Pimpri Chinchwad Education Trust's

Pimpri Chinchwad College of Engineering, Nigdi, Pune 411044

B.E. Mechanical A.Y. 2020-21

Group ID: 48
Category of Project :
Student Sponsored.

Title of Project: Manufacturing of Nylon embedded Continuous Fibre Filament

Name of Students: Rahul Autade, Rajnandan Desai, Rajat Gandhi, Nachiket Joshi

Name of Guide: Mr. Amit Divekar

Introduction:

Current carbon fibre manufacturing process are costly and labour intensive. Only 14% of the cost of manufacturing is material cost. This creates a necessity for a cost-effective carbon fibre manufacturing process.

Problem Definition:

To design and manufacture a setup to produce nylon embedded continuous carbon fiber used for 3D printing.

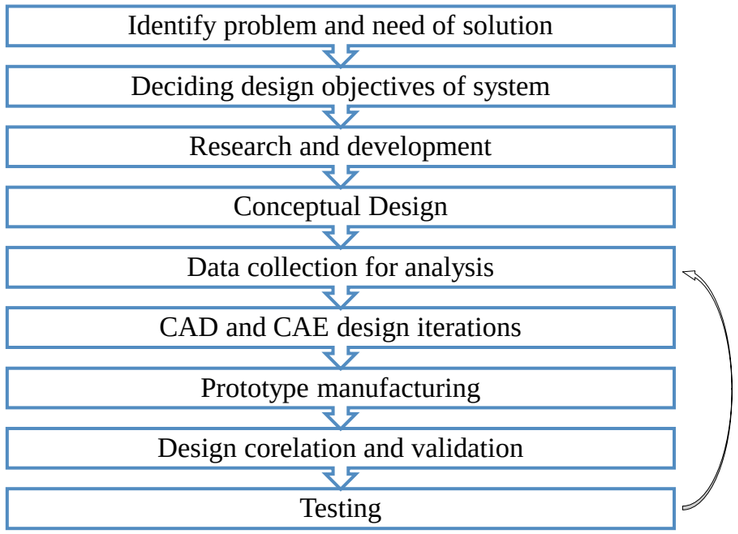
Objectives:

- To produce a nylon embedded fiber used for 3D printing.
- To 3d print and check the produced fiber.
- To perform tensile strength test on the manufactured 3D printed component.

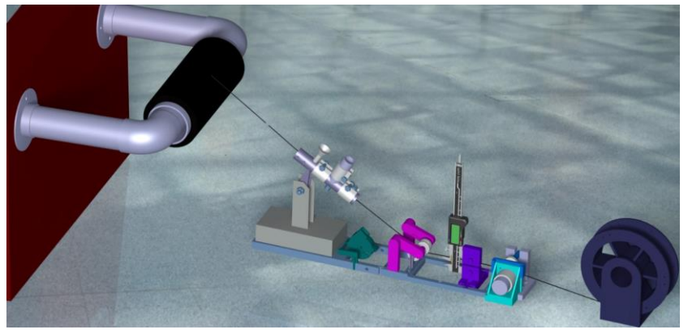
Literature Outcome:

- All the current continuous fiber 3D Printing technology uses Thermoplastic Filament which increases overall cost of printed part.
- Current continuous fibre 3D Printer uses expensive 1 k to 1.5 k fibre.
- rom literature survey it is concluded that 'Thermoplastic 3K fiber 3D Printing filament' is not yet developed which is cheaper and recyclable.

Methodology:



Schematic Diagram of the System:



Filament manufacturing setup

Design Details:

- FVF value is 0.35.
- 3k continuous carbon fibre roving.
- Filament diameter is 1.3mm
- Die diameter 0.8 and 1.2 mm.

Testing and Experimentation Details:

- A rectangular prototype was printed for UTM tensile testing. Specific strength obtained is 69.5x10-3MPa/(Kg/m3) (1.4 times that of mild steel)

- For utility testing we selected a rocker arm of a formula student vehicle.

Results and Discussion :

- Design Pultrusion Setup can manufacture nylon embedded filament at rate of 30 m/hr.
- 3D Printed part from this filament has density of 964 Kg/ m^3, which concludes presence of voids in the printed part.
- Specific tensile strength of printed part is 69.5x10-3MPa/(Kg/m3) which is 1.424 times specific tensile strength 'Mild Steel'.