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The Effect Of Engine Temperature And Speed On Mechanical Efficiency Of Multi Cylinder SI Engine Performance With Gasoline As A Fuel

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Abstract

This country is amongst the tropical countries where the deviation in the temperature is having very vast range. Looking in to this vast varying temperature range it is very difficult to say that which temperature is best suited for operating condition of engines and gives us best performance level as for as Thermal efficiency and brake power is concerned. In this work it tried to investigate the best option to run the S.I. engine. The development of engines with its complexity of in-cylinder processes requires modern development tools to exploit the full potential in order to reduce fuel consumption. The performance results that are reported include brake power and specific fuel consumption (sfc) as a function of engine temperature; i.e. 50, 60, 70°C with varying engine speed of 1500, 1800, 2100 and 2400 rpm. The effect of increasing the temperature can have the multiple advantage of reducing the specific fuel consumption while on the other hand low head temperature will have good impact in reducing the thermal stress of the top portion, reduction in chance of knocking & pre-ignition, increase in the volumetric efficiency.

Keywords: *Engine Temperature, Fuel, S.I. Engine, Thermal Efficiency*

1. Introduction

We have two types of internal combustion engines, the spark ignition, SI, and the compression ignition, CI. Both have their merits.

The SI engine is a rather simple product and hence has a lower first cost. The problem with the SI engine is the poor part load efficiency due to large losses during gas exchange and low combustion and thermodynamics efficiency.

The effect of increasing the liner temperature can have the multiple advantage of reducing the specific fuel consumption, while on the other hand low head temperature will have good impact in reducing the thermal stress of the top portion, reduction in chance of knocking and pre ignition, increase in the volumetric efficiency.

The experimental study is carried out on a three cylinders, four stroke, petrol carburetor water cooled, Maruti800 engine connected to eddy current type dynamometer for loading. The objective of this project is to examine engine performance parameter specific fuel consumption (SFC), brake power (BP) and with varying engine temperature at 50, 60, 70°C and at an engine speed of 1800, 2100, 2400 rpm with respect to engine load 6, 9, 12, 15 kg. The results are shown by various graphs i.e. between engine temperature and specific fuel consumption, engine temperature and brake power, engine speed and specific fuel consumption, engine speed and brake power, engine load and specific fuel consumption, engine load and brake power.

There are two types of engine cooling systems used for heat transfer from the engine block and head; liquid cooling and air cooling. With a liquid coolant, the heat is removed through the use of internal cooling channels with in the engine block. Liquid systems are much quieter than air systems, since the cooling channel absorbs the sounds from the combustion process. However, liquid systems are subject to freezing, corrosion, and leakage problems that do not exist in air system.

The performance of the engine-cooling system has steadily improved as the power output & density of internal combustion engines gradually increases. With greater emphasis placed on improving fuel economy & lowering emissions output from modern IC engines, engine downsizing & raising power density has been the favored option. Through this route, modern engines can attain similar power outputs to larger convectional engines with reduced frictional losses.

2. Experimental setup

Experiment was conducted on a three cylinder, four stroke, Petrol Carburetor Maruti 800 engine which is connected to eddy current type dynamometer for loading. The performance results which include Brake Power (B.P.) and Specific Fuel Consumption (SFC) as a function of engine temperature; i.e. 50, 60, 70°C are reported. The test has been conducted to study the effect of engine temperature on SFC and B.P. with varying engine speed i.e. 1500, 1800, 2100 and 2400 rpm with the load of 6,9,12 and 15 kg.

Engine temperature has been controlled by controlling cooling water flow rate. The cooling water flow rate for engine is measured manually by rotameter. The values of engine performance parameter are directly obtained by "Engine Soft" software.

A test matrix is created to record the engine performance parameter but main focal point was on specific fuel consumption and brake power of the engine at different engine speed 1500, 1800, 2100 and 2400 rpm with the engine load of 6,9,12,15 kg at engine temperature 50,60,70°

3.Results & Discussions An Experiment was conducted on a three cylinder, four stroke, Petrol Carburetor Maruti 800 engine which is connected to eddy current type dynamometer for loading. The performance results which include Brake Power (B.P.) and Specific Fuel Consumption (SFC) as a function of engine temperature; i.e 50,60,70°C are reported.

