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Effects of Milling Process Parameters on Cutting Forces and Surface Roughness When Finishing Ti6al4v Produced by Electron Beam Melting

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Abstract : Electron Beam Melting (EBM) is a metal powder bed-based Additive Manufacturing (AM) technology, which uses computer-controlled electron beams to create fully dense three-dimensional near-net-shaped parts from metal powder. It gives the ability to produce any complex parts directly from a computer-aided design (CAD) model without tools and dies, and with a variety of materials. However, the quality of the surface finish in EBM process has limitations to meeting the performance requirements of additively manufactured components. The aim of this study is to investigate the cutting forces induced during milling Ti6Al4V produced by EBM as well as the surface quality of the milled surfaces. The effects of cutting speed and radial depth of cut on the cutting forces, surface roughness, and surface morphology were investigated. The results indicated that the cutting speed was found to be proportional to the resultant cutting force at any cutting conditions while the surface roughness improved significantly with the increase in cutting speed and radial depth of cut.

Keywords : electron beam melting, additive manufacturing, Ti6Al4V, surface morphology
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