3D Printing

The Process

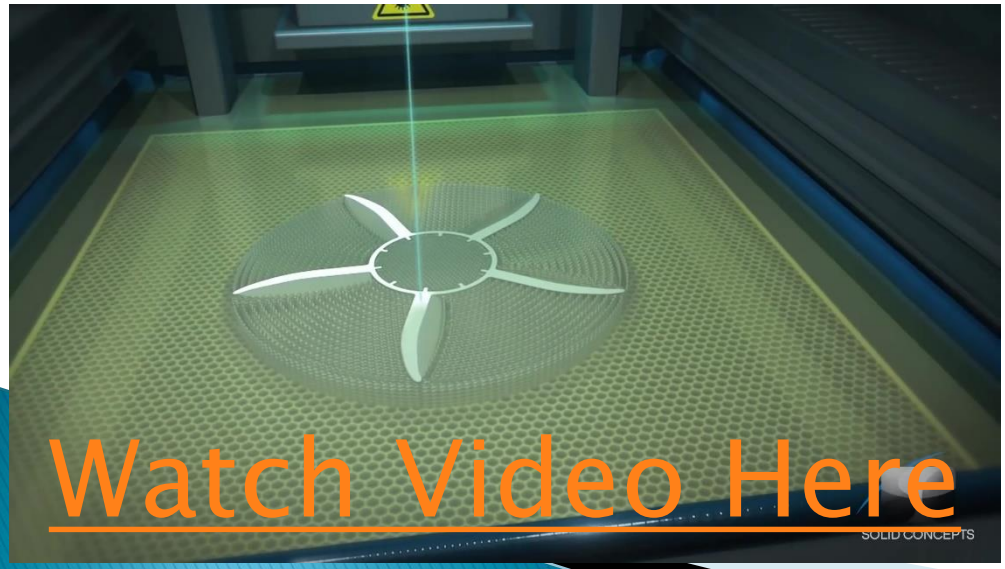
- Create 3D model
- Convert model to generic 3D file (STL)
- Load generic file into printer software
- “Slice” the 3D file into layer
- Determine support structures
- Print model one layer at a time

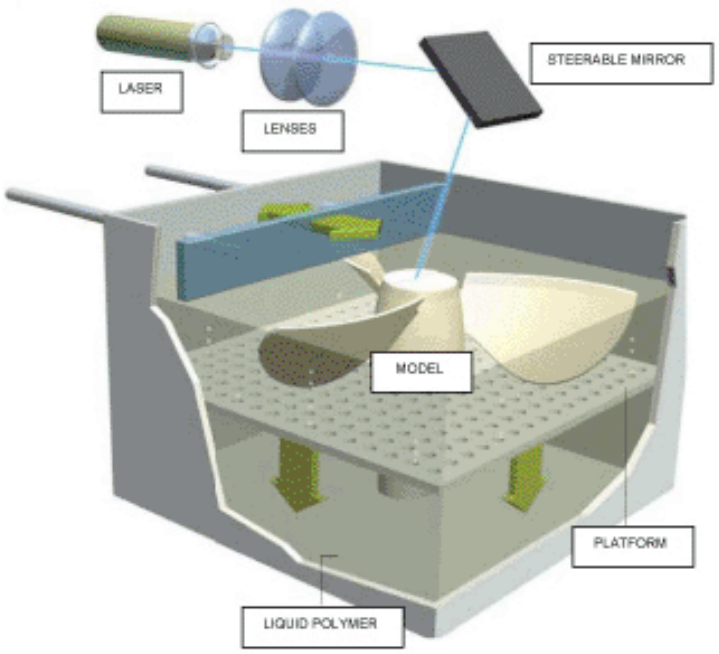
The Materials

- Powders
- Plastics
- Resins
- Metals
- Anything that can be extruded
- Anything that can be selectively cured

The Big Three (or four)

- SLA – StereoLithography Apparatus
  - Laser hardens a thin layer of photocurable polymer
  - Examples dating back to 1984
  - Layers 0.06mm (0.0025in)
  - Minimum feature size
    - 0.25mm(0.01in)

