A Review Paper on Study of Multi Cylinder Morse test Petrol Engine

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***Abstract*- The basic task of the development engineer is to reduce the cost and improve power output and reliability of the engine. Trying to achieve these goals there is various design concepts to find the effects on engine performance of a particular design concept to resorts to testing. Thus, in general, developments of engine will have to conduct a wide variety of engine tests. Engine performance is an indication of the degree of success with which it is doing its assigned job. These performance characteristics can be verified by using different Testing Methods. In this research to designed & fabricated multi cylinder petrol engine test rig for demonstration purpose as well as an experimental setup to carry out various performance characteristics trials on the same. Here set of demonstrated break power, break specific fuel consumption, Break thermal efficiency, mechanical efficiency and heat balance at various load conditions. Generally the Morse Test and Heat Balance can be performed on the multi-cylinder engine by running the engine at required speed and different parameters can be measured by using different measurement systems.**

Index Terms- Multi Cylinder Petrol Engine, Brake Power, Indicated Power, Fuel Consuption, Heat Balancr Sheet, Efficiency

1. INTRODUCTION

The Morse Test is performed to find the power developed in each cylinder in a multicylinder internal combustion engine. It basically gives the relationship between indicated power and brake power. It is assumed that friction and pumping losses do not change and remains same when the cylinder is in firing condition as well as in inoperative condition. Using these test frictional losses in the IC engine can be easily calculated. It is a simple approach to find the mechanical efficiency of the engine. First power developed by all the cylinders is determined experimentally. Then using the power supply cut off to the spark plug of cylinder, powers developed by individual cylinders are determined. Then for the remaining cylinders, power developed by engine is determined experimentally and obtained value is subtracted from the first value and this gives power developed in the cylinder whose spark plug was cut off. In the similar fashion, this test is performed on all the cylinders of the engine individually.

FIG. 4 CYLINDER PETROL ENGINE

2. FOUR CYLINDER PETROL ENGINE

4-stroke engines produce power in only one stroke, which leaves the power very discontinuous and require heavy flywheels to store power generated to sustain the rest of the cycles. Engine is unbalanced by the reciprocating piston and its varying velocity in completing one cycle.

For small capacity engines this unbalance can be kept within tolerable limits with well-balanced counter weights and rubber mountings. But when there is

requirement of power a single cylinder produces such a high torque that it require heavy components to balance this torque. Heavy reciprocating mass reduces engine rpm. As the engine power is a function of torque and engine rpm, limits the power generation.

So the natural solution is to employ multiple cylinders which will cancel the primary and secondary forces acting in the engine. Multiple cylinders also facilitate using lighter flywheels and crank as they fire more often than single cylinder engines.

There are different layout such as Inline, Flat and V having their own pros and cons. Based on the requirement a layout can be considered which provides maximum power to weight ratio.

One end of a U tube manometer is connected to air tank while other is free to atmosphere. The difference in water levels in two sides indicates the pressure gradient across the orifice. The rate of air consumption and volumetric efficiency can be calculated from this pressure gradient. Fuel consumption is measured with a three way cock and simple burette marked on its length. Calorimeter is a heat exchange with counter flow of water. The various inlet and outlet temperatures of water, exhaust gas are measured with thermocouples and digital display. The flow rate of water passing through calorimeter is measured with Rota-meter.

The morse test petrol engine consists of multi cylinder engine, alternator, cooling system, loading Reaostat for engine loading. Morse test petrol engine are connected with independent RPM meter, air box, petrol tank, burette, fuel measuring unit. Calorimeter temperature, engine jacket cooling water inle t& outlet where connected with sensors of temp. displayed on temperature indicator. Cooling system : regular, cold and soft water, at 20m. Head.

3. PETROL & FRICTION ABSORB SYSTEM

Fuel supply system from fuel tank to valves, burette, and carburettor.

And lubricating system, in which lubrication are flow in whole engine where more friction are produced in engine.

4. INDICATED POWER & BRAKE POWER

The purpose of Morse test is to obtain the approximate indicated power of a Multi cylinder engine. It consist of running the engine against the dynamo-meter at a particular speed, cutting out the firing of each cylinder in turn and noting the fall in BP each time while maintaining the speed constant. When one cylinder is cut off, power developed is reduced and speed of engine falls. Accordingly the load on dynamo meter is adjusted so as to restore the speed of the engine. This is done to maintain FP constant, which is considered to be independent of the load and proportional to the engine speed. The observed difference in BP between all cylinder firing and one cylinder cut off is the IP of the cut off cylinder. Summation of IP of the entire cylinder would then give the IP of the engine under test.

