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A Review on Modelling of 3D-Printing Liquefier Heat Sink Model

[1]Ajeet Kumar Mishra, [2]Brijendra Kumar Yadav, [3]Amit Kumar
[1]M-Tech Scholar, [2]Assistant Professor, [3]Head of Department
[123]Department of Mechanical Engineering, PIES, Bhopal
{ajeet.aajeet.mishra@gmail.com, brijendra.yadav1990@gmail.com, amitavit689@gmail.com}

Abstract- A detail survey has been present in this research paper. This paper elaborate the different mechanism related to the additive manufacturing and rapid prototyping. 3D printing is any of various processes in which material is joined or solidified under computer control to create a three-dimensional object, with material being added together (such as liquid molecules or powder grains being fused together). 3D printing is used in both rapid prototyping and additive manufacturing. Objects can be of almost any shape or geometry and typically are produced using digital model data from a 3D model or another electronic data source such as an Additive Manufacturing File (AMF) file (usually in sequential layers). There are many different technologies, like stereo lithography (SLA) or fused deposit modeling (FDM). Thus, unlike material removed from a stock in the conventional machining process, 3D printing or Additive Manufacturing builds a three-dimensional object from computer-aided design (CAD) model or AMF file, usually by successively adding material layer by layer.
The term "3D printing" originally referred to a process that deposits a binder material onto a powder bed with inkjet printer heads layer by layer. More recently, the term is being used in popular vernacular to encompass a wider variety of additive manufacturing techniques. United States and global technical standards use the official term additive manufacturing for this broader sense.

Keywords: 3D-Printing, FDM, CAD, AMF, Rapid Prototype.

I. INTRODUCTION

Early additive manufacturing equipment and materials were developed in the 1980s. In 1981, Hideo Kodama of Nagoya Municipal Industrial Research Institute invented two additive methods for fabricating three-dimensional plastic models with photo-hardening thermoset polymer, where the UV exposure area is controlled by a mask pattern or a scanning fiber transmitter. On 16 July 1984, Alain Le Méhauté, Olivier de Witte, and Jean Claude André filed their patent for the stereo-lithography process. The application of the French inventors was abandoned by the French General Electric Company (now Alcatel-Alsthom) and CILAS (The Laser Consortium). The claimed reason was "for lack of business perspective". Three weeks later in 1984, Chuck Hull of 3D Systems Corporation filed his own patent for a stereo lithography fabrication system, in which layers are added by curing photopolymers with ultraviolet light lasers. Hull defined the process as a "system for generating three-dimensional objects by creating a cross-sectional pattern of the object to be formed". Hull's contribution was the STL (Stereo-lithography) file format and the digital slicing and infill strategies common to many processes today.

The technology used by most 3D printers to date especially hobbyist and consumer-oriented models is fused deposition modeling, a special application of plastic extrusion, developed in 1988 by S. Scott Crump and commercialized by his company Strategy, which marketed its first FDM machine in 1992. AM processes for metal sintering or melting (such as selective laser sintering, direct metal laser sintering, and selective laser melting) usually went by their own individual names in the 1980s and 1990s.

This paper organized as follows: Section 1 describe the introductory part and history of additive manufacturing and rapid prototype. Section II elaborate the discussion of different research papers and their methodologies, problem domain discusses in the section III, last but not the least conclusion of this paper discusses in the section IV.

II. RELATED WORK

In this section discusses the recent development related to 3D printing process technology and their enhancement. This section discusses the different research papers introduce by the researchers and draw some conclusion about their researches. This section also introduce the limitation of their research.

[1] Yifan Jin et al.: Fused deposition modeling has become one of the most diffused rapid prototyping techniques, which is widely used to fabricate prototypes. However, further application of this technology is severely affected by poor surface roughness primarily due to staircase effect. It is necessary to adopt post-treatment operations to improve

surface quality. Chemical finishing is typically employed to finish parts in fused deposition modeling. The purpose of this paper is to provide a universal finishing method or solution for FDM parts made up of PLA, and to represent the evolution of surface topography between adjacent layers during the chemical finishing operation by building a geometrical model of the deposited filament.

[2] Shanling Han et al.: Fused deposition modeling (FDM) has been one of the most widely used rapid prototyping (RP) technologies leading to the increase in market attention. Obviously it is desirable to print 3D objects; however, existing FDM printers are restricted to printing only monochrome objects because of the entry-level nozzle structure, and literature on the topic is also sparse. In this paper, the CAD model of the nozzle is established first by UG (Unigraphics NX) software to show the structure of fused deposition modeling 3D printer nozzle for color mixing. Second, the flow channel model of the nozzle is extracted and simplified. Then, the CAD and finite element model are established by UG and ICEM CFD software, respectively, to prepare for the simulation.

