

## THE EXAMPLE OF A PEN HOLDER PRODUCTION IN 3D PRINTER

IZZAT KASS HANNA

### Abstract

*This article describes the production of a simple shape (pen holder) by 3D printer using Fused Deposition Modelling, the features, the problems of the production and the role that the 3D printer can play in the future.*

### Introduction

First of all, we have to define what 3D printing is. 3D printing or additive manufacturing (AM) is a group of various processes which lead to building three-dimensional objects, even the more complicated ones. This kind of technology is a revolutionary way of producing objects, building a potential in the future development. As an input, it uses 3D model or electronic data sources, which are consequently transferred into movements. The material used is laid down layer by layer under the control of a computer. Since there are many types of 3D printing machines, the way of production differs, and the most important types are:

#### 1- Extrusion deposition:

This type of manufacturing uses Fused Deposition Modeling (FDM), and in this process, as shown in Fig. 1, a plastic or wax are extruded from a nozzle. This nozzle contains a resistive heater that keeps the extruded plastic in a temperature just above the melting point. the material hardens immediately after it is situated on the table, the support material comes in a filament way and the model is built layer by layer.

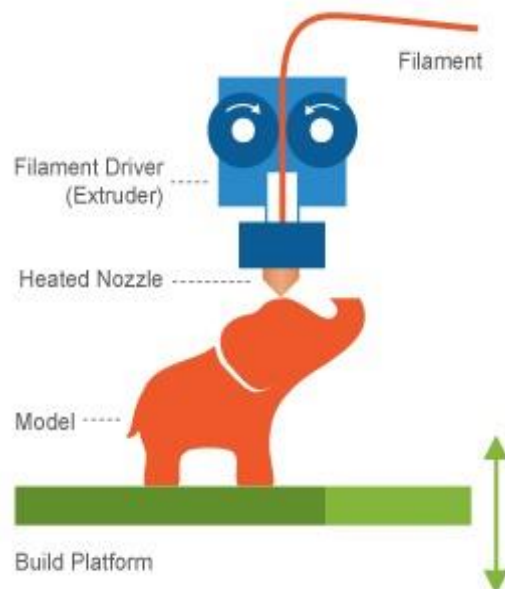


Fig. 1 : Fused Deposition Modeling

#### 2- Selective laser sintering (SLS):

Is a technique that uses laser as power source to form solid 3D objects. This technique was developed by Carl Deckard, and his professor Joe Beaman in 1980s. As shown in Fig. 2, the technique fuses parts of the layer, and then moves the working area downwards, adding

another layer of granules and repeating the process until the piece is built up. This process uses the unfused media to support overhangs and thin walls in the part being produced, which reduces the need for temporary auxiliary supports for the piece. A laser is typically used to sinter the media into a solid.

### 3- Photopolymerization:

Or stereolithography was invented in 1986 by Chuck. It produces 3D solid model from a liquid by being exposed to a light source on the liquid polymer, the liquid hardens and the built plate will move a little bit down and this process will be repeated until the model is finished. This technique is shown in Fig. 3.

