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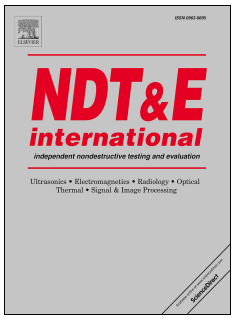

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The Choice of Ultrasonic Inspection Method for the Detection of Corrosion at Inaccessible Locations

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Abstract

Inspection for corrosion and pitting defects in the petrochemical industry is vital and forms a significant fraction of the operating expenditure. Low frequency guided wave inspection is frequently employed as it gives large area coverage from a single transducer position. However, detection becomes problematic at inaccessible regions such as pipe supports or beyond T-joints since the low frequency guided waves produce a significant reflection from the feature itself, hence limiting the defect detectability of the method. This suggests testing at higher frequencies which helps to minimise the reflection from the feature and also improves the sensitivity to smaller defects. There are a number of guided wave and related techniques implemented for corrosion inspection including the S0 mode (at ~ 1 MHz-mm), SH0 and SH1 modes (at ~ 3 MHz-mm), CHIME, M-skip and Higher Order Mode Cluster (A1 mode at ~ 18 MHz-mm). This paper presents a systematic analysis of the defect detection performance of each method with sharp and gradual defects, as well as their sensitivity to attenuative coatings, liquid loading, surface roughness and ability to test beyond features such as T-joints. It is shown by finite element analysis backed up by experiments that the A1 mode provides the best overall performance when dealing with surface features such

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