

DESIGN AND ANALYSIS OF TWO WHEELER ENGINE COOLING FINS FOR INCREASE THE HEAT TRANSFER

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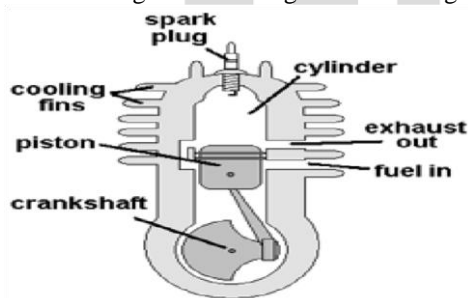
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ABSTRACT -Engine heat can be generated by two ways, heat produced by friction as well as by due to compressing of air at high pressure. So this heat will transfer to atmosphere by fins.as engineers we are primarily interested in knowing the extent to which particular extended surfaces or fin arrangement could improve heat transfer from a surfaces to the surrounding fluid. Finite element method (FEM) is important numerical techniques used in engineering analyses. Usually elements are sub-divided uniformly in FEM (conventional FEM, CFEM) to obtain temperature distribution behaviour in a fin or plate. In this project, non-uniform sub element is consider for FEM solution to reduce the computational complicity.

Index Terms – Design And Analysis of Fins, (key words)

1. INTRODUCTION

Most internal combustion engines are fluid cooled using either air (a gaseous fluid) or a liquid coolant run-through a heat exchanger (radiator) cooled by air. In air-cooling system, heat is carried away by the air flowing over and around the cylinder. Here fins are cast on the cylinder head and cylinder barrel which provide additional conductive and radiating surface. In water cooling system of cooling engines, the cylinder wall and heads are provided with jacket Cooling fins help keep Chevrolet volt battery at ideal temperature We know that in case of Internal Combustion engines, combustion of air and fuel takes place inside the engine cylinder and hot gases are generated. The temperature of gases will be around 2300-2500°C. This is a very high temperature and may result into burning of oil film between the moving parts and may result into seizing or welding of the same. So, this temperature must be reduced to about 150-200°C at which the engine will work most efficiently. Too much cooling is also not desirable since it reduces the thermal efficiency. So, the object of cooling system is to keep the engine running at its most operating temperature. It is to be noted engine is quite inefficient when it is cold and hence the cooling system is designed in such a way that it prevent scooling when the engine is warming up and till it attains to maximum efficient operating temperature, then



it starts cooling.

Fig.1 Engine cylinder fin

In Engine When fuel is burned heat is produced. Additional heat is also generated by friction between the moving parts. Only approximately 30% of the energy released is converted into useful work. The remaining (70%) must be removed from the engine to prevent the parts from melting. For this purpose Engine have cooling mechanism in engine to remove this heat from the engine some heavy vehicles uses water-cooling system and almost all two wheelers uses Air cooled engines, because Air-cooled engines are only option due to some advantages like lighter weight and lesser space requirement. In an internal combustion engine, the expansion of the high-temperature and -pressure gases produced by combustion applies direct force to some component of the engine, such as pistons, turbine blades, or a nozzle. This force moves the component over a distance, generating useful mechanical energy. We know that in case of Internal Combustion engines, combustion of air and fuel takes place inside the engine cylinder and hot gases are generated. The temperature of gases will be around 2300-2500°C. This is a very high Temperature and may result into burning of oil film between the moving parts and may result it seizing or welding of same. So, this temperature must be reduced to about 150-200°C at which the engine will work most efficiently. Too much cooling is also not desirable since it reduces the thermal efficiency.

