

Smart technology for better lives – improving customer outcomes through intelligent networks

A thought leadership paper from CGI and The Water Report



According to Jeremy Heath, innovation manager at SES Water, the focus on smart systems in water today is “unprecedented”. Speaking in his capacity as chair of SMI’s Smart Water Systems conference in April, he said there has “never been such focus, and never been such an opportunity to bring these systems in”.

On one hand, the water industry is simply able to survey the impact smart technologies are making on global business and to ask how the likes of artificial intelligence, robotics, the Internet of Things and augmented reality might help with water sector challenges.

On the other, there are sector specific drivers that mean finding new approaches is becoming a necessity, rather than a nice-to-have. Chief among these is the upcoming water price review, PR19, which makes both specific (for example, a 15% leakage reduction target) and general demands of the industry that will be impossible to meet by 2025 without innovation.

Other drivers include rising government ambitions for the environment; growing recognition of the real risk of drought in the UK where water resources are under growing pressure; and the need for the sector to raise its game in light of political and media criticism. On top of that, customer expectations have become fuelled by the Amazon Prime culture; and data and digital advancements are finally making the smart home a reality – with water-smart white goods potentially part of the picture.

Taking advantage of smart enablers to deliver more of what matters will be crucial if the sector is to improve the lives of customers and outcomes for citizens.

Examples include: supporting consumption reduction through the provision of timely and more granular information on usage; using predictive analytics to preempt unplanned incidents such as bursts or blockages before they impact customer lives; operating networks more intelligently to reduce problems in the first place; enhancing service offerings through smart home technologies; keeping bills down by avoiding unnecessary asset spend; and securing better societal outcomes – from fewer pollution incidents to fewer roadworks.

Taking the initiative

Needless to say, water companies are already exploring how intelligent devices and smart networks can change their customers’ lives for the better. Here are some examples.

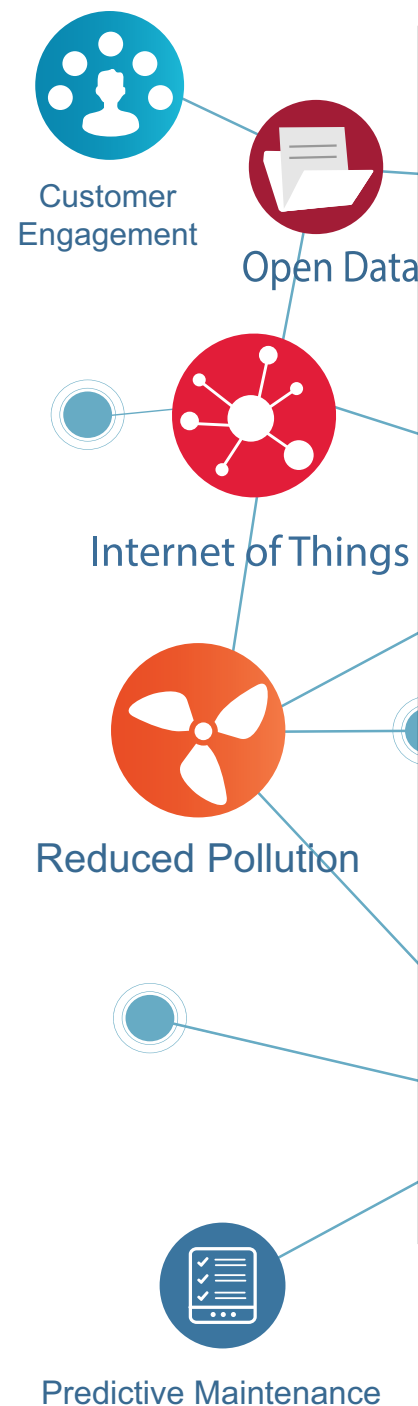
On the clean water side, Anglian Water’s head of innovation Steve Kaye told delegates at the SMI event that “The Smarter Drop” is one strand of the company’s Shop Window work – an innovation testbed centred in Newmarket to explore truly ambitious future goals. Among other things, the initiative seeks to demonstrate: how to drive operational efficiencies through real time control of assets; that multi-parameter sensors play a big part in providing data, creating an Internet of Things, improving asset reliability and customer service; and that smart meters are being used to both influence supply and demand and to monitor the network.

