



SNS COLLEGE OF TECHNOLOGY

Coimbatore – 641 029

An Autonomous Institution



DEPARTMENT OF CIVIL ENGINEERING

19CET303 – 3D PRINTING

III YEAR / V SEMESTER

UNIT 1 :INTRODUCTION TO 3D PRINTING

Topic 1 :INTRODUCTION TO 3D PRINTING



Syllabus



**Introduction To
3D Printing**

**Design Sketching
for 3D Printing**

Fusion 360

3D Scanning

**Applications Of
3D Printing**



UNIT 1 :Introduction to 3D Printing



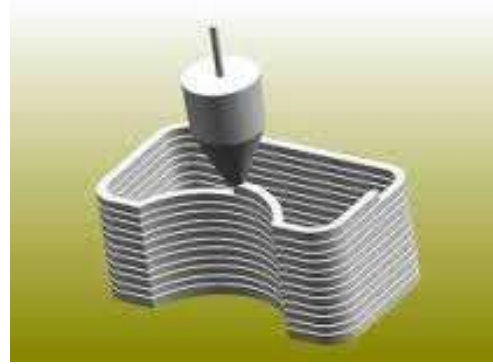
1. Introduction to 3D Printing
2. Advantages of 3D Printing and limitations of 3D Printing
3. Types of 3D Printing - Fused Deposition Modeling
4. Stereolithography
5. Selective laser sintering
6. Types of 3D Printers.



Types of 3d Printing Technologies

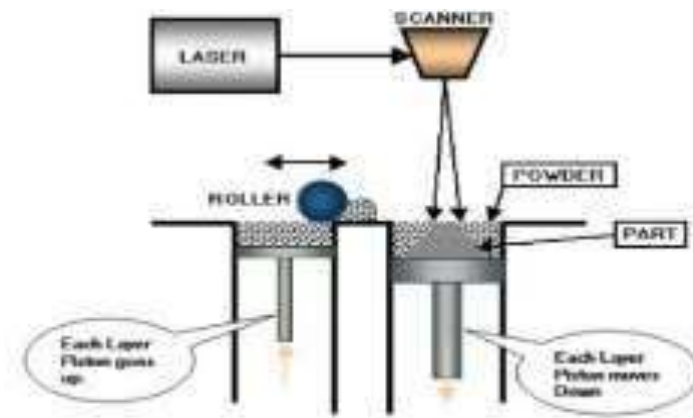


Fused Deposition Modelling



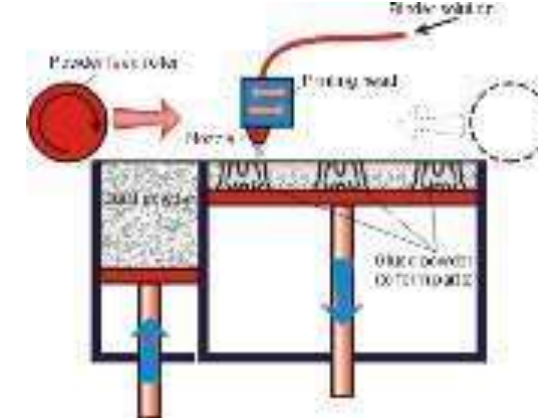
Type: Extrusion
Visible layer lines
Material: PLA, ABS

Selective Laser Sintering



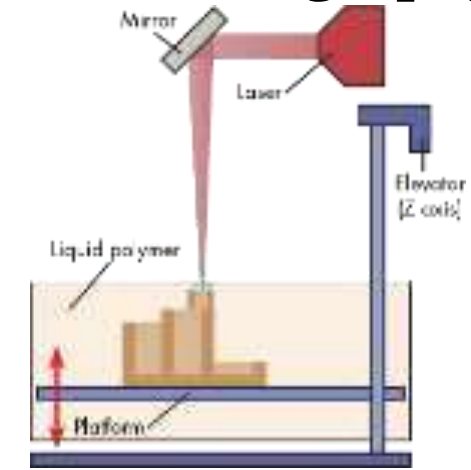
Type: Powder melted with LASER,
Requires post processing
Material: Nylon, metal

