

Abstract

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Acoustic emission source location for steel pipe and pipeline applications: the role of arrival time estimation

Acoustic emission (AE) can be generated by a number of different fault conditions in pipes, including localized fluid-mechanical disturbances, such as local impingement erosion, growing fatigue cracks crack face rubbing, external impacts and leaks, each of which may have its own temporal and frequency characteristics. In this paper, a linear array of sensors is applied with the ultimate aim of locating and reconstituting the time-domain and frequency domain signatures of AE sources in pipes. Experiments have been carried out with a simulated source on sections of line pipe and process pipe using a linear array. The acquired signals have two identifiable components and methods are demonstrated for separating these components automatically and determining their group velocities. A range of techniques, including a wavelet transform technique, a cross-correlation technique, and a filtering and thresholding technique are applied to obtain arrival times for various modes of the signal. Finally, methods are proposed for giving automatic source location in large length–diameter ratios with an accuracy of better than 5 per cent.