

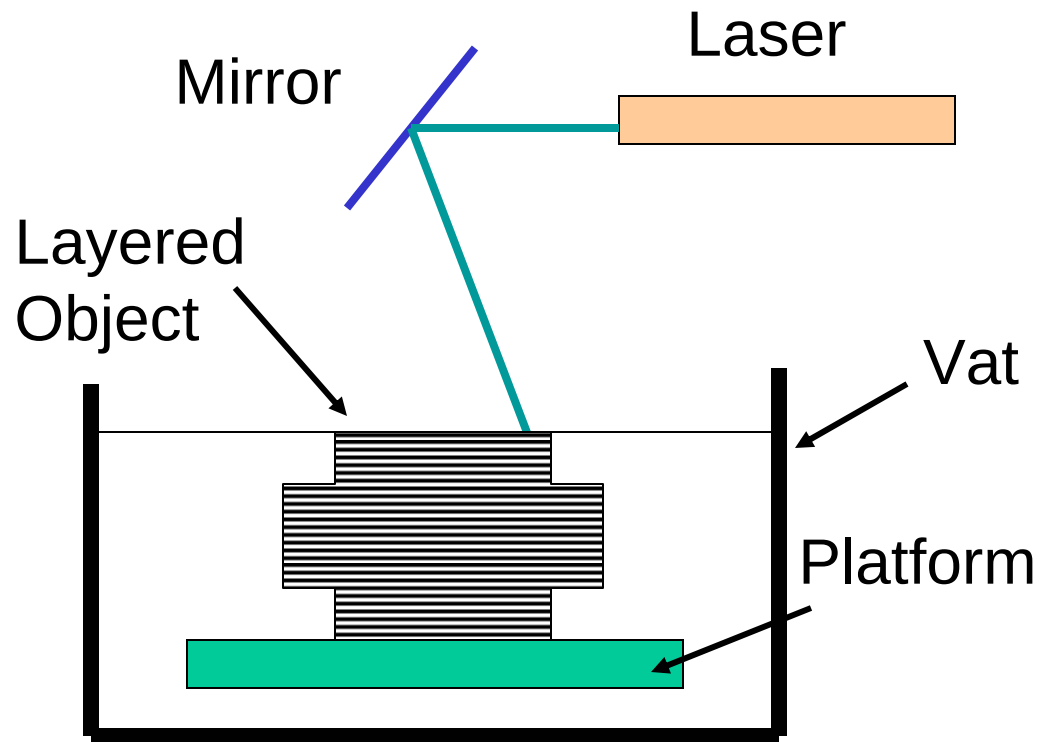
Rapid Prototyping

ver. 1

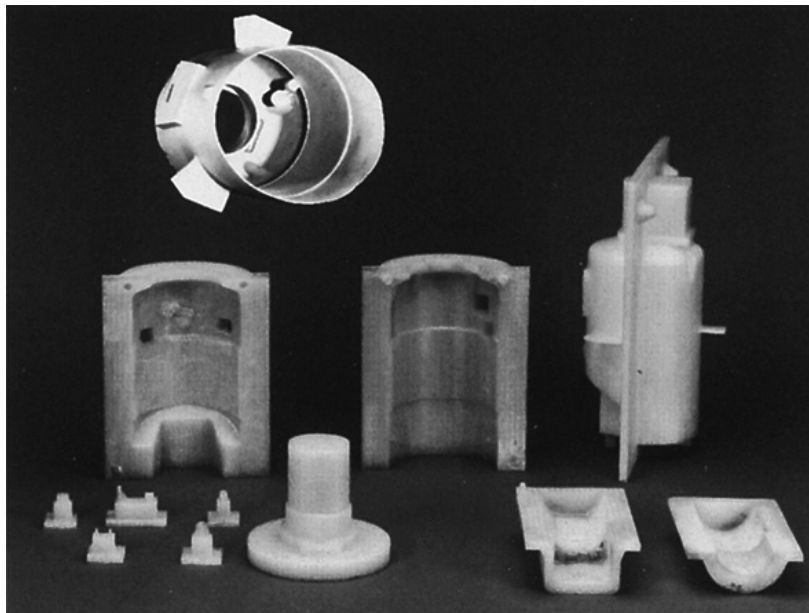
Process

- Additive fabrication
 - material is added, not removed
- Direct fabrication from a CAD file
- Layered manufacturing

Layered Manufacturing - Stereolithography



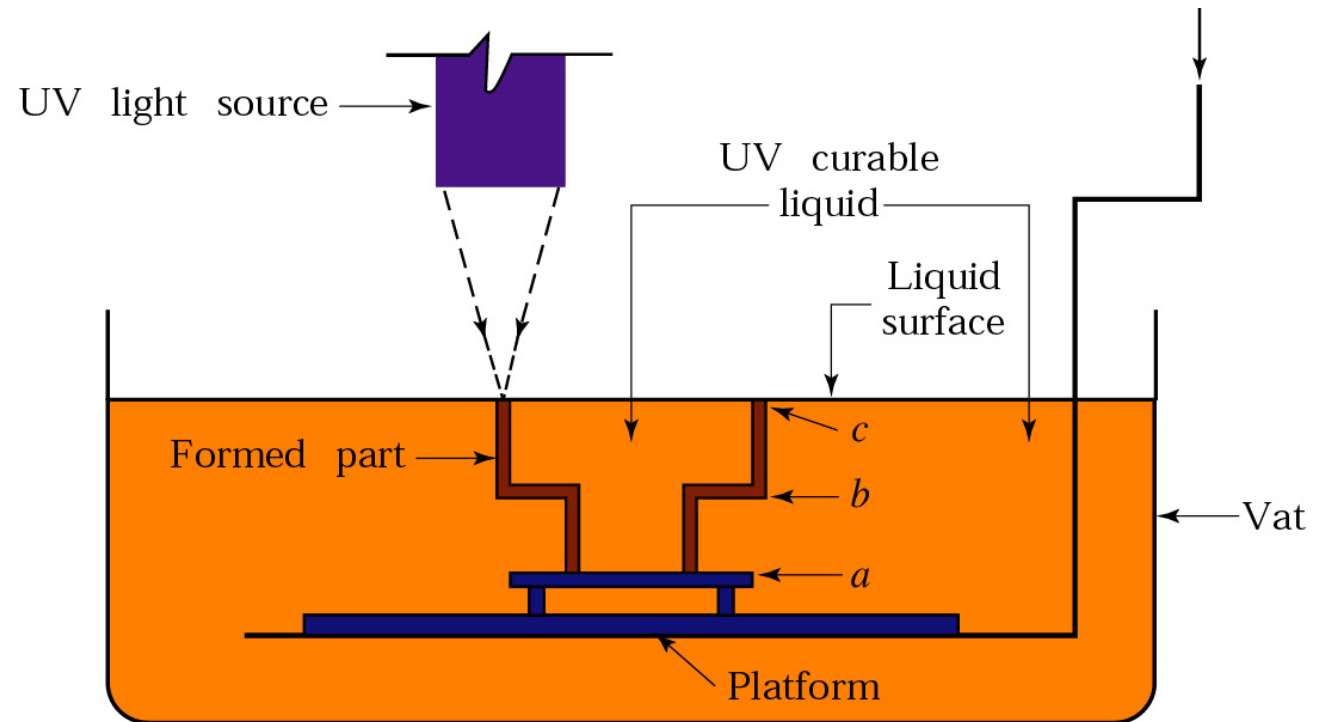
Rapid Prototyping Examples



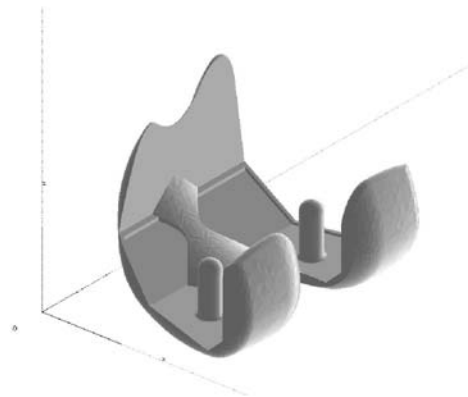
Process Examples

- Stereolithography (SL)
- Selective Laser Sintering (SLS)
- Wax jet printing (Thermojet)
- 3-D Printing
- Light Engineered Net Shaping (LENS)
- Fused Deposition Modeling (FDM)
- Solid Base Curing
- Laminated Object Modeling (LOM)

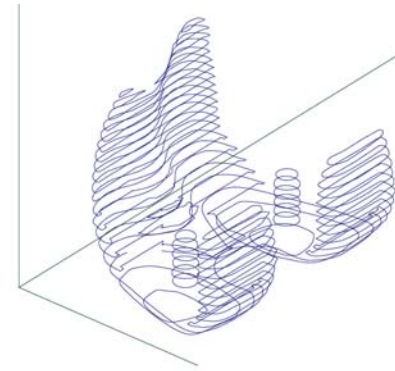
Stereolithography



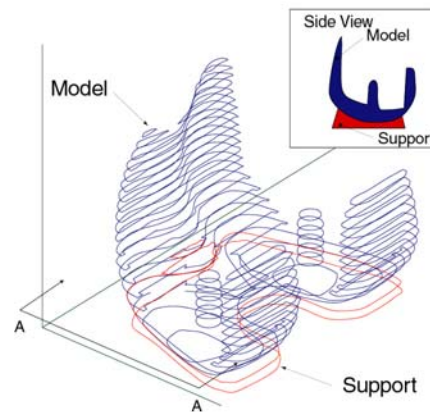
Stereo- lithography



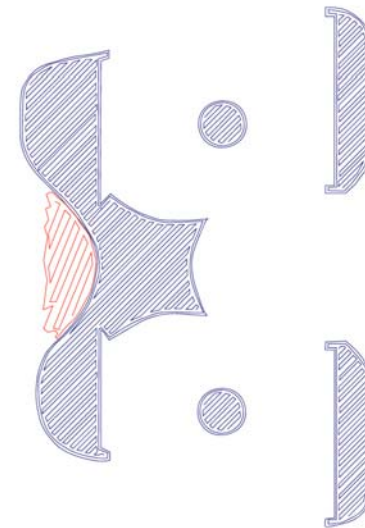
(a)