Powder Binding



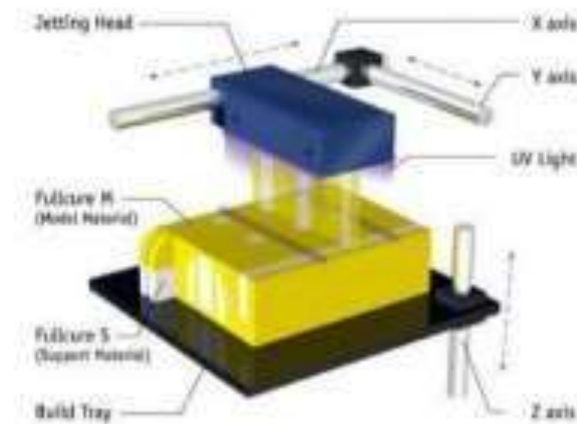
Type: Binder jetting
Full color fragile
Material: Talcum powder

Stereo Lithography



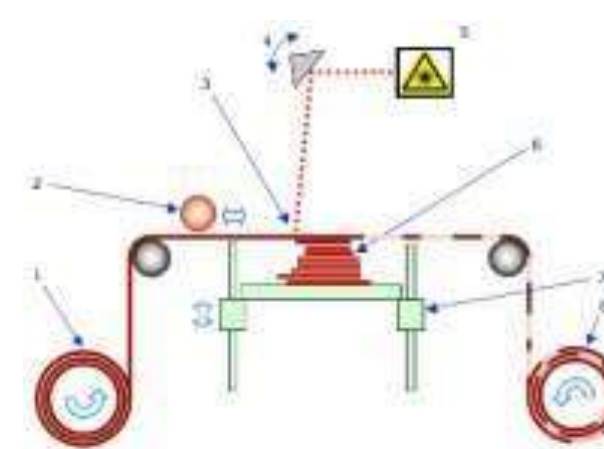
Type: LASER cured resin
High resolution, Fragile
Material: Resin

Polyjet



Type: UV cured photopolymer
High resolution, Multi material
Material: UV cured photopolymer

Laminated Object Manufacturing



Type: UV cured photopolymer
High resolution
Material: Plastic, paper and metal laminates



