PERFORMANCE OF BIO-FUELS ON PISTON COATING IN AN INTERNAL COMBUSTION ENGINE

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Abstract: As we know that atmosphere is polluting day by day because of emissions coming from exhaust of industries and automobiles by using fossil fuels. Bio-diesel is an important alternative fuel to reduce pollution up to some extent. Non-edible oils are potential alternative fuels it can easily substitute in diesel. for example, vegetable oils blended with diesel. In this work, the piston top head is coated with magnesium zirconium trioxide which is one of the ceramic materials. This assessment divided into 3 phases. In phase one, fuel are mixed with diesel in the quantity of 20%.here we are using corn oil. In other phase, piston top head is coated with ceramic material. In the last phase, tests were conducted by fuelling corn oil biofuel and calculating combustion parameters and efficiencies.

***Index terms*: Corn oil (co), coated piston head, Brake thermal efficiency (BTE), Indicated thermal efficiency (ITE), Mechanical efficiency (ME), Brake specific fuel consumption (BSFC)**

INTRODUCTION:

The industrial revolution triggered rapid development in the manufacturing sector increasing demand for energy. This causes energy shortages, environmental Problems due to huge amount of exhaust emissions from industrial sector. Fossil fuels are a primary source of energy production. The main disadvantage of these fuels is that they are not environmental friendly and are a nonrenewable source of energy. In this article research is done on non-edible vegetable oils which are alternative fuels to upcoming world. in this paper investigation is done on Pongamia oil and jatropha curcas oil they got result that esterifies jatropha curcas oil is effective substitute fuel for compression ignition engines. However NO_x emission decreases with these oils combustion parameters also in limit thus these vegetable oils can be utilized as substitute fuels in CI engines [1]. Patel, H. K., & Kumar, S et al [2] these papers focus to improve performance of engine. In this experiment they conducted test by using Jatropha oil bio diesel and nano-Al_2O_3 mixed diesel. Nano-Al_2O_3 gets better burning characteristics which results in improved oxidation of the fuel mixture. Asokan, M. A., Kamesh et al [3] in this paper they extract bio fuel from papaya and watermelon seed oil with different blends proportion with diesel. They found the result that blends 20% performance and combustion characteristics is close to diesel. The emission characteristics of Blend 20% is better than that of diesel as emission of CO, HC is less. In these review they preheat the bio diesel in order to achieve good spray properties. Bio-oil was preheated to 105^0C to decrease viscous level because oils have high viscosity. Experiment is done by fuelling preheated bio-oils in an engine and calculated combustion parameters and efficiencies of bio oil. They found that some amount of emissions is reduced [4]. This audit paper describes the extraction of linseed oil, Linseed plant contains a high quantity of oil in its seeds its properties, arrangement and future potential for bio-diesel which can be changed over to bio-diesel. In this investigation, the properties of methyl ester of linseed oil are contrasted with the properties of fossil fuel. The goal of this survey is to give a report on the linseed plant, the production of bio-diesel from the linseed oil [5]. These study magnesium zirconium trioxide coating is used for engine parts. It can be concluded that coated piston have less amount of heat is rejected to the atmosphere because of the presence of a low thermal conductivity ceramic coating which almost reduces the heat loss to the atmosphere and to the cooling [6]. In these study compairation taken between three different oils i.e., rice bran, neem, and cottonseed oils with varying degree of un saturation. The biodiesels provided better combustion characteristics than diesel. Of all the tested biodiesel blends, rice bran oil biodiesel decreased CO and hydrocarbon emissions [7].

1.1 PROPERTIES OF CORN OIL

In this paper we used the corn oil, the physical properties of corn oil and corn oil are given below.