(b)



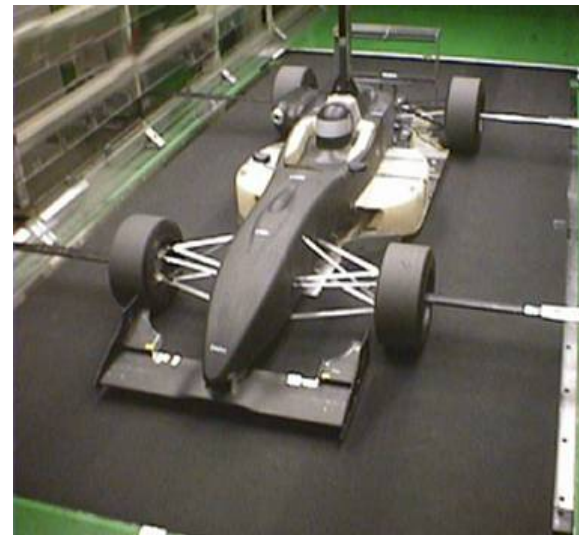
(c)



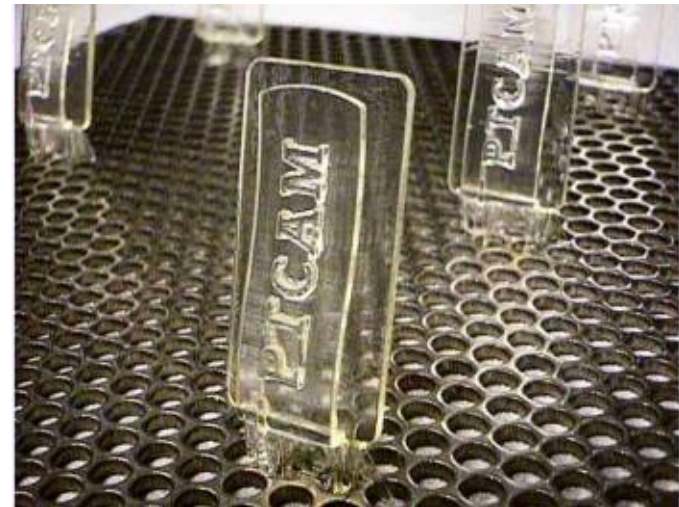
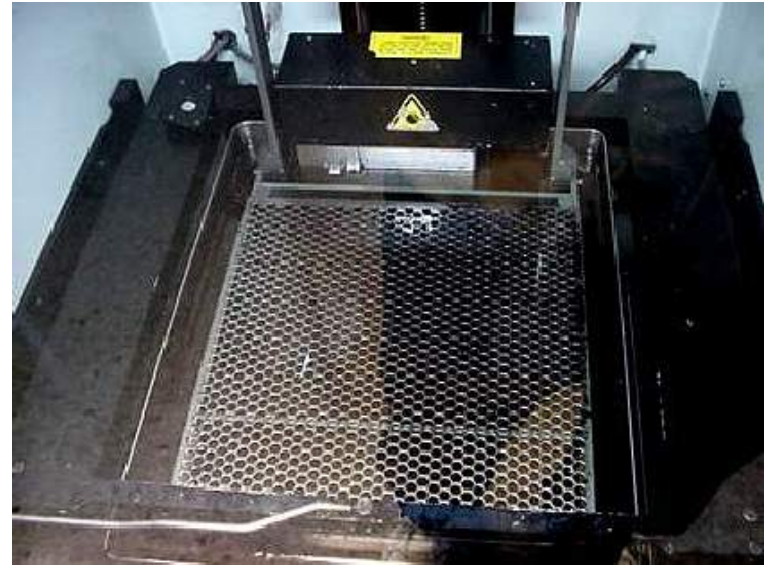
(d)

The computational steps in producing a stereolithography file. (a) Three-dimensional description of part. (b) The part is divided into slices (only one in 10 is shown). (c) Support material is planned. (d) A set of tool directions is determined to manufacture each slice. Shown is the extruder path at section A-A from (c), for a fused-deposition-modeling operation.

Stereolithography Parts

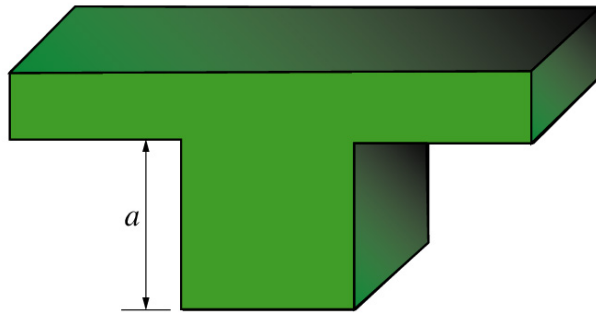


Stereolithography

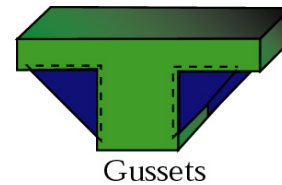


Common Support Structures

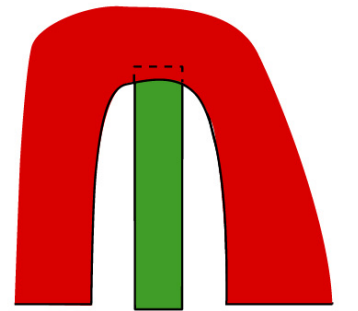
(a)



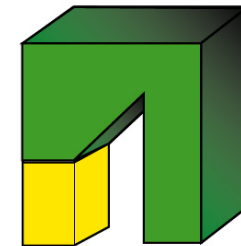
(b)



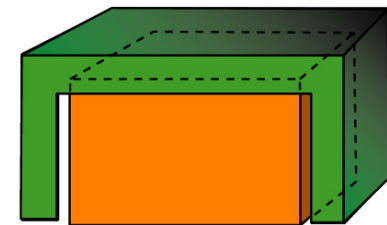
Gussets



Ceiling within an arch



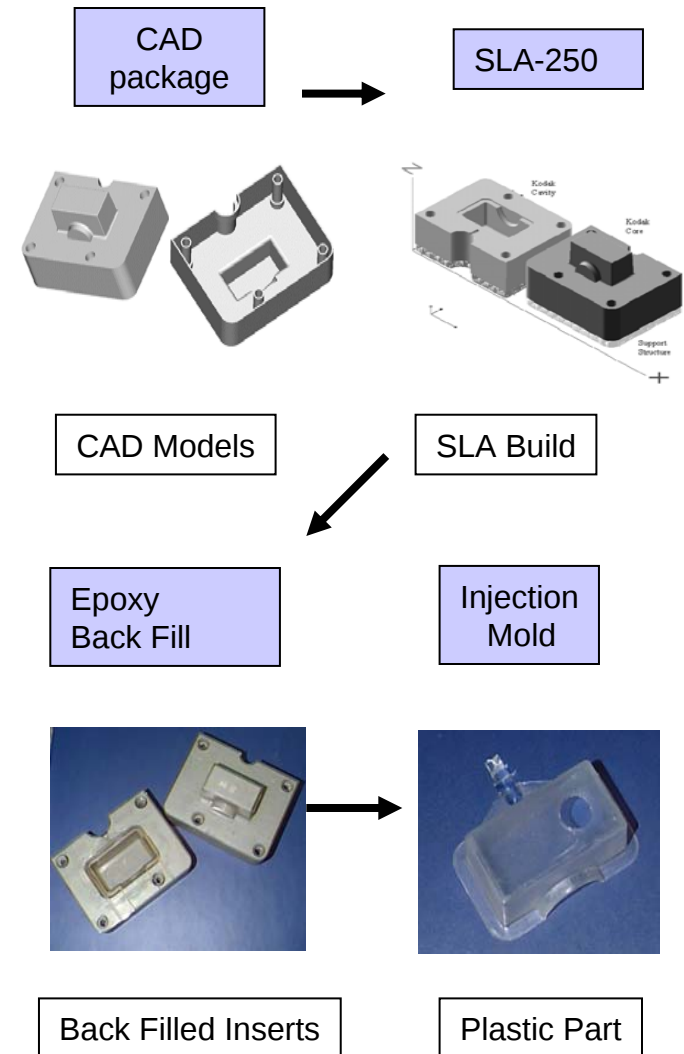
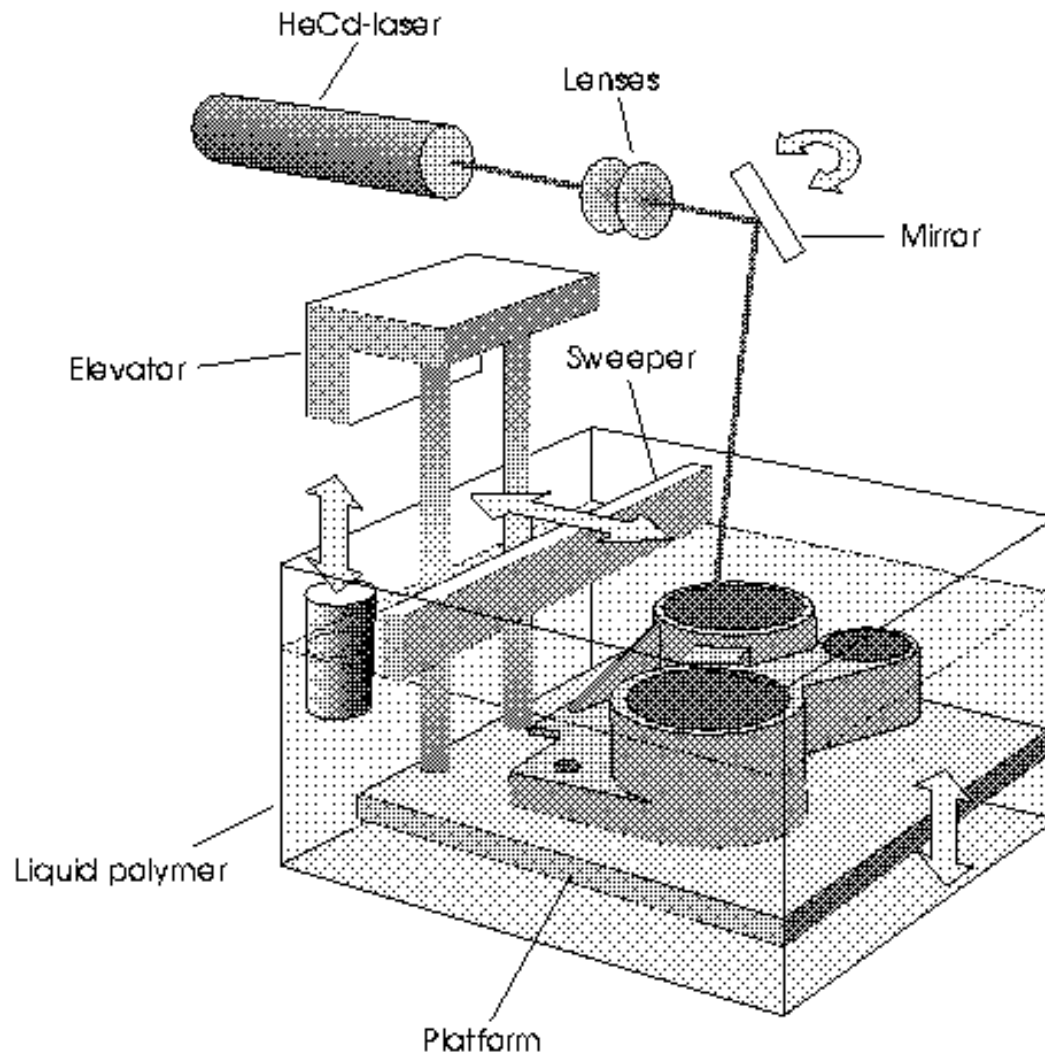
Island



