Welcome to the first of our PR19 Challenge Reports, which look in detail at each of the 14 common performance commitments which will be used to measure the performance of water companies in England and Wales in the five years that follow the price review in 2019. This report focuses on leakage – treated water that is lost through weaknesses in ageing and broken pipes and never reaches the customer.

Here, we take an in-depth look at some of the key statistics involved in measuring and tackling leakage, and present the most important leakage-related news that has recently made the headlines. You’ll also find case studies of some of the innovative techniques water companies are adopting in the fight against leakage, and an introduction to how some of those techniques and innovations work.

We hope this report provides an essential introduction for the newcomer to the subject of leakage, while also being a useful information resource for those involved on the front line in the fight against leaks.

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Driving down leakage is of paramount importance for water companies. As well as being the subject of regulatory incentives and penalties in PR19, leakage is an important reputational issue with customers, results in lost revenue and is of particular significance to those companies in water-stressed areas.

Ofwat has challenged companies to reduce leakage by 15 per cent by 2025, but the 3,123 million litres leaking daily in England and Wales during 2016/17 marks only a 7 per cent reduction on the level seen at the turn of the millennium. Leakage levels have been broadly unchanged over the last five years and 2016/17 saw an increase of 1.2 per cent across England and Wales.

Four companies – Cambridge Water, Essex & Suffolk Water, Portsmouth Water and Thames Water – missed their leakage targets for the 2016/17 period, while leakage levels also increased for Bristol Water (5 per cent) and Dee Valley (14.1 per cent). In June, Thames agreed to pay £65 million back to customers as part of a package of payments and penalties worth £120 million as the result of its disappointing leakage performance.

More encouragingly, some companies – including Affinity Water (-4.4%), United Utilities (-2.8%), Bournemouth Water (-2.6%) and Dwr Cymru Welsh Water (-2.5%) – were able to reduce leakage during that time, and Yorkshire Water is leading on ambition for AMP7 with a target to cut leakage by 40 per cent by 2025.

Leakage accounted for approximately 22 per cent of all water used for public supply in 2016/17
Source: Ofwat

Thames Water leaks
179 litres per property served per day
Industry average is leakage of
121 litres per property served per day
Southern Water leaks
80 litres per property served per day

Million litres of water leaked each day by English and Welsh water companies

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Source: CC Water

Biggest increase in leakage in 2016/7:
Dee Valley Water 14.1%

Largest reduction in leakage in 2016/7:
Affinity Water -4.4%

Source: Discover Water
Ofwat expects to promote greater innovation by setting strong leakage challenges in PR19, the regulator’s director of customer engagement and outcomes, Jon Ashley, told the Utility Week Live conference on 22nd May.

Ofwat is challenging companies to reduce leakage by 15 per cent as part of its PR19 methodology and Ashley said there had been a “mixed response” from the companies, with some “really recognising there was a need for an ambitious reduction in leakage” and others believing the target may be a step too far.

One delegate highlighted the manner in which Ofgem had incentivised risk-averse utility companies to pursue innovation through the Innovation Funding Incentive (IFI) and then the Network Innovation Allowance (NIA) and asked if Ofwat might adopt a similar approach.

Ashley replied: “We don’t have the innovation funding in the way Ofgem has at the moment, but one of the ways we’re stimulating innovation is by really pushing companies on their leakage commitments, like the 15 per cent reduction challenge, on the basis that this necessity is the mother of innovation.”

He added that new chief executive Rachel Fletcher, who joined Ofwat from Ofgem in January, will be “thinking about different incentives” for the following Price Review.

Other speakers at the Tackling Leakage session discussed an array of new methods of tackling the issue of leakage.

Rose Jolly, innovation manager - exploitation & governance - at Severn Trent, discussed a four-day event the company held at the end of last year to spark new ideas on how to tackle leakage. The event involved a design sprint and data hackathon, while Severn Trent adopted a Dragons’ Den-style approach to investigating new technologies including thermal imaging drone technology.

Kaye, who stressed the growing need for an asset intervention strategy rather than relying on new assets, said Anglian had put a “massive effort” into tackling leakage in recent years, partly in response to customers’ strong views on the subject.

