

Enhancing the Heat Transfer Rate for Multi Cylinder Engine Piston and Piston Rings

Amir Sohel

Department of Mechanical Engineering
Narsimha Reddy Engineering College,
Dhulappally Post, Near Kompally, Secunderabad,
Telangana – 500100, India.

Mr. D. Sharan Kumar

Department of Mechanical Engineering
Narsimha Reddy Engineering College,
Dhulappally Post, Near Kompally, Secunderabad,
Telangana - 500100, India.

ABSTRACT

A cylinder is a piece of responding motors, pumps and fuel compressors. It is situated in a chamber and is made gas tight through cylinder gems. In a motor, its motivation is to change constrain from extending fuel inside the chamber to the crankshaft by means of a cylinder bar and additionally associating bar. The combination from which a cylinder is made not best decides its vitality and wears qualities, however also its warm extension attributes.

The regular temperature of gas motor fumes is around 650°C (923°K). This is additionally roughly the dissolving element of most extreme aluminum compounds and it's far least difficult the steady deluge of surrounding air that prevents the cylinder from twisting and falling flat. For this reason looking at exceptional assortments of substances comprising of aluminum composites and compound steel cylinder.

In this undertaking we format the two designs of cylinders level head and curved heads through the use of solid works programming, and broke down statically and thermally through utilizing solid works reenactment. What's more, discover the vonmises stresses, general disfigurement, warmth dispersion, and warmth motion. By contrasting the above outcomes of level head and arched head cylinder the warmth transition is additional for 6061-T6 aluminum combination than the strong iron texture. Along these lines 6061-T6 material is the fantastic reasonable texture for cylinder.

By assessing the above impacts of cylinder ring the warmth motion is more noteworthy for Alloy metallic than the fashioned iron material. Along these lines Alloy metal texture is the fine suitable material for cylinder ring.

INTRODUCTION TO HEAT ENGINES:

Heat Engines

Any sort of motor or contraption which gets warmth control from the ignition of gas or some other supply and converts this power into mechanical works of art is named as a glow motor [13].

Warmth motors might be sorted as:

1. External Combustion Engines
2. Internal Combustion Engines

External Combustion Engines (E.C. Motors)

For this situation, burning of gas takes region outside of the chamber as if there should arise an occurrence of steam motors wherein the warmth of ignition [1], [2] is utilized to produce steam which is utilized to move a cylinder in a barrel.

Internal Combustion Engines (I.C. Motors)

1. Start motor (S.I motor)
2. Pressure start motor (C.I motor)

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As indicated by the cycle of operations yet again those motors are named as

1. Two-stroke motors
2. Four-stroke motors

A Two-stroke S.I motor:

Dugald Clark imagined the 2 stroke motor inside the a year 1878. The two strokes are truly "suction" and "fumes". In stroke motor the cycle is done in a solitary upheaval of the wrench shaft. The real qualification between two stroke and four stroke motors is in the approach of filling the new cost and getting rid of the consumed gasses from the barrel [5]. In the four stroke motors those operations are expert by means of the motor cylinder for the length of the suction and fumes strokes separately. In a stroke motor, the filling strategy is performed by methods for the rate packed inside the crankcase or by utilizing a blower. The enlistment of the compacted charge developments out the result of ignition by means of fumes ports. Subsequently no cylinder strokes are required for these two operations.

Two strokes [3], [4] are adequate to complete the cycle, one for packing the new rate and the option for amplification or quality stroke.

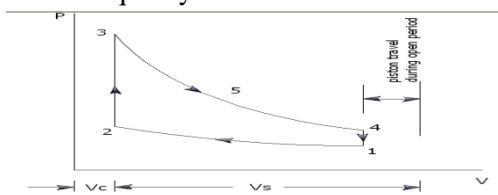


Fig 1: Ideal Indicator Diagram of Two-Stroke SI Engine

1. Four Different components of an I.C. Motors

Here takes after the detail of the different components of an inside ignition motor. A move-portion of an air-cooled I.C. Motor with preminent components is appeared in parent 1.

