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EXPERIMENTAL AND INVESTIGATION OF EMISSION ANALYSIS WITH COMPARATIVE EFFECTS OF CNG AND KARANJA BIO DIESEL USING DIFFERENT BLENDS

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Abstract: - Fuels are one of the important research objectives now a day because its own preferences in various sectors like transportation, industrial and agricultural needs. In order to develop the additional requirement some mixed fuels known as biodiesels is an encouragement in research areas as an alternative fuel source, look on this karanja oil mixes with diesel can give good results in Indian context. In the present work experimental investigations are carried out to evaluate the performance of single cylinder, four stroke, direct injection dual fuel, variable compression ratio engine with pure diesel, Karanja biodiesel (B5, B10, B15, B20) and with enrichment of CNG through inlet manifold (like 2lpm, 4lpm, 6lpm) by varying load (25%, 50%, 75%, 100% load) and at rated speed 1500 rpm.

Initially the experiments are conducted with injection opening pressure 200 bar and at compression ratio of 16, And the experimentations are repeated by varying Injection opening pressure (at 200bar, 220bar and 240bar) and compression ratio (at 16 CR, 17 CR and 18CR) combinations. The effects of various performance, combustion and emission parameters are computed.

The Results obtained from experimental investigations are presented for comparative effects of CNG and karanja bio diesel. The blends of karanja in the diesel under standard conditions have shown distinct performances at various loads, B20 has stood best of all the other blends with the brake thermal efficiency and BSFC equal to that of pure diesel.

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I INTRODUCTION

Diesel engines have been used for heavy duty applications for a long time now; it is only recently that it has become very popular in light duty application due to their higher fuel efficiency. Higher fuel efficiency in the diesel engines is achieved due to the high compression ratios along with high oxygen concentration in the combustion chamber. However, these same factors results in high NO_x emission in diesel engine. The main pollutants of diesel engines are Nitrogen Oxides (NO_x), unburnt Hydrocarbons (HC), oxides of Carbon, oxides of Sulphur and other carbon particles or soot. The pollutants that are exhausted from the internal combustion engines affect the atmosphere and cause problems such as global warming, smog, acid rain, respiratory hazards etc. ., among many solutions offered to reduce the emissions, recent developments are with additives. For reducing the emissions .Vegetable oils are also a very hopeful alternate fuel for diesel engines because they are renewable, clean burning and have properties analogous to that of diesel.

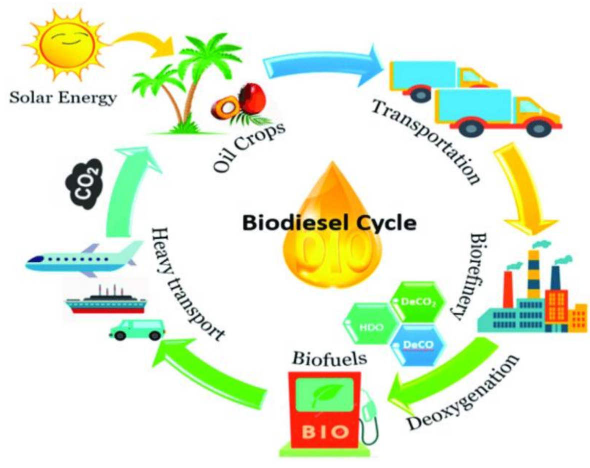

Figure 1 Bio diesel cyclic process

BIO-FUELS

A large portion of the bio fuels are known to be a gas produced chemical change without oxygen withinternal chemical effects. This created from a wide range of regular waste, sewage, cut down plant materials and farming wastages.

BIO-DIESEL

Biodiesel refers to the seeds like vegetable coconut, ground nuts and etc. extracted oil from those nuts, a few oils separated from the leaves too. Economically it become minimal effort assembling of these oils can be considerable compare with crude oils, rough oils and the accessibility of bio-oils are trustable. Numerous tests have been led on IC engines running with bio-powers. Because of the self-start temperature of the oils high, the fuelss are mixed with the regular diesel fuels in determined extents. In the present experimental investigation we have utilized the mixes of a fluid bio-fuel. Karanja oil is utilized in mix with the diesel to discover the presentation and outflows and track down the suitable extent of the mix at different running states of the motor.

