3d Printer, A Revolutionary Machine !

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Abstract- *In 21st century people is become more mature and advanced with digitalization, it is introducing digital as well as mechanical manufacturing machine to reduce their work and save their time and money. 3D printing or 'personal fabrication', as a newly emergent technology. 3D printing often referred to as Additive manufacturing, has the potential to immensely accelerate innovation, compress supply chains minimize materials, energy usage and reduce waste of material with saving money. Our project is about to make the personal manufacturing available to everyone at low cost of printing. To make this happen we used REPRAP technology which also stands for a same. By using this technology, we can make parts which are difficult to produce by convention method and make available manufacturing at place where one cannot produce part by convention method. 3D printing technology is a largesse for humans. It is the process by which one can form any solid shape, including complex structures that cannot be manufactured by other means from a digital model. 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.*

Keywords- Personal manufacturing, Additive manufacturing, Inexpensive 3Dprinter, 3D printing services, Rapid Prototyping, REPRAP technology, Fused Deposition Modelling

I. INTRODUCTION

3D Printer is type of Additive Manufacturing Process which can create three dimensional object by depositing a layer by layer of different materials like (i.e., Plastic, Metal,). . Plastic is currently the only widely used material — usually ABS or PLA. The Additive Manufacturing (AM) process is more convenient compared to traditional manufacturing like Milling, Drilling, Casting ...etc. Additive manufacturing can produce product directly from their 3D CAD Model without additional tools or fixtures.

Several different 3D printing process has been invented since the late 1970s. Additive manufacturing equipment and material were developed in the 1980s.The Printer were originally large, expensive and highly limited in what they could produce.

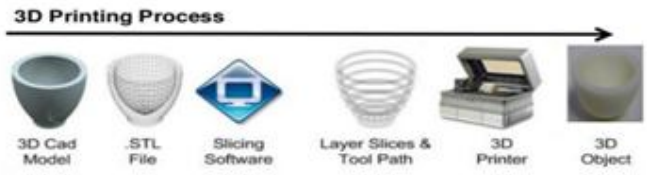
The Technology for printing physical 3D Object from digital was first developed by CHARLES HULL in 1984. He names the technique as stereo lithography and obtained a patent for the technique in 1986. In 1993, Massachusetts Institutes of Technologies (MIT) patented another technology named "Three Dimensional Printing Techniques" which is similar to the inkjet technology used in 2D Printer. In 1996, three major products, "Genisys" from Stratasys, "Actua" 2100 from 3D system and "Z402" from Z Corporation, were introduced. In 2005, Z Corporation launched a breakthrough product, named Spectrum Z510 which was the First High Definition Color 3D Printer in the market. These technologies enjoyed some local success but couldn't really impact the global market around that time. First, there was the high end of 3D printing, still very expensive systems, which were geared towards part production for high value, highly engineered, complex parts. At the other end of the spectrum, some of the 3D printing system manufacturers were developing and advancing 3D printers that kept the focus on improving concept development and functional prototyping. These were built to be cost-effective systems. However, these systems were all still very much for industrial applications. 2007 was the year the shoots started to show through and this embryonic, open source 3D printing movement started to gain visibility. 2012 was also the year that many different mainstream media channels picked up on the technology. 2013 was a year of significant growth and consolidation. One of the most notable moves was the acquisition of Makerbot by Stratasys

Heralded as the 2nd, 3rd and, sometimes even, 4th Industrial Revolution by some, what cannot be denied is the impact that 3D printing is having on the industrial sector and the huge potential that 3D printing is demonstrating for the future of consumers..

II. PROCEDURE OF 3D PRINTING

There are some procedures for printing. First you must create a computer model for printing the object. For creating that, you can use Computer Aided Design Software

like AutoCAD, 3DS MAX, Google SketchUp..Etc. After the object file is created the file need to be modified. The object file contains numerous amount of curves. Curves cannot be printed by the printer directly. The curves has to be converted to STL (Stereo lithography) format. The STL file format conversion removes all the curves and it is replaced with linear shapes. Then the file need to be sliced into layer by layer. The layer thickness is so chosen to meet the resolutionof the 3D printer we are using. If you are unable to draw objects in CAD software, there are many websites available which are hosted by the 3D printing companies to ease the creation of 3D object. The sliced file is processed and generates the special coordinates. These coordinates can be processed by a controller to generate required signal to the motor for driving extruder. This layer by layer process generates a complete object.



3D Printer are based on an X-Y-Z, 3-axis, Cartesian, orthogonal grid. The X-Y axes usually define a horizontal plane, with the Z-axis being vertical, the object is formed in one X-Y plane at a time, with the Z-axis incrementing continually in steps for each Z-axis increment, an X-Y plane is printed. The Head in the X-Y plane may move in a repetitive scanning pattern, or in a series of vector motions, or both.

III. STUDIES AND FINDINGS

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 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.

