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MURUGAPPA POLYTECHNIC COLLEGE

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(An Academically Autonomous Institution)

DEPARTMENT OF MECHANICAL ENGINEERING

(TOOL AND DIE)

DESIGN AND FABRICATION OF 3 DIMENSIONAL TROPHY USING 3D PRINTER

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DEPARTMENT OF TOOL AND DIE MAKING

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1.ABSTRACT

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1.ABSTRACT

Our objective of this project is to Design and Develop an evolutionary 3-Dimensional Trophy for commercial use. The trophy is designed using "solid works" application software and the further exported as "SDL" file extension for production in 3D printer.

Trophy is segmented into 3 parts:

1. BASE STAND OF TROPHY
2. STRUCTURAL ELEVATION
3. EMBLEM

1.1 DESIGN OF BASE STAND: Trophy stand is designed in the shape of trapezoid, inspired form classic trophy models. A rectangular provision is provided on the face of stand, to paste desired naming stickers. E.g., Champions, Winner, Runner,1st place,2nd place, etc. A slot is provided on top of the stand to trophy structure.

Fig:1.1 Base

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1.2 DESIGN OF STRUCTURAL ELEVATION

Trophy is designed in two stages; one stage involves 3 pillars extending at an angle of 120 degree to a platform over which sphere like structure is rest. A slot is provided at the top and bottom. Bottom slot is provided to fix the structure on the stand. Top slot is provided to fix company logo/symbol.

Fig:1.2 Structural Elevation

1.3 DESIGN OF EMBLEM

Any desired corporate emblems can be designed and fabricated using 3D Printer.

The emblem we selected for the project is our own “MURUGAPPA GROUP’S” emblem. The emblem is printed in a way which, every minute detail is taken care of. The best angle is chosen so that, from every angle we can view the emblem clearly. A peacock logo of

MURUGAPPA GROUPS with 15 wings is designed and manufactured. This logo is fixed in the upper slot of the trophy structure.

Fig:1.3 Symbols

1.4 MATERIAL AND COLOURS

Trophy is made up of PLA (Polylactic acid) material. This material is chosen for best finishing look and to withstand long shelf life.

Any color variation is available, desired color and finishing can easily obtain. We use the best coloring agent which suits the PLA material so that, look is enhanced.

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1.5 OBJECTIVES

- To create an aesthetic trophy for commercial purpose.
- To demonstrate new innovative designs and implementing in real life.
- To mass produce trophies with multiple colour variations.

1.6 CONSTRUCTION

The trophy is printed into two parts. The parts are printed separately with different compositions. The symbols or emblem can be printed for any organization and MNC. The structure is standard so it can be mass produced. The structural elevation can be modified by design if needed. The trophy is all about newer design and aesthetical trending designs. Finishing process makes the trophy glossy matt. The trophies then assembled to one full piece. Then the dimension is checked every 10 parts.

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2.INTRODUCTION

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2.1 TROPHY REQUIREMENTS

- 3D trophy is designed and fabricated for awarding excellence in any platform.
- This trophy is designed and implemented as a prototype for an innovative and futuristic development.
- Recognizing hard work, accomplishing great challenges, or acknowledging immense skill and commitment is important and really goes a long way.
- Everyone should recognize these things by letting someone know that you're a big fan of what they achieved. But no one likes a paper certificate, and ordering trophies can be pricey, boring, and takes time.
- With 3D printing, essentially any shape or model can be created in order to design an awesome trophy that is designed uniquely for a specific purpose or person.
- Depending on the printer and size of the trophy, it could be designed, manufactured, assembled, and ready to be presented in the matter of hours.

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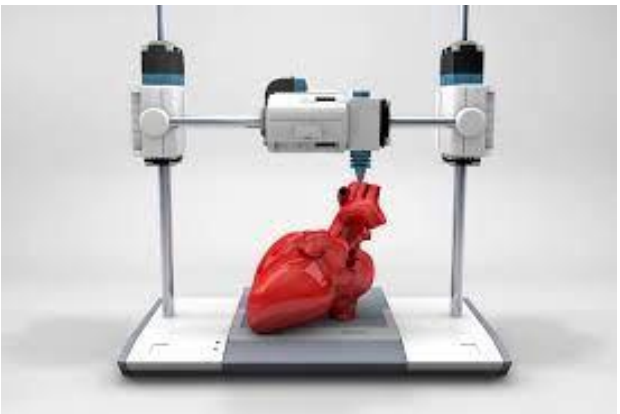

Fig:2.1 3D Printing Machine

subtractive manufacturing processes, such as machining, can result in up to 90% of the original block of material being wasted. In contrast, 3D printing is a process for creating objects directly, by adding material layer by layer in a variety of ways, depending on the technology used.

Simplifying the ideology behind 3D printing, for anyone that is still trying to understand the concept (and there are many), it could be likened to the process of building something with Lego blocks automatically.

3D printing is an enabling technology that encourages and drives innovation with unprecedented design freedom while being a tool-less process that reduces prohibitive costs and lead times. Components can be designed specifically to avoid assembly requirements with intricate geometry and complex features created at no extra cost.

3D printing is also emerging as an energy efficient technology that can provide environmental efficiencies in terms of both the manufacturing

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process itself, utilizing up to 90% of standard materials, and throughout the product’s operating life, through lighter and stronger design.

