International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 08 | Aug 2018 www.irjet.net p-ISSN: 2395-0072

DESIGN AND ANALYSIS OF FOUR STORKE PETROL ENGINE GASKET

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Abstract - *Our project work includes the failures of a Gasket used in an automobile which had been involved in an Engine temperature. The Gasket was found to Thermal stress according to Changing of Varying material. The investigation should be carried out in order to establish whether the failure will be the cause or a consequence of the Engine temperature. To find out the cause of fracture of the Gasket, a finite element analysis should be carried out to predict the stress state of the Gasket under steady State thermal Effect loading respectively. The steady of thermal Effect will be produced under normal operation, while the Temperature generated Engine during working.*

The Gasket fractures in reversed Due to thermal Expansion fatigue as a result of improper Design. Analysis part was done with ANSYS and also theoretical calculations were proved to be correct.As an added advantage we also reduced the cost of Gasket unit with the material we have suggested

***Key Words*: Gasket, ANSYS, Stress, Thermal, and Temperature.**

1. INTRODUCTION

Head gasket plays an important role at ensuring the maximum compression between the engine block and the cylinder head. As a result, the coolant or engine oil would not flow to the cylinder, leading to the appreciated no-leakage. It is also called the cylinder head gasket, which has been widely applied in various combustion systems, including the car's internal combustion engine. The cylinder head gasket here aims to transfer the gases and the heat and prevent the internal leakage.

Gasket affects well as the excellent seal between the surfaces. Since it is compressed together, the strength should be considered carefully by regard of that of the other components of the combustion chamber. The space between the surfaces or the cylinders is nearly none for the leakage. The excellent tightness does great favors to the performance of the whole equipment. Referring to the materials used for the manufacturing of this part, they would be multiple layer steel, graphite or asbestos. Multiple layer steel usually has three layers of the steel and occupies the contact faces coated with a rubber-like coating. To be frankly, the multiple layer steel is mostly used, especially for the typical modern cylinder. And the one made of the graphite or asbestos, which called the composite cylinder head gasket, is easy to be with more blowouts. Whatever, it plays its role perfectly in the engine.

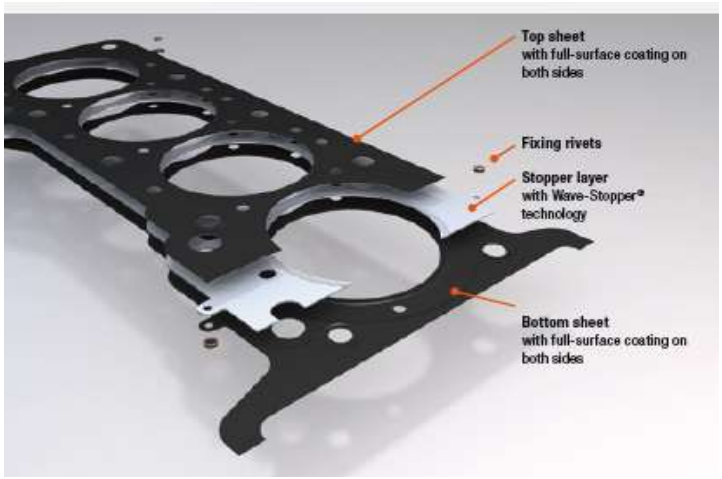


Figure 1 Gasket

2. METHODOLOGY:

For these three materials for gasket we select Solid copper, Composite, Elastomeric materials to analysis the thermal expansion of gasket for different materials and find the thermal stress and temperature deformation of this three material of gasket, by comparing this three temperature distribution which material is good and cost reduction.

