

An introduction to the Monash Pipe Evaluation Platform for water pipe rehabilitation

Introduction

The following fact sheet gives an introduction to the Monash Pipe Evaluation Platform (MPEP) a tool developed to assist in decision-making for water pipe rehabilitation.

Monash Pipe Evaluation Platform



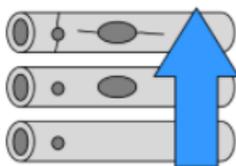
PIPE EVALUATION PLATFORM

The MPEP (<https://pipes.monash.edu/>) incorporates the research outcomes of Monash's work from projects including: Advanced Condition Assessment and Pipe Failure Prediction (ACAPFP), Smart Water Fund, Sydney Water Implementation Phase, and Smart Linings for Pipe and Infrastructure.

There are four main modules in the MPEP

- Pipe ranking
- Pipe failure analysis
- Liner selection
- Lined pipe analysis

Pipe Ranking



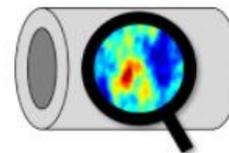
PIPE RANKING

The Pipe Ranking module determines what pipes are a priority for renovation based on failure probability. This can be done through the Monash Pipe Ranking Tool - a probabilistic model to rank and select candidates for

lining and renewal using a Bayesian Simple Model. Alternatively, a utility specific approach of pipe selection, pipe ranking or zone ranking can be used. In this module users will:

- Choose a ranking model
- Upload pipe data
- Select the failure data range for the model to use
- Run the model to rank pipes for renewal/rehabilitation

Pipe failure analysis



PIPE FAILURE ANALYSIS

After the pipes have been ranked, the highest ranked pipes are assessed for current condition

This module is broken down into 4 sub-modules:

- Time to failure
- Probability of failure
- Pipe level analysis
- Zone level analysis

Essential information gathered for use in the module:

- Host pipe properties
- Loading conditions - internal pressure, soil pressure, traffic load and hydrostatic load
- Soil properties
- Host pipe deterioration

Host pipe condition evaluation is estimated using 4 methods:

- Defect characterisation

- Failure history
- Deterioration
- Leak rates

The following host pipe details are estimated

- Present condition
- Remaining life

Liner selection



LINER SELECTION

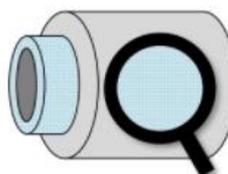
This module is broken down into 2 sub-modules:

- Pipe level analysis (examines a single pipe)
- Zone level analysis (examines multiple pipes)

The host pipe is given a condition grade based on the analysis results from the pipe failure analysis module and suitable methods of rehabilitation are recommended from the following:

- Do nothing
- Spray or CIPP (Class C to B)
- CIPP (Class A)
- Replace

Lined pipe analysis



LINED PIPE ANALYSIS

This module is broken down into 2 sub-modules:

- Long-term analysis
- Net Present Value (NPV) cost analysis

The long-term analysis module can be used to determine an appropriate liner thickness for a selected design life, or to determine an expected service life based on a liner thickness. Liner properties from this module can be inputted by users, if available, or chosen from the generic liner properties for different liner classes. These generic liner properties were obtained from literature and extensive liner testing of different liners (see additional fact sheets on short-term material testing, long-term material testing and large-scale testing).

NPV cost analysis - A simple NPV cost-benefit analysis is used to determine the value of a lined pipe based on the service life predicted from the long-term lined pipe analysis. It considers the following 3 options:

- Replace
- Rehabilitate with liner
- Do nothing

Conclusions

The Monash Pipe Evaluation Platform will position Australia as a global leader in the installation and application of pipe liner techniques and technologies for water mains through achieving:

- Streamlined requirements to simplify the process of lining technology acceptance.
- Improved industry confidence in the technology by independent validation of liner products.
- Acceptance of cost-effective, high-performance products that extend asset life.
- Improvement to the total life cycle cost of asset rehabilitation and quality with innovative material selection.
- Increased access for Australian small and medium enterprises to international industry networks to export advanced knowledge-based services.