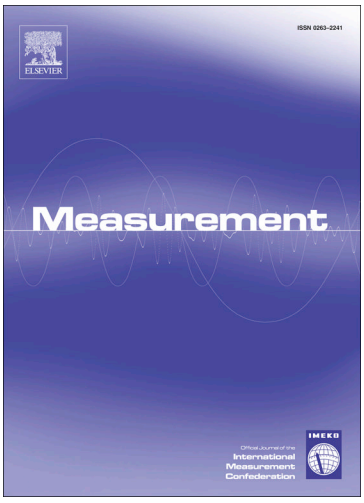

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Excitation and propagation of torsional T(0,1) mode for guided wave testing of pipeline integrity

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Abstract

Guided wave testing is one of non-destructive testing techniques for pipeline inspection using low-frequency ultrasonic waves. Guided wave testing uses a set of equally placed piezoelectric transducers around a pipe, and the number of transducers in the array is a key factor for suppressing higher order flexural modes. This paper presents an effective approach for the excitation and propagation of torsional T(0,1) wave mode for detecting defects in a steel pipe by using finite element numerical simulations and experimental studies. From the numerical and experimental results, the optimised design for transducer arrangement is investigated. The relationship between defect type, dimension and transducer arrangement is also investigated. To validate the finite element modelling, the numerical results are then compared to the experimental data. Finally, the sensitivity of reflected signal from defects to two types of transducer array design is evaluated, and circumferential displacement along the pipe is investigated by using polar plots at different axial positions.

Keywords: Guided Wave; Piezoelectric Transducer Array; Finite Element Modelling; Wave Propagation; Pipeline Integrity.