STRUCTURAL AND THERMAL ANALYSIS OF PISTION ON VERIOUS MATERIAL

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Abstract : A piston may be a device that reciprocates at intervals a cylinder. it's either captive by the fluid or it moves the fluid that enters the cylinder. the most perform of the piston of associate IC engine is to receive the impulse from the increasing gas and to transmit the energy to the rotating shaft through the rod. The piston should conjointly disperse an oversized quantity of warmth from the combustion chamber to the cylinder walls. Piston is created of solid Al thanks to its high heat transfer rate. One vital factor to require care whereas victimization it (cast aluminum) is, as a result of it expands appreciably on heating thus correct quantity of clearance must be provided alternatively it'll lead the engine to seize. For avoiding higher than downside during this project solid Al LM25,ASMT B548 Alloy, A383and AL7475-7351 goes to interchange with the Al Alloys. These materials have high strength and Elongation. The aim of project is to style a piston for 150cc engine victimization style calculations. 2nd drawing is formed by victimization parameters obtained and a 3D model of piston is intended using constant code Catia by using 2nd drawings. Couple field Analysis is to be done on the piston by varied parameters like thickness etc and conjointly by considering materials of Al Alloys. Analysis is to be done to verify the simplest combination of parameters and material for 2 wheeler piston that is finished in solid works.

Keywords: Two wheeler piston, materials like LM25, ASMT B548 Alloy, A383and AL7475-735, Catia, ANSIS, Stress, Displacement, Thermal gradient and heat flux.

I. INTRODUCTION

In each engine, piston plays a very important role in operating and manufacturing results. Piston forms a guide and bearing for the tiny finish of rod and additionally transmits the force of explosion within the cylinder, to the crank shaft through rod. The piston is that the single, most active and extremely essential element of the automotive engine. The Piston is one among the foremost crucial, however considerably behind-the-stage elements of the engine that will the essential work of passing on the energy derived from the combustion among the combustion chamber to the rotating shaft. merely same, it carries the force of explosion of the combustion method to the rotating shaft. Apart from the essential job that it will higher than, there area unit sure different functions that a piston invariably will it forms a form of a seal between the combustion chambers fashioned among the cylinders and therefore the housing. The pistons don't let the high mixture from the combustion chambers over to the housing.

1.5 PISTON DESCRIPTION:

Pistons move up and down within the cylinders that exerts a force on a fluid within the cylinder. Pistons have rings that serve to stay the oil out of the combustion chamber and therefore the fuel and air out of the oil. Most pistons fitted in a very cylinder have piston rings. sometimes there area unit 2 spring-compression rings that act as a seal between the piston and therefore the cylinder wall, and one or additional oil management ring s below the compression rings. the pinnacle of the piston will be flat, bulged or otherwise formed. Pistons will be cast or solid. the form of the piston is generally rounded however will be totally different. A special kind of solid piston is that the hypereutectic piston. The piston is a very important element of a piston engine and of hydraulic gas systems. Piston heads type one wall of associate degree growth chamber within the cylinder. the alternative wall, referred to as the plate, contains body of water and exhaust valves for gases. From there the ability is sent through a rod to a rotating shaft, that transforms it into a rotation, that sometimes drives a gear case through a clutch.

Components of a typical, four stroke cycle, DOHC piston engine.(E) Exhaust rotating shaft, (I) Intake rotating shaft, (S) sparking plug, (V) Valves, (P) Piston, (R) rod, (C) rotating shaft, (W) vessel for fluid flow.

1.5.1 PISTON HEAD OR CROWN 1.5.2 PISTON RINGS:

1.6 FUNCTIONS OF THE PISTON:

1. To receive the impulse from the increasing gas & transmit the energy to the Crank shaft through the rod.
2. It transmits the force of combustion gases to the crank shaft.
3. It controls the gap & closing of elements in a very 2-stroke engine.
4. It acts as a seal to flee of high gases into the crank case

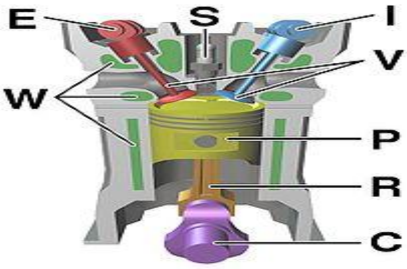

Fig (1.1) Four stroke cycle engine

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II. LITERATURE REVIEW

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“Thermal Analysis and improvement of I.C. Engine Piston victimisation finite component Method”(IJMER) Vol.2, Issue.4, July-Aug 2012 pp-2919-2921 ISSN: 2249-6645) by A. R. Bhagat and Y. M. Jibhakate This paper describes the strain distribution of the seizure on piston four stroke engines by victimisation FEA. The finite component analysis is performed by victimisation pc motor-assisted style (CAD) computer code. the most objectives area unit to research and analyze the thermal stress distribution of piston at the important engine condition throughout combustion method. The paper describes the mesh improvement with victimisation finite component analysis technique to predict the upper stress and demanding region on the element. What is more, the finite component analysis performed with victimisation computer code ANSYS. An optimized piston that is lighter and stronger is coated with metallic element for bio-fuel. during this paper, the coated piston undergone a Von misses take a look at by mistreatment ANSYS for load applied on the highest. Vonmisses stress is magnified by 16 PF and deflection is magnified when optimisation. however all the parameters square measure well with in style thought.

Design, Analysis and optimisation of piston that is stronger, lighter with minimum price and with less time. Since the planning and weight of the piston influence the engine performance. Analysis of the strain distribution within the varied elements of the piston to understand the stresses thanks to the force per unit area and thermal variations mistreatment with Ansys. With the definite-element analysis computer code, a three-dimensional definite-element analysis has been dispensed to the ICE piston.

This paper involves simulation of a 2-stroke 6S35ME marine internal-combustion engine piston to see its temperature field, thermal, mechanical and matched thermal-mechanical stress. The distribution and magnitudes of the afore-mentioned strength parameters square measure helpful in style, failure analysis and optimisation of the engine piston. The piston model was developed in solid-works and foreign into ANSYS for preprocessing, loading and post process. Material model chosen was 10-node tetrahedral thermal solid eighty seven.

“PARAMETRIC AND MATERIAL improvement OF 2 WHEELER PISTON” Vol.2, No.1, Pages: 596 - 601 (2013)ISSN 2278-3091 by Soniya kaushik1, Rayapuri Ashok, prophet zubair nizami, Dr.Mohd. Mohinoddin. Piston is formed of solid Al as a result of its high heat transfer rate. One vital factor to require care whereas victimisation it's, as a result of it expands appreciably on heating thus correct quantity of clearance has to be provided alternatively it'll lead the Engine to seize. The aim of project is to style a piston for 150cc engine victimisation style calculations. 3D model of piston is meant victimisation constant quantity computer code Pro/Engineer by victimisation 2nd drawings. Couple field Analysis is finished on the piston by variable parameters like thickness etc and additionally by considering materials Al alloys.

Objectives of gift project area unit 3 models of piston area unit designed for the 3 Al alloys and couple field analysis is finished to verify best combination of parameters yet because the best material by victimisation solid works.This document is a template.

