A Review on Stereo-Lithography

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Abstract

Stereo-lithography is a distinctive form of technology which permits for the translation of computer aided design illustration to3D solid items within hours. In Stereo-lithography melted plastic is solidified in particular patterns by laser beam consequential in solid epoxy realization of a 3D project. This ultraviolet laser beam is directed by CAD data. Parts created using Stereo Lithography must be demonstrated through the use of CAD system, such as ANSYS, AUTOCAD, IDEAS; Pro.-Engineer/PTC CREO etc. The CAD files are kept in STL format which expresses the boundary surface of the object as mesh of connected triangles.

Keywords- Stereo-lithography, 3D, CAD, Laser

I. INTRODUCTION

Rapid prototyping systematizes the manufacturing of a prototype part from a three- dimensional (3D) CAD drawing. This physical model transports more complete information about the product earlier in the improvement cycle. The turnaround time for a typical rapid prototype part can take a few days. Conservative prototyping may require weeks or even months, subject to the method used. Rapid prototyping can be faster and more cost effective means of building prototypes as opposed to conservative methods.

Manufacturing process fall into 3 groupings: Subtractive, Additive and compressive. In a subtractive process a block of material is imprinted out to produce the desired shape. An additive process builds materials by assembling particles or coats or raw materials.

A. Types of Rapid Prototyping

1) Stereo lithography
2) Selective LASER Sintering
3) Fused Deposition Modeling
4) Laminated Object Manufacturing
5) Solid Ground Curing

Among these Rapid Prototyping techniques Stereo-lithography is most commonly and widely used.

B. Introduction to Stereo-lithography

SL is the most widespread and extensively is used rapid prototyping technology. It is a exceptional form of technology which allows for the conversion of computer aided design illustration to3D solid objects within hours. In Stereo-lithography liquefied plastic is solidified in particular patterns by laser beam consequential in solid epoxy realization of a 3D design. This ultraviolet laser beam is directed by CAD data. Parts produced using Stereo Lithography must be modeled through the use of CAD system, such as ANSYS, AUTOCAD, IDEAS; Pro.-Engineer/PTC CREO etc. The CAD files are stored in STL format which describes the boundary surface of the object as mesh of interrelated triangles.

Stereo Lithography procedure can be route in 3 approaches:

1) Aces Mode.
2) Quick Cast
3) Solid Weave

The ACES mode yields crystal like transparency and exceptional strength at very high dimensional resolve. This mode of stereo lithography is seamless for parts that need exceptional visual excellence such as lenses and optical mechanisms. Quick Cast is a SL mode generates quasi-hollow parts through a robust honey comb interior which is 80% hollow. After a rapid cast prototype metal parts can be finished 3-5 days. Solid weave boasts the quickest reversal time of SLA modes without cooperating on strength and precision. It is also most cost-effective of three

II. STEREO-LITHOGRAPHY

A. Principle of Stereo-lithography

Stereo-lithography process runs on principle of additive manufacturing in which a 3d CAD data is read by machine & machine produces real life physical object layer by layer by using LASER for machining on dielectric liquid resin .A general principle concept diagram is shown in Fig 2.1

