waterfall
the intelligent water solution

IMPROVING WATER NETWORK MANAGEMENT BY SENSOR FLOODING:

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The topic of network management and how to improve it, is a broad and complex one. Here, I want to look at how IoT-enabled Water Event Metering can assist in various aspects of network management, from leak management (including reduction, repair and prevention) to network and demand modelling, optimal pressurisation, and asset management. They all impact highly on water company operations in terms of energy costs, as well as having implications around customer service and network asset health.

GETTING SMART ON LEAK MANAGEMENT

Potable water leakage is arguably where water companies in England and Wales are really being challenged. At least 20% of water produced is lost to leakage - the equivalent of 3 billion litres every single day. There are many examples from recent years of leak reduction targets being missed, and some companies have been criticised by the regulator when it comes to oversight and control of their leakage performance.

As Ofwat Chief Executive Rachel Fletcher has said: "High leakage creates unnecessary strain on the environment, excess costs for customers and increased risk of water shortages. A well-run water company will have a good understanding of the condition of its pipes and will be able to reduce leakage over time."

Of course, water companies have a legal obligation to pay attention to reducing leakage, and to deliver an efficient and economic service. Ofwat has set all water companies a target of bringing down leakage by at least another 15% by 2025, and the regulator has made no secret of the fact it expects further reductions beyond this date. Strategies to combat leakage are necessarily evolving and the acronym PALM (Prevent, Aware, Locate, Mend) is becoming accepted. However, there is still an emphasis on Aware and Locate. More research needs to be carried out and translated into practice to ensure that:

- All new pipework is leak-free (Prevent)
- Repairs are quick and economic with minimum disruption (Mend)
- Networks are modelled and operated to minimise leakage (Prevent)

When it comes to Aware and Locate, visible leaks tend to be the most straightforward, as they are often

reported to the local water company by concerned customers. In-home leaks account for around a third of the freshwater that's lost into the ground or back into the sewage system (a 'double whammy' as perfectly potable water then has to be treated again). Usually the water companies are neither aware of these leaks, nor can they locate them, so much so that they are accounted for in per capita consumption (PCC) figures rather than being treated as network leakage. Finally, the toughest leaks to deal with are unseen or hidden leaks, which rely on instrumentation for awareness and locating.

At the moment, water companies in England and Wales estimate network leakage at a certain point in the small hours of the night and subtract it from the volume of water flowing through their trunk line. This 'nightline measurement' forms the basis of understanding network leakage and serves as evidence of the company's leakage levels, and hopefully their success in reducing leakage.

When, as is the case across most of England and Wales, you lack exact data on water consumption - due to non-metered connections, for example, or data logging, which cannot measure each home - you have to rely on a top-down method like the nightline measurement. Whilst it has served water companies reasonably well, it does not lend itself to instant awareness and leak location. It also needs several 'fudge factors' to assess what is actual leakage and what is simply customer usage at the point the measurement was taken. Time is becoming one of the key factors in reducing leakage. The less time it takes to become Aware, Locate and Mend a leak, the less water is lost.

Introducing IoT-enabled water event meters on every supply point - in customer's homes - provides not only a means of effectively eliminating in-home leaks, but also an accurate means of calculating hidden leaks and removing the inherent pitfalls of the nightline technique. With a combination of instant feedback and transmission, Cloud analytics, artificial intelligence and advanced modelling, Water Event Metering provides the raw data needed for a sophisticated bottom-up method of measuring leakage, which eliminates those fudge factors we talked about. Nightlines are effectively being taken constantly throughout the day, as all the flows can be aggregated and deducted from the main flow sensor at any given point in time.

SMARTER NETWORK MODELLING

The increased frequency and accuracy of data transmission when you have Water Event Metering in every household (compared to the conventional magflow/data logger combinations employed by most UK water companies) promotes far more detailed and reliable modelling of networks and DMAs. Flow, pressure and temperature are monitored almost constantly, which means leaks of any scale can be detected almost immediately.

Not only that, but smarter network modelling can help you to understand where the leak is. Advanced modelling software maps your network using central data and data from each household, so you're able to rapidly pinpoint to within a distance of a few metres (depending on how closely houses are spaced) where the leak is and direct a repair crew there.

OPTIMISING NETWORK PRESSURE

More accurate modelling, as discussed above, combined with near-real-time data from every household on pressure levels (as supplied by their water event meters) means it's possible to more accurately judge optimum network pressurisation.

Compared to the current failsafe of 'estimate optimum pressure and then add some to be on the safe side', this approach can save electricity and reduce financial and environmental costs, as well as reducing stress on pipes and system components. This in turn extends the asset lifecycle and reduces the cost of replacement and maintenance works.

Imagine having all of that without worrying about an increased number of complaints about sub-optimal pressure! As well as analysis tools that give you the ability to see whether complaints about low pressure are the result of a localised leak or a wider issue. There is huge potential to provide better customer service and experience by being highly responsive, proactive and well-informed.

PREDICTIVE MAINTENANCE

Water companies' maintenance programmes have tended to be heavily reactive rather than proactive, focusing on the most visible and biggest leaks. With more accurate demand modelling and increased data on pressure, temperature and flow in your network, it becomes easier to plan pipe replacement and other works in a way that minimises disruption to the public and creates a stronger, safer network for the future. The sensor flood that Water Event Metering provides, increases visibility of in-home and hidden leaks, alongside early warning of small leaks with the potential to escalate. It thereby gives water companies the ability to prioritise work, act quickly, and gain true oversight of their leakage performance.

BETTER IS POSSIBLE

There are cities and countries around the world that are proving better network management is possible, where they have the low leakage rates to show for it. It's well known that The Netherlands are a world leader in network leakage rates; perhaps it is not a coincidence that they are one of the biggest proponents of advanced analytical data on the topic. From a city point of view, a notable example is Tokyo, Japan, where a focus on same-day-repair work helped to drastically reduce the leakage rate from 20% in 1956 to just 3.6% in 2006. Prioritising prevention through the renewal of ageing pipes alongside early repair prevents collateral damage, such as subsidence of roads and contamination of the supply.

These examples serve to show what can be achieved with the right level of commitment and the prioritisation of leak prevention and fast repair. By flooding networks with pressure and flow sensors and harnessing the powerful data insights they provide, the UK has the potential to become a world leader in water network management in its own right.

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