



## ASSEMBLY OF STEROLITHOGRAPHY 3D PRINTING MACHINE

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### ABSTRACT :

As per feasibility study need to optimized the cost of the SLA based 3D printing machine with the high quality of models. Based on Assembly steps of working procedure SLA 3D printing machine is to assembled. the assembly process for a Stereolithography (SLA) 3D printing machine. It covers the step-by-step construction of key components such as the frame, build platform, resin tank, laser system, and control electronics. Safety considerations and troubleshooting guidelines are also discussed to helped user complete the assembly successfully.

Keywords: Halot mage , Chitu box

### Introduction

Liquid resin-based 3D printing, also known as stereolithography (SLA) printing, is a type of additive manufacturing technology that utilizes liquid photopolymer resins to create three-dimensional objects. In this process, a UV laser or light source selectively cures (hardens) thin layers of liquid resin, solidifying them into the desired shape, one layer at a time. The printer's build platform gradually moves downward or upward as each layer is cured, allowing the object to be built from the bottom up or top down. After the printing process is complete, the object is typically rinsed in a solvent to remove excess resin and then post-cured under UV light to strengthen its final structure. SLA printing is known for its high resolution, smooth surface finish, and ability to produce intricate details, making it ideal for prototyping making, dental applications, and other industries where precision and aesthetics are part.

Stereolithography belong to a family of additive manufacturing technologies known as vat photopolymerization commonly known as resin 3D printing machines are all build around the same principle using a light source a laser or projector to cure liquid resin into hardened plastic the main physical differentiation lies in the arrangement of the core components such as light source the platform and the resin tank. Three common technologies for 3D printing plastics exist today. Fused deposition modelling (FDM) melts a string of thermoplastic filament and lays it down on a print bed stereolithography (SLA) solidifies liquid photopolymer resin with a light source, and selective laser sintering (SLS) uses a laser to sinter powdered raw material.

### 1. Literature Review

**Hideo Kodama (1981) [1]** he is the first invented the modern layered approach to stereolithography by using ultraviolet light to cure photosensitive polymer.

**William Mitchell (1990) [2]** He recognition that digital fabrication technologies can support education is not new. Early recognition of its potential was made by architecture educators. at MIT's School of Architecture and Planning set up the first digital fabrication laboratory within an architecture school in the late 1990s. Digital fabrication technologies were used in research to produce scale models and for exploring new techniques in graduate elective subjects. This later became the Digital Design Fabrication Group.

**K Hirowatari (1994) [3]** Three-dimensional micro integrated fluid systems (MIFS) fabricated by stereo lithography. In Proceedings of the IEEE Micro Electro Mechanical Systems An Investigation of Micro Structures, Sensors, Actuators, Machines and Robotic Systems, Osio, Japan.

**J.L. Eguliburu (1995) [4]** Functionalization of poly(lactide) macromonomers by ring-opening polymerization of lactide initiated with hydroxyethyl methacrylate-aluminium alkoxides.

**Hieu (1999) [5]** Reviewed additive manufacturing in medical and methods which based on medical imaging data and reverse engineering. 3D models for anatomical has constructed. These methods are successful for design and manufacturing of medical devices, surgical aid tools, implant and bio-models Since 1999, in Europe and Asia, approximately 40 different types of medical Rapid prototyping applications were implemented.

**Loy (2014) [6]** 3DP has been adopted in a more integrated fashion at Griffith University's Product Design Studio, where it has been incorporated into first year student teaching. Incorporating it into the syllabus has had three main effects: it has promoted student-centred learning and led to observable

improvements in student work; it has changed the relationship between students and lecturers as eLearning has taken place; and (3) it links the student's learning to their ethical responsibilities in the world, such as environmental sustainability.

**Lopes (2014) [7]** Laser curing of silver-based conductive inks for in situ 3D structural electronics fabrication in stereolithography.

**Ngo, Dong (2016) [8]** Retrieved 3 August 2016. More specifically, as the print platform lowers itself into the resin glass tank, an ultraviolet laser light, from underneath the see-through tank, shines on it. (For this reason, SLA is sometimes called the laser 3D-printing technology.) Exposed to the laser light, the resin cures, solidifies and sticks to the platform. As more resin is exposed to the laser light, the pattern is created and joins the layer above. As more and more layers are being created, the build platform slowly -- very slowly -- moves upward, finally pulling the entire object out of the tank as the print process is finished.

**A. Takezawa (2017) [9]** Design methodology for porous composites with tenable thermal expansion produced by multi-material topology optimization and additive manufacturing.

