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Thermal Transient Analysis Of Rectangular Profile Fin By Using Fem Methods

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Abstract: **By doing thermal analysis on the engine fins, it is helpful to know the heat dissipation inside the cylinder. We know that, by increasing the surface area we can increase the heat dissipation rate, so designing such a large complex engine is very difficult. The main aim of the present paper is to analyze the thermal properties of a rectangular fin using Ansys. Transient thermal analysis determines temperatures and other thermal quantities that vary over time. The variation of temperature distribution over time is of interest in many applications such as in cooling. The accurate thermal simulation could permit critical design parameters to be identified for improved life**

Keywords: **Fin; ANSYS; Transient;**

I. INTRODUCTION

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. So, the object of cooling system is to keep the engine running at its most efficient operating temperature. It is to be noted that the engine is quite inefficient when it is cold and hence the cooling system is designed in such a way that it prevents cooling when the engine is warming up and till it attains to maximum efficient operating temperature, then it starts cooling. To avoid overheating, and the consequent ill effects, the heat transferred to an engine component (after a certain level) must be removed as quickly as possible and be conveyed to the atmosphere. It will be proper to say the cooling system as a temperature regulation system. It should be remembered that abstraction of heat from the working medium.

II. FINITE ELEMENT METHOD

FEM cuts a structure into several elements (pieces of the structure). Then reconnects elements at "nodes" as if nodes were pins or drops of glue that hold elements together. This process results in a set of simultaneous algebraic equations.

The finite element method (FEM) is a numerical technique for finding approximate solutions toboundary value problems or partial differential equations. It is also referred to as finite element analysis (FEA). FEM subdivides a large problem into smaller, simpler, parts, called finite elements. The simple equations that model

these finite elements are then assembled into a larger system of equations that models the entire problem. FEM then uses variational methods from the calculus of variations to approximate a solution by minimizing an associated error function.The subdivision of a whole domain into simpler parts has several advantages:

- Accurate representation of complex geometry
- Inclusion of dissimilar material properties
- Easy representation of the total solution Capture of local effects.

ANSYS

Ansys is commercial finite-element analysis software with the capability to analyze a wide range of different problems. ANSYS runs under a variety of environments, including IRIX, Solaris, and Windows NT. Like any finite-element software, ANSYS solves governing differential equations by breaking the problem into small elements. The governing equations of elasticity, fluid flow, heat transfer, and electro-magnetism can all be solved by the Finite element method in ANSYS. ANSYS can solve transient problems as well as nonlinear problems. This document will focus on the basics of ANSYS using primarily structural examples

III. DESCRIPTION AND WORKING OF FIN

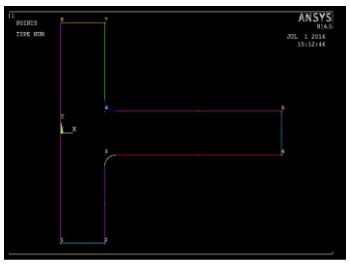
As fins are introduced to enhance heat transfer from a base which is at high temperature, rectangular fins and triangular fins are considered for analysis on two stroke air cooled

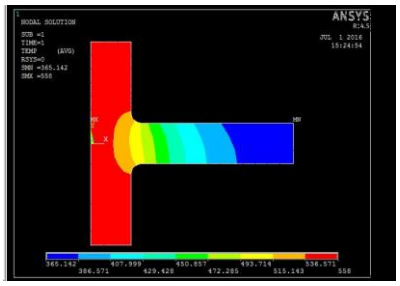
engine. Engine life and effectiveness can be improved with effective cooling. The cooling mechanism of the air cooled engine is mostly dependent on the fin size. The heat is conducted through the engine parts and convected to air through the surfaces of the fins. Insufficient removal of heat from engine will lead to high thermal stresses and lower engine efficiency. As air-cooled engine builds heat, the cooling fins allow the wind and air to move the heat away from the engine.Considering an air cooled petrol engine with two stroke, at no load condition engine does not generate power. When load increases on an engine, the upward movement of a piston causes compression of the previously available charge inside the cylinder. Thus, during upward stroke, suction and compression of charge takes place simultaneously, and both transfer port and exhaust port remain closed. At the end of compression stroke, the charge is ignited by a high voltage electric spark. After ignition of charge, hot high pressure gases expand. The piston goes downwards and compresses the charge drawn in the crank case. At the end of expansion stroke, exhaust port which is slightly placed higher than the transfer port, opens releasing the burnt gases from cylinder to the atmosphere. Fins are provided on a periphery of engine .

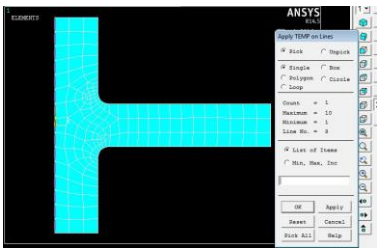
ANSYS PROCEDURE

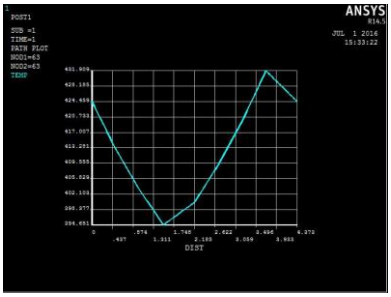
PREPROCESSOR → ELEMENT TYPE→ ADD/EDIT/DELETE
QUAD 4 NODE 55
MATERIAL PROPERTIES→ MATERIAL MODEL→ THERMAL → CONDUCTIVITY→ISOTROPIC
KXX = 192
C=0.88
DENSITY = 2800
MODELING
MESHING
BOUNDARY CONDITIONS
SOLUTION
TRANSIENT TIME = 300 SECONDS

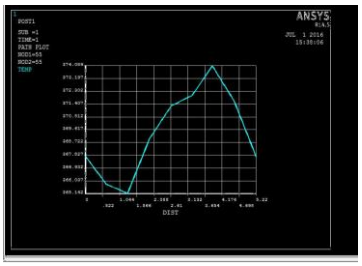
IV. MODELING AND RESULTS

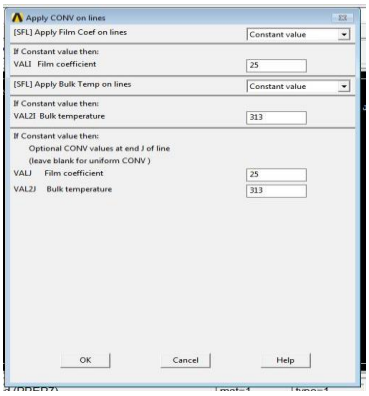












V. CONCLUSION

In present work the thermal analysis of fin is done by using ansys this fins are used for cooling system for automobiles. The various properties of the fin material are conductivity-192, specific enthalphy-0.88, density-2800 and the loads are temperature-558, film coefficient -25, bulk temperature-313 and the temperature graphs are shown at thw different time seconds how the temperature keeps distributed in fin body .

VI. REFERENCES

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