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Facts About Stereo Lithography

- The first Rapid Prototyping technique and still the most widely used
- Uncured material can be toxic. Ventilation is a must
- Process is simple: There are no milling or masking steps required
- Support structures are typically required
- No milling step so accuracy in z can suffer
- Parts are quite brittle and have a tacky surface
- Long-term curing can lead to warping
- Requires post-curing since laser is not of high enough power to completely cure
- Uses a light-sensitive liquid polymer
- Inexpensive compared to other techniques

Stereo Lithography Apparatus (SLA) is the first (1986) and most widely used rapid prototyping technology. Using a laser beam on the surface of a vat of liquid photopolymer, photosensitive resin, builds plastic parts or objects one layer at a time. This photosensitive material was originally developed for the printing and packaging industries and quickly solidifies wherever a laser beam strikes the surface.

Once one layer is completely traced, it's lowered a small distance into the vat and a second layer is traced right on top of the first. The self-adhesive property of the material causes the layers to bond to one another and eventually form a complete, three-dimensional object after many such layers are formed.

Some objects have overhangs or undercuts that must be supported during the fabrication process by support structures. These are both manually or automatically designed and fabricated right along with the object. Upon completion of the fabrication process, the object is elevated from the vat and the supports are cut off.

Stereo lithography generally is considered to provide the greatest accuracy and best surface finish of any rapid prototyping technology. Over the years, wide ranges of materials with properties mimicking those of several engineering thermoplastics have been developed. Limited

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selectively color-changing materials for biomedical and other applications are available, and ceramic materials are currently being developed. The technology is also notable for the large object sizes that are possible.

On the negative side, working with liquid materials can be messy, toxic and parts often require a post-curing operation in a separate oven-like apparatus for complete cure and stability.

Uncured resin is removed and the model is post-cured to fully cure the resin. Because of the layered process, the model has a surface composed

of stair steps. Sanding can remove the stair steps for a cosmetic finish. Model build orientation is important for stair stepping and build time. In general, orienting the long axis of the model vertically takes longer but has minimal stair steps. Orienting the long axis horizontally shortens build time but magnifies the stair steps. For aesthetic purposes, the model can be primed and painted.

