

# AN OVERVIEW OF 3D PRINTING

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## **Abstract**

*Since the Industrial revolution machine tools, economies of scale, production line and factories have been synonymous to manufacturing. 3D printing is a widely used technology also known as an additive manufacturing process to minimize energy and materials to accelerate innovation. It has been more than 35 years since the invention of 3D printing, currently; individual 3D printers are available in the smaller size and at economical cost. In USA 3D printing technology has emerged and is been used in the automotive sector widely. 3D printing has become more and more attractive in recent years. The idea of machinery that can print items much like a paper-based inkjet printer has encouraged manufacturers to declare 3D printing to be "the next industrial revolution." Other analysts responded with scepticism and pointed to the current limitations of technology as well as to relatively low adoption rates. 3D printing or 'additive manufacturing' as it is called, could become the world's biggest disruptive technology. Paper will discuss about the growth of 3D printing worldwide, different types of methods known to the engineers, its implications in manufacturing and detailed working of 3D printing. Engineers have managed to develop new software to aid in 3D manufacturing which also has been discussed below.*

**Keywords:** Additive Manufacturing (AM), Fused Deposition Modelling (FDM), 3D Printing, Printers, Sound System Lithography (SLA).

## **I. INTRODUCTION**

Technology is moving in a quick speed these days and in such countless various ways that it turns out to be hard to focus on one explicit technology. Headway in the additive manufacturing (AM) innovations otherwise called 3D printing over recent years has changed the methods of manufacturing and nature of manufacturing radically [1]. Due to this technology engineers have figured out how to investigate new measurements in planning, they have figured out how to fabricate more current, more secure, lighter and even cleaner items in practical expenses. While for the most part OEM's and various providers utilize this technology for quick prototyping yet it is intriguing to realize that it comes helpful even in

item advancement [2]. This new technology coupling alongside cutting edge and better material is profiting creation. Additive manufacturing or 3D printing has been around for over 20 years, it was first created by engineer Chuck Hall, and he grew first since forever 3D printing measure called sound system lithography in 1983 which utilizes bright treatable material to make strong articles. This strategy is as yet utilized generally among the producers.

For vehicle industry on-going improvements in 3D printing have determined new extent of more secure, more grounded, lighter and more vigorous items, planning of the car parts or car begins with the scale model speaking to real frame which is likewise additionally utilized for aerodynamic testing.

High itemized scale models are produced with the assistance of material streaming and SLA. Regularly prototyping utilizing 3D printing is utilized among manufacturing; from side reflection of the vehicle to guard 3D printing has expanded reach with high exactness. The greatest advantage of 3D printing is its general expense [3]. Due to its interest prototyping arrangement, the amount of creation in the automotive industry is often high because it plays a major step in money saving advantage and in times the executives. These days increment in the size of printers, at the speed they can print gives practical alternative for enormous and medium producers. In the serious market were cost is extremely touchy for shoppers 3D printing has critical effect. Parts can be altered to explicit client or vehicle. At first since forever material which was utilized for 3D printing was photograph treatable tar. Indeed, even there are various sorts of 3D printing for various purposes [4]. Assortment of items can be made without the assistance of enormous office utilizing 3D printing technology, it can fabricate huge and at the same time substantially more mind boggling plans. As of late couple of parts of electric model were created with the assistance of 3D printing.

### **Different Types Of 3D Printing Techniques, Categorised By Type Of Material Used:**

#### **I. Liquid based process:**

By means of a liquid resin called photopolymer, the first 3D printer class produces layers of material which selectively solidify when exposed to laser or other light. Many 3D printers have constructed object layers in a liquid tank for such image polymerization. Others, meanwhile, release a single sheet of resin and use ultraviolet light before adding the next coating to make it stronger. In the same printing job, a few later 3D printers based on technologies will combine many different photo polymers to allow them to create items made of several materials.

#### **II. Power based process:**

By selecting successive layers of very fine powder to bind together, a broad, second class of 3D printing or (AM) hardware constructs an artefact. Such adhesion to powder or granular materials may be accomplished by jetting the adhesive to the surface of the powder or by fusing the powder granules together with a laser or other thermal source [5]. In addition, as they are put on a building sheet, the flakes of a powdered material melt and mix. The other

innovations with a powdered material melt and mix as they are placed on a build layer. Other 3D printing methods are now commonly used in a wide variety of materials, with varying types of powder adhesion. Many of these include nylon, cobalt, bio-plastic, wax, ceramics, stainless steel, titanium and bronze.

### III. Solid based process:

By extruding semi-liquid or molten material from the print head nozzle, some 3D printers operate. Molten thermoplastics are used in most situations. Molten metal or chocolate/cake frosting is used by some 3D printers for crating culinary creations.