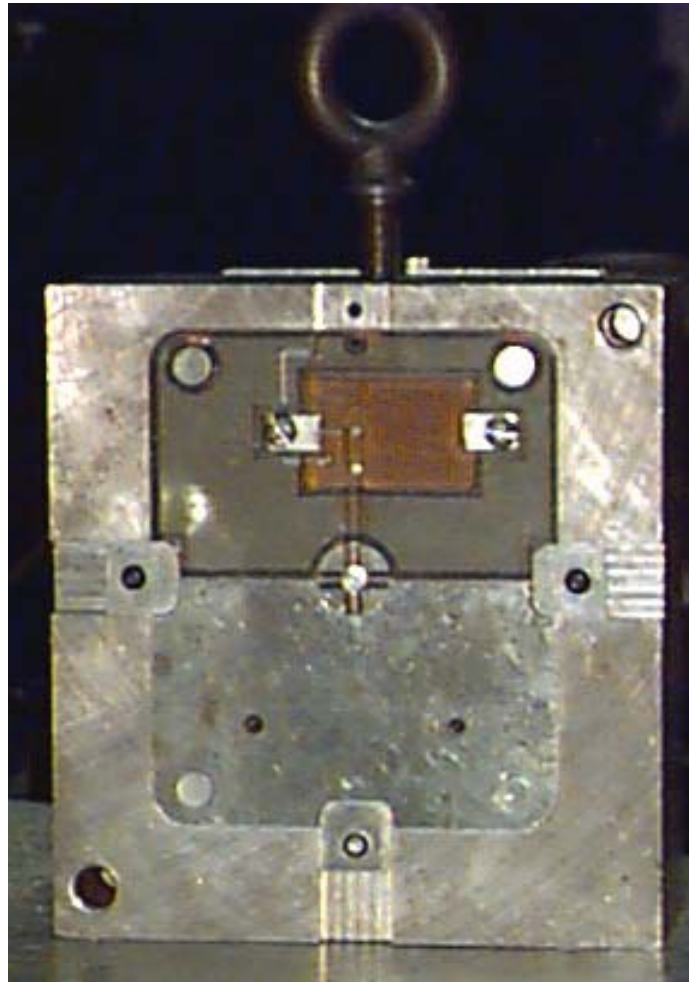
Ceiling

Overhangs need support

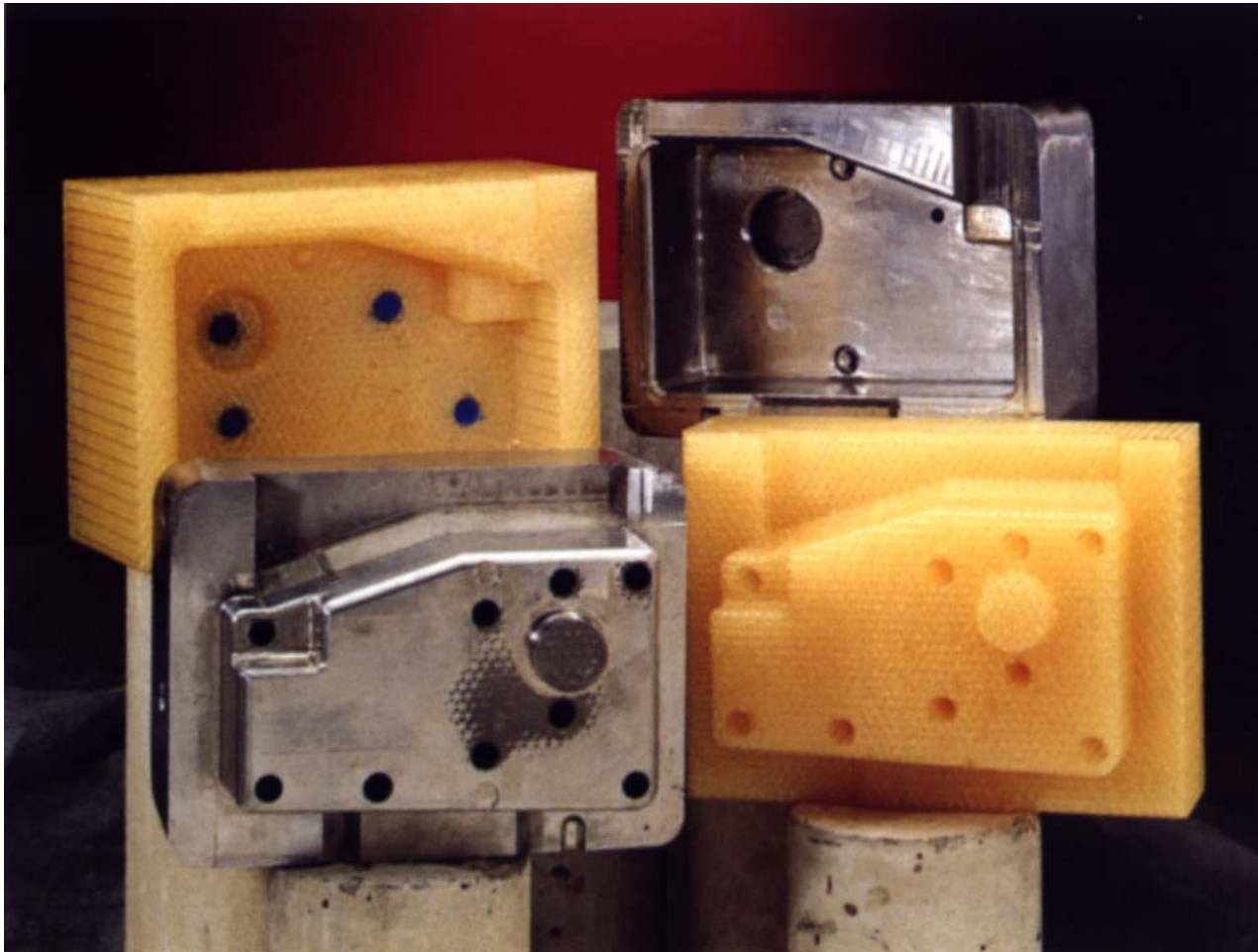
Injection Mold Making Process



Stereolithography Mold



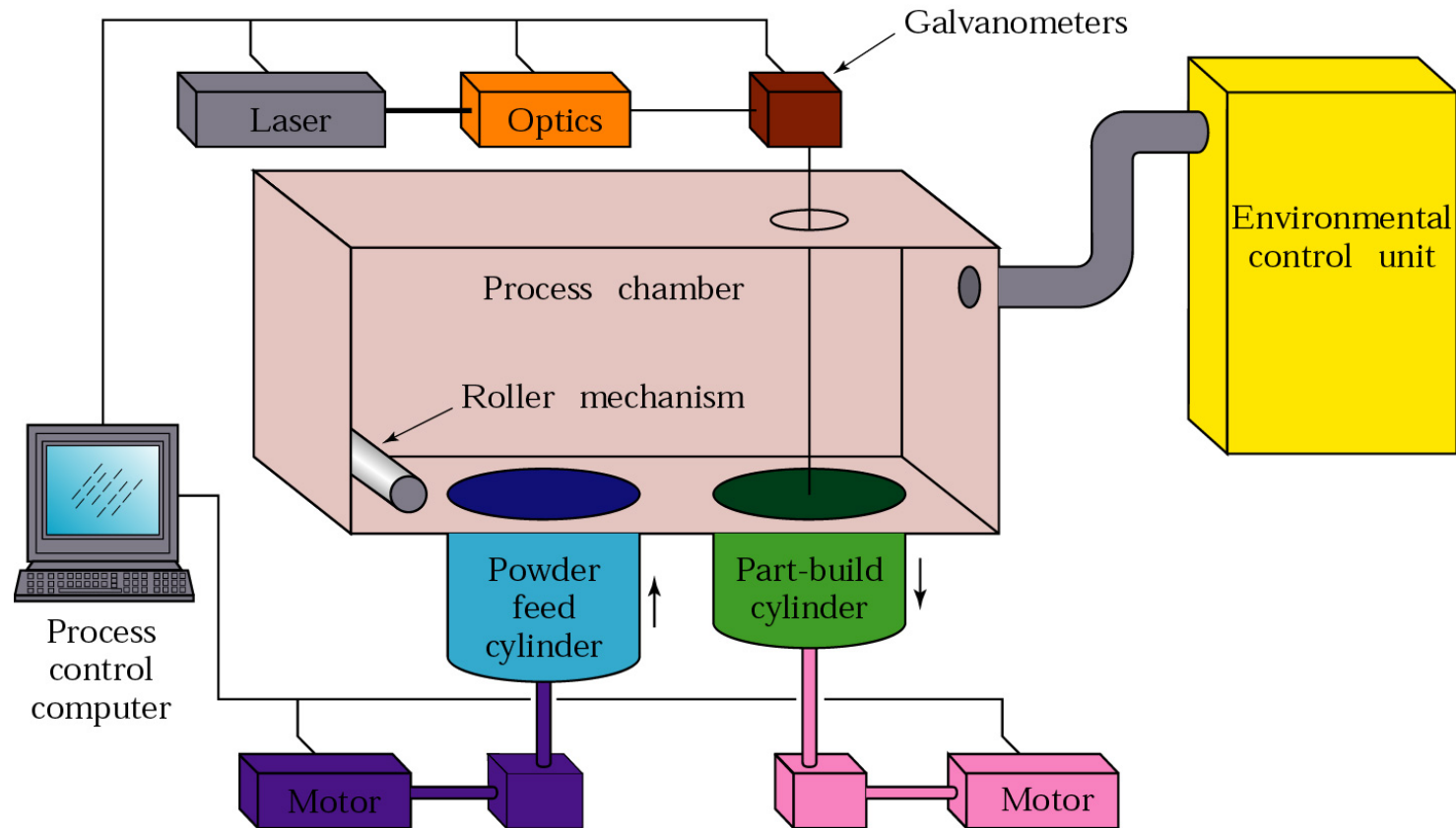
Rapid Tooling - Quick Cast