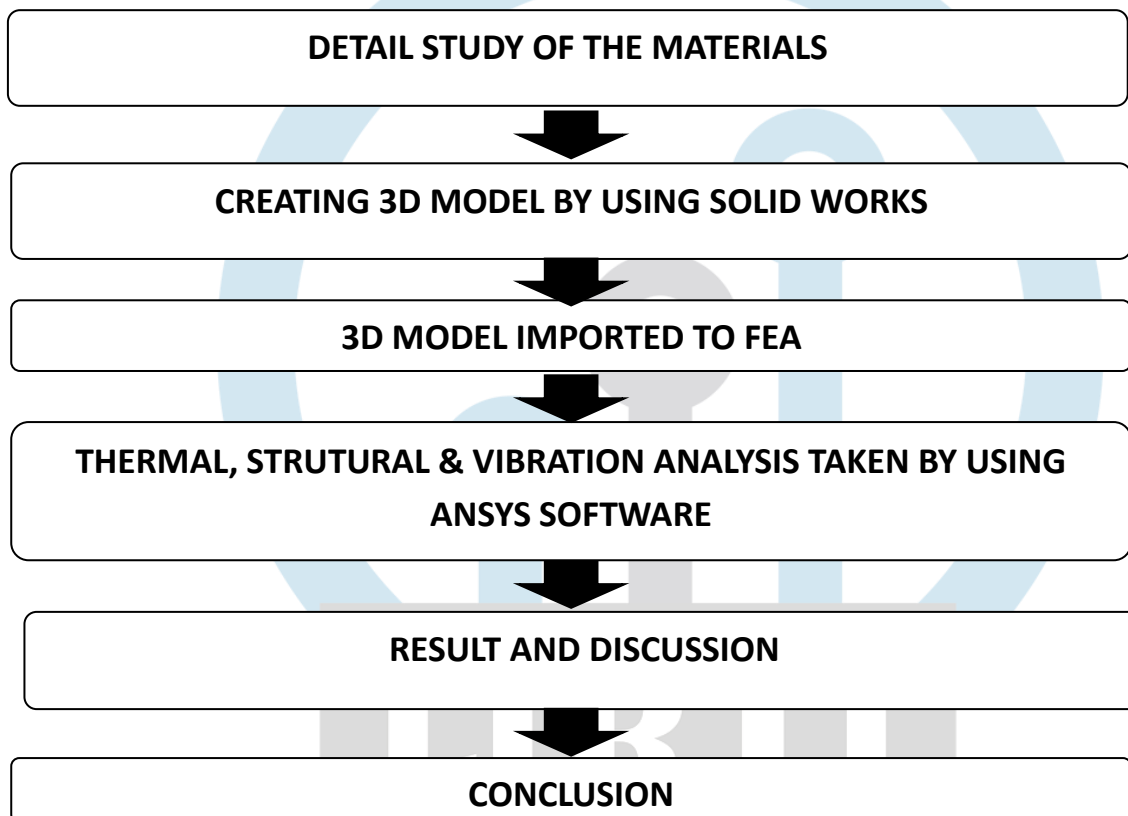
2. LITERATURE REVIEW

- Most internal combustion engines are fluid cooled using either air (a gaseous fluid) or a liquid coolant run through a heat exchanger (radiator) cooled by air. Marine engines and some stationary engines have ready access to a large volume of water at a suitable temperature.
- In the research of J. Ajay Paul and Sagar Chavan Vijay Parametric Study of Extended Fins in the Optimization of Internal Combustion Engine they found that for high speed vehicles Engines thicker fins provide better efficiency. When fin thickness increases, the gap between the fins reduces that resulted in swirls being created which helped in increasing the heat transfer. Large number of fins with less thickness can be preferred in high speed vehicles than thick fins with less numbers as it helps inducing greater turbulence

3. PROBLEM IDENTIFICATION

- Lagging of heat transfer through the fins.
- Without the extensions of fins.
- Other than the rectangular extensions the fins cannot be the effective heat transfer.
- Lagging of ambient fluid temperature.