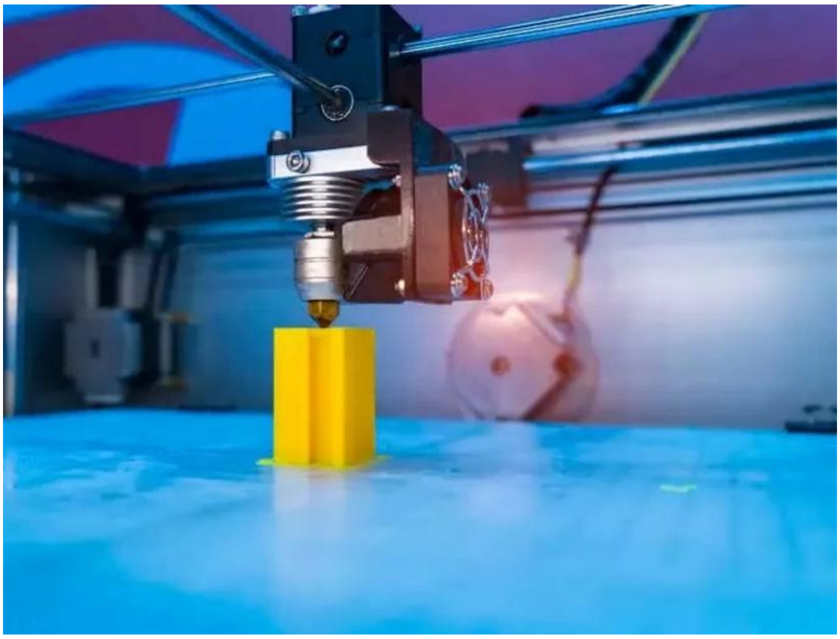

Fig:2.2 FDM Machining

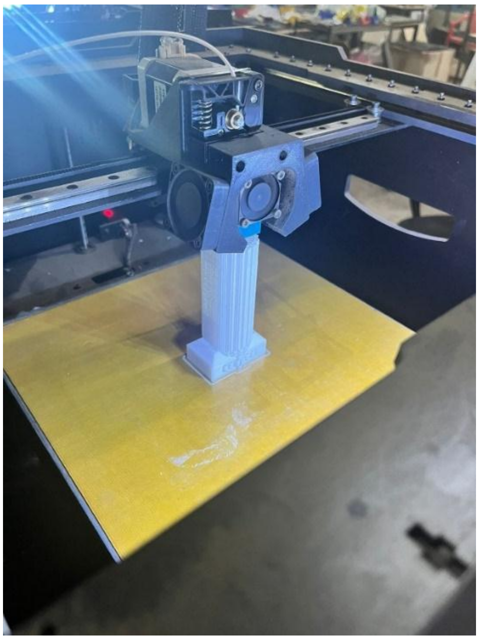

Fig:2.3 Fabrication Process

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3.DESIGN CONSIDERATION

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3.DESIGN CONSIDERATION FOR 3DIMENSIONAL TROPHY

3.1 DESIGN INSPIRATION

The design was inspired from an Australian MNC company's trophy for best employee of the month. We inspired it and redesigned it for our Murugappa Group performance award functions.

3.2 DESIGN CONCLUSION

Design was discussed by the team and multiple professional designers. We then brainstormed with our staffs and lecturer. Then we finaled with our guide and department head.

Fig:3.1 Emblem

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3.3 MAJOR COMPONENTS OF 3-DIMENSIONAL TROPHY

Trophy is segmented into 3 parts:

1.BASE STAND OF TROPHY

2.STRUCTURAL ELEVATION

3. EMBLEM

3.4 DESIGN OF BASE STAND

Trophy stand is designed in the shape of trapezoid, inspired form classic trophy models. A rectangular provision is provided on the face of stand, to paste desired naming stickers. E.g., Champions, Winner, Runner,1st place,2nd place, etc. A slot is provided on top of the stand to trophy structure.

Fig:3.2 Base Stand

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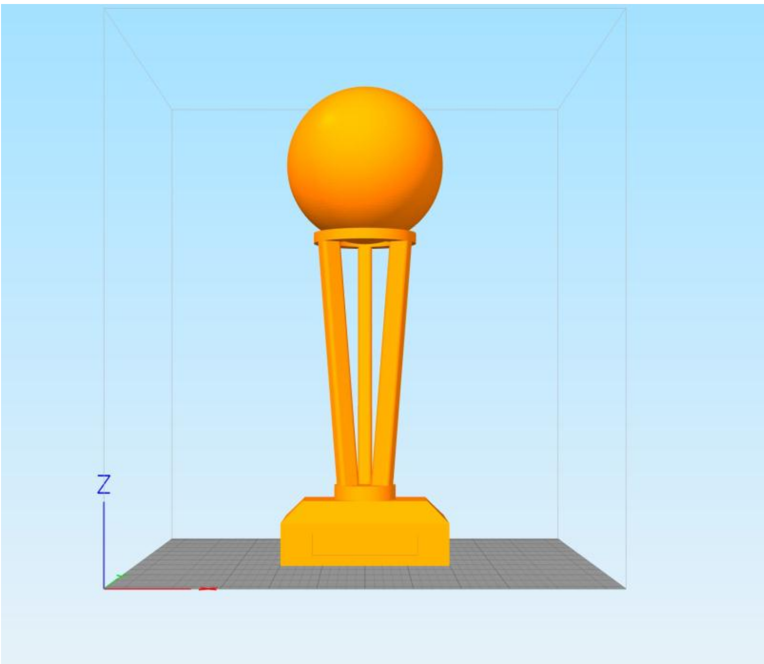

Fig:3.3 3D View in Solid Works Application

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3.6 EMBLEM DESIGN

Any desired corporate emblems can be designed and fabricated using 3D Printer.

The emblem we selected for the project is our own “MURUGAPPA GROUP’S” emblem. The emblem is printed in a way which, every minute detail is taken care of.

The best angle is chosen so that, from every angle we can view the emblem clearly. A peacock logo of MURUGAPPA GROUPS with 15 wings is designed and manufactured. This logo is fixed in the upper slot of the trophy structure.

