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Static and Structural Analysis of Camshaft

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Abstract: Camshaft is all about opening and closing of valves in a piston engine. In the combustion chamber of a piston engine we have an intake stroke, compression stroke, expansion stroke and an exhaust stroke. In the intake stroke and exhaust stroke we have the valves that open that take the air in intake stroke and out in the exhaust stroke and the thing that is lifting the valves to make it happen is the camshaft. In the present work, we are going to do analysis on the camshaft by applying different forces (due to valves) on the cams which are mounted on the shaft and observe total deformation, equivalent elastic strain and equivalent stress on different materials of camshaft by using Solidworks and Ansys softwares. The materials taken are Structural steel and Stainless steel.
Keywords: Camshaft, 4-Strokes, Stainless steel, Structural steel, Solidworks, Ansys.

I. INTRODUCTION

A camshaft is a rotating cylindrical shaft used to regulate the injection of gasified fuel in an IC engine. A camshaft has multiple cams attached to them. A camshaft is directly attached to the rotating shaft so that the valve openings are timed accordingly. We can see the camshafts in different types of machines which require mechanical timing. They are mostly found in IC engines, the example can be a fuel burner which injects fuel in timed intervals to help reduce the fuel consumption. For the analysis of camshaft we have taken two materials: Structural steel and stainless steel.

Properties of materials:

1. Stainless Steel:
Density=7750 Kg/m^3.
Tensile yield strength= 207 MPa.
Ultimate Tensile Strength= 586 MPa.
Young's modulus= 193 GPa.
Shear Modulus= 73 GPa.

2. Structural steel:
Desntiy= 7800 Kg/m^3.
Tensile yield strength= 250 MPa.
Ultimate Tensile strength= 550 MPa.
Young's Modulus= 200 GPa.
Shear Modulus= 75 GPa.

A. Modelling

In the present work the modelling was carried out in Solid works and analysis was carried out in Ansys software. Fig-1 shows the modelled camshaft.

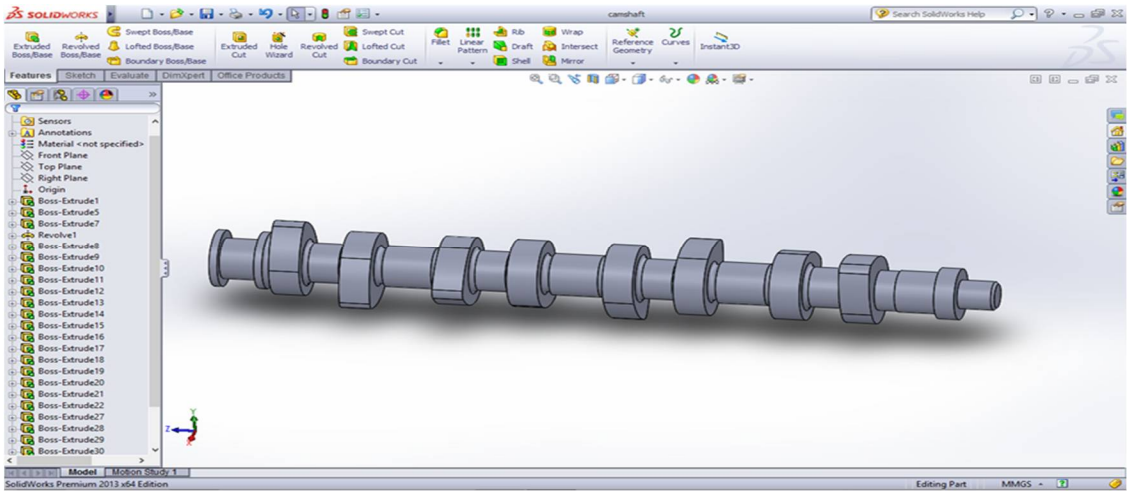

Fig.1- Modelled camshaft in Solid works.

After modelling the camshaft is imported into Ansys workbench and then static structural analysis was carried out. Analysis was

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done to find out which material is best suited for the camshaft under the stipulated condition.

B. Analysis

In the Ansys software the analysis is taken up for static structural. From the analysis we got Total deformation, Equivalent elastic strain, Equivalent stress for both the materials.

Figs.2,3,4 shows the total deformation, equivalent elastic strain and equivalent stress for Stainless steel.

