3D Printer

Rahul Verma[1], Anil Dhankhar[2], Nirmala Choudhary[3]
[1]Dept of MCA
[2]Assoc. Professor, Dept of MCA
[3]Asst. Professor, Dept of MCA
[1, 2, 3] RIET Jaipur

Abstract- *Additive manufacturing, often referred to as 3D printing, has the potential to vastly accelerate innovation, compress supply chains, minimize materials and energy usage, and reduce waste.*

Additive manufacturing, often referred to as 3D printing, is a new way of making products and components from a digital model. Like an office printer that puts 2D digital files on a piece of paper, a 3D printer creates components by depositing thin layers of material one after another, only where required, using a digital blue print until the exact component has been created.

Interest in additive techniques is growing swiftly as applications have progressed from rapid prototyping to the production of end-use products. Additive equipment can now use metals, polymers, composites, or other powders to "print" a range of functional components, layer by layer, including complex structures that cannot be manufactured by other means.

Keywords- 3D Printer, Additive manufacturing, Extrusion deposition, Photo polymeriszation, Lamination Applications, Advantages, Disadvantages

I. INTRODUCTION

3D printing or additive manufacturing (AM) is any of various processes for making a three-dimensional object of almost any shape from a 3D model or other electronic data source primarily through additive processes in which successive layers of material are laid down under computer control. A 3D printer is a type of industrial robot.

Early AM equipment and materials were developed in the 1980s. In 1984, Chuck Hull of 3D Systems Corp, invented a process known as stereo lithography employing UV lasers to cure photopolymers. Hull also developed the STL file format widely accepted by 3D printing software, as well as the digital slicing and infill strategies common to many processes today. Also during the 1980s, the metal sintering forms of AM were being developed (such as selective lasers intering and direct metal lasers intering), although they were not yet called 3D printing or A Mat the time. In 1990, the plastic extrusion technology most widely associated with the term "3D printing" was commercialized by Stratasys under the name fused deposition modelling (FDM). In 1995, Z Corporation commercialized an MIT-developed additive process under the trademark 3D printing (3DP), referring at that time to a proprietary process inkjet deposition of liquid binder on powder.

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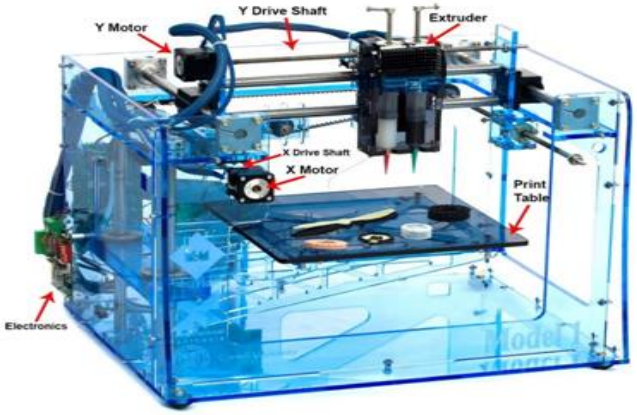
II. . 3D-PRINTER

3D-Printer is a machine reminiscent of the Star Trek Replicator, something magical that can create objects out of thin air. It can "print" in plastic, metal, nylon, and over a hundred other materials. It can be used for making nonsensical little models like the over-printed Yoda, yet it can also print manufacturing prototypes, end user products, quasi-legal guns, air craft engine parts and even human organs using a person's own cells.

We live in an age that is witness to what many are calling the Third Industrial Revolution. 3D printing, more professionally called additive manufacturing, moves us away from the Henry Ford era mass production line, and will bring us to a new reality of customizable, one-off production.



III. ADDITIVE MANUFACTURING

Additive manufacturing is a truly disruptive technology exploding on the manufacturing scene as leading companies are transitioning from "analog" to "digital" manufacturing. Additive manufacturing uses three dimensional printing to transform engineering design files into fully functional and durable objects created from sand, metal and glass. The technology creates products layer by layer – after a layer's particles are bound by heat or chemicals the next layer is added and the binding process is repeated. It enables geometries not previously possible to be manufactured. Full-form parts are made directly from computer-aided design (CAD) data for a variety of industrial, commercial and art applications.

Manufacturers across several industries are using this digital manufacturing process to produce a range of products, including: engine components for automotive applications, impellers and blades for aerospace use, pattern less sand moulds for pumps used in the oil and energy industry, and medical prosthetics which require easily adaptable design modifications.