Ashley also said public opinion would play a part in ensuring leakage will be a major issue in AMP7, even if Ofwat would not be taking its cue from the media coverage of the topic.

“Leakage is a high-profile issue for the water industry – it’s often in the media,” Ashley said. “These headlines illustrate that we’re talking about a very important issue, an issue that matters for our Price Review and for Water Resource Management Plans. However, our policy for the PR19 on leakage is of course not driven by headlines but by a considered view of the evidence on leakage and through consultation with our stakeholders.

“One of the key inputs for our policy on leakage is the views of customers, and our policy explicitly allows companies to take account of their customers’ views in their performance commitments for PR19.

“I’ve met with all the water companies over the last few months to understand their approach to customer engagement and I’ve picked up from them that leakage is as important in this Price Review as it was in PR14.”

The new technology was installed one month ago and has already helped identify and fix 35 underground leaks, saving approximately 86,400 litres of water from being wasted.

Across Yorkshire, 4,500 loggers are currently being installed with plans to fit up to 40,000 within the next 12 months. The company hopes this technology will reduce its overall leakage rate by up to 10 per cent, with a target to save ten million litres of water per day by 2025.

Jason Griffin, leakage technology manager, said: “Each acoustic ‘ear’, or logger, is capable of identifying a leak within a 150 meters radius, which is much more accurate than current technology allows. It will give us a much greater understanding and visibility of what is happening in some of the areas most prone to leaks in Bradford, Huddersfield and Halifax and allows us to respond better and reduce disruption to our customers.”

Yorkshire Water aims to cut its overall leakage rate by 40 per cent by 2025. To achieve this, other cutting-edge technology including space satellites, drones and the testing of thermal imaging cameras are also being used by its leakage technology team. The use of open data intelligence tools will also help to plug the company’s leakage rate.
Ofwat orders Thames Water to pay £65M back to customers

Thames Water has agreed to pay £65 million back to customers as part of a package of payments and penalties worth £120 million over its shortcomings on leakage. This follows an Ofwat investigation that found that Thames Water’s board did not have sufficient oversight and control of the company’s leakage performance.

The £65 million payment to customers is on top of £65 million in automatic penalties incurred by the company for missing the commitment it made to customers to cut leaks.

Following Ofwat’s investigation, Thames has committed to bring forward the payment of these automatic penalties. This means that Thames’ shareholders will return a total of £120 million to customers.

As a result, each Thames customer will get a total rebate of approximately £15 over the next two years.

Ofwat’s investigation found that Thames Water breached two of its legal obligations through poor leakage management. It concluded that Thames Water’s board and management did not pay enough attention to reducing leakage and that the company underestimated the significance of its underperformance on leakage when assuring Ofwat that it was meeting its statutory obligations, one of which is to deliver an efficient and economic service.

As part of the proposed settlement, Thames Water has committed to getting its leakage performance back in line with what it has promised it will deliver for its customers in 2019-20.

It will also publish its performance each month in tackling leaks, appoint an independent monitor to certify the information in its monthly leakage reports, make additional leakage reductions of 15 per cent by 2025 and do more to engage with customers on leakage issues – including at its board.

Thames Water has also pledged to provide Ofwat with more detailed evidence to assure that it is meeting its statutory obligations in relation to leakage and improving its management control over the delivery of core operational functions.

Ofwat chief executive Rachel Fletcher said: “Thames Water failed its customers in tackling leakage and the measures we’ve announced today illustrate the scale of the company’s shortcomings and how seriously we take them.

“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.

“Ofwat has set all water companies a target of bringing down leakage by at least another 15 per cent up to 2025 and expects further reductions beyond this date.

“Thames has assured us that they now have a grip on the leakage situation, but this should serve as a catalyst for the company to improve how it delivers on its wider commitments to customers.

“Customers don’t want to see their water company letting them down like this, but we hope the rebate they will now receive goes some way towards compensating them for their water company’s failure to live up to its commitments to cut leakage.”

Steve Robertson, Thames Water CEO, said: “Reducing leakage is really important to us and to our customers. We met our leakage targets for a decade but our recent performance has not been good enough. We let our customers down and for that we’re sorry.