4. WORKING METHODOLOGY



A comparison between the results obtained based on existing material and the results obtained from the ANSYS 14.0. Work bench has been carried out. In conventional approach conception ideas are converted into sketches or engineering drawing. With the help of this drawings the prototypes i.e. product which looks same as that of final product are made. It is launched in the market after testing of prototype which gives acceptable results. The thing is, product is launched after doing many practical testing and many trial and error procedures which consumes more time and cost too. In CAE approach some steps are same as that of conventional method. Here also ideas, concepts are converted into engineering drawing, but it is then modeled on computer. Geometric model of product is made using solid work software like CAD which enables better visualization of simple as well as complex models. These models then further used for computerized analysis by using different CAE tools (FEA/CFD software's) depending upon the application before the prototype is been made to check whether the components are going to work according to its intended function. After that once appropriate results are obtained the final practical testing is carried out.

5. APPLICATION

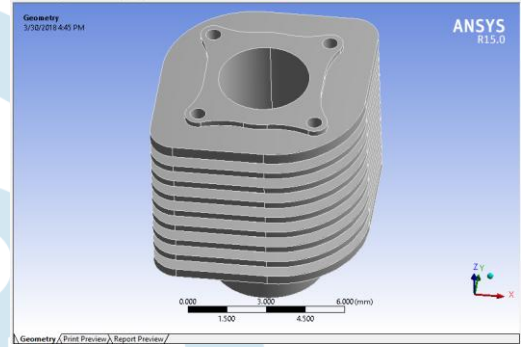
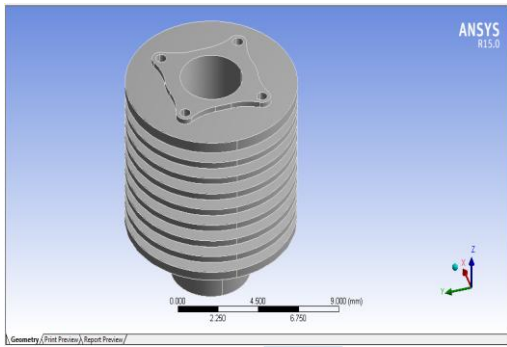
- A second way is by increasing the fin density, which increases the heat transfer area that comes in contact with the fluid.
- Aluminium fins are preferred in aircraft electronic liquid cooling applications due to their lighter weight.
- We consider a rectangular fin with constant volume, length, thickness cooling takes place by free and forced convection.
- Economizers of steam power plants.
- Heat exchangers of a wide variety, used in different industries.
- Cooling of electric motors, transformers etc...

6. THE DESIGN PROCESS:

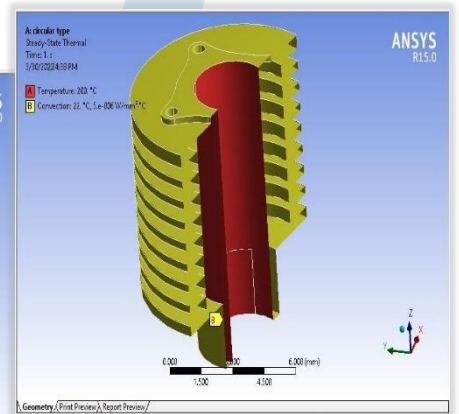
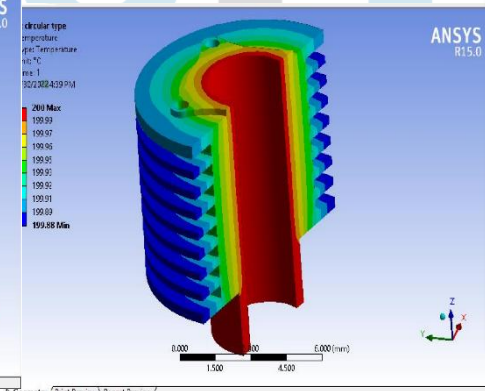
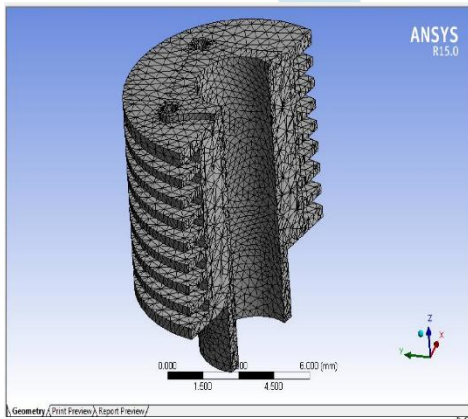
The process of designing is characterized by six identifiable steps or phase

