

Effect of magnetic field on corrosion behavior of X70 pipeline steel with V- groove flaws

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Abstract

Whereas this magnetic flux leakage classifier assured the safe operation of in-service pipelines, its magnetization impact might affect pipeline steel corrosion, particularly for pipelines with flaws in service. In this paper, the weight loss method, AC impedance technique, potentiodynamic polarization technique, X-ray photoelectron spectroscopy (XPS), and finite element simulation were used to analyze the impact of magnetic field (MF) on the corrosion behavior of high-strength pipeline steel with V-groove flaws in Ku'erle simulated solution. The vertical MF increased corrosion near the left end of a V-groove slot in the Y-direction while inhibited corrosion on the right. And the perpendicular and parallel MF induced corrosion externally to the V-groove slot while inhibiting corrosion within the V-groove slot. Moreover, perpendicular and parallel MF on corrosion system are mainly due to magnetic field gradient force, whereas vertical MF is mainly related to Lorentz force.

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