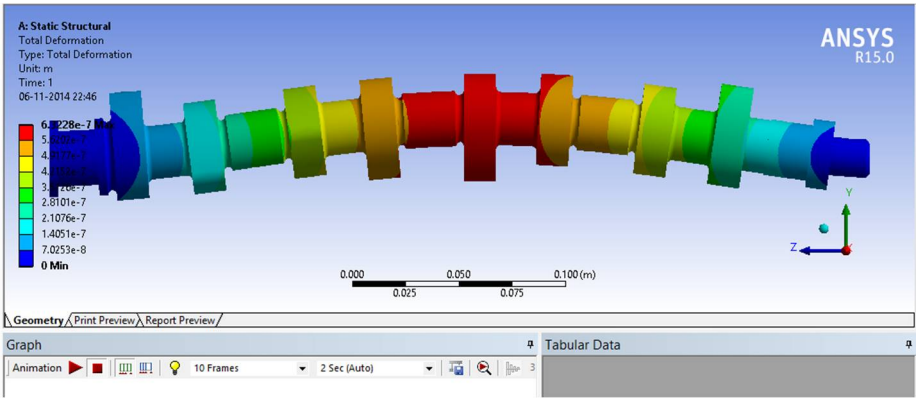

Fig.2- Total Deformation on Camshaft

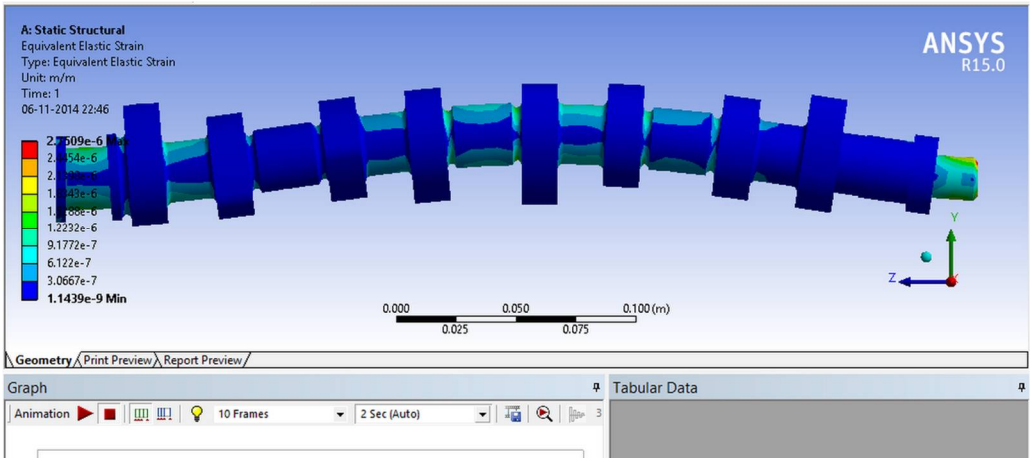

Fig.3- Equivalent elastic strain on Camshaft

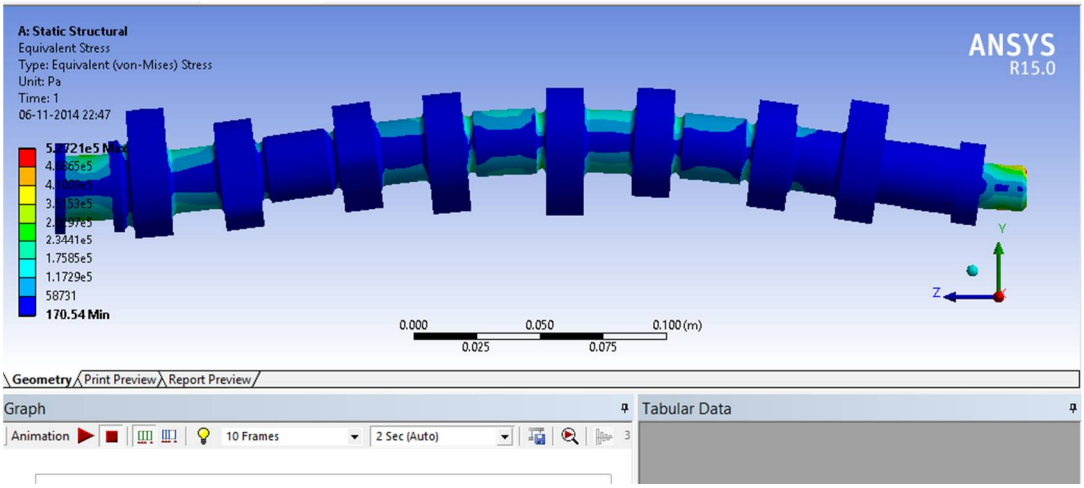

Fig.4- Stress distribution on Camshaft

Figs.5,6,7 shows the total deformation, equivalent elastic strain and equivalent stress of Structural steel material.

