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Experimental Analysis of the Compression Ignition Engine Mixing of Bardhal Oil with Diesel

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ABSTRACT-

The discount of oil assets in addition to the environmental law has caused the improvement of trade power reassets. Diesel with Bardhal components is a variable alternative for petroleum-primarily based totally fuel. Its blessings are progressed lubricity, better cetane number, cleanser radiation, decreased worldwide warming. Bardhal with diesel haspobrableas an opportunity power source. However, this oil by myself will now no longer remedy our dependence on overseas oil inside any realistic time frame. Use of this with different opportunity power reassets and appropriate components along with Varius Blend of Bardahl may want to make a contribution to a greater solid deliver of power. Bardahl mixture hence produced meets the usual bardahl mixture specifications. The manufacturing and intake of bardahl mixture will necessarily upward push in destiny because of excessive overall performance impact, ease of handling, and opportunity of use with out want for predominant changes of present engines of motor vehicles. Production and use of bardahl mixture results in Saves money, Improves power safety of the nation.

Keywords: IC engine,Diesel,Blends

1. INTRODUCTION

An large boom within side the quantity of motors in latest years has led to extra call for for petroleum products. With crude oil reserves envisioned to ultimate best for some decades, consequently efforts are made on manner to analyze on opportunity to diesel. Depletion of crude oil could purpose a prime effect at the shipping zone[1]. Fossil fuels play the widespread position in improvement of country. Continious deliver of gasoline with growing price ought to be ensured to maintain and in addition improvement of country. Recently, widespread issues related to fossil gasoline like brief deliver, substantially growing price, non renewability, infection of environment, detrimental impact on bio structures compiles researcher to go looking within side the gift for future[1]. Energy conservation is crucial for maximum of the growing nations, inclusive of relaxation of world. The scenario may be very grave in growing nations like India which import 70% of the specified gasoline, spending 30% of her general forex on oil imports[1] In view of this, researcher discovered and examine many strength reassets like CNG, LNG, LPG, ethanol, methanol, hydrogen, diesel with bardahl mixture and lots of more. Diesel engines are important supply of transportation, strength generation, marine application, agriculture cars etc. Diesel with bardahl mixture is broadly usual as similar gasoline to diesel in compression ignition engine. It gives blessings like better cetane quantity, decreased radiation of perticulates. Moreover, transportation and agriculture zone relies upon on diesel gasoline consequently, it's far crucial that options to diesel fuels should be developed[19]

Problem Statement

Selection of fuel for diesel engines affects the maintenance required and the performance a user can expect. Due to increase in prices of petroleum based fuels, the adverse effects of exhaust radiation after combustion, the monopoly of Organization of Petroleum Exporting Countries (OPEC), and the fact that petroleum contributes up to 20% of energy source in India and this topic is used to much more durability with diesel additives barhal. It is used to increase engine performance exhaust emission and smooth operation.

Justification

India does not have reserves for fossil fuels and thus imports all liquid fuels. There is need thus, for research on the existing renewable sources of energy considering the fact that, in 2005, 7.4% of Indias GDP was spent in importation of petroleum products,

- Wood fuel (70%)
- Petroleum (20%)
- Electricity (9%)
- Others (solar, wind etc.)

(1%)Biodiesel is increasingly valued for its environmentally friendly properties which can help meet the challenges resulting from air, water and soil pollution due to the continued use of thefossil fuels. The following key properties of vegetable oils contribute to their attraction as

environmentally friendly alternative fuels:

- Low evaporation, reducing inhalation risk• High flashpoint of (160oC) reducing risk of fire
- High biodegradability
- Low toxicity, both oral and dermal
- Reduced radiation, particularly carbon dioxide, sulphur oxides soot (particulate carbon matter) and poly aromatic hydro compounds (PAH).

Objective

Main objective to develop a process break power,bsec and exhaust emission .

Specific Objectives

1. To produce and characterize barhal with diesel is smoothrunning operation and reducing the choking,knocking.

l.2. To assess the environmental impacts of using blendwith diesel from oil compared to using petroleum diesel.

EXPERIMENTAL SETUP

Experimental setup used is shown in figure 1. Engine specification, exhaust gas analyzer device and other details are discussed in following section. Also, cooling ofhydraulic dynamometer is done with water circulation.