Following are the graphs which has obtained for various engine performance parameters:

I. The effect of engine speed on Mechanical Efficiency at 50°C and at different engine load.

II. The effect of engine speed on Mechanical Efficiency at 60°C and at different engine load.

III. The effect of engine speed on Mechanical Efficiency at70°C and at different engine load.

4. Graphs

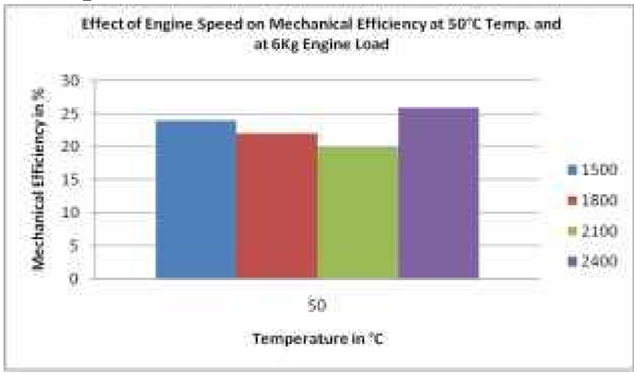

Fig. 1 Graph showing effect of engine speed on mechanical efficiency at 50ºC Temp. and at 6 Kg Engine load

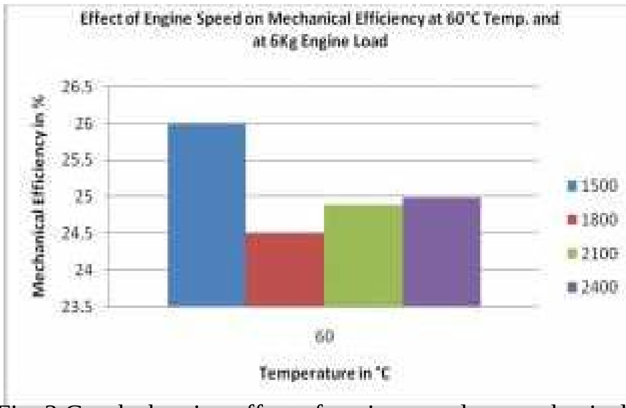

Fig. 2 Graph showing effect of engine speed on mechanical efficiency at 60ºC Temp. and at 6 Kg Engine load

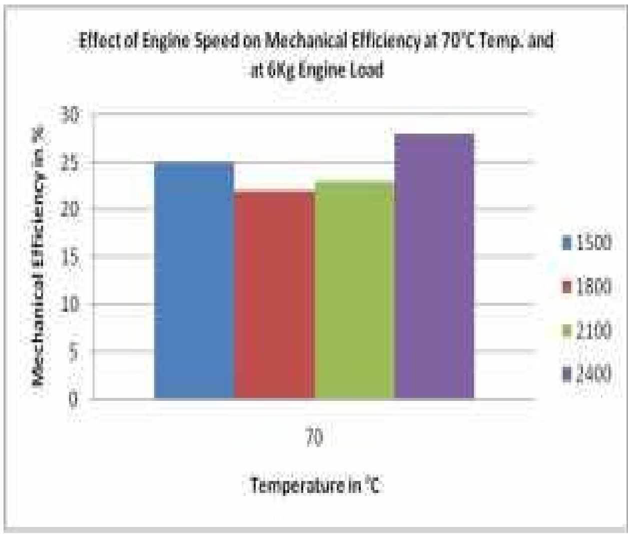

Fig. 3 Graph showing effect of engine speed on mechanical efficiency at 70ºC Temp. and at 6 Kg Engine load

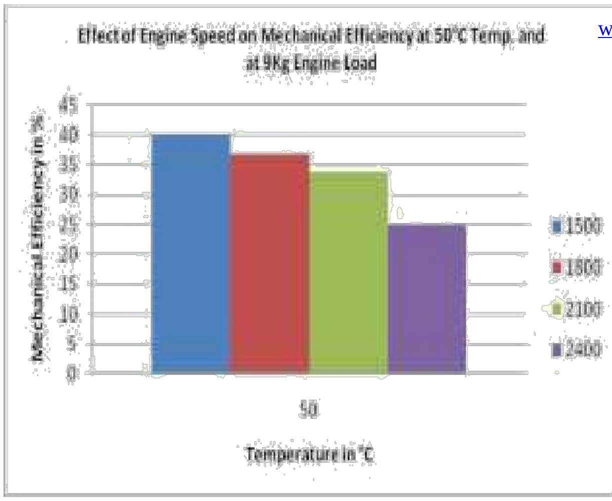

Fig. 4 Graph showing effect of engine speed on mechanical efficiency at 50°C Temp. and at 9 Kg Engine load

