World Academy of Science, Engineering and Technology
International Journal of Transport and Vehicle Engineering
Vol:9, No:07, 2015

The Effect of General Corrosion on the Guided Wave Inspection of the Pipeline

Authors : Shiuh-Kuang Yang, Sheam-Chyun Lin, Jyin-Wen Cheng and Deng-Guei Hsu

Abstract : The torsional mode of guided wave, T(0,1), has been applied to detect characteristics and defects in pipelines, especially in the cases of coated, elevated and buried pipes. The signals of minor corrosions would be covered by the noise, unfortunately, because the coated material and buried medium always induce a strong attenuation of the guided wave. Furthermore, the guided wave would be attenuated more seriously and make the signals hard to be identified when setting the array ring of the transducers on a general corrosion area of the pipe. The objective of this study is then to discuss the effects of the above-mentioned general corrosion on guided wave tests by experiments and signal processing techniques, based on the use of the finite element method, the two-dimensional Fourier transform and the continuous wavelet transform. Results show that the excitation energy would be reduced when the array ring set on the pipe surface having general corrosion. The non-uniformed contact surface also produces the unwanted asymmetric modes of the propagating guided wave. Some of them are even mixing together with T(0,1) mode and increase the difficulty of measurements, especially when a defect or local corrosion merged in the general corrosion area. It is also showed that the guided waves attenuation are increasing with the increasing corrosion depth or the rising inspection frequency. However, the coherent signals caused by the general corrosion would be decayed with increasing frequency. The results obtained from this research should be able to provide detectors to understand the impact when the array ring set on the area of general corrosion and the way to distinguish the localized corrosion which is inside the area of general corrosion.

Keywords : guided wave, finite element method, two-dimensional fourier transform, wavelet transform, general corrosion, localized corrosion
Conference Title : ICAE 2015 : International Conference on Automotive Engineering
Conference Location : Prague, Czechia
Conference Dates : July 09-10, 2015

Open Science Index, Transport and Vehicle Engineering Vol:9, No:07, 2015 publications.waset.org/abstracts/24573.pdf