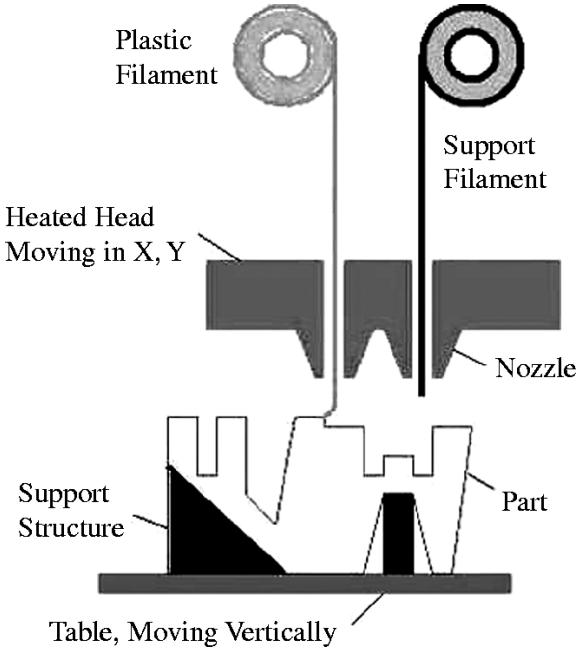




www.lasersintering.com

The Big Three (or four)

- FDM – Fused Deposition Modeling
  - Thin stream of plastic is extruded onto a platter
  - Layers are typically thicker 0.254 mm (0.010 in)
  - Parts are durable
  - Minimum feature size
    - 1mm(0.025in)



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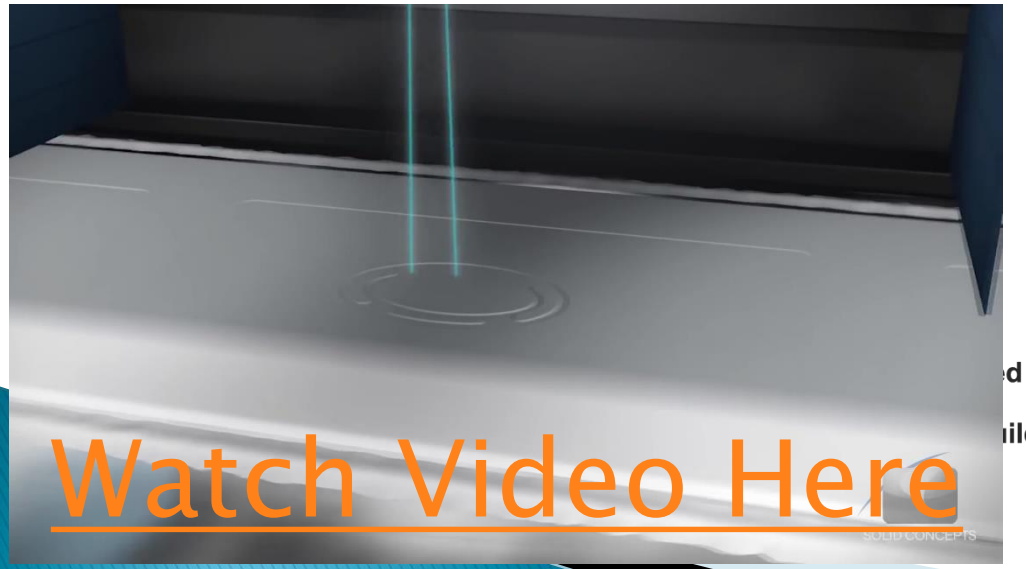
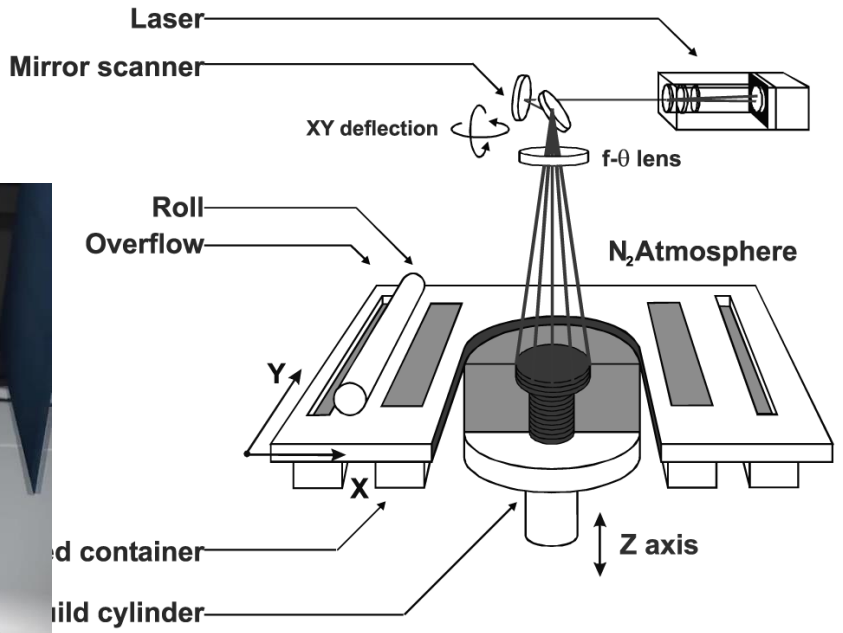
The Big Three (or four)

