

DEVELOPMENT OF ADDITIVE MANUFACTURING 3D PRINTER FOR AERO & SPACE MATERIAL

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COLLEGE : S.J.C. INSTITUTE OF TECHNOLOGY, CHIKKABALLAPURA

GUIDE (S) : Dr. RAVI KUMAR M

STUDENT (S) : Mr. ETHASHAM ULLAQ

Ms. GREESHMA M K

Mr. NAVEEN S

Ms. KAVYA SHAPUR

Synopsis - As we see the progress in the aero and space leading industries the demand for additive manufacturing is highly affected and are creating high order. This development in additive manufacturing can also lead us to use natural and synthetic fibers. In this project, we will work on the development of 3D printer that uses fiber and FDM technology. The printer is redesigned in such a way that it must print the resin and the natural fiber in the proper desired ratio. The newly redesigned printer, we will be the first in the world to achieve 3D printer that can 3D print with fibers, two different materials. There is other sophisticated metal 3D printer that prints two different metals. But these printers have drawbacks. In simple words, we can say that we are going to work on the Bi-Nozzle 3D printer first in the world.

Keywords-Natural and synthetic fiber, altering the design of 3D printer, Fused Deposition Modeling technology, Bi-nozzle 3D printer.

Introduction- A 3D printer uses an additive manufacturing process to create 3D components and objects by building them up from many layers of material. Another name for it is rapid prototyping. It is a mechanised process in which 3D items are swiftly created in accordance with the necessary size using a machine linked to a computer that contains blueprints for every object. The additive procedure could be different from the subtractive method, which involves drilling or carving away material from a block. 90% of the material is used up when using a 3D printer, which also increases product life and makes products lighter and stronger. In many industries, including construction, aerospace, automotive, medicine, and the manufacture of several domestic goods, 3D printing is effectively used.

Work done earlier-We have done literature survey of 3D printers and methodology, Short listing of resin is done, problem definition is defined and suitable software is selected for Bi-Nozzle 3D printer.

Objectives-

- 1.Shortlisting the resin.
- 2.Alterng the design 3D printer by using bi-nozzle extrusion
- 3.Designing the circuit.

Methodology-

- 1.Short listing of resin

Hemp fibre- It is used because of its tensile strength which is three times stronger than cotton, it has high durability, it has antimicrobial characteristics, it can resist ultraviolet radiation also it has dyeing affinity.

Polylactic acid (PLA)- It can withstand temperature of 110 0C. Its high surface energy results in good printability which makes it ideal for 3D printing.

2. Alterng the design 3D printer by using bi-nozzle extrusion

A Bi-Nozzle printer uses two nozzles to generate prints of higher quality and greater detail. A 3D printer with two independent controllable nozzles is used in the Bi-Nozzle printer CATIA design. The two nozzles are used to simultaneously print two different types of layers of material. Based on the project's needs and the application. The CATIA bi-nozzle printer provides a number of advantages over traditional 3D printing methods, including faster printing times, and improved accuracy.

