

# Materials 3D Printing

FDM: Fusion Desposition Modeling

1. CAD Model> Slicing> 3D Printing (Layer by layer operation)

What ever we produce using 3D Printing can we produce it using anyother maufacturing machine?

No we cannot !!

## Materials

Raw Material Can be of many forms

1. Liquid : 1 lakh to 6 lakhs
2. Solid Form (FDM): This is the cheapest, 15k or less, here PLA (Polymers) is used which will cost around 800 rupees
3. Powder form : 50lakh to 1 crore
4. Sheets

other 3D Printers cost 2lakhs

whereas FDM based cost 15k only

In FDM we require a Support Material

the material will pass through the nozzel and at the nozzel the materil will be heated above its melting point !! like 220 degrees centegriade

The nozzel temperature must be greater than the melting point of the material that we are using whether it is PLA or anything

The bed temperature cannot be at room temperature

It completely depends upon the material that we are using

if the melting temperature of the material is 220 degrees  
the base must be at 60 degrees or more

## **FDM**

- It is the most economical process
- 15 k or less
- easy to learn, easy to get trained

Disadvantage

- It requires Support material !!

## **Materials Used in FDM**

Polymers will be of two types

- Thermosets and thermoplastics
- Thermosets cannot be melted and cannot be reshaped
- so we use thermoplastics which can be melted and reshaped for 3D printing !!

All the material Like PLA, ABS etc... all are thermoplastics

## **Injection Modelling**

Chairs are manufactured using Injection Modelling !!

and they use thermoplastics as a material !!

there are many disadvantages for injection modelling so we go with 3D printing

## **3D printing**

## Applications

1. Prototype Manufacturing !!

## Materials used in FDM

1. PLA, ABS are standard plastics
2. Engineering Plastics: PET, TPE, HIPS, PVA ..etc
3. Advanced Plastics: PEEK .. etc

## PLA (Poly Lactic acid)

Melting temperature: 180degrees

Bed temperature: 50 degrees

printing temperature: 210 degrees

### Advantages

- It is biodegradable

### Disadvantages

- it is weak

## ABS (Acrylonitrile butadiene styrene)

This is much better than PLA

### Advantages

it has many advantages

### Disadvantages

challenged to print

we need a box to print it

we need a heating chamber and maintain the temperatures

**Pet-G,**

**Peek (poly ether ether ketone)**

This is the best material !!

very expensive

60k/kg

**Carbonx PETG\_<sub>CF</sub>**

this is the best solution and it will have better properties than all of the other materials

available at 4900/ kg

PLA\_<sub>CF</sub>= 2699/kg (This is also the best)

## **Glass transition temepature**

The temperature above which the material will become rubbery

This is a major concern once after printing the model

example for a model printed using PLA cannot survive above the temperatures of 60 degrees, it will melt !!

because the glass transition temperatures of the PLA is 60 degrees