International Journal of Interdisciplinary Innovative Research &Development (IJIIRD)
ISSN: 2456-236X
Vol. **08** Special Issue **01** | **2023**

Review Paper on Four Cylinder Four Stroke Petrol Engine

Mr. P. B. Bhise[1], Mr. S. S. Patil[2], Mr. S. M. Bhole[3]
Lecturer, Department of Mechanical Engineering, VBKCOE, Malkapur, Maharastra, India[1]
Head of Department, Department of Mechanical Engineering, VBKCOE, Malkapur, Maharastra, India[2]
Lecturer, Department of Mechanical Engineering, VBKCOE, Malkapur, Maharastra, India[3]

ABSTRACT

How to do a four-cylinder, four-stroke engine analysis is the subject of this thesis. As is common knowledge, dynamometers are quite expensive, hence a method must be developed to do engine performance analysis based on dynamometer functionality. So, the fabrication process for the engine test rig that was previously designed can begin. To plan out the shape of the engine test rig, tools such as AutoCAD and Solid Work was employed. The design process also includes the choice of materials. In order to determine if engine performance will improve or worsen, variable loads will be applied while the engine runs at a constant speed. Now, we may examine the engine speed that will yield the most performance from this little engine. However, some losses, such as those in fuel and power,
Keywords:- Energy, Design, Combustion chamber, engine performance.

1. INTRODUCTION

A heat engine is any device that produces heat via the burning of fuel and uses some of that heat to produce mechanical work. These heaters are primarily divided into two groups:
(1) Internal combustion engines
(2) Combustion devices outside the body

In an internal combustion engine, the fuel is burned while there is air in the cylinder, and the combustion byproducts directly affect the piston to provide power. According to the type of fuel they use, internal combustion engines are further divided into petrol, diesel, and petrol engines. They are divided into two categories based on how they ignite: spark ignition engines and compression ignition engines.

2. Literature Review

Tadala akhil, K.naresh, Abdul khurshid, Purushotham anil kumar (2016) [1] The COUPLED field analysis by finite element method (FEM) had depicted the temperature and the stress distribution of the piston, which is initially made of four distinct materials. The temperature as a thermal conditional, the force or pressure exerted on the piston crown, and the piston's material characteristics are the variables employed in the simulation. The piston's specs are those of a four-stroke single cylinder. Honda-Hero motorbike. Due to their low thickness, high quality, and excellent structural unbending nature, aluminium metal composites are becoming more widely accepted for use in cars, current technology, and aviation applications. The piston is modelled in the current work using CATIA V5 modelling, and structural and thermal analyses are performed on the same model using ANSYS software for aluminium (pure), aluminium alloy (A6061), al-GHS 1300, and al-Sic graphite. The results were discussed. The findings of utilising FEA to simulate the different aluminium alloy pistons predict the maximum stress and the critical zone. Finding the main location of intense stress is crucial for making the necessary adjustments.

Nilesh T. Dhokane, Anand R. Nadgire and Savita U. Shinde (2016) [2]. [H2 or O2 addition, as well as the use of turbochargers and superchargers, had been used to indicate engine performance metrics. I have experimented with SI engine intake side development. Research shouldn't be done on using pure oxygen to introduce oxygen-rich air into the intake manifold. Therefore, this study aims to enhance SI engine performance while lowering fuel consumption and, thanks to complete combustion, lowering SI engine emissions. As a result, research on oxyrich air for fuel combustion in SI engines may be conducted. Here, I have calculated the system's brake thermal efficiency and estimated the fuel consumption for brakes both with and without oxyrich air energizers. Additionally, I looked at the SI engine's emission data both with and without an ox rich air energizer. I discovered engine volumetric and mechanical efficiency with and

without oxygen blending. I used a computerised MPFI 4 stroke petrol engine test apparatus to create the experimental setup for an ox rich air energizer.

