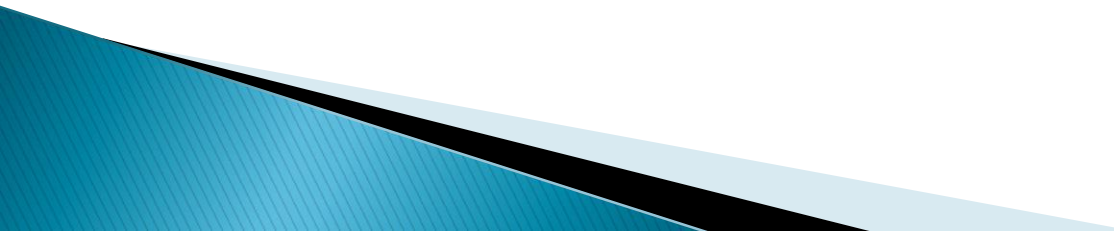
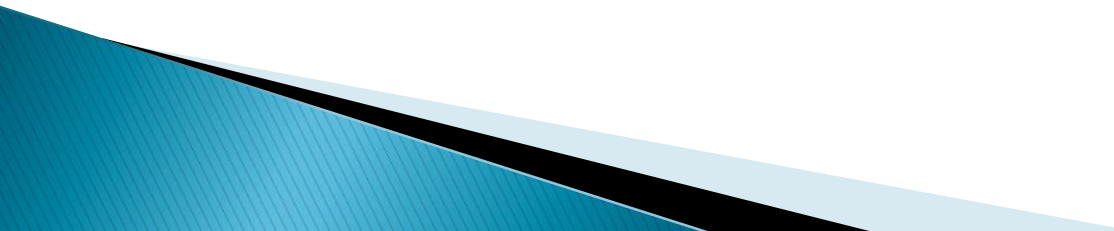


# 3D Printing

# The Process

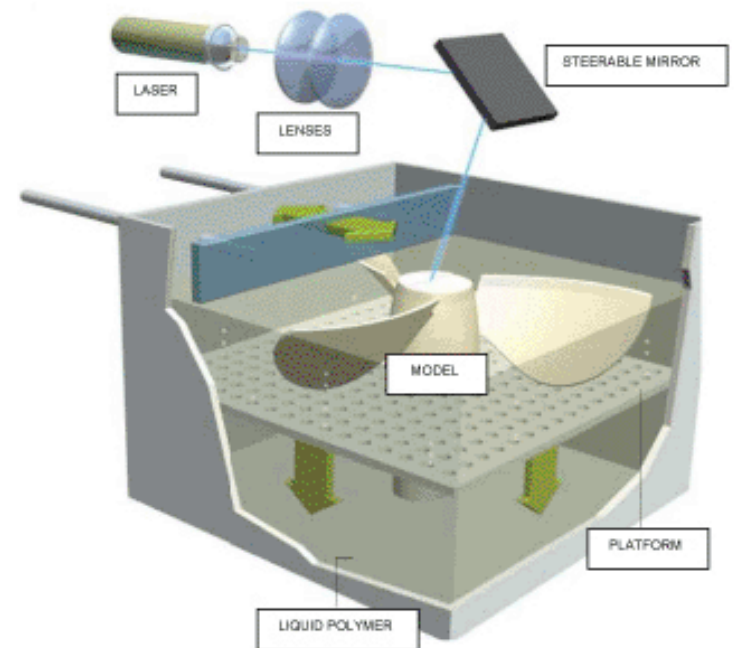
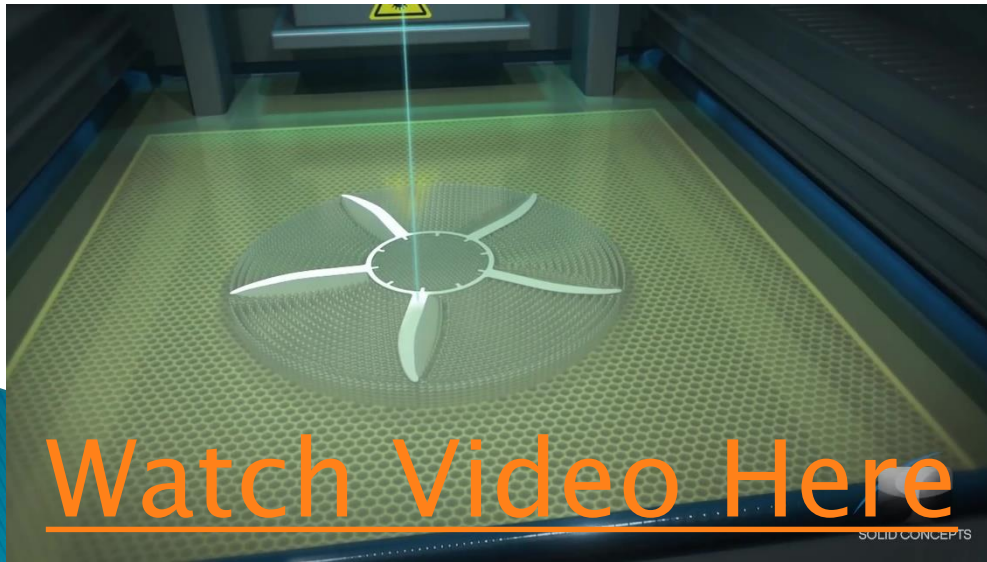
- ▶ Create 3D model
  - ▶ Convert model to generic 3D file (STL)
  - ▶ Load generic file into printer software
  - ▶ “Slice” the 3D file into layer
  - ▶ Determine support structures
  - ▶ Print model one layer at a time
- 