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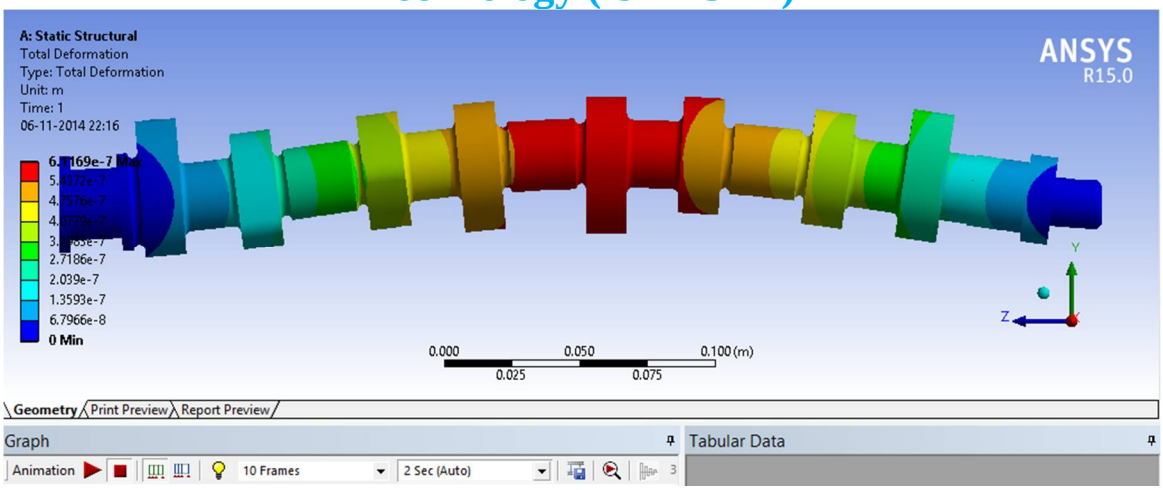