2.1.Engine Specification

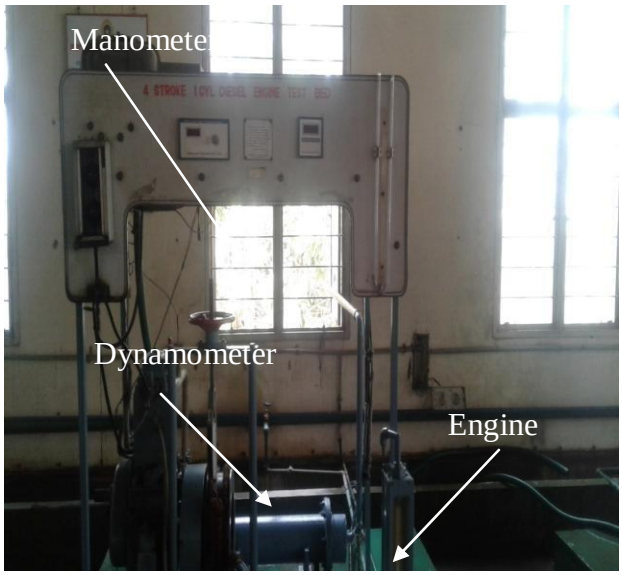

Figure 1 Engine Test Rig

Multi cylinder, four stroke, water cooled, direct injection CI engine is used for sexperimental purpose. Figure 3.1 shows the position of engine in experimental setup. Table 3.1 shows details of engine specification and otherdetails of engine. Cooling water is circulated at constant flow rate.

***Experiment calculation formulae*N= Revolution per minute (RPM) W= Load on dynamometer (KG)**

t = time required for 100ml fuel consumption Mass of test fuel (m_f)= Sample volume x densityCalorific value = CV