**Jamieson (2018) [10]** He research suggested that additive manufacturing is an attractive market in the field of orthopaedics. Bone geometry also examined and allows to the construction of implant prototype with the help of machining process and compared the development and manufacturing of surgical tool with the aid of machining process and Rapid prototyping technology.

**Gibson [11]** He implant mechanical strength is approximately three to five times higher than the implant made from processes in 2018 Consider various characteristics of multiple transplants, such as density, pore size and shape. It has an important parameter which will manipulate growth in tissue and implant bone mechanical properties

**Van Noort [12]** Additive manufacturing technology makes operations faster, cost efficient and accurate than the manual process Quickly fabricate model at low cost

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## 2. Assembly Specification

- UV light Source: In SLA (stereolithography) 3D printing machines, UV light sources play a critical role. This used to cure the photosensitive resin layer by layer, solidifying it into the desired shape.
- Motion Control System: an SLA 3D printing machine, the motor control system is responsible for precisely positioning the build platform and the resin container to facilitate the layer-by-layer printing process.
- Print Controller: This device controls in an SLA (stereolithography) 3D printing machine serves as the brain of the operation, managing various aspects of the printing process to ensure accurate and reliable fabrication of 3D models.
- Cooling System: In SLA (stereolithography) 3D printing machines, a cooling system is essential for maintaining optimal operating conditions and ensuring the longevity of various components. While SLA printers don't generate as much heat as FDM (fused deposition modeling) printers, they still require cooling systems for specific purposes.
- Carbon Air filter: The carbon air filter system would typically utilize activated carbon filters, which are highly effective at adsorbing odors, volatile organic compounds (VOCs), and airborne particles. These filters are designed to trap contaminants while allowing clean air to pass through.
- Safety Features: Safety features in SLA (stereolithography) 3D printing machines are essential to ensure the well-being of users, protect the environment, and prevent accidents.
- Software: Design software is required to create or import designs and slicing convert them into high quality 3d models or components.
- Power Supply: Provides electrical power to all components of the system.

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## 4. Objective

The objective of a SLA (stereolithography) 3D printing machine is to fabricate high-quality 3D objects with precision, speed, and reliability using a process called photopolymerization. SLA (Stereolithography) 3D printing machine is to create precise and detailed three-dimensional objects from digital designs SLA printing works by using a laser to solidify layers of liquid resin, one on top of the other, until the desired object is formed.

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## 5. Description of components

### *Touch screen display*

Touch screen displays are becoming increasingly common in SLA 3D printers as they offer a user-friendly interface for controlling the printer's settings and monitoring the printing process

### *Build platform*

The build platform in an SLA 3D printer serves as the foundation for printing objects. It's typically a flat surface where the printing process occurs. Its must be perfectly flat to ensure accurate layering of the resin during printing. This printing machine involves curing liquid resin layer by layer using a laser or other light source, the printed object can adhere strongly to the build platform.

### 8K Mono Lcd Display

An 8K mono LCD display refers to a liquid crystal display (LCD) panel with an 8K resolution (7680 × 4320 pixels) that displays monochrome (black and white) images. These displays are commonly used in resin-based 3D printers, particularly SLA (Stereolithography) and DLP (Digital Light Processing) printers, where they serve as the light source for curing each layer of resin during the printing process

### Mother board

In SLA (Stereolithography) 3D printing machines, the motherboard (also known as the control board or mainboard) is a critical component that serves as the central control unit for the printer. While the specifics can vary depending on the manufacturer and model of the SLA printer, the motherboard typically performs several key functions

### FEP Film & Vat Gasket Tank

FEP (Fluorinated Ethylene Propylene) film is a transparent, flexible material that is commonly used as the bottom layer of the resin tank in SLA printers. The FEP film acts as a release layer, allowing the cured layers of resin to easily detach from the bottom of the tank during the printing process. The VAT gasket is a sealing component located around the edges of the resin tank, where the FEP film is attached. Its primary function is to create a watertight seal between the resin tank and the printer's frame

### Stepper Motor

In 3D SLA 3D printing machines, stepper motors are commonly used to drive the movement of various components, such as the print head (in SLA printers) or the build platform. Stepper motors are chosen for their precise control over movement and their ability to move in discrete steps, making them ideal for applications that require accurate positioning

