

An Indian-Australian research partnership

Project title Fuzzy logic-based failure prediction model for water distribution pipes

Project number: IMURA0120

Monash University supervisors: Associate Professor Jayantha Kodikara

Monash University contact: Associate Professor Jayantha Kodikara, kodi@eng.monash.edu.au

IITB supervisors: suggested Prof. Pradipta Banerji/Prof. Sauvik Banerjee

IITB contact: Prof. Pradipta Banerji, pbanerji@iitb.ac.in

Research Academy theme/s

The research academy theme/s that is relevant to the project

1. Advanced computational engineering, simulation and manufacture
2. Infrastructure engineering

The research problem

Water supply and waste water piping systems form a major essential service to urban communities. With the ageing of these systems, failures have become a common occurrence with substantial financial, social and environmental costs. To put in global context, in the US alone, the pipe rehabilitation/replacement costs have been estimated to be US \$460 billion over the next 20 years, and worldwide this cost is billions of dollars annually. In addition, water – a precious commodity – is also lost at alarming rates. In some instances, there are losses of up to 30 to 40%, due to pipe leaks and bursts. Therefore, the effective management of this pipe asset is a major issue for urban centres worldwide. A significant problem facing the development of effective pipe failure prediction and management models is the imprecision of data that deal with the static and dynamic variables influencing the failures. In this regard, models have been attempted on the basis of traditional probabilistic approaches such as Monte-Carlo simulation etc to deal with the uncertainty. This project proposes to develop a new methodology to deal with this problem using fuzzy logic mathematics, which are deemed to be superior in handling imprecise and uncertain data sets as in pipe failures.

Project aims

The aim of this project is to develop new pipe failure prediction methodologies based on fuzzy logic mathematics.

Expected outcomes

The outcomes will be development of new theoretical basis and techniques of analysing pipe failure statistics in the face of uncertainty and imprecise data. It is expected that such models will be more useful in developing effective pipe asset failure management worldwide, especially urban centers.

Which of the above Theme does this project address?

Primarily the project addresses infrastructure engineering and advanced computation.

How will the project address the Goals of the above Themes?

The project will be based on theoretical analysis and numerical modelling. The project will address sustainable infrastructure and manufacture that underpins the economy of a country.