

An adaptive approach of the total focusing method for the inspection of parts with a complex shape

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Total focusing methods such as SAFT, TFM and AFM are becoming standard in the nondestructive testing industry, as they generally give better image quality than conventional phased array ultrasound. Since all TFM methods are time-based approaches they provide excellent results, as long as the geometry and the acoustic properties of the material are well known. In reality, there are often cases where the characteristics of the part being tested, such as the geometry, are not well known. In this paper, we propose an adaptive approach of the total focusing method (ATFM) in order to take into account a complex specimen shape. ATFM requires a single data set for a single image and does not need multiple acquisitions to detect the surface profile, which becomes preserved in the B-Scan images as no beam correction is needed. We show different applications and results of ATFM (and APWI), and how these adaptive methods can detect the surface profile of the specimen under test and generate high-quality images, both in real-time and off-line. Real examples from the inspection of diverse materials containing various flaws are presented as well, demonstrating how ATFM can overcome ultrasonic coupling issues derived from complex or unknown geometries/positions. Keywords: TFM, PWI, UT, PAUT, ATFM, Adaptive coupling