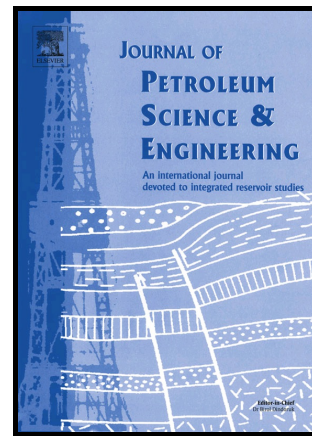


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Failure assessment and safe life prediction of  
corroded oil and gas pipelines

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**ABSTRACT**

Failure of in service oil and gas pipelines can result in catastrophic consequences. To avoid the economical, environmental and social impacts due to pipeline collapse, rational methodologies should be employed to predict the safe life of corrosion affected steel pipes and to instigate maintenance and repairs for the corroded pipeline system. The uncertainties in corrosion sizes and pipe characteristics actuate the residual strength model to be a probabilistic model rather than a deterministic one. Therefore, an analytical reliability-based methodology using first passage probability theory for failure assessment of corrosion affected oil and gas pipelines is presented in this paper. The methodology is applied for a defected 1.5km oil pipeline and failure probability is estimated versus time. Sensitivity analysis is also undertaken to identify and evaluate the factors that affect the failure due to the strength loss. It can be quantitatively estimated that how decrease in internal pressure can increase the safe life of the pipeline. The methodology can help pipeline engineers and asset managers in prioritizing pipeline repairs and/or replacements based on their estimated probability of failure.

**Keywords:** Reliability analysis; Safe life prediction; Corrosion; Steel pipes; Stochastic model

**1. INTRODUCTION**

Oil and gas constitutes 60% of the world's fuel usage. Although pipelines are a very safe form of energy transportation, in the case of pipeline failures, the spilled oil and gas can cause a considerable hazard to the surrounding environment and population.

Deterioration and ageing of pipeline infrastructure is one of the major problems facing pipeline industry. More than half of the USA oil and gas pipeline network is over 40 years old. 20% of Russia's oil and gas system is almost at the end of its design life and it is expected that in 15 years

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