### IV. Paper based process:

By extruding semi-liquid or molten material from the print head nozzle, some 3D printers operate. Molten thermoplastics are used in most situations. Molten metal or chocolate/cake frosting is used by some 3D printers for crating culinary creations.

### Operation of 3D Printing:

Just imagine designing an exact prototype of a vehicle. It will begin by cutting solid pieces of wood from inside to outside and forming a car's form slowly. A laser could simply cut wood to bring it into form and now it is not a rocket science to automatically train a robot arm to carve the shape, but 3D printing systems do not use any of these technologies, in fact it is like our computer's traditional ink jet printer [6]. Fused deposition modelling (FDM) is used in which printer continuously prints layer by layer by depositing deposition materials for example plastic. A 3D Cad template is transformed into a two-dimensional layer, inserting layer by layer to form a 3D model. The printer deposits 2D plastic or powder layers instead of using ink and fuses them together with the assistance of adhesive to form the desired model.

### 3D Printing Innovations in Car Manufacturing:

In 2014 Local Motors originally printed an electric vehicle with the assistance of 3D printing with the utilization of carbon filler mix known as strati, made in just 44hrs. Additive manufacturing machine is utilized for printing strati from thermoplastic. This is completely recyclable machine which can be reprocessed and hacked and again be utilized for next vehicle manufacturing [7]. After the whole structure of the vehicle is 3D printed, at that point other electrical and mechanical segments, for example, motor; gear box, drive train, battery, suspension and so forth are physically gathered. Some little non OEM's organizations supply parts to Local Motors. For organization like this having decentralized manufacturing measure 3D printing technology gives wonderful cross section plans. Not limited to vehicles 3D printing technology is even utilized for wide scope of transports.

Driving organizations, for example, American goliath Ford additionally utilizes 3D printing technology for manufacturing save parts [8]. German organization BMW likewise utilizes 3D printing and displaying to produce save hand instruments for gathering of vehicles. GM utilizes different innovations, for example, sound system lithography and particular laser

sintering. Wide assortments of side back view reflect are made my Chrysler utilizing 3D displaying. While utilization of prototyping has been exceptionally fruitful in 3D printing yet some enormous producers have likewise progressed new phases of this technology, these makers have arrived at new degrees of 3D printing advancements manufacturing dances, hand device figures and so forth and furthermore utilizing creative and new material.

### Software Used In Car Production for 3D Printing:

3D printing technology allows templates, research, prototyping, and manufacturing to be more effective in nature. Technology helps designers to create printable prototypes, and is the first significant phase in the production of vehicle components that are modelled in 3D. Editors and software that can monitor hardware for modelling are needed to use the capability of this technology.

Standard software's used are:

- Netfabb
- Dreamcatcher
- Stratasys
- Solid Works
- Solid Edge
- Creo

### The Applications of 3D Printing:

- I. *Aerospace:* NASA engineers used 3D modelling to create 70 percent of the parts of a rover. The development of complex shapes is capable of additive processing or fused deposition modelling (FDM). Materials including polycarbonate, PCABS and ABS were used by NASA.
- II. *Architecture Industry:* With the aid of 3D jet printing technology, smooth and detailed architectural models can be created.

## II. CONCLUSION

3D printing is the latest worldwide rising technology for potential scopes of new vehicle production and developments. 3D printing will also play a significant role in the mass manufacturing industry, generating confidence and expertise in terms of design in the automobile process, which will deliver better material usage and mass reduction. Additive manufacturing is a general category of tool and method of design where it is possible to increase the main product life cycle and practical efficiency, such as reliability, cost and manufacturability. The technology behind 3D printing is easy, relative to other conventional techniques. If 3D printing technology is to be fully transformed in the global market, it should be capable of generating mass manufacturing at the same pace as other conventional processes, since factories essentially need a high production volume to satisfy demands continuously. Some claim that hybrid systems that mix existing technology with the latest will be established in the recent future, but it is understood that 3D printing is not a question

for the future, and its benefits have been very well known. It is shown that with the help of 3D printing, it is possible to create a sand model of an automobile design that reduces previous conventional measures comprehensively. In other words, conventional methods and 3D printers have become famous for fusion. The current state of 3D printers in the manufacturing of DDM metal parts is that they are primarily available for prototyping and less so for components that are mass-produced. One reason is that there is currently no need for metal parts created using DDM for customers like OEM. Since it cannot produce output quickly, according to the current 3D technology, the best way to use a 3D printer is to build a prototype of a design, it is not at all sufficient for rapid mass production, but because of some new software technologies and powerful computers, 3D technology development can be rapidly improved.

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