“We have taken more control of how we manage the network and are investing significantly more in people and resources to tackle leakage, get back on track and then go beyond. Thanks to these changes already in place, our current leakage repair performance is our best ever at around 1,000 a week. Our focus is to restore customers’ trust and confidence in Thames Water.”

Environment Secretary Michael Gove welcomed the announcement, saying: “Thames Water completely failed in their duty of care to their customers, leaving them to suffer leaks for far too long through poor management. But actions speak louder than words, and they must deliver on their commitment to provide compensation and much-needed improvements to customers.

“This is exactly the kind of decisive action Ofwat should be taking, and shows an ongoing commitment to ensuring customers receive the service they deserve. I fully support [Ofwat chairman] Jonson Cox and his team’s work to hold the water industry to account.”
Northumbrian to use satellite technology to spot leaks

Northumbrian Water has become the latest water company to use satellite technology for leak detection. The utility has teamed up with SUEZ UK and satellite experts Utilis to use the technology – which is also used to help find water on other planets – to help identify leaks on a stretch of its network in County Durham and rural Northumberland.

The satellites, which can capture detailed images that cover 3,500 square km at once, will analyse the imagery to detect leaks and unusual amounts of water on the networks and pinpoint them to a team of leakage technicians on the ground, who will follow up, carry investigations and repairs.

The first phase of activity will be focusing primarily on trunk mains, which often run through quite rural areas of the region and are particularly difficult to identify leaks on due to the terrain and geography.

The survey from space could result in problematic leaks in some of the most remote areas of the region being fixed and water being saved more quickly than ever before.

Northumbrian Water’s network performance technical specialist, Joseph Butterfield, said: “This is extremely exciting technology that opens up a whole world of leakage detection benefits for us and we’re delighted to be working with SUEZ UK on the project and to see what we find and can fix.

“The sheer speed of the process, the detail it gives and the distances the images cover is fantastic and should really help us improve our performance around finding and fixing leaks and saving water.”

Nick Haskins from SUEZ UK, the exclusive representative of Utilis in the UK and Ireland, is said: “We’re very excited to be teaming up with Northumbrian Water on this project and are really excited to see what impact it can have on the company’s performance around leakage.

“Using satellite technology to locate and fix water leaks is the most up-to-date and innovative method there is out there and it gives water companies the ability to survey the whole water pipe network in a single operation. This, of course, has the added benefit of being completely discreet to the customer and without any disruption to them.”

Severn Trent, Yorkshire Water and United Utilities have each previously announced that they are trialling the use of satellite technology in leakage detection.

United Utilities has recruited a sniffer dog to find leaking water mains. The dog, named Snipe, has been trained to help pinpoint problem pipes in rural areas where the water does not always show on the surface.

The 16-month old cocker spaniel was a stray rescued in Ireland before he was headhunted to begin his training for the North West water company.

He has been going through a rigorous training programme to help him become the first dog in the UK to assist in finding leaks, learning how to recognise the tiniest traces of chlorine used to disinfect water supplies. Next he will learn how to put this into practice in a live environment, working with the leakage detection teams at the water company.

Tап water contains one part chlorine per million parts water, with the dog’s nose capable of detecting scents at one part per billion. Hannah Wardle, Leakage Manager at United Utilities, said: “Tackling leakage is a real priority for us and we’re always looking for new and innovative ways to do the job more effectively.

“The North West of England is a notoriously wet region, and sorting the leaks from the puddles especially out in the fields can be real challenge. This is where we hope Snipe will really come into his own, as his sensitive nose can detect mains water at incredibly low concentrations.

“With leakage detection it’s all about building up the evidence using a range of different technologies. We’re trialling the use of satellites and drones to get a bird’s eye view of a particular area, but the devil is in the detail, and pinpointing the exact place to start digging is more difficult than you might think.

“Snipe is going to be an invaluable asset to the team.” Snipe is being trained by North West-based Ross Stephenson and Luke Jones, both ex-military dog trainers.