Dynamometer Constant = 2950BP = brake Power

BTE= Brake thermal efficiency

BSEC= Brake Specific Fuel Consumption

$$BP = \frac{WN}{2950}$$

$$BTE = \frac{BPt}{m_f CV}$$

$$BSEC = \frac{3.6 m_f CV}{BPt}$$

Experiment calculation for Diesel Fuel

1. W= 10 kg ,t=120.4 sec., CV_{diesel}=41907.6Kj/kg

Mass of test fuel (m_f)=0.100*0.814 = 0.0814kg

$$BP = \frac{WN}{2950}$$

$$BP = \frac{10*1500}{2950}$$

$$BP = 5.0847 \text{ Kw}$$

$$BTE = \frac{BPt}{m_f CV}$$

$$BTE = \frac{5.0847*120.4}{0.0814*41907.6}$$

$$BTE = 17.943\%$$

$$BSEC = \frac{3.6 m_f CV}{BPt}$$

$$BSEC = \frac{3.6*41907.6*0.0814}{5.0847*120.4}$$

BSEC = 20.07 kj/kghr1. **W=20kg,t=98.4sec**

$$BP = \frac{WN}{2950}$$

$$BP = \frac{20*1500}{2950}$$

BP = 10.169 kw

$$BTE = \frac{BPt}{m_f CV}$$

$$BTE = \frac{10.169*98.4}{0.0814*41907.6}$$

BTE =29.34%

$$BSEC = \frac{3.6 m_f CV}{BPt}$$

$$BSEC = \frac{3.6 * 0.0814 * 41907.6}{10.169 * 98.4}$$

BSEC=12.27 kj/kghr3.W=30kg,t=68.02

$$BP = \frac{WN}{2950}$$

$$BP = \frac{30*1500}{2950}$$

BP=15.24KW

$$BTE = \frac{BPt}{m_f CV}$$

$$BTE = \frac{15.24*68.02}{0.0814*41907.6}$$

BTE=30.41%

Experiment calculation for Diesel Fuel withbardhal additives

1. W=10kg

t= time required for 100ml and 20ml fuelconsumption 115.2

m_f = mass of test fuel

= 0.100*0.874= 0.0874 kgBP=5.084kw

$$BTE = \frac{BPt}{m_f CV}$$

$$BTE = \frac{5.084*135}{0.0874*42805.9}$$

BTE=18.35%

$$BSEC = \frac{3.6 m_f CV}{BPT}$$

$$BSEC = \frac{3.6*0.0874*42805.9}{5.084*135}$$

BSEC=19.63kj/kghr

2. **W=20kg, t=112.1sec**

BP=10.169kw

$$BTE = \frac{BPt}{m_f CV}$$

$$BTE = \frac{10.169*112.1}{42805.9*112.1}$$

BTE=30.21%

$$BSEC = \frac{3.6 m_f CV}{BPt}$$

$$BSEC = \frac{3.6 * 0.0874 * 42805.9}{10.169 * 112.1}$$

BSEC=11.82kj/kg

3. **W=30kg, t=92.4sec**

BP=15.24kw

$$BTE = \frac{BPt}{m_f CV}$$

$$BTE = \frac{15.24*92.4}{0.0874*42805.9}$$

BTE = 37.68%

$$BSEC = \frac{3.6 m_f CV}{BPt}$$

$$BSEC = \frac{3.6 * 0.0874 * 42805.9}{15.24 * 92.4}$$

BSEC=9.56kj/kghr

4. **W=40kg,t=68.41sec**

BP=20.38kw

$$BTE = \frac{BPt}{m_f CV}$$

$$BTE = \frac{20.38*68.41}{0.0874*42805.9}$$

BTE=37.27%

$$BSEC = \frac{3.6 m_f CV}{BPt}$$

$$BSEC = \frac{3.6 * 0.0874 * 42805.9}{20.38 * 68.41}$$

BSEC=9.66kj/kghr

5. **W=50,t=60.12sec**

BP=25.43kw

$$BTE = \frac{BPt}{m_f CV}$$

$$BTE = \frac{25.43*60.12}{0.0874*42805.9}$$

BTE=40.87%

$$BSEC = \frac{3.6 m_f CV}{BPt}$$

$$BSEC = \frac{3.6 * 0.0874 * 42805.9}{25.43 * 60.12}$$

BSEC=8.80kj/kghr

RESULT AND DISCUSSION

3.1 Properties and Characteristics of Fuel and blends

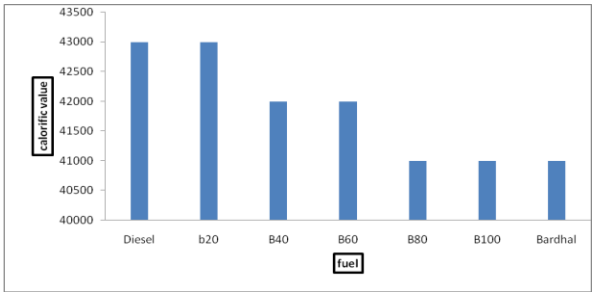

Figure 3.1 Calorific Values of Various Fuels

From figure 3.1, it is seen that C.V. of diesel fuel is 43000 kJ/kg. and that of diesel with bardahl blend is 41208.4 kJ/kg. calorific value of different blend B20 43000 k j/kg is equal to diesel calorific value , B40 and B60 is calorific value are same is 42000KJ/KG, B80,B100 and barhal blend are calorific value same 41000 KJ/KG.

This topic is used the diesel and diesel with blend bardhal I study a many paper related to using the fuel additives they are used different type of blend additives they are good result.

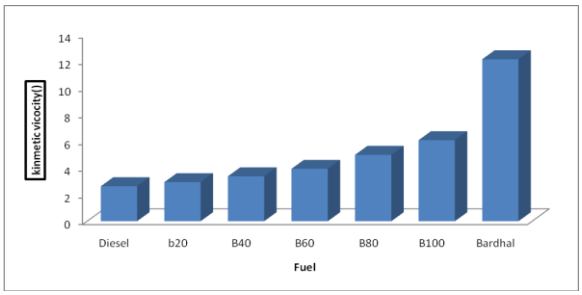

Figure 3.2 Kinematic Viscosities of Various Fuels

Higher or lower kinematic viscosity play very important role when Diesel with bardahl blend is used in engine without any modification in injection pressure as this result in change of fuel atomization and distribution inside cylinder. Kinematic viscosity for pure Diesel with bardahl blend figure 3.2. Diesel with bardahl blend and another blend.

3.2 Brake Specific Energy Consumption

Figure 3.5 shows variation in BSEC with brake power and Bardhal with diesel percentage in blend. Brake specific energy consumption analysis is done instead of brake specific fuel consumption to account the effect of lower calorific value of Bardhal with diesel compared to diesel. Brake specific fuel consumption may be higher even though brake thermal efficiency is higher with Bardhal with diesel blends compared to diesel fuel. This is due to lower calorific value of Bardhal with diesel results in more amount of fuel consumption for same energy input compared to diesel. Bardhal with diesel has 11% lower energy density compared to diesel. At brake power of 5.08 kW, BSEC is approximately 100% higher compared to BSEC at brake power of 25.42 kW for all fuels. Further, with increase in load or brake power BSEC for all fuel reduces. BSEC value comes to approximately 50% of initial value at maximum brake power for all fuels. Lower cylinder temperature and lean fuel air ratio at part load results in incomplete combustion and results in highervalues of BSEC for all fuels. Minimum BSEC for diesel, B20 and B40 fuels are 10.38 MJ/kWh, 10.12 MJ/kWh and

