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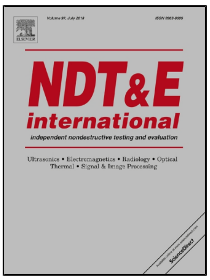

Simulation Analysis and Experimental Study of an Alternating Current Field Measurement Probe for Pipeline Inner Inspection

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ABSTRACT:

Alternating current field measurement (ACFM) is an electromagnetic inspection method. It can be used as an alternative to magnetic particle inspection in the pipeline industry. This paper presents an ACFM probe for efficient, accurate, and contactless inner inspection of pipelines. The performance of the detection elements, cambered rectangular current-carrying coil, and cambered rectangular core are simulated, and the influences of various parameters, lift-off value, and inducing frequency are optimised. Finally, experiments are carried out using the proposed probe to evaluate its detective ability. The smallest axial crack detected by the probe had a length of 3 mm and depth of 1 mm. The results of this study show that the probe can quantitatively evaluate axial cracks on the surface of a pipeline, and the findings will aid in designing ACFM probe.

Keywords: ACFM probe; Inner inspection; Simulation analysis; Experiment.

1. Introduction

Pipelines, such as long-distance pipelines, drill string and tubing, and risers, are used quite extensively. However, these pipelines suffer from the effects of stress and corrosion. When there is a change in geo-ecological conditions and transmission medium, microscopic fissures on pipelines will transform into numerous tiny axial cracks, or even lead to defects and breaks. Pipeline leakage, fractures, and boosters