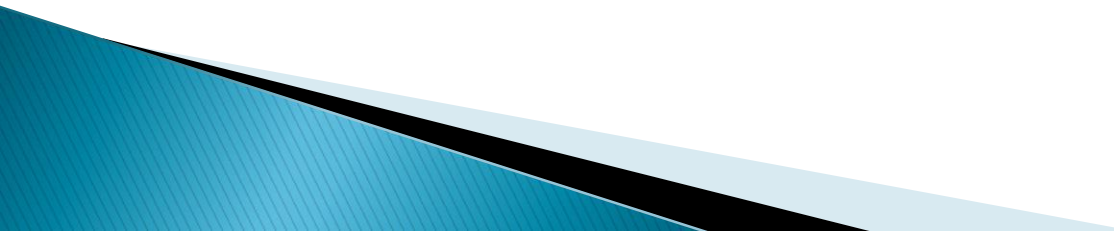
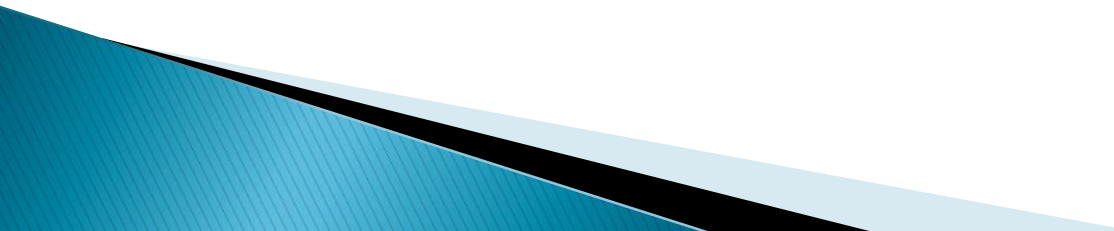


3D Printing

The Process

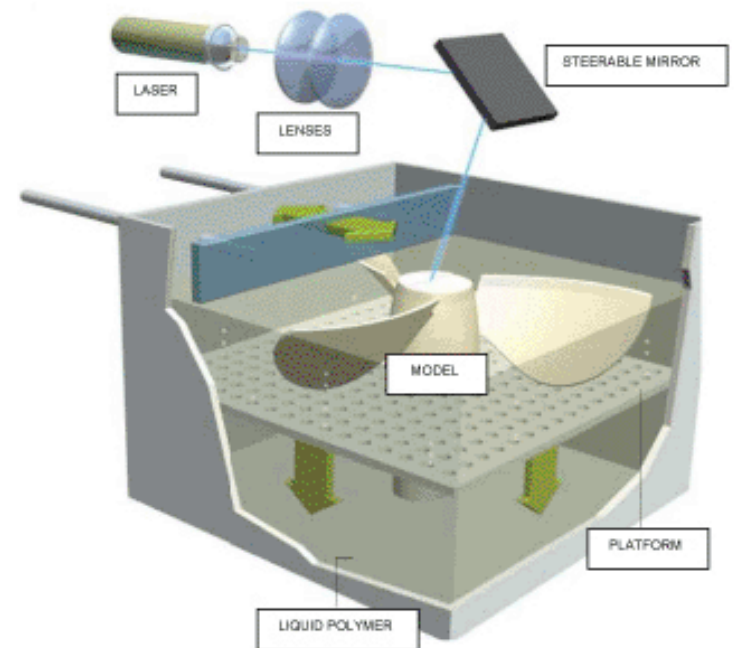
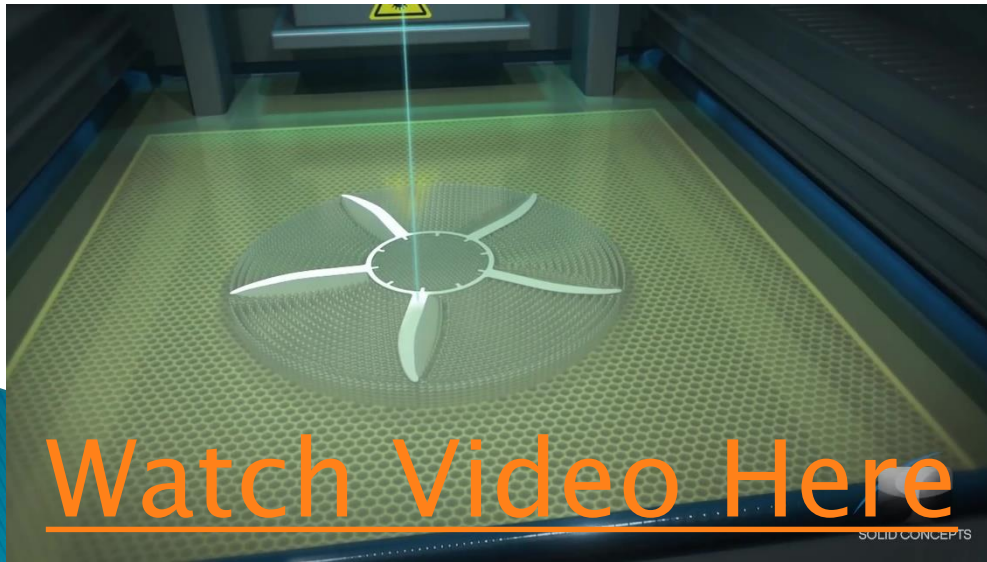
- ▶ Create 3D model
 - ▶ Convert model to generic 3D file (STL)
 - ▶ Load generic file into printer software
 - ▶ “Slice” the 3D file into layer
 - ▶ Determine support structures
 - ▶ Print model one layer at a time
- 