Table 1: Corn oil and Corn oil properties

Properties	**Corn oil**
Density (Kg/m^3)	0.922
Viscosity (mm^2/s)	44
Flashpoint (°C)	318
Calorific value(KJ/kg)	39862

1.2 PISTON COATING

In this paper, the cylinder head is coated with ceramic material. Coated piston have less amount of heat is rejected to the atmosphere because of the presence of a low thermal conductivity ceramic coating which almost reduces the heat loss to the atmosphere and to the cooling. Decrease the temperature of the hidden, less warmth safe metal part. The ceramic coating is intended to shield the metallic substrate from oxidation and consumption and advance fired topcoat bond.

Figure (a) Coated Piston

Fig-1: Piston types used in the present work

1.3 OIL BLENDS QUANTITY

1. Pure diesel (100%)

2. (a) CO(20%)+DIESEL(80%)

   (b) CO (40%)+DIESEL(60%)

   (c) CO (60%)+DIESEL(40%)

   (d) CO (80%)+DIESEL(20%

   (e) CO (100%)

2.1 EXPERIMENT

In this investigation, a 4-stroke compression ignition fuelled motor with DC generator loading having 5HP as rated power at 1500 rpm is utilized. The trial arrangement is exhibited in Figure 2. The streaming rate of the fuel is evaluated on the volumetric reason using stopwatch and burette. The sort of the CI motor is water-cooled. Diesel engine determinations are exhibited in Table 2. The tank is loaded up with the rice-bran oil and is taken. The pipe ought to be watched that there ought to be no air bubbles and the pipe is associated with the motor. The decompression switch has continued so that there will be no air getting in the barrel and the chamber. By then, the engine is to be initiated and it is allowed to get the speed, effectively for a few minutes. Using the tachometer, the speed of the motor is assessed. Presently bring down the voltmeter, ammeter readings; time is taken for the usage of fuel on no-heap conditions and seeking after of a manometer. By then, the engine is stacked by bit by bit cutting down the copper plate in water rheostat. In the wake of applying weight on the engine at set point, bring down the readings. A comparative technique is repeated for the piston coated with Magnesium zirconium trioxide ceramic material and look at the qualities.

TABLE 2: Specifications of diesel engine

Make	**Kirloskar Make, Compression Ignition with D.C. Generator**
No. of cylinders one	One
Bore	80 mm
Coefficient of discharge (CD)	0.62
Capacity	4 KW
The diameter of Orifice (d)	20 mm
Stroke	110mm
Compression ratio	16:1
Maximum Current	13 amps
Efficiency of dynamometer	80%
Armature voltage	220V

Fig-2: Experimental Setup

2.2 RESULTS AND DISCUSSIONS

The results are obtained from the plain piston and piston coated with ceramic material Magnesium zirconium trioxide of all blends of Corn oil is analyzed. The results thus obtained are compared.

2.3 BREAK THERMAL EFFICIENCY

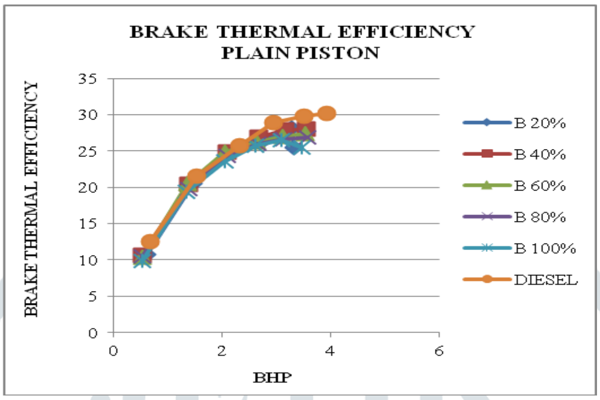

Chart-1: BHP Vs Brake thermal efficiency

Brake thermal efficiency is defined as it is the ratio of brake power to the heat input. In chart 1 brake thermal efficiency of the blend B60 of the plain piston is higher in contrast to diesel and all other blends