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Fig:3.4 Emblem

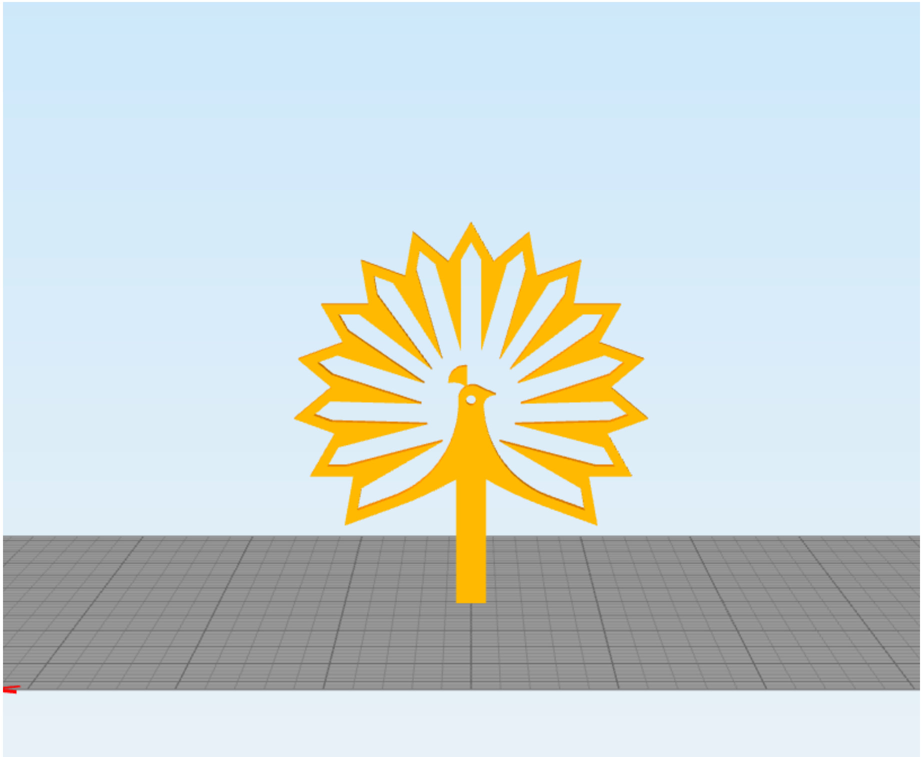

Fig:3.5 EMBLEM FRONT VIEW

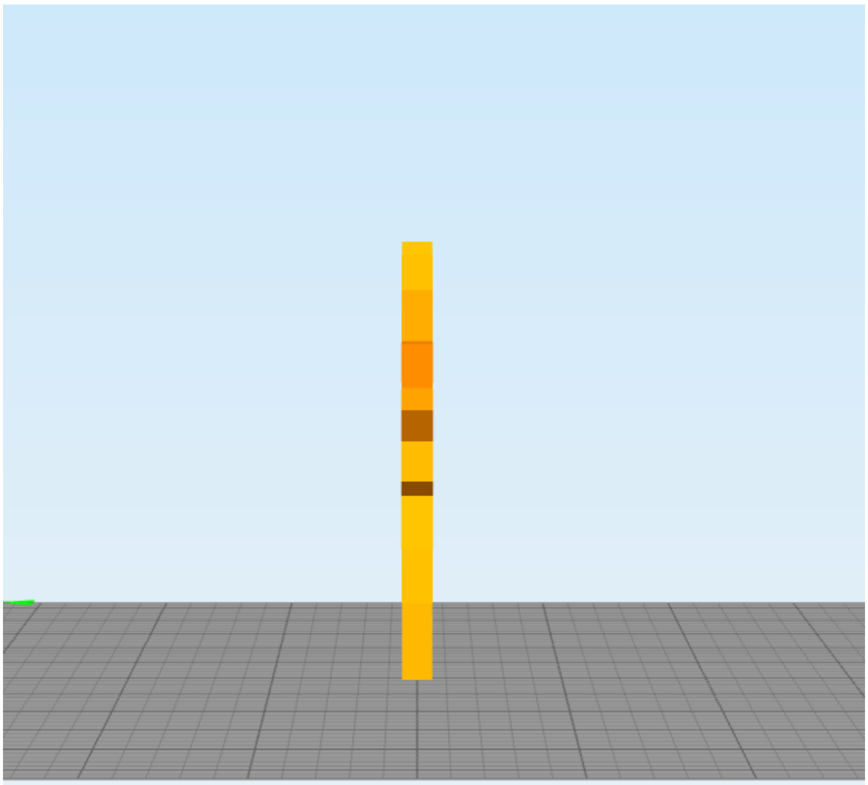

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Fig: 3.6 EMBLEM SIDEVIEW

4.FABRICATION

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4.FABRICATION

4.1 FABRICATION OF TROPHY

Since the design is completed, manufacturing begins. Trophy printing involves many steps, most of which are very exacting work required highly accurate printing and machining is required.

The process employed in printing include filament selection, nozzle selection, layer programing, polishing, sand blasting, spray painting if needed. All the parts are completed then its moved to assembly section.

Entire components should must be fit together precisely to achieve an aesthetic and presentable trophy and to provide an strong and firm structural balance. The trophy should not get dull over time and shelf time should be more than a decade.

By considering all this factors fabrication process is carried on with futuristic consideration. It should be non-breakable and shock and water proof.

