Application of X-ray Computed Tomography for Assessment of Additively Manufactured Products

av

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Abstract

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Additive manufacturing (AM) is referred to technologies for fabricating parts from three-dimensional model data, usually by joining materials in layer upon layer fashion. The freedom in design in these technologies has resulted in a possibility for fabrication of parts with complex geometries. Manufacturing near-net-shape parts by substituting multiple manufacturing processes by only one, resulting in faster lead time has made AM a compelling method for industry. Despite the numerous advantages of the AM methods, the imperfections affiliated to the manufacturing processes has remained a challenge for the application of additively manufactured parts. The surface quality of parts especially in Laser Powder Bed Fusion (LPBF) methods, as well as porosity are the main contributors to the structural response of thin-walled or lattice structures. The quality of the bond between the filaments in Fused Deposition Modelling (FDM) resulting in porosity is also a crucial factor for the strength of parts manufactured using FDM. In order to investigate the effect of such imperfections on the mechanical strength of AM parts, X-ray computed tomography (CT) was used in this thesis work with main focus on improving the aforementioned AM processes. The effect of CT magnification as one of the influential CT parameters, on measurements of surface features as well as porosity, was investigated too. The results of this thesis work can be widely used for the selection of appropriate design thickness of thin-wall structures by AM designers as well as the development of LPBF method.

Keywords: Additive manufacturing, X-ray computed tomography, Surface roughness.

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