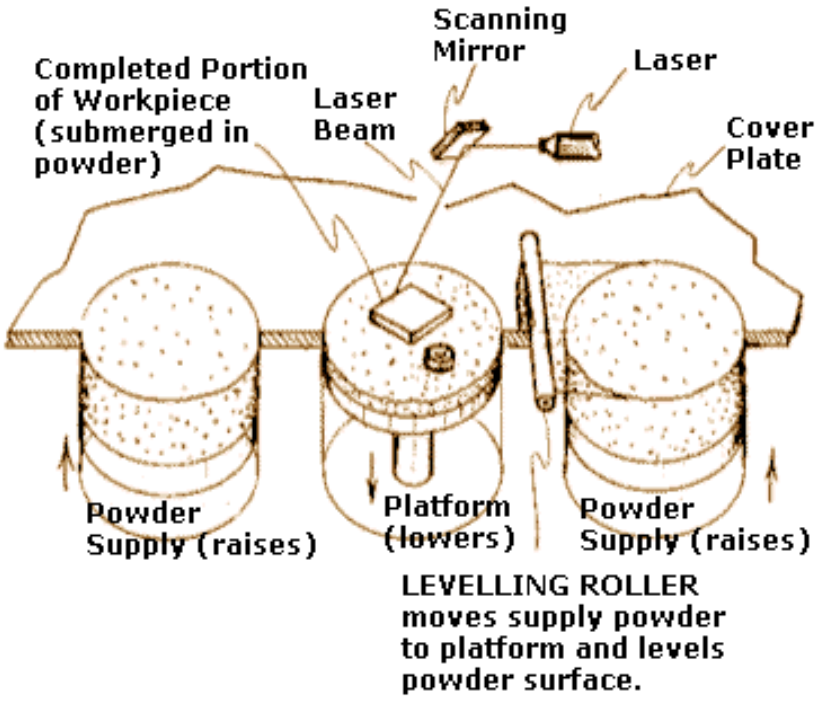
Baldwin Manufacturing

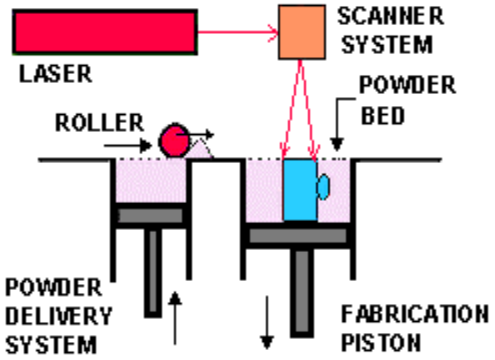
Facts About Selective Laser Sintering

- Patented in 1989
- Considerably stronger than an SLA; sometimes structurally functional parts are possible.
- Laser beam selectively fuses powder materials: nylon, elastomer, and soon metal
- Advantage over SLA: Variety of materials and ability to approximate common engineering plastic materials
- No milling step so accuracy in Z-axis can suffer
- Process is simple: There are no milling or masking steps required.
- Living hinges are possible with the thermoplastic-like materials.
- Powdery, porous surface unless sealant is used. Sealant also strengthens part
- Uncured material is easily removed after a build by brushing or blowing it off

Thermoplastic powder is spread by a roller over the surface of a build cylinder. The piston in the cylinder moves down one object layer thickness to accommodate the new layer of powder. The powder delivery system is similar in function to the build cylinder. Here, a piston moves upward incrementally to supply a measured quantity of powder for each layer.



A laser beam is then traced over the surface of this tightly compacted powder to selectively melt and bond it to form a layer of the object. The fabrication chamber is maintained at a temperature just below the melting point of the powder so that heat from the laser need only elevate the temperature slightly to cause sintering. This greatly speeds up the process. The process is repeated until the entire object is fabricated.



After the object is fully formed, the piston is raised to elevate it. Excess powder is simply brushed away and final manual finishing may be carried out. No supports are required with this method since overhangs and the solid powder bed supports undercuts.

SLS offers the key advantage of making functional parts in essentially final materials. However, the system is mechanically more complex than stereolithography and most other technologies. A variety of thermoplastic materials such as nylon, glass filled nylon, and polystyrene are available. Surface finishes and accuracy are not quite as good as with stereolithography, but material properties can be quite close to those of the intrinsic materials. The method has also been extended to provide direct fabrication of metal and ceramic objects and tools.

Since the objects are sintered they are porous. It may be necessary to infiltrate the part, especially metals, with another material to improve mechanical characteristics.