Experimental Investigation of Performance Parameter of Compression Ignition engine by using the blend of refined waste Engine oil of Railway

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Abstract: In this research work biodiesel production of waste engine oil using Nmethylpyrolidone (NMP) as aromatic selective solvent is able to extract all unwanted aromatic contaminants present in the paraffinic lubricating oil fraction, subsequent to fractional distillation and the study of the fuel properties like density, viscosity, flash point, calorific value, fire point etc. with varying blends of waste engine oil. Different blends of waste engine oil were tested in a single cylinder, four stroke, direct-injection, water cooled diesel with the aim of obtaining comparative measure of performance parameter of blends of waste engine oil. The results have been analyzed to optimize best operating conditions for maximum performance.

Index Terms **- CI engine, Waste engine oil, performance parameter, combustion, Engine testing, blending, etc.**

I. INTRODUCTION

Compression ignition (CI) engines are used to move major portion of the world's goods, power much of the world's equipment, and generate electricity more economically than any other device in their size range. Increasing industrialization of developing countries is resulting in increased demand for diesel worldwide [1,2]. Substitution of this demand with waste engine oil (WEO) is comparatively environmentally benign compared to mineral diesel and biodiesel. Utilization of locally produced and processed fuel strengthens economy and energy security. Newer options of alternative fuels should be technically feasible, economically competitive, environment friendly and provide energy security without compromising the engine performance and emitting lesser quantity of harmful pollutant species [6,7]. Even Rudolf Diesel, the inventor of CI engine expressed the possibility of using alternate fuel as CI engine fuel during 1900 world exhibition in the Paris and demonstrated using peanut oil as fuel in his newly invented diesel engine. Waste engine oil can be described as are just extensions of these basic hydrocarbon structures, containing from 20 to 70 carbon atoms per molecule often in an extremely complex arrangement of straight chains side chains and five and six member ring structures as that of conventional diesel However, they differ from the latter because of having oxygen in their molecular structure [8]. They also have higher kinematic viscosity and density, lower calorific value, cetane number and stoichiometric ratio compared to mineral diesel density of some oils like orange oil is reported to be lower than mineral diesel waste engine oil can be used blended with mineral diesel to fuel compression ignition engines. Blends of vegetable oils with mineral diesel have been used successfully by various researchers in several countries the use of waste engine oil results in increased fuel consumption i.e. increased brake specific fuel consumption (BSFC). Various studies found higher CO and HC emissions with vegetable oils and their blends, and lower NOx and particulate emissions compared to mineral diesel [9,10]. Engine performance and emissions tests conducted by several studies indicated good potential for most of the waste engine oil as potential CI engine fuels Currently, refining of waste engine oil into paraffinic lubricating oil fraction by subsequent to fractional distillation is the most suitable route of waste engine oil utilization in CI engines. The present research is aimed at exploring technical feasibility of using waste engine oil blends in direct injection compression ignition engine without any substantial engine hardware modification [11, 12].

II. LITERARUTE REVIEW;-

Dwivedi Gaurav et al.[1] have presented the Diesel engine performance and emission analysis using biodiesel from various oil sources Nazzal Thamer Ibrahim.[2] have presented the Experimental Study Of Vegetable Oil -Diesel Blends On the performance Of Compression Ignition Engine. Mohamed F. Al-Dawody et al.[3] have presented the effect of soybean oil biofuel blending on the performance and emission of diesel engine using diesel Ignition Engine Using Diesel. N. Ravi Kumar [4] has presented the performance and emission characteristics of a slow speed diesel engine fuelled with soybean bio diesel. Sherwani A.F. [5] Experimental study on the performance and emission characteristics of a 4-S diesel engine running with mahua oil ethyl ester.

III. LIST OF THE INGREDIENTS USED IN THE EXPERIMENT SETUP

. Fundamental structure	2. Steel frame mountings
3. Load	4. Waste Engine Oil
5. Electric load panel	6. Temperature sensing device

7. Tachometer	8. Rotameter
9. Calorimeter	10. Dynamometer

IV. EXPERIMENTAL SETUP

Following layouts are concerned with the various parts of experimental setup.

Test Rig

Digital Tachometer

Refined WEO Blend

V. SPESIFICATION OF CI ENGINE USED IN THE EXPERIMET SETUP –

Engine Make	KIRLOSKAR AVI
Engine Sr. No.	K0H 6898076 SPT
Engine Variety	Vertical, Single Cylinder
Number Of Stroke	Four
Rated RPM	1500 RPM
Compression Ratio	19:1 to20:1
Stroke	1 10mm

Bore	87.5mm
Specific Fuel Capacity	624cm^3
10. Fuel Tank Capacity	5 litre
. Starting	Rope starting
12. Lubricating Oil	SAE 20W40
13. Cooling System	Water cooling
14. Rated Power Output	3.73Kw

VI. EXPERIMENT METHODOLOGY

(a) Preparation of oil:- We took the used engine oil of railway, after that it has refined by some chemical treatment from Laboratory Fare Labs Pvt. Ltd. Gurgaon.

