Effect of the Deposition Layer Three-Dimensional Printed Jute Fiber Reinforced Composite

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Abstract

Three Dimensional (3D) printing sometimes referred to as additive manufacturing, uses computer-aided design to create three-dimensional objects through a layering method that adds material in continuous layers to produce the finished product. Making three-dimensional objects directly from a CAD model requires a methodology that differs significantly from other traditional manufacturing methods. It reduces the losses of traditional subtractive manufacturing methods such as milling, turning, cutting, and so on by carefully adding material. The primary function is to convert computer-aided design (CAD) files into real-world parts, and 3D printing technology accomplishes this in a different way. The purpose of this research is to see the effect of the deposition layer three-dimensional printed jute fiber reinforced composite using digital light processing stereolithography process. Digital light processing stereolithography (DLP) also known as the vat polymerization technique, a vat of liquid UV resin is exposed to high-intensity light from a projector, which selectively cures the resin to a build platform in a layer-by-layer process. In digital light processing, stereolithography process layer height influences not only printing quality but also printing time. The total number of layers used to create a part determines its surface quality and printing time. The thinner the layer height, the more the fixed height is sliced, which results in longer printing times. Digital light processing stereolithography printing can obtain a 25 - 100 µm (frequently used: 50 µm) layer deposition rate. In our research, we study 100µm, 75µm, 50µm, and 25µm layer deposition rate to see how layer deposition rate influence the tensile strength and other properties. Choosing an appropriate layer height is essential for 3d Printed composite manufacturing processes for better mechanical properties.

Keywords
Polymer Composites, Vat Polymerization, 3d Printing, Natural Fibers and Mechanical properties.

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Biographies
Jonaed Hossain is an undergraduate student of Mechanical Engineering (ME) under the department of Mechanical and Production Engineering (MPE) at Ahsanullah University of Science and Technology. He has great interest in 3D printing, composite material and industry 4.0. He has good experience in product design and development. He has short time industrial training at Bangladesh Industrial Technical Assistance Center (BITAC) and also taken part different kinds of tech based competition throughout his educational career.

Arafath Mohiv is an undergraduate Mechanical Engineering (ME) student at Ahsanullah University of Science and Technology's Department of Mechanical and Production Engineering (MPE) (AUST).His research interests include Additive Manufacturing, Industry 4.0, Product Design & Development, Generative Design, and the Reverse Engineering Process.He is proficient in Soildworks,Matsercam,catia,Ansys,Autocad,Fusion360,Simplify3D,Pursa Slicer, Photon Workshop,Cura,Keyshot and the C and Python programming languages.He aspires to conduct extensive research in Additive Manufacturing, Industry 4.0, non-traditional manufacturing processes and so on.

Md Amjad Hossain Khan is an undergraduate student of Mechanical Engineering (ME) under the Department of Mechanical and Production Engineering (MPE) at the Ahsanullah University of Science and Technology (AUST). His research interest includes the area of Design and Manufacturing, Automotive materials, Vehicle maintenance, Advanced material processing, Combustion and Energy Systems, Industry 4.0, Electric Vehicles, Sustainable Product Design. He has achieved prizes and certificates in an International Automobile competition (SHELL ECO MARATHON-2018) in Paris, France. He has also participated in various technological competitions in Bangladesh like AUST ROVER CHALLENGE, Science fairs etc. He has completed his internship program at Bangladesh Power Development Board (BPDP), Ghorashal Training Centre, Narsingdi (Ghorashal Power Plant Station) as a Trainee Engineer. He has basic idea over Solidworks, MATLAB, ANSYS, AutoCAD, CNC programming and operation. And also have knowledge on programming languages JAVA, C, C++, Python. He wishes to conduct substantial studies in Design and Manufacturing, Automotive materials, Vehicle maintenance, Advanced material processing, Combustion and Energy Systems, Industry 4.0, Electric Vehicles, Sustainable Product Design etc.

Dr. M. Azizur Rahman is an Assistant Professor in Industrial and Production Engineering (IPE) under the department of Mechanical and Production Engineering (MPE) at Ahsanullah University of Science and Technology (AUST), Dhaka, Bangladesh. He is a member of IEB (Bangladesh), OCIEBS (Singapore) and IMechE (UK). Dr. Azizur is a registered Chartered Engineer (CEng, UK). He earned B.Sc. in Mechanical Engineering from Bangladesh University of Engineering and Technology (BUET), Masters in Mechanical Engineering from National University of Singapore (NUS), Master of Science (Logistics) from Nanyang Technological University (NTU), Singapore and Ph.D. in Mechanical Engineering from National University of Singapore (NUS), Singapore. Dr. Azizur is currently serving as a Guest Editor for Special Issue "Intelligent Additive/Subtractive Manufacturing" in Journal Micromachines. He also serves in Editorial, Advisory, and Review Board of IJAMP (International Journal of Advanced Manufacturing Processes), JPSME (Journal of Production System and Manufacturing engineering), AOE (Annals of Engineering). Dr. Azizur has extensive working experience in various manufacturing industries in Singapore. His research interests include Additive manufacturing (3D printing), Metal cutting and Ultra-precision machining, Electrical discharge and Laser beam machining, Micro/nanofabrication, Logistics and Supply chain management, Intelligent manufacturing process for Industry 4.0.

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