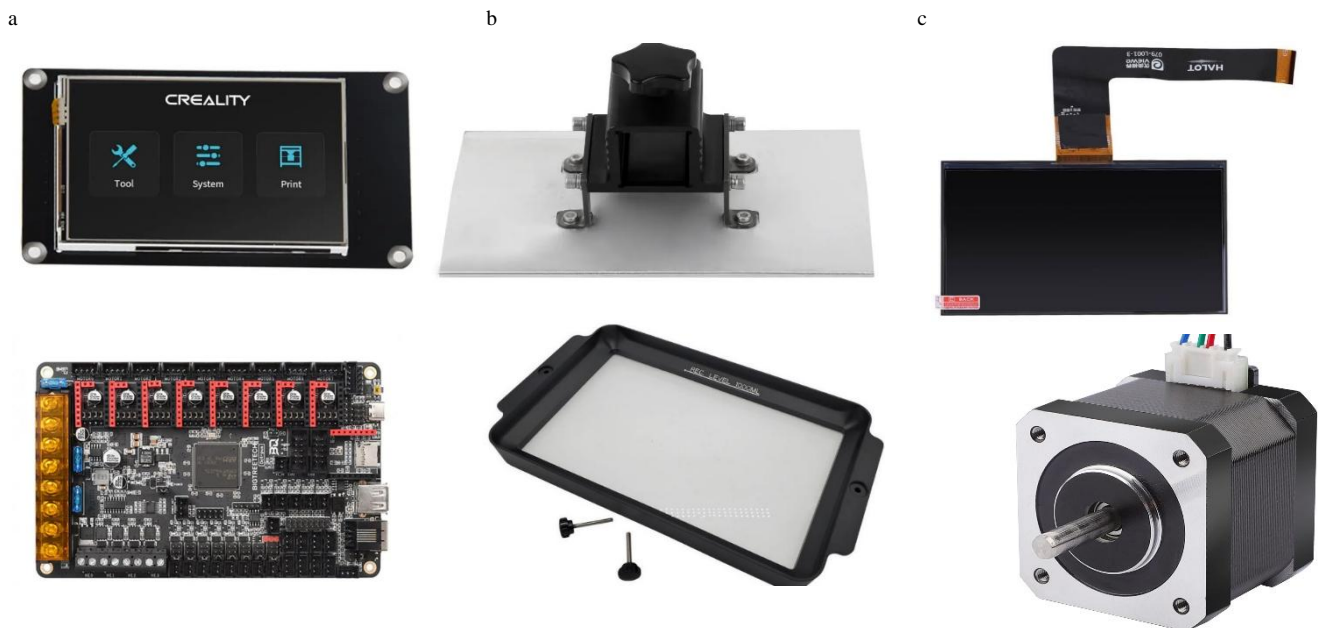
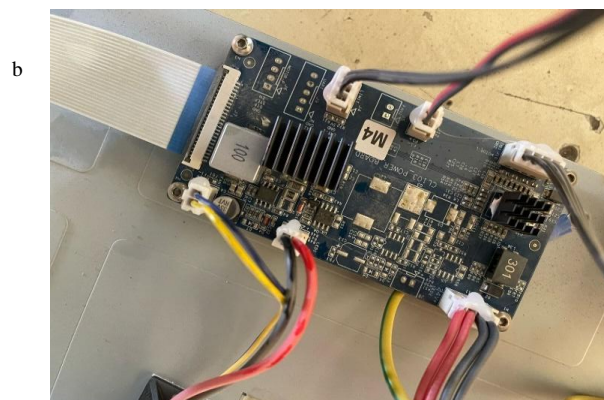


Fig 1- (a) Touch screen display, (b)Build platform , (c) 8K mono LCD display, (d) Mother board, (e)FEP film & VAT gasket , (f) Stepper Motor.

## 6. Assembly





**Fig 2- (a) Assembly of touchscreen display, (b) Assembly of motherboard, (c) Assembly of connecting wires, (d) Assembly of build platform, (e) Assembly of air filter (f) final Assemble of SLA 3D printing machine .**

## 7. Conclusions

SLA ( Stereolithography) has emerged as a powerful 3D printing technology with several advantages and a wide range of applications. Its speed, accuracy, cost-effectiveness, and material versatility make it an attractive choice for professionals and enthusiasts alike.

The speed of SLA printing, facilitated by the simultaneous exposure of entire layers, enables faster production compared to other resin-based techniques. The fine resolution of the LCD screen ensures high levels of accuracy and detail, making it suitable for producing intricate and precise prints

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3. <https://youtu.be/yW4EbCWaJHE?si=DbuxIbKIkjDfK6k9>
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