In fact, power costs associated with the operation of the aeration process generally run from 30 to 60% of the total electrical power used by a typical wastewater treatment facility. If DO levels become too high, energy is wasted, expensive aeration equipment undergoes unnecessary usage, and unwanted organisms (filamentous biology) are promoted. If DO content is too low, however, the environment is not stable for these micro-organisms and they'll die due to anaerobic zones, which mean the sludge will not be properly treated and plants will be forced to conduct an expensive and time-consuming biomass replacement process.

Improving aeration efficiency can achieve significant cost savings. For example, using an automated aeration system with on-line continuous DO measurement to maintain the correct amount of DO in aeration basins can reduce plant energy usage by as much as 50%, according to the U.S. Environmental Protection Agency.

Advanced Analytical Technology

Today's plants are facing challenges owing to many knowledgeable personnel retiring each year, but new advances in technologies can help counteract these issues. Sophisticated diagnostics, wireless capabilities, and longer life sensor technologies reduce maintenance requirements and labor costs and improve plant operation efficiency overall. In addition, technologies such as automated aeration systems dramatically improve energy efficiency. Plant operations that integrate these innovations are poised to modernize their facilities and improve their efficiency and productivity.

About the Author

Snehal Shah is Business Development Director for Analytical India for Emerson Process Management, Rosemount Analytical.

Emerson Process Management, an Emerson business, is a leader in helping businesses automate their production, processing and distribution in the chemical, oil and gas, refining, pulp and paper, power, water and wastewater treatment, mining and metals, food and beverage, life sciences and other industries. The company combines superior products and technology with industry-specific engineering, consulting, project management and maintenance services. Its brands include PlantWeb™, Syncade™, DeltaV™, Fisher®, Bettis™, Micro Motion®, Rosemount®, Daniel™, Ovation™ and AMS Suite.

To know more about the author, you can write to us. Your feedback is welcome and should be sent at: mayur@eawater.com. Published letters in each issue will get a one-year complimentary subscription of EverythingAboutWater Magazine.