

Hydrant dynamics for acoustic leak detection

Need for project

Leakage is one of the key challenges facing the water industry and UKWIR have an ambitious aim of “achieving zero leakage in a sustainable way by 2050”. This aspirational target cannot be achieved with existing processes, techniques and equipment, so UKWIR have developed a strategic programme of research projects to address this.

One area is investigating leak detection and location methods and UKWIR are working with the University of Southampton on fundamental research, specifically exploiting acoustic and vibration detection methods. This builds on gap analysis work previously carried out by the University. The research is being progressed via a number of PhD projects which feed into the UKWIR Zero Leakage 2050 programme. One of these projects is summarised below.

Project overview and objectives

The effectiveness of acoustic leak detection methods is restricted for plastic pipes due to the high attenuation of the acoustic signals. Much of the acoustic signal can be “lost” when travelling from the pipe to the detection sensor located (usually) on a hydrant. Resonances of the pipe system at these hydrant sensors can have a profound effect on the bandwidth of the measured leak noise. The aim of the research is to investigate the dynamics of the hydrants to examine if such resonances may be exploited.

This exciting and innovative project will investigate hydrant dynamics so that new guidelines can be given for sensor numbers, type and positioning and hydrant design. This will be done via theoretical modelling of vibrational wave propagation in hydrants, laboratory experiments on simplified hydrants and laboratory and field experiments on real hydrants. Industrial assistance has been provided for this project from the

Bournemouth Water division of South West Water.



Figure 1. AVK hydrants being trialled as part of the research

Work programme and timetable

This 4-year PhD commenced in late 2018 and is due for completion in 2022. The first year comprised taught courses, a group design project and a mini individual research project. During years 2-4, the main body of research will be carried out, including: further dynamic testing in the laboratory; the acquisition and analysis of data from live networks; and analytical modelling of the hydrant-riser-pipe dynamic system.

Benefits

To provide Industry guidance on detection sensor installation at hydrants to improve leak detection and ultimately fix more leaks. Also, to work with manufacturers to improve future hydrant design for more effective leak detection.

Project team

This research is being carried out by Rahma Nassoro at the Institute of Sound and Vibration Research at the University of Southampton under the supervision of Dr Jen Muggleton. The UKWIR Programme Lead is Jeremy Heath, SES Water, with support from Dennis Dellow, UKWIR Technical Lead for Leakage and UKWIR Project Management by Rebecca Haylock.