

Estimation of Appropriate Process Parameters for a Plasma Electron Beam Re-Melting Process Using Finite Element Analysis

ABSTRACT

Metal additive manufacturing using electron beam melting (EBM) process applies electron beam for heating, sintering, and melting of powders to fabricate a three-dimensional component. The component may contain residual porosity internally and may be subjected to poor surface finish externally. To improve the quality of the surface finish and densification, re-melting is conducted. The purpose of this paper was to estimate the appropriate process conditions for a plasma electron beam remelting process using heat transfer finite element analyses (FEAs). The impact of the travel speed of table and thickness of the deposited part on temperature distributions were examined. The size of molten pool was estimated from the results of the thermal FEA. From the estimated size of molten pool, the travel speed of table and the hatch spacing between remelting tracks are discussed and selected as the appropriate process conditions for electron beam re-melting process from the perspective of minimum overlapping region of the molten pool.