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CFD Analysis Of Gearbox

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Abstract

Gear box performance is dependent on viscosity of lubricant oil and due to the thermal effect of heat generated in side of an oil span of gear box. Thus if we change properties of an oil, the performance of gear box does change. The effect on gear box performance will be studied by CFD Analysis. The equations of fluid mechanics which have been known for over a century are solvable only for a limited no. of flows. The known solutions are extremely useful in understanding fluid flow but rarely used directly in engineering analysis or design. CFD makes it possible to evaluate velocity, pressure, temperature, and species concentration of fluid flow throughout a solution domain, allowing the design to be optimized prior to the prototype phase.

1. Introduction

Gearboxes are used in almost every industry right from power to marine, and also include agriculture, textile, automobiles, aerospace, shipping etc. There are different types of gearboxes available for varying uses. CFD analysis has been carried out on different oils having different viscosity which affects the performance of gear box. For that, a model of gear box is generated with the help of 'Solid works' software and analysis is carried out in 'ANSYS' software.

2. CFD Analysis of Gear box

For CFD Analysis of gear box first of all modal of gear box is prepared in solid works which is shown in fig 1. After making the modal it is imported in ANSYS workbench. For CFD Analysis first of all meshing of gear box is done. The element chose for meshing by ANSYS is ten nodes tetrahedral shown in fig.2 this element is good for meshing in curvature area. After meshing required boundary conditions are inserted in pre processor.

Table 1: Meshing detail of gearbox

Number of Nodes	114633
Number of Elements	595456

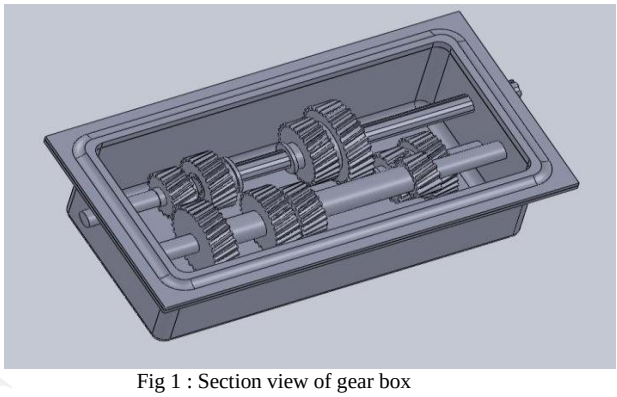

Fig 1 : Section view of gear box

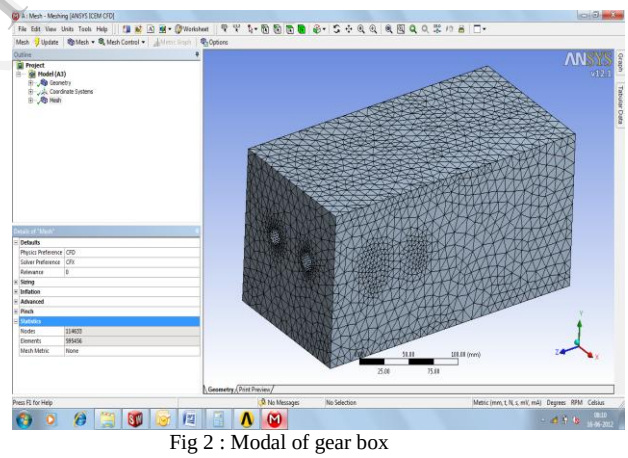

Fig 2 : Modal of gear box

In Pre processor various boundary condition is define. In present analysis first step in pre processor is define the domain. There are one domain are define gear oil. Here the gear is defining as rotating domain and speedof rotation is 5000 rpm. This rotation effect is transferring to the oil which also rotating domain. The input temperature at outer surface of the heater is given as boundary condition is 100° c. Finally all result is showing in post processor for different type of oil. All result of temperature difference for different oils are shown below. Material Property of gear oil SAE85W140 inserted in ANSYS is shown in fig 3.

