DEVELOPMENT OF A PREDICTIVE MODEL FOR THE DESIGN OF PARTS FABRICATED BY FUSED DEPOSITION MODELING

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ABSTRACT

The prediction of the behavior of parts fabricated by fused deposition modeling (FDM) is an essential part of transitioning the process from rapid prototyping to rapid manufacturing. The overall part strength of an FDM part is dictated by the strength of the bonding between filaments, requiring the prediction of bong length. The prediction of bond length is completed by combining heat transfer analysis with a bonding model. The results from the bonding equation are validated by comparing the calculated bond lengths with actual bond lengths, which are observed via images obtained with a scanning electron microscope and are shown to be reasonably accurate. Tensile tests are conducted to complete a factorial analysis and to correlate predicted bond length and bond strength. Annealing is also conducted in an attempt to improve bond length and bond strength. The current work serves as an important step in part behavior prediction and FDM development.