

A Review Paper on 3D Printer

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Abstract— This is a review paper on 3D printing & various materials used in 3D printing. First, define what is meant by 3D printing and what is significant of 3D printing. We will go through time line of 3d printing technology from 19th century. The various filament used in designing of final product. This printing technology is varying fabulous and most of researcher attracted to this field.

Keywords: 3D printer demo model, filament material its technical parameters, merits, demerits, future scope etc.

I. INTRODUCTION

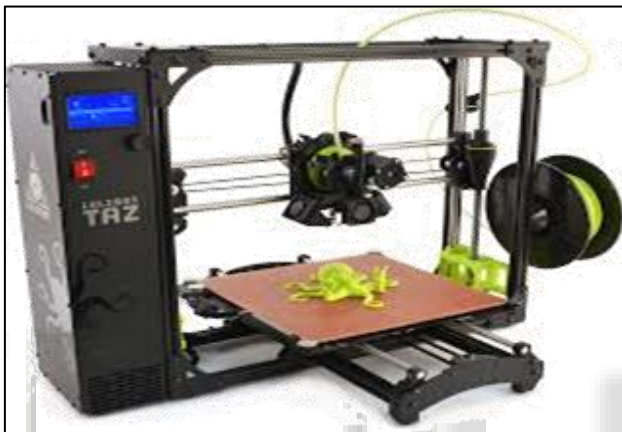


Fig. 1: 3D printer Machine

3D Printing Technology means 3-dimensional physical object creating process also known as additive manufacturing processes. Herein this technology 3D Printer creates an object by lying down the material on the platform of printer until the desired object is formed. In this melted material or powder use to create object. Printing is nothing but the process of producing text or images. In 2D Printing can be done using paper & ink but in 3D there is various material used to print an object. This technology mostly use in industry to turn ideas into reality. This is the leading technology now a day's which attracts the educated students & industries. We can create a whole model at once using 3d printer. If we use another method then it takes more time & cost to design, creates separate part and then joined all the parts by glue. The basic principal of this technology is material cartridge, flexibility of output, & converting code into visible manner. The printer is a machine which is convert digital data or simply the design into physical object. This 3D design creates by using CAD software. It is used in various industries such as footwear, jewellery, dental, aerospace, automotive etc..

II. LITERATURE REVIEW

3D Printing technology was first invented by Charles Hull in 1984; he gives the name to this technique as stereo lithography. This technology had become popular in 1990s. And others technology were introduced like Fused deposition moulding and selective laser sintering. In 1993 MIT institute of technology was change the name from stereolithography to 3D Printing Technology. In 1996 three

major products were introduced by three different companies such as "Genisys" from stratasys, "Actua 2100" from 3D system, and "Z402" from Z Corporation[2]. In 2005 Z Corporation were launched 1st 3D HD colour printer in the market named as Spectrum Z510

[2]. Another 3D printer introduced in 2006 named as Riprap which was aimed at self replicating 3D printer. In 2007 Z450 were introduced with the focus of ease of use & office compatibility. Likewise in 2008 Z650 with increase size & performance and in 2009 Z350 with a new level of 3d printing affordability[2].

A. General Principals in 3d Product designing

- 1) Modeling of Product
- 2) Printing of Product
- 3) Finishing of Product
- 4) Final Product Checking



Fig. 2: 3D Printer filament non transparent



Fig. 3: 3D Printer filament transparent

B. Technical Specification of product ABS

acrylonitrile Butadiene Styrene [ABS] One of the most widely used material since the inception of 3D printing. This material is very durable, slightly flexible, and lightweight and can be easily extruded, which makes it perfect for 3D printing

- Density-1-1.4 gm/cm³
- Dielectric constant-3.1 to 3.2
- Dielectric Strength [Breakdown Potential]-15-16 kV/mm [0.59-0.63 V/mil]
- Elastic modulus-2 to 2.6 GPa

- Elongation at break-3.5 to 50%
 - Flexural modulus-2.1 to 7.6 GPa
 - Flexural strength-72 to 97 MPa
 - Heat deflection temperature at 1.82 MPa -76 to 110°C
 - Heat deflection temperature at 455 KPa-83 to 110°C
 - Strength to weight ratio-37 to 79 kN-m/kg
 - Tensile strength: 37 to 110 MPa
 - Thermal expansion-81 to 95 $\mu\text{m/m-K}$
- Material Properties of Acrylonitrile Butadiene Styrene [ABS]
- Temperature -225°C
 - Flow Tweak -0.93
 - Bed Temperature -90°C
 - Bed Preparation -apply glue stick 2 layer & then abs glue 1 layer

C. Technical Specifications of PLA

Poly Lactic Acid [PLA]Poly lactic acid (PLA) (is derived from corn and is biodegradable) is another well-spread material among 3D printing enthusiasts. It is a biodegradable thermoplastic that is derived from renewable resources

- Density -1.3g/cm³ (81lb/ft³)
- Elastic (Young's, Tensile) Modulus -2.0 to 2.6GPa(0.29 to 0.38x 10³psi)
- Elongation at Break -6.0%
- Flexural Modulus -4.0GPa(0.58x 10⁶psi)
- Flexural Strength -80MPa(12x 10³ psi)
- Glass Transition Temperature -60°C(140°F)
- Heat Deflection Temperature At 455 kPa (66 psi) - 65°C(150°F)
- Melting Onset (Solidus) -160°C(320°F)
- Shear Modulus-2.4GPa(0.35x 10⁶psi)
- Specific Heat Capacity -1800J/kg-K
- Strength to Weight Ratio -38kN-m/kg
- Tensile Strength : Ultimate (UTS) -50MPa(7.3x 10³psi)
- Thermal Conductivity -0.13W/m-K
- Thermal Diffusivity -0.056Material Properties of Poly Lactic Acid [PLA]
- Temperature -180°C
- FlowTweak -0.95
- Bed Temperature -60°C
- Bed Preparation -apply glue stick 2 layer

III. MERITS

- 1) Less wastage of filament material
- 2) Easy to design
- 3) Semi- skilled person required.
- 4) Cheaper process.
- 5) low design complexity

IV. DE-MERITS

- 1) Cost of raw material is high
- 2) 3d Printer is also expensive.
- 3) more time to create a single object using stl format

V. APPLICATION

- 1) In manufacturing: who needs to develop better product in less time the can use it.
- 2) It is used for architecture to design full colour model.
- 3) It is used in medical field to improve preparation of student.
- 4) In geospatial colourful3D maps more impactful & understandable than traditional paper maps.
- 5) In marketing 3D colour model more impactable than brochures for the customers

VI. CONCLUSION

As after review of this paper I designed low cost 3d printer using DvD drive and its simulation result concluded on pronterface software using g code and stl format and I present this result on my next paper of implementation

VII. FUTURE SCOPE

Today's3d printer can make only the remote battery cover but in future we can make the whole TV remote also in future we can make body parts or organs for people in need of transplant

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