Leakage Reduction in PR19

A multi-faceted challenge

demanding a collective response

By ControlPoint

Leakage Reduction in PR19

A multi-faceted challenge demanding a collective response

Ofwat's focus on leakage reduction in PR19 is to be welcomed. After major progress in the first ten years after privatisation of the water companies in 1989, leakage reduction has stalled. Water companies have reacted to Ofwat's prompting by setting leakage reduction targets of 15% or more and MPs believe that they could potentially have been even more ambitious. At a time when consumers are being encouraged to manage and reduce water consumption, it seems only right that the water industry should also make a public commitment to putting its own house in order.

Reducing water leakage is important for a number of reasons over and above consumer perceptions. In many areas of the UK changing rainfall patterns combined with population growth have led to water shortages. The South-east, in particular, is water poor. Successful leakage reduction should also go hand-in-hand with a reduction in water abstraction that would have a positive impact on the nation's water courses and wildlife. There is also the carbon impact of water loss. Treating water so it is fit for human consumption requires a considerable amount of energy and chemicals.

Currently, about 23% of water that enters the water distribution system is lost. This puts the UK just below mid-table in the European water loss championship with Germany, Denmark and The Netherlands leading the way (see table below). For the five years 2020 to 2025, water companies have committed to reducing water leakage by 16% with the majority adopting Ofwat's minimum target of 15%. Yorkshire Water (25%) and South Staffs (23%) are the only companies to set far more ambitious targets.

Table 1 – Distribution losses in % across EurEau member countries[1]

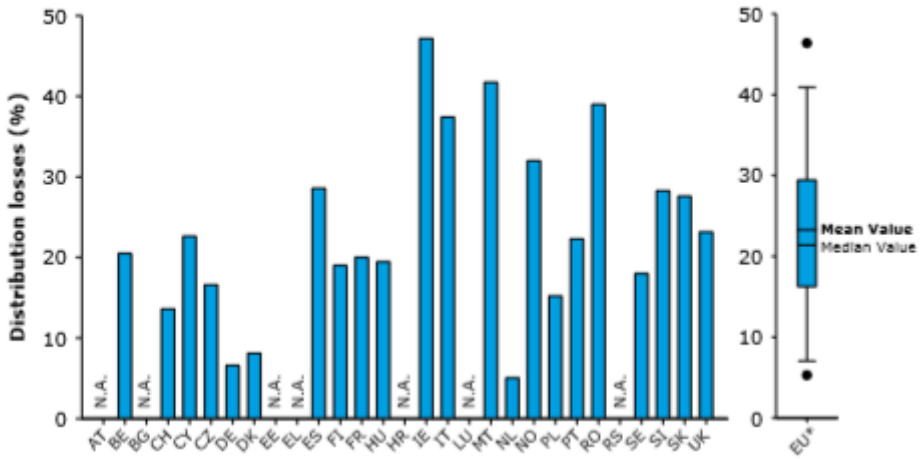
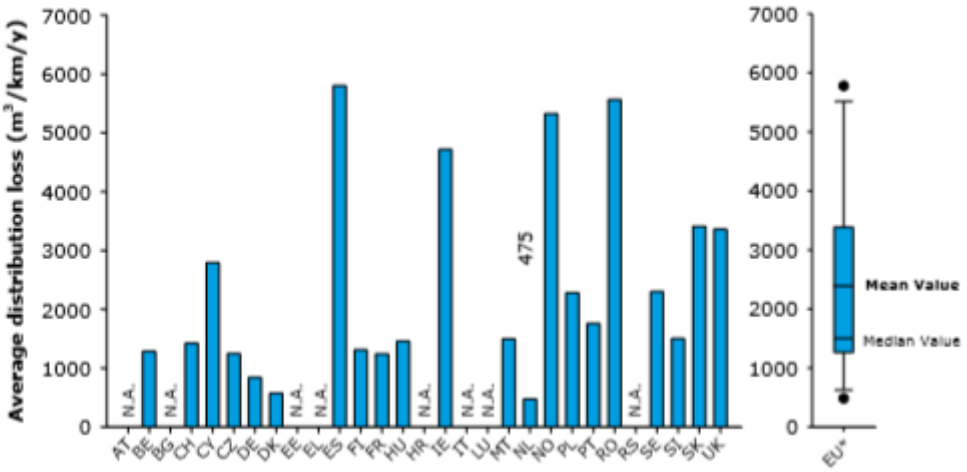


Table 2 – Distribution losses in m³/km/yr across EurEau member countries



The debate in parliament and the press continues as to whether the reduction targets are stretching or not. What is clearly true, however, is that achieving them will require a degree of change and innovation. So, what needs to be done?

There is no golden bullet. Tackling leakage, as highlighted by UKWIR in its documentation relating to its 'Achieving zero leakage' programme, is multi-faceted. Let's look first at existing networks and then move on to new networks.

There are almost 350,000km of water pipes in England and Wales alone. Operating the network generates huge amounts of data. Ensuring the correct data is collected at the right time, manipulating and interrogating the data to generate meaningful information, and then using this to improve decision making will have an important role to play. For example, it is widely held that much of the network is operating at pressures that are too high. Reducing pressure would reduce leakage but there is a trade-off between pressure, customer service and water quality. Big data can help get that balance right. There is a lot of interesting work going on in this area with companies such as Invenio Systems (www.invenio-systems.co.uk) and Inflowmatix (www.inflowmatix.com).