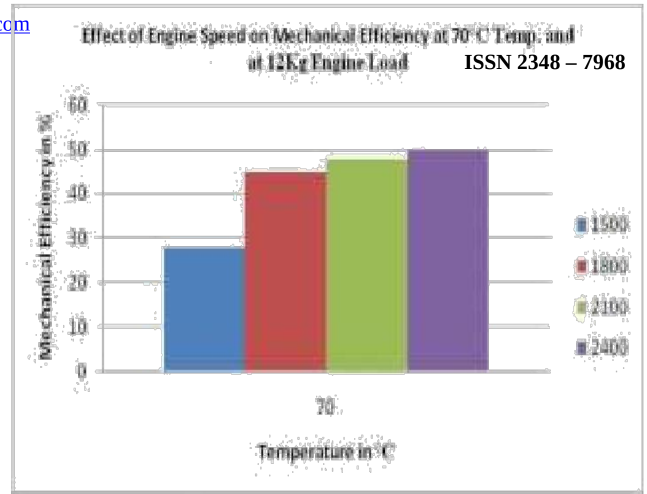

Fig. 7 Graph showing effect of engine speed on mechanical efficiency at 70°C Temp. and at 12 Kg Engine load

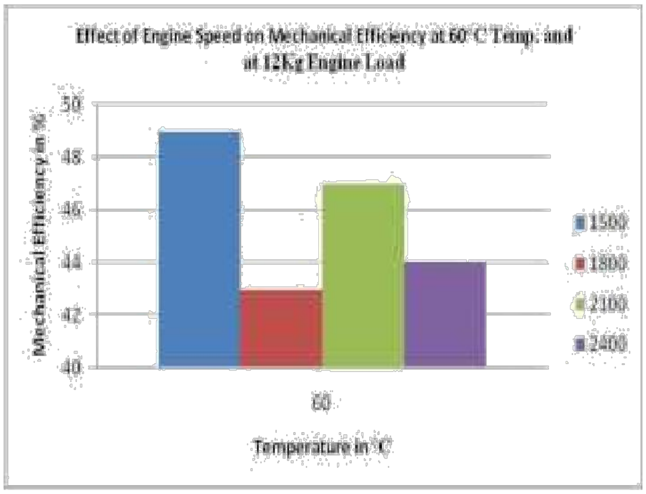

Fig. 5 Graph showing effect of engine speed on mechanical efficiency at 60°C Temp. and at 12 Kg Engine load

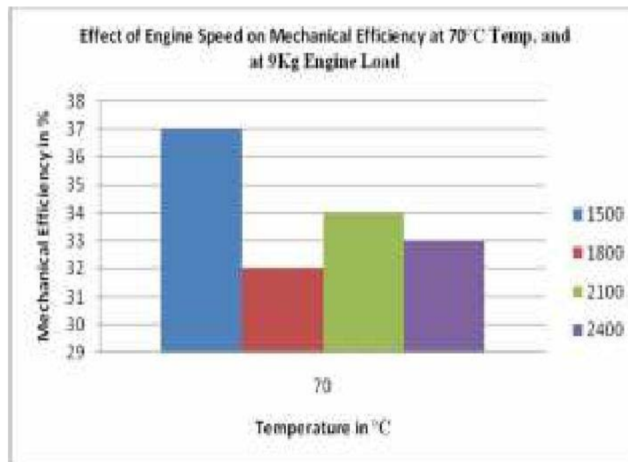

Fig. 8 Graph showing effect of engine speed on mechanical efficiency at 70°C Temp. and at 9 Kg Engine load

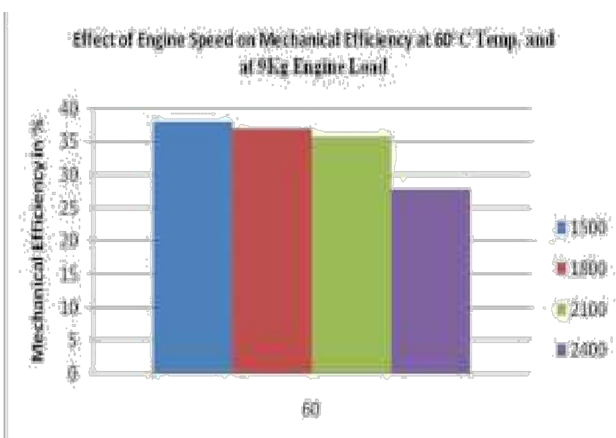

Fig. 6 Graph showing effect of engine speed on mechanical efficiency at 60°C Temp. and at 9 Kg Engine load