TYPES OF 3D PRINTING



**FUSED DEPOSITION
MODELING**

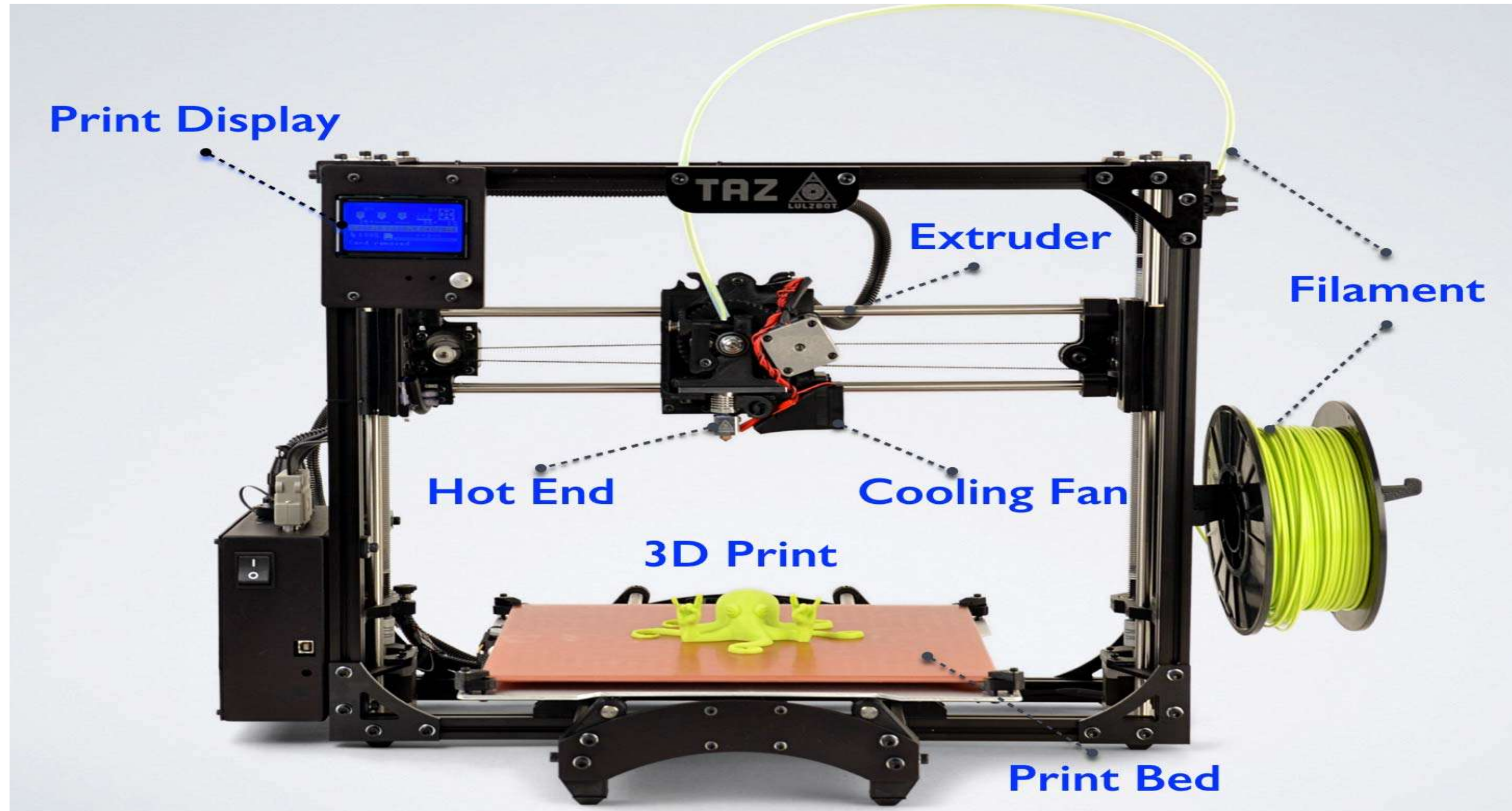
**SELECTIVE LASER
SINTERING**

**STEREO
LITHOGRAPHY**

POLYJET



FUSION DEPOSITION MODELING

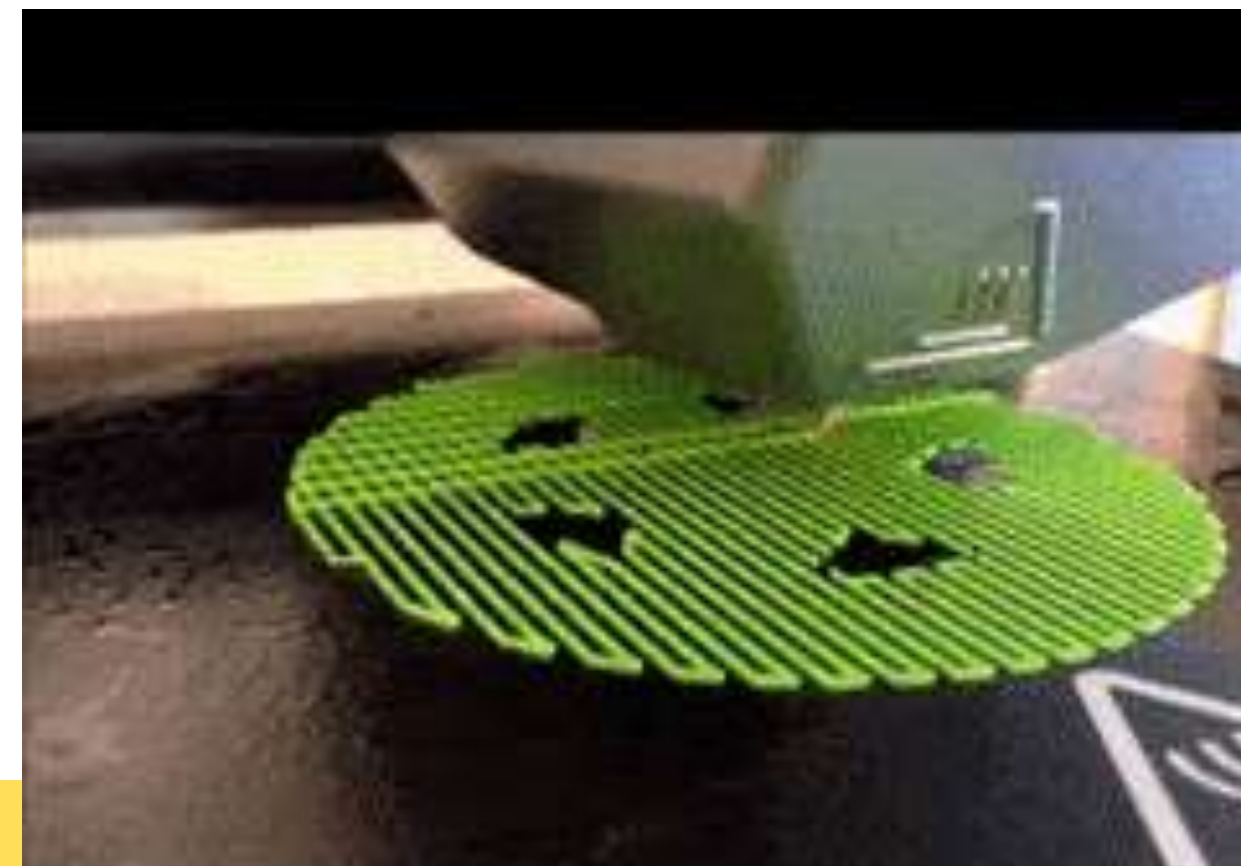




FUSION DEPOSITION MODELING



- Stl file of the design is fed into the printer.
- Raw material is heated up to its melting point in the extrusion head.
- Model or part is produced by extruding thermoplastic used.
- The part is created layer by layer – Additive Manufacturing.
- Material layers hardens immediately after extrusion from the nozzle.
- The finished product is removed easily.