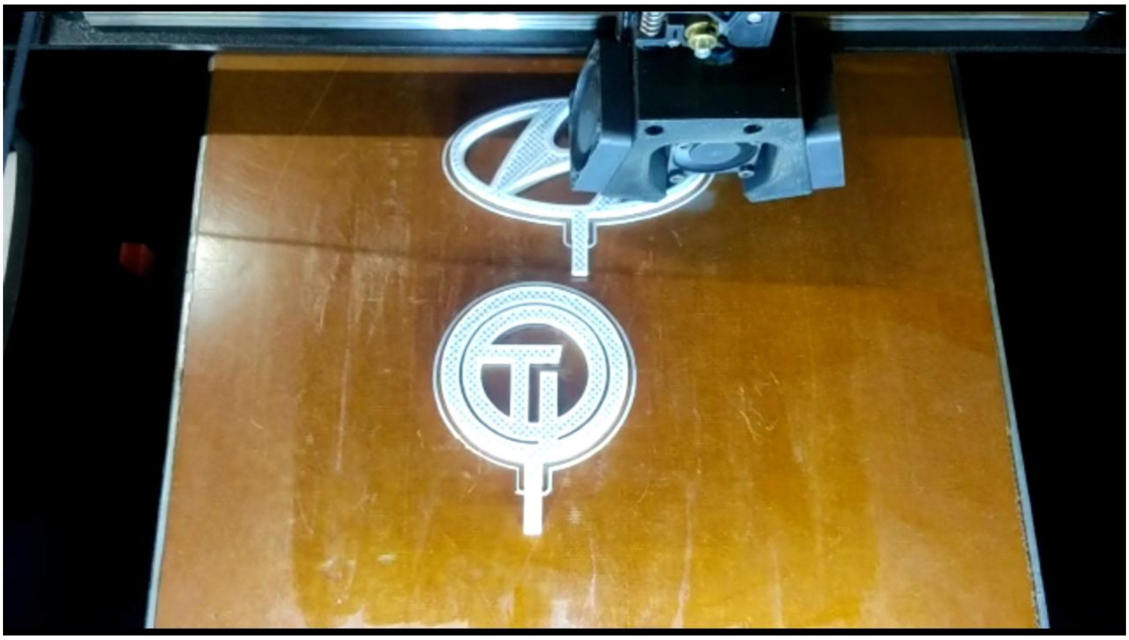

Fig:4.1 Corporate Emblem Print

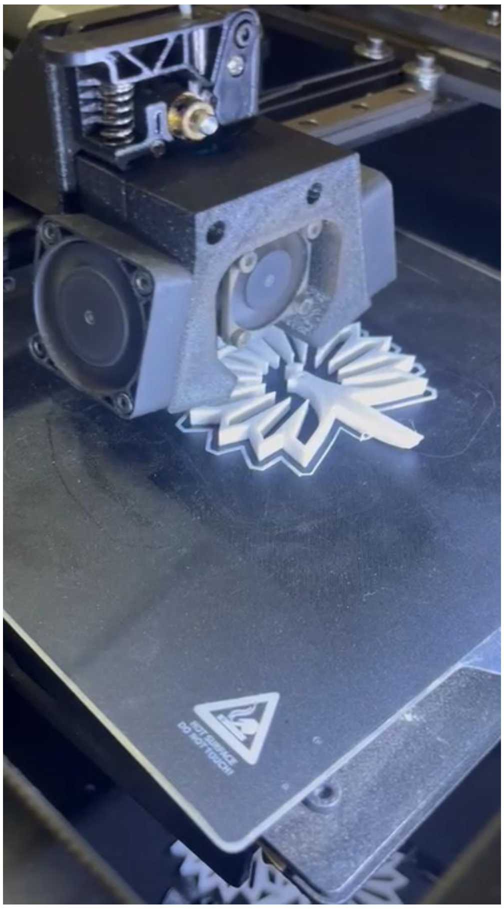

Fig:4.2 Murugappa Emblem Print

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4.2 SEQUENCE OF OPERATION

- Printing
- Scrap removing
- Sand paper polishing
- Buffing
- Smoothening
- Primer coating
- Spray painting
- Paint over polishing

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5. SELECTION OF MATERIAL AND PROPERTIES

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5.1 PLASTIC

Out of all the raw materials for 3D printing in use today, plastic is the most common. Plastic is one of the most diverse materials for 3D-printed toys and household fixtures.

Products made with this technique include desk utensils, vases and action figures. Available in transparent form as well as bright colours, plastic filaments are sold on spools and can have either a matte or shiny texture.

With its firmness, flexibility, smoothness and bright range of colour options, the appeal of plastic is easy to understand. As a relatively affordable option, plastic is generally light on the pocketbooks of creators and consumers alike.

Plastic products are generally made with FDM printers, in which thermoplastic filaments are melted and moulded into shape, layer by layer. The types of plastic used in this process are usually made from one of the following materials:

- **Polylactic acid (PLA):** One of the eco-friendliest options for 3D printers, polylactic acid is sourced from natural products like sugar cane and corn starch and is therefore biodegradable.
- Available in soft and hard forms, plastics made from polylactic acid will likely **dominate the 3D printing industry** in the coming years. Hard PLA is the stronger

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and, therefore more ideal material for a broader range of products.

- **Acrylonitrile butadiene styrene (ABS):** Valued for its strength and safety, ABS is a popular option for home-based 3D printers. Also referred to as "LEGO plastic," the material consists of pasta-like filaments that give ABS its firmness and flexibility.
- ABS is available in various colours that make the material suitable for products like stickers and toys. It is popular among hobbyist printers but also used in commercially made consumer goods.

- **Polyvinyl alcohol plastic (PVA):** Used in low-end home printers, PVA is a suitable plastic for support materials of the dissolvable variety.
- Though not suitable for products that require high strength, PVA can be a low-cost option for temporary-use items.

- **Polycarbonate (PC):** Less frequently used than the aforementioned plastic types, polycarbonate only works in 3D printers that feature nozzle designs and that operate at high temperatures.
- Among other things, polycarbonate is used to make low-cost plastic fasteners and moulding trays.
- Plastic items made in 3D printers come in a variety of shapes and consistencies, from flat and round to grooved and meshed.

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- A quick search of Google images will show a novel range of 3D-printed plastic products such as cog wheels and Incredible Hulk action figures.

5.2 POWDERS

Today’s more state-of-the-art 3D printers use powdered materials to construct products. Inside the printer, the powder is melted and distributed in layers until the desired thickness, texture and patterns are made.

The powders can come from various sources and materials, but the most common are:

- **Polyamide (Nylon):** With its strength and flexibility, polyamide allows for high levels of detail on a 3D-printed product. The material is especially suited for joining pieces and interlocking parts in a 3D-printed model.
- Polyamide is used to print everything from fasteners and handles to toy cars and figures.
- **Alumide:** Comprised of a mix of polyamide and Gray aluminium, alumide powder makes for some of the strongest 3D-printed models. Recognized by its grainy and sandy appearance, the powder is reliable for industrial models and prototypes.

In powder form, materials like steel, copper and other types of metal are easier to transport and mould into desired shapes.

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As with the various types of plastic used in 3D printing, metal powder must be heated to the point where it can be distributed layer-by-layer to form a completed shape.

5.3 RESINS

One of the more limiting and, therefore, less-used materials in 3D printing is resin. Compared to other 3D-applicable materials, resin offers limited flexibility and strength.

Made of liquid polymer, resin reaches its end state with exposure to UV light. Resin is generally found in black, white and transparent varieties, but certain printed items have also been produced in orange, red, blue and green.
The material comes in the following three categories:

- **High-detail resins:** Generally used for small models that require intricate detail. For example, four-inch figurines with complex wardrobe and facial details are often printed with this grade of resin.

- **Paintable resin:** Sometimes used in smooth-surface 3D prints, resins in this class are noted for their aesthetic appeal. Figurines with rendered facial details are often made of paintable resin.

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- **Transparent resin:** This is the strongest class of resin and therefore the most suitable for a range of 3D-printed products. This resin is often used for models that must be smoother to the touch and transparent in appearance.

Fig:5.1 Filament

5.4 METALS

The second-most-popular material in the industry of 3D printing is metal, which is used through a process known as direct metal laser sintering (DMLS).

This technique has already been embraced by manufacturers of air-travel equipment who have used metal 3D printing to speed up and simplify the construction of component parts.

Metal can produce a stronger and arguably more diverse array of everyday items. One of the main advantages of this process is that the printer handles the engraving work. As such, products can be finished by the box-load in just a few mechanically programmed

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steps that do not involve the hands-on labour that engraving work once required.

The technology for metal-based 3D printing is also opening doors for machine manufacturers to ultimately use DMLS to produce at speeds and volumes that would be impossible with current assembly equipment.

Supporters of these developments believe 3D printing would allow machine-makers to produce metal parts with strength superior to conventional parts that consist of refined metals.
The range of metals that apply to the DMLS technique is just as diverse as the various 3D printer plastic types:

- **Stainless steel:** Ideal for printing out components that could ultimately come into contact with water.
- **Bronze:** Can be used to make vases and other fixtures.
- **Nickel:** Suitable for the printing of coins.
- **Aluminium:** Ideal for thin metal objects.
- **Titanium:** The preferred choice for strong, solid fixtures.