Rapid Tooling - Quick Cast

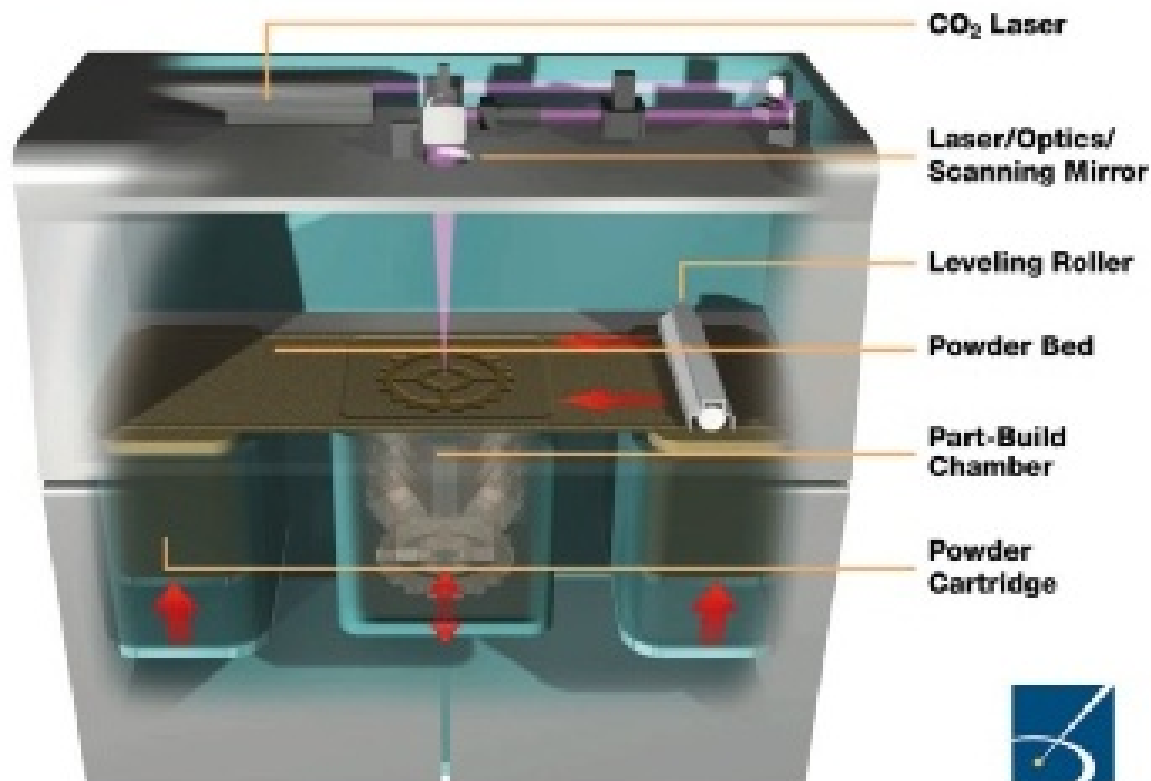


Selective Laser Sintering

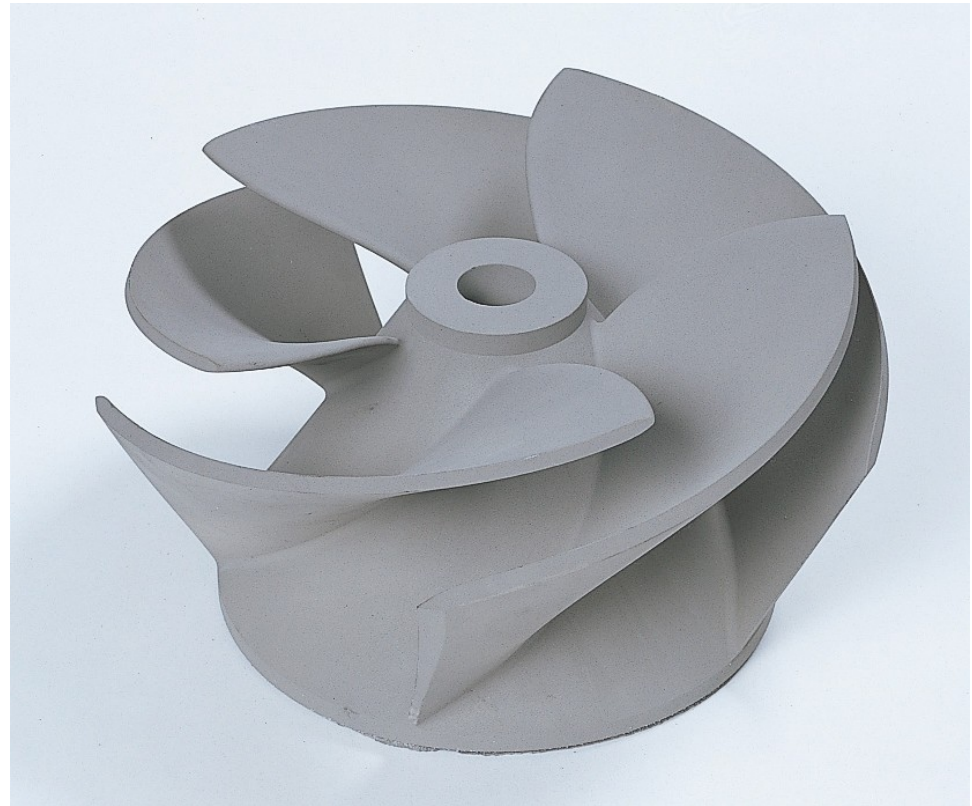


Selective Laser Sintering (3D Systems)

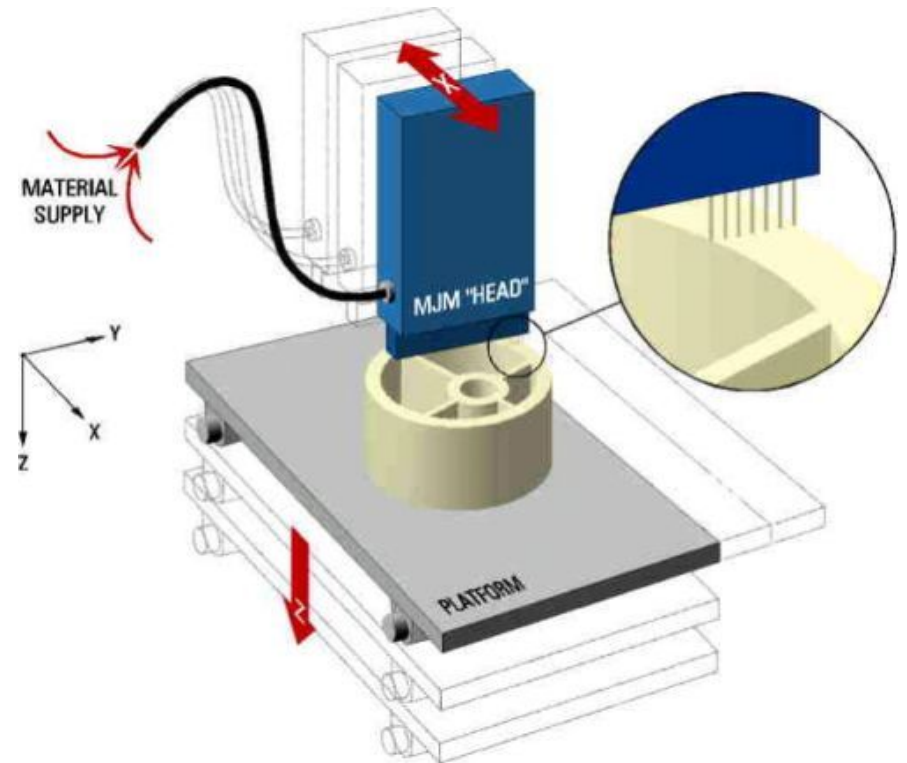
The Sinterstation® 2500 System Process Chamber