Smart meter programme manager Paul Glass explained the company has “carpet bombed” four district metered areas in Newmarket with sensor meters, and has been collecting hourly data since January 2017 and

communicating this regularly to customers since June 2017, including through a new opt-in data portal. The work seeks to establish “what benefits could reliable hourly data bring to customers and the company?” Its early findings suggest there was an 8% drop in the average daily consumption of measured households over 12 months; more where the portal is in action (currently only 5% have opted-in). Glass said “low hanging fruit” has come from being able to easily identify plumbing losses (like leaky loos) and supply pipe leaks on the back of the more granular data, with longer term opportunities in behaviour change areas.

Similarly motivated by a need to manage consumption down and a desire to take control of its network, Thames Water secured permission in 2014 to roll smart meters out across London. It has installed 240,000 devices so far from which hourly reads are transmitted. Metering manager Stephanie Baker reported the company now receives 5.8m reads a day; “we get more in a day than we used to get in a year”. Thames has seen usage reductions of 7% on the back of meter installation, rising to up to 15% if the device is combined with a 45 minute water saving home visit. Water efficiency and affordability manager Andrew Tucker explained to delegates that without this behavioural support, installing a smart meter is like “having a fast car and driving on the motorway in second gear”. Baker added that smart metering means leaks and plumbing losses are picked up “almost instantly”. Thames has found one in eight homes have water passing continually through the meter.

Welsh Water meanwhile is pursuing a more intelligent wastewater network. Steve Wilson, managing director of wastewater services, explains

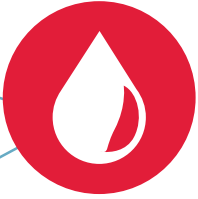


the company has already moved “from one of the worst companies on pollution to one of the best” after installing 2,000 monitors on its combined sewer overflows. The data, which is publicly available, has provided visibility and supported sewer network modelling which has in turn informed actions, including managing surface water more effectively and targeting the most problematic assets first.

The company is now turning its attention to using its smart technologies to support better customer outcomes, particularly regarding network



Smart Environment



Leak Detection



Smart Home



Water Quality

what's the problem you are trying to solve"; with the potential for so much data, you need to narrow down what you want and how you might achieve it.

System integration

These are but a few examples of the work going on across the industry to harness the power of smart technologies to improve customer outcomes. In light of that proliferation, Andy Austin, Northumbrian Water's network performance manager, reports a live discussion going on now concerns defining what a smart water network actually is. "The industry is generally trying to get its head around what it is we want, and what should the basic design be," he explains. His view is "the industry would benefit from some standardised thinking on smart networks."

Austin goes on to describe what he sees as necessary for a network to be smart, deploying an extended car analogy in his explanation. A smart network, he says, needs to feature:

- "High quality visual operational performance information on a daily or hourly basis," – the equivalent of the speedo or fuel gauge.
- Visibility of wider spatial information to see how the system fits into the wider network – sat nav.
- Asset management information based around set parameters and that can indicate risk of failure – the oil light.
- External information, for instance from customers (outages, pressure problems) or environmental monitors (river water quality or quantity) – road signs.

blockages. For the coming AMP, one of the company's areas of focus will be what Wilson describes as "the worst served customer" – those subject to repeated and intractable problems such as sewer flooding or odour nuisance. Alongside devices to provide better network visibility, the company is using machine learning to identify sewer defects and has developed apps to help field works identify the source of odour problems and the whereabouts of blockages.

According to Wilson, one of the key ingredients for smart success is "being clear about

Austin details that Northumbrian has been "on the smart journey for a number of decades": pioneering SCADA controls since the late 1970s; then putting a multi-layered GIS system around that; moving in the last ten years to the Aquadapt system which optimises the running of the system automatically; and now it is two years in to a four year programme to implement an intelligent asset management system. He sees the next major evolution as the integration of smart meter data. "Does all that make a smart network? I see these as lots of individual building blocks. The final part of enhancing the system will be integration, so everything is working in tune."

Crucially, says Austin, that hugely complex set of information must be presented in a "visually simple" way, so whoever is best placed to make a decision can do so intelligently. "My passion is to provide the best possible visual environment for operators in the field to make the best possible decisions," he explains. He likens his vision to the dissemination of computing power, once restricted to "professors and astronauts", now in everyone's pocket.

