Development of Fuel Injector Body by 3D-Printing

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Abstract— Prototyping or model making is one of the important steps to finalize a product design. It helps in conceptualization of a design. When a soft prototype modeled by 3d curves and surfaces could be stressed in virtual environment, simulated and tested with exact material and other properties. third and the latest trend of prototyping, i.e., rapid prototyping (rp) by layer-by-layer material deposition This report, aims at development of Fuel Injector Body by 3D-Printing.The modeling of the component was carried by using features of CATIA software there after modeled file is imported to KISSLICER software which will generate the g-code, and is used to print the component in 3d.

Key words: 3D-Print, Rapid Prototype, CATIA, Fuel Injector Body, KISSLICER

I. INTRODUCTION

RP process belong to the generative (or additive) production processes unlike subtractive or forming processes such as lathing, milling, grinding or coining etc. in which form is shaped by material removal or plastic deformation. In all commercial RP processes, the part is fabricated by deposition of layers contoured in a (x-y) plane two dimensionally. The third dimension (z) results from single layers being stacked up on top of each other, but not as a continuous z-coordinate. Therefore, the prototypes are very exact on the x-y plane but have stair-stepping effect in z-direction. If model is deposited with very fine layers, i.e., smaller z-stepping, model looks like original. Rp can be classified into two fundamental process steps namely generation of mathematical layer information and generation of physical layer model. Process starts with 3d modelling of the product and then stl file is exported by tessellating the geometric 3d model. In tessellation various surfaces of a cad model are piecewise approximated by a series of triangles and co-ordinate of vertices of triangles and their surface normals are listed. The number and size of triangles are decided by facet deviation or choral error as shown in figure. These stl files are checked for defects like flip triangles, missing facets, overlapping facets, dangling edges or faces etc. and are repaired if found faulty. Defect free stl files are used as an input to various slicing software's.

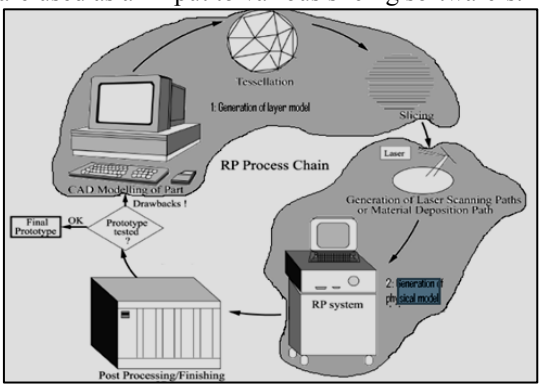

Fig. 1: RP Process Chain

II. MODELLING OF FUEL INJECTOR BODY BY CATIA

Catiav5r20 is an interactive computer- aided design and computer aided manufacturing system. The cad functions automate the normal engineering, design and drafting capabilities found in today's manufacturing companies. The cam functions provide NC programming for modern machine tools using the catiav5 r16 design model to describe the finished part. Catiav5r20 functions are divided into "applications" of common capabilities. These applications are supported by a prerequisite application called "catiav5r20 gateway". Catiav5r20 is fully three dimensional, double precision system that allows to accurately describing almost any geometric shape. By combining these shapes, one can design, analyze, and create drawings of products.