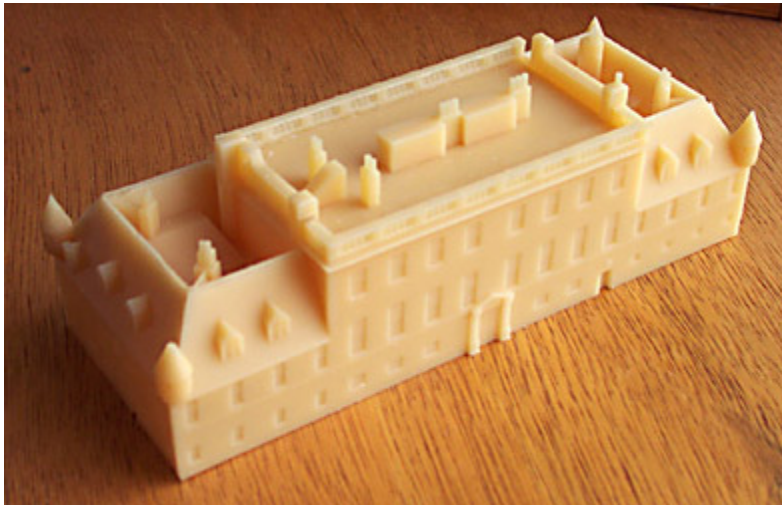
SLS Parts



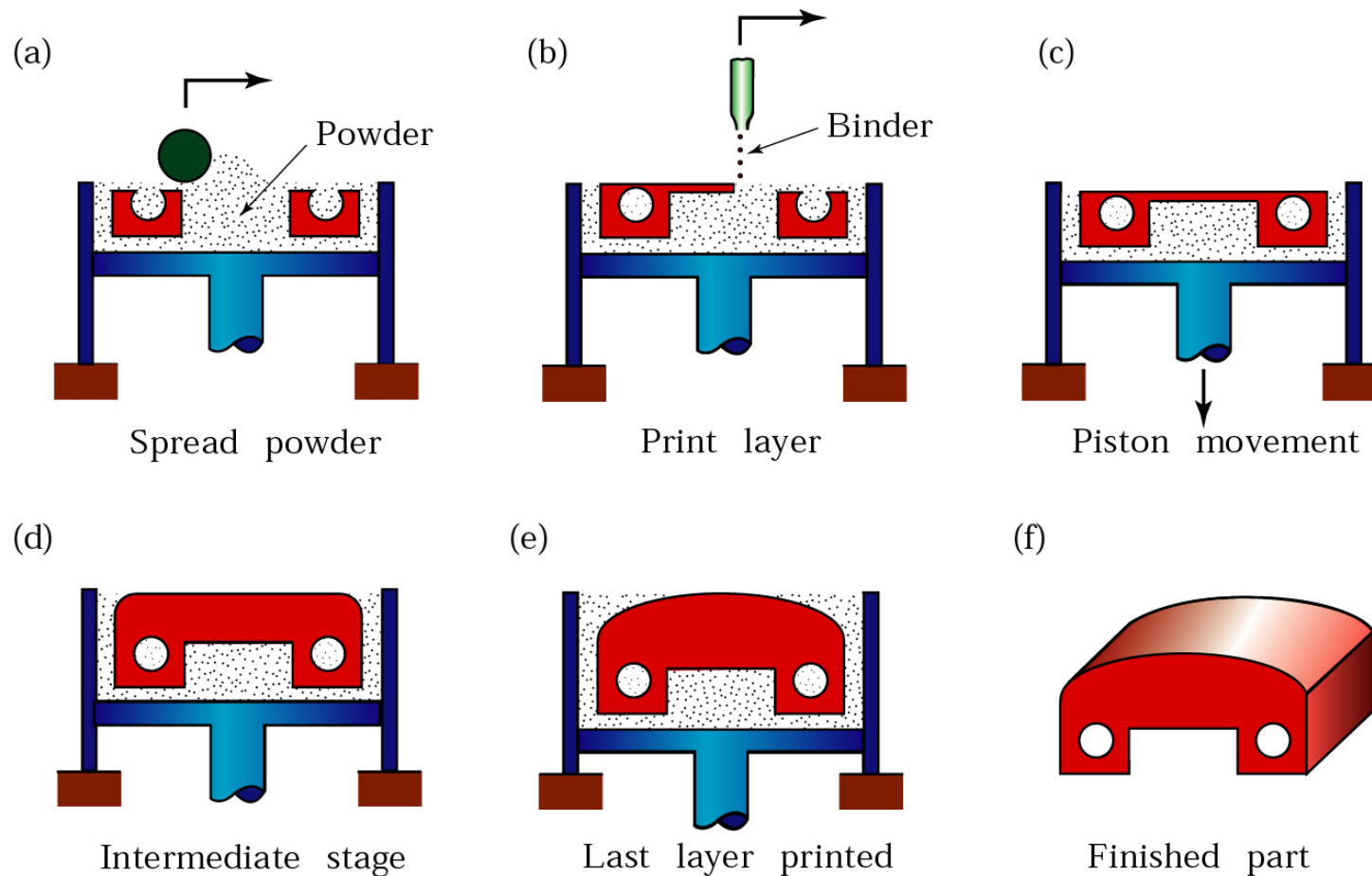
Wax Jet Printing - Thermojet



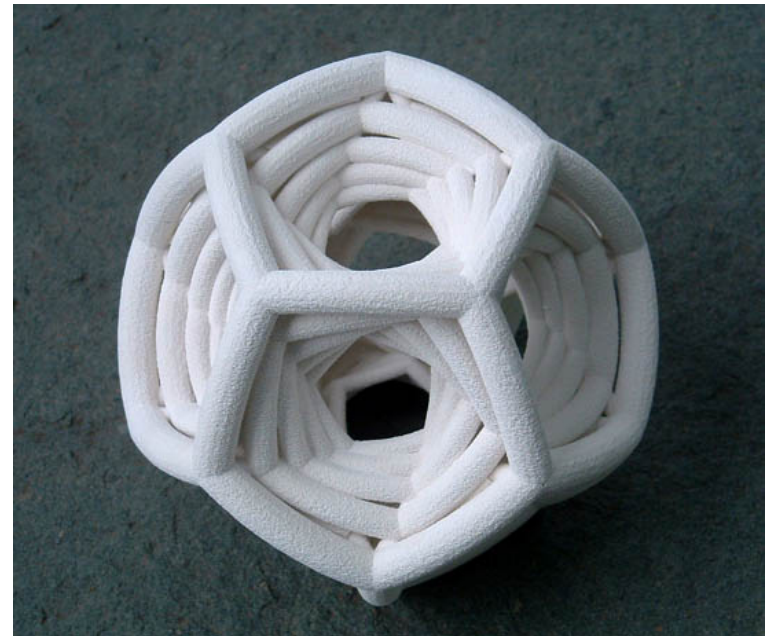
Thermojet



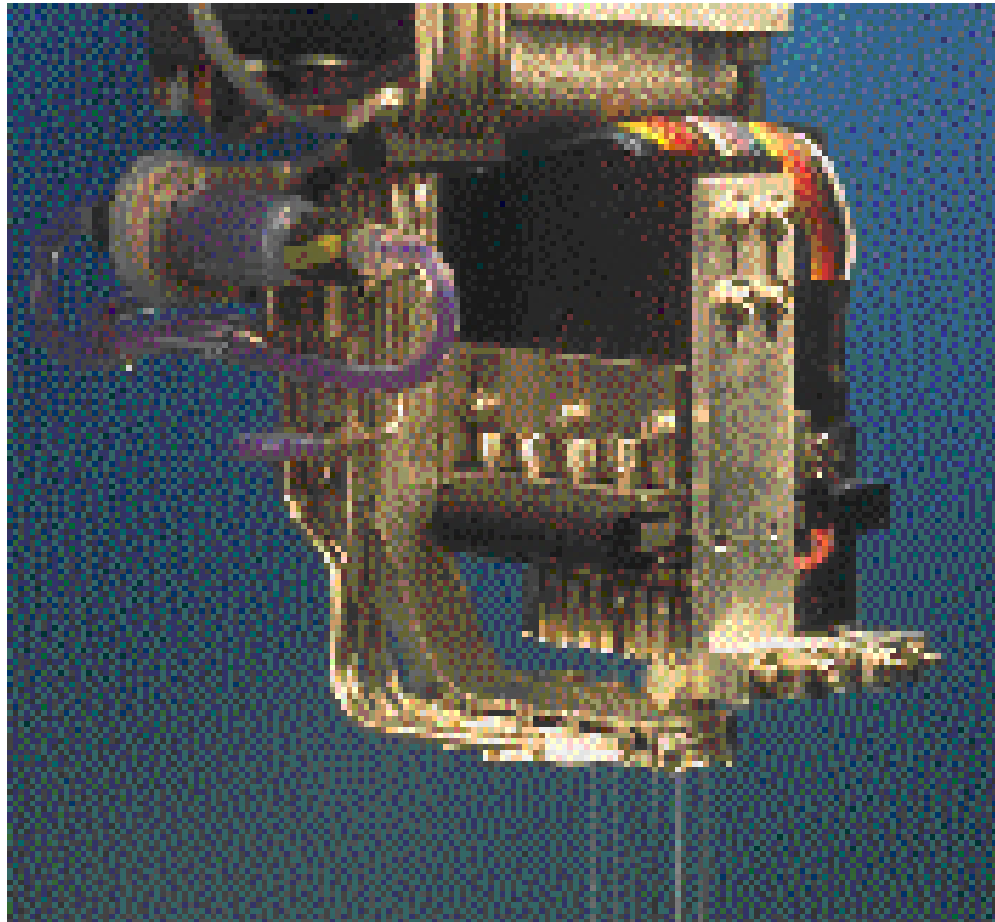
Three-Dimensional Printing



Z Corp Machine



3D Printing Head (Soligen)

