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Modelling Of S.I Engine Piston With Thermal Analysis Of Different Materials

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ABSTRACT

The project MODELLING AND ANALYSIS OF PISTON inS.I engine according to the forces acting on it from the gases, which are released during the combustion.The piston head acts as a particular case and hence the piston is analyzed for the stresses developed due to the conditions.

At first, the piston is designed according to the specifications. After the designing, the model is subjected to certain conditions. Mainly piston is connected to connecting rod and that connecting rod is engaged to crank shaft. According to the conditions we have checked the stresses acting on it and checked analysis of the model. After the analyzing the changes are done to the model if required.

In the analysis a model of piston of

the s.i engine is generated using software CATIA, the analysis of the piston is generated using Ansys. Here were are doing thermal analysis of the piston with two materials .The result are calculated and tabulated below and the temperature and heat flux are shown using with different materials (aluminum alloy and E glass epoxy (composite material)).

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INTRODUCTION:

The **internal combustion engine** is an engine in which the combustion of a fuel (normally a fossil fuel) occurs with an oxidizer (usually air) in a combustion chamber that is an integral part of the working fluid flow circuit. In an internal combustion engine (ICE) the expansion of the high-temperature and high-pressure gases produced by combustion apply direct force to some component of the engine. The force is applied typically to pistons, turbine blades, or a nozzle.

This force moves the component over a distance, transforming chemical energy into useful mechanical energy. The first commercially successful internal combustion engine was created by Étienne Lenoir.

SOME TYPES OF I.C ENGINES PISTONS

A **piston** is a component of reciprocating engines, reciprocating pumps, gas compressors and pneumatic cylinders, among other similar mechanisms. It is the moving component that is contained by a cylinder and is made gas-tight by piston rings. In an engine, its purpose is to transfer force from expanding gas in the cylinder to the crankshaft via a piston rod and/or connecting rod. In a pump, the function is reversed and force is transferred from the crankshaft to the piston for the purpose of compressing or ejecting the fluid in the cylinder. In some engines, the piston also acts as a valve by covering and uncovering ports in the cylinder wall.

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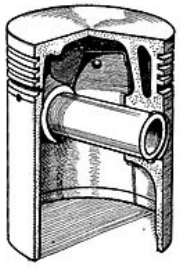
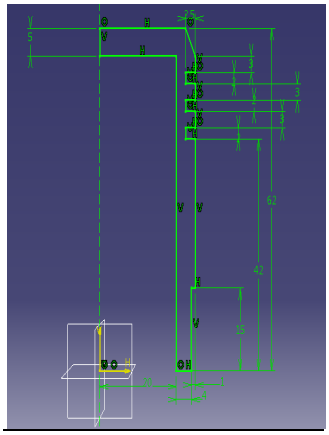
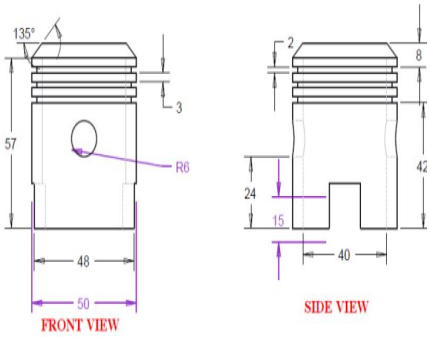
Internal combustion engines

