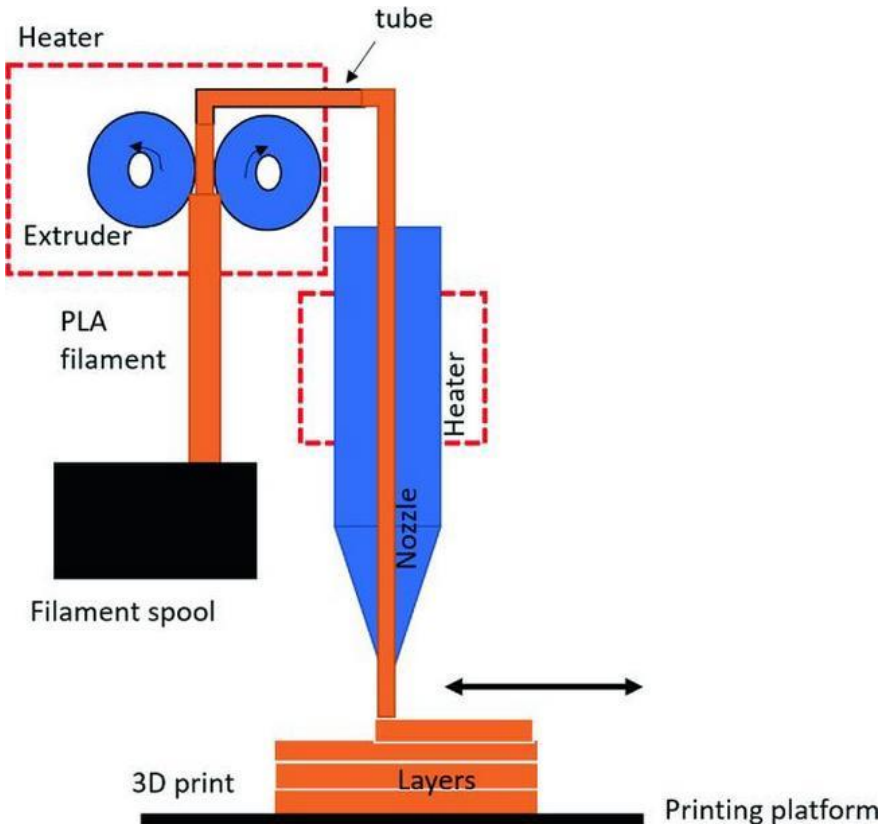
UNIT-3- LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING

Fused deposition Modeling (FDM)

What is fused deposition Modeling FDM?

Fused deposition modeling (FDM), also known as the **material extrusion additive manufacturing technique**, utilizes polymers as the raw material (filament). The filament is usually heated to a molten state and then extruded through the nozzle of the machine



There are various materials used in FDM and as stated earlier, PLA is the most adopted material by most 3D printer users at domestic and industrial levels due to the following reasons:

- Polylactic acid (PLA) is a bioplastic and therefore eco-friendly and not harmful to human and animal health. PLA is a green material since it is fabricated from fully renewable sources such as corn, sugarcane, wheat or any other high carbohydrate containing resources [12]. As such, it is recommended for use in making cooldrink cups, deli and food take aways, and packaging containers.
- PLA has a glass transition temperature ranging between 50 and 70°C and a melting point temperature ranging between 180 and 220°C [13–15]. As such, most low-energy and cost-effective 3D printers can extrude it. It is harder than Acrylonitrile butadiene styrene (ABS) although it (PLA) has higher friction when compared to ABS and therefore susceptible to extrusion blockage.
- PLA plastics are compostable and break down quickly upon disposal unlike the other plastics, which have posed serious disposal challenges. Being among the biopolymers, PLA degrades to natural and non-poisonous gases, water, biomass and inorganic salts when it is exposed to natural conditions, hydrolysis or even when incinerated.
- In its semi-crystalline form, PLA has shown to exhibit good flexural modulus, better tensility and flexural strengths.
- PLA is preferred by most 3D printer users because it does not always need a heated bed for the adhesion to occur between the print and the platform. Graphene-doped PLA, however, presents a great challenge for non-heated bed printers and it does not produce quality prints on non-heated build plates.
- PLA is commercially available in the market in a variety of colours and textures. This makes it attractive for users, especially domestic and decorative 3D printer handlers. The availability in various colours and texture has expanded the markets for CAD designers and toy enthusiasts. As such, the designers can develop interesting ideas and post in various databases (such as TurboSquid, CG Trader, Shapeways, Cults3D, 3DSquirrel and Thingsverse) where the toy enthusiasts can

purchase, download and print with a variety of colours and texture designs of the PLA filaments.