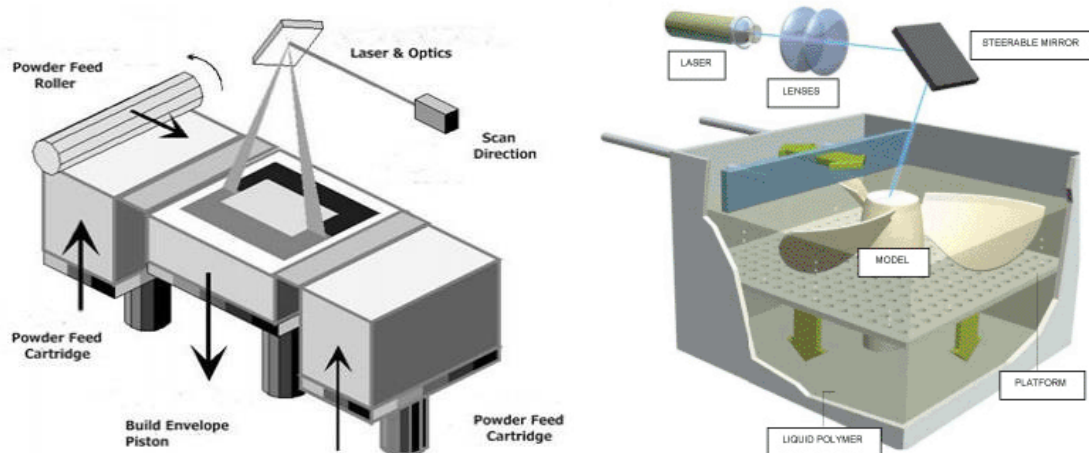
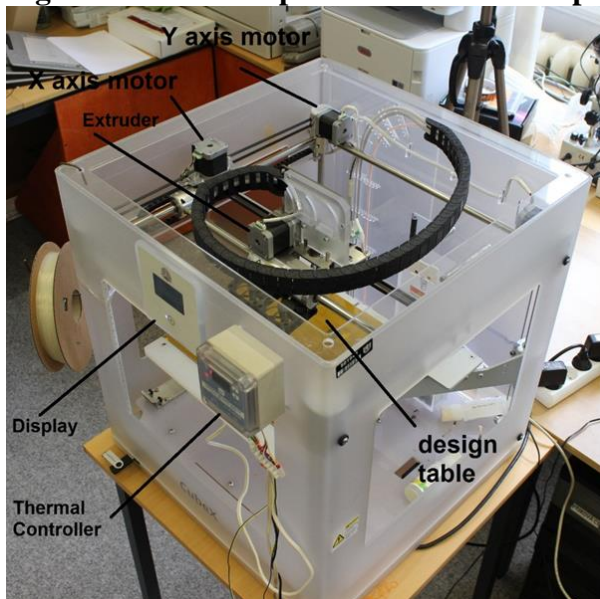


Fig. 2 : Selective laser sintering Fig. 3 : Stereolithography

### Designing and producing

A simple shape of a pen holder was designed using Solidworks program. It was produced using CUBEX 3D printer, the technology used in this printer is the Fused Deposition Modeling.

Fig. 4 shows the 3D printer and the main parts in it.



### The designing part:

The sample has been designed using Solidworks program and then it has been saved in STL file type, so that the machine can read it. After that, the file will be opened by a specific program to make the orders for the machine. The Fig. 5 shows the frontage of the program with the model.

