



3D Printed V8 Engine Model

Saqer Al Ali, Pratik Dubey, Suresh Kumar Moru, Prashanth Sobhani
Department of Mechanical Engineering
University of Bridgeport, Bridgeport, CT

Abstract

The improvements on accuracy, speed and quality of materials in 3D printing technology have opened new doors for it to move beyond the use of 3D printing in the modeling process and actually move it to manufacturing strategy. 3D printing can be particularly useful in research labs and industrial design.

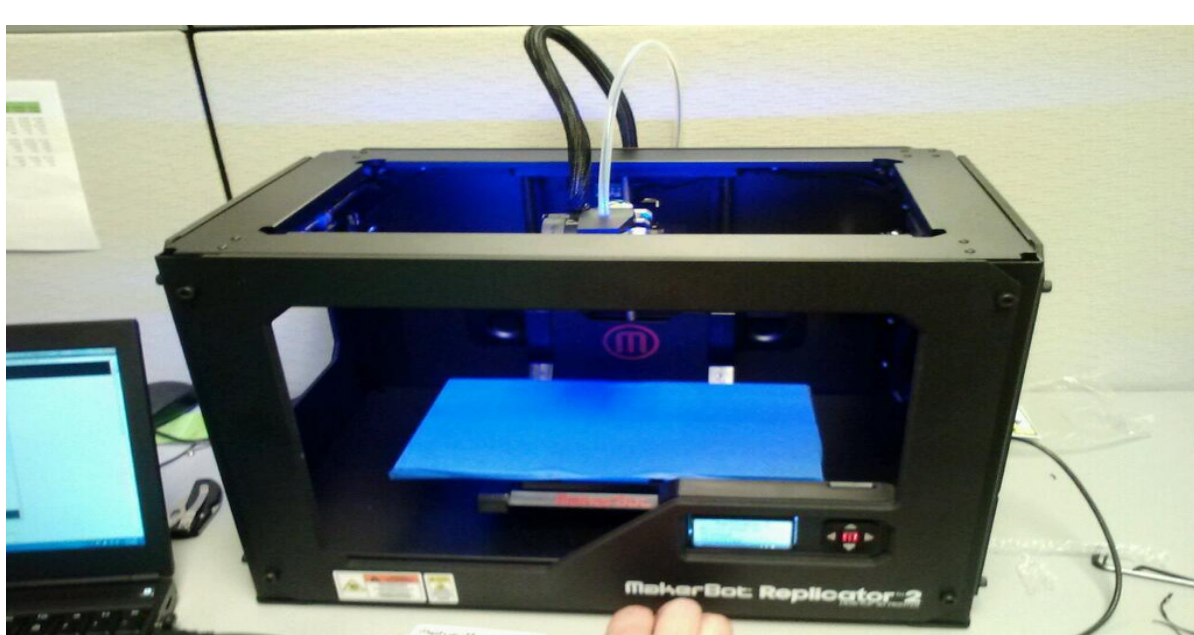


Introduction

3D printing is various processes used to synthesize a three dimensional object. Successive layers of material are formed under computer control to create an object. These objects can be of almost any shape or geometry and are produced from a 3D model or other electronic data source.

More recently, the meaning of the term has expanded to encompass a wider variety of techniques such as extrusion and sintering-based processes.

In this project we have used 3D printing to create a small working model of a V8 engine. This has allowed us as students to truly understand components, component interaction and potential improvements.