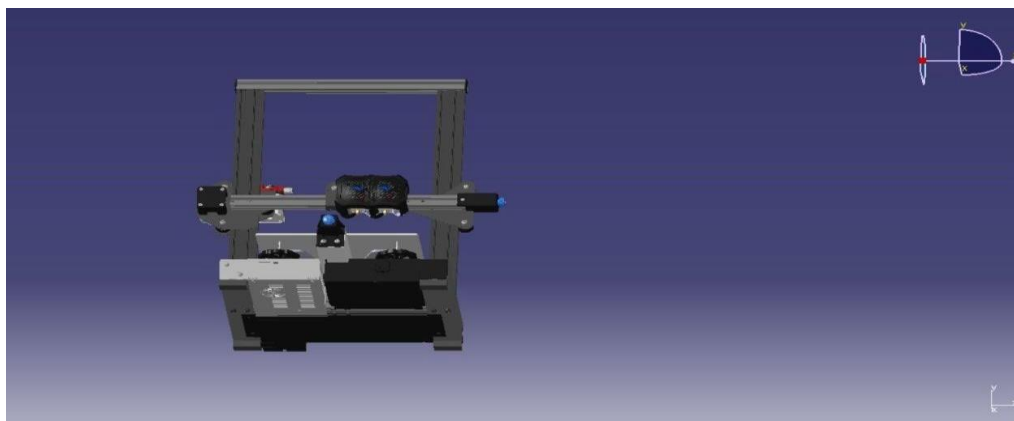


Fig. 1: Catia prototype of 3D printer.

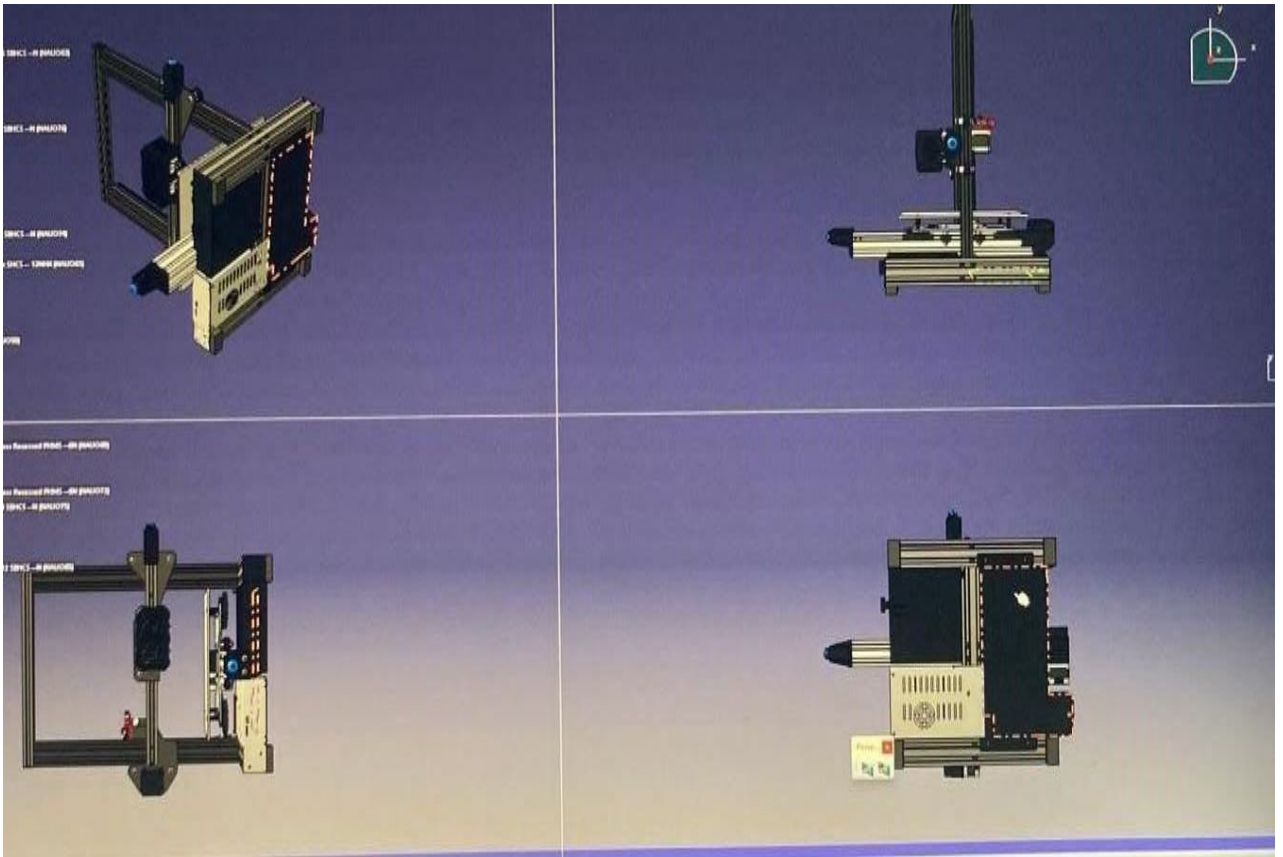


Fig. 2: Multi view of 3D printer.