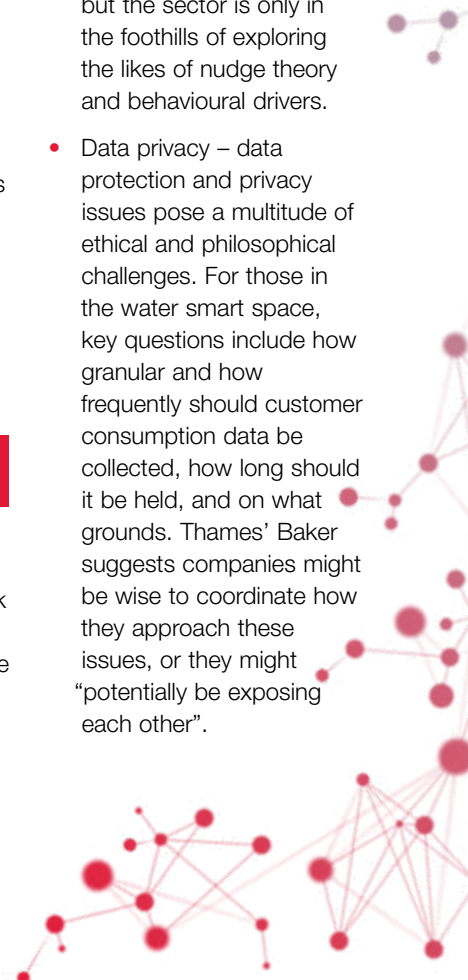
Northumbrian will be exploring smart networks at its Innovation Festival in July. Austin says this is a "high priority" for the company.

Beyond technology

Finally, in considering prospects for smart water systems, it is important to look beyond the technology. Water companies will have to grapple with a host of – often difficult – issues as they seek to bring their ageing networks further into the modern world.

Some of the key issues are:

- Cost/benefit – the cost of metering and monitoring technologies will inevitably hinder how widely they can be deployed and to what end. Welsh Water's Wilson comments: "The real difficulty with smart wastewater networks is the cost." Compare, for instance, that the average cost to physically clear a blockage is £110, while monitoring technologies can run to thousands of pounds. "The real prize is, how granular do you go, and at what cost? I'd say at the moment we've come down from a hay stack to a hay bale in terms of looking for the needle, but there's so much further to go."
- Engaging the customer – even with state of the art technology on hand, getting customers to make the most of it will be an uphill challenge. Not only are company/customer relationships often lacking, but the sector is only in the foothills of exploring the likes of nudge theory and behavioural drivers.
- Data privacy – data protection and privacy issues pose a multitude of ethical and philosophical challenges. For those in the water smart space, key questions include how granular and how frequently should customer consumption data be collected, how long should it be held, and on what grounds. Thames' Baker suggests companies might be wise to coordinate how they approach these issues, or they might "potentially be exposing each other".





“ Smart technology presents unprecedented opportunities for water companies.”



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The introduction of smart technology could be a real game-changer for water companies and water customers alike. Smart technology presents unprecedented opportunities: to deliver efficiencies in the operation of networks; to improve customer service levels; and to reduce water bills. And now with the threat of water shortages on the horizon – can smart technology provide the answer to that challenge too?

Within this context water companies are right to prioritise an immediate focus on the implementation of smart technology. More intelligent systems offer a win-win for companies and customers.

Water companies have a continual challenge in delivering high quality services securely and at low cost. Their networks are largely buried underground, in remote and inaccessible and invisible locations. The companies have little control over the availability of water. Nor do they have much control over how much water people use or on demographic changes.

However, water companies do have some smart tools that they can call upon to help address these challenges. They have massive amounts of data to help them understand what is happening in their networks. There is a proliferation of new sensors and monitoring devices being introduced that bring even more data to improve visibility. The Internet of Things can access these data sources and make them readily available to improve network operation. Smart meters give a much clearer view of usage. Artificial intelligence, robotics and augmented reality are techniques that are now commonly used in other industries. These smart enablers can all bring benefits for companies and customers.

For companies, the operational efficiencies to be had include prolonged asset lives, more cost effective maintenance, increased automation and lower energy/carbon costs, to name but a few.

Smart meters in particular offer demonstrable potential. CGI is at the heart of the energy smart meter rollout, as Data Service Provider to the Data Communications Company. The benefits case for energy is proven and many of those benefits have parallels for water - in understanding usage patterns, in reducing consumption and in investment planning for example. On top of that, there is an opportunity to identify customer side leakage readily and alert customers when this is found. In fact, we may see a greater role for water in the smart home of the future.

We can turn these benefits round and look at them from a customer perspective too. Increased operational efficiencies should mean lower bills - a big win, given affordability is very much in the spotlight. Smarter maintenance strategies and a more predictive mode of operation will improve customer service levels with fewer blockages, interruptions and floods. There will be societal and environmental benefits too; including fewer pollution incidents, reduced consumption and a reduced risk of water supply shortages.

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