Optimisation of an emergency plan in gas distribution network operations with Bayesian networks

Abdelaziz Lakehal Related information
[1]Department of Mechanical Engineering, Mohamed Chérif Messaadia University, P.O. Box 1553, Souk-Ahras, 41000, Algeria
, Zine Ghemari Related information
[2]Department of Electrical Engineering, University of M'sila, M'sila, Algeria

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Abstract

The focus of this paper is on the development of a predictive emergency plan for operating gas networks in crisis situations (major incident or disaster). The first contribution of this paper is summarised in the first part, which defines the essential elements of an emergency plan and the centre position of reliability in such plan. A Bayesian model is implemented; it allows the estimation of probabilities of valve closure based on system-level performance for isolating gas distribution network. Also it allows the prioritisation of revamp work and capacity-upgrade actions related to existing gas pipe networks for the sake of safe operations. Finally a case study of a distribution network supplying a city is presented. The paper demonstrates that Bayesian networks allow for the management and the predictive control of gas networks and the simulation of effect of maintenance and investment actions on the performance of isolating system.

Keywords: gas distribution networks, emergency planning, valve reliability, Bayesian networks, safe operations, optimisation, safety, crisis management, emergency management, disaster management, valve closure, gas pipe networks, gas pipes, predictive control, gas networks, simulation, pipe maintenance, isolating systems

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