

ANALYSIS OF FAILURE PROBABILITY IN THE NETWORK PIPELINES

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Abstract

The aim of the work presented in this paper is development and application of a common scientific methodology for the assessment of failure probability of the pipeline network energy systems. The developed methodology is applicable for district heating, gas and oil supply networks. The failure probability of all these systems depends on the degradation mechanisms and structural integrity of pipes. The developed approach for assessment of failure probability for pipeline networks is treated as a complex task, which involves the probabilistic mathematical and deterministic-probabilistic structural integrity analyses. As example in this paper this approach was applied for the analysis of Kaunas (Lithuania) district heating system. In the first step of research the statistical analysis was performed and the piping with the highest failure rate was determined. The next step was the integrated deterministic-probabilistic structural integrity analysis. This analysis evaluates the uncertainties associated with loads, material properties, and geometrical parameters. The pipe rupture probability dependence on the defected zone thickness and loading was identified. Finally, Bayesian method was applied for the integrated assessment of failure probability of the district heating network piping. The failure probability of pipelines (per 1 km per year) depending on operation time was calculated.

KEY WORDS: Probabilistic Analysis, Deterministic-Probabilistic Structural Integrity Analyses, District Heating Network Pipeline, Bayesian method