Fig.5- Total deformation on Camshaft

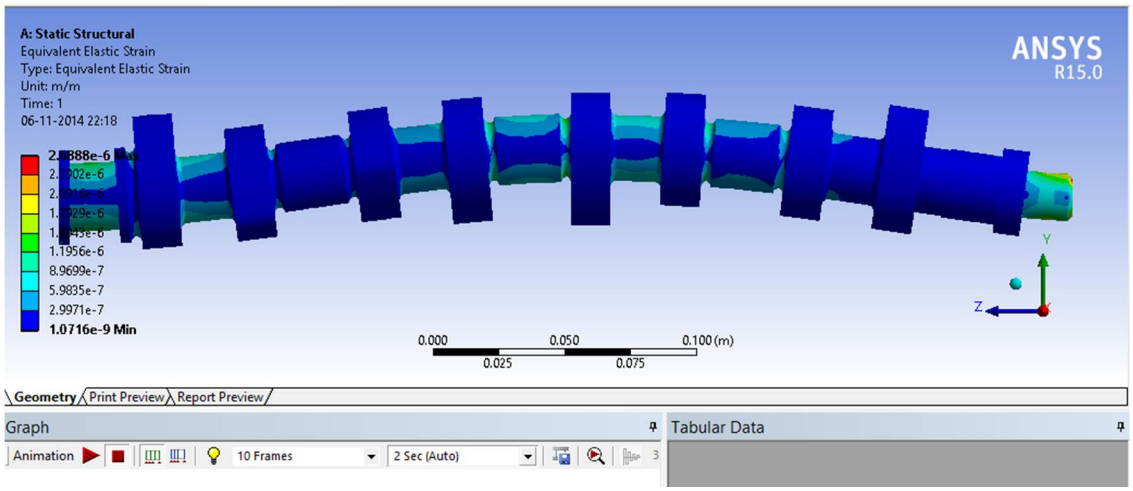

Fig.6- Equivalent elastic strain on Camshaft

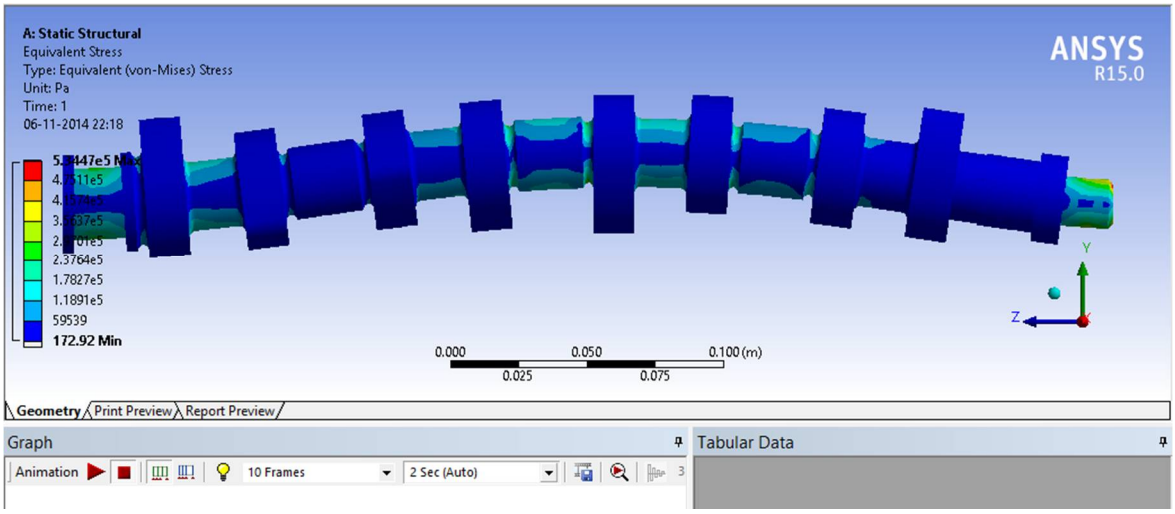

Fig.7- Stress distribution on Camshaft

II. CONCLUSION

The aim of the present work was to select the best material among Stainless steel and Structural steel. And based on the result obtained from both the analysis on camshaft stainless steel is suggested since it has less stress when compared to structural steel.

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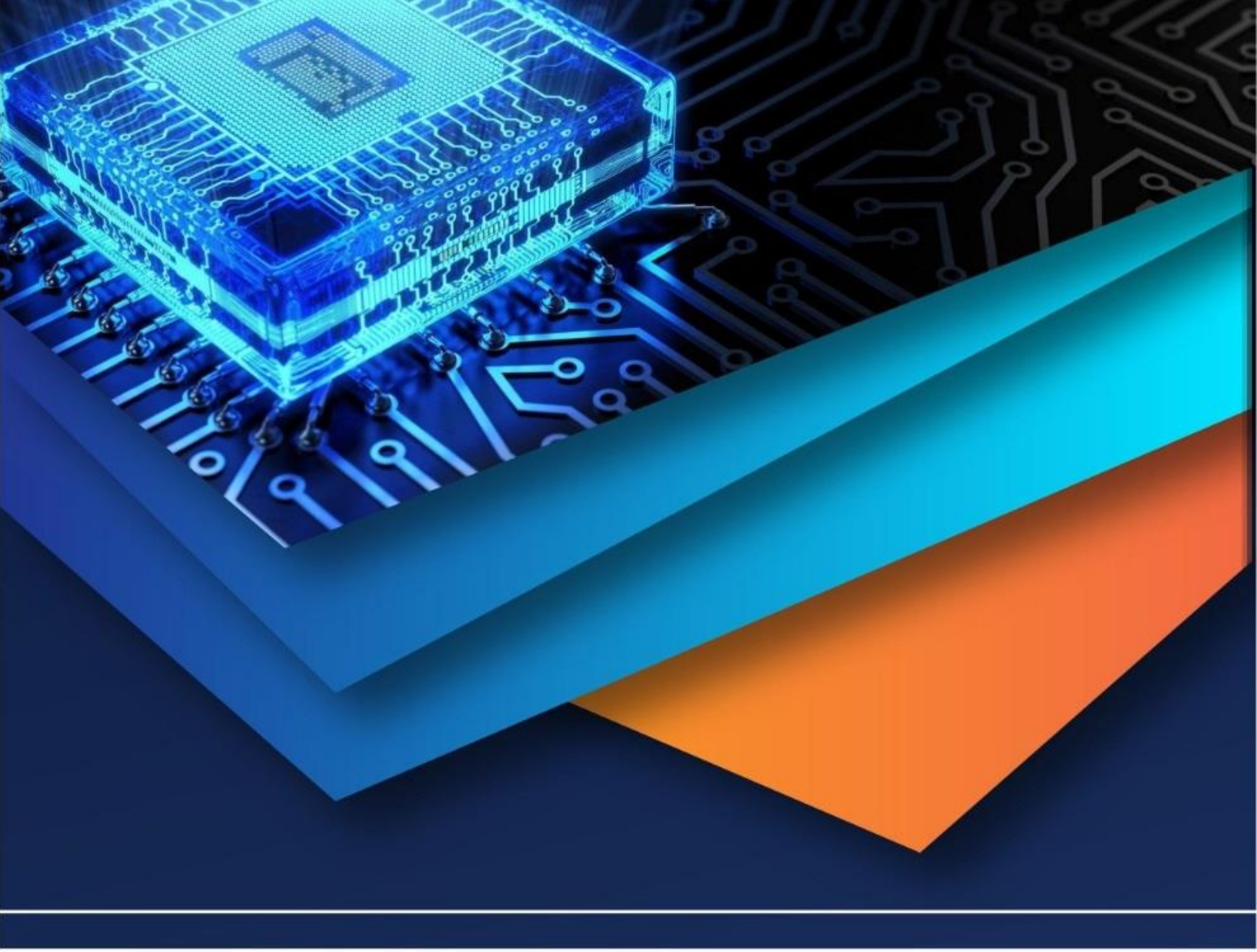

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