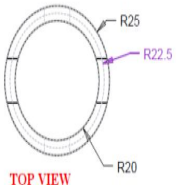


HOW TO DRAW A PISTON IN CATIA



Dimensions of the piston





Rovolue the drawn the figure using command shaft

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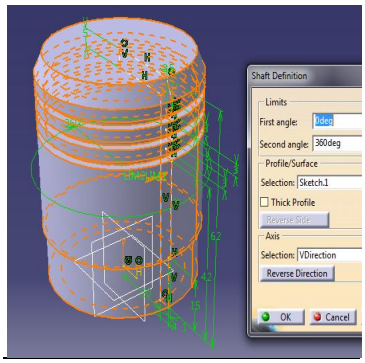
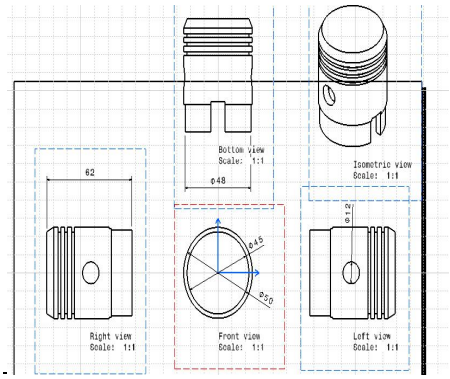
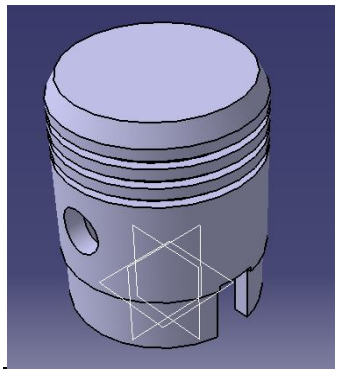


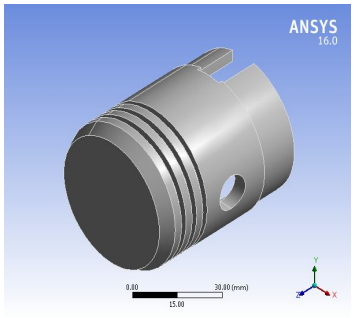


Final piston



Drafting of piston

ALUMINUM ALLOY



MESH

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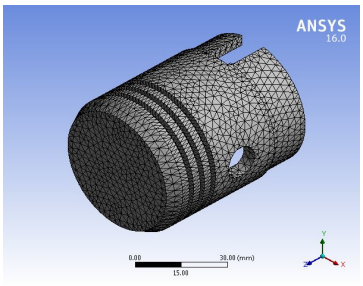
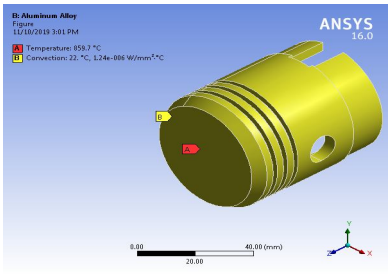
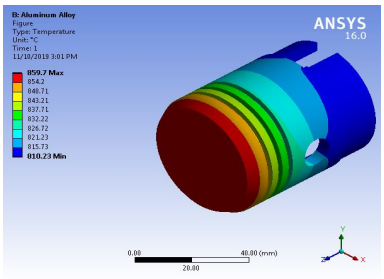