III. DESIGN CALCULATIONS

3.1 PRESSURE CALCULATIONS:

TVS Aapche RTR 160 V4 specifications

Engine type: air cooled 4-stroke Bore (mm) × stroke(mm) = 62 × 52.9

Displacement =159.7 cc Maximum power = 12.13 kW @8000rpm

Maximum force = 14.8Nm @ 6500 revolutions per minute

Compression quantitative relation =9.5/1

Density of gasoline C_8H_{18} = 737.22 kg/m3 at 15.550C

= 0.00073722 kg/cm3 = 0.00000073722 kg/mm3

T =15.550C=288.855K

Mass = density × volume m = 0.00000073722 × 159773 m = 0.118kg

Molecular cut for gasoline 114.2285 g/mol

PV = mRT

P= mRT/V = (0.118×8.3143×288.555)/(0.11422×0.000159773) = 263.9/0.00001707

P = 15512260.1915 J/m3 = N/m2 P =15.52 N/mm2

Mean effective pressure P_m = 1.5N/mm2

Indicated power informatics = (P_m×l×A×n)/60=(1.5×0.0529×3020.3×3250)/60=12981.63kW

Brake power BP = 2πNT/60= (2π×6500×14.8)/60 = 10078.1kW

Mechanical potency η_{mech}=BP/IP = 10078.1/12981.63 = 0.743 = 77.63%

3.2 PISTON CALCULATIONS:

Material: solid Al LM25

Temperature at the middle of piston head Tc = 2600C to 2900C

Temperature at the sting of piston head Te = 1850C to 2150C

most pressure P = fifteen.454N/mm2 Bore or outside diameter of piston = 57mm

3.2.1 THICKNESS OF PISTON HEAD:

Considering strength

$t_h = \sqrt{\frac{3pD^2}{16\sigma_t}}$ (σ_t = 200MPa) $t_h = \sqrt{\frac{3\times15.52\times62^2}{16\times200}}$ $t_h = \sqrt{54.777} = 7.4$ mm

Considering heat transfer

$t_h = \left(\frac{h}{12.56k(t_c - t_e)}\right)$ Heat conduction force = 174.75 W/m/0c

T_c-T_e = 75^0C H = C×HCV×m×B.P (in kW) C = constant = 0.05

HCV = 47×10^3KJ/kg for gasoline

m = mass of fuel for brake power per second BP = brake power

$H = C\times HCV\times\left(\frac{m}{BP}\right)\times BP$ $H = 0.05\times47\times10^3\times0.118$ H = 277.3

$t_h = (\frac{h}{12.56k(t_c - t_e)})$ t_h= 277.3/ (12.56× (174.75 × 75)) = 0.00168 m

t_h = 1.68mm t_h = 5.72 mm

3.2.2. PISTON RINGS:

Radial thickness $t_1 = D\sqrt{\frac{3p_w}{\sigma_t}}$ $t_1 = 57\sqrt{\frac{3p_w}{\sigma_t}}$

p_w = pressure of the gas on the cylinder wall = 0.042N/mm^2

σ_t = allowable bending (tensile stress) for cast iron rings = 110MPa

$t_1 = 62\sqrt{3 \times \frac{0.042}{110}}$ t_1 = 2.1 mm

Axial thickness $t_2 = D/10n_r$ = 62/10×3 = 2.067 mm n_r = no of rings = 3

Width of the top land b_1= 1.2t_h b_1 = 1.2× 7.4 = 8.88 mm

With of other land (i.e.) distance between ring grooves $b_2 = t_2$ = 2.067 mm

The gap between the free ends of the ring = 3.5t to 4t = 8.268mm

3.2.3 PISTON BARREL:

t_3 = 0.03D + b +4.5 b = radial depth of seal

b = t_1 +0.4 = 2.5mm t_3 = 0.03 62+2.5+4.5=8.86mm

The piston wall thickness towards the open finish $t_4 = 0.35t_3$ = 3.101mm

3.2.4 PISTON SKIRT:

Most gas load on the piston P = P πD2/4 = (15.52×π×62^2/4) P = 46855.98N

Maximum aspect thrust on the cylinder R = p/10 = 4685.598N

R = bearing pressure × bearing space of the piston skirt R = P_b× D × l

l = length of the piston skirt in metric linear unit l =50.4 mm

Bearing pressure metallic element = 1.5N/mm2

Total length of the piston L = length of the skirt length of ring section + prime land

Length of ring section = 5 b_2 or t_2 = 10.335mm L = 50.4 + 10.335+ 8.88 = 69.615 mm

3.2.5 PISTON PIN:

Material: - heat treated steel

Center of piston pin ought to be 0.02D to 0.04D above

the middle of skirt = 0.04D = 2.48 mm higher than center of skirt durability = 710 to 910MPa

Length of the pin within the rod bushing l_1 = 0.45D = 27.9mm

Load on the piston because of pressure = 46855.98N

p = bearing pressure bearing space $p = p_{b1} \times d_0 \times l_1$ l_1 = 27.9 mm

p_{b1} = 5 to 100Mpa for bronze p_{b1} = 50MPa $d_0 = p/p_{b1} \times l_1$ = 33.6mm

Inner diameter of piston pin $d_i = 0.6d_0$ = 20.15mm

Maximum bending moment at the middle of pin

M = P.D/8 = (46855.98N × 62)/8 M = 363133.845 N-mm

$Z = \pi/32[(d_0)^4 - (d_i)^4/d_0]$ $Z = \left(\frac{\pi}{32}\right)\left[\frac{[(d]_0)^4}{d_0} - \frac{[(d]_i)^4}{d_0}\right]$

= (π/32)(32981.4) = 3242.4 mm^3

Allowable bending stress σ_b = M/Z = 112 N/mm^2

This is less than the allowable value 140MPa for heat treated alloy steel

The mean diameter of the piston losses = 1.5d_0 = 50.4 mm

Design parameters for three models of piston are as follows:

	Design A (mm)	Design B (mm)	Design C (mm)
t_h	7.4	9.22	5.77
t_1	2.1	2.1	2.1
t_2	2.067	2.067	2.067
t_3	8.86	8.86	8.86
t_4	3.101	3.101	3.101
b_1	8.88	11.26	7.056
b_2	2.067	2.067	2.067
L	69.615	71.834	67.757

Table 1

IV. INTRODUCTION TO CAD

Software package (CAD), additionally called software package and drafting (CADD), is that the use of pc systems to help within the creation, modification, analysis, or improvement of a style. Computer-aided drafting describes the method of making a technical drawing with the utilization of pc computer code. CAD computer code is employed to extend the productivity of the designer, improve the standard of style, improve communications through documentation, and to make a information for producing.

4.3 Important Capabilities of CAD

wonderful things with CADD, that ne'er thought attainable whereas making drawings with a pen or pencil. the subsequent area unit a number of the vital capabilities that create CADD a strong tool:

Flexibility in piece of writing Storage and access for drawings Project reportage Engineering analysis & Design

4.4 Geometric Modeling

Geometric modeling may be a branch of mathematics and machine pure mathematics that studies ways and algorithms for the mathematical description of shapes. The shapes studied in geometric modeling area unit principally two- or three-dimensional, though several of its tools and principles will be applied to sets of any finite dimension.

i. Wire frame modeling. ii. Surface modeling. Iii. Solid modeling.

4.5 Introduction to CATIA

CATIA (Computer motor-assisted Three-dimensional Interactive Application) may be a multi-platform CAD/CAM/CAE industrial computer code suite developed by the French company Dassault Systems. Written within the C++ artificial language, CATIA is that the cornerstone of the Dassault Systems product lifecycle management computer code suite.

4.5.1 CATIA Application

Unremarkably mentioned as 3D Product Lifecycle Management computer code suite, CATIA supports multiple stages of development (CAx), from conceptualization, style (CAD), producing (CAM), and engineering (CAE). CATIA facilitates cooperative engineering across disciplines, as well as emergence style, engineering science, instrumentation and systems engineering. CATIA permits the creation of 3D elements, from 3D sketches, flat solid, composites, and molded, cast or tooling elements up to the definition of mechanical assemblies.

V. INTRODUCTION TO FEM

The fundamental plan within the Finite component is to seek out the answer of sophisticated downside with comparatively simple approach.. Applications vary from deformation and stress analysis of automotive, aircraft, building, defense, and missile and bridge structures to the sphere of research of dynamics, stability, fracture mechanics, heat flux, fluid flow, magnetic flux, flow and different flow issues..

