

1.3.4. DEMONSTRATION OF THE APPLICATION OF THE TOTAL FOCUSING METHOD TO THE INSPECTION OF STEEL WELDS

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Ultrasonic phased arrays offer many advantages for industrial inspection due to increased flexibility over methods involving single-element probes. This paper will compare and contrast two previously developed methods for the inspection of welds involving phased arrays: the swept sector scan and the total focusing method, with particular emphasis on the latter. The total focusing method requires the acquisition of the full data set of time-domain signals from every possible send-receive combination in an ultrasonic array and the computation of time delay laws that will allow focusing at the post-processing stage. Two variations of the total focusing method are also presented: the common source method and the synthetic aperture focusing technique. These variations are discussed and their use for weld inspection is investigated. The resulting images from experiments involving an aluminum block with side-drilled holes and industrial weld samples containing various realistic defects are shown.