

# Instrumentation, Data & Information – An End to End Process

The wastewater industry is under increasing pressure to deliver the services that it needs to its customers. Escalating pressures, such as those of increasing population numbers, as well as climate change, the Carbon Reduction Commitment, the Water Framework Directive, and the drive to increase business efficiency of in order to keep customer's bills at an affordable level have resulted in the need to deliver better effluent from treatment works.

“The water industry has a large number of challenges to face, and delivering efficiency in the way it operates is going to require more instrumentation employed in the correct way.”

AMP 6 is set to become the asset management period of efficiency, with many Water & Sewerage Companies (WASC's) expected to do more for less. The challenge for the water industry will be to answer the question of "How to deliver an increased level of service for a lesser operating cost." Looking at the trends of the industry it is quite clear how some water companies intend to deliver this service to their customers.

Thames Water have quite clearly shown that they are a forward thinking company within this field, taking on IBM as a strategic partner due to its experience in big data, the installation of smart potable water networks and meters, investment in advanced process control systems at some of their major works, and more recently the announcement of the use of real time asset monitoring with Accenture.

Thames are not the only WASC to do this, as both Southern Water and Northumbrian Water have also invested in APC; most water companies are seen to be interested in the possibilities and potentials surrounding the use of Smart Wastewater Networks. Only Southern Water was brave enough to go public and announce it formally in their business plan.

However, underpinning all of these initiatives is the need for data and information, and for these things to be gathered the industry has to get serious about the instrumentation that it has in both the networks and treatment works that serve its customers.

## The State of Play in Instrumentation

The number of instruments and sensors that are available to WASC's at the current time is probably at the greatest level it has ever been. The industry has technologies solely to measure the flow that is passing through the wastewater system which encompass level (ultrasonic & radar), radar velocity, time of flight, electromagnetism, area velocity, laser, and more recently microwave in various different forms. The choice is quite literally staggering and the various research departments of the supplying companies have worked hard to deliver this wide choice.

However, if you walk onto the vast majority of wastewater treatment works in the UK you will see very little instrumentation. All sites above 50m<sup>3</sup>/day are required, as per the Environmental Permit, to monitor flow, and on the smaller works there may be a rotation sensor on a biological filter; in an activated sludge plant a dissolved oxygen probe may be present, but overall the level of instrumentation is relatively low.

On the larger works the situation is slightly different, as more enlightened companies have turned their treatment works into pseudo production factories capable of producing energy and biosolids, with one recovering phosphorus as a resource, and yet others providing final effluent to customers for water reuse.

The question is, though, where should the industry go?

## Where should the Industry go?

In the UK the industry has developed a different operational model in the 25 years since privatisation, and gone is the era when each treatment works would have a dedicated operator, or indeed when there was an operator to look after just a handful of treatment works. We are currently in a time when where an operator goes is governed by SAP and Click, and this has brought efficiencies in the way that treatment works are operated.

However, what is missing is the instrumentation in the field that gives the operator the data to make an informed decision and to enable them to actually operate a treatment works rather than simply clean it and measure manually how the works are performing. Despite this, a guesstimate of how much data is produced by the water industry daily would not be far off if a figure of around 300 million actual data points per day was stated.



This particular flow meter a 900mm electromagnetic flow meter - one of the standard choices in the Water Industry



Other choices include ultrasonic flow meters, Time of Flight Flow meters, Insertion Flow Meters & non contact flow velocity meters (last two pictured)



Just another choice of meters including flow, level & dissolved oxygen (left to right)

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### So what happens to all of this data?

The vast majority of the data that is produced by the sensors and instruments within the modern industry is lost, or is in a form that renders it unusable. This is changing to some extent thanks to Advanced Process Control systems that work as an automation system, whereby the on-site PLC accepts the data and the control system cuts the operator out of the loop.

When treatment works or networks are designed and built there is a need to incorporate the instrumentation, data and information as an end to end process within the initial design. Unfortunately, the instrumentation is often the last thing to be installed, let alone designed.

This sounds a quite complex process, but it is really just a case of internal stakeholder engagement within the water industry in order to identify what everyone, from the management board, right down to the engineers and operators on the ground, need to see on a day to day basis. Asset managers must also work out when assets need replacing as this further simplifies the process.

Identifying the right information drives the types of data that are required, which in turn drives the type of instrumentation that needs to be installed.

### What are the barriers to instrumentation?

Unfortunately the barriers to instrumentation within the water industry are significant:

- It is difficult in the current water industry to get an instrument installed as it is hard to show a return on the investment. Notable exceptions to this are flow meters, where there is a regulatory

requirement to have them installed, and dissolved oxygen monitors with which there is an easily demonstrable benefit.

- When the decision to install an instrument is made often an incorrect instrument is installed for an application. For example; an area velocity flow meter located at the bottom of an inlet channel where it will be covered in debris, or an ion selective ammonia monitor on the outlet to a works where it is more suited to the inlet.
- Where the correct instrument chosen it is often installed contrary to the manufacturer's instructions or is installed in such a way that it is not operationally maintainable and so falls into a state of disrepair.
- Where an instrument is selected correctly, installed correctly, and is communicating properly with the company telemetry system, the operation and maintenance may slacken off.



*Whatever meter you fix you have to maintain. The pictured meter worked for a number of years but without the correct maintenance will fail*

It only takes one of these scenarios for the quality of the data to be compromised and trust in the instrumentation lost. With this loss of trust in the data the water industry as a whole loses a valuable source of information that can be used to deliver efficiencies that the industry so desperately needs.

Moving forward, the water industry has a large number



*Choosing the right meter for the right place is essential. The flow meter installed in this channel (see if you can spot it) can't possibly work correctly considering the conditions its expected to work in*

of challenges to face, and delivering efficiency in the way it operates is going to require more instrumentation employed in the correct way, and for the data that that instrumentation produces to be converted in such a way that it is useful to the different stakeholders within each of the WASC's. This will enable the water industry to take the data it produces and convert it into the information that is needed operationally across the industry, be it for short term operational management, medium to long term asset management, as well as strategic investment plans.

If the industry manages to deliver this then the challenges of operating efficiently should be easily overcome.

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