# The Materials

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

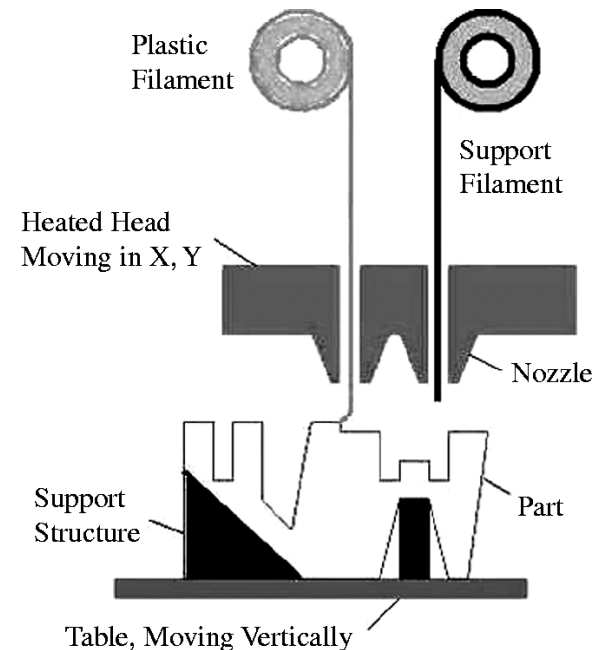
# The Big Three (or four)

- ▶ 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)



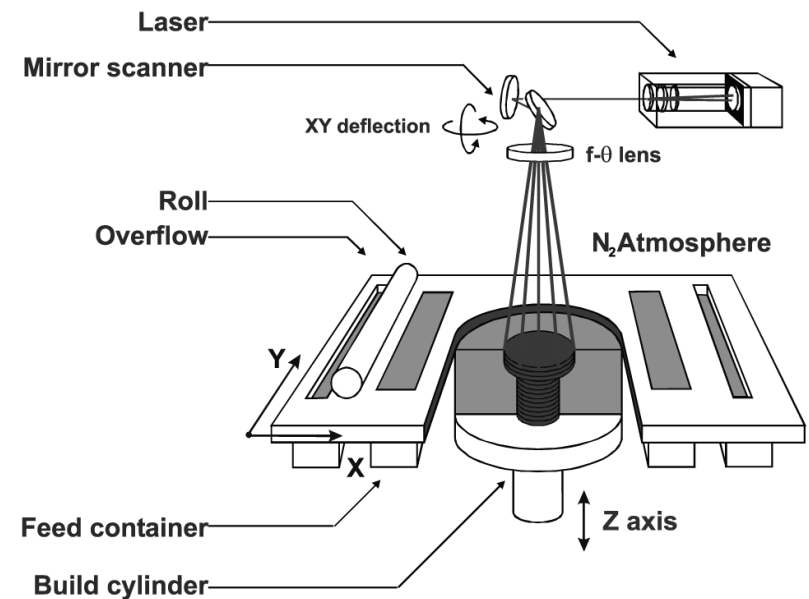
# The Big Three (or four)

- ▶ 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)



# 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)



[Watch Video Here](#)



# 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



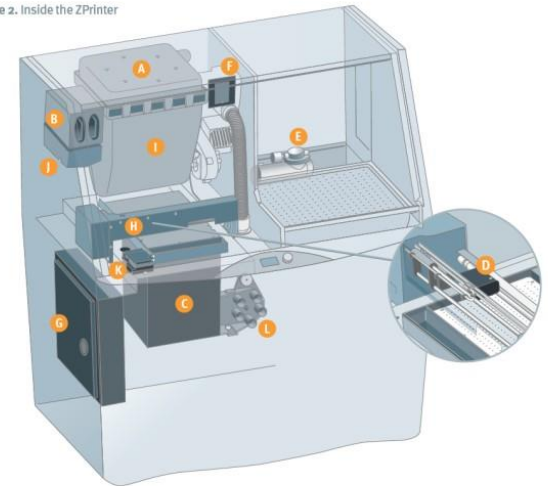
HOW 3D PRINTING WORKS

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.

