3D FILAMENT PLASTIC WIRE EXTRUSION MACHINE

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ABSTRACT:

The objective of this project was to provide plastic filament appropriate to be used with Rep Rap 3D printers from raw plastic pellets or recycled plastic waste for the UBC speedy student team. The specifications for the filament needed whether or not it's of comparable quality to industrial filaments, swish and with marginal bubbles with a relentless diameter of concerning 3mm

To accomplish this finish, a paradigm plastic extruder was designed, made, and tested. The paradigm was tested running at totally different speeds and temperatures to see an honest operation purpose. The investigation showed that extrusion of plastic filaments of comparable quality to industrial filaments is feasible with the careful operation. The diameter is the most important feature and relies on the speed at which the filament is drawn off from the die still as a gradual input to the heating pipe. With AN outfeed mechanism, the filament may be drawn at a relentless rate to make a relentless diameter.

Keywords: ABS, 3D printing, Extraction, Single Screw Extruder, etc

INTRODUCTION:

Overview:

The construction and operation of the plastic extruder are mostly supported by existing styles employed in each industrial and hobby applications. the fundamental mechanism is comprised of a screw that transports raw plastic pellets from a hopper through a heating zone during a metal pipe wherever the plastic is dissolved. The raw plastic pellets are gravity-fed from the hopper into the screw. within the pipe, the liquid plastic is forced through a die at the tip of the pipe to make a filament. The extruded plastic is often drawn from the die to see the ultimate diameter of the filament. The die is formed to make the extruded plastic into the required crosswise. Figure one below shows a schematic of the fundamental extrusion system.

Objectives

1. to style and develop a plastic filament extruder for 3D printing a pair of. the main focus was specifically on making one.75-millimeter diameter filament from ABS pellets. 3. To develop a 3D printing filament-making extruder that will be utilized by small-scale producing units, companies, and faculties that have moveable 3D printers in-house. 4. To Perform style calculations to base the event of filament creating extruder

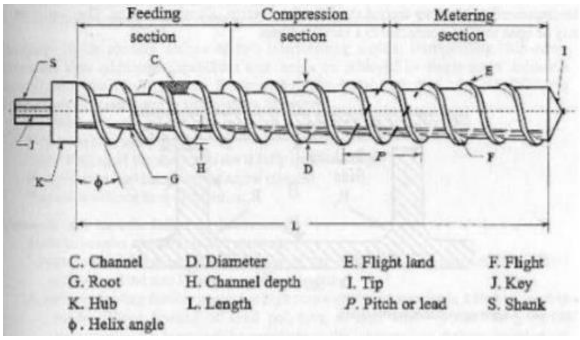


Fig: Screw Geometry details

Most 3D printers use a wire as feed material, so the 1st choice is to develop AN extruder that allows the manufacture of the wire. this enables the North American nations to start the method of printing from plastic granulate. the method starts by feeding the hopper with plastic. The screw drags and breaks granulate. The extrusion method continues till the fabric comes out of the nozzle making the wire which can be radio-controlled by a plastic tube into the printer´s head. this selection is the simplest one however there are some issues to be resolved. the most important drawback is once the extruder stops operating all the plastic within the canal lowers its temperature and solidifies. therefore isn't doable to start the method once more. moreover, because the wire comes out at warmth and during a dissolved method, the fabric gets stuck into the tube's walls and therefore the writing isn't uniform and it will block the tube.

EQUIPMENT DESCRIPTION:

Screw

There are 2 basic characteristics that the screw ought to satisfy to perform its perform properly. it's to be arduous enough in reality the doable erosion and to be ready to handle high temperatures. The high temperatures are going to be caused by the movement that the screw has, the friction against the cylinder, and therefore the heating.

Barrel or Cylinder

Just as for the screw, the fabric chosen for the cylinder is steel F-174, for similar reasons. The cylinder should even be ready to handle high temperatures and be arduous enough to resist degradation because of the friction generated between the inner face of the cylinder and therefore the plastic flow.

Barrel Extension

Barrel Extension material is the same as Barrel for similar reasons. it's factory-made by turning operation. it's welded to the tip of the Barrel. This extension is employed to couple barrel items to die and to present enough thickness to suit the secondary heater.