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In the printing process, metal is utilized in dust form. The metal dust is fired to attain its hardness. This allows printers to bypass casting and directly use metal dust in forming metal parts.

Once the printing finishes, these parts can then be electro-polished and released to the market.
Metal dust is most often used to print prototypes of metal instruments, but it has also been used to produce finished, marketable products and field-ready parts.

Powderized metal has even been used to make medical devices.
When metal dust is used for 3D printing, the process allows for fewer parts in the finished product.

For example, 3D printers have produced rocket injectors that consist of just two parts, whereas a similar device welded in the traditional manner will typically consist of more than 100 individual pieces.

5.5 OTHER MATERIALS

You'll also find other materials used in 3D printing, such as:

- **Carbon fiber:** Composites like carbon fiber are used in 3D printers as a top coat over plastic materials.

- The purpose is to make the plastic stronger. The combination of carbon fiber over plastic has been used in the 3D printing industry as a fast, convenient alternative to metal. In the future,

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3D carbon fiber printing is expected to replace the much slower process of carbon-fiber layup.

- With the use of conductive carbamorph, manufacturers can reduce the number of steps required to assemble electromechanical devices.
- **Graphite and graphene:** Graphene has become a popular choice for 3D printing because of its strength and conductivity.
- The material is ideal for device parts that need to be flexible, such as touchscreens. Graphene is also used for solar panels and building parts.
- Proponents of the graphene option claim it is one of the most flexible of 3D-applicable materials. It is light, strong **and very electrically conductive**.
- **Nitinol:** As a common material in medical implants, nitinol is valued in the 3D printing world for its super-elasticity.
- Made from a mixture of nickel and titanium, nitinol can bend to considerable degrees without breaking. Even if folded in half, the material can be restored to its original shape.
- As such, nitinol is one of the strongest materials with flexible qualities. For the production of medical products, nitinol allows

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printers to accomplish things that would otherwise be impossible.

Paper: Designs can be printed on paper with 3D technology to achieve a far more realistic prototype than a flat illustration. When a design is presented for approval, the 3D-printed model allows the presenter to convey the essence of the design with greater detail and accuracy.

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5.6 SELECTION OF MATERIAL FOR TROPHY

PLA (polylactic acid) is one of the most widely used plastics in the additive manufacturing sector. Invented in 1930 by chemist Wallace Carothers, also the developer of nylon and neoprene, this material can be used in filament or pellet form for desktop 3D printers or more industrial solutions.

Unlike many other material options available on the market, PLA is often considered to be a more sustainable thermoplastic since it does not come from finite resources, as is the case with petroleum, but is sourced from natural and renewable resources. Due to its somewhat eco-friendlier origins, this material has been popular since its inception in the field of 3D printing.

In fact, its use has spread to a wide variety of industries and applications. In this guide we will learn all about this material, including its characteristics, ease of printing, some applications as well as the main manufacturers in the market.

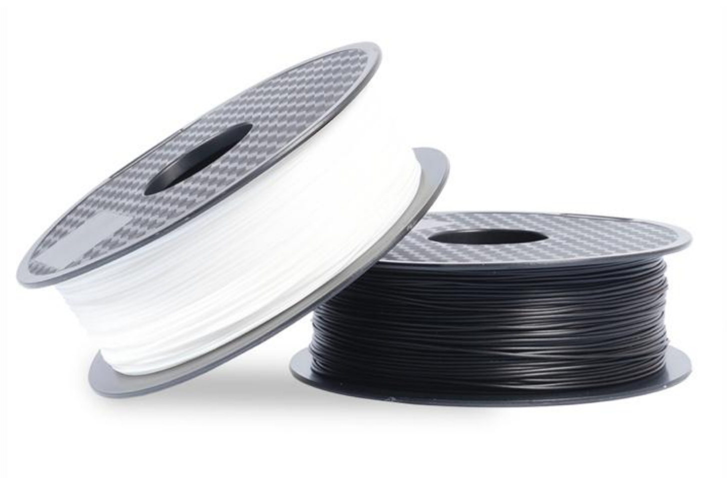

Fig:5.2 PLA Filament

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5.7 ABOUT PLA MATERIAL

PLA is a type of polyester made from fermented plant starch from corn, cassava, maize, sugarcane or sugar beet pulp. The sugar in these renewable materials is fermented and turned into lactic acid, when is then made into polylactic acid, or PLA.

There is more detailed information on PLA production methods below.

Fig:5.3 Multiple Colored Filaments

The material properties of PLA make it suitable for the manufacture of plastic film, bottles and biodegradable medical devices, including screws, pins, plates and rods that are designed to biodegrade within 6 to 12 months).

PLA can be used as a shrink-wrap material since it constricts under heat. This ease of melting also makes polylactic acid suitable for 3D printing applications.

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However, many types of PLA have a low glass transition temperature, making them unsuitable for making plastic cups designed to hold hot liquids.

5.8 ADVANTAGES

PLA production uses 65% less energy than producing conventional plastics and generates 68% fewer greenhouse gases and contains no toxins. It can be also remained environmentally friendly should the correct end-of-life scenario be followed.

However, the rate of degradation is very slow in ambient temperatures, with a 2017 study showing that there was no degradation seen in over a year of the material being submerged in seawater at 25°C.

However, PLA can be degraded by hydrolysis, thermal degradation or photodegradation:

- **Hydrolysis:** The molecular weight is reduced by cleaving the ester groups of the main chain

- **Thermal Degradation:** This process leads to the appearance of different compounds, such as linear and cyclic oligomers or lighter molecules with different lactide and Mw

- **Photodegradation:** UV radiation causes degradation, particularly where PLA is exposed to sunlight

There are currently four common end-of-life scenarios for PLA:

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1. Recycling

This is either chemical or mechanical. Waste material can hold contaminants, but polylactic acid can be chemically recycled using thermal depolymerisation or hydrolysis to create a monomer that can then be manufactured into virgin PLA. PLA can also be chemically recycled using transesterification to create methyl lactate.

2. Composting

Industrial composting conditions allow for chemical hydrolysis followed by microbial digestion to degrade the PLA.

3. Incineration

End-of-life PLA can be incinerated, creating 19.5 MJ/kg (8,368 btu/lb) of energy and leaving no residue.

4. Landfill

While PLA can go to landfill, this is the least environmentally friendly option, due to the slow degradation rates of the material in ambient temperatures.

