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Reliability estimation of pressurized API 5L X70 pipeline steel under longitudinal elliptical corrosion defect.

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Abstract: The probabilistic approach is the best way to give realistic answers for design and maintenance and it is considered as a powerful decision-making tool. In the present paper, assessment of the failure probability of corroded pipeline subjected to internal pressure is estimated by using the first order reliability method (FORM). Measurements of defect dimensions have been achieved changed into collected by using ultra sound inspection probe through a 75-km pipeline portion on one of the main Algerian high pressure gas transportation that has been in service for 30 years. The sensitivity analyses have been carried out on random variables to identify the importance of the parameters within the reliability mechanical model. The modified B31G code has been coupled as a mechanical model, with Rackwitz optimization algorithm by using PHIMECA Software. The limit state function resumes the difference between the pipeline burst pressure and the pipeline operating pressure. The aim of the present work is to make in evidence the competitive importance of pressure service, wall thickness and the defect depth with regards to defect length and to determine the influence of the coefficients of variation on the failure probability and the remaining life of the pipeline. A diagram based on the reliability index results is proposed to predict the pipeline degradation and it can be used as a decision tool for maintenance program.

Keywords : corrosion, Failure probability, Coefficient of variation, Modified ASME B31G