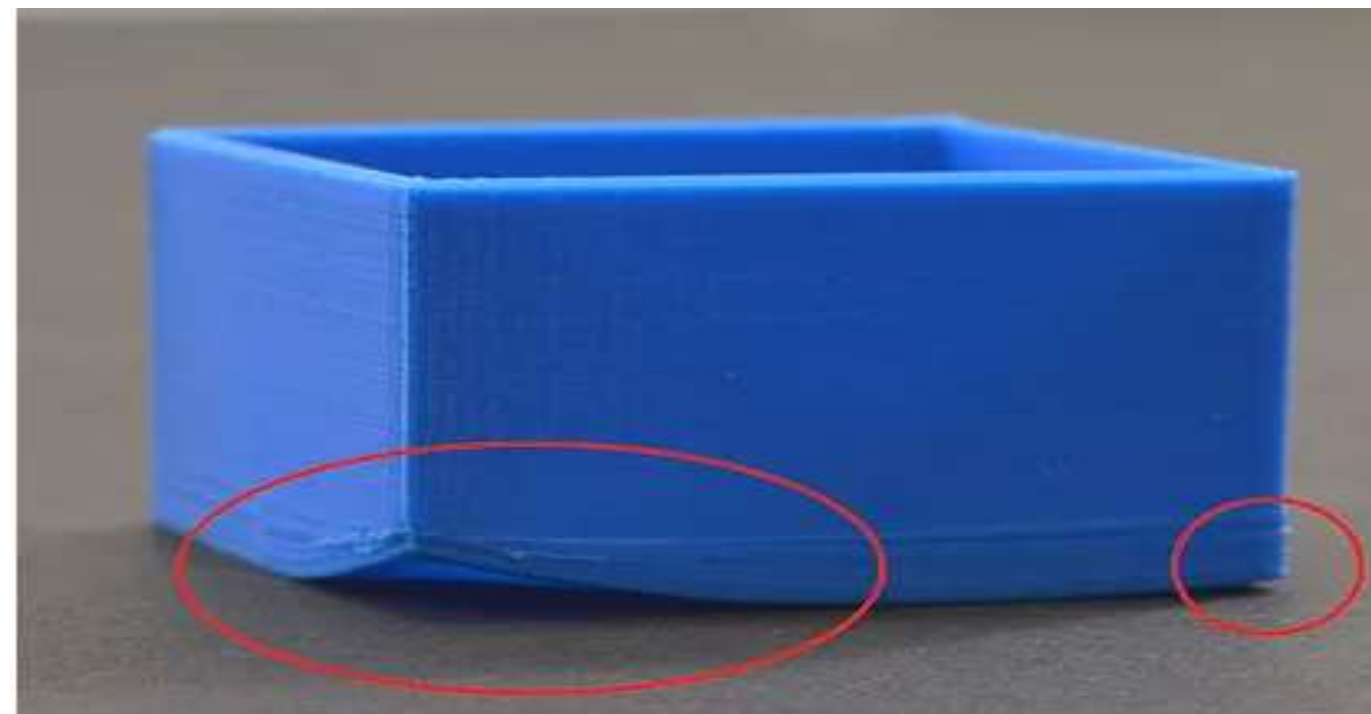




FUSION DEPOSITION MODELING

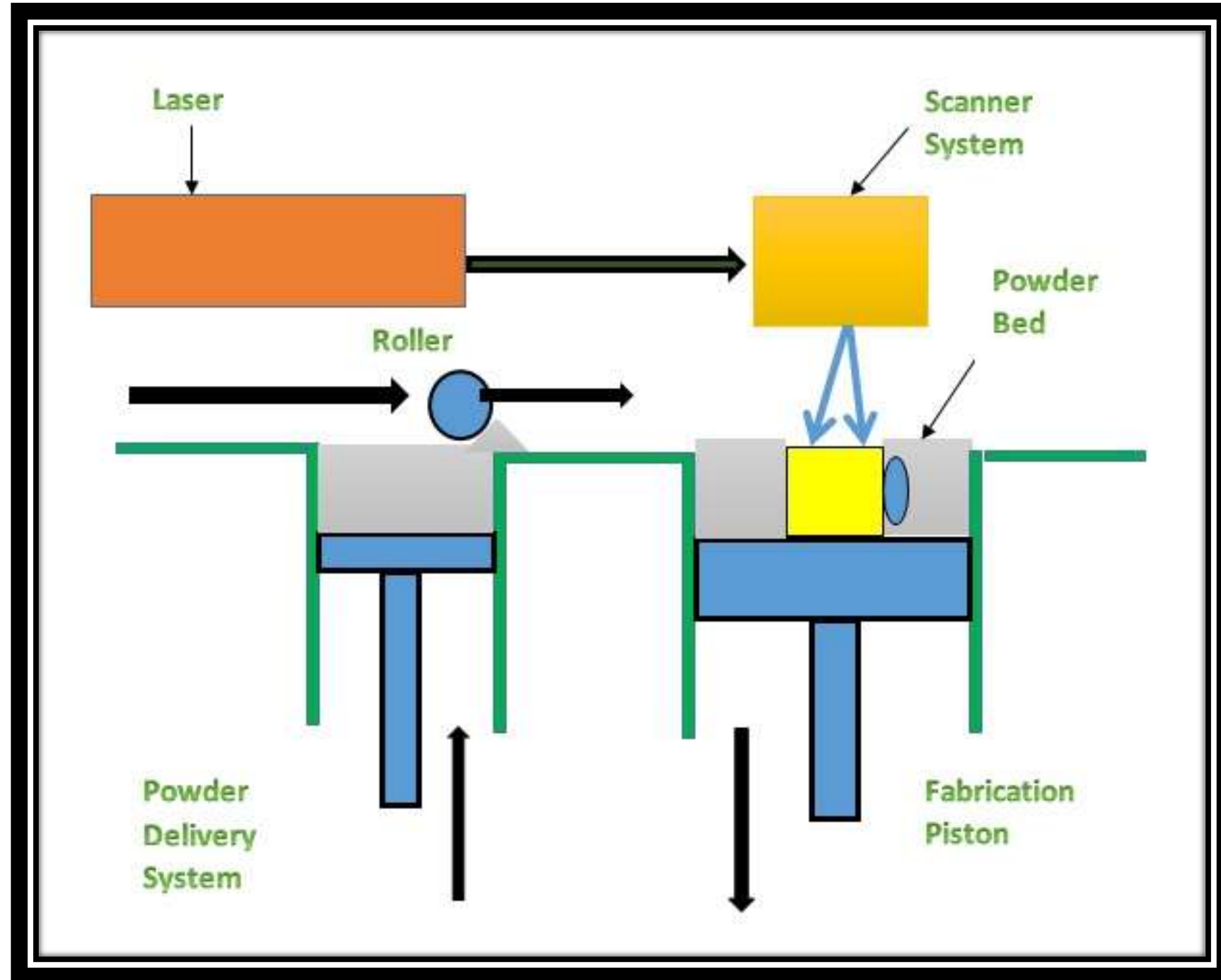


- Advantages:
 - Cheaper since uses plastic, more expensive models use a different (water soluble) material to remove supports completely.
 - Even cheap 3D printers have enough resolution for many applications.
- Disadvantages:
 - Supports leave marks that require removing and sanding.
 - Warping, limited testing allowed due to Thermo plastic material.





