TEST ARTEFACT FOR ADDITIVE MANUFACTURING TECHNOLOGY: FDM AND SLM PRELIMINARY RESULTS

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ABSTRACT

Additive manufacturing continues to increase in popularity and is used in many industrial applications that require sub-millimeter dimensional accuracy and decent surface finish. The purpose of this preliminary study is to design a test artefact for determining the capabilities of additive manufacturing systems to produce components, with a focus on those relevant to structural applications. The test artefact (TA) was designed and produced using a modular architecture approach, composed of five groups of varying geometries, distances and dimensions; including holes, cylinders, rectangles, gaps, and lattices. The TA was built using fused deposition modelling (FDM) of ABS plus thermoplastic material, and selective laser melting (SLM) of AlSi10Mg alloy techniques. The actual built dimensions were compared to the target dimensions showing a better accuracy at the top of all geometries than at the lower part of the printed geometries. The accuracy differences between the upper and lower regions for the FDM method result from gravity forces and the contact between the machine nozzle head with the heated thermoplastic polymer. The accuracy differences between the upper and lower areas for the SLM method result from gravity forces and heterogeneous distribution of the heat during the building process. The test artefact design is applicable to various systems and materials, uses a minimum amount of construction material, and can be measured with a variety of simple metrology tools.

KEYWORDS: additive manufacturing, 3D printing, test artefact, FDM, SLM, ABS, AlSi10Mg alloy.

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