Suramya Naik, Fabien Redon, Gerhard Regner, and John Koszewnik (2015) [3] Many Indian manufacturers are looking at new technologies in order to comply with upcoming fuel economy and emissions regulations, such as the newly passed Corporate Average Fuel Consumption (CAFC) guidelines for light-duty cars. However, these technologies must boost efficiency without raising cost if they are to offer a sustainable economic answer. The opposed-piston engine is one viable method to satisfy both present and future standards. The opposed-piston engine was frequently utilised for on-road applications in the early 20th century, but problems with oil control and pollutants forced its final abolition. However, Achates Power has created a modern opposed-piston diesel engine architecture that is clean, significantly more fuel efficient, and less expensive to produce than the four-stroke engines used today. This was made possible by advances in computer-aided engineering tools, which were combined with cutting-edge engineering practises.

Khalaf I. Hamada, M.K.Mohammed and M.M. Rahman (2014) [4] for building a test-rig based on a modern motorbike engine, had represented experimental operations that had been carried out in the Automotive Engineering Centre laboratories in University Malaysia Pahang. An eddy current dynamometer that was connected to a four-stroke single cylinder SI motorcycle engine served as the foundation for the development of the experimental engine test rig. Additionally, the test rig includes all of the measurement tools, sensors, and accessory kits required to conduct adequate engine testing. A one-dimensional model built around that single cylinder engine has been validated using the findings of these operations. The engine model was validated using both the in-cylinder pressure trace and the braking torque. The results of the simulation and the experiments were in good accord. The built-in test-rig can be put to use in other research and development projects.

P.T.Aravindhan, P.T.Anandhan (2014) [5] A two-stroke, single-cylinder S park Ignition engine with HHO-blend fuel had been evaluated for performance. The piston crown and inner side of the cylinder head are coated with 300-thick copper. In this study, a potassium hydroxide (KOH) catalyst was used to electrolyze water to create hydroxy gas. In a leak-proof chamber, electrolysis is carried out. Utilising on-board gas generation lowers the danger of storage. Studying how adding hydroxy gas to petrol fuel affects a spark ignition engine's performance characteristics. For various load conditions, it is possible to compute brake thermal efficiency, indicated thermal efficiency, mechanical efficiency, and specific fuel consumption. Compared to pure petrol, the HHO system produces improved engine efficiency at mid- and higher engine speeds. Engine performance is improved by the hydro-oxy air mixture's high burning velocity and low ignition energy. When using two separate test fuels, the performance of the copper-coated engine outperformed that of the conventional engine.

M.A.Bote, H.M.Dange (2014) [6] investigates Because of rising demand, petroleum-based fuels play a significant part in the rapid depletion of fossil fuels.Thumba oil is used in the manufacturing of biodiesel. Since biodiesel is known for being an environmentally friendly fuel, in the course of the experiment, an attempt was made to blend Thumba biodiesel on a SI engine in a lab setting and determine its features and characteristics. With a single cylinder, four-stroke petrol engine, the performance of various Thumba biodiesel mixes was assessed.

Pareshkumar D. Chavada, Raghuvir S. Khanna, Prof. V. G. Trivedi (2013) [7] had acted as petroleum Today, there are more attempts being made to optimise engine efficiency by constructional modifications; for instance, ceramic coating applications in internal combustion engines are expanding quickly in tandem with the development of advanced technology ceramics. Fuel energy must be transformed into mechanical energy as quickly as feasible to improve engine performance. Internal combustion engine cylinder temperatures and pressure rise as a result of coating the combustion chamber with low heat-conducting ceramic materials. Consequently, an improvement in engine efficiency should be seen. Methanol burns at temperatures lower than petrol. Due to its high octane rating and high heat of vaporisation, methanol can be blended with petrol in spark ignition engines to boost thermal efficiency and power output. Because of increased temperature during compression and poor heat rejection in ceramic coated IC engines, starting the engine can be made simpler. Less explosion and noise from uncontrolled combustion can result in more silent engine running. Because of the shorter ignition delay, the engine can be run at lower compression ratios. Thus, higher mechanical efficiency and fuel efficiency are possible.

Gayatri Kushwah (2013) [8] provided an evaluation of the four-stroke petrol engine's environmental impact. The Eco indicator 99 method and Eco it software are used to conduct the assessment. The evaluation of the engine's entire life cycle's environmental impact takes into account the effects of the production, processing, shipping and packing, use, and disposal phases. Data are gathered, then analysed for assessment; during analysis, an indicator point produced from eco-IT software for a specific material and procedure is used. Following analysis, the impact is represented by indicator scores in millipoints, with the phase with the highest indicator score having the greatest environmental impact.