(b) Blending:- After refining the oil it is blended with in different proportions as B5, B10, B15, B20, B25 and B30.

(c) Experimentation:

Experiment has been conducted on the particular setup by taking the observations such as load, fuel consumption, rpm, water flow rate, suction air flow rate. Inlet, out let temperature of cooling water and exhaust gas has also measured. The observations have been taken at different loads from 2 kg to 8 kg at a particular blend and likewise all the observations have been taken by diesel, B-10 up to blend B-30. Following parameters have calculated and analysed on the basis of observations taken during the experiment.

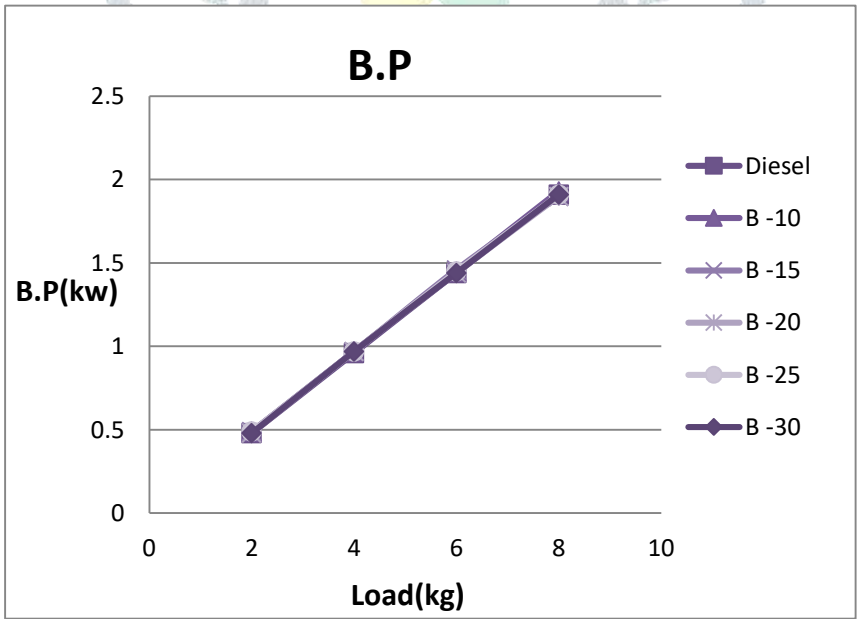
1.Brake power (BP)	**2**. Brake Specific fuel consumption (BSFC)
3.Brake Thermal Efficiency (BTE)	**4**.Total fuel consumption (TFC)

VI. Results and Discussion

On the basis of experimental evidences Observed from variable compression ratio diesel engine, following results are obtained.

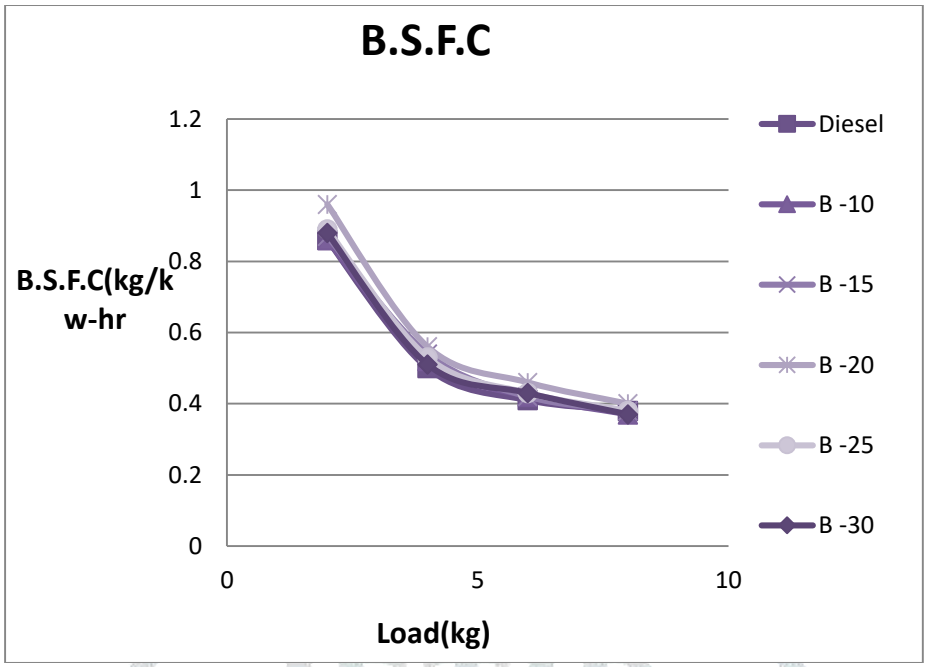
1 Variation of Break power with respect to load at different blend.

