



DESIGN AND ANALYSIS OF PISTON BY USING FIVE DIFFERENT MATERIALS

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Abstract—: In the present work describes the stress distribution and thermal stresses of Five different materials for piston by using finite element method (FEM), testing of mechanical properties. The parameters used for the simulation are operating gas pressure, temperature and material properties of piston. The specifications used for this study of these pistons belong to four stroke single cylinder engine of Pulsar 220cc motorcycle. The results predict the maximum stress and critical region on the different materials piston using FEA. Design by using catia v5 software and analysis by using Ansys software in Ansys 16.0 Static and thermal analysis is performed. The suitable material is selected based on results of structural and thermal analysis on these Al-sic graphite, A7075, A6082, A4032, AL-ghy 1250 materials

INTRODUCTION

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Introduction An internal start engine is described as an engine in which the engineered energy of the fuel is conveyed inside the engine and used direct for mechanical work, instead of an external consuming engine where an alternate combustor is used to devour the fuel. The internal consuming engine was thought of and made in the last piece of the 1800s. It through and through influences society, and is seen as conceivably the primary advancements of the last century. Within consuming engine has been the foundation for the productive progression of various business advancements. For example, consider how such an engine has changed the transportation business, allowing the turn of events and improvement of vehicles, trucks, planes and gets ready. A chamber is a portion of reacting engines, reacting siphons, gas compressors and pneumatic chambers, among other tantamount segments. It is the moving section that is contained by a chamber and is made gas-tight



by chamber rings. In an engine, its inspiration is to move power from developing gas in the chamber to the driving bar through a chamber shaft or possibly interfacing post. Vehicle sections are in unbelievable interest these days considering extended use of vehicles. The extended interest is a direct result of improved execution and lessened cost of these fragments. Innovative work and testing experts should make essential sections in most concise possible opportunity to restrict dispatch time for new things. This requires appreciation of new developments and quick absorption in the improvement of new things. It is the moving portion that is contained by a chamber and is made gas-tight by chamber rings. In an engine, its inspiration is to move power from developing gas in the chamber to the driving bar through a chamber post or possibly interfacing shaft. Vehicle sections are in unimaginable interest these days taking into account extended use of vehicles.

LITERATURE SURVEY

R.P. Pescara is generally credited with the creation of the free-cylinder motor with his patent dating from 1928, yet different merchants, among others Junkers in Germany, were likewise chipping away at free-cylinder

apparatus right now. From that point forward, a high number of licenses depicting free-cylinder apparatus or identified with such hardware have been distributed. The first Pescara patent portrays a solitary cylinder sparkle lighted air blower however the patent looks to ensure countless applications using the free-cylinder standard. Pescara began his work on free-cylinder motors around 1922 and he created models with both sparkle start 1925 and diesel ignition 1928. The last prompted the improvement of the Pescara free-cylinder air blower. Pescara proceeded with his work on free-cylinder hardware and furthermore licensed a multi-stage free-cylinder air blower motor in 1941.

Vibhandik et. al . (2014), contemplated that Design examination and streamlining of cylinder and distortion of its warm anxieties utilizing CAE apparatuses, he had chosen I.C. motor cylinder from TATA engines of diesel motor vehicle. He had performed warm examination on traditional diesel cylinder and furthermore on streamlined cylinder made of aluminum amalgam and

titanium composite material. Regular diesel cylinder made of primary steel. The primary target of this investigation is to diminish the pressure focus on the upper finish of the cylinder to build life of cylinder. After the investigation he presume that titanium has better warm property, it additionally assist us with improving cylinder characteristics.

Ch. Venkata Rajam et. al . (2013), zeroed in on Design investigation and streamlining of cylinder utilizing CATIA and ANSYS. He had improved with all boundaries are inside thought. Focus of improvement was to arrive at a mass decrease of cylinder. In this examination an earthenware covering on crown is made. In a streamlining of cylinder, the length is consistent in light of the fact that warmth stream isn't influenced the length, distance across is likewise made steady because of same explanation. The volume differed in the wake of applying temperature and pressing factor loads over cylinder as volume isn't just relying upon length and breadth yet additionally on thickness which is more influenced. The material is taken out to lessen the heaviness of the cylinder with

diminished material. The outcomes acquired by this examination shows that, by lessening the volume of the cylinder, thickness of barrel and width of other ring lands, Von mises pressure is expanded by and Deflection is expanded after enhancement.

PISTON DESIGN FEATURES

- 1adequate mechanical strength and firmness.
2. Can adequately impede the warmth arrived at the cylinder head.
3. High temperature erosion opposition.
4. Measurements as conservative as could be expected, to diminish the heaviness of the cylinder.



METHODOLOGY

1. Logical plan of cylinder, utilizing determination of four stroke single chamber motor of Bajaj Kawasaki bike made.

2. Creation of 3D model of cylinder utilizing CATIA V5 and afterward imported in ANSYS 14.5.

3. Investigation of cylinder utilizing FEA technique.

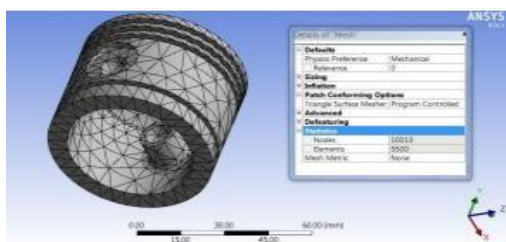
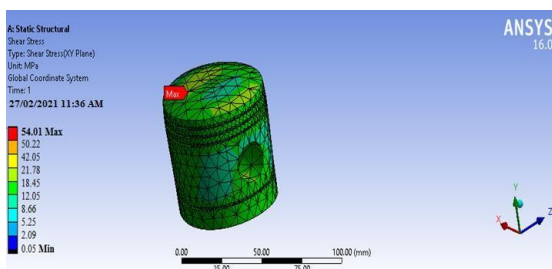


FIG 3 MESH BODY
Nodes:10013 Elements are 5500



4. Based on the anxieties, distortion, shear pressure, Temperature dissemination and Total warmth transition.

RELATED WORK

Frictionless help at pin bore regions and fixed all level of opportunity. Descending pressing factor (13.65MPa) because of gas load following up on cylinder head. The cylinder is dissected by giving the requirements they are Pressure or underlying investigation and Thermal examination.

Primary Analysis of Piston: Combustion of gases in the burning chamber applies tension on the top of the cylinder during power stroke. The pressing factor power will be taken as limit condition in primary examination. Fixed help has given at surface of pin opening. Because of the cylinder will move from TDC to BDC with the assistance of fixed help at pin opening. So whatever the heap is applying on cylinder because of gas blast that power causes to

CONCLUSION

Modeling and analysis of piston is done . Modeling of piston is done in



catia 2016 design software by using various commands. The catia part file is converted into IGS file and imported to ansys workbench. First Static structural analysis is carried out on piston at 13.65MPa pressure with three different materials, such as grey cast iron, aluminum alloy and Al-sic graphite in ansys workbench. Pistons made of different aluminum alloys like Al-sic graphite, A7075, A6082, A4032, AL-GHY 1250 were designed and analyzed successfully. In static analysis, and in thermal analysis the pistons were analyzed to find out the equivalent (von-mises) stress, equivalent elastic strain, total deformation heat flux and temperature distribution in all conditions ALSIC material is better compared to the remaining materials because of From above results we can conclude that ALSIC alloy piston is better than conventional alloy piston.

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