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WORKING PAPER

SEAS - WP - 2021 - 21 - 009

Effect of Tool's Geometry, Rotational Speed, Travel Speed and Workpiece's Layer Number on the Build Characteristics of Friction Stir Additive Manufacturing of Aluminium Alloy

Shuja Ahmed

shuja.ahmed@ahduni.edu.in

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Ahmedabad University, Commerce Six Roads, Navrangpura, Ahmedabad-380009, Gujarat, INDIA
Email: workingpaper@ahduni.edu.in



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Title: Effect of Tool's Geometry, Rotational Speed, Travel Speed and Workpiece's Layer Number on the Build Characteristics of Friction Stir Additive Manufacturing of Aluminium Alloy

Author(s): Ujjaival Modi, Akhand Rai, Shuja Ahmed*

School/Address:

School of Engineering and Applied Science
Ahmedabad University
GICT Building, Central Campus
Navrangpura, Ahmedabad 380009
Gujarat, India

Email: shuja.ahmed@ahduni.edu.in

Abstract (150 words, Font 12): Friction stir additive manufacturing, which is a solid-state process of additive manufacturing, is to be examined in this work. The material to be used is aluminium alloy 5083-O, which strengthens by grain boundary strengthening and solid solution strengthening mechanism. Five AA5083 layers have been joined using the FSAM process with three variable parameters viz. tool pin profile, spindle speed and feed rate. Layer number will also be considered as a process parameter to understand its effect on mechanical property and microstructure. Temperature and force will be measured for each FSAM pass during the process using a K-type thermocouple and strain-gauge-based force dynamometer, respectively. Conical shape, cylindrical pin with three concave arc grooves and flared pin with three concave arc grooves will be used as the three pin profiles.

Purpose: To develop an understanding of the FSAM process physics based on the thermo-mechanical variables viz. temperature and forces observed during the process under various sets of input process parameters.

Design/Methodology/ Approach: Experimental

Findings: There is strength improvement in the FSAM build zone.

Research Limitations/ implications: The research applicability is limited to non-age hardenable wrought aluminium alloys such as AA5083-O

Originality/ Value: Effect of layer number on the mechanical property and microstructure of the build.

Keywords: Friction stir additive manufacturing, Build layer number, Hardness, Microstructure, AA5083-O

Description: The research work is under progress