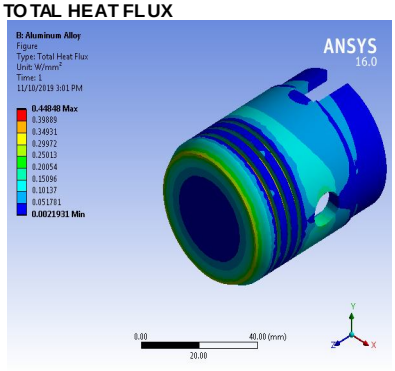
STEADY-STATE THERMAL



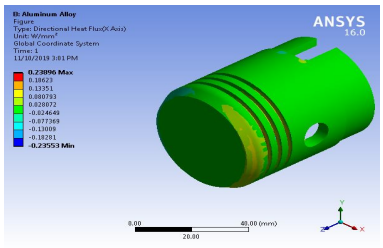
TEMPERATURE



TOTAL HEAT FLUX



DIRECTIONAL HEAT FLUX



EPOXY S GLASS UD

STEADY-STATE THERMAL

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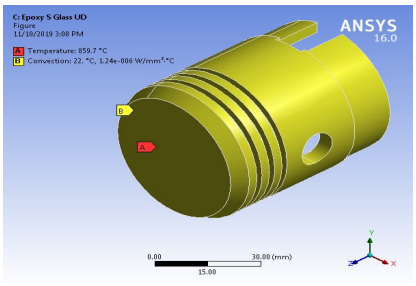
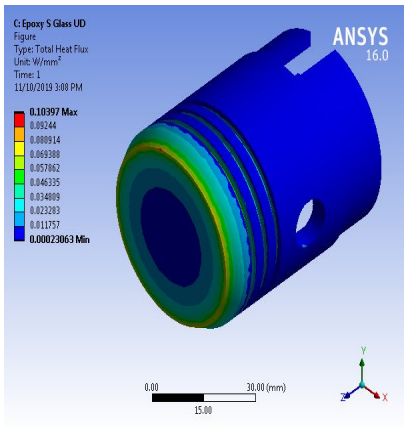
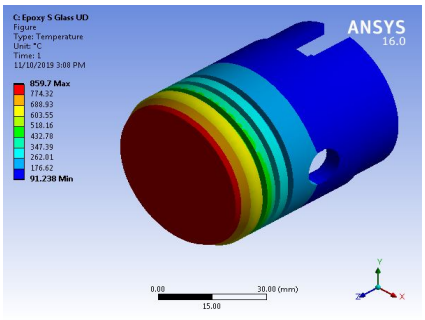


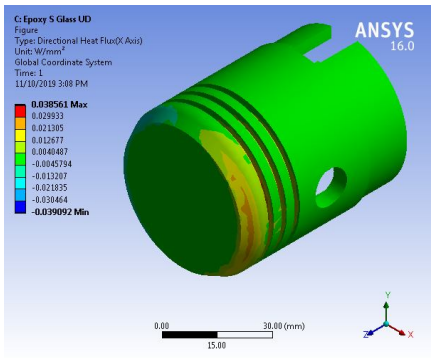
TEMPERATURE



DIRECTIONAL HEAT FLUX



TOTAL HEAT FLUX



GRAPHS

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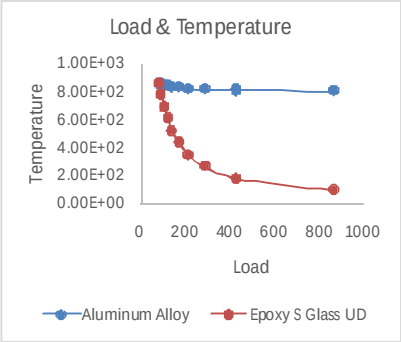

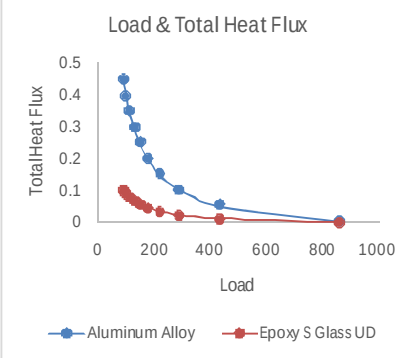

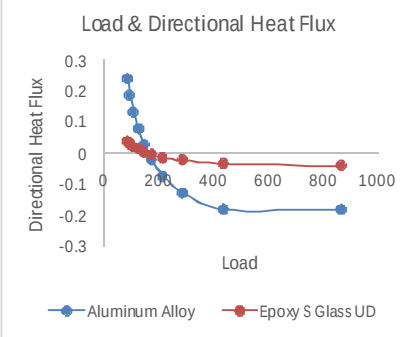

CONCLUSION

	Temperature	Total Heat Flux	Directional Heat Flux
Aluminum Alloy	859.7	0.44848	0.23896
Epoxy S Glass UD	859.7	0.10397	3.8561e-002

From the above result it is analyzed. The Piston made of two different materials Aluminum alloy and Epoxy S Glass UD are analyzed. Maximum temperature is found at the center of the top surface of the piston crown. This is equal for all materials. Depending on the Total Heat Flux and the Directional Heat Flux of the materials the heat transfer rate is found maximum in Aluminum alloy piston and minimum in Epoxy S Glass UD. For the given loading conditions, Aluminum alloy piston is found most suitable. But when the loading pattern changes, other materials may be considered. With the advancement in material science, very light weight materials with good thermal and mechanical properties can be used for failsafe design of the I.C.engine. This will reduce the fuel consumption and protect the environment.

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