The Materials

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

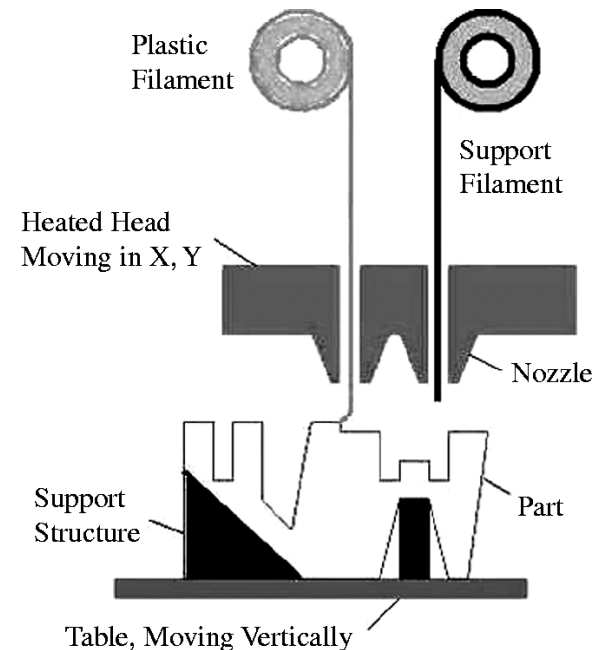
The Big Three (or four)

- ▶ 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)



The Big Three (or four)

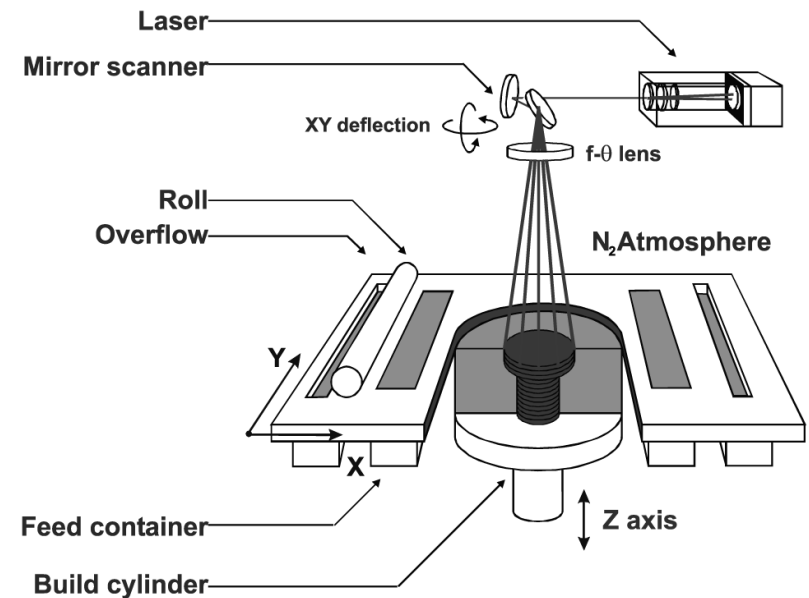
- ▶ FDM – Fused Deposition Modeling
 - Thin stream of plastic is extruded onto a platter
 - Layers are typically thicker 0.254 mm (0.010 in)
 - Parts are durable
 - Minimum feature size
 - 1 mm(0.025in)



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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 0.1 mm (0.004in)
 - Minimum feature size
 - 0.76mm(0.03in)



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



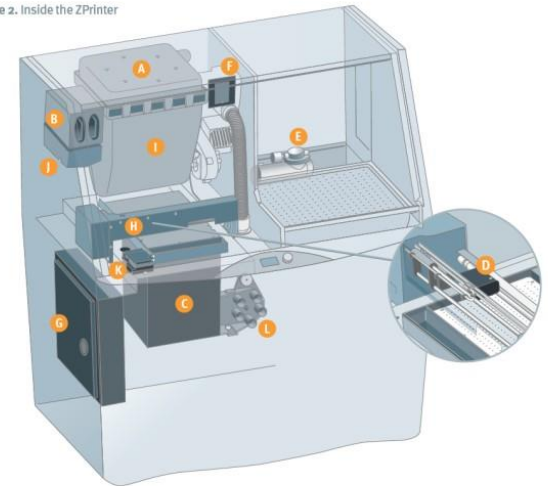
HOW 3D PRINTING WORKS

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.