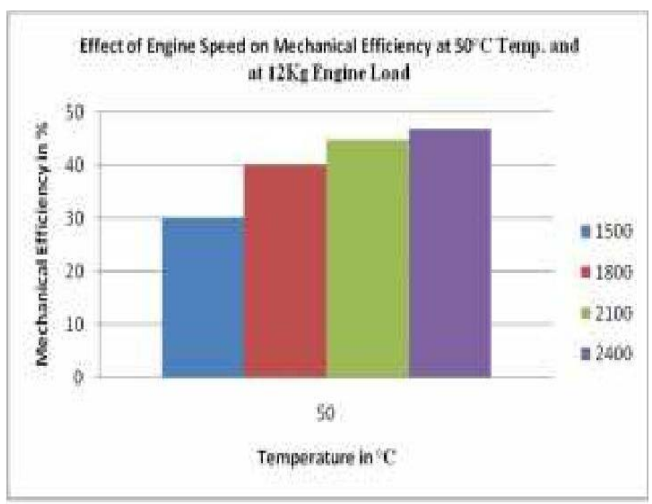

Fig. 9 Graph showing effect of engine speed on mechanical efficiency at 50°C Temp. and at 15 Kg Engine load

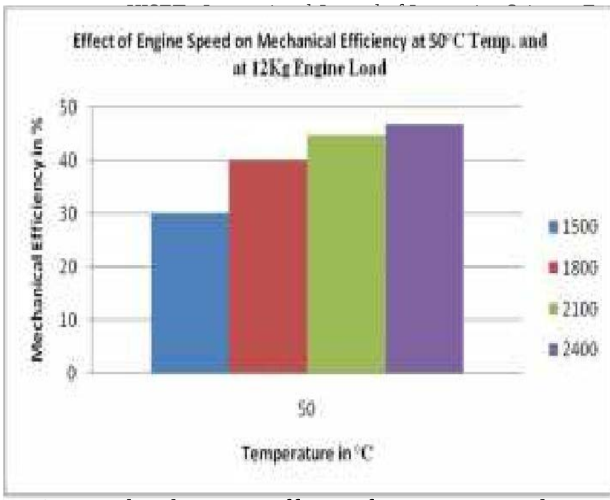

Fig. 10 Graph showing effect of engine speed on mechanical efficiency at 50ºC Temp. and at 12 Kg Engine load

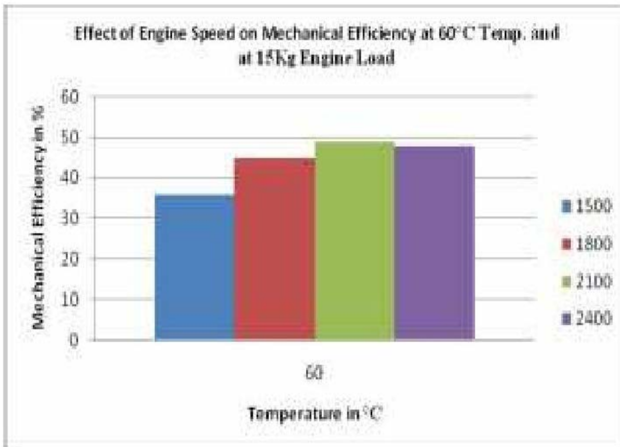

Fig. 11 Graph showing effect of engine speed on mechanical efficiency at 60ºC Temp. and at 15 Kg Engine load

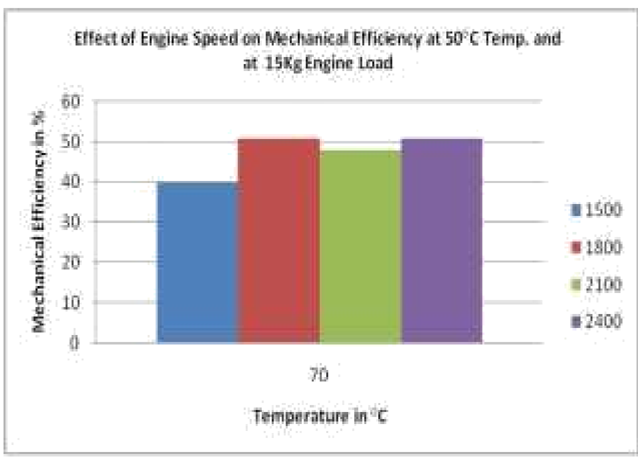

Fig. 12 Graph showing effect of engine speed on mechanical efficiency at 50ºC Temp. and at 15 Kg Engine load

5 Conclusions It is conclude that from the graphs if engine temperature is increased there is some fall in specific fuel consumption but brake power is unaffected but when increase in engine speed there is some decrement in specific fuel consumption and brake power is increased. It is also affected by applying different loads on the engine. Best result are obtained in this study is 522 g/KWhr specific fuel consumption and 6.51 KW brake power with mechanical efficiency is 50% and Thermal efficiency is 43.6% at 70°C engine temperature and 2400 rpm engine speed with 12 kg engine load

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