Nozzle

The material most ordinarily used for die is brass as a result of its face up to high temperatures. Likewise, maybe a smart conductor of warmth, a top quality that's required to heat quickly and uniform the nozzle because the printing material must be written at around 200ºC. Brass is one of the materials with the simplest characteristics and this is often why we tend to ar selecting it for the nozzle. The nozzle is additionally one of the foremost necessary parts of the extruder because it defines the ultimate form of the plastic. Between its characteristics, we tend to ar reaching to remark on its hardness and therefore the indisputable fact that it utterly keeps its conditions for a protracted amount. Also, it does not get full of external conditions. Its characteristics create it one every of the simplest materials on the market however at a cheaper price. The die that's used is AN M12 Brass plug with a 2mm hole.

Hopper

Hopper is formed of chrome steel flat solid. There are not any specifications for hopper style. Its size varies betting on the appliance or amount of production. that the hopper style is simply to satisfy the need of this project.

Heater system design

Heaters are settled on the barrel, with thermocouples in every zone to regulate the warmers and barrel temperature. the warmers cowl the maximum amount of barrel expanse as sensible, minimizing hot and cold spots on the barrel length. In a personal extruder temperature zone, there are also one, two, or 3 heater bands with one thermocouple junction dominant them. Assume the heater band nearest to the thermocouple junction burns out; the opposite 2 heater bands have to be compelled to offer all the external energy needed, making the chance that {the ara|the world|the realm} is hotter close to the 2 heater bands that are operating. within the event, the band farthest from the thermocouple junction burns out, the barrel space below the burnt-out heat input.

METHODOLOGY OF THE WORKING PROCESS

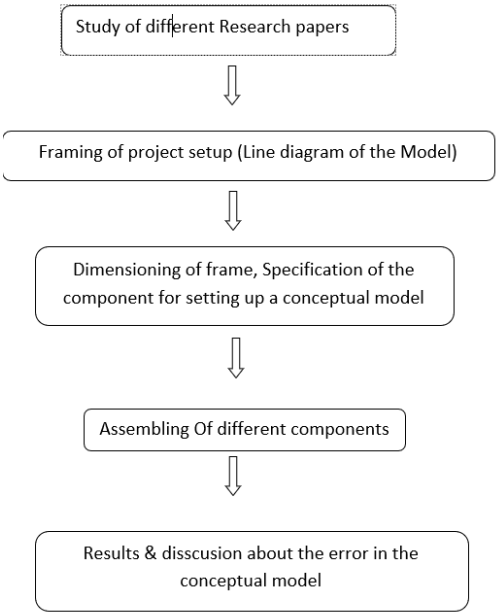
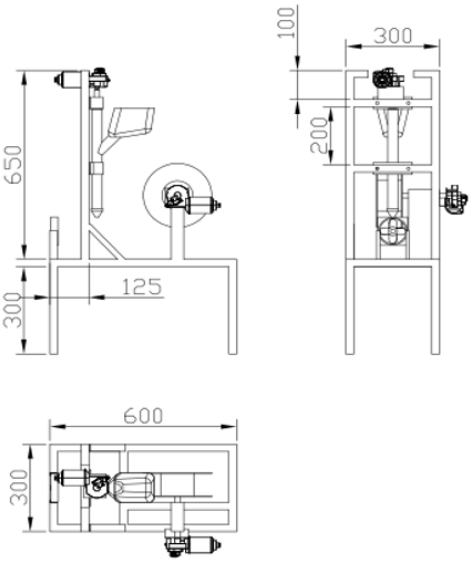


Fig., Flow chart for the working process

SYSTEM DESIGN



CONCLUSION

Initial tests employed the silicone heaters to melt the plastic. Though rated to 210°C the heaters only provided enough power to achieve temperatures up to 110°C inside the tube and 150°C outside. The melting point of the PLA plastic being used (3001D from Jamplast) was 200°C. Insulation was added to the outside of the tube but that only increased the temperature to 150°C inside the tube. The heat from silicon heaters caused the plastic to melt somewhat, but not enough to allow extrusion through the die. The plastic would remain in the tube and finally cause the motor to stall when it couldn't provide enough torque.

More power to heat the extrusion tube was provided by switching to Ni-Chrome wire as the heating element. With 3.6m of wire, run at 60V, drawing 2.0A the interior of the tube reached 210°C. This provided 120W of power, fully melting the plastic and successfully extruding filament. The resulting extruded filaments are shown in Figure 6 below alongside a commercially produced PLA filament on the right.

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