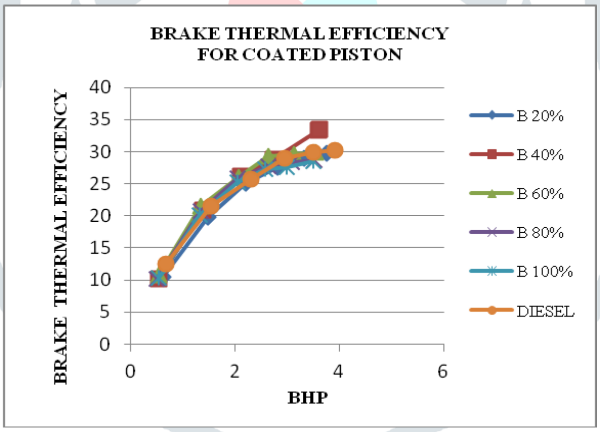

Chart-2: BHP Vs Brake thermal efficiency

In chart 2 brake thermal efficiency of blend B60 of the coated piston is higher in contrast to diesel and all other blends

2.4 INDICATED THERMAL EFFICIENCY

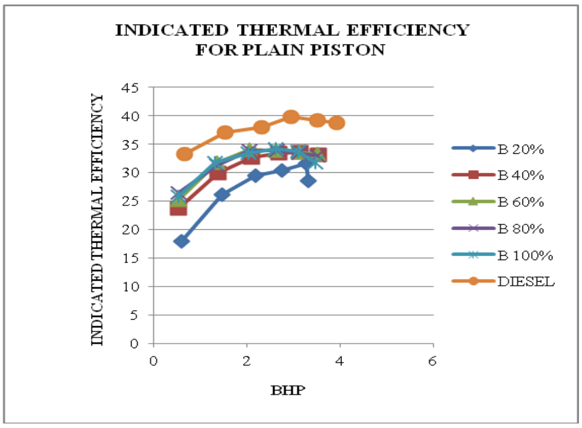

Chart-1: BHP Vs Indicated thermal efficiency

The ratio of the Indicated power of the engine to the thermal input is called Indicated thermal efficiency. In chart 1 Indicated thermal efficiency of the plain piston blend B80 is higher in contrast to diesel and all other blends

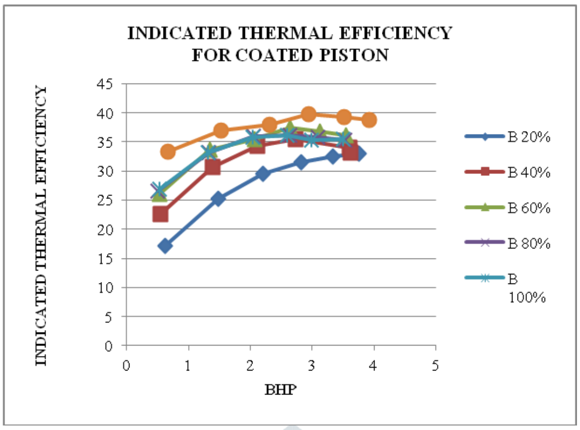

Chart-2: BHP Vs Indicated thermal efficiency

In chart 2 Indicated thermal efficiency of blend B60 of the coated piston is higher in contrast to diesel and all other blends

2.5 MECHANICAL EFFICIENCY

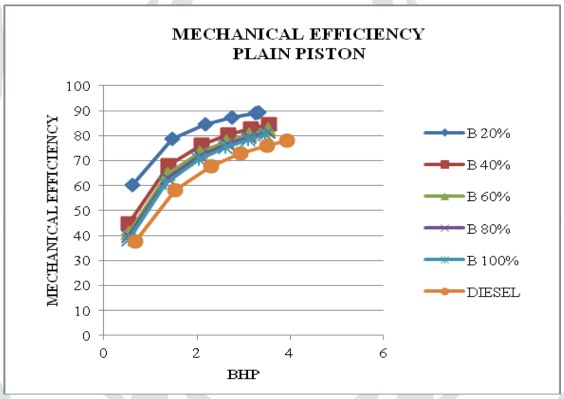

Chart-1: BHP Vs Mechanical efficiency

Mechanical efficiency is defined as Brake power divided by Indicated power. In chart 1 Mechanical efficiency of the plain piston, blend B20 is higher in contrast to diesel and all other blends

