Leak Characterisation for Pipelines in a Closed Water Distribution Network

Measuring basic parameters of a closed water distribution network, at consistent periodic intervals to determine critical leak information.

Published: 13th June 2019

Concrete water pipe / bidgee / https://commons.wikimedia.org/wiki/File:Concrete_water_pipe.jpg / CC BY 3.0

Background

Leak detection and management is an important topic in the management of water distribution systems. Various instruments and measurement techniques have been developed to identify the occurrences and locations of new leaks in large distribution systems and networks.

UCT researchers have shown that there is a linear relationship between the leakage area and system pressure for all types of leaks, pipe materials and loading conditions, provided that the pipe material undergoes elastic or viscoelastic deformation (which is expected to be the case for the vast majority of leaks). This relationship has enabled the calculation of "leakage parameters" which is useful in identifying the size and type of leak, and can be used to describe how changes in pressure will affect losses in a water distribution system.

However, despite this linear relationship being assumed for decades, the application of this concept has not found acceptance in leakage management practices.

Technology Overview

Researchers at UCT have developed a method to determine critical leak information of a water distribution network. By measuring basic parameters of a closed water distribution network, at consistent periodic intervals, the following can be determined:

- Types of cracks in the closed water distribution network i.e. horizontal or longitudinal
- Sizes of cracks in closed water distribution network
- Volume of water lost due to leaks in closed water distribution network

This information is critical in making decisions on pipeline management, maintenance and replacement on a network level. The UCT technology can be integrated with existing measurement instruments which are typically remotely installed and communicate information to a control room(s).

Once the UCT algorithm is introduced into the instruments, no human pintervention is required to obtain the information. The above information is calculated and stored daily to show network behaviour and deterioration over time and allows utility managers to pro-actively monitor and manage leaks in closed water distribution networks.

Benefits

The UCT leak characterisation technology provides the following benefits:

- Automatically determining of leak parameters such as leak size, leak volume, leak type in a closed water distribution network
- Provide network operator with near real time feedback of leak statuses of the network

- Remote and self-operating system – needs no human intervention
- Integrates with existing equipment already commonly installed on most bulk supply networks

Applications

Potential applications and uses for the technology include:

- Municipalities, regional and national water network managers can use the innovation to obtain a daily view of leaks in specific sections of large distribution networks. Data is sent to control rooms and important infrastructure management decisions can be made based on credible data i.e. repair leak because the water losses outweigh actual repair costs.
- Large enclosed water users (industrial plants, mines, housing estates, office parks, malls, etc.) can use system to manage the health of their distribution network within their enclosed premises. Information on the losses and leaks will be available on a daily basis to allow infrastructure managers to proactively manage the water distribution infrastructure.
- Water instrumentation companies can incorporate the technology into standard equipment and provide their clients with additional value when selling the instruments.

Opportunity

UCT is seeking a partner to license the technology and incorporate it into either their water instrumentation and/or associated systems for increased value addition to clients. UCT is able to assist with R&D in projects related to this technology.

Patents

- PCT Application: PCT IB2017-056420

IP Status

- Provisional patent
- Know-how based

Seeking

- Development partner
- Licensing
- Commercial partner