Looking for invisible flaws in our water mains.

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Trunk mains are the backbone of our water network, carrying drinking water from our treatment works over long distances. Bursts on these pipes are relatively rare, but when they do happen they can cause serious negative impacts like flood damage, widespread interruption to water supplies, and even risk to life.

We know that trunk main bursts are a concern to our customers and the public. This means we're constantly trying to learn more about what causes these bursts, and where they have the worst effects, so we can work out the best ways to invest in these important pipes.

Ageing wonder material.

Much of our 3,600km trunk main network is made from cast iron dating back up to 200 years, with diameters as great as 1.5m. Although cast iron was a wonder material of its day, it was put in the ground with little protection from corrosion. Many of these pipes have decades of service left, but we know that in some places they've become badly corroded or could have other hidden defects. During the current five-year period we've already invested £240m in improving our trunk mains, and this project will further enhance our understanding for the future.

Three-year programme.

Our three-year programme started in 2017, and over the next two years we'll continue to invest £4.5 million in research and technology trials for trunk mains. We're continuing to inspect the outside of pipes whenever we dig them up to work on them, since this provides useful information about the network as a whole. We're going to build on this experience and our previous research to let us inspect hundreds of metres of pipe at a time without digging up entire roads. To achieve this, we need a method that will work from inside the pipe.

In-pipe scanning technology.

The oil industry has been inspecting pipes from the inside for years, using sophisticated scanners, but we can't just copy them. We need technology that will work on thick cast iron, which is much more difficult for scanners to penetrate than the steel used in oil pipelines. We also need to avoid damaging our pipes or affecting the quality of the water that flows through them. To achieve this we're working with technology companies to test and improve their in-pipe scanners.

- **£4.5m three-year project to trial new ways of testing trunk mains.**
- **Innovative trial to detect defects in these important pipes.**

Innovative trial.

In August 2017, we carried out the first ever ‘in-situ’ trunk main survey in the UK using a pipe scanning technology not previously used with cast iron mains of this size. The 24 inch trunk main was out of service following a burst in Lee High Road in December 2016, providing an opportune test location for this trial. The aim of the trial was to measure the success of this new scanning technology by detecting defects along a 1200m length of the pipe.

For this trial, we manually machined different shaped defects, including holes of various sizes, into a section of the trunk main (which we’d already scheduled to remove and replace after testing was complete). Then we cut a special hatch into the main, and lowered a torpedo-shaped scanning device into the pipe. The device used acoustic resonance technology to measure the condition of the trunk main wall – a technique which had never been used before in cast iron mains of this size.

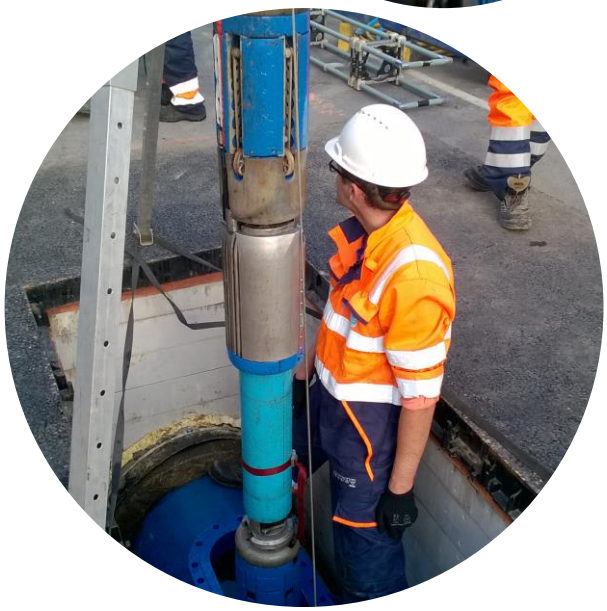
In the end, although the scanner couldn’t detect our deliberate test defects, we still learned important lessons from this trial. The scanner was able to travel a significant distance along the pipe, but we now believe that such thick metal trunk main walls (up to 25mm) are beyond the limit of this scanning technology. The scanner’s data analytics and hardware are now being further developed by the supplier, and future tests of any modified version will be possible at our new dedicated trunk main testing facility.

Unique testing facilities.

We’re building a dedicated facility for testing trunk mains at one of our sites. This will give us a testing ground for a variety of trunk main technologies, including in-pipe scanners, while simulating many of the challenges of the real water network without disrupting traffic or water supplies to customers. We’re also collaborating with other water companies to share technology testing, and demonstrate a wider market for new technologies.

Scanning real trunk mains.

The most promising in-pipe scanners will get the opportunity to be used in real trunk mains in our network. By 2020 we aim to have identified technology that can be used more routinely. But this will still be expensive work, so we’ll need to target our inspections carefully.



Making sense of it all.

Alongside the technology trials, we’ll be working with experts from universities and industry on analytical tools to translate this scanning data into insight, to help us invest money where it’s needed most.

We’ve already been working closely with the University of Surrey for a number of years to understand how corrosion affects the strength of cast iron pipes. Further postgraduate research into the corrosion and deterioration of trunk mains is also being funded by this programme.

Our future vision.

Ultimately we hope that by scanning the highest-risk trunk mains, we’ll be able to work out which sections really need to be replaced, and which sections are safe to carry on using. Being able to target our investment better will help us avoid replacing pipes needlessly, which will benefit everyone in the end.