World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:17, No:11, 2023

Additive Manufacturing Optimization Via Integrated Taguchi-Gray Relation Methodology for Oil and Gas Component Fabrication

Authors : Meshal Alsaiari

Abstract : Fused Deposition Modeling is one of the additive manufacturing technologies the industry is shifting to nowadays due to its simplicity and low affordable cost. The fabrication processing parameters predominantly influence FDM part strength and mechanical properties. This presentation will demonstrate the influences of the two manufacturing parameters on the tensile testing evaluation indexes, infill density, and Printing Orientation, which were analyzed to create a piping spacer suitable for oil and gas applications. The tensile specimens are made of two polymers, Acrylonitrile Styrene Acrylate (ASA) and High high-impact polystyrene (HIPS), to characterize the mechanical properties performance for creating the final product. The mechanical testing was carried out per the ASTM D638 testing standard, following Type IV requirements. Taguchi's experiment design using an L-9 orthogonal array was used to evaluate the performance output and identify the optimal manufacturing factors. The experimental results demonstrate that the tensile test is more pronounced with 100% infill for ASA and HIPS samples. However, the printing orientations varied in reactions; ASA is maximum at 0 degrees while HIPS shows almost similar percentages between 45 and 90 degrees. Taguchi-Gray integrated methodology was adopted to minimize the response and recognize optimal fabrication factors combinations.

Keywords : FDM, ASTM D638, tensile testing, acrylonitrile styrene acrylate
Conference Title : ICZM 2023 : International Conference on Zeolite Materials
Conference Location : London, United Kingdom
Conference Dates : November 27-28, 2023