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OPTIMIZATION OF FUSED DEPOSITION MODELING PROCESS PARAMETER FOR BETTER MECHANICAL STRENGTH AND SURFACE ROUGHNESS

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ABSTRACT

Rapid prototyping (RP) refers to a class of technology that can automatically construct physical models from computer aided design (CAD) data. Reduction of product development cycle time is a major concern in industries for achieving competitive advantage. So, the focus of industries has shifted from traditional product development methodology to rapid fabrication techniques. The Fused deposition modeling (FDM) is a one of the rapid prototyping (RP) technology by which physical objects are created directly from CAD model using layer by layer deposition of extruded material. The quality of FDM produced parts is significantly affected by various parameters used in the process. In this present work three important process parameter of the FDM process such as layer thickness, part builds orientation and raster width are considered.. The powerful Taguchi's method is used for design of experiments because of it can be provide simplification of design plans and reduced the number of experimental runs. Specimens are prepared for compressive test and impact test as per ASTM standards. The signal-to-noise (S/N) ratio is used to get the contribution of each parameter. The validity of process parameters and response is tested by using analysis of variance (ANOVA). Through this study the main process parameter that affects the quality of prototype can be found. At this end, Artificial neural network is carried out. The ANN models are developed in order to predict compressive and impact strength of test specimen. The experimental data and data obtained by ANN is closely correlated which validated the models. After completing the experiments we have found that the mechanical properties and surface roughness of the test specimens is increasing with the increase in layer thickness and decrease in the part build orientation. The major reason for weak strength of FDM processed parts may be attributed to distortion within the layer or between the layers while building the parts due to temperature gradients.

KEYWORDS: FDM, ANN, Rapid Prototyping, Taguchi Method, Layer Thickness