Study of Volumetric Efficiency and Flue air Temperature of Single Cylinder Diesel Engine with Various Mixture of Thumba Oil with Diesel

Avinash Dhar Dubey[1] and Mr. Devendra Kumar Lohia[2]
Student[1] and Asst. Professor[2], Mechanical Engineering Department, Faculty of Engineering and Technology, Rama University,

Abstract- **The current lookup on biodiesel targeted on overall performance of Tumba biodiesel and its blends with diesel. The present work goals to check out the possibilities of the application of mixtures of two biodiesel and its blends with diesel as a fuel for diesel engines. The current investigations are planned after a thorough review of literature in this area[1]. The mixtures of Tumba biodiesel along with diesel are taken for the experimental analysis. Experiments are carried out the use of a single cylinder direct-injection diesel engine with unique loads at rated 1500 rpm. In this study the effect of Tumba biodiesel blend with diesel on volumetric efficiency and flue air temperature is shown.**

In Present Study, experimental analysis have been carried out to study the effect of Thumba oil mixed with Diesel on Volumetric efficiency and Flue air Temperature on single cylinder Diesel engine.

1. INTRODUCTION

As the fossil fuels are depleting at a very faster rate, there is a need to discover out an alternative gas to fulfill the strength demand of the world. Biodiesel is one of the great available sources to fulfill the energy demand of the world. The petroleum fuels play a very enormous role in the development of industrial growth, transportation, agricultural sector and to meet any requirements. However, these fuels are confined and depleting day by day as the consumption is growing very rapidly. Moreover, their use is alarming the environmental troubles to society. Hence, accessible abundantly in India which can be there is a want of lookup for alternative fuels. There is a long list of trees, shrubs, and herbs exploited for the production of biodiesel. India ranks sixth in the world in whole power consumption and needs to accelerate the Development of the region to meet its growth aspirations. India had approximately 5.6 billion barrels of proven oil reserves as of January 2010, the second-

largest amount in the Asia-pacific region after China[2. And it is also integral for higher financial boom forour country .

Dr.Rudolf Diesel invented the diesel engine to run on a host of fuels along with coal dirt suspended in water, heavy mineral oil, and, vegetable oils. Dr. Diesel's first engine experiments have been catastrophic failures, but via the time he confirmed his engine at the world exhibition in Paris in 1900, his engine was once running on a hundred percent peanut oil[3]. Research is nonetheless in growth in diesel engine

for finding higher ways of making exact performance and less emissions emittingand gasoline environment friendly engines for the reduction in emission of poisonous gases while brining fuels.

The lookup on interior combustion engine is of extra than a hundred and fifty years maturity. Due to quite a biodiesel at distinct loads and constant velocity (1500 rpm).On the whole it is considered that

operation of the engine is easy with biodiesel blends.

The compression ignition engine is greater efficient than gasoline engine due to greater compression ratio. As a result CI engine is highly favoured as the propulsion machine for road transportation. With the extend in residing standard and population, the wide variety of vehicles on avenue is day by using day increasing. These automobiles no longer only devour gallons of fuel however additionally emits large quantity of pollutant into environment each day[4]. The dependency of mankind on petroleum product from ultimate many years resulted in its depletion and environmental degradation. Therefore

study is centered to consider the ruin volumteric efficiency and wreck specific fuel consumption of mixture of thumba oil and diesel.

2. EXPERIMENTAL SETUP

In India, nearly all agricultural tractors, pump sets, farm machinery, and transport vehicles, have direct ignition diesel engines. Keeping the specific features of diesel engine in mind, a typical engine system having a variable compression ratio have been selected for present investigations . Test rig is interfaced with high speed computer where possible data can be stored. Necessary instruments and arrangements were rigged up after calibration for measurement /analysis of important engine parameters. The experimental setup, developed test facility and instruments are discussed below[5].

A single cylinder, direct injection, four-stroke, vertical, water-cooled, naturally aspirated diesel engine, with a bore of 80 mm and a stroke of 110 mm was selected for the research study.

This test engine, which is a compact engine; having rated power output of 3 to 5 HP, manufactured by Legion Brothers, Bangalore (India). The nozzle opening pressure recommended by the manufacturer is 203 bars. The inlet valve of the engine opens at 4.5^0 CA BTDC and closes 35.5^0 CA ABDC. The exhaust valve opens 35.5^0 CA BTDC and closes 4.5^0 CA ATDC. The engine has a provision of loading by eddy current dynamometer. The engine can be started by hand cranking.