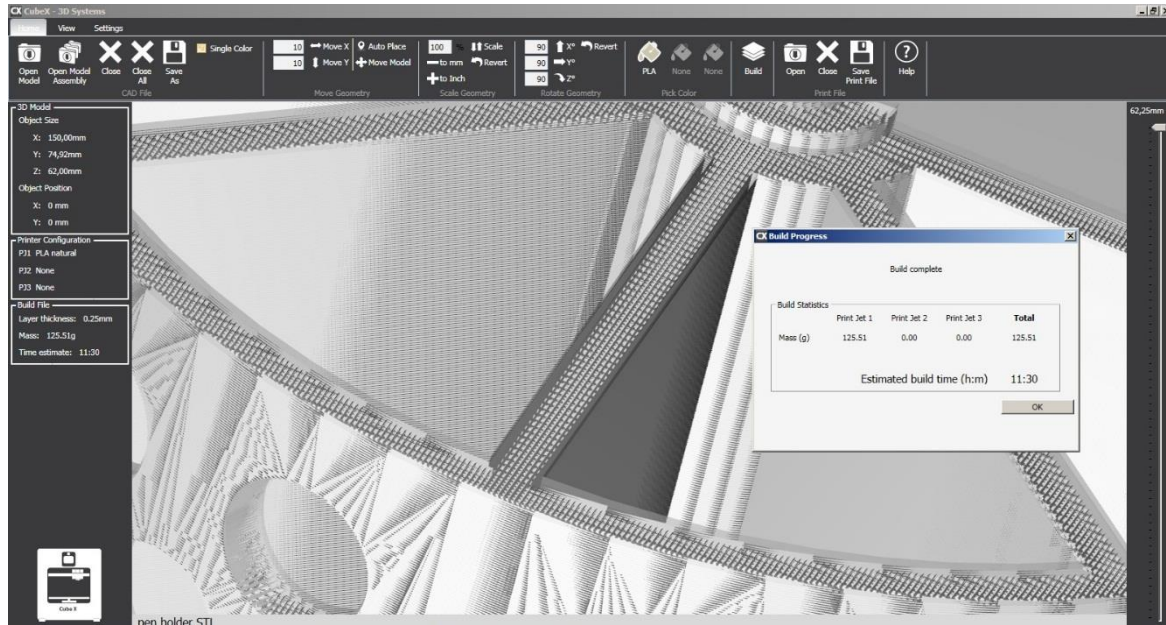


Fig. 5 : 3D printer program.

It is clearly noticed that the program calculated the estimate time for building and the weight of the model depending of the input material and also noticed that the time and weight can change according to the change of the position as shown in Fig. 6.

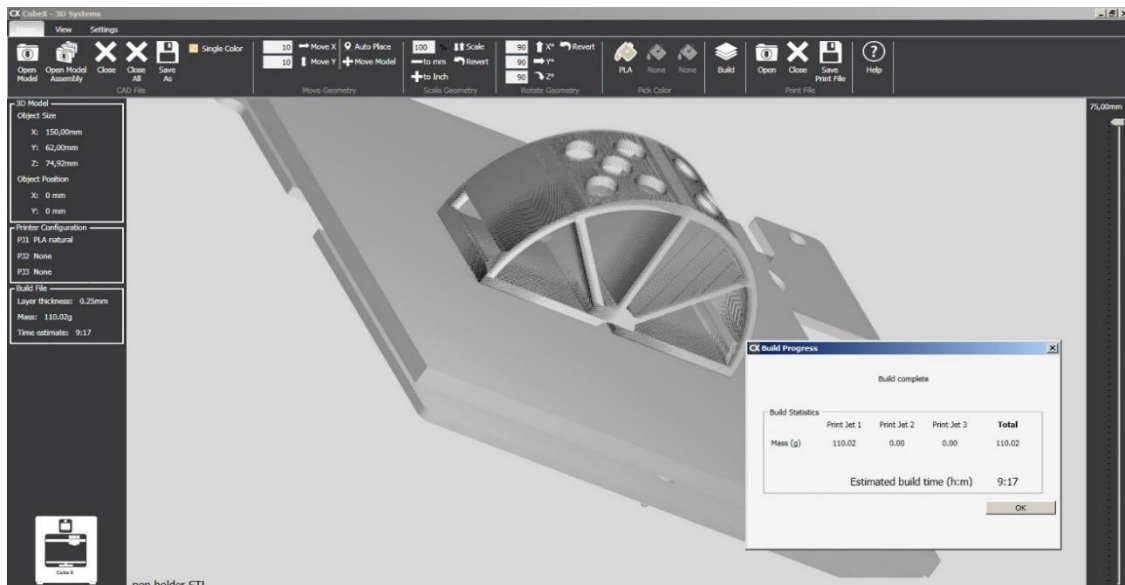


Fig. 6 : 3D printer program.

Fig. 5 shows the weight of the model equal to 125.51g, the estimated time is 11.30 hours and when the real measured is 124g.

During the building, the problem was with the gapes in the model, since that the printer does not have a nozzle for the supporting material. This means limitation in the

abilities of designing complex models, the Fig. 7 shows the production defects during the production and the layer by layer structure.