Design issues

Engineering style is that the method of fashioning a system element or method to fulfill desired wants. it's the decision-making method (often iterative) within which the fundamental sciences, arithmetic and engineering sciences area unit applied to convert resources optimally to fulfill a explicit objective.

a. Cost b. Reliability c. easy operation and maintenance
d. Appearance e. Compatibility f. Safety options
g. Noise level h. Effectiveness i. Durability
j. Feasibility k. Acceptance l. Weight

INTRODUCTION TO COSMOS

COSMOS works is beneficial computer code for style analysis in engineering science. COSMOS Works may be a style analysis automation application absolutely integrated with Solid Works simulation. Solid Works Simulation may be a style analysis system absolutely integrated with Solid Works. Solid Works Simulation provides one screen answer for stress, frequency, buckling, thermal, and improvement analyses. hopped-up by quick solvers, Solid Works Simulation permits to unravel giant issues quickly victimisation notebook computer.

5.5.1 ANALYSIS BACKGROUND

This section provides the fundamental theoretical data needed for victimisation the computer code.

Linear Static Analysis
Thermal Analysis
Fatigue Analysis
Beams and Trusses
Frequency Analysis
Nonlinear Analysis
Style Studies
Liberalized Buckling Analysis
Dynamic Analysis
Drop check Analysis
Pressure Vessel style

Making 2-D Model Of Existing wheel hub

With the assistance of Catia computer code 2nd illustration of Existing element can takes place. In Catia, sketcher is that the main tool accustomed represent 2nd models. A sketcher may be a 2nd section of the feature being created

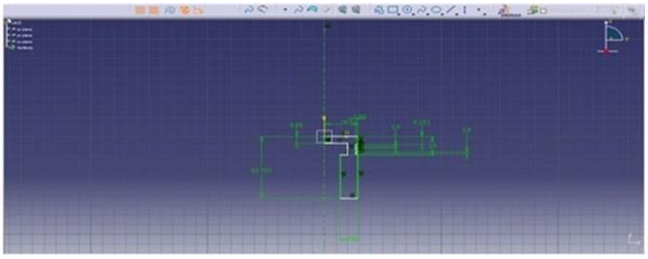


Figure 4 : Drawing of piston

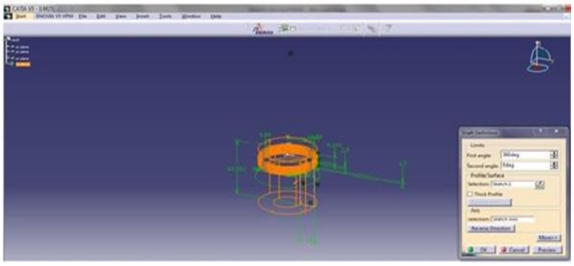


Figure 5: changing 2nd to 3D Drawing of piston

Generating 3D Model Of Existing piston

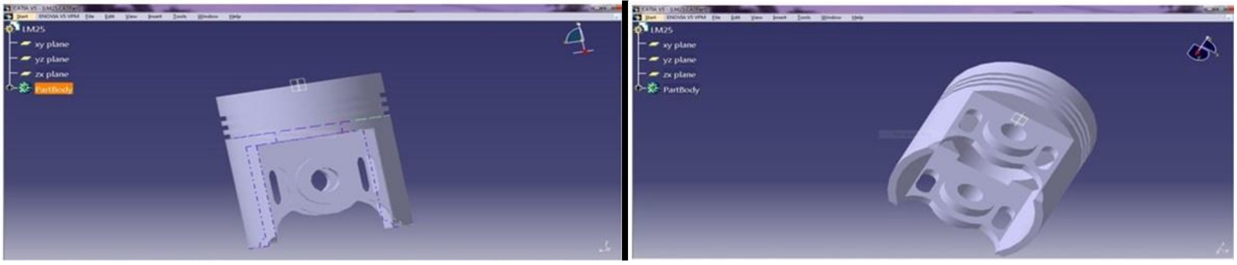


Figure 6 : 3D model of Existing piston

a) Add Material Properties

From this step analysis a part of the prevailing piston element goes to start out. during this case, with the assistance of COSMOS computer code properties of materials area unit intercalary.

Material Properties of LM 25

Elastic modulus : 71 Gpa Tensile Strength : 200 Mpa Poisson Ratio : 0.32
Shear modulus : 318.9 Gpa Yield strength : 210 Mpa Mass Density : 2680 kg/m^3
Coefficient of Thermal Expansion : 2.2e-0005/K Thermal conductivity : 134 w/(m-k) Specific heat : 963 J/(kg-K)

ASMT B548 Alloy Material properties

Elastic modulus : 70 Gpa Tensile Strength : 124.08 Mpa Poisson Ratio : 0.33
Shear modulus : 26 Gpa Yield strength : 55.15 Mpa Mass Density : 2700 kg/m^3
Coefficient of Thermal Expansion : 2.36e-0005/K Thermal conductivity : 234 w/(m-k) Specific heat : 1300 J/(kg-K)

A383 Material properties

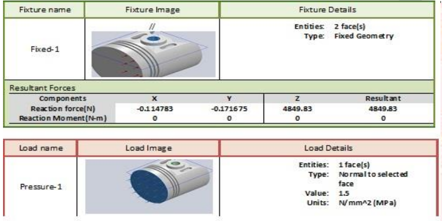
Elastic modulus : 71 Gpa Tensile Strength : 310 Mpa Poisson Ratio : 0.33
Shear modulus : 25 Gpa Yield strength : 150 Mpa Mass Density : 2740 kg/m^3
Coefficient of Thermal Expansion : 2.11e-0005/K Thermal conductivity : 96.2 w/(m-k) Specific heat : 963 J/(kg-K)

AL7475-7351 Material properties

Elastic modulus : 71.7 Gpa Tensile Strength : 496 Mpa Poisson Ratio : 0.33
Shear modulus : 27 Gpa Yield strength : 481 Mpa Mass Density : 2810 kg/m^3
Coefficient of Thermal Expansion : 2.3 e-0005/K Thermal conductivity : 177 w/(m-k) Specific heat : 880 J/(kg-K)

b) Apply Loads

After adding material properties for the prevailing oiston, styles of masses performing on the piston area unit applied.

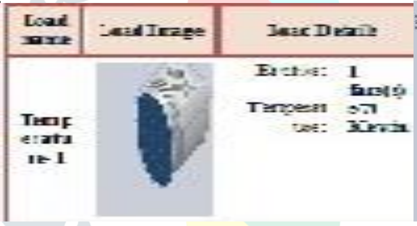


Fixture name	Fixture Image	Fixture Details
Fixed-1		Entities: 2 face(s) Type: Fixed Geometry

Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(N)	-0.114783	-0.171675	4849.83	4849.83
Reaction Moment(N-m)	0	0	0	0

Load name	Load Image	Load Details
Pressure-1		Entities: 1 face(s) Type: Normal to selected face Value: 1.5 Units: N/mm^2 (MPa)



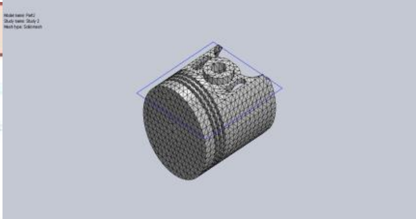


Figure 7: knowledge concerning masses Figure 8: Thermal loads Figure 9:Mesh Generation

STRUCTURAL AND THERMAL ANALYSIS OF PISTON

STRUCTURAL ANALYSIS OF DESIGN "A"