The cylinder of the engine is made of cast iron, is fitted with a hardened high-phosphorous cast iron liner and the piston is made up of cast aluminum[6]. The water jacket is provided between the cylinder and the cylinder liner. Liberal cooling areas are provided in both cylinder head and barrel. Water circulation is by a centrifugal pump in a closed circuit, which includes heat exchanger and orifice type flow meter. The high rate of circulation ensures a uniform temperature in the head.

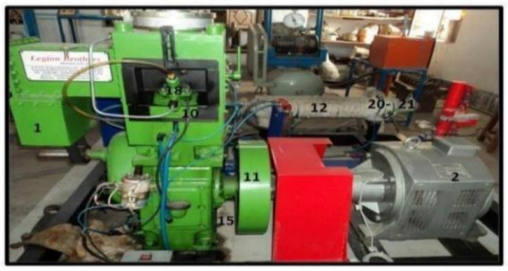
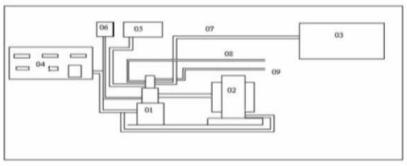


Figure [3.1] Overall View of Experimental Setup

Fig 3.2 Experimental setup for Study

1: Engine
2: Dynamometer
3: Gas Analyser
4: Digital display of mass of fuel, mass of air, Various Temperature and Dynamometer Control Knob
5: Air Tank
6: Fuel Tank
7: Exhaust Gas Pipe Line
8 : Water In
9 : Water Out



[3.3] View of Setups for Measurement System With Computer System

3. EXPERIMENTAL PROCEDURE

Before starting the measurement some vital points should be considered in order to get the meaningful data from the experiments. The engine was once warmed up prior to data acquisition. the tests were carried out for exclusive engine load from low load to most load conditions at fixed velocity of 1500 rpm. At every operative condition measurements of variety of parameters were taken. The check engine normally started at decrease engine speed till attaining the steady condition. Then the engine velocity was accelerated steadily up to 1500 rpm for each engine load, the measurement of fuel consumption, air consumption, exhaust gas temperature , break energy specific fuel consumption , thermal efficiency and volumetric efficiency were recorded. The equal conditions ,methods and processes have been used for both the experiments of biodiesel. For every engine load, the was operated for round 10 minutes until the reading gets stabilize . at the qual time the dynamometer , all analyzer and meters had been switched on and the suited prepearations and setting

for measurement have been carried out in accordance to the recommended strategies given in the makers instruction manuals. When the test engine reached its secure conditions, the experiments had been commenced and measurement recorded . initially the take a look at engine was once operated with basefuel diesel for about 10 minutes to achieve a regular working temperature situation in order to begin the measurements. The engine was then operated with various mixture of Thumba oil and diesel. For every operating condition the engine pace used to be checked and maintained constant. The exceptional performance and emission parameters studied in the current investigation were brake power , thermal efficiency , unique fuel consumption , exhaust gas temperature , volumetric efficiency etc are measured .

Table 1. Range Of Experiment

Load (%)	0	20 40	60	80	100
Blends of Vegetable oil / Biodiesel with	10 20 30 40 50 60 70 80 90 100				
Diesel					
(By % Volume)					
Compression Ratio	15	16	17	18	1 9
Injector Needle Lift Pressure (bars)	125 150 170 180 203 225				
Injection Timing (CA BTDC)	23	25.4	27.9	30.3	
Engine Speed (rev/min)	1500				

4.

5. RESULTS AND DISCUSSION

A test has been performed on the engine and the results obtained are discussed below:

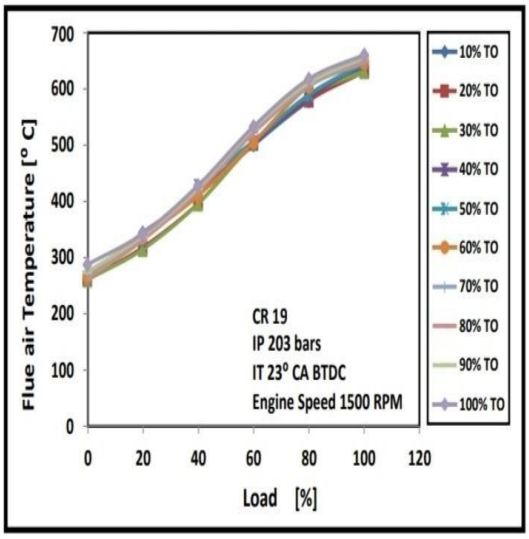


Figure Load vs. Flue air Temperature for Various Mixture of Thumba Oil-Diesel

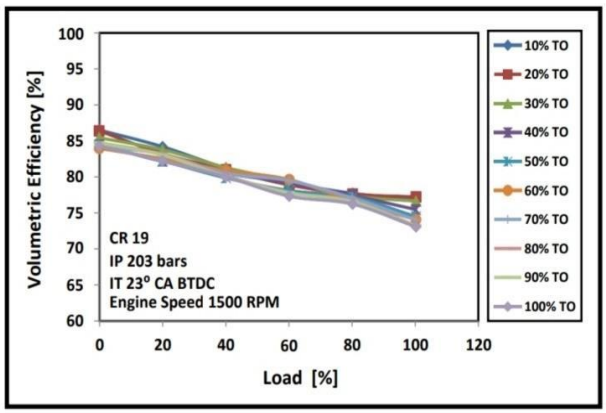


Figure Load vs. Volumetric Efficiency for Various Mixture of Thumba Oil-Diesel

The experimental consequences of engine operation for ideal thumba oil diesel mixture at 1500 rev/min and at unique compression ratios, exceptional injector needle lift pressures and injection timings can be summarized as follows:

- No hassle was faced at the time of starting the diesel engine and the engine ran easily over the vary of thumba oil percentage in gasoline blend.
- The combination of 20% thumba oil in diesel was observed to give satisfactory Volumetric efficiency.
- It is evident from the experiments that low attention blends of thumba oil in diesel

confirmed exceptional short term engine operation. However, some operational problems with pure thumba oil and excessive awareness blends were found like coking of injectors and cylinder walls, valves and piston sticking, carbon deposits on piston etc. Gum formation round valves and injectors have been additionally seen after extended engine operation

Table [2] Results Obtained at Optimum Engine Operation with Optimized Thumba Oil-Diesel bend

Parameters	Optimum Thumba Oil Blend
Volumetric Efficiency (%)	77.26
Exhaust Gas Temperature (□ C)	630.69

5. CONCLUSIONS

1. The combination of 20% thumba oil in diesel was observed to give higher volumetric efficiency.
2. We can see that as Thumba oil proportion increases it results in poorer engine parameters.
3. With neat thumba oil will very poor operation performances and it deposits lots of carbon on piston top.
4. It is can be seen that exhaust air temperature increases as thumba oil proportion increases in diesel.

6. ACKNOWLEDGEMENT

At this moment of accomplishment, first of all I would like to show deep sense of gratitude to my guide **Mr. Devendra Kumar Lohia.**. This work would not have been possible without his guidance, support and encouragement. Under his guidance I successfully overcame many difficulties and learned a lot. Despite of all difficulties, he used to review my thesis progress, give his valuable suggestions and made corrections. His unflinching courage and conviction will always inspire me, and I hope to continue to work with his noble thoughts.

REFERENCE

[1] Frank Rosillo-Calle, Luc Pelkmans and Arnaldo Walter: "A Global Overview of Vegetable Oils, with Reference to Biodiesel", A Report for the IEA Bioenergy, U.S.A, 2009.

[2] Bajpai D and Tyagi V K: "Biodiesel: Source, Production, Composition, Properties and its Benefits",

[3] Journal of Oleo Science, Volume 55, 2006, Pages 437-502.

[4] Babu B V: "Biomass Pyrolysis: a State-of-the-Art Review", Biofuels and Bioproducts, Volume 2, 2008,

[5] Pages 393–414.

[6] Bridgwater A V: "Renewable Fuels and Chemicals by Thermal Processing of Biomass", Journal of

[7] Chemical Engineering, Volume 91, 2003, Pages 87–102.

[8] Manurung R, Wever D A Z, Wildschut J, Venderbosch R H, Hidayat H, Van Dam E G, Leijenhorst E J, Broekhuis A A and Heeres H J: "Valorization of Jatropha Curcas L. Plant Parts: Nut Shell Conversion to Fast Pyrolysis Oil", Food and Bioproducts Processing, Volume 87, 2009, Pages187–196.

[9] Billaud F, Dominguez V, Broutin P and Busson C: "Production of Hydrocarbons by Pyrolysis of Methyl Esters from Rapeseed Oil", Journal of American Oil and Chemist Society, Volume 72, 1995, Pages1149-1154.