1. Recognition of need
2. Definition of problem
3. Analysis and optimization
4. Evaluation
5. Presentation
6. Synthesis

7. DESIGN



7.2 THERMAL ANALYSIS OF CIRCULAR TYPE FIN

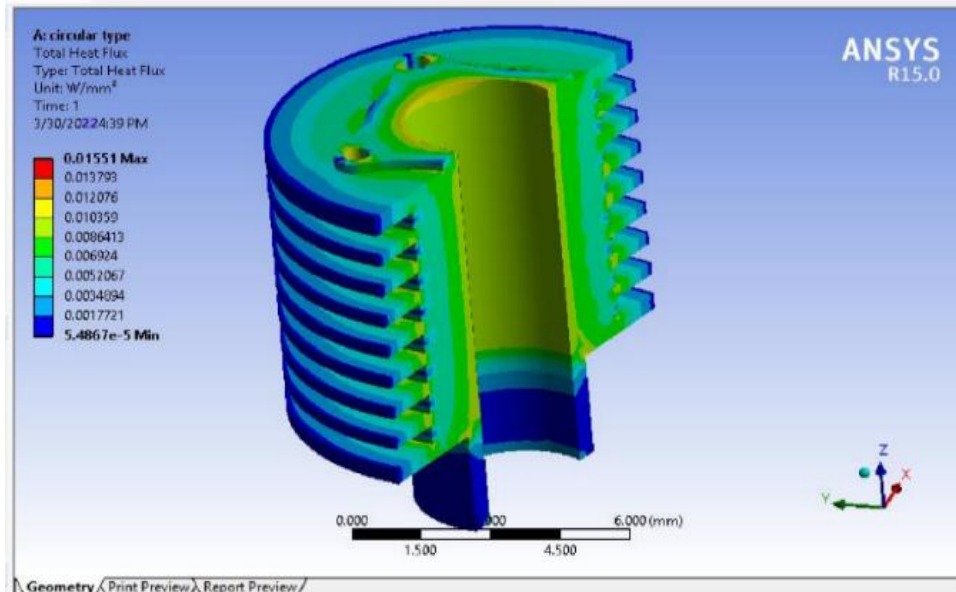


Temperature Distribution

In this step total temperature distribution of circular type pin using ANSYS software applying 200°C. In result we get maximum temperature is 200°C and minimum 199.88°

software applying 200°C. In result we get

7.3 HEAT FLUX



In this step heat flux using ANSYS software total heat flux obtained on the Circular type pin is 0.01551 w/mm² and minimum 5.4867e-5 w/mm².

8 RECTANGULAR TYPE MESH MODEL

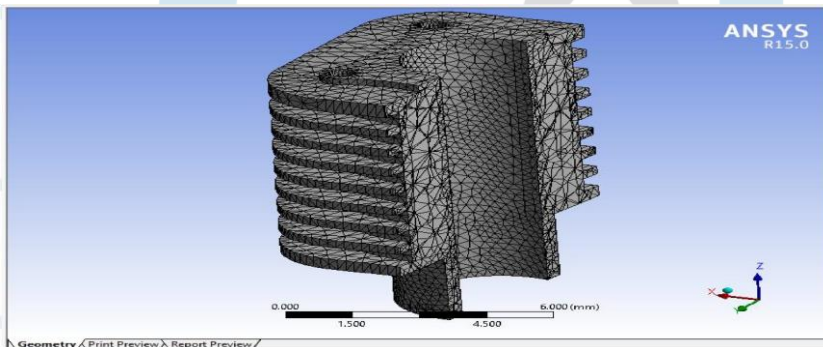
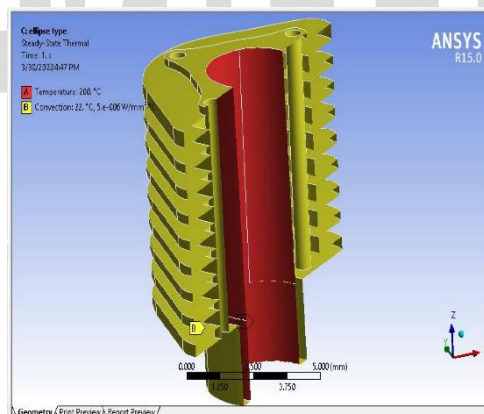


