

# **Ultrasonic Total Focusing Method Technology in Carbon Steel Butt Weld Application**

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Carbon steel butt welds are widely used in aircraft carrier, shipbuilding, railway, aerospace and other industries. As a new technology of ultrasonic non-destructive testing, Total Focusing Method (TFM) technology is a method of image reconstruction in which the value of each constituent datum of the image results from focused ultrasound. TFM may also be understood as a broad term encompassing a family of processing techniques for image reconstruction from full matrix capture (FMC). This paper compares resolution and focus between TFM and conventional phased array technology, by using phased array test block type B. The paper also introduces the testing system, including equipment, probe, wedge, calibration block as per ASME, PC analysis software, for detection of 21mm thickness carbon steel welds. In order to improve the defect detection ability, a customized software on board was designed based on TFM technology, and an appropriate propagation mode was adopted for different types of defects, such as longitudinal cracks on surface, lack of fusion, porosities, slag inclusions. The test results showing that compared with conventional phased array technology, the defect information such as length and depth detected by TFM are nearer to the actual situation, and the shape is closer to the physical one. TFM technology has more advantages in quantitative and qualitative capabilities in testing carbon steel butt welds, and can meet the requirements of on-site testing.