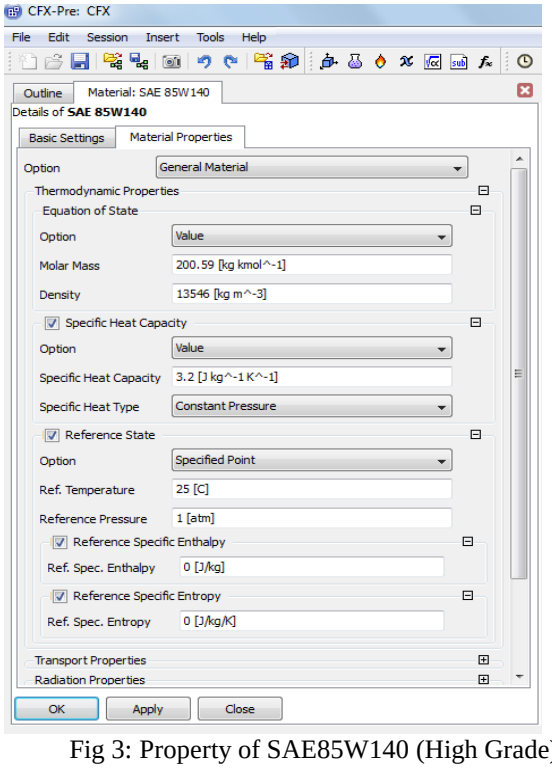

Fig 3: Property of SAE85W140 (High Grade)

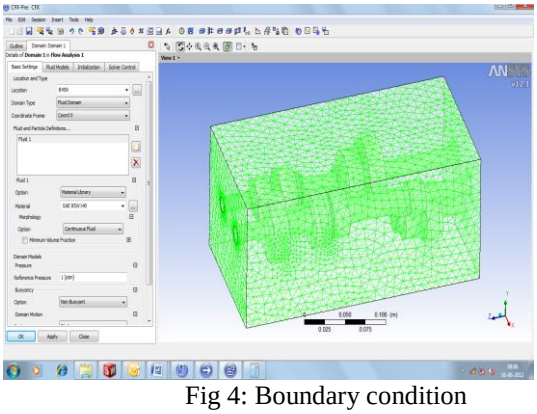

Fig 4: Boundary condition

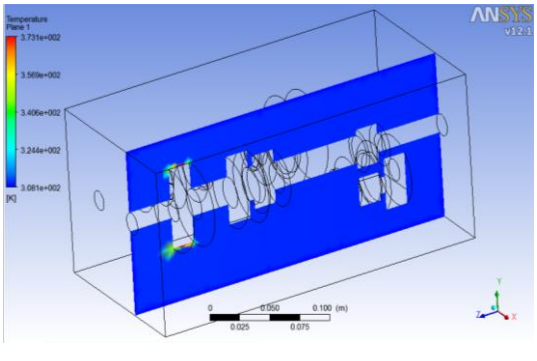

Fig 5: Temperature contour

3. Experimental set up

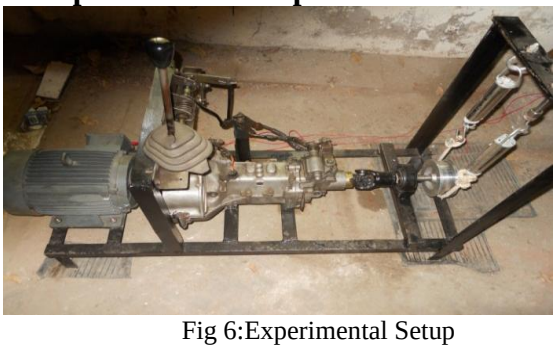

Fig 6:Experimental Setup

4. Comparison

Comparison between Practical Reading and ANSYS result is shown in table no.2 below.

Table no: 2

	ANSYS RESULT	PRACTICAL READING
Maximum temperature	373.1 k	374.3 k
Minimum temperature	308.1k	305.3 k

5. Conclusion

ANSYS is very important software for analysis purpose. The application of ANSYS is wide in engineering field. In table no 2 ANSYS and experimental result are compared and found in good agreement, thus proving the strength of model. After completing CFD Analysis Results, we can say that CFD Analysis is a good tool to avoid costly and time consuming Experimental Work. It also reduces the lead time of New Product Development Chain.

4. References

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