

Design for Metal Additive Manufacturing: An Investigation of Key Design Application on Electron Beam Melting

Authors : Wadea Ameen, Abdulrahman Al-Ahmari, Osama Abdulhameed

Abstract : Electron beam melting (EBM) is one of the modern additive manufacturing (AM) technologies. In EBM, the electron beam melts metal powder into a fully solid part layer by layer. Since EBM is a new technology, most designers are unaware of the capabilities and the limitations of EBM technology. Also, many engineers are facing many challenges to utilize the technology because of a lack of design rules for the technology. The aim of this study is to identify the capabilities and the limitations of EBM technology in fabrication of small features and overhang structures and develop a design rules that need to be considered by designers and engineers. In order to achieve this objective, a series of experiments are conducted. Several features having varying sizes were designed, fabricated, and evaluated to determine their manufacturability limits. In general, the results showed the capabilities and limitations of the EBM technology in fabrication of the small size features and the overhang structures. In the end, the results of these investigation experiments are used to develop design rules. Also, the results showed the importance of developing design rules for AM technologies in increasing the utilization of these technologies.

Keywords : additive manufacturing, design for additive manufacturing, electron beam melting, self-supporting overhang

Conference Title : ICMSAM 2019 : International Conference on Manufacturing Systems and Additive Manufacturing

Conference Location : London, United Kingdom

Conference Dates : May 23-24, 2019