Parts of an I.C. Motor:

1. Cylinder
2. Cylinder head
3. Piston
4. Gudgeon stick
5. Connecting pole
6. Crankshaft

7. Crank
8. Crank case
9. Flywheel
10. Governor
11. Valves and valve running component

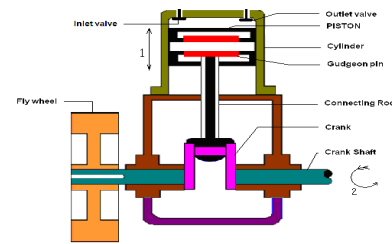


Fig three: Parts of an I.C Engine

LITERATURE REVIEW:

An improved cylinder that is lighter and more grounded is secured with zirconium for bio-fuel. The poor quality LHR motors are the utilization of earthenware coatings on cylinder, liner and chamber head, in the meantime as mid-range review LHR motors give air opening inside the cylinder and diverse added substances. It is basic to check the covered cylinder for withstanding the anxieties and strains. In this paper, the lined cylinder experienced a vonmisses investigate method for the utilization of ANSYS for stack actualized on the zenith. Investigation of the anxiety circulation wound up plainly finished on various parts of the lined cylinder for finding the anxieties in light of the gas strain and warm forms.

Vonmisses strain is stretched out by methods for sixteen% and avoidance is enhanced after advancement. Be that as it may, every one of the parameters are legitimately with in design thought.

Shuoguo Zhao

The cylinder is a "coronary heart" of the motor and its running condition is the most exceedingly awful one of the key components of the motor in the running condition. So it's far extremely significant for basic investigation of the cylinder. This paper investigations and ascertains the cylinder with the guide of ProENGEER programming to profit an outcome, which enhances and advances the state of the cylinder.

Swati S Chougule, Vinayak H Khatawate

This composition portrays the anxiety appropriation of the cylinder by method for the utilization of limited detail approach (FEM). FEM is finished by methods for the utilization of tablet helped designing (CAE) programming. The fundamental target of this wander is to explore and break down the weight dissemination of cylinder at the real motor condition all through burning way. The parameter utilized for the recreation is working fuel weight and material places of cylinder. The record portrays the work improvement by utilizing FEM way to deal with are expecting the better weight and essential area on the thing. The cylinder beneath inspect has a place with the two stroke unmarried barrel motor of SUZUKI Max100 motorbike.

PISTON

Piston

A piston is a component of reciprocating engines, pumps and gasoline compressors. It is placed in a cylinder and is made gasoline-tight with the aid of piston earrings. In an engine, its motive is to transfer pressure from increasing fuel inside the cylinder to the crankshaft through a piston rod or connecting rod [6]. In some engines, the piston additionally acts as a valve through masking and uncovering ports inside the cylinder wall.



Fig five: Piston samples

The cylinder/piston fit is one of the most critical factors governing the fulfillment of a home-built model engine. Material selection sensible, the house constructor has a number of selections however every has their very own characteristics, advantages, and downsides. The most common selections [6], [7], in ascending order of revel in required, are:

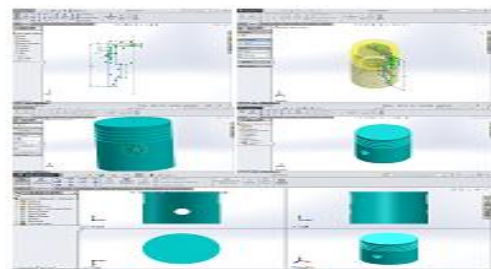
1. Steel liner, Cast Iron piston
2. Cast Iron liner, Cast Iron piston
3. Steel liner, Steel piston

4. Steel liner, Aluminium piston, and Cast Iron ring

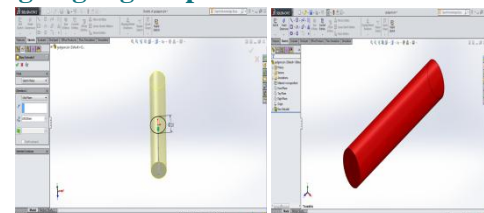
PISTON DIMENSIONS:

Piston Diameter(D)	100mm
Length Of The Piston (Lp)	105mm
Thickness Of Piston Head (T1)	5.25mm
Height Of Top Part(Lh)	52.5mm
Length Of Skrit (Ls)	70mm
Thickness Of Ring Land(X1)	9mm
Thickness Of First Ring (X2)	4mm
Axial Thickness (T4)	3mm
Thickness Of Barrel at Open End Of Piston(T6)	10.5mm
Pin Outer Diameter(dp)	25mm
Piston Inner Diameter(Di)	68.55mm
Thickness Of Crown Wall (T5)	7.5mm
Inlet Port	30mm
Outlet Port	25mm
Spark Plug	20mm
Gudgeon Pin	20mm
Cylinder Height	195mm
Clearance Volume	5mm
TDC TO BDC	60mm
Compression Ratio	12