IV. EXTRUSION DEPOSITION

In extrusion deposition, Fused Deposition technique is used. Fused Deposition Modelling (FDM) was developed by Stratasys in Eden Prairie, Minnesota. In this process, a plastic or wax material is extruded through a nozzle that traces the part's cross sectional geometry layer by layer. The build material is usually supplied in filament form, but some setups utilize plastic pellets fed from a hopper instead. The nozzle contains resistive heaters that keep the plastic at a temperature just above its melting point so that it flows easily through the nozzle and forms the layer. The plastic hardens immediately after flowing from the nozzle and bonds to the layer below. Once a layer is built, the platform lowers, and the extrusion nozzle deposits another layer. The layer thickness and vertical dimensional accuracy is determined by the extruder die diameter, which ranges from 0.013 to 0.005 inches. In the X-Y plane, 0.001 inch resolution is achievable. A range of materials are available including ABS, polyamide, polycarbonate, polyethylene, polypropylene, and investment casting wax.

V. LAMINATION

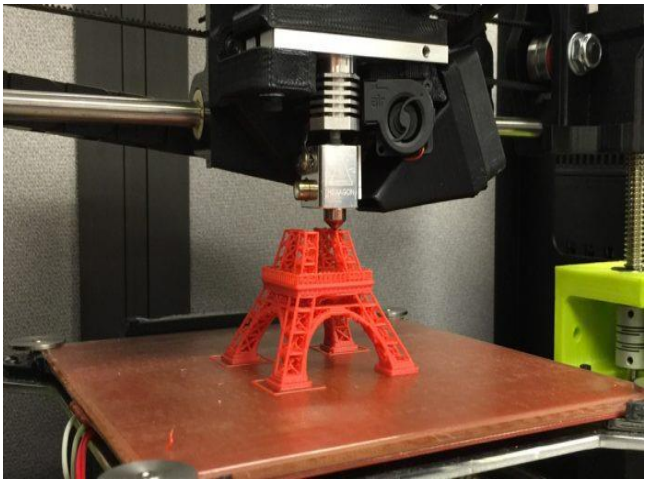
Laminated Object Manufacturing works by layering sheets of material on top of one- another, binding them together using glue. The printer then slices an outline of the object into that cross section to be removed from the surrounding excess material later. Repeating this process builds up the object one layer at a time. Objects printed using LOM are accurate, strong, and durable and generally show no distortion over time which makes them suitable for all stages of the design cycle. They can even be additionally modified by machining or drilling after printing. Typical layer resolution for this process is defined by the material feed stock and usually ranges in thickness from one to a few sheets of copy paper. Mcor's version of the technology makes LOM one of the few 3D printing processes that can produce prints in full colour.

VI. APPLICATIONS

Three-dimensional printing makes it as cheap to create single items as it is to produce thousands and thus undermines economies of scale. It may have as profound an impact on the world as the coming of the factory did. Just as nobody could have predicted the impact of the steam engine in 1750 or the printing press in 1450, or the transistor in 1950. It is impossible to foresee the long-term impact of 3D printing. But the technology is coming, and it is likely to disrupt every field it touches.

Standard applications include design visualization, prototyping/CAD, metal casting, architecture, education, geospatial, healthcare, and entertainment/retail.

3D printer came with immense number of applications. All the traditional methods of printing causes wastage of resources. But 3D printer only uses the exact amount of material for printing. This enhances the efficiency. If the material is very costly, 3d printing techniques can be used to reduce the wastage of material.



VII. ADVANTAGES

- Ability to personalize every product with individual customer needs.
- Additive manufacturing can eliminate the need for tool production and therefore reduce the costs, lead time and labour associated with it.
- 3D printing is an energy efficient technology..
- Lighter and stronger products can be printed.
- Increased operating life for the products..
- 3D printing can create new industries and completely new professions.
- Printing 3D organs can revolution a rise the medical industry.

VIII. DISADVANTAGES

- Since the technology is new, limited materials are available for printing.
- Consumes more time for less complicated pats.
- Size of printable object is limited by the movement of extruder.
- In additive manufacturing previous layer has to harden before creating next layer.
- Curved geometry will not be much accurate while printing.

IX. CONCLUSION

The world is forever changing with the help of 3D printing. The use of 3D printing for medicinal purposes today is beyond astonishing but what the future holds is unknown, however It is certain that additive layer manufacturing will be a large corporate in solving our problems. 3D printing really is limitless and only the surface has been scratched, there is still much more to be uncovered. 3D printing bones is still new and continuously improving and adjusting but it has already enhanced the life of many patients around the world. It is evident that the more funding and research put into 3D printing, the further 3D printing will take us. 3D is forever unpredictable. “If a picture is worth a thousand words… A prototype is worth a thousand pictures.

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