The Entire 3D printing technology can be divided into 3 steps – (a) 3D Design (b) Slicing (c) 3D Printing. 3D digital model is the starting point for any 3D printing process. This digital model can be created using various 3D design software's or also can be created using 3D scanning. Once the 3D model is created, it is then sliced into layers thereby converting the design into a file readable by 3D printer. 3D printer will then print this file layer by layer using the material given as input to the 3D printer. Because parts can be printed directly, it is possible to produce very detailed and intricate objects.

Major Component of 3D Printer are:-

1) The Frame,
2) Head Movement Mechanism,
3).Stepper Motors,
4) The Print Head/Extruder,
5) Power Supply,
6) Controller.

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.

The 3D printing process allows the creation of parts and/or tools through additive manufacturing at rates much lower than traditional machining

3D printing provides a wide variety of manufactured products, including customizable products and even an individual's personal designs.

An average Costs of 3d Printing per gram of the Object is around less than Rs.2/-(Particularly in PLA material)

The Advantages of 3D Printing:-

1) Time-to-Market: 3D printing allows ideas to develop faster than ever. Being able to 3D print a concept the same day it was designed shrinks a development process from what might have been months to a matter of days, helping companies stay one step ahead of the competition.

2) Save Money: Prototyping injection mold tools and production runs are expensive investments. The 3D printing process allows the creation of parts and/or tools through additive manufacturing at rates much lower than traditional machining.

3) Mitigate Risk: Being able to verify a design before investing in an expensive molding tool is worth its weight in 3D printed plastic, and then some. Printing a production-ready prototype builds confidence before making these large investments. It is far

cheaper to 3D print a test prototype then to redesign or alter an existing mold.

4) Clear Communication: Describing the product you are going to deliver is often misinterpreted since it leaves construction up to the imagination. A conceptual picture of the product is better than the description since it is worth 1,000 words, but getting to hold the tangible product-to-be, in hand, clears all lines of communication. There is no ambiguity when holding the exact, or at least a very close, representation of the product.

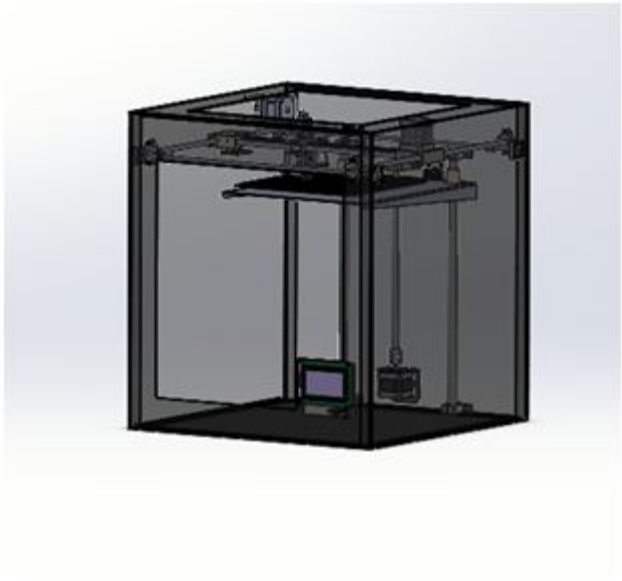
5) Feedback: With a prototype you can test the market by unveiling it at a trade-show, showing it to potential buyers or investors, or raising capital by pre-selling on Indiegogo or Kickstarter. Getting buyers response to the product before it actually goes into production is a valuable way to verify the product has market potential.

6) Get the Feel: One thing you can't get from a picture or virtual prototype on the computer screen is the way something feels in your hand. If you want to ensure the ergonomics and fit of a product are just right, you must actually hold it, use it and test it

7) Build your Imagination: In the modern boom of digital art and design, the possibilities are not only accelerating but limitless. One can now 3D print almost anything they imagine after drawing it up virtually. In a relatively short time, an idea, concept, dream or invention can go from a simple thought to a produced part that you can hold.

8) Square Holes?… No Problem: The limitations of standard machining have constrained product design for years. With the improvements in additive manufacturing, now the possibilities are endless. Geometry that has been historically difficult or impossible to build; like holes that change direction, unrealistic overhangs, or square interior cavities, is now possible and actually simple to construct.

This Revolutionary method for creating models with the use of inkjet technology save time and cost by eliminating the needs to design, print and glue together separate model parts. Now we can create a complete model in a single process using 3D printer.



IV. CONCLUSION

Nothing communicates ideas faster than a three-dimensional part or model. the development and application of 3D printing reminds us that human beings have both a physical and a psychological need to keep at least one foot in the real world. Additive manufacturing only "prints" what you want. where you want it. Other manufacturing techniques can be just as wasteful. 3D printing is the ultimate just-time method of manufacturing.The 3D printer inexpensive,material saving revolutionary machine.Comparing the numerous advantages, applications and future scope, we can conclude that the 3D printer and its technology will able to create next industrial revolution

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