Drawbacks of Using High Current Intensities when 3D Printing Parts of Al-5356 Alloy by Cold Metal Transfer Technique

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***Abstract*—**In this paper, the impact of 3D printing parameters using the Cold Metal Transfer (CMT) technique on the morphological, mechanical, and tribological properties of manufactured parts from Al-5356 Alloy has been studied. The essential parameter treated is the current intensity and its behavior on manufactured parts features. Fabricated parts using the technique mentioned above are walls and massive parts with different filling strategies, using grid and zigzag patterns and at different current intensities. The main goal of the following paper is to know the drawbacks of using high currents and to find out the welding parameters suitable for having parts with low defects and improved properties from morphological, mechanical and tribological properties point of view of CMTed parts of Al-5356 alloy. It has been observed from the results obtained that the high current intensity causes a rapid solidification, resulting the high intensity is, the low hardness and high porosity values are ,either walls or massive parts. The good filling strategy corresponds to grid patterns at 40 A with a hardness of 88Hv. Furthermore, the intensity of the zigzag filling strategy (70A) provides an overall good filling duo to the rapid solidification. However, A high hardness found is corresponds to the low intensity current (60A). Besides, The results show that there is an evident relationship between hardness, coefficient of friction of parts and the wear test for CMTed walls. Some interesting results are presented in this paper.

***Keywords*—** Aluminium Alloy, Cold Metal Transfer, Porosity, Microstructures, Hardness.

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