Types

Due to the nature of lactic acid, there are several distinct forms of polylactide. These include poly-L-lactide (PLLA) which comes from the polymerization of L, L-lactide (also known as L-lactide).

In addition, while PLA can be produced from different biomass materials, such as corn starch or sugar cane, it can also be enhanced by adding other materials to provide different properties. This is particularly true

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with PLA filaments where the additional materials allow 3D printed PLA to be used in different ways.

There are many different PLA blends available, although adding materials to PLA can make 3D printing more difficult and even reduce the properties of PLA. Using blends can also mean that you need to alter the temperature required to melt the material while printing.

1. Wood Filaments

PLA is mixed with woods such as bamboo, cedar, coconut wood, cork, pine, or walnut. This can, for example, be used to give PLA printed furniture a natural-looking appearance.

2. Metal Filaments

Mixing PLA with metals such as brass, bronze, copper, iron and steel can make printed parts stronger and glossy.

3. Other Filaments

PLA can also be mixed with other materials and substances, including carbon fibre, conductive carbon and even beer or coffee (to add a scent to printed items). PLA filaments can also be given colour-changing properties.

Properties

PLA is soluble in solvents including dioxane, hot benzene, and tetrahydrofuran. The physical and mechanical properties differ according to the exact type of polymer, ranging from an amorphous glassy polymer to a semi or highly crystalline polymer with a glass transition of 60–65

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°C, a melting temperature 130-180 °C, and a tensile modulus of 2.7–16 GPa.

Heat resistant PLA can withstand temperatures of 110 °C, and the melting temperature can be increased by 40–50 °C and the heat deflection temperature can be increased from around 60 °C to as much as 190 °C by physically blending the polymer with PDLA (poly-D-lactide).

Annealing, adding nucleating agents or forming composites with other materials can all change the mechanical properties of PLA. However, the basic mechanical properties of PLA range between those of polystyrene and PET, with similar properties to PET but a lower maximum continuous use temperature.

The high surface energy of PLA makes it ideal for 3D printing. PLA can also be solvent welded using dichloromethane, while acetone softens the surface of the material, making it sticky without dissolving it so it can be welded to another PLA surface. Ethyl acetate can be used as an organic solvent, dissolving PLA and making it a good solution for

removing PLA printing supports or cleaning 3D printing extruder heads. Propylene carbonate and pyridine can also be used as a solvent, but are less favourable than ethyl acetate and propylene carbonate, being less safe in the first instance and emitting a distinct bad fish odour in the second.

Here are the general properties of PLA:

Advantages

PLA provides several advantages over other materials, including:

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- Environmentally friendly (if disposed of correctly)
- Easy to 3D print
- Safe for use in applications such as food containers and medical devices
- Comes with a wide range of composite and colour options to provide different properties and appearances
- Can be solvent welded (such as with dichloromethane)

Disadvantages

There are, however, some disadvantages with using PLA, including:

- Low heat resistance
- Comparatively low strength
- Machine processing can be difficult

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5.9 PROPERTY AND VALUE OF MATERIAL

PROPERTY	VALUE
Heat deflection temperature	126 °F (52 °C)
Density	1.24 g/cm³
Tensile strength	50 MPa
Flexural strength	80 MPa
Impact strength (unnotched)IZOD (J/M)	96.1
Shrinkage	0.37-0.41% (0.0037-0.0041 in/in)

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6. SELECTION OF 3D PRINTING MACHINE

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6. SELECTION OF 3D PRINTING MACHINE

The machine selected: Extrusion / FDM / FFF

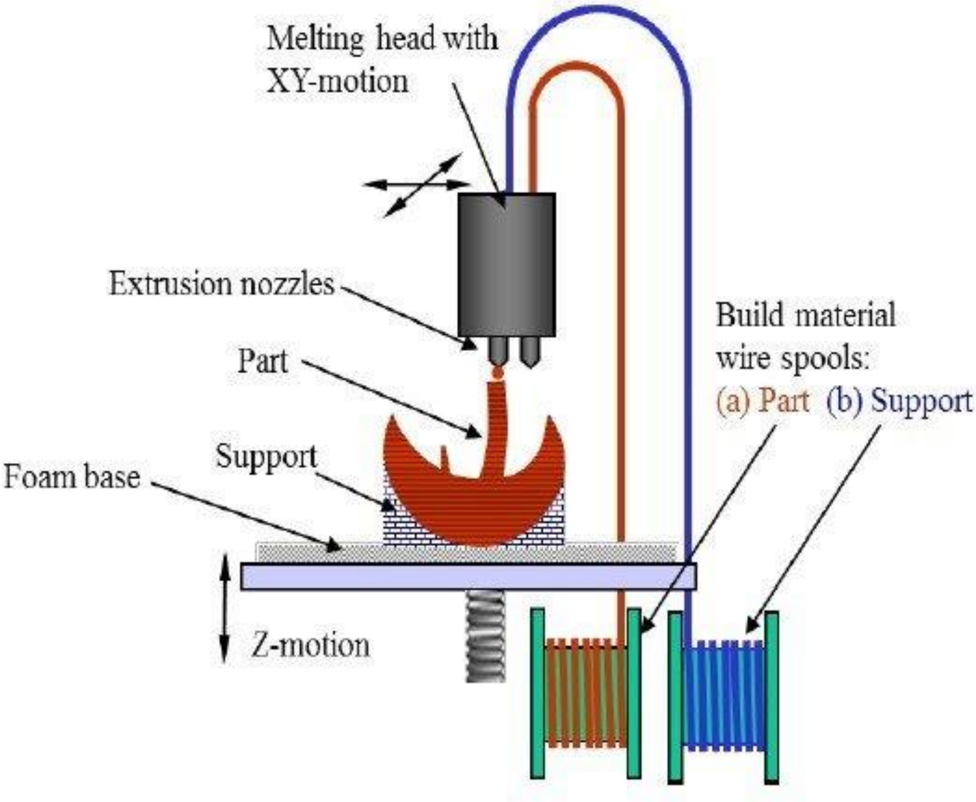

Fig:6.1 FDM Extrusion Machine

Extrusion / FDM / FFF 3D printing utilizing the extrusion of thermoplastic material is easily the most common and recognizable 3DP process. The most popular name for the process is Fused Deposition Modelling (FDM).

However, this is a trade name, registered by Stratasys, the company that originally developed it. Stratasys' FDM technology has been around since the early 1990's and today is an industrial grade 3D printing process. However, the proliferation of entry-level 3D printers that have emerged since 2009 largely utilize a similar process, generally referred

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to as Freeform Fabrication (FFF), but in a more basic form due to patents still held by Stratasys.

