

# In-process non-destructive ultrasonic testing application during wire plus arc additive manufacturing

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## ABSTRACT

Additive manufacturing is a technique which builds structures by depositing material in a layer-by-layer manner. Wire plus arc additive manufacturing technology also belongs into this group of manufacturing processes. It has been investigated in the last twenty-five years, although the first patent dates from 1925. Wire plus arc additive manufacturing uses existing welding equipment, an electric arc as the heat source, and wire as the feedstock. In this paper, we explain some basic process planning and implementation techniques, as well as the main advantages and disadvantages of the process. In addition, we discuss the potential of in-process non-destructive ultrasonic testing application to this process, in order to inspect the quality of the part while it is being produced, and to enable eventual repairs in-situ. Some authors have already presented the idea of non-destructive testing for AM products, and stated that ultrasonic testing could provide the most reliable results for detecting the lack of fusion, porosity, and other possible flaws. While researches so far were limited to post-process testing, this paper proposes the idea of in-process testing, which could provide a chance to find the flaws and the defects earlier in order to change the parameters in-situ, and avoid production of the whole part if it is already recognised as unacceptable. Despite some constraints, we believe the proposed method has great potential and represents a challenge worth investigating in more detail in the future.

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