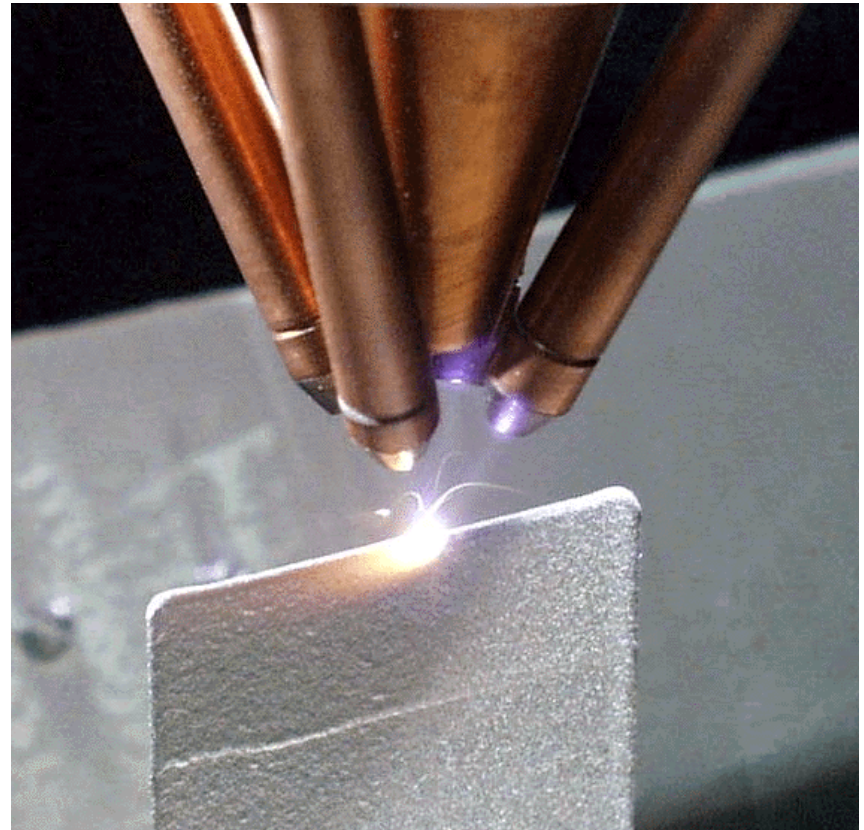
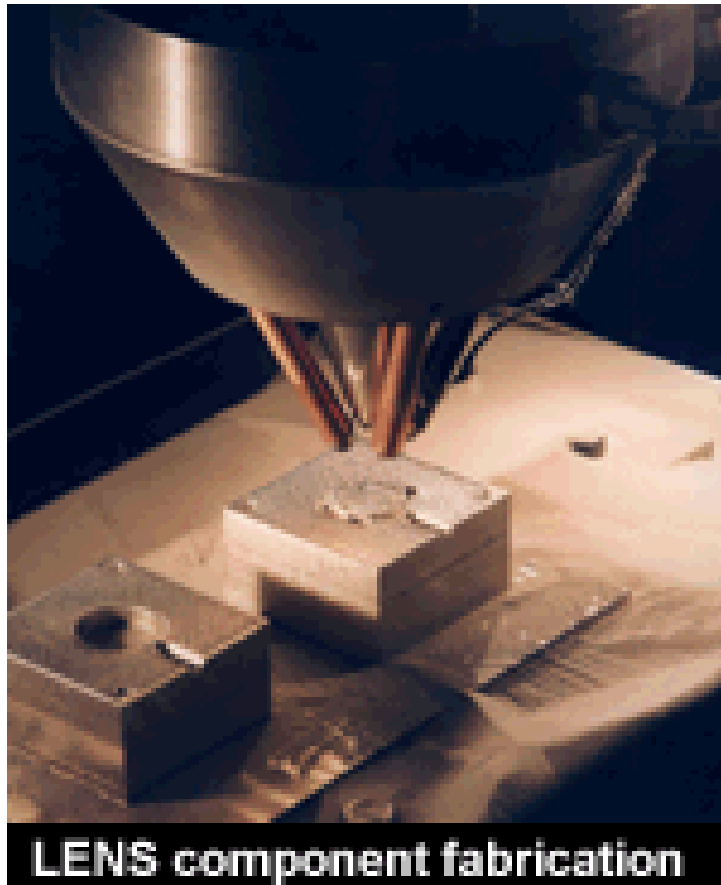


Soligen



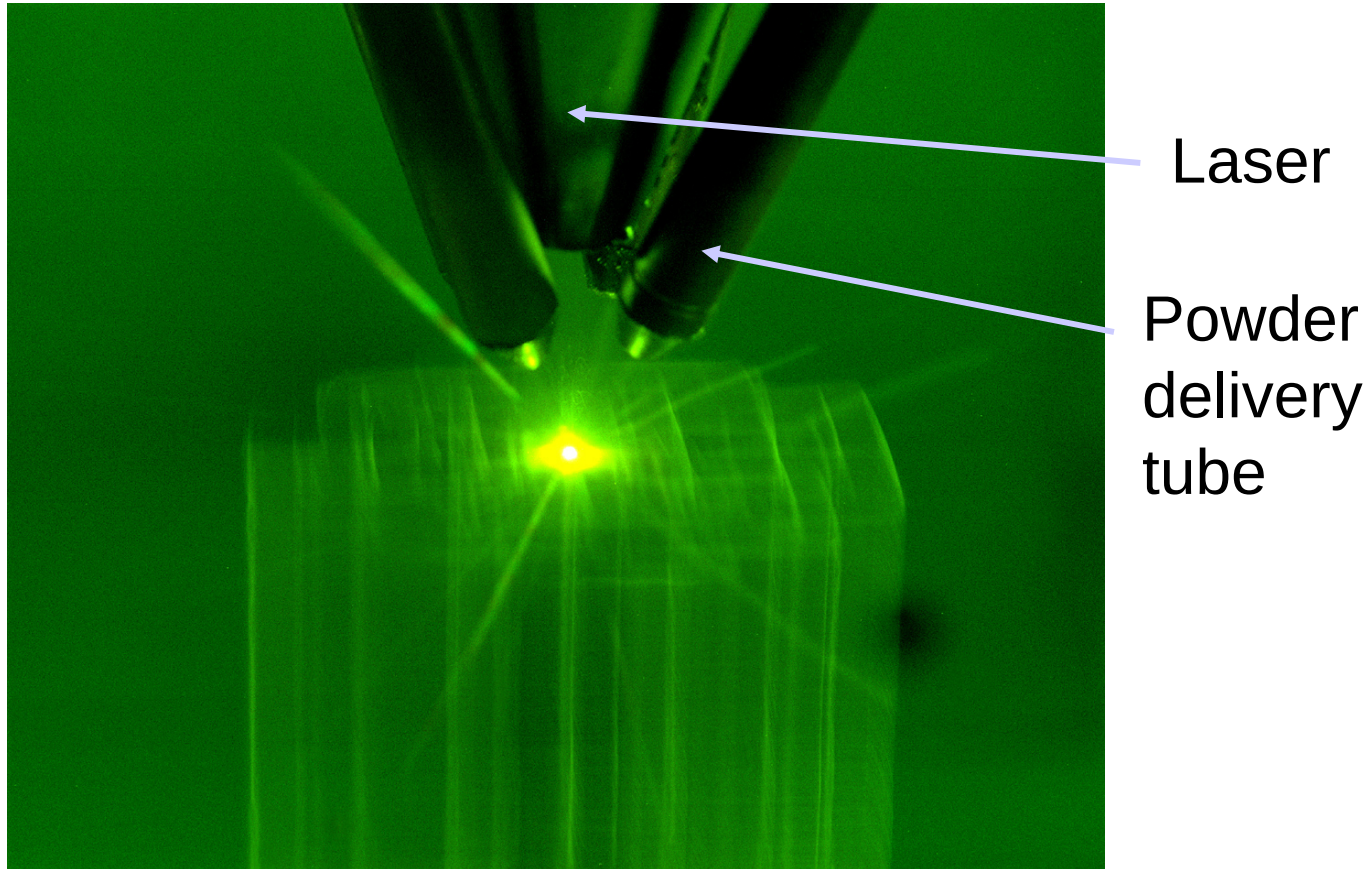
Light Engineered Net Shaping (1)

(Sandia National Lab)



Light Engineered Net Shaping (2)

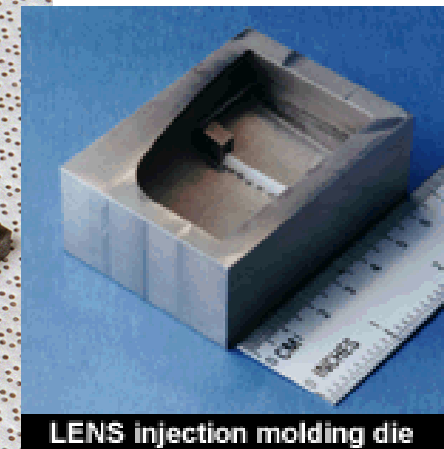
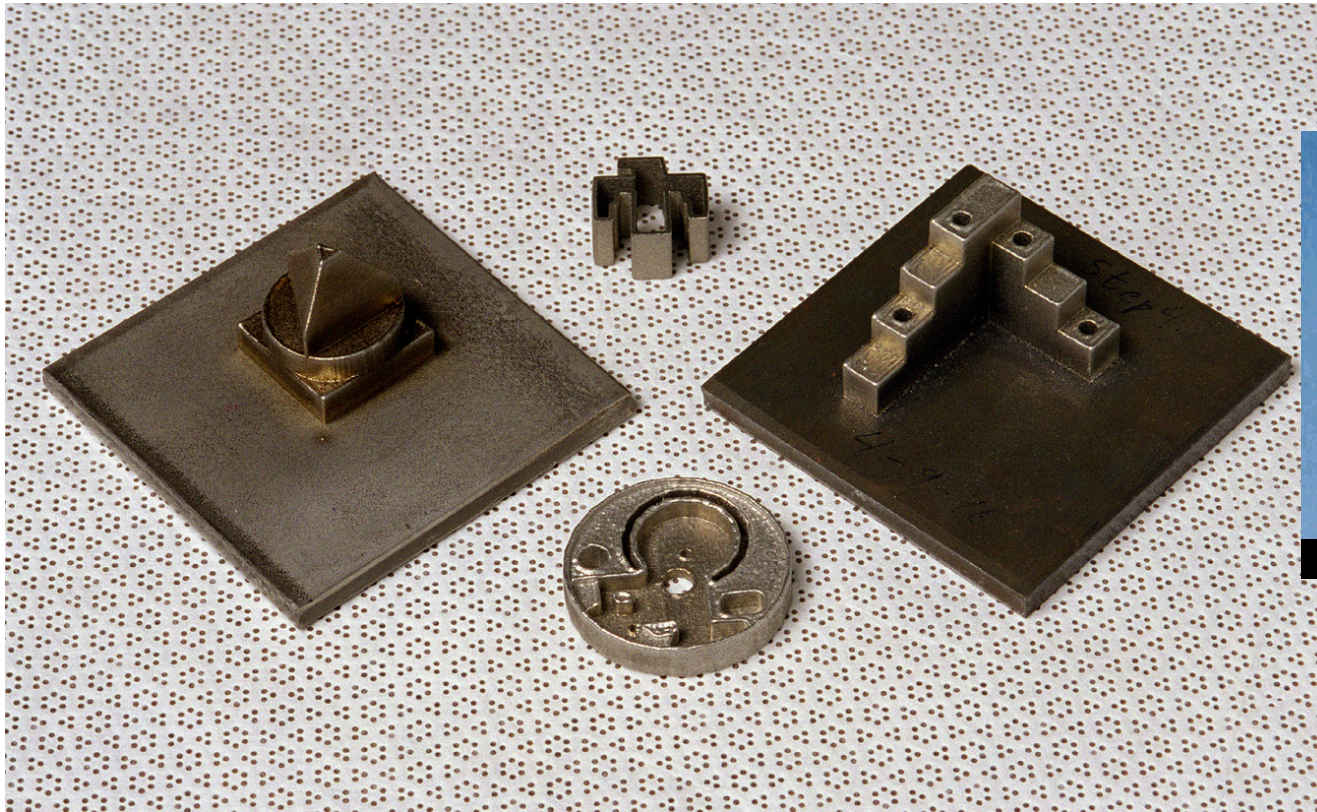
(Sandia National Lab)