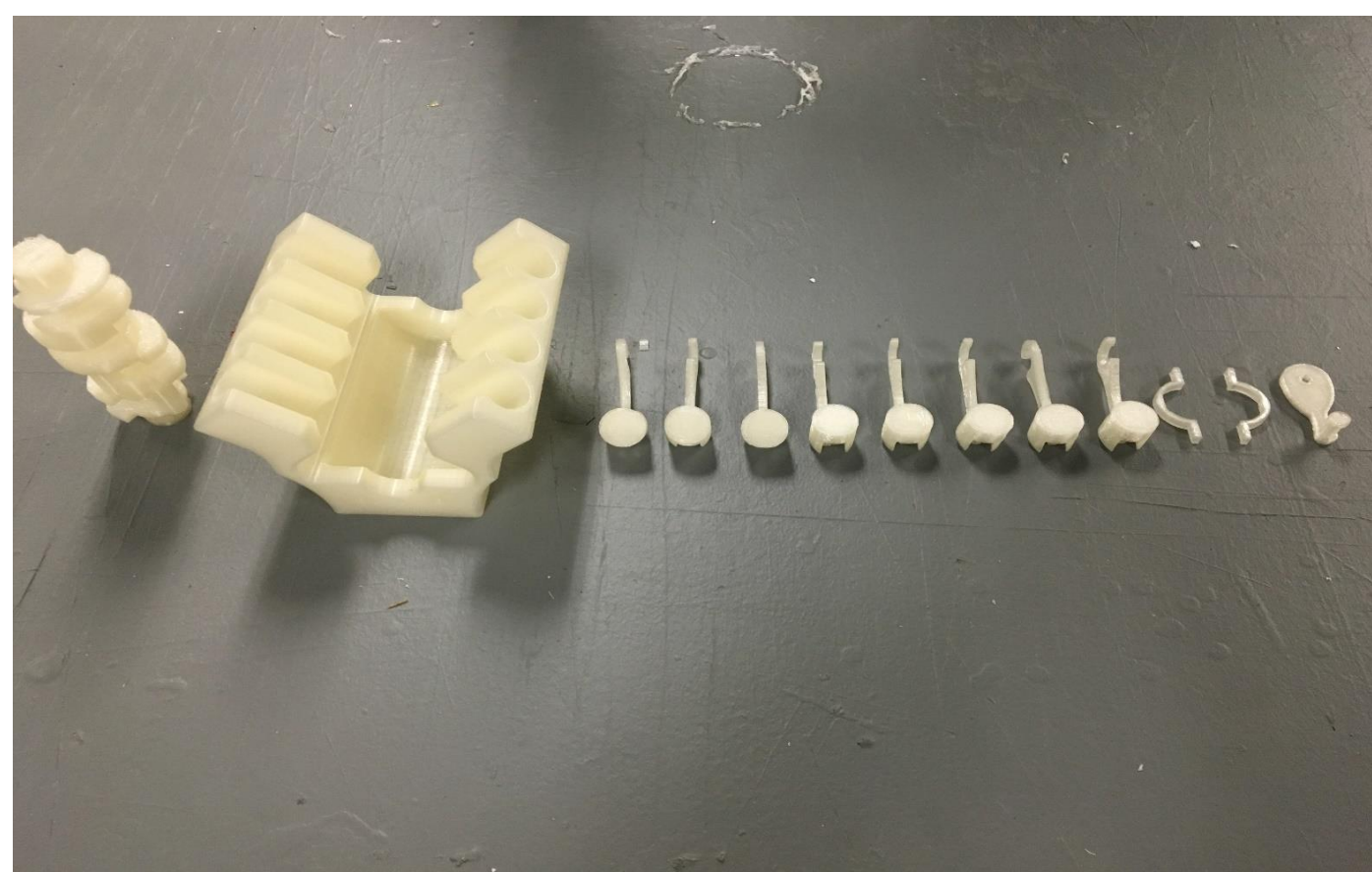


3D Printer (MakerBot)

Engine Components

The 3D printed V8 engine model is composed of the following parts:

- Engine Block
- Crank Shaft
- 8 Pistons
- Connecting Rod



Engine Components

Design Procedures

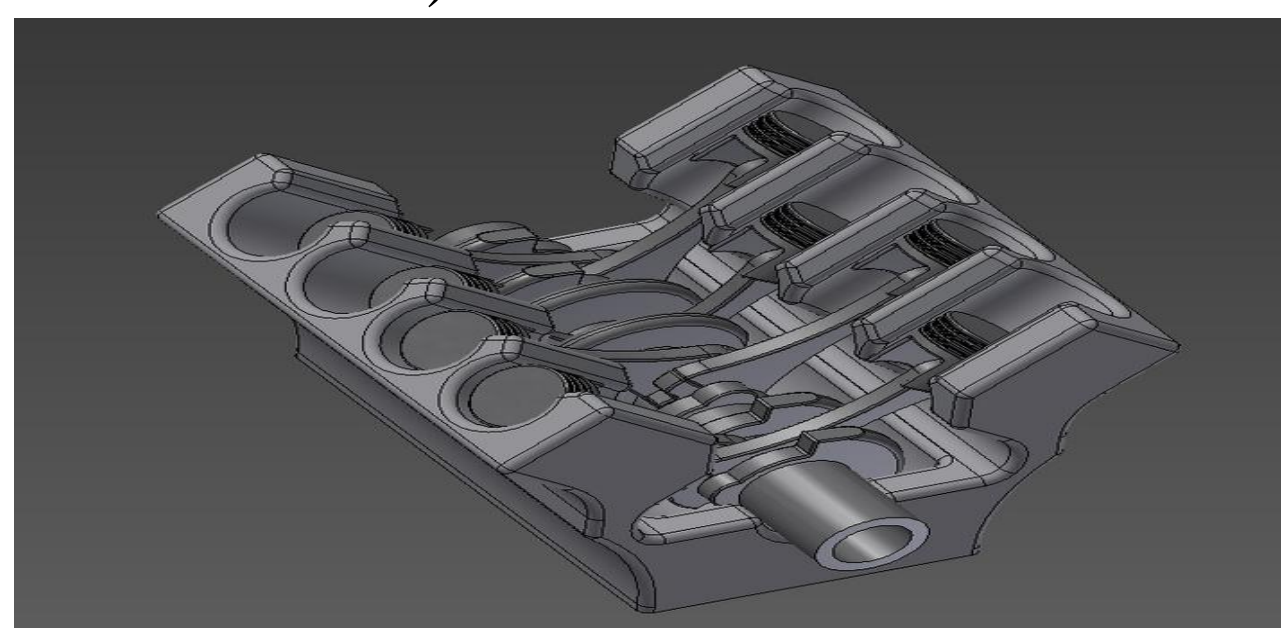
The parts are designed separately in CAD software (SolidWorks, Pro Engineer, etc.).

In addition, parts will be assembled together in CAD software. This is very critical to see if these parts can be assembled before printing them, which helps eliminating design errors.

Then, each CAD file is converted to STL file format. STL is a file format that is needed for a 3D printer to recognize a CAD file.

After that, an STL file is transferred to a 3D printer to be ready printed. The printing method is called fused deposition modeling (FDM). The model or part is produced by extruding small beads of material, which harden immediately to form layers.

A thermoplastic filament or metal wire that is wound on a coil is unreeled to supply material to an extrusion nozzle head (3D printer extruder).



V8 Engine Assembly (SolidWorks)

Discussion

Construction of the model with contemporary methods can take anywhere from several hours to several days, depending on the method used and the size and complexity of the model. Also, the higher quality of the part, the longer duration for it to be finished. FDM is rather restricted in the variation of shapes that may be needed to be fabricated. Sometimes printed parts come with support materials so we have to remove these unwanted materials to get the actual parts. This finishing process should be done carefully otherwise parts can potentially break apart. Lubricants can be used to reduce the surface roughness or friction of the assembled model.

Conclusion

We concluded that 3D printing, and an open source 3D printer in particular, is the latest technology making inroads into the classroom. 3D printing allows students to create prototypes of items without the use of expensive tooling required in subtractive methods. Students can design and produce actual models they desire as long as they are designed and 3D printed properly.

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