3. RESULTS AND DISCUSSIONS

3.1 Cad model created for analysis

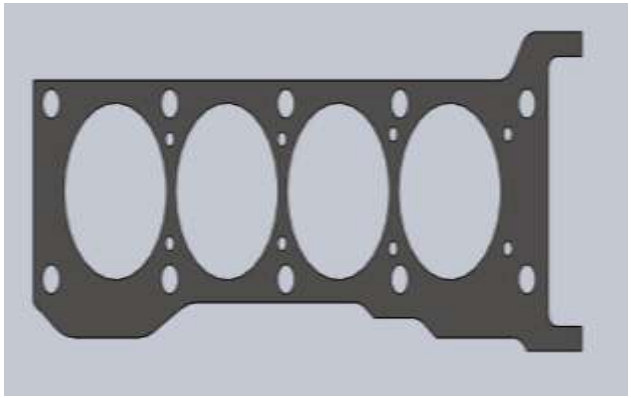
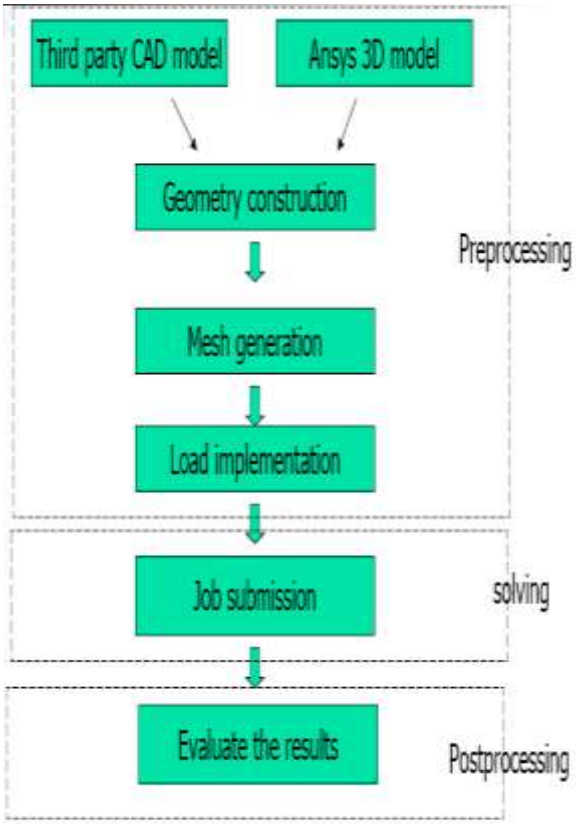


Figure 2 Cad model created for analysis

4. STEPS IN A THERMAL ANALYSIS



5. PROCEDURE

Element type defines:

5.1 PRE-PROCESSOR

Analysis type: Thermal

Element type: solid and thermal solid and quad 4 nodes

5.2. MATERIAL PROPERTIES

Material properties

⇩

Material model

⇩

Thermal conductivity

⇩

Isotropic enter for Kxx

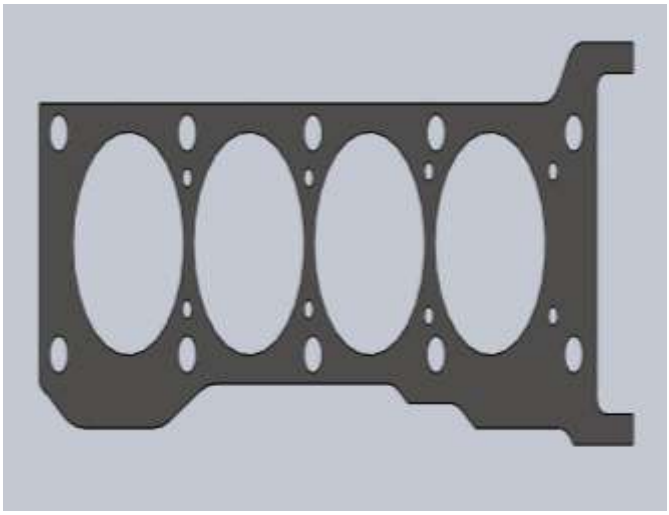
5.3. BOUNDARY CONDITIONS

Apply temp around edges of the Gasket

And apply all DOF in the Outer side of the Gasket

5. 4.REVIVE THE RESULT OF NODAL TEMPERATURE AND THERMAL ENERGY

Cad Model



5.5 MESH IN ANSYS

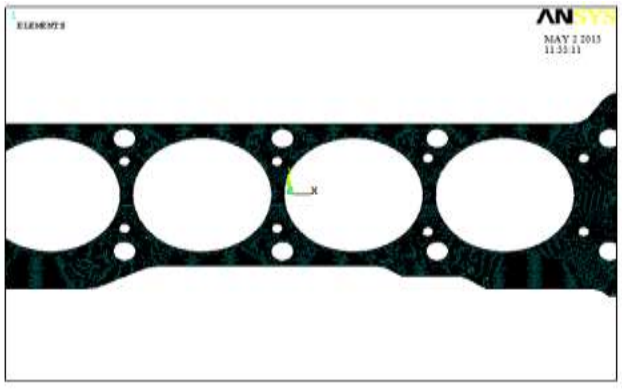


Figure 5.1 Mesh in ansys

5.6 FINE MESH

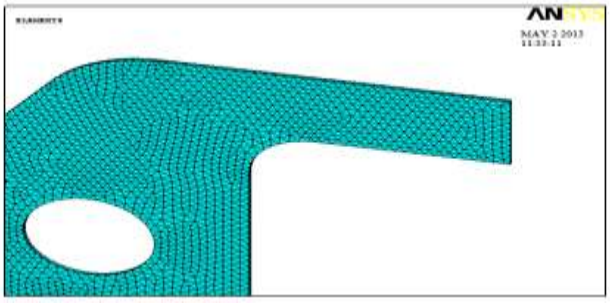


Figure: 5.2 Fine mesh

5.7 NODAL TEMPERATURE OF STEEL

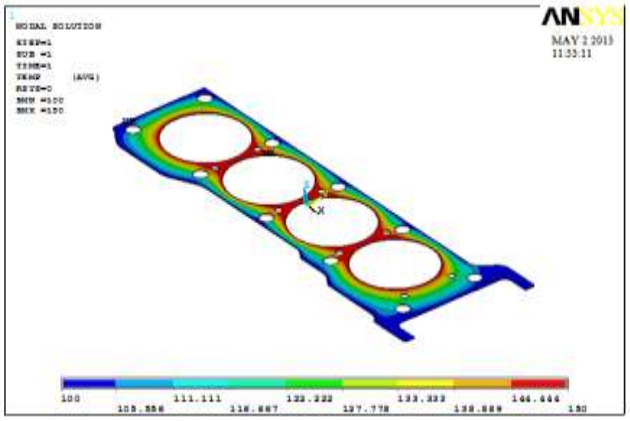


Figure 5.3 Nodal Temperature of Steel

5.8 DAMAGED AREA OF THE NODAL TEMPERATURE FOR STEEL

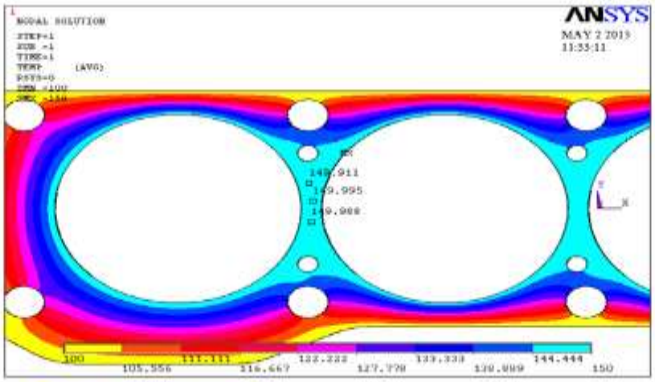


Figure 5.4 Damaged Area of the nodal temperature for steel: 149*c

5.9 THERMAL ENERGY IN STEEL

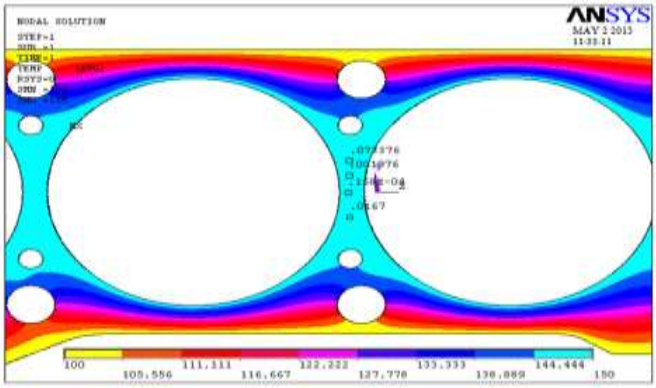


Figure 5.5 Thermal Energy of steel Thermal Energy of steel is: 0.168

5.10 NODAL TEMPERATURE OF COPPER

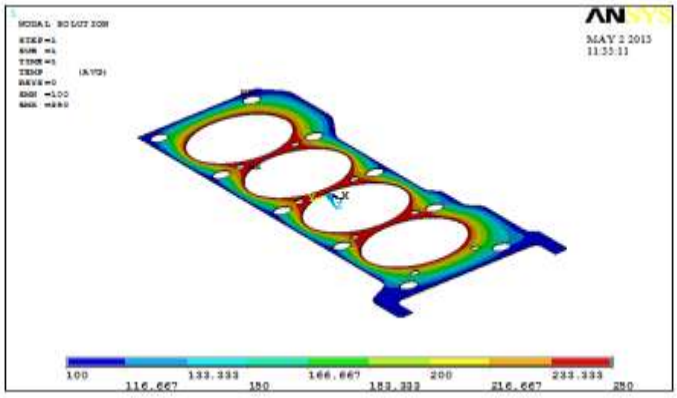


Figure 5.6 Nodal temperature of Copper