Selective Laser Sintering (SLS)





Selective Laser Sintering (SLS)



- The technique that uses a laser as the power source to sinter powdered material.
- Laser automatically points in space defined by a 3D model and binds the material together to create a solid structure.
- A *recoater* blade is used to move new powder over the build platform.
- The technology fuses metal powder into a solid part by melting it locally using the focused laser beam.





SELECTIVE LASER SINTERING



Advantages:

- Speed is the most obvious because no special tooling is required and parts can be built in a matter of hours.
- SLS allows for more rigorous testing of prototypes.
- The components are built layer by layer, it is possible to design internal features and passages that could not be cast or otherwise machined.
- Complex geometries and assemblies with multiple components can be simplified to fewer parts with a more cost effective assembly.
- SLS does not require special tooling like castings, so it is convenient for short production runs..



SELECTIVE LASER SINTERING



Disadvantages:

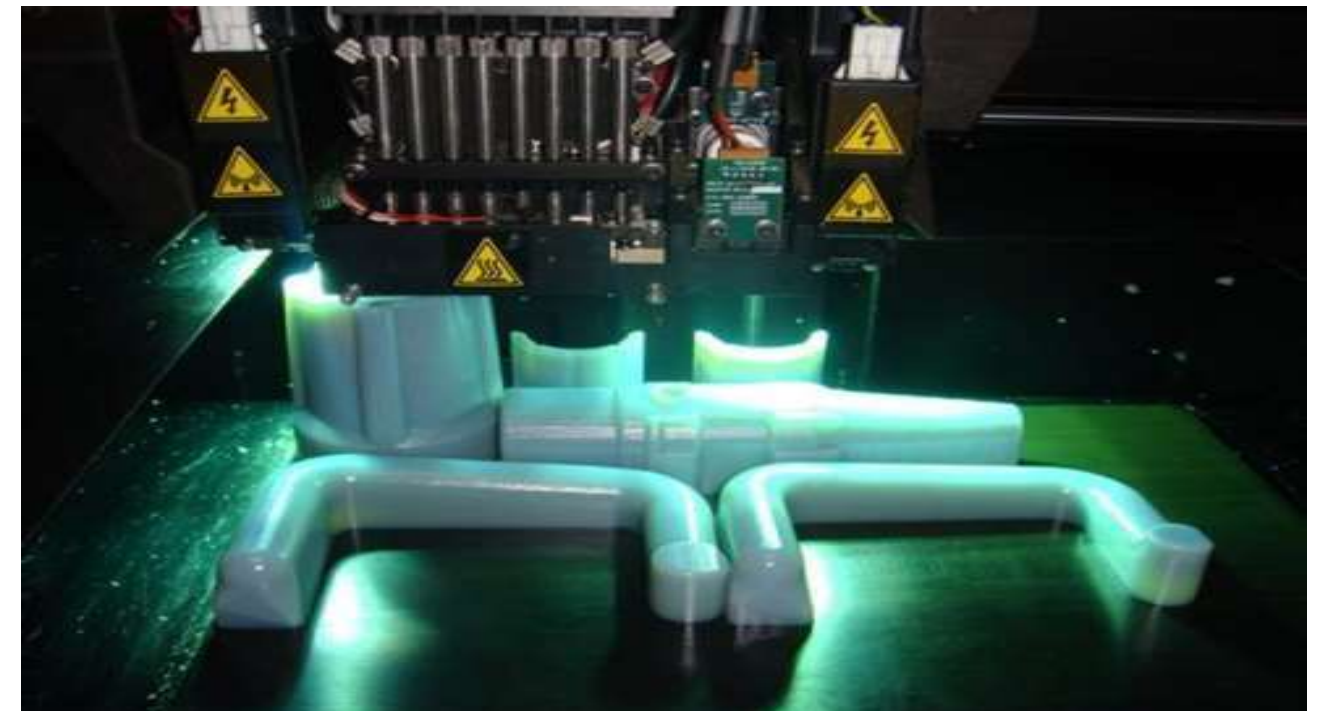
- The aspects of size, feature details and surface finish, as well as print through error in the Z axis may be factors that should be considered prior to the use of the technology.
- Surfaces usually have to be polished to achieve mirror or extremely smooth finishes.
- In this process metallic support structure removal and post processing of the part generated is a time consuming process and requires use of EDM and/or grinding machines.



PolyJet printing



It works by jetting photopolymer materials in ultra-thin layers onto a build platform. Each photopolymer layer is cured by UV light immediately after it is jetted, producing fully cured models that can be handled and used immediately, without post-curing. The gel-like support material, designed to support complicated geometries, is subsequently removed by water jetting.