10.33 MJ/kWh respectively. B20 fuel has lowest BSEC followed by B40 and diesel fuels. B20 and B40 fuels show approximately 2.5% and 0.5% reduction in BSEC compared to diesel fuel. Inbuilt oxygen content, higher cetane number, similar kinematic viscosity and lower combustion duration compared to diesel may be majorcontributor for lower BSEC of B20 and B40 fuels. Lowest

BSEC for B100 fuel is 10.97 MJ/kWh. Lowest BSEC for B100 fuel is approximately 6% higher compared to lowest BSEC for diesel fuel. As Bardhal with dieselpercentage in blend increase, kinematic viscosity of fuel increase. With higher kinematic viscosity and without change in injection pressure, droplet diameter increases and spray pattern also changes for blends as fuels compared to diesel fuel. With higher droplet diameter duration for combustion increases which results in shift of peak pressure from TDC. Change in spray pattern with higher droplet diameter may results in fuel impingement on combustion chamber walls and improper mixing of fuel with air. Moreover, Bardhal with dieselis less volatile than diesel fuel. In overall effect of these effects, BSEC for B100 fuel is higher as compared to diesel fuel.

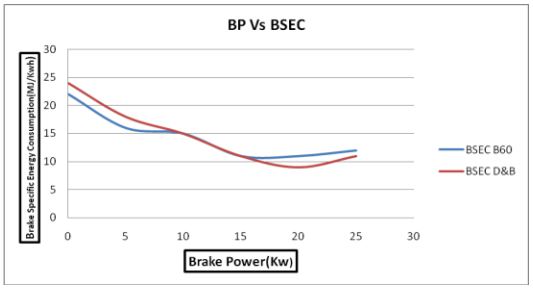

Figure 3.3 Variations in Brake Specific Energy Consumption with Brake Power B20 bardahl blendPercentage in blend

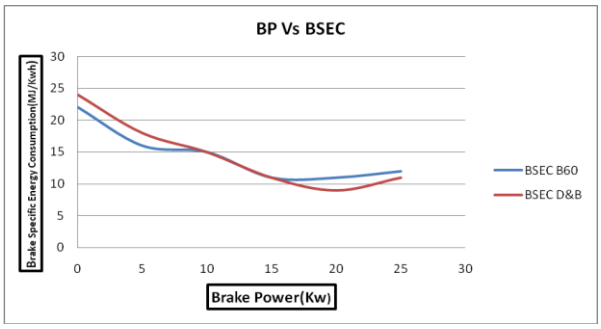

Figure 3.4Variations in Brake Specific Energy Consumption with Brake Power B40 bardahl blend Percentage in blend

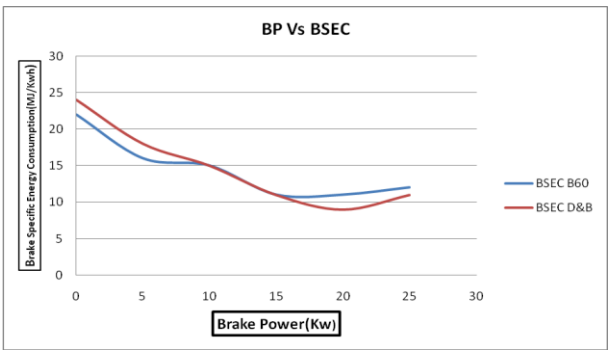

Figure 3.5 Variations in Brake Specific Energy Consumption with Brake Power B60 bardahl blend Percentage in blend

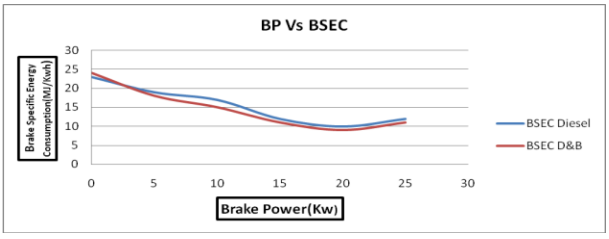

Figure 3.6 Variations in Brake Specific Energy Consumption with Brake Power and Diesel with bardahlblend Percentage in blend

CONCLUSION

The boom of Blen extent fraction reduced the gas density, kinematic viscosity, and floor anxiety. These houses are at once stimulated through the advanced atomization performance. The mixing of gas injectorcleaner induced a lower in droplet length through growing the range of small droplets and lowering the range of massive droplets. The lower in droplet length became because of the lower in floor anxiety because the Bardhal gas fraction increased, which triggered an boom in droplet volatility. The ignition postpone became prolonged and a greater homogeneous combination shaped due to Barhal mixing. These advanced combustion traits concurrently decreased NOx and soot radiation. Addition of 3% (through extent) of Bardhal on diesel produce suitable end result and it's miles relevant in diesel engine. However, the HC and CO radiation have been slowly increased. The distinction in HC and CO radiation among natural diesel and bardhal combined diesel fuels reduced, because the engine load increased. From experimental consequences it's miles decide through utility of bardhal addition, powerful electricity output will increase at the extent of 5-9% and gas intake decreases through about 6%.

