

Ensuring compliant and efficient water treatment process from the right device data

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Water utilities face growing pressure to balance environmental compliance with efficiency, yet critical data gaps persist despite increasing digitalisation. While higher-level systems provide visibility, overlooked field-level devices including valves can undermine performance, reliability, and cost control. Targeted data capture, focused on quality, not quantity, is key to achieving smarter operations.

Greg Wainhouse, Regional Business Development Manager - Industrial Water, North Europe at Bürkert, explains.

Across the UK and Europe, water utilities are under pressure to optimise environmental compliance while improving efficiency and cost control. Digitisation has long been seen as key to increase plant intelligence and identify areas of improvement, yet the challenges remain.

While investment in digitisation isn't uniform across national regions, as a whole, the water sector generates a high volume of data. Despite the visibility that this data offers, blind spots relating to process performance, efficiency, and maintenance still exist. Is the issue too much data, with challenges surrounding its effective management and use, or is there still a lack of data at critical points in the system?

Digitising field-level devices

Across the data hierarchy of the automation pyramid, focus on the enterprise layer is crucial to determine overall performance and cost. In direct contribution, SCADA systems present plant-level metrics, while feeding this layer, PLC-managed data converts system-level information to inform process decisions. At each level, the data is accessed by a corresponding stakeholder, creating a context-based hierarchy. The challenge, however, is that senior management might prioritise enterprise- and plant-level automation investment over devices involved in field-level digitisation, risking data gaps.

Clearly, a wide range of field equipment such as valves, sensors and flowmeters is already integrated to enable the flow of data to top-level enterprise or plant layers. However, across the digitisation of a water treatment plant, devices that could provide valuable data are easily overlooked. It may not be practical to integrate every device within a digital system, not least where cost analysis is concerned. Moreover, considering the high volume of field-level devices to review, alongside the budget competition of stakeholder-prioritised higher-level automation, this can increase the potential of their exclusion.

The reason that sufficient coverage of field-level devices matters within the digital network of a water plant is because of the cost challenges, or missed opportunities, that can result. The reality is that a low-cost solenoid valve can influence plant-wide performance. For example, a wastewater sensor costing over £50,000 can be disabled due to a maintenance challenge with its cleaning mechanism, caused by the failure of a £100 solenoid valve. In situations like this, adding digital feedback can be crucial to inform system-critical maintenance and ensure its availability, as well as reducing total cost through improved maintenance regimes.

Valve data and water analysers

To implement efficient and diligent digitisation to field-level devices, a thorough audit of architecture provides a robust approach. While this should involve the input from operational and maintenance teams at device level, the scope of the audit should also include process instrumentation, such as water analysers. This is where there's a crucial differentiation: the accurate integration of information from this level of instrumentation doesn't directly contribute to the big data that informs plant performance and efficiency. However, it does provide high-value data that could be critical to plant compliance and performance, albeit based on the analysis of extremely small volumes of water.

Analysis at the microfluidic level spans the sample of raw water, through to the disinfected water stage, and can also include sampling the distribution network, as well as wastewater. Within these systems, valves are relied on for the flow of samples and reagents, and their performance is critical for the accuracy and repeatability of analysis. A valve opening/closing failure, a partial stroke, or a degradation in switching can all impact the validity of analysis, and with it the failure to accurately measure parameters such as chlorine or turbidity, which could lead to critical compliance issues.

Approaches to data feedback

Using analysis instrumentation with standardised NAMUR analogue signals can inform the PLC if an issue such as the sample or reagent dosing valve is open or closed, as well as faults including a sensor failure, as well as whether the analysis device is inside or outside the expected range.

Position control devices used with valves from Bürkert extend beyond NAMUR or binary feedback by providing more detailed information on valve behaviour, such as continuous or proportional position data, stroke timing, and status of the

commanded position. This approach requires additional hardware such as integrated position sensors or actuator-mounted feedback, preferably with industrial protocols based on digital communications to directly provide PLCs with more granular data. The advantage is a more detailed understanding of valve operation, providing a foundation for a more holistic view of water analysis system performance and health.

ValveInsight

Taking this approach further, Bürkert also provides the ValveInsight service, relying on the valve itself as the sensor to provide subtle changes in valve behaviour that a positioner alone may not detect, resulting in more detailed diagnostics.