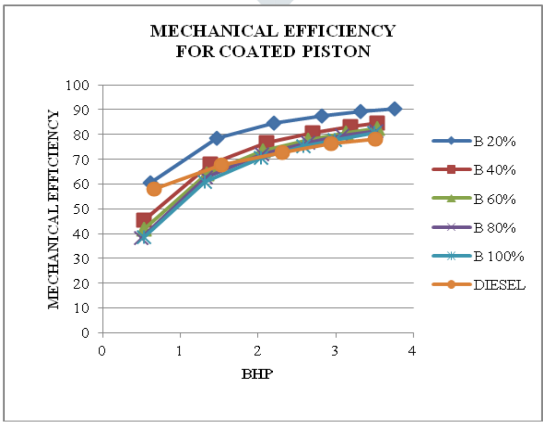

Chart-2: BHP Vs Mechanical efficiency

In chart 2 Mechanical efficiency of blend B20 of the Coated piston is higher in contrast to diesel and all other blends

2.6 BRAKE SPECIFIC FUEL CONSUMPTION

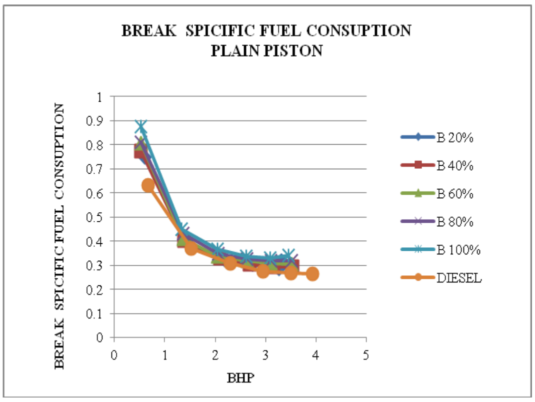

Chart-1: BHP Vs BSFC

From chart 1 it is observed that brake specific fuel consumption on blend B60 of the plain piston is lower compare with diesel and other blends

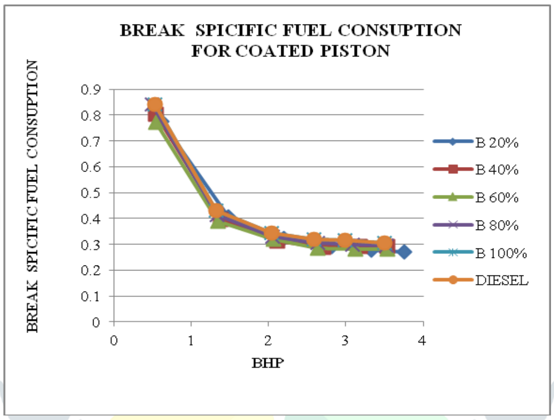

Chart-2: BHP Vs BSFC

From Chart 2 it is observed that brake specific fuel consumption on blend B40 of the Coated piston is lower compare with diesel and other blends

3. CONCLUSION

The investigation is done on IC engine by using corn oil biodiesel the following results are obtained.

- Compared to diesel BTH, ITH and ME for biodiesel mixes were decreased, the Brake specific fuel consumption esteems for biodiesel mixes were higher when contrasted with diesel fuel in the plain piston
- By utilizing a coated piston, the efficiencies of BTH,ITH,ME, were improved
- It is prescribed for the current engine with corn oil with 40% diesel mix with no engine alteration and has useful impacts as far as alternative diesel fuel. Because of the utilization of corn oil as a mixed fuel-prudent state of a rancher can likewise be improved. By utilizing the above-mixed fuel bringing in oil-based commodities from other nations is decreased somewhat. It might improve the Indian economy.

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