In the prevailing serve, a test look into the carried out to probe the performance, combustion and emission traits with devolpment of engine operation the use of diesel, and bardhal blends with diesel gasoline in direct injection multi cylinder variable C.R. multi gasoline diesel engine. The gift attempt has contribut specially withinside the following aspects: A complete survey of to be had literature has been carried out on • C.I. engines fuelled with non suitable for eating oils, bardhal and their designated blends in diesel with twin gasoline mode operation, to increase an information of performance, combustion and emission conduct of the engine. In addition to this an exhaustive literature assessment turned into additionally undertaken on bardhal manufacturing techniques, price estimation of bardhal manufacturing and utilization, homes and environmental effect of bardhal. A appropriate take a look at rig along with stress pickup, rate amplifier and high • pace records acquisition machine turned into advanced collectively with emission measuring equipments like smoke meter and exhaust fueloline analyzer for undertaking exact experimental research of performance, combustion and emission traits of diesel engine fuelled with thumba oil, thumba bardhal and their designated blends with diesel. .A exact experimental analysis of engine operation turned into achieved the use of diesel gasoline and their extraordinary blends in diesel with bardhal engine and big quantity of beneficial experimental records turned into generated.

Suggestions For Future Work and Recommendations

Bardhal and different combination components might not eliminate the world's strength problem, but it is able to be a great gasoline additive and opportunity gasoline for plenty uses. The gift studies paintings reveals the preliminary feasibility of bardhal as a diesel engine gasoline. Moreover, the experimental process followed in gift studies paintings may be prolonged to multi-cylinder diesel engines, tractor engines and different diesel engines utilized in agronomics and transport. However, the long time persistence take a look at is likewise essential to assess the sturdiness of the engine with extended operations. In upload to this, the enhance a manufacturing of bardhal ought to be executed withinside the destiny to sell bardhal houses and first-rate and extra studies in bardhal sources and engine designs are needed. Subsequently, similarly I continue the extra gasoline belongings degree and put on evaluation of bardhal Blend fuelled engine is likewise require. Overall, bardhal blen, in particular for the blends with a small unit of bardhal, is technically feasibility as an change gasoline in C.I. engines with out new adjustments to engine. In spite of vegetable oils like jatropha, karanja etc, that have been encouraged through the Planning Commission as a supply of bardhal manufacturing, a few un-tapped, un-explored vegetable oils like thumba, neem etc. can also be used to provide bardhal to fullfill the strength wishes of the usa as an opportunity or replacement gasoline for diesel engines. All in all, the possibility of big use of bardhal seems shiny at this juncture: however if the full pobrable of this selection is to be tapped adequately, clean techniques and rules want to be advanced and installed location for making sure early results. As the inventory of fossil gasoline is getting depleted, emphasis ought to receive to renewable reassets of gasoline which include sustainable bio-gasoline vegetation and tree-borne oilseeds. As such, prima facie, bardhal appears to have the sufficient pobrableto make a contribution to India's strength security, the want of the hour is to adopt studies and improvement on sustainable plantation management, oil extraction, transesterification and environmental and social effect evaluation of bardhal utilization. The small partial substitute of diesel with bardhal will alleviate the strain on current diesel oil sources and reduce import case of diesel gasoline. Moreover, it's far anticipated that the fee of bardhal may be decrease than the fee of traditional diesel gasoline with inside the close to destiny because of the linear boom with inside the fee of traditional diesel gasoline with the boom in its call for and constrained supply.Bardhal and different combination components might not eliminate the world's strength problem, but it is able to be a great gasoline additive and opportunity gasoline for plenty uses. 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[35] M. PRABHAHAR this paper investigates the performance and emission characteristics of a diesel engine with mustard oil and its diesel blends
[36] V.Gnanamoorth et all The result of engine test showed that the addition of ethanol caused an increase in the performance which includes improved Brake thermal fficiency by 8% for 10% Ethanol addition and only 2%increase on further Etha nol addition.