

1.3.91. ULTRASONIC INSPECTION OF THICK PARTS WITH PHASED ARRAY DYNAMIC FOCUSING

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Some crucial thick parts, such as aero-engine disks, usually require high inspection sensitivity to test small defects at all depth of the parts. With conventional ultrasonic inspection method, a variety of monolithic focus transducers have to be used separately to test different depth scope of the thick part, based on the theory that the monolithic transducers with different element diameters and focusing properties have different inspection capabilities at different depths within the materials. With the increase in depth of the inspection zone, the transducers with larger element diameters should be used to provide concentrated narrow beam and enough acoustic energy. That's the reason that the same surface of a part has to be scanned many times to insure the coverage of the whole thickness of the part by high sensitivity ultrasonic beam, which results in a low inspection efficiency. The phased array dynamic focusing technique may be a good solution to improve the efficiency by focusing over the whole thickness in one scan and simply using one transducer.

In this paper, the research work on using phased array dynamic focusing technique to test thick parts is presented. Focal law of phased array testing determined with CIVA sound field simulation and calculation software is illustrated on emphases and demonstrated with experiment results. Typical application of phased array dynamic focusing with high sensitivity and rapid scanning on a thick disk is described and the result of comparison with conventional multi-zone focusing technique is also presented.