LM 25 Alloy

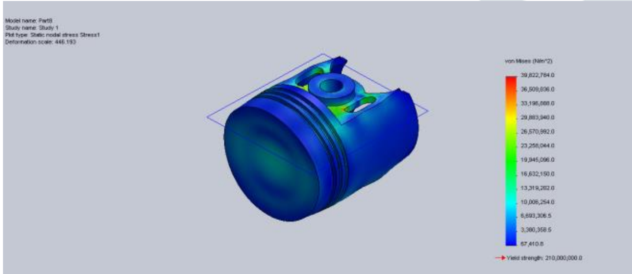


Figure 11: Stress Developed in existing piston Model

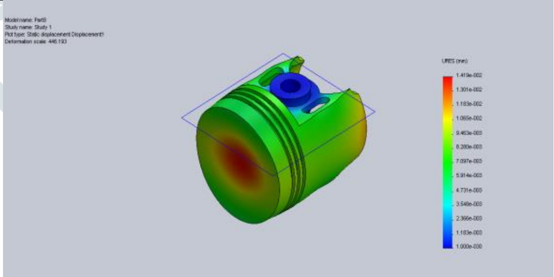


Figure 12: Displacement in existing piston Model

Fabric ASMT B548Alloy

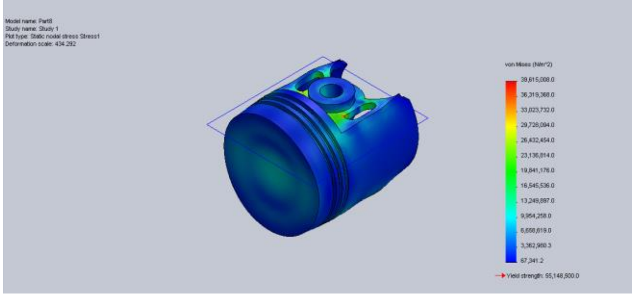


Figure 13: Stresses Developed in existing piston Model

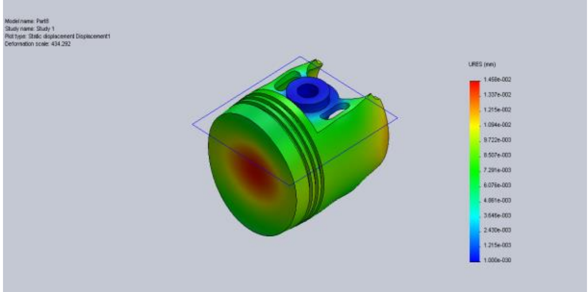


Figure 14:Displacement in existing piston Model

AL 7475-T7351 Alloy

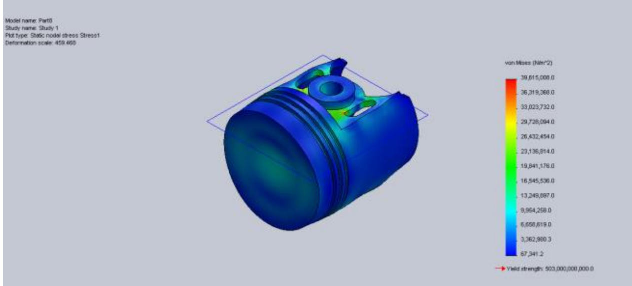


Figure 15: Stresses Developed in existing piston Model

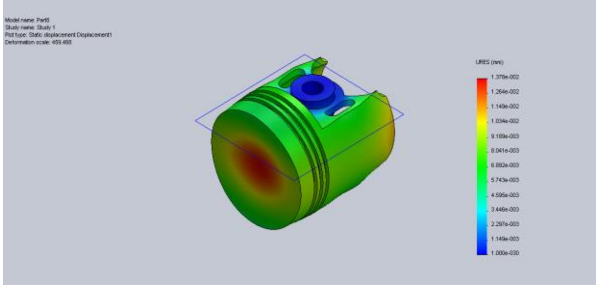


Figure 16: Displacement in existing piston Model

AL A383 Alloy

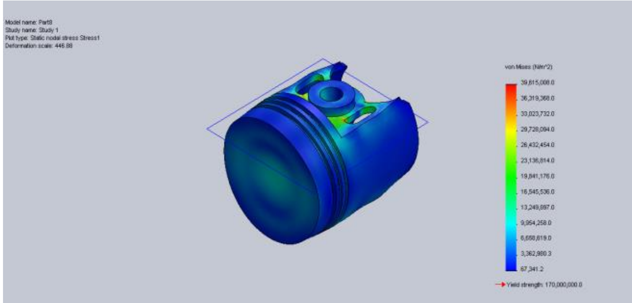


Figure 17: Stresses Developed in existing piston Model

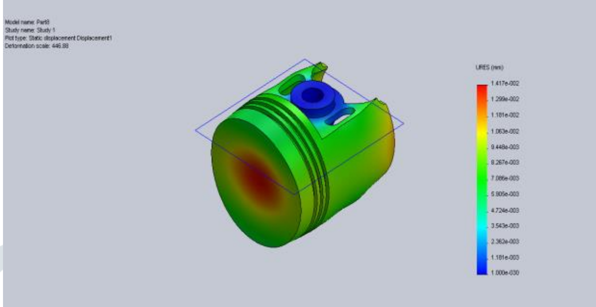


Figure 18: Displacement in existing piston Model

STRUCTURAL ANALYSIS MODIFIED DESIGN "B"

