RELIABILITY BASED REHABILITATION OF WATER DISTRIBUTION NETWORKS
BY MEANS OF BAYESIAN NETWORKS

Abstract

Water plays an essential role in the everyday lives of the people. To supply subscribers with good quality of water and to ensure continuity of service, the operators use water distribution networks (WDN). The main elements of water distribution network (WDN) are: pipes and valves. The work developed in this paper focuses on a water distribution network rehabilitation in the short and long term. Priorities for rehabilitation actions were defined and the information system consolidated, as well as decision-making. The reliability data were conjugated in decision making tools on water distribution network rehabilitation in a forecasting context. As the pipes are static elements and the valves are dynamic elements, a Bayesian network (static-dynamic) has been developed, which can help to predict the failure scenario regarding water distribution. A relationship between reliability and prioritization of rehabilitation actions has been investigated. Modelling based on a Static Bayesian Network (SBN) is implemented to analyse qualitatively and quantitatively the availability of water in the different segments of the network. Dynamic Bayesian networks (DBN) are then used to assess the valves reliability as function of time, which allows management of water distribution based on water availability assessment in different segments. Before finishing the paper by giving some conclusions, a case study of a network supplying a city was presented. The results show the importance and effectiveness of the proposed Bayesian approach in the anticipatory management and for prioritizing rehabilitation of water distribution networks.

Key words: dynamic Bayesian networks, predicting reliability, rehabilitation, static Bayesian networks, water distribution network