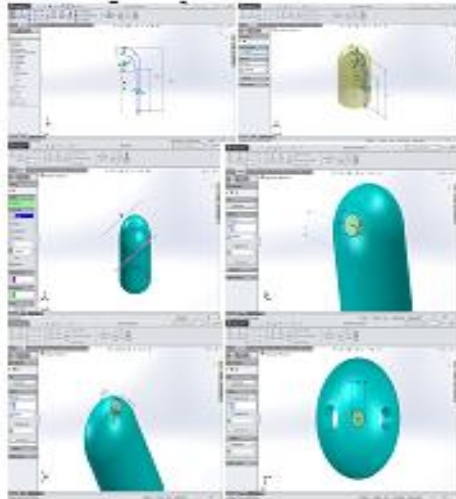
MODELING OF PISTON



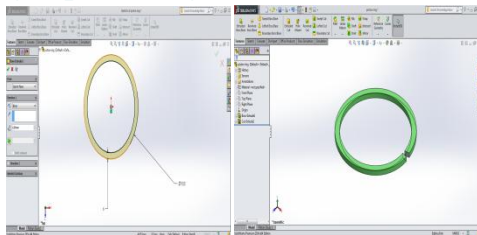
Modeling of gudgeon pin:



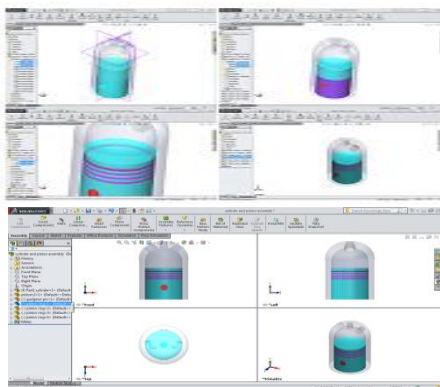
Modeling of cylinder:



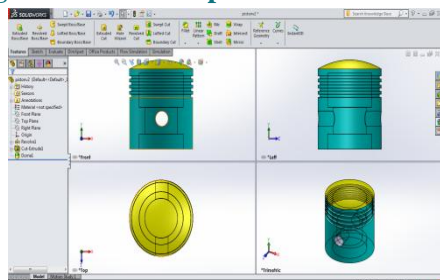
Modeling of piston rings:



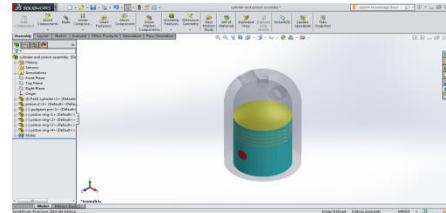
Assembly of flat head piston and cylinder :



Modleing of convex head piston:



Assembly of convex head piston and cylinder:

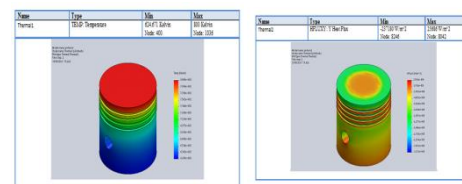


THERMAL ANALYSIS OF FLAT HEAD PISTON BY APPLYING 6061-T6 ALLOY

Now the thermal evaluation of flat head piston is done by way of applying 6061-T6 alloy and applying a temperature of 800k on the flat face of piston and convection coefficient of 22w/m2k and bulk ambient temperature of 300k.

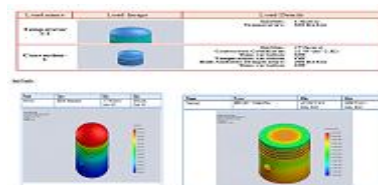


Thermal Analysis Of Flat Head Piston By Applying Cast Iron



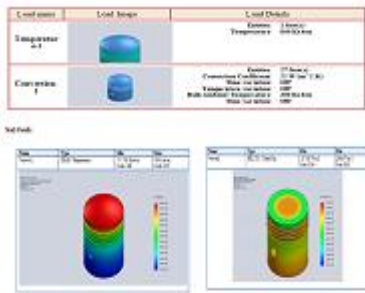
thermal analysis of convex head piston by applying 6061-t6 alloy lmaterial:

Now the thermal analysis of convex head piston is finished by using making use of 6061-T6 alloy and making use of a temperature of 800k on the flat face of piston and convection coefficient of 22w/m2k and bulk ambient temperature of 300k.



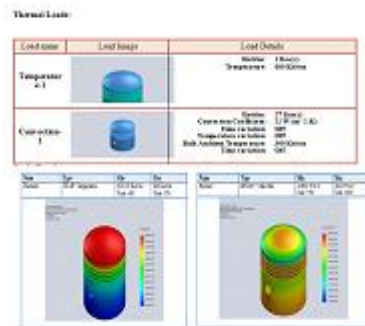
Thermal analysis of convex head piston by applying 6061-t6 alloy material:

Now the thermal analysis of convex head piston is carried out by means of making use of 6061-T6 alloy and making use of a temperature of 800k at the flat face of piston and convection coefficient of 22w/m²k and bulk ambient temperature of 300k.