LM 25 Alloy

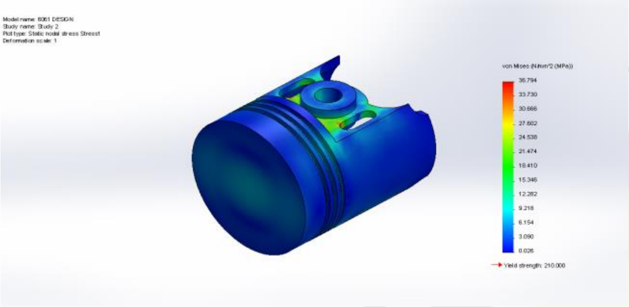


Figure 19: Stresses Developed in modified piston Model

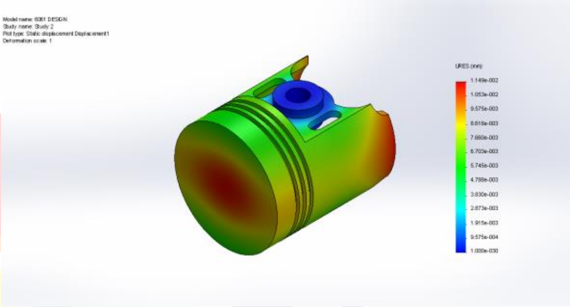


Figure 20: Displacement in modified piston Mode

ASMT B548alloy

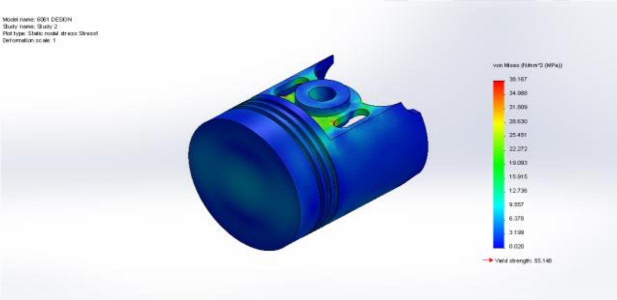


Figure 21: Stresses Developed in modified piston Model

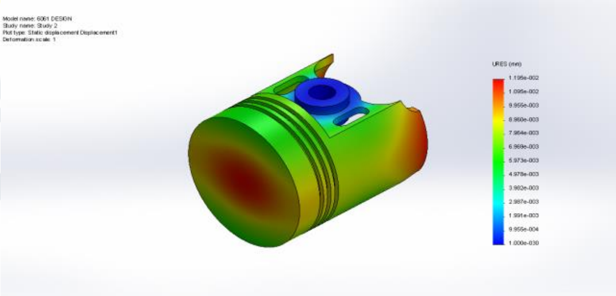


Figure 22: Displacement in modified piston Model

AL7475-T7351 Alloy

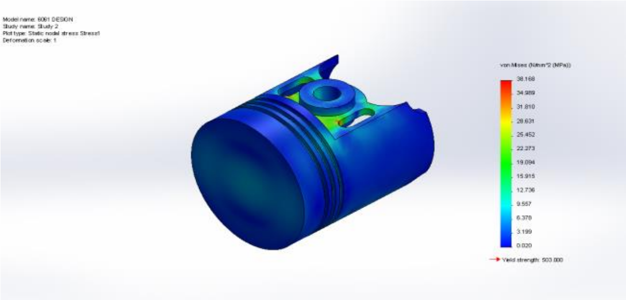


Figure 23: Stresses Developed in modified piston Model

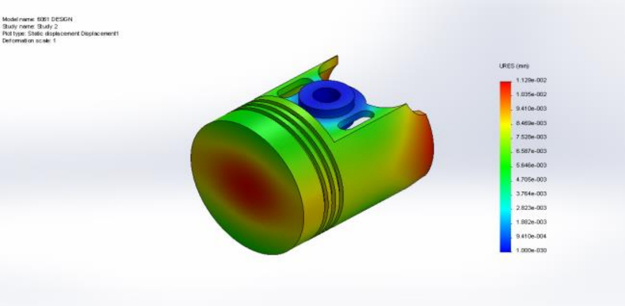


Figure 24: Displacement in modified piston Model

A383 Alloy

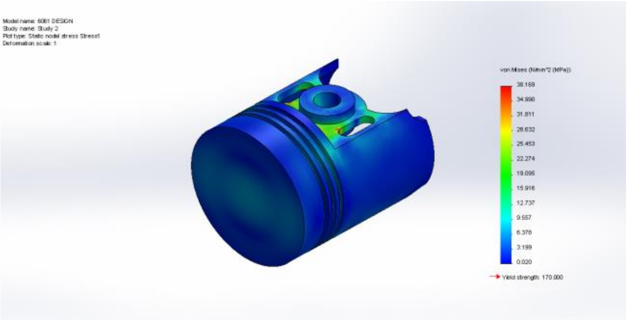


Figure 25: Stresses Developed in modified piston Model

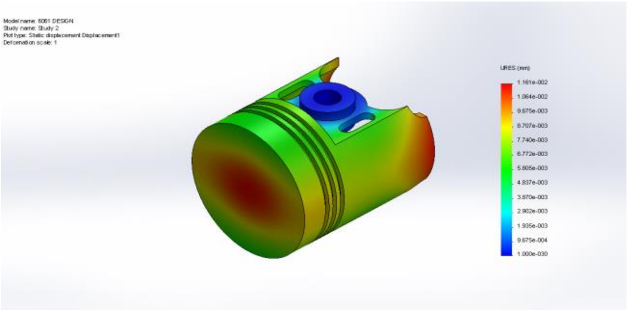


Figure 26 : Displacement in modified piston Model

STRUCTURAL ANALYSIS FOR MODIFIED DESIGN -C

LM 25 Alloy

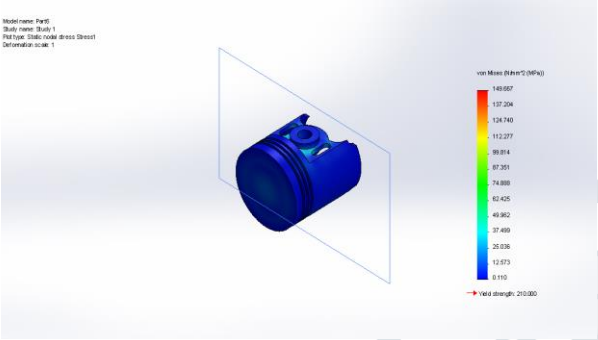


Figure 27 : Stresses Developed in modified piston Model

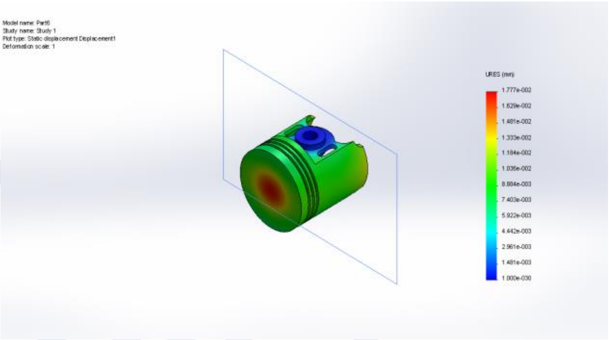


Figure 28 : Displacement in modified piston Model

ASMT B548Alloy

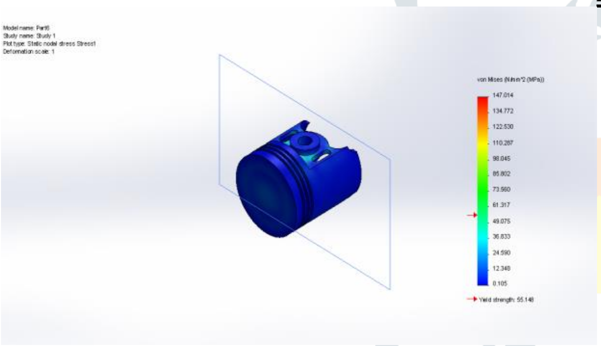


Figure 29 : Stresses Developed in modified piston Model

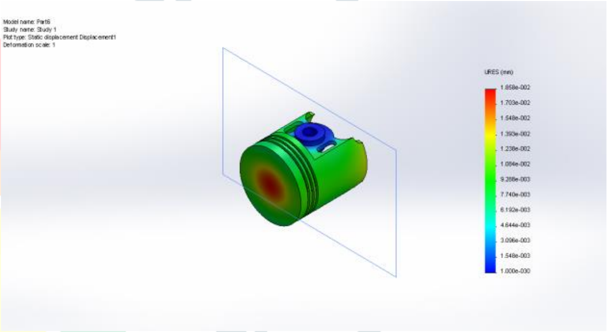


Figure 30 : Displacement in modified piston Model

7475-T7351 Alloy

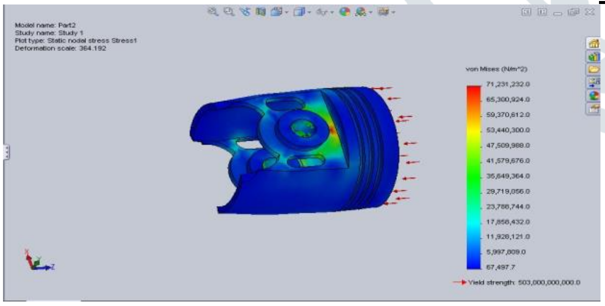


Figure 31: Stresses Developed in modified piston Model

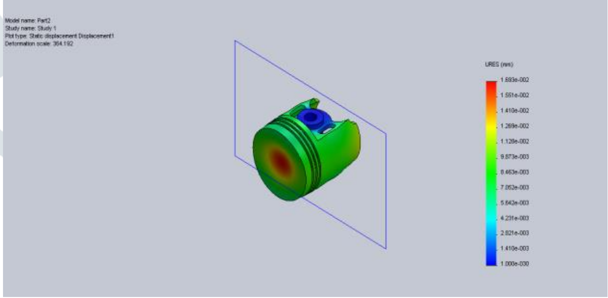


Figure 32: Displacement in modified piston Model

A383 Alloy

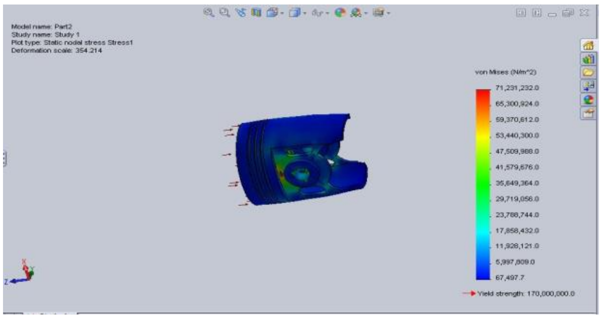


Figure 33 : Stresses Developed in modified piston Model

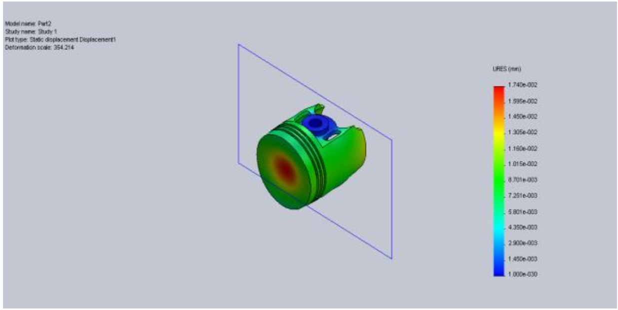


Figure 34: Displacement in modified piston Model

THERMAL ANALYSIS OF DESIGN “A”