“Using dogs to search for drugs and explosives is well known, but there are a host of other applications that we are only just starting to explore,” Stephenson said. “We’re really excited by the progress Snipe is making and we hope that soon water leak sniffer dogs will be a common sight.”
Rise of the robots

In this innovation special, we take a look at inline leak detection – small hi-tech robotic devices which can enter pipes to locate leaks and other potential issues

By Robin Hackett

Leakage is a major issue for water suppliers throughout the world, particularly for those in water-stressed areas. In Britain, there are numerous methods of detection in current use, including listening tubes, drones, satellites, sniffer dogs, acoustic logging devices and smart meters.

For leak detection surveys, though, inline devices may well be the future. By traveling through the pipeline, they can pinpoint leaks – and sometimes even areas of the pipe that are vulnerable to leakage – and there is the potential to provide video footage and additional sensors to detect and locate impurities.

Here, we take a look at inline leakage detection systems present and future.

SmartBall
(Pure Technologies)

Southern Water is currently trialling Pure Technologies’ SmartBall, a bowling ball-shaped device that can be used to tackle leaks in both water and wastewater.

A foam casing houses an acoustic sensor that can detect variations in flow in a pipe, with signals sent to monitoring devices that are installed along the pipeline prior to its journey. The SmartBall is propelled by the water pressure, travelling through pipes for up to 12 hours, with preliminary leak locations provided 48 hours after the inspection. The device requires a minimum pipe diameter of 250mm, and does not disrupt pipeline operation.

SmartBall, which has been in use for several years and was originally developed for the oil and gas industry, also contains an accelerometer and gyroscope - which track the movement of the ball and can be used for pipeline mapping - and a magnetometer, which measures the magnetic field coming off the pipe wall that can be used to find features in the pipeline including joints.

The device offers typical leak location accuracy of around 1-2m and has detected leaks as small as 0.11 litres/min in optimal conditions. It can be inserted through a variety of means due to its flexible foam exterior, ranging from hydrants and 4-inch (100m) taps to reservoirs.

PipeDiver
(Pure Technologies)

Pure also offers the PipeDiver, which is used for water and wastewater pipelines with a diameter of 300mm to 3,000mm and consists of a navigation-aid battery module, a tracking module and an electromagnetic sensor module. Its ‘fins’ help to centre it and propel it along, and their flexibility mean it can navigate most butterfly valves, bends and tees. The sensors on each fin create electromagnetic fields that interact with the pipe wall and collect a magnetic signature for each section of the pipe, providing comprehensive data on areas of damage. It is also equipped with cameras, which help provide further help in condition assessment. All the data is then downloaded and assessed by the company’s analysts on behalf of the clients.

PipeDiver can pinpoint areas of distress within the pipeline: for pre-stressed concrete pipes, it can identify and locate broken wire breaks, while for metallic pipes, it can locate and detect areas of corrosion and cylinder defects. There are also multiple methods of insertion and extraction, requiring a 12-inch (304mm) access. The technology was first used in the UK by Scottish Water in 2015 and, like SmartBall, does not disrupt operation of the...
Elsewhere, Qinov8 has announced that it is in talks with all the major UK water suppliers, including Southern Water, Affinity Water, Thames Water, Welsh Water and Yorkshire Water, as well as international companies for its new leak detection technologies.

Its AquaNav system is used inside large plastic water mains and features a transmitter enclosed in a buoyant spherical carrier around the size of a tennis ball. It freeflows through the pipe, drawn by the force of the escaping water, as an above-ground operator follows AquaNav at walking pace with a handheld receiver. Once the AquaNav reaches the source of the leak, the device is drawn to and plugs the hole; as there is then no moving water, it is held in place and sends a signal to the receiver to notify the operator. The AquaNav, which can be inserted and extracted via hydrants, can identify leaks as small as as 20 litres/min and provides a location within 2ft (0.6m). It is aimed at mains located up to 16ft (4.9m) underground, although Qinov8 can offer a larger transmitter for a depth range of 45ft for the larger diameter trunk mains.

