

Failure Pressure Analysis of the Pipe with Inner Corrosion Defects by FEM

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Inner corrosion defects can severely impact the reliability of the corroded pipeline. The mechanical behavior and failure pressure of the pipeline with single inner corrosion defect, multiple interacting inner corrosion defects and multilayer structural inner corrosion defect were investigated by nonlinear finite element method in this paper. Effects of length, width and depth of the corrosion defect and inner pressure were discussed. The results demonstrate that von Mises stress and the plastic strain of the corroded pipeline increase with the increasing of inner pressure. Failure pressure of the corroded pipeline decreases with the increasing of length and depth of the corrosion defect, but width has a small effect on it. The pipelines with multiple and multilayer corrosion defects were also studied. Stress concentration appears on the longitudinal separation of the interacting corrosion defects. Failure pressure of the pipeline with multiple inner defects is lower than it with single inner pressure. Stress concentration and plastic deformation firstly occurs on the lowest layer of the corrosion defects and then expands to other layers with the increasing of the inner pressure.

Keywords: inner corrosion defects, pipeline, FEM, failure pressure, corrosion morphology

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