LM 25 Alloy

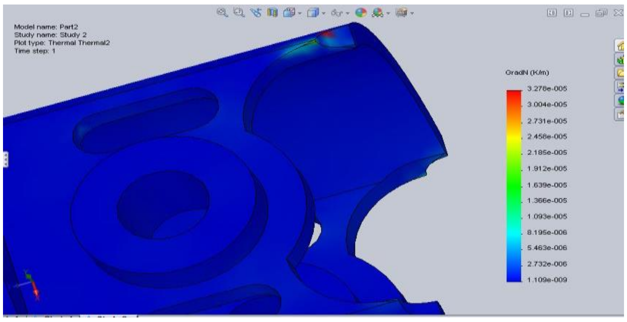


Figure 35: Resultant temperature gradient

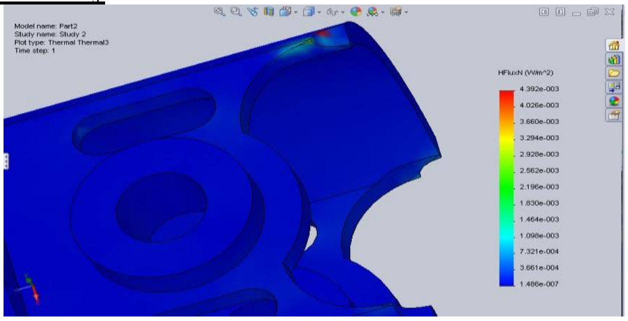


Figure 36 : Resultant heat flux for existing piston model

ASMT B548Alloy

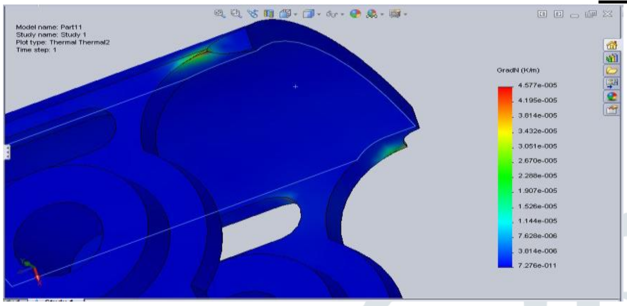


Figure 37 : Resultant temperature gradient

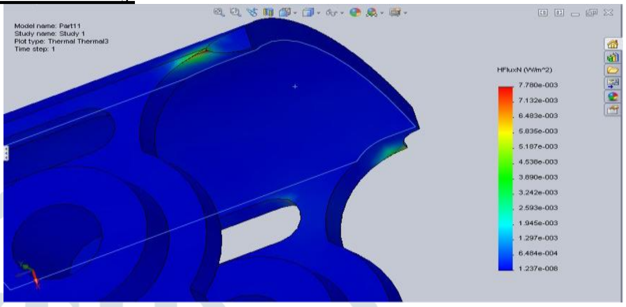


Figure 38 : Resultant heat flux for existing piston model

7475-T7351

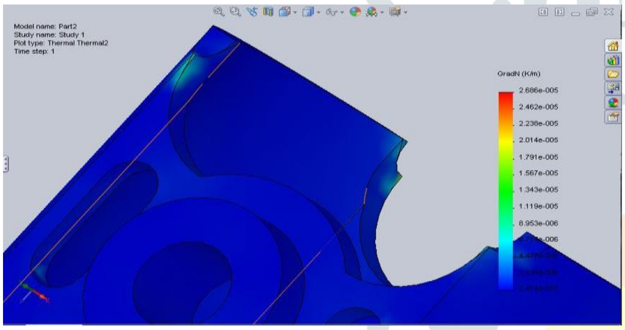


Figure 39 : Resultant temperature gradient

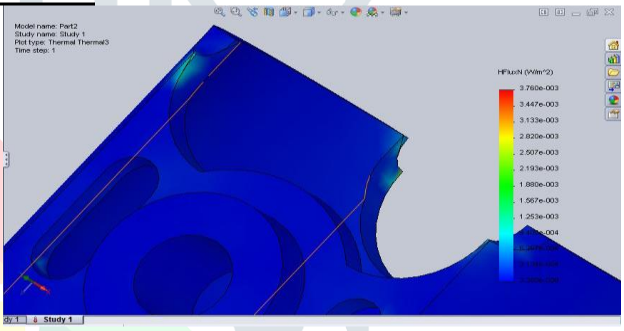


Figure 40 : Resultant heat flux for existing piston model

A383 Alloy

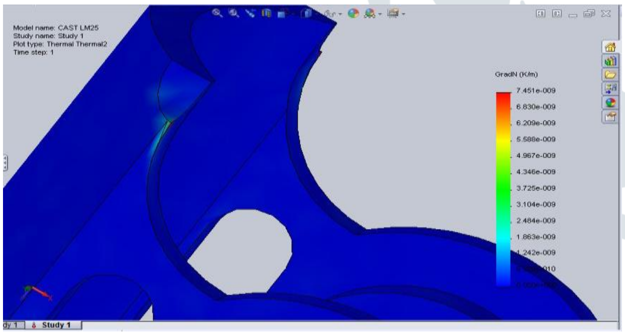


Figure 41: Resultant temperature gradient

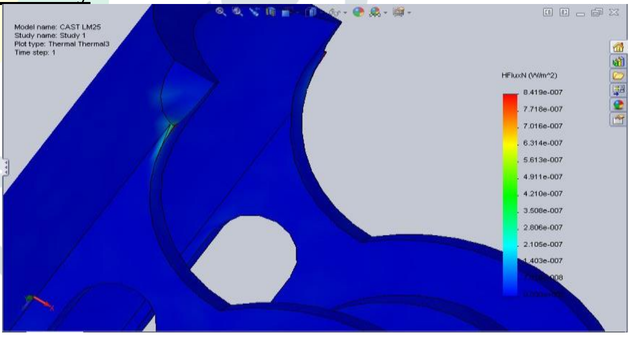


Figure 42: Resultant heat flux for existing piston model

THERMAL ANALYSIS FOR MODIFIED DESIGN “B”

