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**Assessment of Burst and Collapse Strengths of Pipeline Due to Multiple Corrosion Defects**

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## Abstract

Corrosion is one of the most common and serious threats to oil and gas pipelines. Corrosion defects of random shapes can be found either as a single pit at one location or multiple pits in near vicinity. Assessment of pipe integrity is very important to maintain continuity of production, and to plan for repair and maintenance. Experimental testing to predict behavior of corroded pipes is both time consuming and costly. Numerical simulation can give reasonably accurate predictions without the need for elaborate testing. In computational modeling or empirical testing, defect shapes can be approximated by various polygonal or conic-section shapes, together with their orientation and separation from each other. If corrosion defects are close to each other, their interaction increases, resulting in lower failure pressure compared to single defect. Finite element analysis (FEA) is used in this work to determine the failure pressure, considering different parameters such as defect shape and geometry, distance between defects, and defect orientation (longitudinal, circumferential, and diagonal). Initially, results are compared with published findings from experimental and numerical studies. After validation, simulated values of failure pressure are used to determine burst and collapse strengths of corroded pipes. Parametric studies are then conducted, including the effects of pipe diameter, defect depth, pipe wall thickness, etc. Results show that existing codes are highly conservative which may result in unnecessary shutdowns, repairs, or operation below design conditions. Some notable conclusions are that the defect shape has small effect on pipeline failure pressure, while the defect depth to pipe thickness ratio has a significant influence. Defect location either internal or external and defects orientation have also a big influence in pipe burst and collapse strengths as well as defects interaction. A new correlation equation is proposed as a correction to standard equations to determine the collapse failure pressure of a pipeline with two corrosion defects.