

Improvements in the Ultrasonic Inspection of Cast Austenitic Stainless Steel (CASS) using Advanced Total Focusing Methods

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The ultrasonic inspection of Cast Austenitic Stainless Steel (CASS) has historically been a very challenging endeavor. The casting process creates a coarse and dispersive grain structure that results in material properties that attenuate and scatter the propagated sound waves. These characteristics have required inspections to be performed with low frequency and low resolution techniques, making accurate crack detection and sizing extremely difficult. Recent advancements in advanced ultrasonic images, such as TFM (Total Focusing Method), and more specifically derivative algorithms PWI (Plane Wave Imaging) and VSA (Virtual Source Aperture), may offer a significant improvement over current methods by allowing much higher frequencies to be used, yielding better sizing accuracy and overall detection. The superior focusing abilities of these methods over conventional single or dual element ultrasound and PAUT (Phased Array Ultrasound) also offer improvements in signal-to-noise ratio when using historically accepted frequencies. We will share PWI and VSA inspection results from several flawed CASS mockups using a frequency spectrum that was historically thought unusable for the material category. Through a thorough analysis of these results, we are also able to provide insight to the future development and improvement of these approaches by identifying additional technical improvements that may be implemented to further advance the inspection of CASS.