LM 25 Alloy

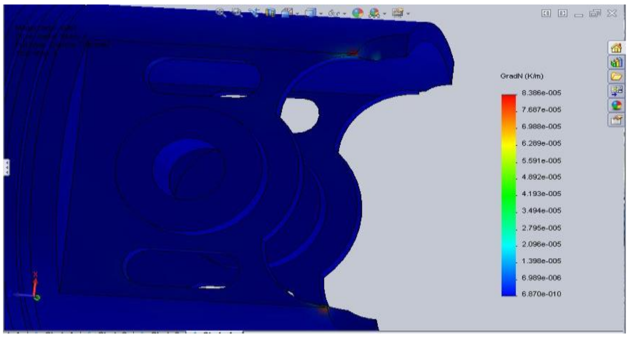


Figure 43: Resultant temperature gradient

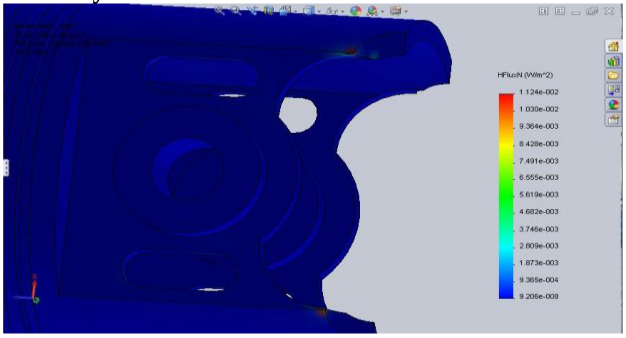


Figure 44: Resultant heat flux for modified piston model

ASMT B548Alloy

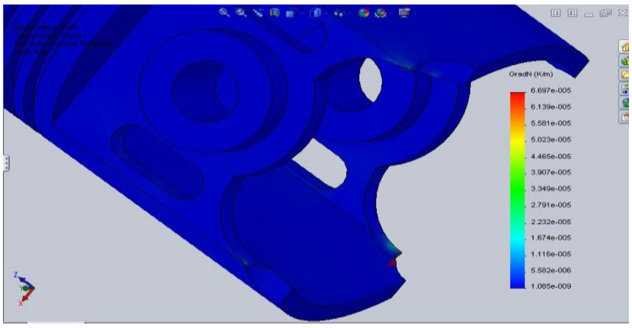


Figure 45: Resultant temperature gradient

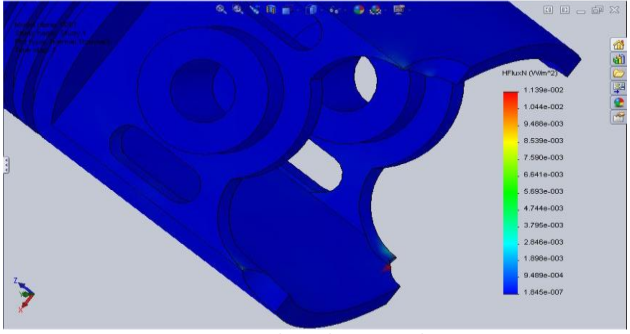


Figure46: Resultant heat flux for modified piston model

7475-T7351 Alloy

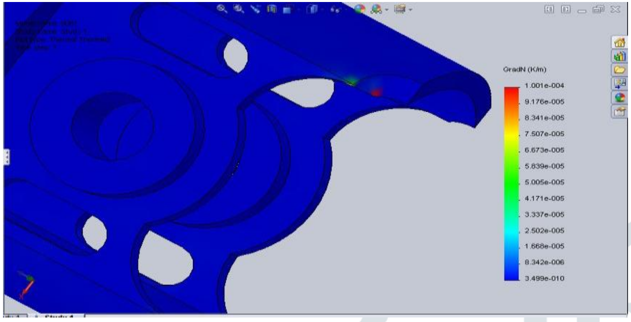


Figure 47: Resultant temperature gradient

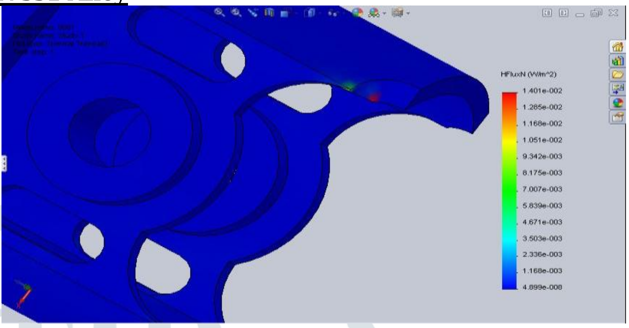


Figure 48: Resultant heat flux for modified piston model

A383 Alloy

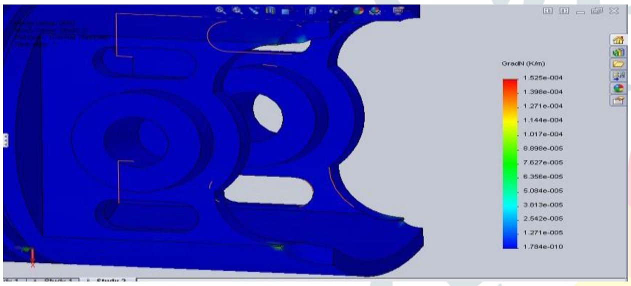


Figure 49 : Resultant temperature gradient

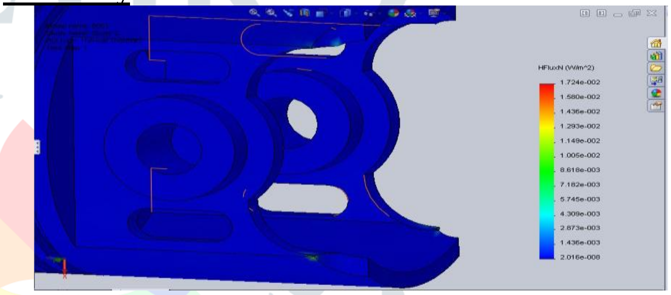


Figure 50 : Resultant heat flux for modified piston model

7.2THERMAL ANALYSIS FOR MODIFIED DESIGN “C”