- SLS/SHS – Selective Laser/Heat Sintering
  - Fine powder is fused with laser or direct heat
  - Wide range of materials – Nylon, Glass, Ceramic, Steel
  - Layers 0.1mm (0.004in)
  - Minimum feature size
    - 0.76mm(0.03in)





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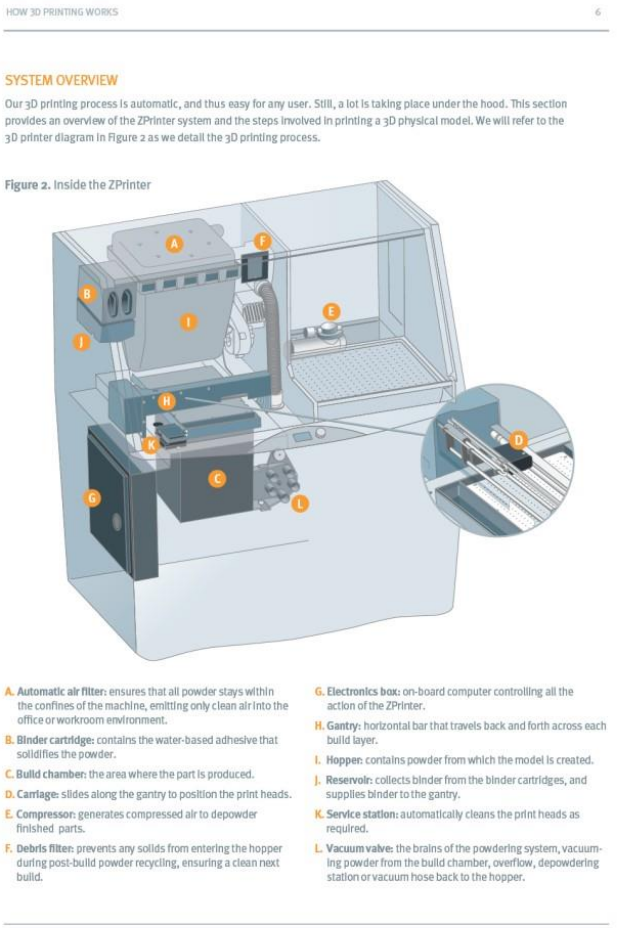
The Big Three (or four)

- PolyJet
  - Fine powder infused w/ binders
  - Starch
  - Can print in full color
  - Layers 0.015mm
  - Minimum feature size – 0.8mm



HOW 3D PRINTING WORKS 6

SYSTEM OVERVIEW

Our 3D printing process is automatic, and thus easy for any user. Still, a lot is taking place under the hood. This section provides an overview of the ZPrinter system and the steps involved in printing a 3D physical model. We will refer to the 3D printer diagram in Figure 2 as we detail the 3D printing process.

Figure 2. Inside the ZPrinter

A. **Automatic air filter:** ensures that all powder stays within the confines of the machine, emitting only clean air into the office or workroom environment.

B. **Binder cartridge:** contains the water-based adhesive that solidifies the powder.

C. **Build chamber:** the area where the part is produced.

D. **Carriage:** slides along the gantry to position the print heads.

E. **Compressor:** generates compressed air to depowder finished parts.

F. **Debris filter:** prevents any solids from entering the hopper during post-build powder recycling, ensuring a clean next build.

G. **Electronics box:** on-board computer controlling all the action of the ZPrinter.

H. **Gantry:** horizontal bar that travels back and forth across each build layer.

I. **Hopper:** contains powder from which the model is created.

J. **Reservoir:** collects binder from the binder cartridges, and supplies binder to the gantry.

K. **Service station:** automatically cleans the print heads as required.

L. **Vacuum valve:** the brains of the powdering system, vacuuming powder from the build chamber, overflow, depowdering station or vacuum hose back to the hopper.

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CHOCOLATE


CONCRETE


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