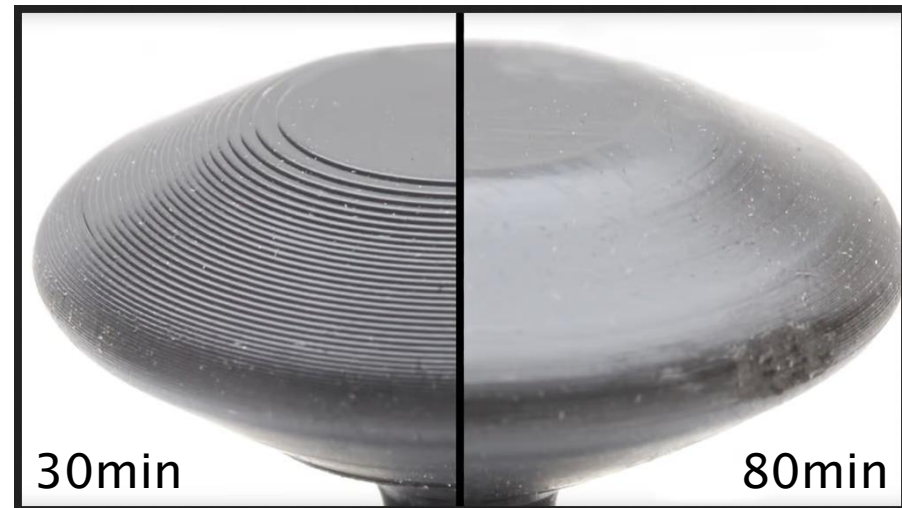
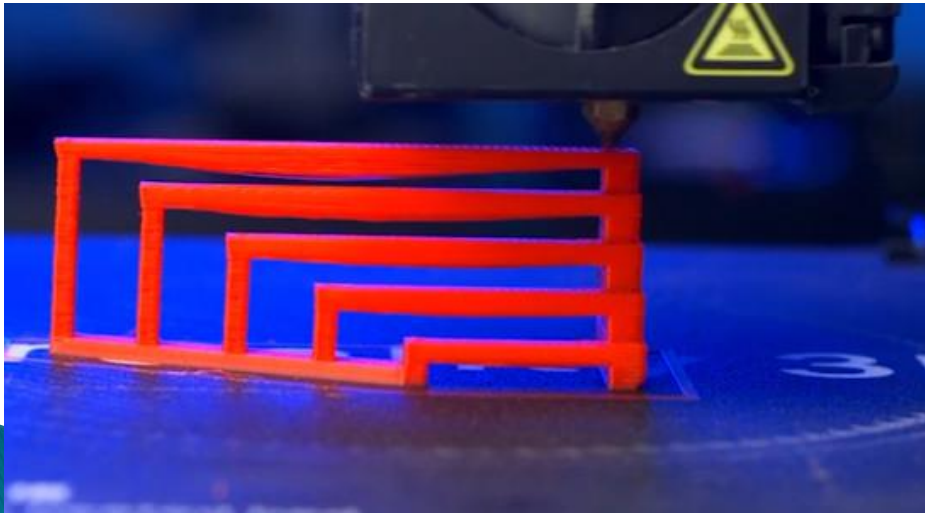
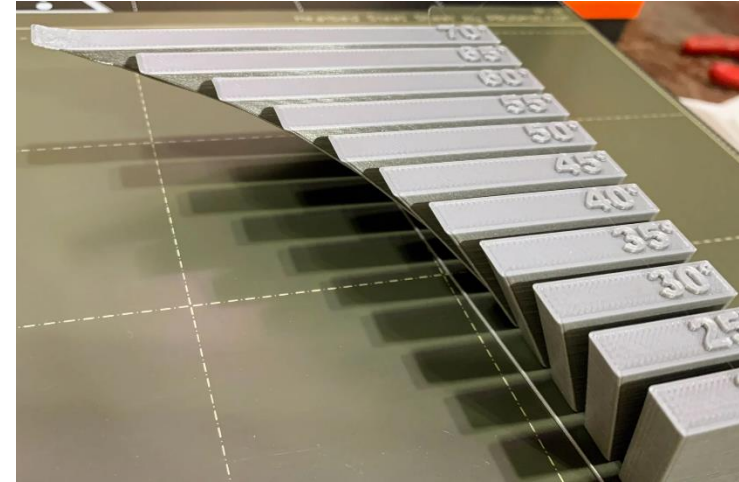
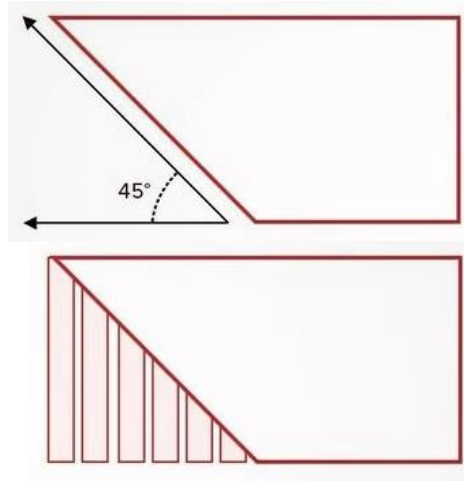
K. Service station: automatically cleans the print heads as required.

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.



Other Considerations

- ▶ Overhang
- ▶ Bridge
- ▶ Layer Height



Other Considerations

► Orientation

