DESIGN AND GENARATION OF CNC PROGRAM FOR CASTING MOLD FOR INLINE BOXER MOTOR LINEAR

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Abstract: The inline boxer motor is a linear type of engine which is used in Japan cars which is manufactured using Japan technology. The boxer motor contains linearly of 4 piston cylinder and each of the pistons is attached with spark plugs. The general example of such motors is Subaru car. Manufacturing process involves great strategic decisions and a careful analysis with engineers and expertise in order to execute the process plan and adapt a wide range of production of every single component to build. This paper deals with detailing about the inline boxer motor parts and manufacturing drawings. Each component in this motor is modeled using 3D CAD software (NX-CAD) and by using NX-CAM software CNC program is generated and the process plan for manufacturing each component.

Index Terms **– Modeling & Manufacturing process plan.**

I. INTRODUCTION

In Line Engine design is very basic and conventional. In this engine construction, the cylinders are placed in a straight line as shown in figure 1. As all the cylinders are in a straight line, manufacturers sometimes refer to this engine as the 'Straight Engine'. In line engines can have up to 2, 3, 4, 5, 6 or 8 cylinders.

Fig 1: Inline Four Cylinder Engine

II. OBJECTIVE AND METHODOLOGY

2.1 OBJECTIVE

The objective of the project is to establish a manufacture process plan for inline engine and tabulated the required flowchart of requirement of tools, sequence of operations.

2.2 METHODOLOGY

In the first step, 3D model of junction is developed using NX-CAD software by using reversing engineering tactics. In the second step, manufacture process plan is created for producing the component. At last each sequence of operation is tabulated and explained.

III. MANUFCTURING PROCESS PLAN FOR INLINE MOTOR LINEAR

3.1 Production process planning: Scheduling is the process of arranging, controlling and optimizing work and workloads in production process or manufacturing process. Scheduling is used to allocate plant and machinery resources, plan human resources, plan production processes and purchase materials.

3.2 Computer-aided manufacturing (**CAM**) is the use of software to control machine tools and related ones in the manufacturing of work pieces. This is not the only definition for CAM, but it is the most common; CAM may also refer to the use of a computer to assist in all operations of a manufacturing plant, including planning, management, transportation and storage.

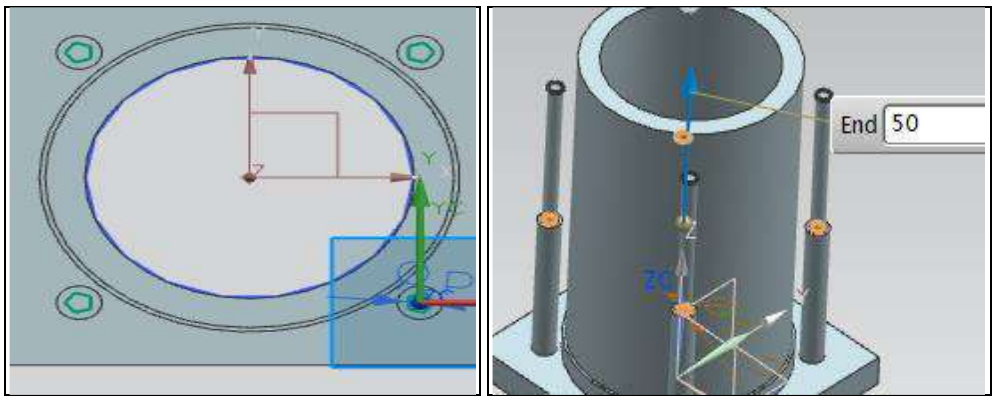

Fig 2: 2D, 3D Sketch and Extrusion of Inline Boxer Motor

Every new product development process undergoes 12 steps to design, overlook, analysis, manufacturing of a product on their dependency.

12 steps which are used to establish into our project to generate CNC code for inline boxer engine are as follows:

1. Product Concept
2. Research
3. Product Design Development
4. Research and Development of the Final Design
5. CAD
6. CAM
7. Prototype Testing
8. Manufacturing
9. Assembly
10. Feedback and Testing
11. Product Development
12. Final Product

IV. MANUFACTURING PROCESS MODELING OF BASE PART

In manufacturing process plan the first step is to select a raw material, here the in NX-CAM the raw material is called as blank also. Like developing a 3d model by converting 2d to 3d, in the same manner the blank or raw material is created which can be seen in figure 3.

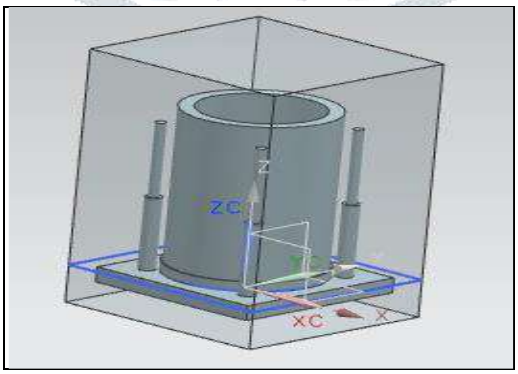

Fig 3: Blank Material for the Inline Boxer Motor

V. GEOMETRIC MODELING OF UPPER PART

The basic sketch of base part is started by converting 2d manufacturing into 3d modeling.

