Design and Analysis of Camless Engine
Karthikeyan, V1, Nantha Kumar. R2, Nandhagopal. N3, Rajasekar. I4, Ajeeth Kumar. A5
Assistant Professor1, UG Research Trainee2,3,4
Department of Mechanical Engineering
Sri Venkateshwarao College of Engineering and Technology, Puducherry, India

Abstract:
This project is about to develop the 4stroke engine without cam profile by operating valves with the computer controlled electromagnet system which is equipped with solenoid valve mechanism. The user interface communication serially with Micro controller. This Micro controller monitor and reports the engine performance and controlling the opening and closing of the engine valves. The micro controller was used in it is a control unit. The solenoid valve mechanism was used is direct acting valve mechanism. The total engine operation is fully computerized and total engine will be controlled by the control unit by when to open and close the inlet valve and outlet valve.

Keywords: Micro controller, Cam less mechanism, Solenoid valve, Opening and Closing of valves.

1. INTRODUCTION

In this project introducing solenoid mechanism by eliminating the cam. Project says about to control the four stroke engine valves using the help of computer control chip. By using this mechanism user can access the timing of valve in the engine due to this different mode of engines can attained. For example, sports mode, mountain mode, normal mode by no external mechanisms. So that weight of the engine reduced up to 40%.

The above Fig 2.1 is design of camless engine using the Solidwork 2016 software.

2. 3D DESIGN OF CAMLESS

The Fig 2.2 is the design of the camless engine head. This can be designed by the Solidwork 2016 software.

3. WORKING OF ENGINE

• In our camless the valve motion can controlled directly by the electromagnet and control unit. The inlet valve and outlet valve are connected with the electromagnet and return spring.

• When the electromagnet energized it will push the valve in the downward direction and return to the original position using the return spring. Return spring can be placed between the valve and electromagnet in Fig 2.2

• The opening and closing of the inlet valve and outlet valve can be determine by the control unit. The control unit will send the signal to the electromagnet for opening and closing of the engine valve.

• For suction stroke, control unit will send the signal to the inlet electromagnet and it will be energized and push the inlet valve in downward direction (valve will open and it will allow the air fuel mixture). After the end of the stroke valve will be in original position using the return spring.

The above 2d design fig.1.1 is designed using Solidwork 2016 software.

Figure.1.1

Figure.2.1

Figure.2.2.
• In compression stroke, control unit won’t send the signal to the both inlet and outlet electromagnet. In this stroke both valves will remain in closed position.

• In power stroke, in this stroke also control unit will won’t send the signal to the inlet and outlet electromagnet. Both the valve will be in closed position.

• For exhaust stroke, control unit will send the signal to the outlet electromagnet and it will be energized and push the outlet valve in downward direction (outlet valve will open and it allow the burnt air fuel mixture to the atmosphere).

• This process will continue as many numbers of time as cycle.

4. ANALYSIS

4.1 ENGINE VALVE
The inlet valve and outlet valve are made up of Neodymium magnet composite with titanium alloy. Titanium alloys will be having the lowest thermal conductivity of 7W/mK. The Titanium alloy will maintain the magnetic property of Neodymium magnet. The stainless steel having the conductivity of 14W/mK. The outlet valve and inlet valve are made up of different in dimension.

![Outlet Valve Total Deformation](image1)

![Outlet Valve Equivalent Stress](image2)

Figure 4.1.1 (Outlet Valve Total Deformation)
Figure 4.1.2 (Outlet Valve Equivalent Stress)

The above Fig 4.1.1 and 4.1.2 are engine outlet valve.

![Inlet Valve Total Deformation](image3)

![Inlet Valve Equivalent Stress](image4)

Figure 4.1.3 (Inlet Valve Equivalent Stress)
Figure 4.1.4 (Inlet Valve Total Deformation)

The above Fig 4.1.3 and 4.1.4 are the inlet valve. They are analysis by Ansys workbench 15.0.

4.2 ENGINE HEAD
The engine head made up of aluminum alloy. In the olden day engine head made up of iron. The aluminum alloy light in weigh when compare to iron. The engine head can be analysis using the Ansys workbench 15.0 shown in Fig 4.2.1 and 4.2.2.

![Equivalent Elastic Strain](image5)

![Total Deformation](image6)

Figure 4.2.1. (Equivalent Elastic Strain)
Figure 4.2.2 (Total Deformation)

The above Fig 4.2.1 analysis using the Ansys workbench 15.0.

4.3 PISTON
The piston is made up of aluminum alloy. They are used for light weight and good heat transfer. When on heat aluminum alloy will expend so proper clearance will be given. The piston can be analyzed by Ansys workbench 15.0. in Fig 4.3.1 and 4.3.2.
5. RESULT OF ANALYSIS

5.1 ENGINE VALVE

<table>
<thead>
<tr>
<th>SLNO</th>
<th>TYPE</th>
<th>MAX(Mpa)</th>
<th>MIN(Mpa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total deformation (Inlet valve)</td>
<td>62515</td>
<td>8.9623e11</td>
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<tr>
<td>2</td>
<td>Equivalent stress (Inlet valve)</td>
<td>5.0064e-8</td>
<td>4.172e-9</td>
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<tr>
<td>3</td>
<td>Total deformation (Outlet valve)</td>
<td>40079</td>
<td>5.9505e-13</td>
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<td>4</td>
<td>Equivalent stress (Outlet valve)</td>
<td>2.2003e-8</td>
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5.2 ENGINE HEAD

<table>
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<td>Total deformation</td>
<td>1.4855e-8</td>
<td>1.6268e-12</td>
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<td>2</td>
<td>Equivalent Elastic stain</td>
<td>2.2607e-9</td>
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5.3 PISTON

<table>
<thead>
<tr>
<th>SLNO</th>
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<td>Total deformation</td>
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<td>2</td>
<td>Equivalent stress</td>
<td>99704</td>
<td>86.543</td>
</tr>
</tbody>
</table>

6. RESULT

By the manufacturing of this type of engine will have more efficiency in the fuel consumption.

7. REFERENCE

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