The earliest RepRap machines and all subsequent evolutions employ extrusion methodology. However, following Stratasys' patent infringement filing against Afinia there is a question mark over how the entry level end of the market will develop now, with all of the machines potentially in Stratasys' firing line for patent infringements. 16 The process works by melting plastic filament that is deposited, via a heated extruder, a layer at a time, onto a build platform according to the 3D data supplied to the printer. Each layer hardens as it is deposited and bonds to the previous layer.

Stratasys has developed a range of proprietary industrial grade materials for its FDM process that are suitable for some production applications. At the entry-level end of the market, materials are more limited, but the range is growing.

The most common materials for entry-level FFF 3D printers are ABS and PLA. The FDM/FFF processes require support structures for any applications with overhanging geometries. For FDM, this entails a second, water-soluble material, which allows support structures to be relatively easily washed away, once the print is complete.

Alternatively, breakaway support materials are also possible, which can be removed by manually snapping them off the part. Support structures, or lack thereof, have generally been a limitation of the entry level FFF

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3D printers. However, as the systems have evolved and improved to incorporate dual extrusion heads, it has become less of an issue. In terms of models produced, the FDM process from Stratasys is an accurate and reliable process that is relatively office/studio friendly, although extensive postprocessing can be required.

At the entry-level, as would be expected, the FFF process produces much less accurate models, but things are constantly improving. The process can be slow for some part geometries and layer-to-layer adhesion can be a problem, resulting in parts that are not watertight. Again, post-processing using Acetone can resolve these issues.

Fig:6.2 Full Structural Printing Process

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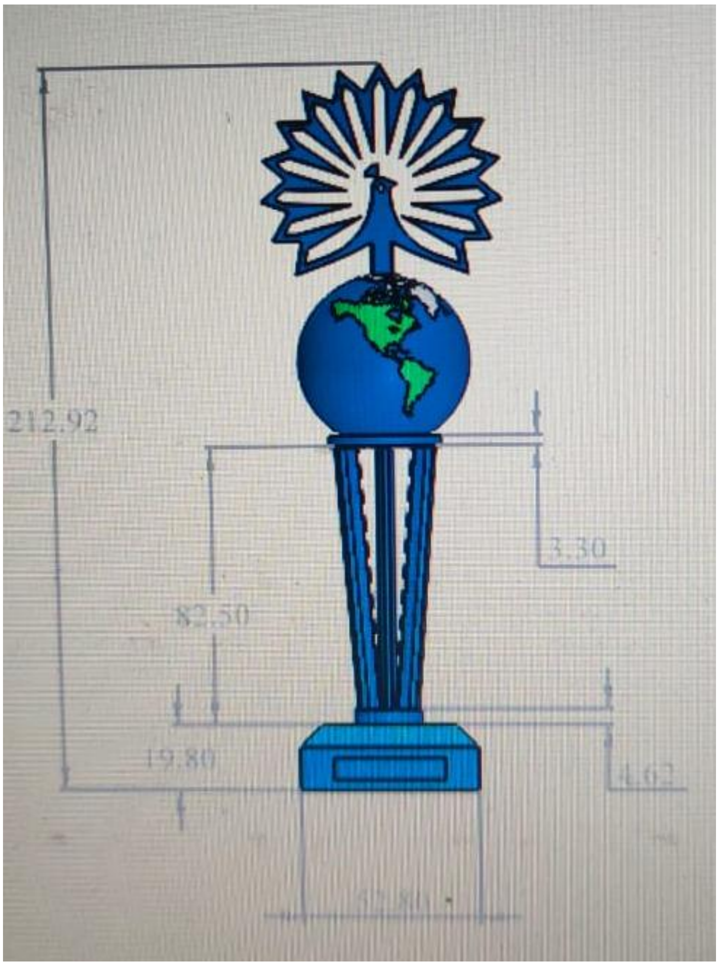

Fig:6.3 2D CADD View Of trophy

6.1 OVERVIEW OF THE MACHINE

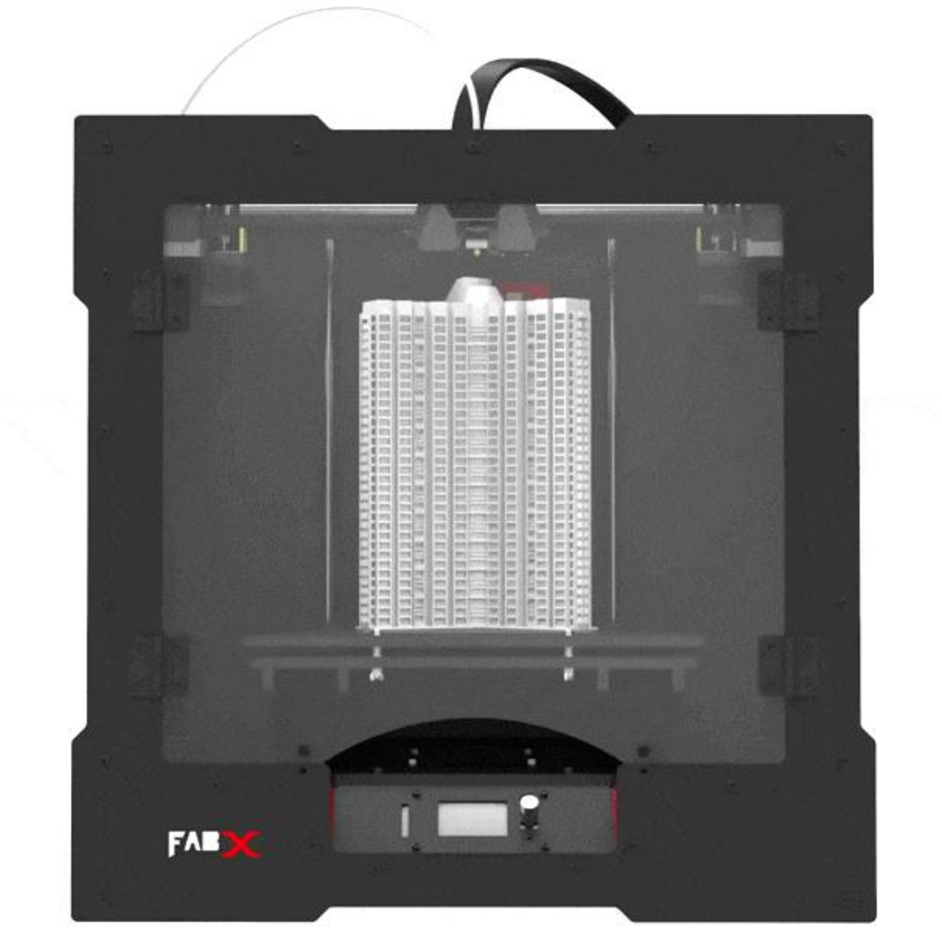

Fig:6.4 FABX 3D Printer

We used FABX 3d printers for printing our trophies. It is a precise printer used for printing high detailed components. The machine also printed parts for NASA.