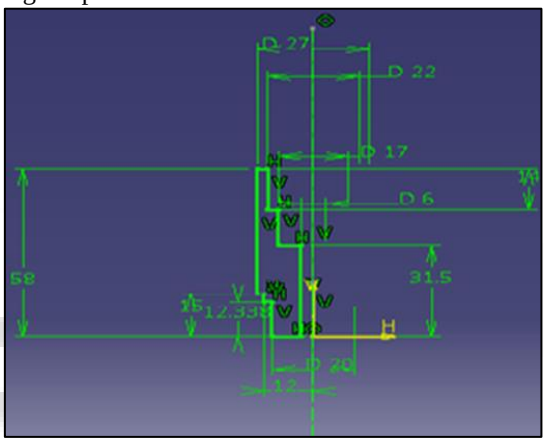

Fig. 2: 2D Figure using Sketcher

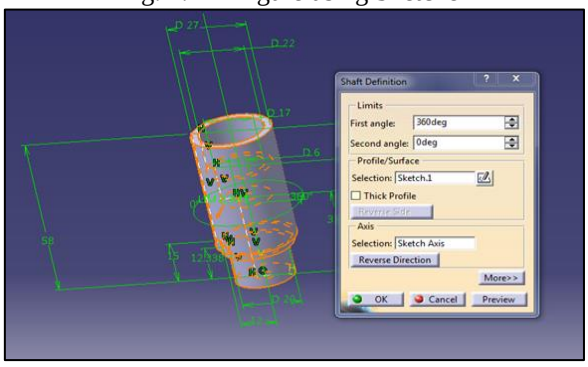

Fig. 3: Body Casing

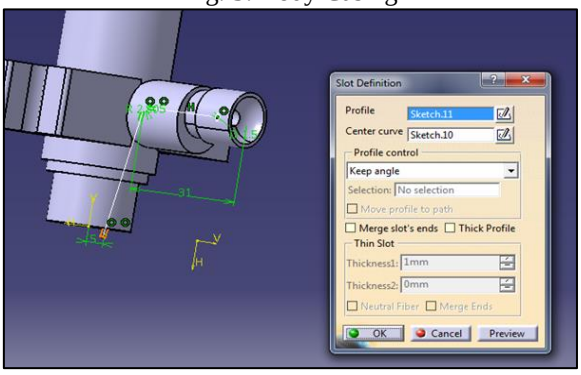

Fig. 4: Modelling of Outer Parts

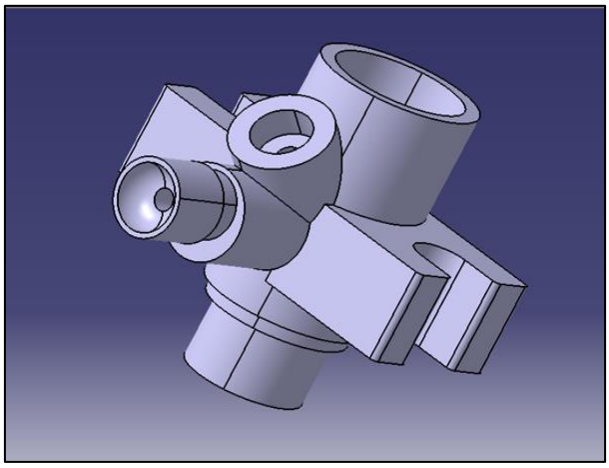

Fig. 5: Final Modelled Injector

III. STEREO LITHOGRAPHY

In this process photosensitive liquid resin which forms a solid polymer when exposed to ultraviolet light is used as a fundamental concept. Due to the absorption and scattering of beam, the reaction only takes place near the surface and voxels of solid polymeric resin are formed. A sl machine consists of a build platform (substrate), which is mounted in a vat of resin and a uv helium-cadmium or argon ion laser. The laser scans the first layer and platform is then lowered equal to one slice thickness and left for short time (dip-delay) so that liquid polymer settles to a flat and even surface and inhibits bubble formation. The new generative manufacturing processes slice is then scanned.

In new sl systems, a blade spreads resin on the part as the blade traverses the CATIA. This ensures smoother surface and reduced recoating time. It also reduces trapped volumes which are sometimes formed due to excessive polymerization at the ends of the slices and an island of liquid resin having thickness more than slice thickness is formed (Pham and demo, 2001). Once the complete part is deposited, it is removed from the vat and then excess resin is drained. It may take long time due to high viscosity of liquid resin. The green part is then post-cured in a uv oven after removing support structures.

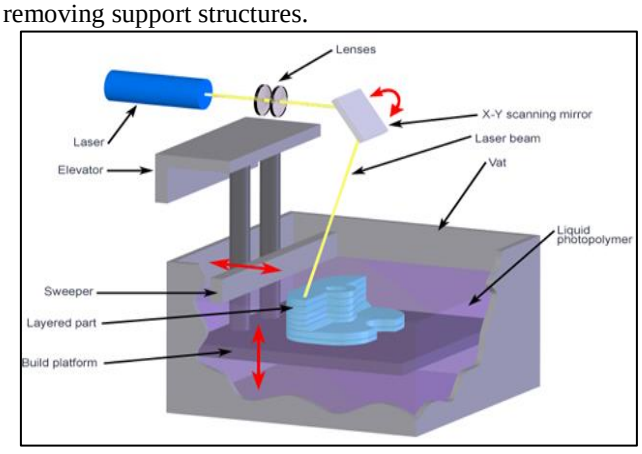

Fig. 6: Stereo Lithography Apparatus

IV. 3D PRINTING

Here we are getting 3d object by using (fused deposition modelling process).

The developed 3D model CAD file is to be converted into .stl file format. And is imported to KISSLICER software to generate G-codes.

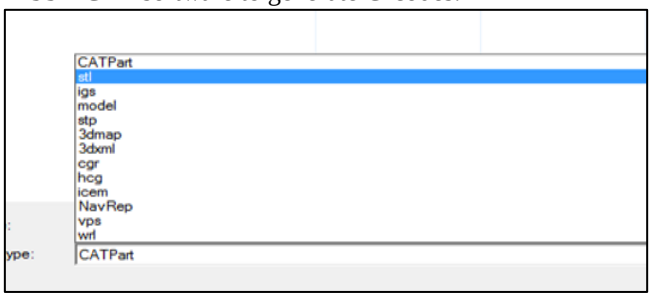

Fig. 7: Conversion of Cad to .stl file

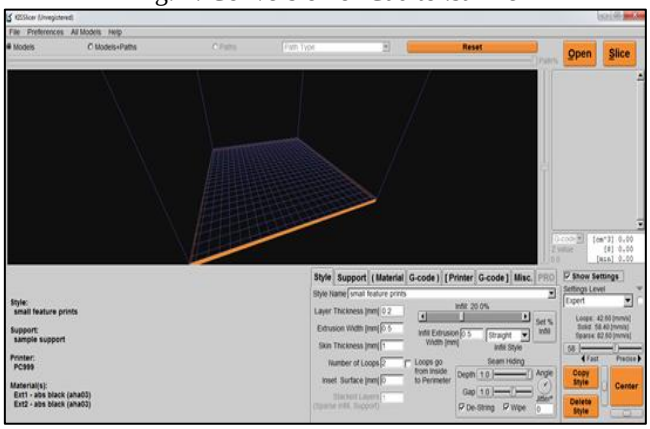

Fig. 8: .stl in kisslicer

V. CONCLUSION

The three dimensional fuel injector body is designed using CATIA software .The design is saved in .stl (stereo lithography) format which in then converted into G-codes using KISSLICER .Then it is given to 3D printer and Fuel injector body printed.

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