

Reliability-Based Maintenance Management Methodology to Minimise Life Cycle Cost of Water Supply Networks

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Abstract : With a large percentage of countries' total infrastructure expenditure attributed to water network maintenance, it is essential to optimise maintenance strategies to rehabilitate or replace underground pipes before failure occurs. The aim of this paper is to provide water utility managers with a maintenance management approach for underground water pipes, subject to external loading and material corrosion, to give the lowest life cycle cost over a predetermined time period. This reliability-based maintenance management methodology details the optimal years for intervention, the ideal number of maintenance activities to perform before replacement and specifies feasible renewal options and intervention prioritisation to minimise the life cycle cost. The study was then extended to include feasible renewal methods by determining the structural condition index and potential for soil loss, then obtaining the failure impact rating to assist in prioritising pipe replacement. A case study on optimisation of maintenance plans for the Melbourne water pipe network is considered in this paper to evaluate the practicality of the proposed methodology. The results confirm that the suggested methodology can provide water utility managers with a reliable systematic approach to determining optimum maintenance plans for pipe networks.

Keywords : water pipe networks, maintenance management, reliability analysis, optimum maintenance plan

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