Engineers solve leaky water pipes problem

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Leaky pipes are a common problem for the water industry: according to UK regulator, Ofwat, between 20 and 40 per cent of the UK's total water supply can be lost through damaged pipes. Developing more accurate ways of finding leaks would enable water companies to save revenue and reduce their environmental impact.

The system invented at Sheffield tests pipes by transmitting a pressure wave along them that sends back a signal if it passes any unexpected features, such as a leak or a crack in the pipe's surface.

The pressure wave is generated by a valve fitted to an ordinary water hydrant, which is opened and closed rapidly. The wave sends back a reflection, or a signal, if it encounters any anomalous features in the pipe. The strength of that signal can then be analysed to determine the location and the size of the leak.

Originally created by a team led by Professor Stephen Beck in the University's Department of Mechanical Engineering, the invention was developed into a prototype device in partnership with colleagues in the Department of Civil and Structural Engineering, and UK water company, Yorkshire Water.

The device has now been trialled at Yorkshire Water's field operators training site in Bradford, UK and results show that it offers a reliable and accurate method of leak testing. Leaks in cast iron pipes were located accurately to within one metre, while leaks in plastic pipes were located even more precisely, to within 20cm. The results of the trial are

published today (6 August 2012) in a paper entitled, 'On site leak location in a pipe network by cepstrum analysis of pressure transients', in the *Journal - American Water Works Association*.

Existing leak detection techniques rely on acoustic sensing with microphones commonly used to identify noise generated by pressurised water escaping from the pipe. This method, however, is time consuming and prone to errors: the use of plastic pipes, for example, means that the sound can fall away quickly, making detection very difficult.

In contrast the device invented by the Sheffield team uses a series of calculations based on the size of the pipe, the speed of the pressure wave , and the distance it has to travel. The device can be calibrated to get the most accurate results and all the data is analysed on site, delivering immediate results that can be prioritised for action.

Dr James Shucksmith, in the Department of Civil and Structural Engineering at the University of Sheffield, who led the trial, says: "We are very excited by the results we've achieved so far: we are able to identify the location of leaks much more accurately and rapidly than existing systems are able to, meaning water companies will be able to save both time and money in carrying out repairs.

"The system has delivered some very promising results at Yorkshire Water. We hope now to find an industrial partner to develop the device to the point where it can be manufactured commercially"

Dr Allyson Seth, Networks Analytics Manager at Yorkshire Water comments: "Driving down leakage on our 31,000km network of water pipes is a high priority for us.

"Over the last 12 months alone, we've targeted leakage reduction and as a result we're currently recording our lowest ever levels of leakage.

"But we want to do more, which is why, in addition to the existing technologies we use, we're looking at new ways to help us to reduce leakage.

"Our work with engineers at the University of Sheffield is the latest example of this, and we look forward to working with them going forward to build on what has been achieved so far."

More information: On site leak location in a pipe network by cepstrum analysis of pressure transients, J.D Shucksmith, J.B.Boxall, W.J.Staszewski, A.Seth and S.B.M.Beck, *Journal - American Water Works Association*
www.awwa.org/files/secure/index.cfm?FileID=212310

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