Thermal Analysis Of Convex Head Piston By Applying Cast Iron Material

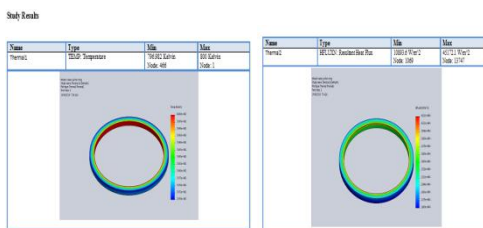
Performing identical thermal analysis as above the consequences acquired are as follows.



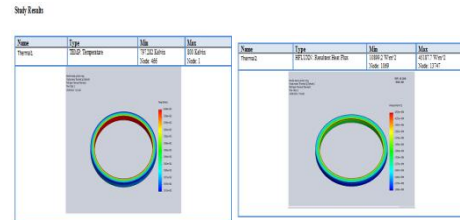
Thermal Analysis Of Piston Ring By Using Cast Iron



Meshed model



Thermal Analysis Of Piston Ring By Using Alloy Steel



Results And Discussions

The compound from which a cylinder is made decides its power and wears attributes, as well as its warm extension qualities [8]. More blazing motors require additional strong compounds to hold close resilienties without scraping. The foremost components affecting on cylinder are:

- 1.Strength and worry of head thickness
- 2.Heat conveyance of cylinder material
- 3.If the computed stresses are excessively mind blowing, it's miles vital, making it impossible to substitute cylinder plan. Such adjustments can be:
- 4.Increasing the cylinder head thickness
- 5.Changing the cylinder crown shape
- 6.Changing the material
- 7.Length of cylinder
- 8.Piston adornments

COMPARISION OF RESULTS:

Shape of crown	Flat head	Convex head
Temperature (kelvin)	800	800
Maximum	739.7	737.7
Minimum		
Total Heat Flux(w/m ²)	30372	32080.6

Table : Final Results Of Piston for 6061-T6 ALUMINIUM ALLOY

Shape of crown	Flat head	Convex head
Temperature (kelvin)		800
Maximum	800	620
Minimum	624.6	.3
Total Heat Flux(w/m ²)	25686	26425

Table : Final Results Of Piston for Cast Iron

Shape of crown	Alloy steel	Cast iron
Temperature (kelvin)	800	800
Maximum	797.2	796.9
Minimum		
Total Heat Flux(w/m ²)	45187	45172

Table : Final Results Of piston ring

By looking at the above impacts of level head and arched head cylinder the glow transition is more for 6061-T6 aluminum compound [10], [11], [12] than the manufactured iron material. Hence 6061-T6 material is the uncommon suitable fabric for cylinder.

By assessing the above results of cylinder ring the glow motion is more noteworthy for Alloy steel than the produced press texture. Hence 6061-T6 material is the fine proper texture for cylinder ring.

CONCLUSION

1. In our task we have planned a cylinder utilized as a part of bike and demonstrated in 3-D displaying programming program SOLIDWORKS after which we inspect the cylinder with one of a kind substances like 6061-T6 combination and Alloy metallic with help of fem package solidworks reproduction .In this Project we depicts the strain conveyance of the seizure on cylinder Two stroke motor through utilizing FEA.

2. By contrasting impacts of both the materials 6061-T6 amalgam and Alloy metal , the got results comprehensive of warm warmth switch are inside the sheltered quarter of stylish for level head and arched head cylinder.

3. So, far the taken bore sizes the got comes about are inside the standard and configuration is protected. At long last the arched frame crown cylinder is having higher outline in view of the anxieties are low in contrast with aluminum composite and warmth motion produced is additionally low.

4. By changing cylinder substances with unmistakable creations we can design the cylinder in accordance with their energy and warmth motions are can likewise be proficient using FEM.

5. We Conclude and look at the warm anxiety dissemination of cylinder on the genuine motor condition all through burning technique.

6. By contrasting the above consequences of level head and raised head cylinder the warmth motion is more for 6061-T6 aluminum combination than the strong iron material. In this way 6061-T6 fabric is the wonderful proper material for cylinder.

7. By looking at the above impacts of cylinder ring the glow transition is additional for Alloy metallic than the strong iron material. Consequently 6061-T6 material is the agreeable fitting fabric for cylinder ring.

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