Advanced Condition Assessment & Pipe Failure Prediction Project

Optimal management of water infrastructure

Fact Sheet No. 3, December 2012
Progress on Activity 2

In August 2011 international water research organisations, Australian water utilities and three Australian universities came together through a collaborative research agreement, and committed overall funding of $16 million (including $4 million cash) over five years to find ways of finding a solution to failure of critical water pipes.

The partners in this research project include Sydney Water Corporation,Water Research Foundation of the USA, UK Water Industry Research Ltd, Water Corporation (WA), City West Water, Melbourne Water, South Australia Water Corporation, South East Water Ltd and Hunter Water Corporation.

Monash University leads the research supported by University of Technology Sydney and the University of Newcastle. Other collaborators include Water Environment Research Foundation and Dr Balvant Rajani of Rajani Consultants Inc.

Round 1 of the project covers three activities initially:

Activity 1 How, when and where will pipes fail within the entire network?

Activity 2 How do we assess the condition of the pipe cost effectively?

Activity 3 How do we calculate pipe deterioration rates accurately with respect to the pipe environment?

Further Activities planned for Round 2 include:

Activity 4 What is the time-dependent probability of failure along the pipeline?

Activity 5 How do we transfer the new knowledge to the industry for optimal pipe management?

All five activities are due for completion by 2016.

Activity 2 How do we assess the condition of the pipe cost effectively?

The aim of the Activity is to advance knowledge and improve levels of confidence of direct methods for condition assessment using advanced data interpretation techniques. Its scope includes development of innovative methods for automatic interpretation of data gathered from existing sensors.

A/Prof. Jaime Valls Miro and Prof. Gamini Dissayanake from the University of Technology Sydney are co-leading this Activity.

Figure 1 shows an image of the automatic ultrasonic scanner currently in development at UTS.

Figure 2 shows a picture of the RFEC tool during the condition assessment trial.

Industry Partners

The expected outcomes of Activity 2 include:

- Algorithms for automatic interpretation of data gathered from magnetic flux leakage (MFL), broadband electromagnetic (BEM) and remote field eddy current (RFEC) and acoustic sensor methodologies.
- Identification and evaluations of potential enhancements to sensors based on MFL , BEM, RFEC and acoustics.
- Sampling strategies for enhancing the effectiveness of MFL, BEM and RFEC and acoustics.
- A test bed prepared to evaluate the effectiveness of future technologies for pipe condition assessment.
- A comprehensive database for direct evaluation of the effectiveness of various technologies evaluated.
- A decision making framework on the use of technologies evaluated.

Progress to date includes:

- Research agreements established with three technology providers.
- First and second condition assessment trials on the test bed using BEM and MFL technologies completed.
- Condition assessment of 1 km of the test bed completed using RFEC technology.
- Data analysis of the first trial in progress.
- Sensor model simulations developed for BEM and MLF using finite element analysis.
- Research program established for RFEC technology.
- Machine learning interpretation tested for simple defects using simulated data.
- An in-house automatic ultrasonic scanner development is being assembled to provide accurate and repetitive remaining wall thickness from test-bed pipe cut sections.
- Evaluation of a 3D laser scanner to get high resolution geometric profiles of test-bed pipe sections has been completed, a unit has been purchased and training of operators concluded.

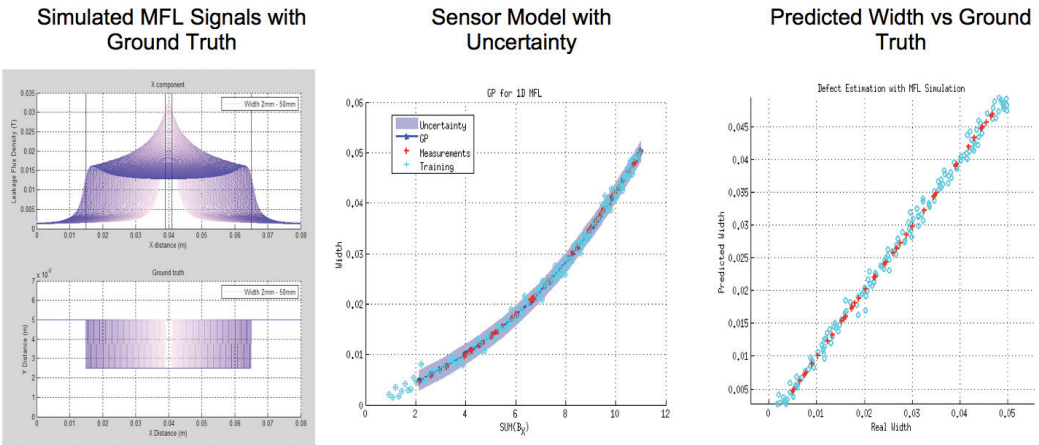

Figure 3 shows an example of a machine learning interpretation method for simulated MFL signals.

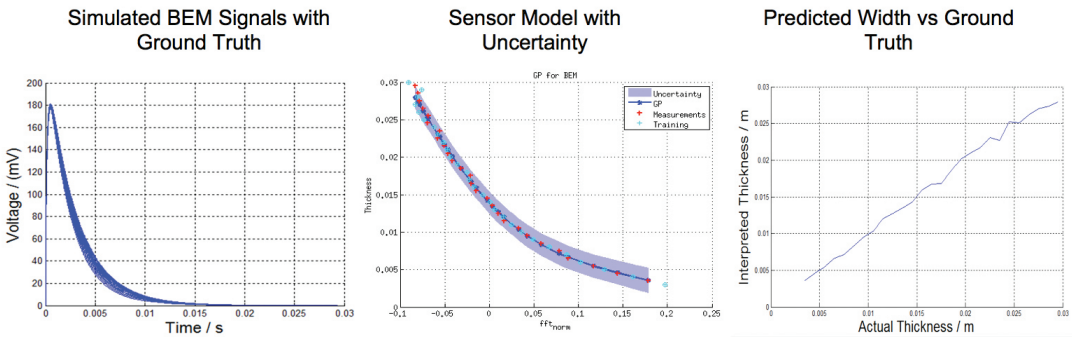

Figure 4 shows an example of a machine learning interpretation method for simulated BEM signals.

Research Partners

MONASH University

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

UNIVERSITY OF TECHNOLOGY SYDNEY

International Partners

Water Research Foundation

UKWIR