HOW DIGITAL MEASUREMENT IS MAKING WAVES IN WATER AND WASTEWATER TREATMENT

Developments in measurement technology are opening new opportunities for the operation and management of both potable and wastewater treatment processes. Julian Edwards, Analytical Sales Specialist for ABB Measurement and Analytics looks at some examples of the new digital sensing technologies on offer and explains how they are already delivering real benefits for water utilities.

Conventional wisdom dictates that it's always better to prevent a problem rather than trying to deal with it once it has happened. This is especially the case in the water industry, where failure of an instrument, pipeline or item of plant such as a pump or motor can have a potentially significant impact on everything from supply through to regulatory compliance.

The need to meet stringent environmental legislation and maximise profitability through reduced operating costs is incentivising many operators to find ways to better understand what's happening in their processes.

Developments in digital water sensing technology are offering unprecedented access to a raft of real-time, high accuracy data without the drawbacks associated with many conventional sensor types. By utilising these devices, operators can count on greatly improved measurement of many of the key parameters entailed in potable and wastewater treatment processes.

For operators, a key advantage has been the ability to make informed decisions based on data that reflects actual operating conditions, either in real or near-real time. This is becoming increasingly desirable as the management of water supplies comes under pressure from the combined forces of population growth, rising urbanisation and growing industrialisation. Each consumes large amounts of water and generates effluent waste that needs to be treated to the highest quality before being returned to the environment.

Making the switch to digital

Successful adoption of digitalisation starts with identifying the right balance of both tools, in terms of the front line instruments, and the systems that will be used to collect, analyse and distribute the collected data.

At the most basic level, digitalisation enables plant operators to improve their snapshot view and understanding of what's happening in their current operations. At the highest levels, it can also be leveraged strategically for improving customer satisfaction, balancing allocation of capital, and supporting better decision-making in day-to-day business, financial, and water treatment activities.

The immediacy of digital technology makes it an ideal platform for continuous water quality measurement. Compared to traditional manual sampling methods, continuous online analyser systems enable samples to be automatically measured and analysed at the point of sampling, giving real-time indication of current process conditions and eliminating many of the uncertainties that can arise when a sample is transported for laboratory analysis. When combined with the inherent benefits of digital technology, continuous water quality analysers are offering new possibilities for a more detailed picture of water quality as well as greatly improved accuracy and performance.

Digital Transmitter range

These same benefits also extend to maintenance. Traditionally, devising an instrument maintenance regime has relied on a combination of manufacturer guidelines, established practice and, to some extent, guesswork. Operators could put together a maintenance schedule based on the likely operational lifespan of a device, coupled with the anticipated effects of exposure to the medium being measured. What they often couldn't predict, however, was the impact of any unforeseen variations, either in the performance of the device or the substance it was in contact with.

The effectiveness of the maintenance and inspection routines also relied on having the staff available to carry them out. With a growing number of companies increasingly faced with shrinking engineering teams stretched across multiple sites, there has been a risk that these routines are not always carried out to plan or operated as thoroughly as they should be.

In both cases, there is a risk of measurement performance being affected by deteriorating accuracy or complete instrument failure, increasing the potential for a breach of consent levels and the likelihood of stiff financial penalties being imposed.

With the advent of digital continuous water quality sensors, these challenges are being overcome. When coupled with the arrival of next generation digital transmitters, digital sensors are helping to transform water quality analysis, not least by enabling operators to use the data they generate to create smart maintenance routines. This data can include not just the water quality parameter being measured, but also device-level diagnostics, opening new possibilities for assessing performance and pinpointing problems before they can develop.

By using this data on the known performance of the sensors to create tailored maintenance routines, operators can start to manage their maintenance resources more intelligently and effectively. Now, engineers need only be dispatched to site when necessary, equipped with the tools and knowledge required to fix a problem. As well as greatly enhancing the reliability of the installation, the availability of this 'deeper data' also helps to reduce the cost of operation and maintenance, enabling digital sensors to offer a much lower total cost of ownership than their analogue counterparts.

AWT210 Modular design

AWT420 front view - pH & cond

Continuous measurement helps compliance

With the introduction of increasingly stringent regulations governing the discharge of water to the the environment, it quite literally pays to use the best available technology to minimise the risk of any infringements.

The need to measure phosphate levels was behind one UK water company's decision to install 120 Aztec 600 phosphate analysers in wastewater treatment plants throughout its operating area. With the ability to accurately measure phosphate levels down to 0.0016ppm, the analysers are helping to ensure that the company keeps within the increasingly stringent consent limits set by the UK Environment Agency.

Operating as part of a dosing control system alongside ammonia analyzers, iron analyzers and turbidity monitors, the phosphate analysers have reduced the company's reliance on manual sampling.

Connected to the company's eSCADA system, the analysers provide continuous real-time data, including any alarms generated by issues such as high phosphate levels. Combined with the data obtained from other instruments, such as ammonia and turbidity analyzers, the company now has a complete picture of its water quality at all times.

Obtaining real-time data on phosphate levels helps ensure the company never strays outside its consented limits. The data is also a boon when it comes to planning future investments designed to further improve effluent quality.

Taking the wider view

The drive to greater efficiency and accountability in the water sector makes it desirable for measurement data to be able to be shared as widely and as easily as possible. For this to happen requires a shift in both mindsets and infrastructures that have until now allowed data to effectively be locked into location or application-specific silos with limited opportunities for wider dissemination.

Whilst digital instrumentation brings great benefits to the management and monitoring of individual processes, it offers even greater advantages if seen as part of a more strategic, company-wide process of digitalization. The rise of web-connected devices allows companies to benchmark their various facilities against each other to tease out best practice.

In this way, data can be used not only to maximize process performance but also to address other key areas, including improving customer satisfaction, determining the most effective allocation of capital and enabling better decision-making to improve day-to-day business, financial, and operational activities.

Sharing this data is being assisted by the growing capabilities of artificial intelligence and machine learning. With these technologies, the traditional challenge of data – how it is analysed, processed and shared – is increasingly being addressed. The wealth of data produced by digital and connected instruments across a company can be collected and analysed by software solutions that share inputs from sensors, analysers, and control systems. The result is a better, overall view of what is happening, helping operations achieve tighter integration across functions.

This is particularly beneficial for meeting the water industry's total expenditure (TOTEX) approach, with its emphasis on holistic network management. Here, the ability to share data between

AWT210 Front View pH

instruments in a network more efficiently makes it easier to obtain a clearer picture of what is happening throughout a network rather than being focused on a few specific parts of it.

Connected with this is the ability to to use maintenance resources more effectively. Data from instruments can be used to create predictive maintenance routines based on actual performance, enabling employees to be deployed more effectively, with the knowledge and tools needed to address any potential issues.

Summary

More information, better control, less cost, more focused maintenance, fewer breakdowns and a substantially reduced chance of water quality incidents – when it comes to wastewater treatment, the all-round benefits offered by the latest generation of online digital sensors and analyser systems make them the ideal solution for water companies needing to find ways to keep a continuous eye on process performance and regulatory compliance.

For more information, visit www.abb.com/measurement, call 0870 600 6122 or email enquiries.mp.uk@gb.abb.com ref. 'digital water quality sensors'.

Author Contact Details

Julian Edwards, Continuous Water Analysis Product Manager, UK & IE, ABB Measurement & Analytics • Howard Road, St Neots, Cambs, PE19 8EU • Tel: +44 (0)870 600 6122 • Email: enquiries.mp.uk@gb.abb.com • **Web: www.abb.com/measurement**