**PipeGuard (MIT)**

Internationally, there are several inline leak detection systems in the works. It was announced last year that Massachusetts Institute of Technology (MIT) researchers were working on PipeGuard, a small robotic device resembling a shuttlecock, with its soft rubber ‘skirt’ – the membrane sensor – filling the diameter of the pipe. The device, which can operate in water or sewage pipes, logs its position as it travels through, detecting small variations in pressure via the pull at the edges of the skirt.

Using that information, which is collected upon extraction, Pipeguard Robotics uses a cloud-based analytics platform to create a Google Map of leaks, offering information on their location and size. Field test data shows PipeGuard can detect leaks as small as 1 US gallon/minute (3.785 litres/min) to within 1ft (305mm).

Each robot is developed to fit the size of the pipeline it will be inserted into, although they can adapt to pipe diameter changes of up to 20 per cent, and the developers have so far built robots for pipe diameters ranging from 50mm and 300mm. PipeGuard, which can be inserted and extracted through T junctions and hydrants, requires a minimum pressure of 0.8 Bar (or 10 psi) and minimum flow speed of 0.3 ft/s (0.1 m/s).

**PipeFish (USC Viterbi)**

PipeFish, from researchers at USC Viterbi’s Information Sciences Institute (ISI), operates in similar fashion – moving passively with the water flow and inserted via hydrants – but captures real-time video using a 360-degree camera that records at a minimum of 30 frames per second, as well as using sensors to collect data and log its position.

The robot features an onboard microcomputer that controls lights, sensors and the camera. The developers plan to include further sensors to collect additional information, including flow rate, air pockets and chemicals, while the PipeSnake – several PipeFish tethered together – has been used to handle the twists and turns of more complex water networks.

Creator Wei-Min Shen began working with the Los Angeles Department of Water and Power (LADWP) to develop and test the robot around 18 months ago.
Leak detection that is out of this world

The use of satellite imagery is gaining ground as a method of detecting leaking water pipes. But how does it work and what is involved in a satellite leak detection project? Nick Haskins of SUEZ UK explains

Sniffer dogs, drones and satellites – solutions for detecting leaks are becoming more innovative than ever before and it’s long overdue.

With Ofwat’s stricter regulations on UK water companies to reduce their leakage levels in a bid to lower household bills for customers, new innovations continue to emerge for the detection of water leaks.

One such innovation makes use of an existing Japanese satellite that has been in use for over 20 years, detecting the presence of water on distant planets. Now, this satellite looks for water leaks here on Earth.

The satellite orbits around 620km above Earth and has previously been used to detect water on distant planets. Not long ago it was realised that the satellite could be used for locating leaks in water distribution systems, contributing to the reduction of non-revenue water.

A scientist at the University of Jerusa-
PR19 Challenge Report: Leakage

Problem was conducting research for his thesis in geophysics and radiation transfers in the atmosphere by using microwave technology to find underground water on Venus and Mars. Fast-forward four years and Utilities, an Israeli start-up that specializes in satellite technologies, has a fully commercialized technology offering with 25 partners worldwide and a record of locating thousands of previously hidden leaks.

In addition to detecting larger leaks, the technology can pick up on very small leaks that might otherwise go undetected, helping water utilities to be proactive in reducing their background losses.

SUEZ, in collaboration with Utilities Corporation, have partnered to offer the patented, satellite imaging technology to the UK and Ireland which can cover entire distribution systems in one single image.

So, how does it work? Here are the steps involved in a typical satellite leak detection project undertaken by a UK water utility:

**Step 1: Image acquisition and analysis**
A typical project will focus on a defined area set out by the water company where they know of areas with high leakage and nightlines, or DMA’s with high percentages of plastic and AC pipes. The satellite will cover the specified area by acquiring raw imaging using synthetic-aperture radar (SAR) sensors. These sensors send out electromagnetic waves which collect data from the Earth’s surface to send back to the satellite.

**Step 2: Radiometric corrections and algorithmic analysis**
The raw data collected by the SAR sensor must be prepared by filtering out unwanted satellite bounces from buildings, other man-made objects, vegetation, lakes, swimming pools, drainage and sewage assets and a whole range of other interferences.

Every pixel from the image acquired is put through a unique algorithm that has been developed to search for the spectral signature of drinking water.

