



NEW APPROACH FOR ADDITIVE MANUFACTURING COMPONENTS IN-LINE INSPECTION USING ULTRASONIC PHASED ARRAY TECHNIQUE WITH IMMERSION AND CONTACT METHODS

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Abstract

Phased Array (PA) Ultrasonic testing is an advanced Non-Destructive Testing (NDT) and today it is an accepted practice that is used to access metallic components in the industry. PA has proven to be a reliable technology for welds and corrosion inspection. This NDT technique generates ultrasonic waves by numerous small piezo-electric elements creating two-dimensional and three-dimensional images of the components. Hence, it allows to measure the dimensions of the defects with high precision.

During the last twenty years' the Additive Manufacturing (AM) technologies gain more and more importance in the Industry, becoming an interesting and economic viable option for some parts and components production. The AM is a manufacturing technology that allows to create metallic near net shape components from deposition of material layer-by-layer.

In this context, this work aims to evaluate the applicability of PA Ultrasonic testing to AM technology during the production of the AM components in line inspection. Hence, AM test specimens were produced with real defects and artificial flaws and posteriorly PA examinations on the test specimens were performed.

During the AM process, the high temperature that is required to fully melt the material, which can damage the NDT probes, and the surface roughness of the built parts are the main constraints of the in-line inspection. Primarily was evaluated the surface's roughness and waviness of the AM components through optical measure systems. Secondly, PA examinations were performed in a first stage immersing both test specimens and PA probe in water, and, afterwards using solid rubber couplants between the PA's probe and the test specimen.

Finally, radiographic analysis was effectuated to also confirm the accuracy of the PA experimental results.

Keywords: Additive Manufacturing, Non-Destructive Testing, Phased-Array, Radiography