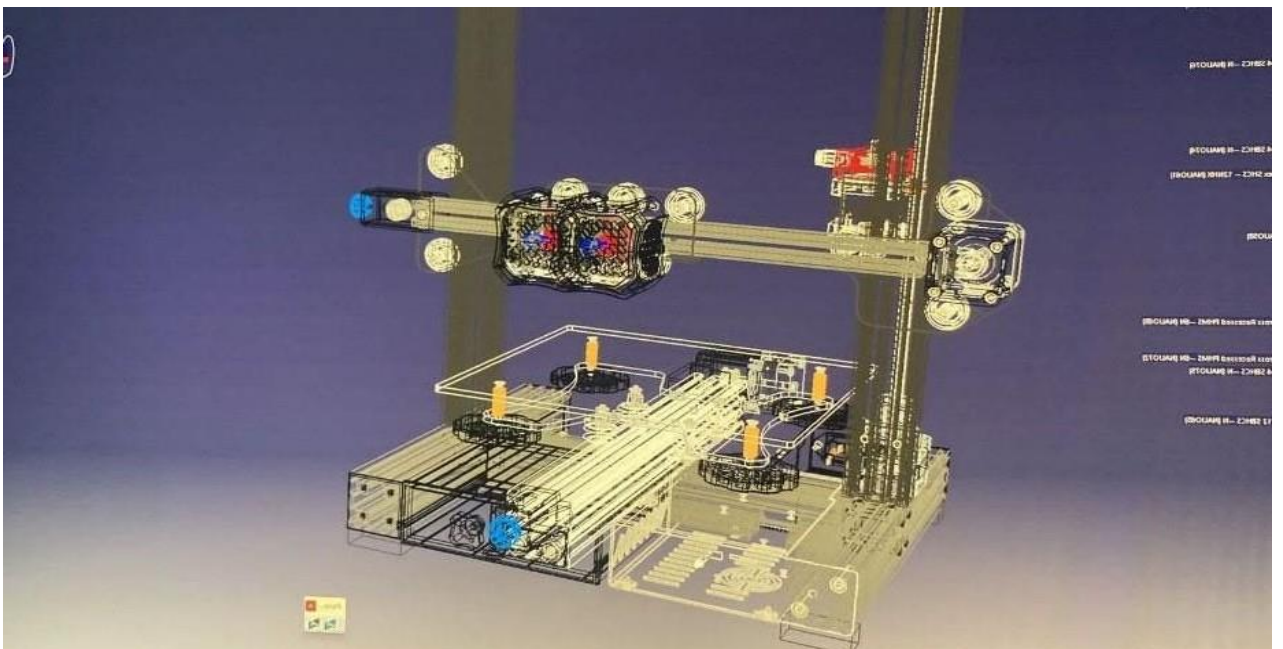


Fig. 3: wireframe view of 3D printer.

3.Designing the circuit

Electric circuit design- An initial 3D CAD model is used in the procedure. The digital model is divided into several layers using slicing software, which then produces a G-code file for the printer. To create the 3D model, the solid PLA filament is heated, melted, and extruded from a nozzle onto a build plate in layers. Depending on the desired resolution, each layer can range in thickness from 0.1mm to 0.5mm. FDM 3D printing is a process that operates both horizontally and vertically, where an extrusion nozzle moves across a build platform. The procedure involves the use of thermoplastic material that reaches melting point and is then forced out, to construct a 3D object layer by layer.

