

PIPE LEAK DETECTION TECHNOLOGY DEVELOPMENT



IMPACT STATEMENT

The U.S. Environmental Protection Agency (EPA) has determined that one of the nation's biggest infrastructural needs is the replacement or rehabilitation of the water distribution and transmission systems. The institution of more effective pipe leak detection technology will improve the water utilities' ability to respond to major and minor pipe leaks in a timely manner to reduce water loss and property damage, as well as to protect human and environmental health. From this research, EPA will be able to help local utilities to implement the technology necessary to pinpoint leaks in the water distribution system and reduce water loss.

BACKGROUND:

In 2007, EPA began the implementation of a new science and engineering research program to evaluate and further develop innovative technologies for evaluation, rehabilitation, and replacement of the Nation's aging water and wastewater infrastructure. The water infrastructure program has four pillars, one of which is "condition assessment," under which effective pipe leak detection technologies and techniques are investigated and developed.

The U.S. water distribution systems are aging and many pipes in this infrastructure are beginning to leak or fail altogether. Leakage from water distribution systems costs the nation 1-2 billion dollars annually and this figure grows when taking into account property damage and replacement costs due to infrastructural failures. Leaks in the water infrastructure do not have to be large to have a major impact on water loss. Large water main breaks receive much more media attention, but these types of failures only account for 1 percent of water loss due to leaks. A chronic service line leak on the order of 1 gallon per minute would most likely go unnoticed for years before being found, and would result in the loss of 525 thousand gallons of water per year. This water had to be treated and purified to meet drinking water standards, which increases the costliness of leaks. Water loss on the level of 10-20 percent is considered normal, but in some areas the aging infrastructure is losing 50 percent of water distributed.

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DESCRIPTION:

The Office of Research and Development's (ORD) National Risk Management Research Laboratory has funded this research project in support of its Aging Water Infrastructure (AWI) Research Program. This project aims at developing

new sensor-based water leak detection protocols, methods and technologies for effective pipe leak detection in drinking water distribution systems. A pipe leak detection system (PLDS) experimental station for testing technique for future applications was established at the EPA T&E Facility located in Cincinnati, Ohio. This PLDS is constructed of 3-inch ductile iron pipe and is designed to accommodate different types of pipe and leak configurations. Leak detection experiments were performed by using acoustic leak detection technology. The specific system used was the ZCorr acoustic leak detection system manufactured by FlowMetrix, Inc. of Maynard, MA. The efficacy of the ZCorr system in pinpointing the exact location of water leaks under various experimental conditions was evaluated. From this research, EPA will be able to help local utilities to implement the technology necessary to pinpoint leaks in the water distribution system and reduce water loss.

EPA GOAL: Goal #2 - *Clean & Safe Water*; Objective 2.1.1- *Water Safe to Drink*

ORD MULTI YEAR PLAN: Drinking Water (DW), Long Term Goal (LTG) - DW-1 *Characterize risks associated with DW sources, distribution, treatment, and use*

RESEARCH PARTNERS:

Collaborators: University of Cincinnati; Flow Metrix, Inc.

Contractors: Shaw Environmental; University of Cincinnati

EXPECTED OUTCOMES AND IMPACTS:

It is expected that this project will result in improved monitoring techniques for end-users; lowered cost and increased effectiveness of design, operation, maintenance, rehabilitation, and replacement of aging water infrastructure; reduced water loss in distribution; reduced energy consumption and water loss; extended service life and functionality of existing conveyance systems; and reduced life cycle cost.

OUTPUTS:

In this project, new and improved sensor-based leak detection technologies will be developed in order to aid utilities and the water industry in reducing water loss and avoiding greenhouse gas emissions through tangible water savings. It is anticipated the new methods and techniques are patentable. Additionally, the project will produce journal articles and conference proceedings.

RESOURCES:

Aging Water Infrastructure Research Program: <http://www.epa.gov/awi/>

Water Resource Adaptation Program (WRAP): <http://www.epa.gov/nrmrl/wswrd/wqm/wrap/>

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Drinking Water



Aging Water Infrastructure