

Additive Manufacturing's Impact on Product Design and Development: An Industrial Case Study

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Abstract : The aim of this study was to redesign a pressing air nozzle with lower weight and improved efficiency utilizing Selective Laser Melting (SLM) technology based on Design for Additive Manufacturing (DfAM) methods. The original pressing air nozzle was modified in SolidWorks 3D CAD, and two design concepts were introduced considering the DfAM approach. In the proposed designs, the air channels were amended. 3D models for the original pressing air nozzle and introduced designs were created to obtain the flow characteristic data using Ansys software. Results of CFD modeling for the original and two proposed designs were extracted, compared, and analyzed to demonstrate the impact of design on the development of a more efficient pressing air nozzle by AM process. Improved airflow was achieved by optimizing the pressing air nozzle's internal channel for both design concepts by providing 30% and 50.6% fewer pressure drops than the original design. Moreover, utilizing the presented designs, a significant reduction in product weight was attained. In addition, by applying the proposed designs, 48.3% and 70.3% reduction in product weight was attained compared to the original design. Therefore, pressing air nozzle with enhanced productivity and lowered weight was generated utilizing the DfAM-driven designs developed in this study. The main contribution of this study is to investigate the additional possibilities that can be achieved in designing modern parts using the advantage of SLM technology in producing that part. The approach presented in this study can be applied to almost any similar industrial application.

Keywords : additive manufacturing, design for additive manufacturing, design methods, product design, pressing air nozzle

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