5. MATERIAL AND METHOD

The IP and the mechanical efficiency of a multi-cylinder auto engines found out in a very short time by this test. During the test the engine is run at a constant speed and at same throttle opening. First the b.p. of the engine with all cylinder's operative is measured by means of dynamometer. Next, the b.p. of the engine is measured with each cylinder rendered inoperative one by one by shorting the spark plug in case of petrol engine or by cutting off the fuel supplyin case of diesel engine. When any cylinder is rendered inoperative, the speed abruptly goes down. before taking any reading, the initial speed must be restored by adjusting the load.t is assumed that the f.p. of the inoperative cylinder remains the same as it were when the cylinder was operative. Considering the case of a 4-cylinder engine.

6. TECHNICAL MEASUREMENT

The equipment is instrumented so that the following experiments could be performed.

- Bhp Measurement
- Ihp Measurement (By Morse Test Arrangement)
- Fuel Consumption Measurement
- Air Intake Measurement
- Measurement of Heat Rejected to Water Jacket
- Heat Balance Test
- Performance (BHP Measurement) from no load to full load

- Performance at various throttle position

7. LITERATURE REVIEW

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An IC engine is used to produce mechanical power by combustion of fuel. Power is referred to as the rate at which work is done. Power is expressed as the product of force and linear velocity or product of torque and angular velocity. In order to measure power one needs to measure torque or force and speed. The force or torque is measured by Dynamometer and speed by Tachometer. The power developed by an engine and measured at the output shaft is called the brake power. While calculating brake power for single cylinder engine it is easy but in case of multi cylinder engine its quite difficult because of the inertia forces developed. In such cases the Morse test can be used to measure the indicated power and mechanical efficiency.

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IC Engine is an integral part of modern human society. It might be a cliché that IC Engines drives human society but for most of the clichés it is far more accurate. Exhaustive research work has taken place in the field of IC Engines and the work has continued in recent years as well. Human society today is facing humongous tasks of reducing GHG emissions and emissions of suspended particulate matters (SPM), SOX and NOX. Depleting resources of conventional fuels has forced us to look for alternative sources of fuels. IC Engines are not capable enough to work on multiple fuels. Thus, specialized engines needs to be developed for such fuels. These alternative fuels must be able to produced desired power in the engine keeping emissions below standards. Thus over all there is a huge scope in the field of research in IC Engines. Usually IC Engines are tested using standard testing rigs. Many times calculations related to such experiments are extremely complicated and requires a lot of time and efforts. The main concept behind this work is to assist the calculations for such research work by standardizing them and simplifying them using Microsoft excel. I hope this work helps and guides aspiring researchers and scholars in their respective work.

8. FUTURE SCOPE

In the common test rig, each & every input parameter have to be changed manually and to find out the required output parameter, we have to measure by connecting the test equipment's manually and to carry out the calculations manually. In future this manual test rig can be computerized using software's which would be operator friendly. Modifications can be made such that it will result as a test bed and not as test rig which means any engine can be tested on the same setup. Fuel consumption can be measure by volume difference or by weight difference. Radiator can be eliminated with direct connections. Flow meter is required for calculating mass and flow of exhaust gas.

9. CONCLUSIONS

The complete design of each component has been discussed in detail and the same details are used for fabrication. The trail is carried on the engine and various performance parameters such as specific fuel consumption, Break thermal efficiency, mechanical efficiency and heat balance at various load conditions.

1. As brake power increases fuel consumption also increases
2. Brake specific fuel consumption decreases with increase in brake power
3. Exhaust temperature increases as brake power increases
4. As brake power increases both brake thermal efficiency and mechanical efficiency increases our project might be have some its own limitations but an effort has been made to the fullest to make it successful.
5. Other than this theoretical view, in a real life scenario, the performance, comfort and fuel efficiency of a car depends on many other factors starting from the aerodynamics to the passenger weight.
6. There is no generalization that all three cylinder ones are fuel efficient and all four cylinder ones are better to drive.

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