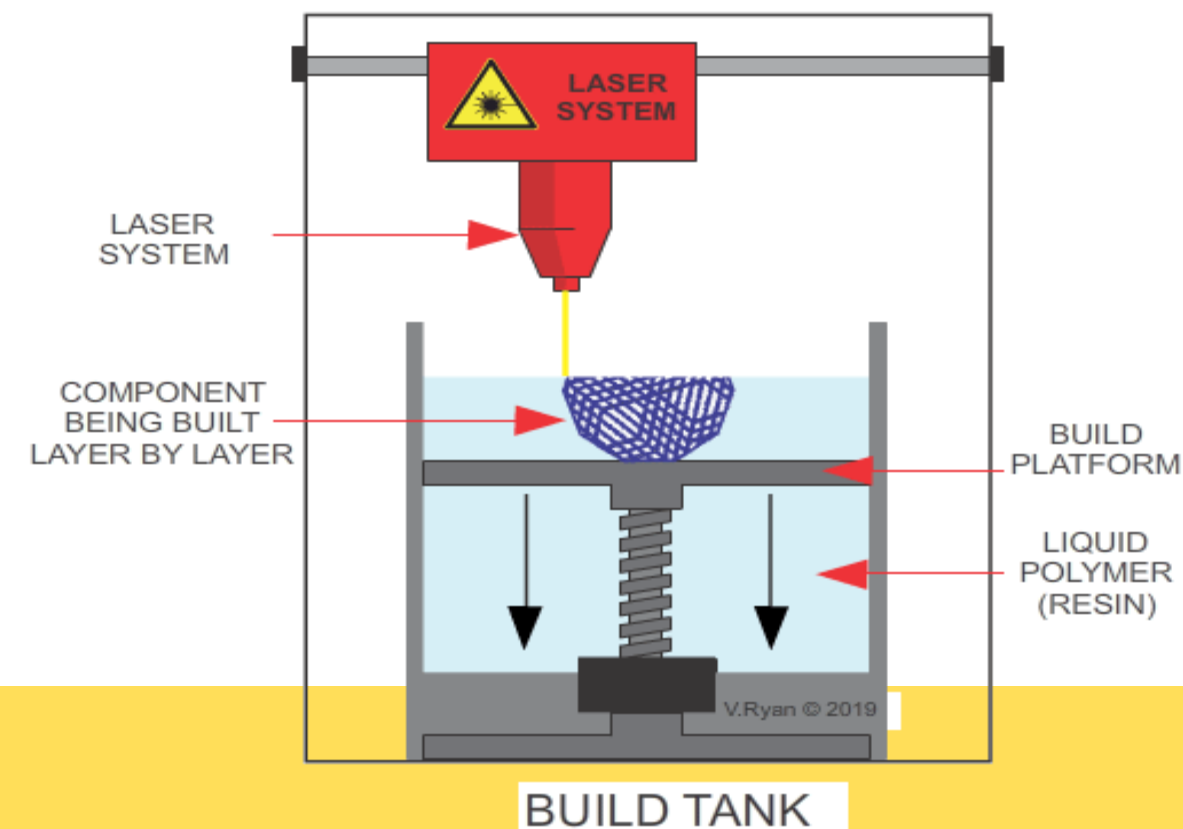




STEREOLITHOGRAPHY



- Stereolithography is an additive manufacturing process which employs a vat of liquid ultraviolet curable photopolymer "resin" and an ultraviolet laser to build parts' layers one at a time.
- For each layer, the laser beam traces a cross-section of the part pattern on the surface of the liquid resin.
- Exposure to the ultraviolet laser light cures and solidifies the pattern traced on the resin and joins it to the layer below.





STEREOLITHOGRAPHY



- Advantages

- It is speed and functional parts can be manufactured within a day.
- Most stereolithography machines can produce parts with a maximum size of approximately 50×50×60 cm and are capable of producing single parts of more than 2m in length.
- Prototypes made by stereolithography are strong enough to be machined and can be used as master patterns for injection molding, thermoforming, blow molding, and various metal casting processes.

- Disadvantages

- Its is expensive
- The cost of photo-curable resin has long ranged from \$80 to \$210 per liter, and the cost of stereolithography machines has ranged from \$100,000 to more than \$500,000.



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