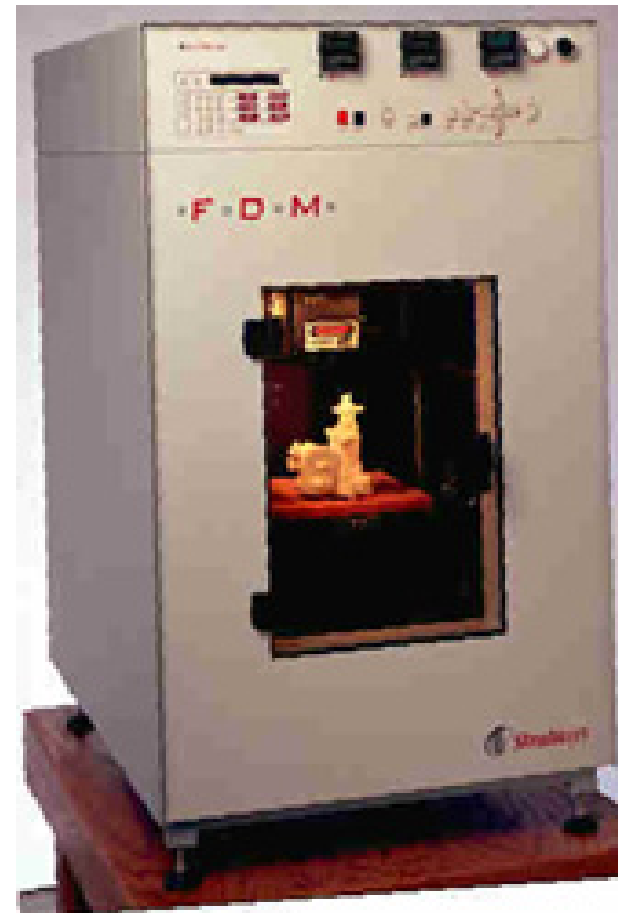
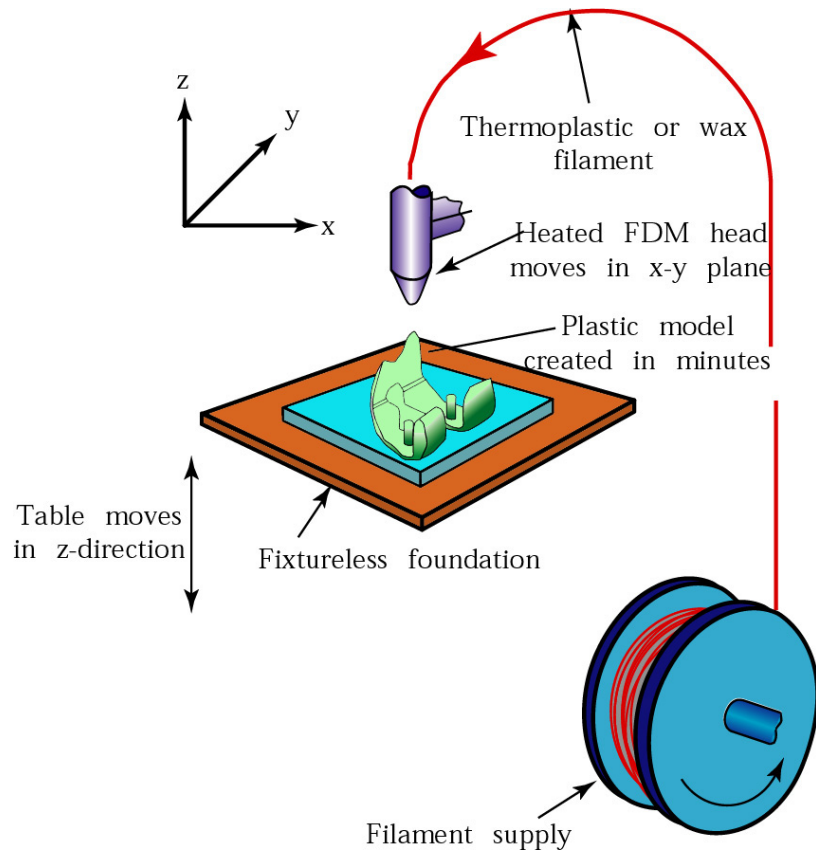
Light Engineered Net Shaping (3) (Sandia National Lab)



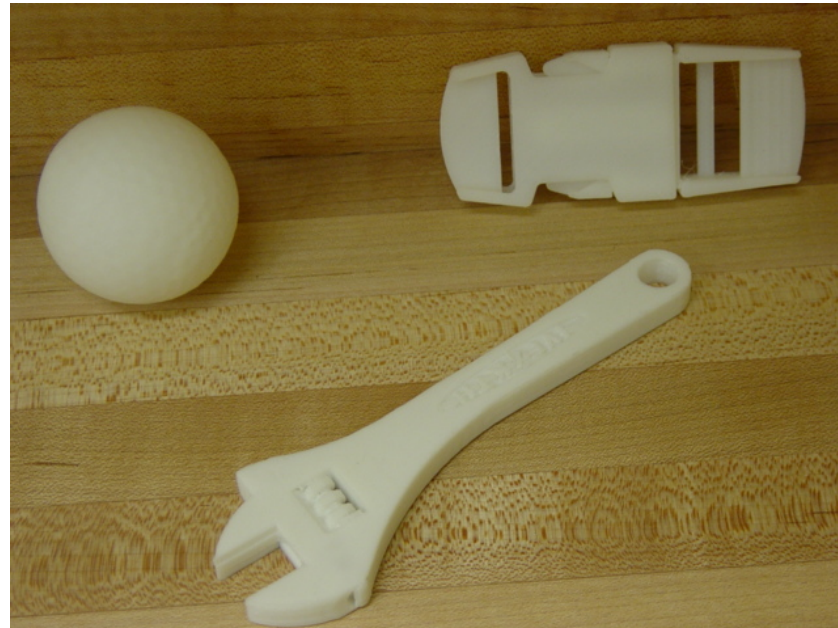
Light Engineered Net Shaping Parts (Sandia National Lab)



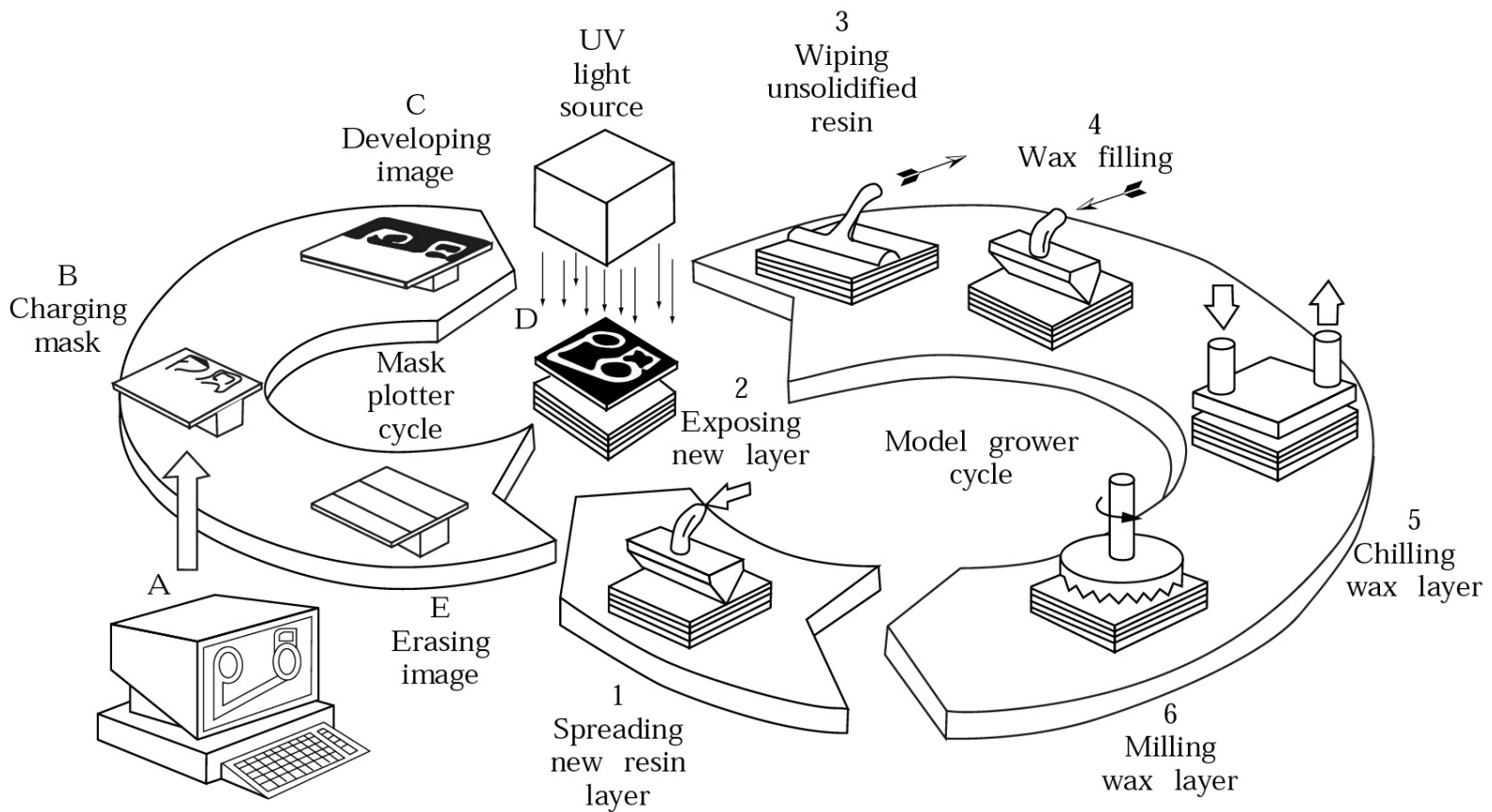
Fused Deposition Modeling (FDM)- (Stratasys)