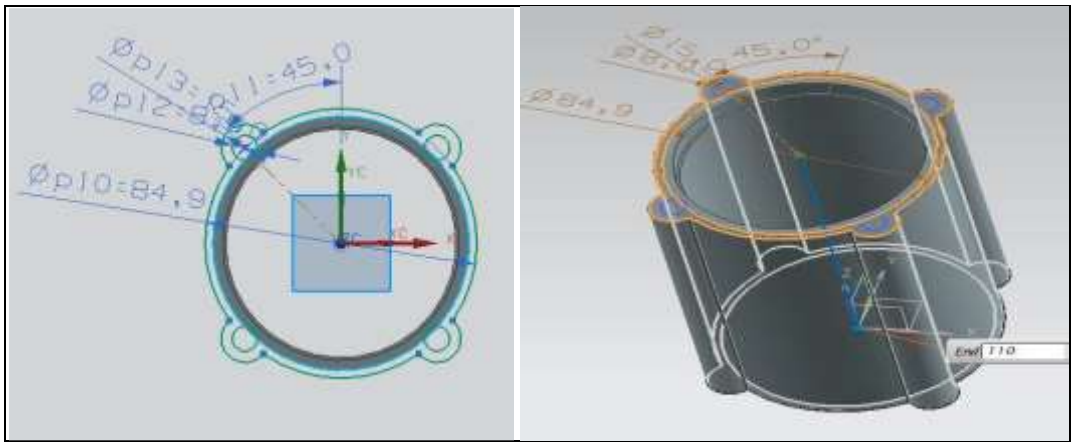

Fig 4: 2D Sketch and Extrusion of Inline Boxer Motor

VI. GEOMETRIC MODELING OF BASE PART

The basic sketch of base part is started by converting 2d manufacturing into 3d modeling.

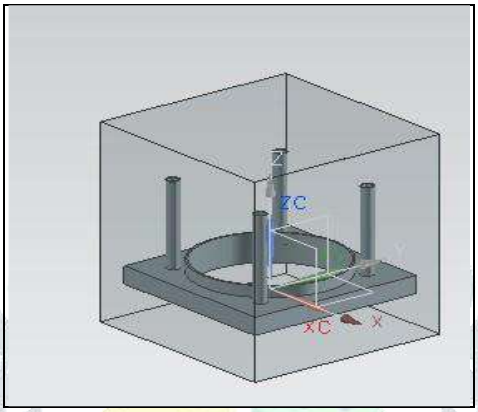

Fig 5: Base Material for the Inline Boxer Motor

VII. PROFILE MILLING OPEARTION FOR SIDE WING OF INLINE BOXER MOTOR

The profile milling is used to cut the side wing of part.

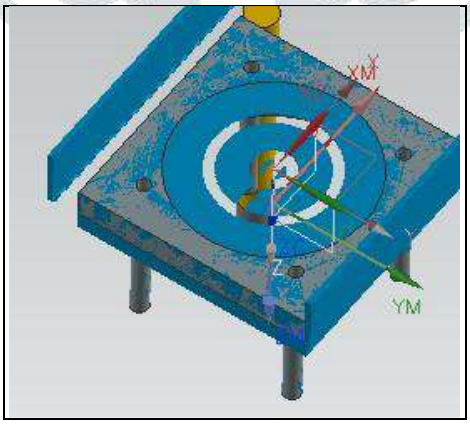

Fig 6: Profile Milling Operation (side walls) of Inline Boxer Motor

VIII. ASSELMBLY OF INLINE MOTOR BOXER

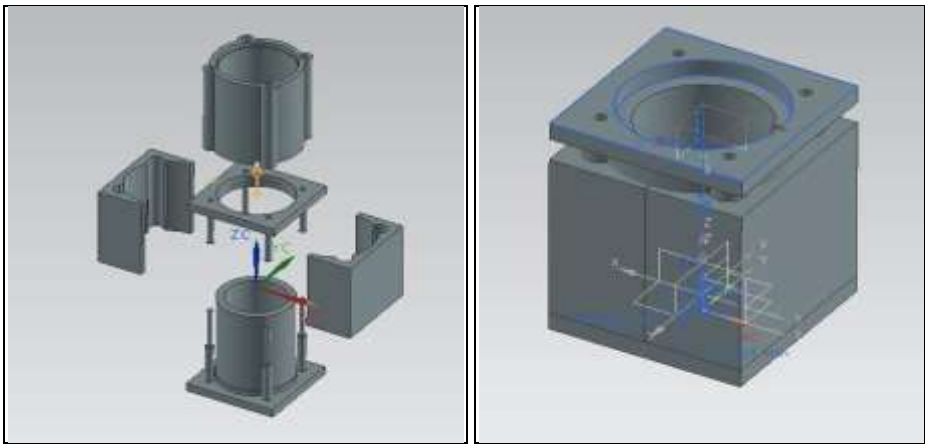

Fig 7: Exploded View of and total assembly of Inline Boxer Motor

IX. RESULTS

3D model of inline boxer motor is done using NX-CAD software by considering tolerances given in 2D input. The generated 3D model is drafted and cross checked with 2D inputs for verification. Tool path is generated on 3D model of inline boxer motor using NX-CAM software. NC program is generated for inline boxer motor component and this program is given to 5-axis MILLING CNC machine through DNC line.

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