LM 25 Alloy

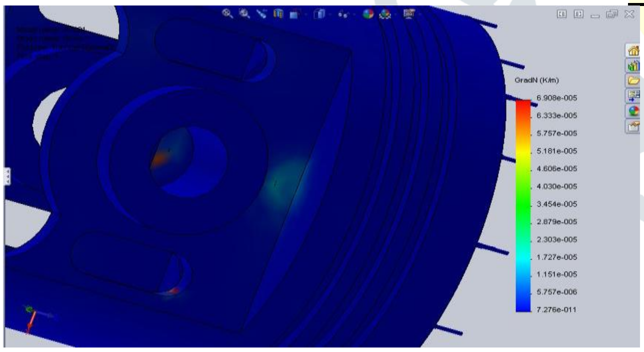


Figure 51: Resultant temperature gradient model

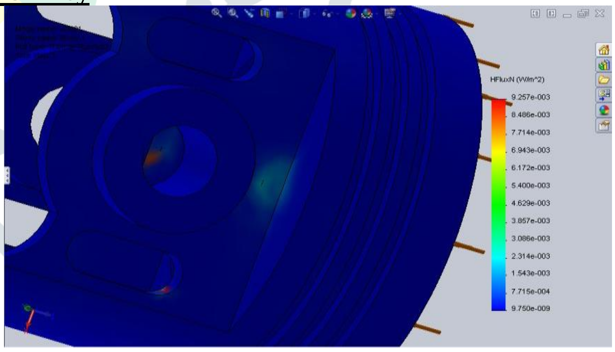


Figure52 : Resultant heat flux for modified piston model

ASMT B548Alloy

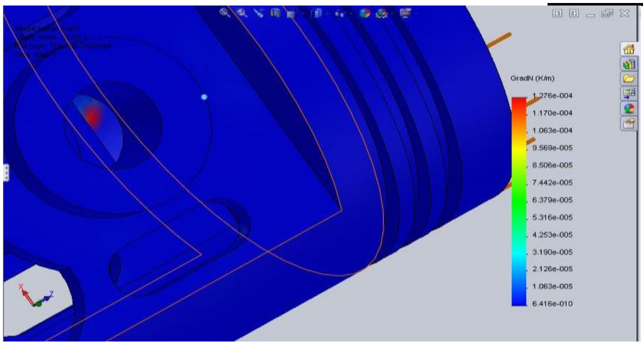


Figure 53 : Resultant temperature gradient model

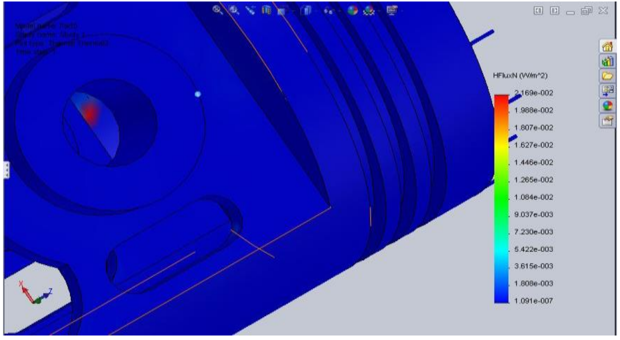


Figure 54 : Resultant heat flux for modified piston model

7475-T7351 Alloy

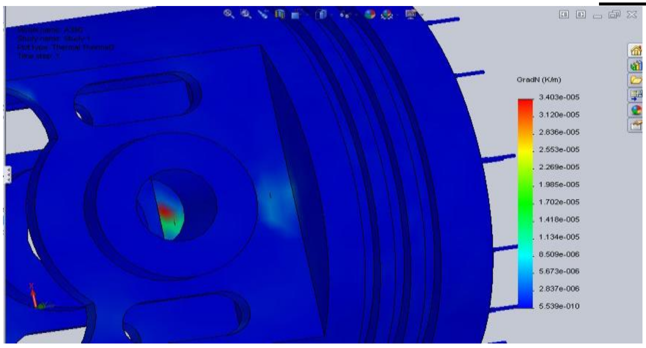


Figure 55: Resultant temperature gradient

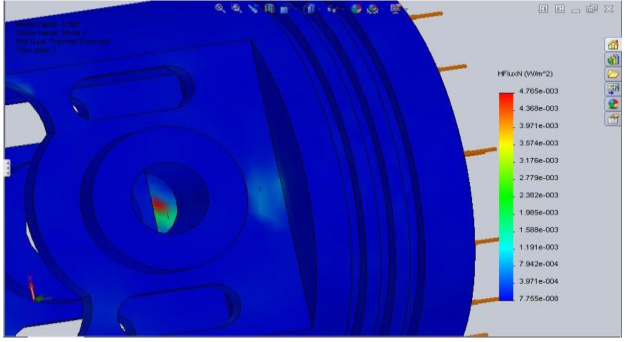


Figure 56 : Resultant heat flux for modified piston model

A383 Alloy

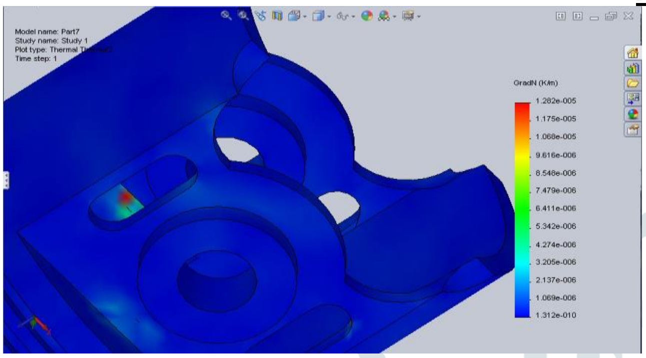


Figure 57: Resultant temperature gradient

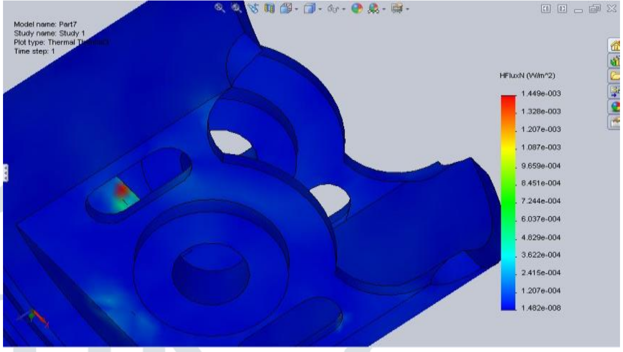


Figure 58: Resultant heat flux for modified piston model

RESULTS AND COMPARISION OF VERIOUS MATERIALS

STRUCTURAL AND THERMAL ANALYSIS RESULTS OF VERIOUS MATERIALS FOR DESIGN "A"

Material Name	Von-mosis Stress in Mpa	Displacent in mm	Resultant temperature gradient	Resultant heat flux
LM25	3.98E+01	0.014194	3.28E-05	0.004392
ASMT B548	3.96E+01	0.014583	4.58E-05	0.00778
7475-T7351	3.96E+01	0.013784	2.69E-05	0.00376
A383	3.96E+01	0.014172	3.85E-05	4.35E-03

Table2

STRUCTURAL AND THERMAL ANALYSIS RESULTS OF VERIOUS MATERIALS FOR DESIGN "B"

Material Name	Von-mosis Stress in Mpa	Displacent in mm	Resultant temperature gradient	Resultant heat flux
LM25	3.68E+01	0.01149	8.39E-05	0.011237
ASMT B548	3.82E+01	0.011946	6.70E-05	0.011385
7475-T7351	3.82E+01	0.011292	0.0001	0.014014
A383	3.82E+01	1.16E-02	0.000153	0.017236

Table3

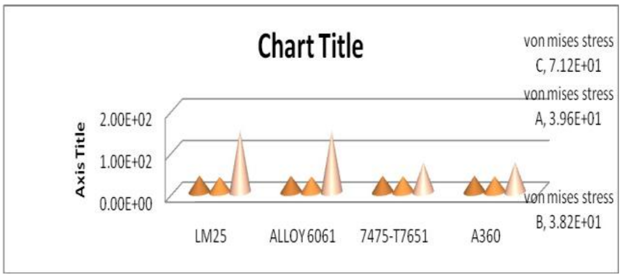
STRUCTURAL AND THERMAL ANALYSIS RESULTS OF VERIOUS MATERIALS FOR DESIGN "C"

Material Name	Von-mosis Stress in Mpa	Displacent in mm	Resultant temperature gradient	Resultant heat flux
LM25	1.49E+02	0.017767	6.91E-05	0.009257
ASMT B548	1.47E+02	0.018577	0.000128	0.021689
7475-T7351	7.12E+01	0.016925	3.40E-05	0.004765
A383	7.12E+01	1.74E-02	1.282E-05	1.449e-003

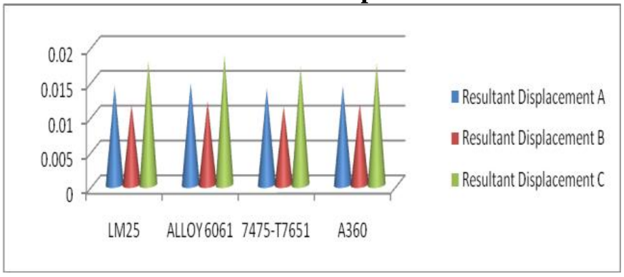
Table4

GRAPHICAL COMPARISON OF RESULTS

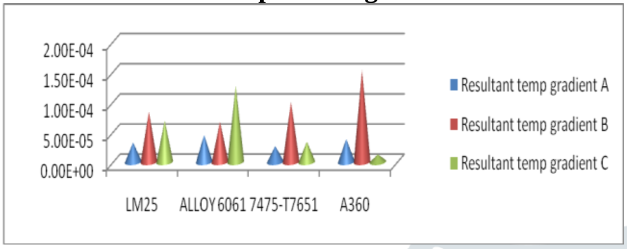
VonMisses stress



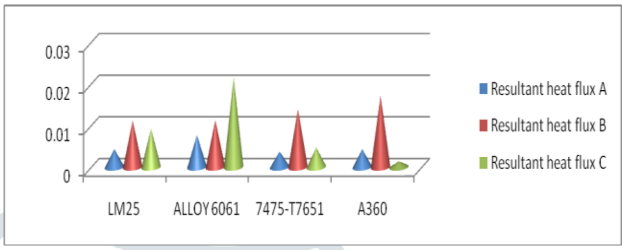
Resultant displacem



Resultant temperature gradient



Resultant heat flux



CONCLUSION

In this project piston is meant 2 wheeler 150cc engine. The current material for piston is Al alloy LM25. Al alloy is replaced with totally different Al alloys ASMT B548, 7475-T7351 and A383, since these materials have high strength than the Al alloy LM25. Three models of piston area unit designed for 3 materials Al alloys LM25, ASMT B548and A383. Couple field analysis is finished on the models to validate structural and thermal properties like displacement, stress, thermal gradient and thermal flux. By perceptive the analysis results, stress and displacement values area unit less and thermal gradient is additional for material AL7475-T7351 when put next to ASMT B548, LM25 and A383 in existing style A. once a comparison is formed among 3 styles, style B offers less displacement, stress and high thermal gradient for a fabric ASMT B548. thus best style is style B and therefore the material is AL ASMT B548Alloy.

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