At this stage the utility pipe layer is added, which provides the identified leaks on a map along with streets and pipes locations, which display thousands of square kilometres.

**Step 3: Leakage report and delivery of findings**
An entire network can be surveyed periodically, providing multiple sets of findings annually. Clients will receive the data in keyhole mark-up language (KML) which can be added to their GIS systems and maps, web or mobile applications to produce a comprehensive leak sheet.

Areas that have a low probability of a leak will be marked in blue, where areas marked in red mean a high probability of a leak. Leakage technicians are then sent to the areas to locate the exact spot.

Depending on the customer’s preference, findings can be provided in one of four ways:
- Web-based GIS
- Leaksheets for fieldwork
- App that allows for remote access
- GIS files

**Step 4: On-ground findings confirmation**
Situations may arise where the leaks have been reported or repaired after the satellite image was taken, and confirmation of this is carried out before field verification can commence.

Leakage technicians equipped with their points of interest can very quickly start to locate leaks. With this technology, the time it takes to locate the leaks is greatly reduced because potential areas are significantly narrowed down.

Technicians are then able to start normal surveying in a much more structured way, eliminating the issue of having to randomly work through a DMA hoping to hear something, and can typically survey between eight to 10 points of interest in single day – results that equate to a much higher number of leaks located per technician per day when satellite data is used.

**Conclusion**
The technology continues to deliver impressive results by not only detecting leaks but also picking up background leaks or ones that have in the past been incredibly difficult to locate.

Its ability to cover 3500km² area of land and thousands of kilometres of pipework per image makes for an ideal solution for significantly improved field labour, targeting priority leaks quickly and reducing potential damage and claims.

Satellite leak detection offers utilities much lower operating costs and no preparations or upfront investments are required. Leaks can be located faster, resources can be managed more efficiently, and background losses can be reduced, all resulting in decreased water losses.

As water becomes increasingly scarce, we will no doubt see more innovations that can deliver water-saving solutions in an efficient and cost-effective way. Satellite leak detection, with its many capabilities, is doing just that.
Case study: Affinity Water’s acoustic loggers seek leaks

Affinity Water has taken leakage detection in its network to new levels by fitting 20,000 permanent acoustic loggers covering a vast swathe of its central supply area.

The water-only company is in pursuit of an ambitious target of reducing leakage by 14% by 2020, as part of its 2015-20 business plan which emphasised water saving to close a projected supply-demand imbalance in the water-stressed South East.

With customers being asked to save water through reduced usage, metering and water-saving devices, the company has promised to fulfil its side of the bargain by saving water lost from leaks. During this AMP period, it intends to bring leakage down by a massive 27ML per day.

While leaks are inevitable in the UK’s ageing pipe infrastructure – and the utility is also investing millions into replacing pipes as part of its mains renewal programme - leak detection is a major area where technological innovation can help in the fight against water losses. If bursts and large leaks can be identified in hours rather than days or weeks, with a high degree of accuracy, then repair teams can be dispatched swiftly and with a more focused remit, and will spend less of their time trying to pinpoint a leak or digging fruitless ‘dry holes’.

To this end, between January and May this year the company installed PermaNET+ acoustic loggers, made by HWM, across 25 per cent of its network that is most prone to leakage. These devices, placed at 300m intervals on distribution mains, listen for the noise of escaping water that follows a leak or burst. When such a noise is detected it transmits an alert, together with an
Customers expect us to do the right thing on leakage

DREW RITCHIE
MANAGING DIRECTOR OF WHOLESALE OPERATIONS, AFFINITY WATER

“At PR14, we set out a challenging business plan, that was agreed by Ofwat, and part of that strategy was to look to reduce leakage by 14%, or 27ML per day, by 2020. The size and scale of that challenge is huge; that’s why we committed in the business plan to investing around £500M between 2015 and 2020.

“Clearly, part of the challenge is that we don’t know where all the leaks are. We have a series of flow monitors across our network which tell us the amount of water that is going in and coming out, but alongside that we’ve still been using traditional methods of detection: people on the street with metal rods and a wooden block on top, listening to detect sounds from the water meter or the stop tap.