Extrusion nozzles are used in 3D printers that use FDM technologies. The extrusion nozzle can move horizontally and vertically over the build platform. When the thermoplastic polymers reach the melting point, they are forced out via the nozzle by the 3D printer. The nozzle shapes the

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three-dimensional design further by depositing melted thermoplastic polymers layer by layer.

After completing or printing a layer, the 3D printer deposits the following layer by lowering the nozzle. As a result, the nozzle adds the next layer of thermoplastic polymers to the finished layer. Each layer of thermoplastic polymers appears as a horizontal cross section, allowing the printers to view the FDM printing process. Finally, after the printing process is completed, the material required to support the three-dimensional item is removed.

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7. ASSEMBLY OF TROPHY

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7. ASSEMBLY OF TROPHY

(Construction of 3-dimensional trophy)

The trophy consists of a sphere structure where cavity is provided. Murugappa’s emblem is separately printed. The stem is separately machined for accuracy. The machined part is then checked for precision fitting.

Now the whole trophy is sand blasted to clear the supports and burrs around the trophy.

Painting is done to enhance the beauty and texture of the trophy better than the plastic texture. It can be painted and repolished for our convenience and taste of user.

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Fig:7.1 Fully Finished Trophy

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8.ADVANTAGES & USES

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8. ADVANTAGES OF 3D PRINTED TROPHIES

8.1 3D-printed trophies advantages:

1**. Customization:**3D printing allows for intricate and personalized designs. Trophies can be tailored to specific events, themes, or individual achievements.

2. **Complex Designs**: Traditional manufacturing methods may struggle with intricate or complex designs, but 3D printing can handle them with ease. This opens up creative possibilities for unique and detailed trophy designs.

3. **Quick Prototyping**: 3D printing enables rapid prototyping, allowing designers to test and refine trophy designs quickly. This can be particularly useful for creating one-of-a-kind trophies for special occasions.

4. **Cost-Effective for Small Batches**: Traditional manufacturing processes may involve high setup costs, making them less practical for small quantities. 3D printing doesn't have these high setup costs, making it more cost-effective for producing a limited number of trophies.

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5**. Material Variety**: 3D printing supports a wide range of materials, allowing for the selection of materials that best suit the desired aesthetic or functionality of the trophy.

6**. Reduced Waste**: Traditional subtractive manufacturing methods can generate a significant amount of waste material. 3D printing, being an additive process, generates less waste as material is only deposited where needed.

7. **Personalization:** Beyond just customization, 3D printing allows for individual personalization of each trophy. Names, dates, or specific achievements can be easily incorporated into the design.

8. **Innovative Shapes and Structures**: With 3D printing, trophies can take on unconventional shapes and structures that might be difficult or impossible to achieve with traditional methods. This adds a modern and innovative touch to the awards.

Remember, while 3D printing offers these advantages, the choice between 3D printing and traditional manufacturing methods depends on factors such as budget, timeline, and the specific requirements of the trophies.

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9. APPLICATIONS OF 3D PRINTED TROPHY

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9. APPLICAIONS OF D3 PRINTED TROPHIES

Trophies serve various applications across different domains, and their significance goes beyond mere physical symbols of achievement. Here are some common applications of trophies:

1.Sports Events:

Recognition of Excellence: Trophies are awarded to individuals or teams for outstanding performance in sports competitions, whether it's a local tournament or a global championship.

2.Academic Achievements

Student Recognition: Trophies are often awarded to students for academic achievements, such as winning science fairs, spelling bees, or excelling in specific subjects.

3. Corporate Recognition:

Employee Appreciation: Companies use trophies to recognize and reward employees for their dedication, outstanding performance, or years of service.

4.Arts and Entertainment:

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Film and Music Awards: Trophies, such as Oscars or Grammy Awards, are prestigious recognitions in the entertainment industry for outstanding contributions in film, music, and other artistic endeavors.

5.Community and Nonprofit Events:

Volunteer Recognition: Trophies can be given to individuals or groups for their exceptional contributions to community service or nonprofit initiatives.

6. E-sports Competitions:

Gaming Achievements: Trophies are becoming increasingly popular in the world of e-sports, where gamers and teams receive recognition for their skills and achievements in competitive video gaming.

7. Corporate Competitions:

Innovation Awards: Companies often use trophies to acknowledge and reward employees or teams for innovative ideas, projects, or solutions that contribute to the success of the organization.

8. Cultural and Academic Competitions:

Debates, Speech, and Drama: Trophies are awarded to participants in debates, public speaking competitions, drama, and other cultural events to acknowledge their skills and efforts.

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9.Military and Public Service:

Service Recognition: Trophies may be awarded to military personnel or public servants for their exemplary service, acts of bravery, or contributions to the community.

10. Achievements in Hobbies:

Hobbyist Competitions Trophies are often given in various hobbyist competitions, such as photography contests, model building, or gardening competitions.

11. Motivational Tools:

Employee Motivation: Trophies can serve as motivational tools in the workplace, encouraging healthy competition and recognizing individual or team accomplishments.

12. Charity Events:

Fundraising Achievements: Trophies may be awarded to individuals or groups who excel in fundraising efforts for charitable causes.

Trophies, regardless of the context, play a crucial role in recognizing and celebrating excellence, motivating individuals and teams, and fostering a

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sense of accomplishment and pride. They symbolize hard work, dedication, and success in various fields of endeavor.

TROPHY PRESENTED TO COLLEGE PRINCIPAL

TROPHY PRESNTED TO CHIEF GUEST

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10. COST ESTIMATION

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10. COST ESTIMATION

FACTORS

- **Material type: PLA (poly lactic acid)**
- **Density: g/cm^3 - 1.24**
- **Filament diameter mm:1.75mm**
- **Filament length: NA**
- **Filament weight: N/A**
- **Price/kg :1499/-**
- **Cost per hour: 160/-**
- **Labour cost: no labour cost**

COST IS ESTIMATED BY ALL THESE FACTORS

PRICE OF ONE TROPHY: 1659/-

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