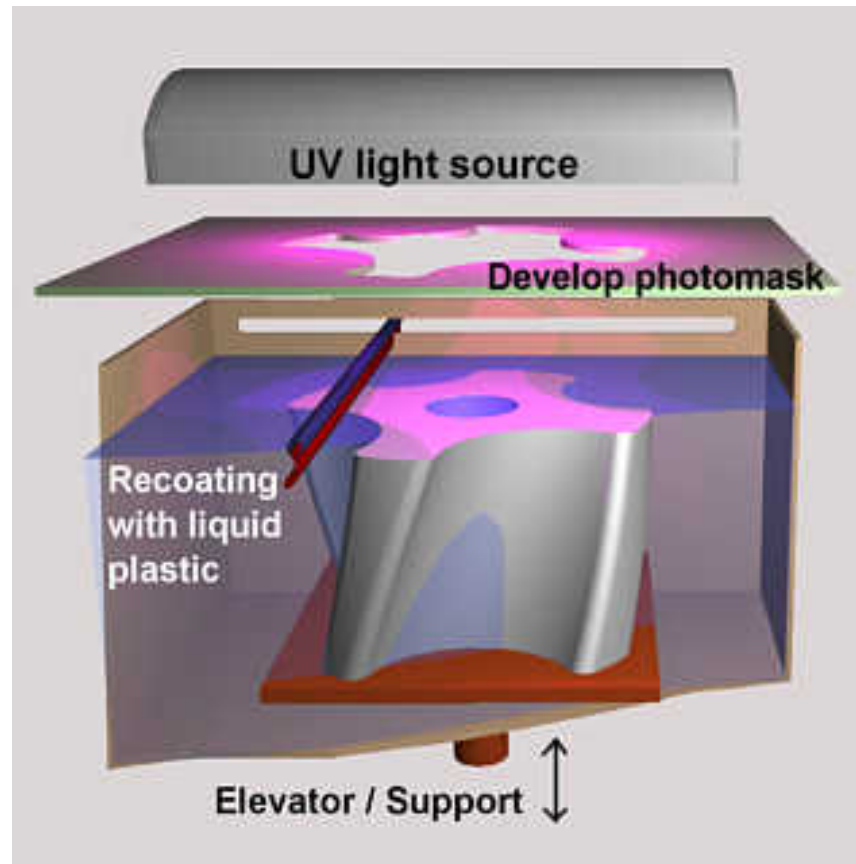
FDM Parts



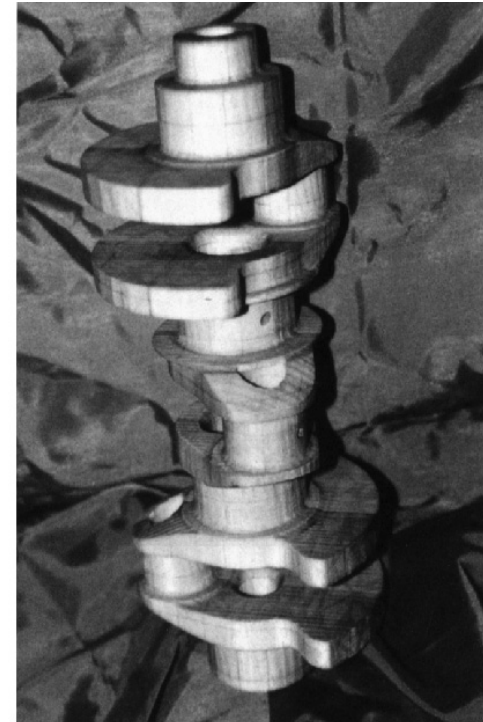
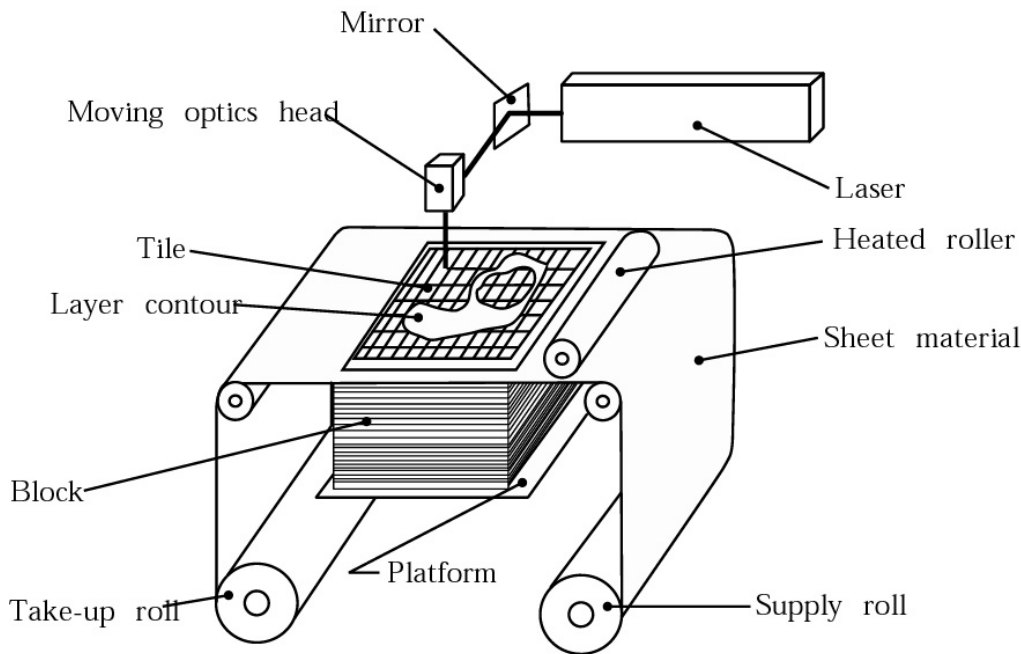
Solid-Base Curing - Cubital Solider



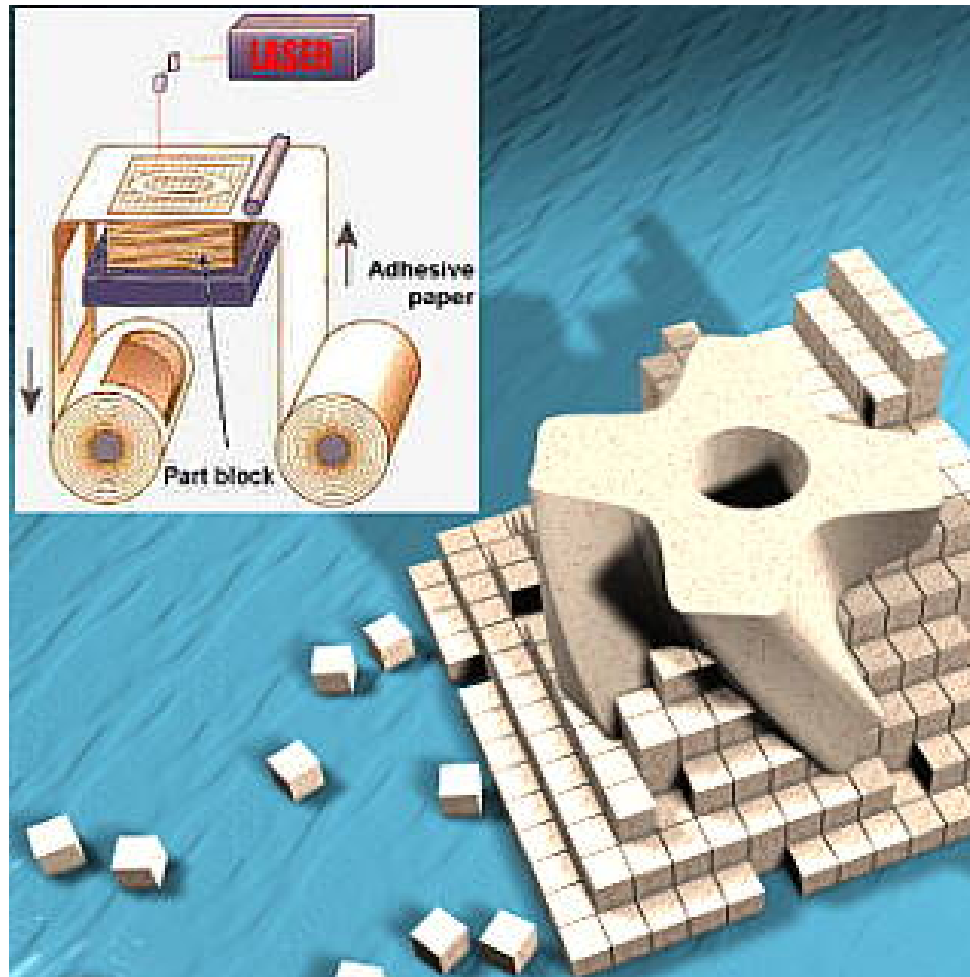
Solid Base Curing



Laminated Object Manufacturing (LOM) - (Helisys)



Laminated Object Manufacturing



Summary

- Additive fabrication
 - material is added, not removed
- Direct fabrication from a CAD file
- Layered manufacturing
- Stereolithography (SL)
- Selective Laser Sintering (SLS)
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