Following figure shows the variation of Break Power in kW with respect to load (weight) in kg for diesel and different blends.



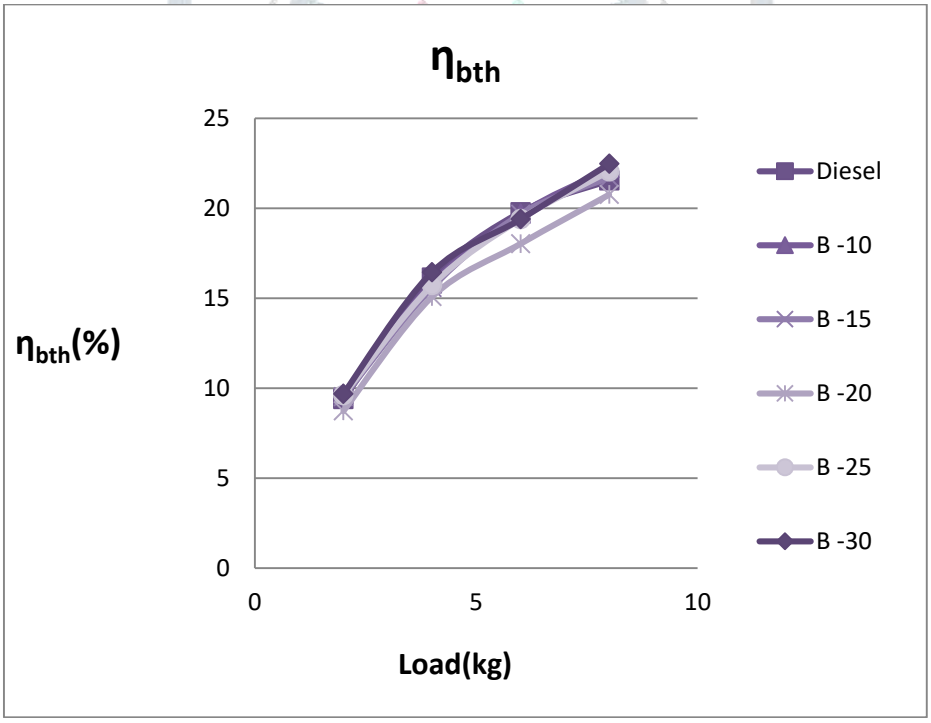
2. Variation of Brake Specific Fuel Consumption with respect to load at different blend.

Following figure shows the variation of BSFC with respect to load (weight) in kg for diesel and different blends



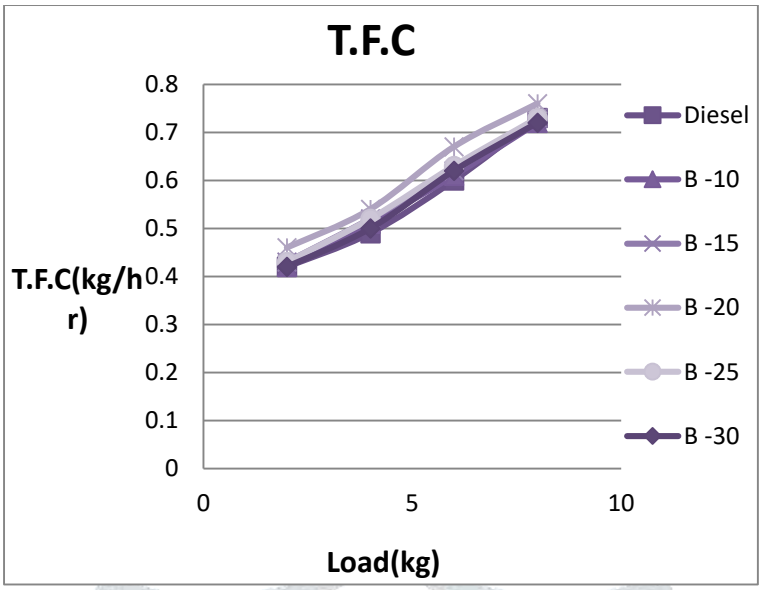
3 Variation of Brake Thermal Efficiency with respect to load at different blend.

Following figure shows the Thermal Efficiency in % with respect to load (weight) in kg for diesel and different blends:



4 Variation of Total Fuel Consumption with Respect to load at different blend.

Following figure shows the TFC with respect to load (weight) in kg for diesel and different blends:



7. Conclusion:

The experimental analysis of compression ignition engine is done by using the blend of refined waste engine oil from railway. After experiment it is concluded that

Total fuel consumption, and is optimum for blend B 30.and finally we recognize that exhaust gas temperature and heat supplied is optimum for blend B 20.so finally B 30 is found majorly optimum blend for compression ignition engine. Hence use of refined waste engine oil blends will increase the use of waste engine oil and reduce the soil contamination. The local production of alternative fuel will save huge amount of foreign exchange. This capital when invested in our country will improve its financial structure.

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