NEED OF BIODIESEL

1. Many alternative biodiesel fuels have been shown to have better exhaust emissions than traditional diesel holds promised as fuel alternatives for diesel engine.
2. Depletion of the primary fuels
3. Biodiesel is agriculture oriented.
4. A number of researches have shown that biodiesel has fuel properties and provides engine performance that is very similar to diesel fuel.
5. Biodiesel are nontoxic, biodegradable and renewable fuel.
6. The severe emission regulations in the world have placed design limitation on heavy duty diesel engines. The trend towards cleaner burning fuel is growing worldwide and it is possible through biodiesel.
7. Biodiesel includes a high cetane number, low Sulphur, low volatility and the presence of oxygen atoms in the fuel molecule.
8. Expected efficiency is achieved through biodiesel. Biodiesel performs better than petroleum diesel.
9. Reduces serious air pollutants such as particulates, carbon monoxides, hydrocarbons and air toxic. A mutagen city study shows that biodiesel dramatically reduces potential risks of cancer and birth defects.

II LITERATURE REVIEW

1. Domenico De Serio., The obtained information were dissected for different parameters, for example, break warm proficiency, Break particular fuel utilization, break particular vitality utilization, fumes gas temperature. Outflow parameters viz. HC, CO, CO2 and Unburned hydrocarbon were likewise arranged. The execution objects were insignificantly substandard yet the emanation was essentially diminished as the mix proportion was expanded. The break warm viability of ethanol blend was lower and as the pile was extended the differentiation in capability moreover augments. The HC spreads were decreased with the usage of the ethanol-diesel fuel blends concerning that of wonderful diesel.

2. Jayesh B Galchar, (2017),The impact of EGR and cottonseed B20 biodiesel on motor execution emanation and burning attributes of a solitary barrel diesel motor with control rating of 3 kW and at steady speed of 1500 rpm contemplated. It was seen that start delay was shorter with cottonseed B20 biodiesel as comp to base diesel because of biodiesel was having higher cetane number and oxygenated fuel. CO and HC emanation diminished with cottonseed B20 biodiesel because of zero sweet-smelling, oxygenated fuel results in clean consuming of fuel. In any case, CO and HC emanations marginally expanded with fumes gas distribution.

Mahesh BabuTalupul (2017)A representation framework and a four-chamber diesel motor furnished with a burning and outflow analyzer were used in order to break down the splash and fumes emanation qualities of the ethanol mixing diesel fuel. A development in the infusion timing additionally prompts an expansion in the burning weight due to the adequate premixed length. In a four-chamber diesel motor, an expansion in the ethanol mixing proportion prompts an abatement in NO_x discharges because of the high warmth of vanishing of ethanol fuel, nonetheless, CO and HC emanations increment. Also, the CO and HC emanations display a diminishing pattern as per an expansion in the motor load and a development in the infusion timing.

4.M., Paramesh, M., Raghu, J. (2016), An assessment was driven on the feasibility of totally cooling a lone barrel diesel engine by arrange mixture of water into the start chamber Ideal total engine cooling by facilitate water implantation was master over a broad assortment of water imbuement timings (from 450 to 720 CA degrees after TDC control stroke) at water/fuel extents of 2.9 to 3.7 with yield force and brake specific fuel use upgraded 5 to 20%, exclusively, over that with the standard coat cooled CLR engine. A theoretical addition of around 17.5% in available exhaust imperativeness in view old enough of steam was learned, close by a temperature lessening of two or three hundred degrees Fahrenheit.

5. Varun, S. R. Chauhan, (2016), Tests were finished to investigate different imbuement strategies on a significant diesel engine Specifically, pilot/standard, post/essential and single major mixture techniques were thought of. He explains fuel change profitability relies determinedly upon the implantation timing, explicitly on the rule mixture timing. Regardless, the point by point hardship examination uncovers that fuel change efficiency was by and large directed by the correspondence between veritable consuming and divider warm adversities, independently.

6. Pravin B. Ghungrad, Sandeep (2016) Broke down and showed the effects of biodiesel (rapeseed methyl ester, RME)

and assorted diesel/RME blends on the diesel engine NOx releases, smoke, fuel usage, engine efficiency, barrel weight and net warmth release rate NOx outpourings were diminished to similar characteristics, yet the smoke transmissions were basically lower because of RME. The obstruction of the mixture timing because of unadulterated RME and 50/50 (by volume) blend in with diesel results in advance decline of NOx to a detriment of little augmentations of smoke and fuel use.