Vinod Yadav, Dr. N. D. Mittal (2013) [9 had stands for The piston is the component of an engine that transforms the pressure and heat energy released during fuel combustion into mechanical work. The most intricate part of an automobile is the engine piston. The design process for a piston for a 4-stroke petrol engine used in a hero bike is illustrated in this paper, along with its examination through comparison with the original piston dimensions used in the bike. As part of the design process, different piston size are calculated analytically while operating at maximum power. While

determining various dimensions in this study, the combined effect of mechanical and thermal stress is taken into account. The engine's fundamental specifications were drawn from a hero bike's identified engine type.

Mr. Hitesh B. Bisen, Mr. Y. R. Suple (2013) [10] had performed Gaseous fuels such as liquefied petroleum gas (LPG) and liquefied natural gas (LNG) have been widely used in commercial vehicles. In this project the main aim is to evaluate the exhaust emission by running the conventional engine on Liquefied Petroleum Gas (LPG) as an alternative fuel for four-stroke spark ignition engine. The primary objective of the study is to determine the performance and the exhaust emissions of the engine using LPG as a fuel. The engine used in the study is originally a single cylinder; four-stroke spark ignition engine with certain modifications is to make to permit the experiments to run on LPG fuel. During the running, the engine was coupled to a ropeway dynamometer to measure a number of engine performance parameters, and a 5-gas analyzer is to be inserted into the engine exhaust tailpipe to measure the exhaust emissions.

3. ACKNOWLEDGMENT

I take great pleasure in expressing my sincere gratitude to everyone who has ever helped me with this dissertation effort. I sincerely thank my thesis advisor. Assistant professors Dhaval P. Patel of the Gujarat Institute of Technology, Gandhinagar, and Roshni R. Kapadia of Silver Oak College of Engineering and Technology have offered invaluable guidance, inspiration, cooperation, and encouragement at every stage of my work. I owe him a big debt of appreciation for his incisive thoughts and constructive critique, which allowed me to express the research's scientific conclusions effectively and clearly.

4. CONCLUSION

I am really happy to express my appreciation to everyone who has ever supported me in my dissertation work. I want to thank my thesis advisor from the bottom of my heart. At every level of my work, assistant professors Dhaval P. Patel of Gujarat University of Technology, Gandhinagar, and Roshni R. Kapadia of Silver Oak College of Engineering and Technology have provided important advice, inspiration, collaboration, and support. I owe him a big debt of gratitude for his astute observations and insightful criticism, which enabled me to succinctly and precisely communicate the research's scientific findings.

5. REFERENCES

[1] Tadala akhil, K.naresh, Abdul khurshid, Purushotham anil kumar, "Analysis on Four Stroke Single Cylinder Engine Piston by using Aluminum Alloys (Al-GHS 1300, Al-Sic- Graphite, A6061, Pure Aluminum)'', SSRG International Journal of Mechanical Engineering (SSRG-IJME) – volume 3 Issue 1 – January 2016.

[2] Nilesh T. Dhokane, Anand R. Nadgire and Savita U. Shinde, " Performance Evaluation of Four Stroke SI Engine with and without Oxyrich Air Energizer at 1000rpm'', International Journal of Current Engineering and Technology, MIT College of Engineering, Pune, India, AMET 2016, INPRESSCO IJCET Special Issue-4 (March 2016).

[3] Suramya Naik, Fabien Redon, Gerhard Regner, and John Koszewnik, "Opposed-Piston 2-Stroke Multi-Cylinder Engine Dynamometer Demonstration'', SAE International, 2015-26-0038 Published 01/14/2015.

[4] Khalaf I. Hamada, M.K.Mohammed and M.M. Rahman, "Development Of A Test-Rig For A Modern Motorcycle
Engine", International Journal of Automotive and Mechanical Engineering (IJAME), Volume 10, pp. 2034-2041, July-
December 2014.

[5] P.T.Aravindhan, P.T.Anandhan, "Efficiency Analysis of a Copper Coated SI Engine using Normal and HHO blended Gasoline under Various Loads'', International Journal of Innovative Research in Science, Engineering and Technology, Volume 3, Special Issue 3, March 2014.