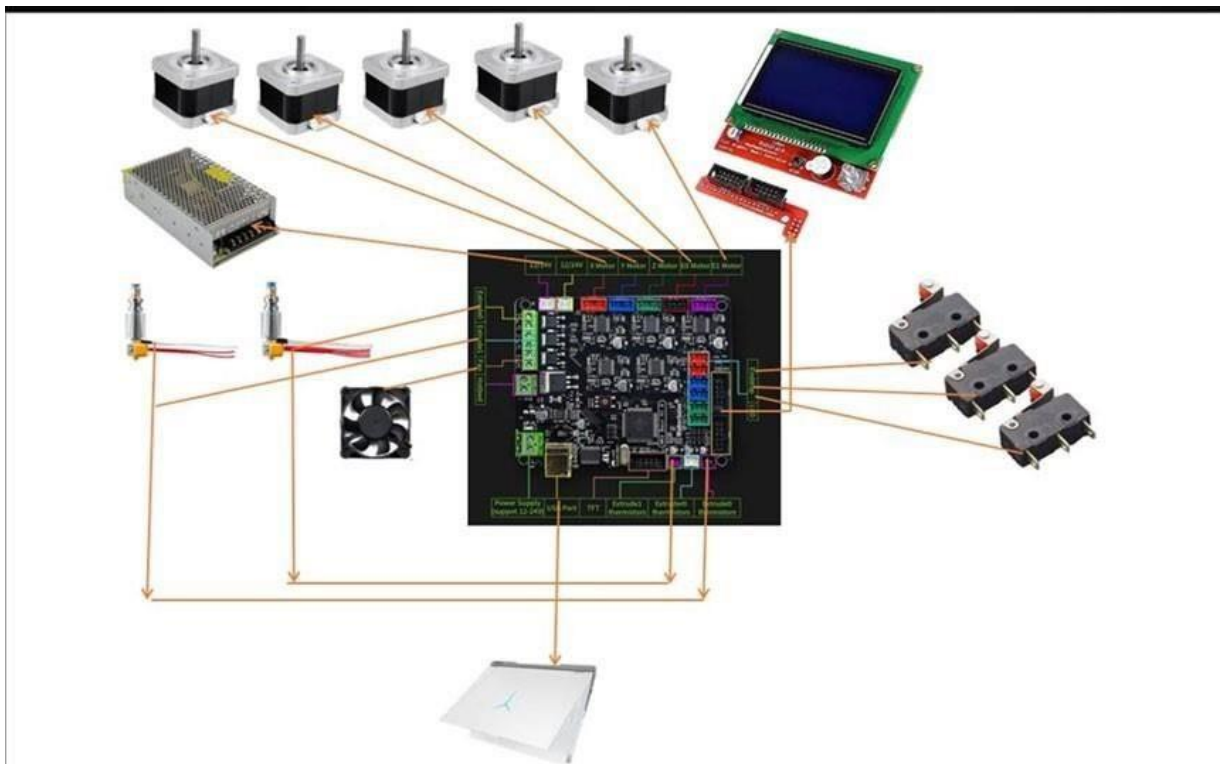


Fig. 4: Circuit connection with electrical and mechanical components.

Design Software- Cura is an open-source slicing application for 3D printers. Ultimaker Cura works by slicing the user's model file into layers and generating a printer-specific G-code. Once finished, the G-code can be sent to the printer for the manufacture of the physical object.

Results and Conclusion-

A highly efficient 3D printer is selected for the design and development of aero & space materials. Therefore, the resins are selected and hence the circuit of 3d printer is designed. The best suitable CATIA software is selected for designing the 3D printer.

FUTURE SCOPE

The aerospace industry has a lot of potential for Bi-Nozzle 3D printer technology, especially for producing cutting-edge materials and parts. Here are some potential applications for bi-nozzle 3D printing in the aerospace industry in the future: Better-part quality, cost-effectiveness, advanced materials and reduced lead time. Overall, Bi-Nozzle 3D printing technology holds great potential for the aerospace industry, and its continued development and use could lead to significant advancements in the manufacturing of advanced materials and components.