This capability involves the analysis of an electrodynamic actuator that contains a coil within a magnetic field. When electrical current flows through the coil, it stimulates the Lorentz force that moves it to produce precise and rapid motion that actuates the valve. As the coil moves within the magnetic field, this generates an induced current, and its analysis provides a wide scale and precise measurement of valve stroke. As a result, ValveInsight can accurately monitor switching status as well as wider factors that influence valve switching behaviour.

For water analysis systems, ValveInsight can provide immediate detection of faults or deviations, for example enabling the most rapid response to challenges in quality and conformance, as well as supporting process documentation. A further advantage of the system is its diagnostic flexibility. ValveInsight uses algorithms that are offered open source on the developer platform Github, which can be integrated into third-party, higher-level control systems, with the algorithms trained for specific analysis conditions. Simple to integrate, the ValveInsight capability is inclusive with Bürkert's Whisper Valve technology.

Taking the wastewater sensor example previously mentioned, a solenoid valve with ValveInsight and its free software could have alerted the controller to the gradual deterioration in valve performance, preventing total sensor failure. While there's always an emphasis on ensuring performance during commissioning, this focus can drift as the system ages, combined with a lack of resources for accurate and timely condition monitoring. As a result, device failure in the field occurs all too often.

Avoiding data overload

To optimise the performance, efficiency, and environmental conformance of a water treatment plant, utilising data is crucial. This means accurately obtaining the right level of data granularity through the automation pyramid. While including data from common field-level devices, previously overlooked, could be critical, the focus should remain on obtaining the right data, rather than simply collecting more data.

A thorough audit of valuable data points is vital, combined with an understanding of the type of data that's most useful, as well as the speed and accuracy of its delivery. Valves and sensors are integral to the performance of water treatment plants, both at the macro and micro level, and the technology available now enables a high degree of flexibility on the level of data granularity that can be achieved.

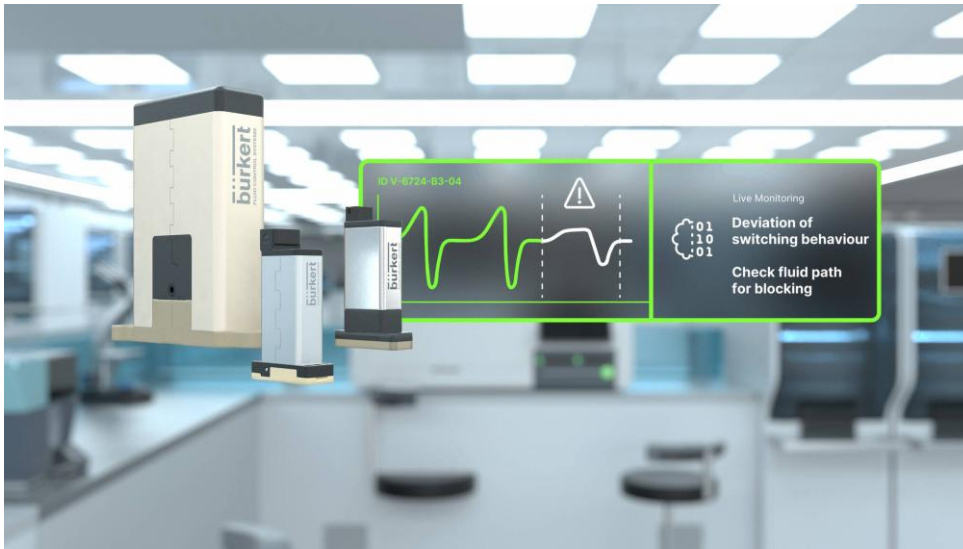
Images & Captions:

Image 1: Process quality instrumentation needs to be monitored to ensure reliable data is achieved after commissioning.



Image 2: ValveInsight capabilities are included in Burkert's Whisper Valve technology.



Image 3: Thanks to the ValveInsight functionality, the Whisper valves offer intelligent monitoring and diagnostic capabilities.

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Bürkert Fluid Control Systems is one of the leading manufacturers of control and measuring systems for fluids and gases. The products have a wide variety of applications and are used within food & beverage, pharmaceutical and water industries as well as in medical engineering and space technology. The company employs over 3,700 people and has a comprehensive network of branches in 36 countries world-wide.

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