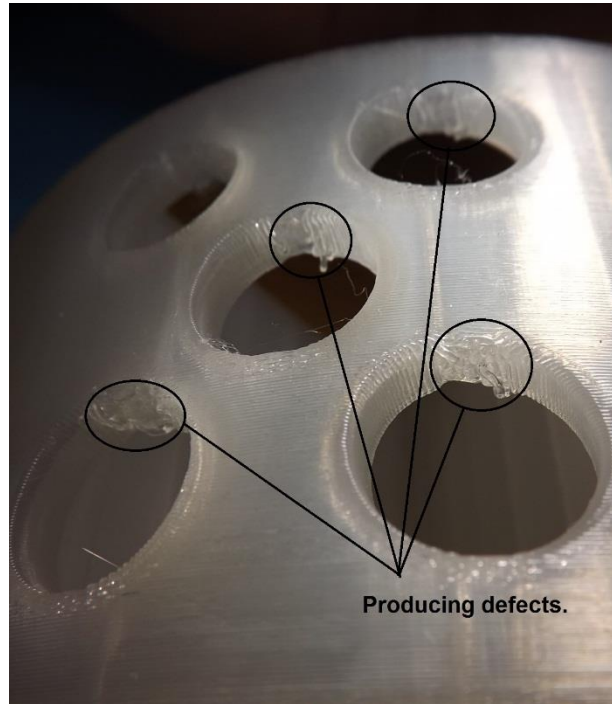


Fig. 7 : defects in production and the structure of the model.

The figure 8. shows the structure of the model under the Microscope with many ranges of zooming

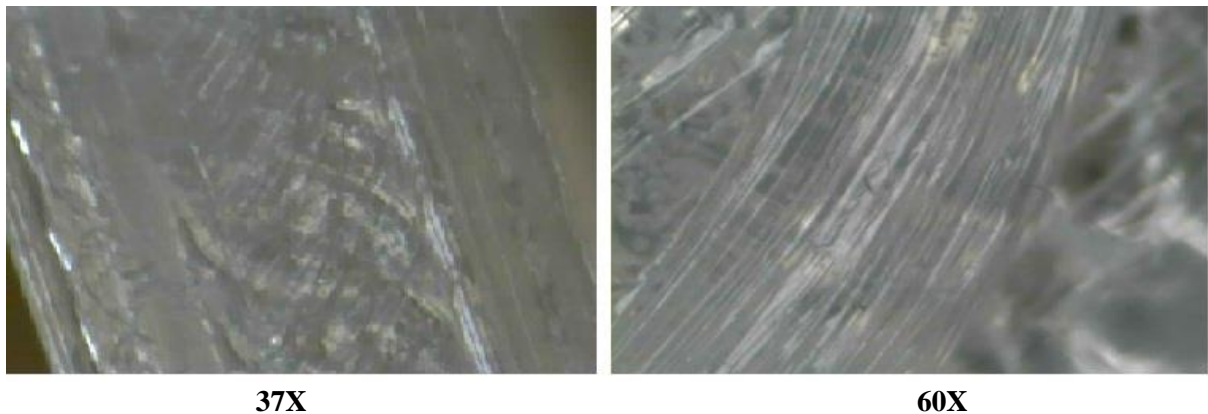


Fig. 8 : the structure of the model under many range of zooming using microscope

## CONCLUSION

This research aimed at showing the 3D printer usage in making a model with the Fused Deposition Modeling technology. The problem that happened during the production was related to the defects in the gapes. The reasons of this problem and how we can increase the accuracy of the produced part and also what role the position of the model during the production process can play in the time of producing and the weight.

## **BIBLIOGRAPHY**

- ARJUN, R. A Seminar Report on Print a New World Using 3D-printer. Cochin University of Science and Technology. August 12, 2014 [cit.2016-04-01]. Available from: [www.slideshare.net/arjunrtvm/seminar-fair-report](http://www.slideshare.net/arjunrtvm/seminar-fair-report), p. 8-17.

## **Other references**

<https://www.researchgate.net/publication/272789911>

Fig .1 [www.printspace3d.com](http://www.printspace3d.com)

Fig. 2 [www.dorotheacarney.com](http://www.dorotheacarney.com)

Fig. 3 <http://intech-ind.com>