5.11 DAMAGED AREA OF THE NODAL TEMPERATURE FOR COPPER

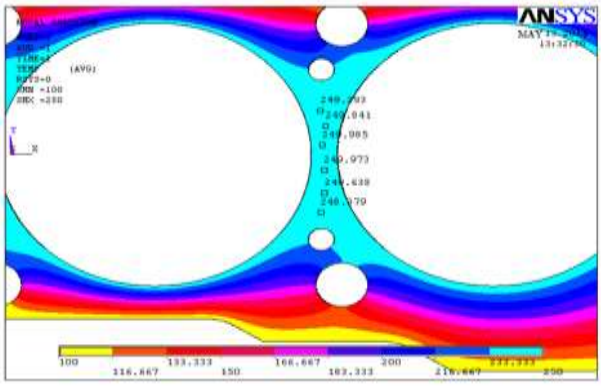


Figure 5.7 Damaged Area of the nodal temperature for Copper 249*c

5.12 THERMAL ENERGY OF COPPER

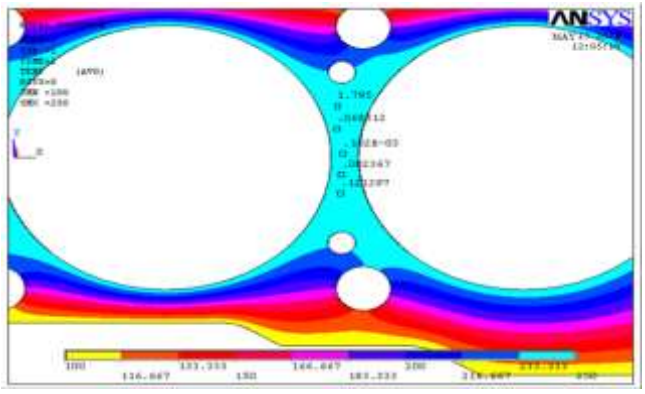


Figure 5.8 Thermal Energy of copper is: 1.795

5.13 NODAL TEMPERATURE OF POLYMER

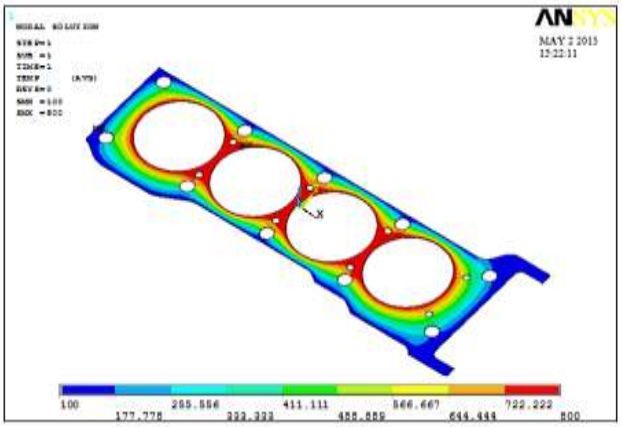


Figure 5.9 Nodal temperature of Polymer

5.14 DAMAGED AREA OF THE NODAL TEMPERATURE FOR POLYMER

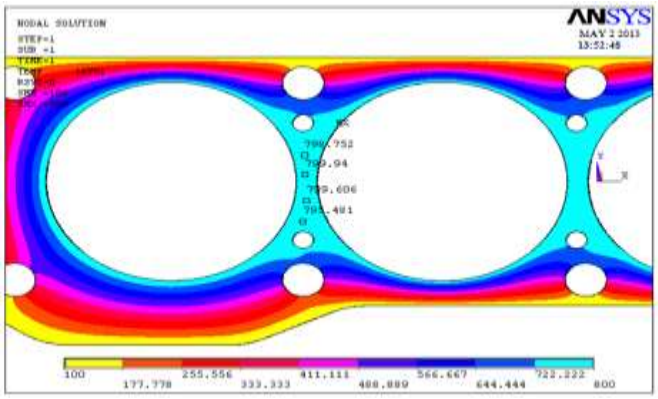


Figure 5.10 Damaged Area of the nodal temperature for Polymer: 799*c

5.15 THERMAL ENERGY OF POLYMER

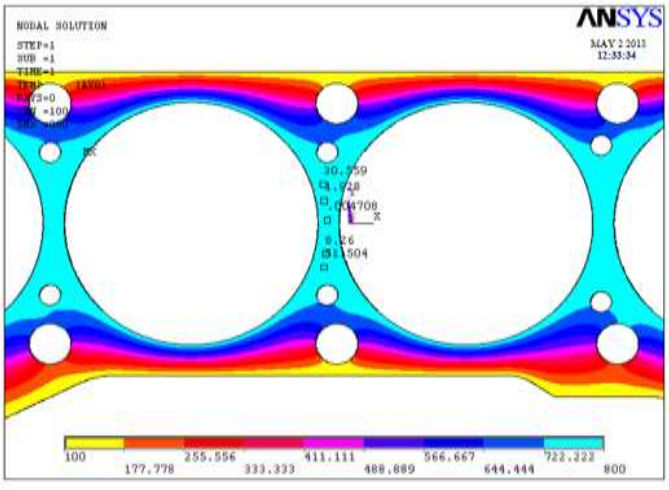


Figure 5.11 Thermal Energy of polymer is: 30.5

5.16 NODAL TEMPERATURE: CHART

1.Nodal temperature of steel.

2.Nodal temperature of Copper.

3.Nodal temperature of polymer.

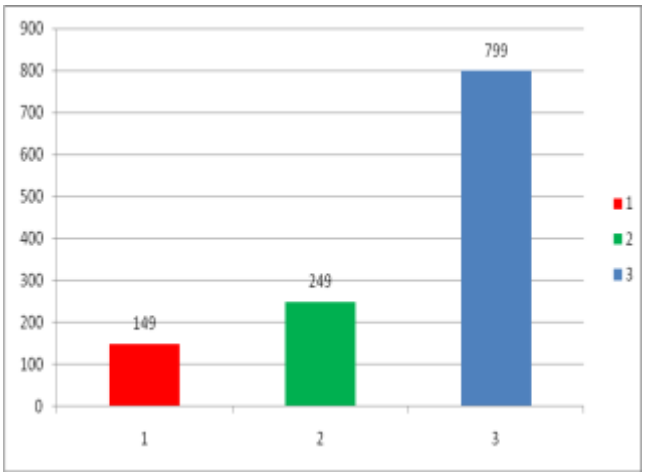


Figure 4.15 Nodal temperature chart

The temperature of Polymer is Very high the steel is very low compare to other.

5.17 THERMAL ENERGY: CHART

1.Thermal energy of steel.

2. Thermal energy of Copper.

3. Thermal energy of polymer.

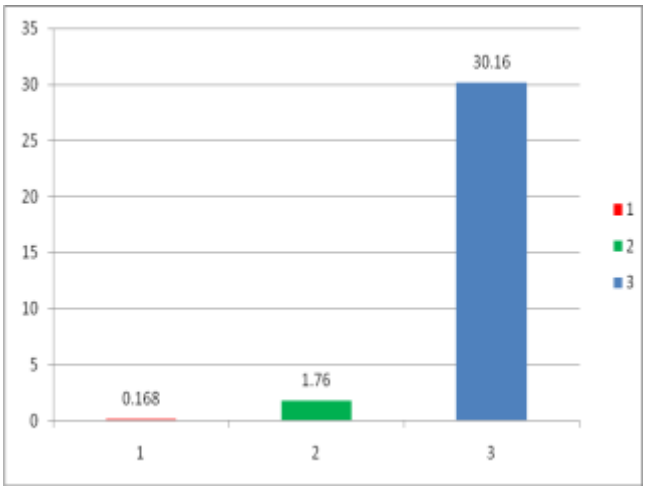


Figure 4.16 Thermal energy chart

The Themal energy of Polymer is Very high the steel is very low compare to other.

5.18 NODAL TEMPERATURE AND THERMAL ENERGY FOR DIFFERENT MATERIALS

Table 1 Nodal temperature and thermal energy for different materials

S.NO	NODAL TEMPERATURE	THERMAL ENERGY
1. STEEL	149	0.168
2.COPPER	249	1.795
3.POLYMER	799	30.5

CONCLUSION

Extensive damage caused by a blown head gasket can be the most detrimental form of engine problems. If a faulty head gasket is not detected early, a required repair of the engine block, the cylinder head, or a complete engine replacement could be required.

As analyzed this three materials Steel, Copper and polymer. The steel has the nodal temperature is less when compare the others and thermal energy is higher than the other material. So in this project steel gasket is better efficiency than comparing the other materials. Which is shown above the result table?

As we are reducing the heat transfer by using steel as gasket and at the same time we find the causes and failure.

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BIOGRAPHIES

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