On the repair side, acoustics appear in the short term at least to provide the best, or most accepted, technology for identifying the location of leaks. Most standard repair techniques remain relatively expensive, invasive and disruptive to supply. Companies such as Curapipe (www.curapipe.com) are looking at developing systems that self-detect leaks over a given section of pipeline and then automatically repair them and there may eventually be scope to deploy CIPP (Cured in place pipe) techniques to repair major leaks. Widely used in the wastewater sector, the challenge for CIPP is to develop a curing process where there is no risk of contamination to the water supply. At the point of writing, the author was unable to identify a CIPP technique that has the necessary quality approvals.

However the industry tackles leakage on existing networks, the importance of installing new leak-free networks should be emphasised. The UKWIR report - Achieving zero leakage by 2050: laying leak-free new networks – is just one of many reports that highlight that this is not the case. Laying leak-free new networks, when either replacing existing pipes or extending the network, is one area in which water companies can take immediate action.

The UKWIR report referenced in the paragraph above is exhaustive. It looks at network design, materials, jointing techniques, testing and commissioning, protection systems (barrier pipes), workmanship, commercial arrangements, sensors and standards. To paraphrase its key findings, the report identifies electrofusion jointing and 'poor workmanship', sometimes driven by dysfunctional commercial incentives relating to productivity, to be the principal causes of leaks on new networks.

Polyethylene (PE) is the dominant pipe material used in new networks for good reason. PE is incredibly reliable and bursts on pipe lengths are incredibly rare. As in any network, the joints are the weakest link. One approach is to reduce the number of joints needed by extruding longer stick lengths of pipe or by using longer lengths of coiled pipe, although there could be logistical constraints with longer pipe lengths and ovality can become an issue as coil sizes and density increase. Network design can also help in reducing connections.

The report suggests implementing a specific compulsory standard for the training of electrofusion welders (p25/p34) as a way of reducing the incidence of failures. The report continues by stating, 'That is not to say that the installers are not currently competent but perhaps don't fully recognise the importance of following the correct procedures'. This is certainly the experience of ControlPoint in our dealings with water and gas utilities and their appointed contractors.

The ControlPoint system is referenced in the report under the heading of 'Technology for Auditing of Electrofusion Welding' (p28).

> 'Real time joint inspection is a tool which is currently being used so that trained joint technicians can assess live joint connections made, to determine if they are fit to be incorporated into the network. Following identification of a poor joint, the technician can notify supervisors before backfilling takes place to reduce the likelihood of that joint failing in the future. This system provides an audit trail to assess any future failures and inform the person responsible, helping the whole team improve on a continual basis and apply retraining where necessary.'
>
> (author's note: the trained joint technicians view digital images of the joint in real time via an app that communicates with the installers' electrofusion box or butt fusion machine)

The report concludes on p34 that:

> ‘Systems are available which monitor and allow for remote ‘real time’ inspection and approval of procedures by experts. An example of this is the telemetry system developed by ControlPoint. In instances where it has been used the system has been highly successful in improving the quality of workmanship.’

‘Highly successful in improving the quality of workmanship’. In other words, it works! The ControlPoint system utilises mobile application technology to facilitate faster and more efficient joint installations on-site, supported by real-time quality monitoring and more recently the introduction of artificial intelligence, taking quality-assured site practices to new levels of efficiency.

Where there is a proven solution to one of the most critical leakage reduction challenges, in this case ‘poor workmanship’, then surely the emphasis should be on the water utilities adopting and implementing it across the board. It has been proven that a preventative approach, such as that taken by the utilities and contracting firms using the ControlPoint system can make multi-million-pound savings when compared to the cost of failures that can occur. Such a move would not only deliver measurable quick results and positive PR, but also ensure that the limited research funds available are focussed on those aspects of leakage reduction where it is most needed (Zero Leakage Roadmap, UKWIR).

There is no single technology that will solve leakage, and technology of itself will not be the answer. Some reports predict that almost 50% of the skilled workforce will retire by 2025. What is the water industry, including supply chain trade associations such as the Future Water Association, doing to encourage young people to join the industry? There is also a need for procurement innovation and contracts that incentivise the correct behaviours whilst achieving the desired outcomes. It would also be worth applying a circular economy mindset to the challenges.

Collaboration is key. Leakage reduction is a multi-faceted challenge that demands a collective response.

Footnotes:

[1] *Tables are taken from: 'Europe's Water in Figures – 2017 Edition'. Published by EurEau, the European Federation of National Water Services*

Bibliography

Achieving zero leakage by 2050: laying leak-free new networks (UKWIR, 2016)

Regulation of the water industry (House of Commons Environment, Food and Rural Affairs Committee, Eighth Report, 12/09/18)

Zero Leakage Roadmap (UKWIR, 2016)

A manifesto for water: summary of the water industry's plans in England 2020-25 (Water UK, 2018)

Water company business plans PR19 (various): https://www.ofwat.gov.uk/regulated-companies/price-review/2019-price-review-final-methodology/business-plans/