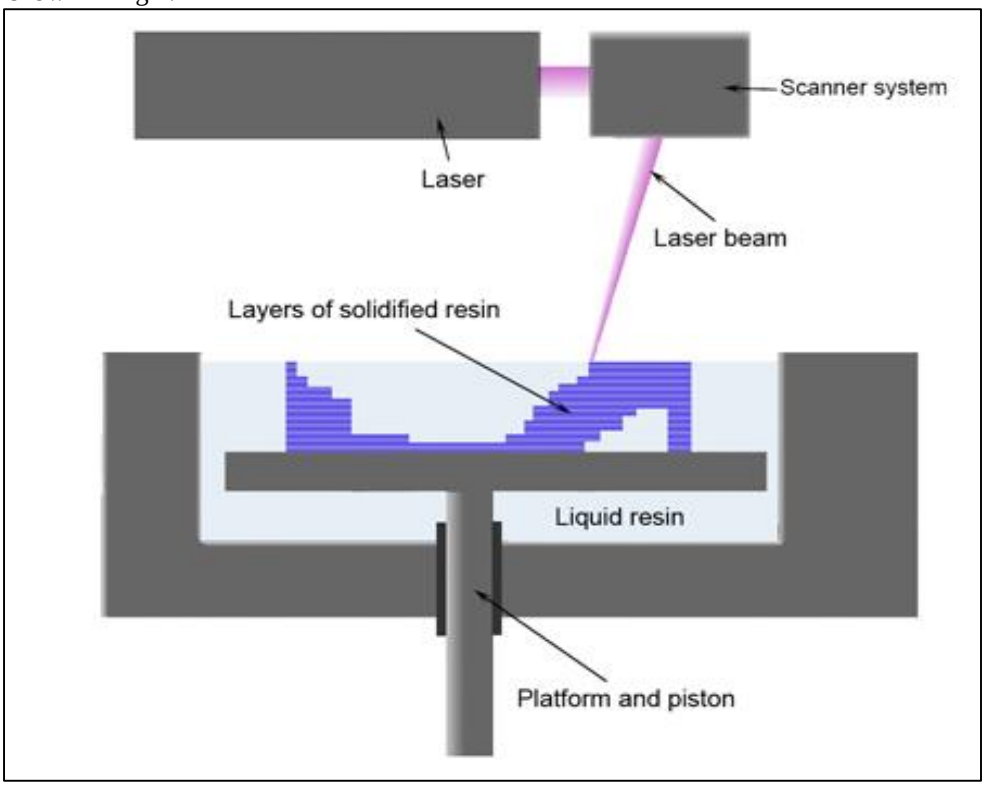

Fig. 2.1: Stereo-lithography Principle Concept Diagram.

B. Stereo-Lithography Materials

A number of outstanding photopolymer constituents are now accessible for SLA rapid prototyping. Each material has exceptional properties which can be castoff to simulate more traditional metals or plastics for rapid prototypes. Some SLA resins mimic traditional engineering plastics such as PBT or ABS, with toughness and durability that helps the consequential SLA parts appropriate for mechanical analysis and evaluation. Other SLA resins have properties comparable to polypropylene, with acceptable features and particulars that can deliver accurate test parts. If higher temperatures are desirable, new SLA resins deliver heat deflection resistance up to 220°F (105°C) as compared to traditional limits of 130°F (55°C). And, for near-metal performance, ceramic-filled SLA resins can be used to make parts with higher stiffness and high temperature resistance. The great stiffness also provides mechanical foundation for structural Nickel plating the ensuing parts has a composite structure through mechanical and thermal performance impending that of metal. New SLA resins are continuously being developed and sophisticated to extend the mechanical and thermal performance of SLA parts.

III. FITS FOR INSERTS IN SLA PARTS

The fits for SLA depend heavily on the surface roughness of the insert surface. The following Table 2 indicates the dimensions for clearance, transition and interference fits between inserts and SLA parts. It should be noted that it is possible to insert components during the build for clearance and transition fits, but it is extremely difficult to insert a component having an interference fit since it requires considerable force that may damage the part or break the support structures skewing the existing build.

Table 1: Fits Between Inserts & SLA Parts

Insert Cross Section	*Fit*	*Critical Dimension*
Cylindrical	*Clearance*	*D1-D2= 0.006"*
	Transition	*D1-D2= 0.000"*
	Interference	*D1-D2= -0.006"*
Rectangular	*Clearance*	*L1-L2= B1-B2= 0.006"*
	Transition	*L1-L2= B1-B2= 0.000"*
	Interference	*L1-L2= B1-B2= -0.006"*

IV. SURVEY

A. Modern Trends in Stereo-lithography

1) Metal Stereo-lithography

In metal stereo-lithography as an alternative of using liquid resin, powdered metal is used as machining element & LASER is used as machining tool. Nowadays this technique is a most widely secondhand technique in industries for manufacturing prototypes of metal for doing real life tests.


Fig. 4.1: Articles made using metal stereo lithography

2) Ceramic Stereo-lithography

This is the most recent investigation in stereo-lithography. As we know ceramic articles are conservatively completed by manual processes, but it is not conceivable to produce same identical articles by conventional method. To overwhelm this disadvantage 'Ceramic Stereo-lithography plays a gigantic role. In this stereo-lithography process ceramic powder is machined using LASER. It very common technique in ceramic trades today.

Fig. 7.2: Articles made using ceramic stereo-lithography

V. CONCLUSION

The report consists of review on Stereo Lithography process and it is concluded that stereo lithography saves time, money, allows speedy delivery and helps in improving design. Stereo Lithography can be useful to almost any manufacturing industry comprising oil refining, petrochemical, power and marine industries. It is also the furthermost operative and economical of all Rapid Prototyping practices. It is still a technology in its emergent stages and will demonstrate to be a foremost technology in the forthcoming.

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