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A HIGH-SPEED ADDITIVE MANUFACTURING APPROACH TOWARDS DIRECT DIGITAL MANUFACTURING

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Direct Digital Manufacturing (DDM) of customized end-use product on demand is the key concern of forth industrial revolution. In order to implement DDM to future manufacturing industry, it must have the potential of mass production, high accuracy with functional material property. Though the unique capabilities of AM make it suitable for DDM, there are numerous limitations in existing AM technologies that restricted its inclusive penetration in the manufacturing industry. The key challenges of AM include low speed of production, less accuracy and repeatability, and a limited selection of materials with the most suitable material property for a particular application. However, hybrid additive manufacturing, which is an integration of AM with subtractive technologies, may fix the aforementioned challenges; it may restrict the utilization of AM capabilities up to a certain limit. Therefore, a high speed AM system is required that is capable of achieving three key criteria i.e. the high speed of production, high accuracy and surface finish, and functional material property, without integration with subtractive technologies. In this paper, a High-Speed Additive Manufacturing (HSAM) approach is presented. For better understanding, the author describes those AM technologies that are capable of mass production of highly accurate parts with functional material property. The samples of various dimensions were 3D printed by using same material (PA12) on a Selective Laser Sintering (SLS) and a High Speed Jet Fusion 3D printer. The results were compared in the context of printing speed and surface roughness. Results revealed that Jet fusion process is extremely faster than its counterpart while sacrificing surface roughness (Ra) to some extent. The samples printed by the SLS process had 15% lower value of Ra compared with High-speed jet fusion process. The results also revealed that the jet fusion process may be able to print composite/multi-materials; however, more research needs to be done.

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