“We re-tendered our leakage detection framework last year, and I wanted to challenge the organisations on the new framework to find a more innovative way of working. We were using a leakage detection resource which worked for us in some months of the year but not others, and moved between water companies; I felt that this sent the wrong signal and that we ought to be looking for leaks all year round, using the most innovative methods and people with the best training and skillets.

“The permanent loggers are one way of changing that. The benefit of this system from our perspective is it’s far more efficient and effective: it means you can plan deployment of your resources during the day to find out where those leaks are. Detection time is cut massively, and the quality of what you can find – large and small leaks – is markedly better. Hopefully, no more dry holes and wasted effort.

“We’re also addressing the skills challenges in this area. As part of our leakage detection function we’ve taken 30 people from our leakage detection resource in-house and taken on 10 new apprentices, and we are putting them all through the NVQ three-year programme to train and develop and mentor them, as part of our commitment as a community employer.

“We’ve made a massive strategic push into the loggers, and we will keep pushing the boundaries. Our customers expect us to do the right thing on leakage, and I think we’ve proven that we are up for the challenge and willing to invest for the long term.”
The roll-out of 20,000 acoustic loggers is the most by any water utility globally.

For its roll-out of permanent acoustic loggers in its network, Affinity Water is using HWM’s PermaNET+ loggers. Launched just over a year ago, this equipment has been deployed in many water companies internationally - with some large deployments in the USA and Hong Kong in particular - although Affinity’s application of 20,000 units represents the largest use of this kind of equipment anywhere in the world.

The loggers are intended to be fitted at 200-400 metre intervals on distribution mains and are located entirely below ground (an advantage for water companies, as above-ground infrastructure usually requires consultation with local authorities or other stakeholders). Each unit consists of a sensor block, which is positioned on a valve spindle where it can ‘listen’ to vibrations from the pipe, and the logger itself which is secured in the chamber nearby. Data is automatically sent to the control room from the logger via a combination of GPRS cellular communication and SMS, so once installed, there is no need to visit the unit again apart from to change the battery every 5 years.

Each unit is tagged with its GPS location, so the information it provides can appear on a map and feed into the user’s GIS system. Its analysis, conducted at night when flows are low, is aimed at detecting a loud and consistent noise which may be a leak; when such a noise is detected, it sends an alarm together with an audio file to the user. Because the units are deployed at such regular intervals, simultaneous alarms from two loggers is a reliable indication of a leak between the two points, and the relative sound level can give a good indication of where on the pipe the leak is.

Using permanent loggers in this way is vastly less labour intensive than moving mobile loggers around your network, and it is also the only way of being sure that you are picking up leaks of all sizes, according to Mike Tennant, Director of Sales and Business Development at HWM. “If you do a sweep through an area using acoustic loggers you will find some leaks, but you will also miss some – essentially, you will find the loudest leaks, which aren’t necessary the biggest ones. A pipe under pressure with a small hole in it will make a louder noise than a pipe that’s actually split in two, but more water is being lost in the second case. A permanent device is the best way of picking up those secondary, quieter leaks that are often the biggest leaks, and therefore driving your leakage down to lower levels.”

HWM were able to assist Affinity with the quick roll-out of the technology (20,000 installed in four months) by developing an app for the installers to use on their mobile phone, explains Tennant. “All the devices were pre-configured, so they just needed to swipe them with a magnet to switch them on automatically, swipe the barcode on the unit which contains all its details, and take a couple of photographs of the location. The GPS is automatically tagged - that’s all done through the app - and the information is all sent up to the database where it loads up automatically. It all enables them to move very, very quickly,” he said.

Information from the loggers can be easily married up with those from flow meters in the network, so operators can quickly ascertain how much water is being lost to a new leak and therefore how much of a priority it should be. Operators are able to enter comments about particular locations or leaks, so the company builds up a history of the problems in its network and gains intelligence that can feed into its future programme of improvements.

The rapid detection and pinpointing of leaks also means that repair teams can be dispatched quickly, so the total water loss from each leak will be much reduced. An additional benefit is that more targeted repair will ease disruption to the public caused by frequent streetworks.

PR19 Challenge Report: Leakage