Fig 8 Mesh Model



8.1 STEADY STATE THERMAL BOUNDARY CONDITIONS

Fig 8.1 Thermal Boundary Condition

8.2 THERMAL ANALYSIS OF ELLIPTICAL TYPE FIN

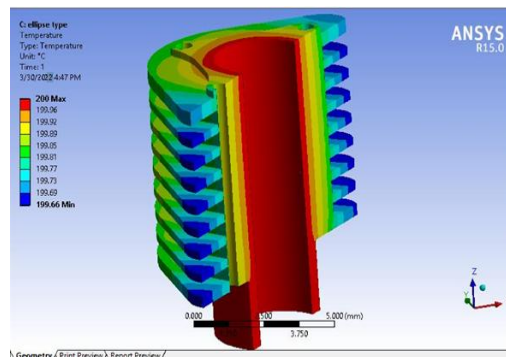
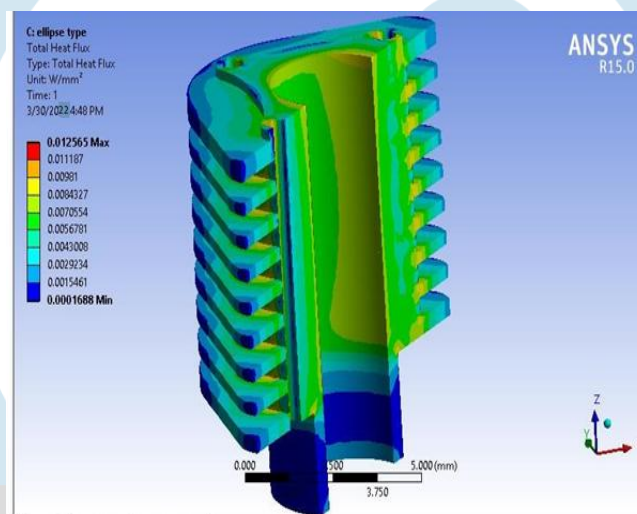


Fig 8.2 Temperature Distribution

➤ In this step total temperature distribution of circular type pin using ANSYS software applying 200°C. In result we get maximum temperature is 200°C and minimum 199.66°C

8.3 HEAT FLUX

Fig 8.3 Heat Flux



In this step heat flux using ANSYS software total heat flux obtained on the ellipse type pin is 0.012565 w/mm2 and minimum 0.0001688 w/mm2.

9. RESULT

S.no	Type	Temperature distribution (°C)	Heat flux (w/mm2)
1	CIRCULAR TYPE	200 Max 199.88 Min	0.01551 Max 5.4867e-5 Min
2	ELLIPTICAL TYPE	200 Max 199.66 Min	0.012565 Max 0.0001688 Min

10. CONCLUSION

- Contact time between air flow and fin (time between air inlet and outlet flow through fin) is also important factor in such heat transfer. Wavy fin shaped cylinder block can be used for increasing the heat transfer from the fins by creating turbulence for upcoming air. Improvements in heat transfer can be compare with two model of the engine fins geometry by thermal Analysis are studied for all the geometries it is found that the elliptical fins provide better result when compared with other geometries.

11. REFERENCE

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