

1.3.76. LONG RANGE ULTRASONIC TESTING FOR INDUSTRIAL APPLICATIONS

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Long Range Ultrasonic Testing (LRUT) uses guided waves in the kilohertz range to assess the integrity of an elongated component from a single point of access for many meters. This technique is well developed for pipes and pipelines in the oil, gas and chemical industries. However, this technique has the potential to extend its application to cover other industries, for example rail and aerospace. In order to exploit the propagation of guided waves in unfamiliar structures there is a need to establish the physical characteristic of guided waves in terms of their frequency velocity relationship (i.e. dispersion curves), to identify suitable mode of vibration in terms of their displacement distribution and their non-dispersive characteristics and finally to establish a suitable means of excitation for the selected wave mode. This research has been performed to provide a basis for the selection of guided wave test conditions covering a wide range of industrial applications where either large area coverage is required or where the component is inaccessible for local scanning of ultrasonic transducers. The work was carried out using a Finite element Analysis along with experimental validation. The findings show that there are many wave modes with significant presence of the dispersion effect over the kilohertz frequency range. In addition, the nature of the wave modes has a complex displacement distribution. However, by choosing a suitable means of excitations, it will impose the wave mode of interest over others. Finally, this research demonstrates the ability of Long Range Ultrasonic Guided Waves to propagate and inspect industrial engineering structures for different types of flaws at different locations.