[3] Susana Fafenrot et al.: Fused deposition modeling (FDM) is a three-dimensional (3D) printing technology that is usually performed with polymers that are molten in a printer nozzle and placed line by line on the printing bed or the previous layer, respectively. Nowadays, hybrid materials combining polymers with functional materials are also commercially available. Especially combinations of polymers with metal particles result in printed objects with interesting optical and mechanical properties.

[4] Kensuke Takagishi et al.: The authors focus on the Fused Deposition Modeling (FDM) 3D printer because the FDM 3D printer can print the utility resin material. It can print with low cost and therefore it is the most suitable for home 3D printer. The FDM 3D printer has the problem that it produces layer grooves on the surface of the 3D printed structure. Therefore the authors developed the 3D-Chemical Melting Finishing (3D-CMF) for removing layer grooves.

[5] A. Tsouknidas et al: Despite additive manufacturing emerging as an effective alternative to conventional manufacturing methods, ought partially to the support of open source communities, little is known about the shock absorbing properties of the parts produced. An open source fused deposition modelling device was employed to fabricate 3D polymeric structures and their shock mitigating properties were evaluated. The effect of commercially available layer heights, infill patterns and density on the energy dissipation properties of the printed PLA (poly-lactic acid) cylinders was examined.

[6] Caterina Casavola et al: The Fused Deposition Modelling (FDM) has become one of the most used techniques to 3D object rapid prototyping. In this process, the model is built as a layer-by-layer deposition of a feedstock wire. In recent years, the FDM evolved from rapid prototyping technique towards a rapid manufacturing method, changing the main purpose in producing finished components ready for use.

[7] Sithiprumnea Dul et al: For the first time, graphene Nano-platelets (xGnP) were incorporated at 4 wt% in acrylonitrile–butadiene– styrene (ABS) filaments obtained by a solvent-free process consisting of melt compounding and extrusion. Nanocomposite filaments were then used to feed a fused deposition modelling (FDM) machine to obtain specimens with various build orientations.

[8] Fuda Ning et al: Carbon fiber-reinforced plastic composites have been intensively used for many applications due to their attractive properties. The increasing demand of carbon fiber-reinforced plastic composites is driving novel manufacturing processes to be in short manufacturing cycle time and low production cost, which is difficult to realize during carbon fiber reinforced plastic composites fabrication in common molding processes.

[9] Zixiang Weng et al: Acrylonitrile butadiene styrene (ABS) nanocomposites with organic modified montmorillonite (OMMT) were prepared by melt intercalation. ABS nanocomposite filaments for fused deposition modeling (FDM) 3D printing were produced by a single screw extruder and printed by a commercial FDM 3D printer.

[10] Fuda Ning et al: Additive manufacturing (AM) technologies have been successfully applied in various applications. Fused deposition modeling (FDM), one of the most popular AM techniques, is the most widely used method for fabricating thermoplastic parts those are mainly used as rapid prototypes for functional testing with advantages of low cost, minimal wastage, and ease of material change.

[11] Souad Djellali et al: The rheological properties and the viscoelastic behavior of blends of polyethylene with different percentages of poly (lactic acid), ranging from 0 to 100 wt%, were studied. In a first part, all blends were examined under steady conditions using a capillary rheometer (at 180, 190 and 200 ^{0}C) and dynamic conditions using a parallel plate rheometer.

[12] Md. Hazrat Ali et al: Three-dimensional printing or additive manufacturing is a process of producing three-dimensional solid objects from a software design. Color and material limitations for simultaneous usage and relatively low printing speeds are the major problems of fused filament fabrication (FFF).

[13] Mahdi Kaveh et al: Fused deposition modeling (FDM) is an alternative process for fabricating wax pattern in investment casting technologies due to its ability to fabricate parts with complex geometries within a reasonable time using HIPS as extruded material.

III. PROBLEM STATEMENT

After studying a lot of research papers involves in the field of rapid prototype 3D printing draw some conclusion and problem face gone through their modelling of 3D printing technology.
The survey of different previous works predict the temperature is higher as compared to present study is shown in our base paper. The purposes of this study reduce the temperature and increase the heat transfer rate at various velocities. Thus Chosen Circular fin with different filaments to determine temperature distribution.

IV CONCLUSION

In this paper discusses the recent development related to 3D printing process technology and their enhancement. This section discusses the different research papers introduce by the researchers and draw some conclusion about their researches. This paper also introduce the limitation of their research.

This paper compromises the survey of development research in the field of 3D printing rapid prototype technology. This paper also gives us a detailed amount of discussion about 3D printing technology and their methodology also. At last but not the least section discusses the problem statement or problem which face by the many researcher.

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