7. RupeshPatela, L., Sankhavarab.C.D. (2016), Fuel properties of blends and unadulterated citrus sinensis biodiesel were found and execution ascribes and vapor surges of the engine loaded up with blends were poor down. The wrapped up, citrus sinensis biodiesel can be used as an incredibly reassuring added substance to improve CO outpourings of conventional diesel fuelled engine. The force and force yield of engine was decreased possibly when CSB was added to the diesel. CO radiation regards improved however NOx regards extended with CSB use.

8. Keneni, Jorge Mario Marchetti. (2015) Exhibits a couple of revelations of the usage of honge oil and diesel fuel blend in arrange imbuement diesel engine with extended implantation opening weight (IOP) The execution spreads and copying boundaries of 20% honge oil and 80% diesel fuel (volume premise) were found close to impeccable diesel fuel where as higher blend extents were found inferior diverged from amazing diesel fuel. Upgraded premixed warm release rate were seen with H30 when the IOP is improved. Execution and outpourings with H30 are far better than perfect diesel fuel at improved IOP. With extended mixture weight proportion of honge oil in blend can be extended from 20% to 30%.

9. Ashok Kumar Yadav, MohdEmran (2015) An optically accessible single-barrel quick direct-imbuement (HSDI) diesel engine was used to look at the sprinkle and consuming methodology with slim point divider guided showers. Effects of mixture timings and implantation weight on start characteristics and surges were viewed as An information is grasp the smoke issues related with tight point imbuement strategy under high burden conditions. With thin edge injectors, start could occur for in a general sense hindered post-TDC mixtures, which gives a stand-out mixing approach to manage diesel engines. The guideline justification this examination was to evaluate the glow incidents at different engine loads and rates with and without creative covered diesel engine the results showed a lessening in warm hardships to the coolant and a development in drain imperativeness at all stack levels.

10. Ashok Reddy, K., (2016), A diesel engine was an internal consuming engine that utilizes the glow of strain to begin to bum the fuel, which is injected into the chamber Different techniques of the diesel engine strategies were reenacted by forming a C program for the mathematical model delivered for the various systems. By then the program was continued running with the diesel fuel and diesel fuel mixed with the various measures of di-methyl ether and the results got are differentiated and the engine continued running by unadulterated diesel alone. A work is dealt with the consuming and exhaust execution of a DME premixed charge pressure turn over diesel engine

11.G., Bose, N., Edwin Raj, R. (2013),50 the port premixing DME, the glow release measure was contained the premixed charge homogeneous charge pressure begin consuming and scattering start. DME was suctioned from port, NOx radiations reduced first thing yet this lessening design halted later. Smoke reduced, yet CO and HC extended with a rising of DME sum. Meanwhile, like the customary DICI movement, NOx extended, yet smoke, CO and HC declined with an early immediate implantation. To explore the execution of little cruiser turn over engines fuelled with biogas in the best extent of undertaking conditions. He focuses the changed moved fuel structure with assurance of retrofit pack, framework and progression of blender device. It might be assumed that engine was turned out acceptably for unpurified biogas because extra time was available for start which was not sensible for oil and cleaned biogas.

12. Agustian, E., Praptijanto, A., Sebayang(2013) The significance of this assessment was the all out replacing of diesel fuel with bio-empowers In the current assessment a methyl ester got from paradise oil was considered as a beginning improver. The results exhibit a 49% abatement in smoke, 34.5% reduction in HC spreads and a 37% lessening in CO outpourings for the Me50–Eu50 blend in with a 2.7% extension in NOx release at full burden. There was a 2.4% development in brake warm capability for the Me50–Eu50 blend at full burden. The start characteristics of Me50–Eu50 blend were essentially indistinguishable with those of diesel.

13. Ranjan Kumar Swayne, (2013) The exploratory inspected effects of fuel mixture weight on engine execution Trials have been performed on a diesel engine with four-barrel, two-stroke, arrange implantation. Engine execution regards, for instance, showed weight, exhibited pull, shaft force, brake drive, break mean incredible weight and fuel use have been investigated both of assortment engine paces - settled burden and settled engine speed – assortment stacks by changing the fuel mixture weight from 180 to 220 bars. The results shows that, the settled burden assortment speeds and settled speed-assortment loads have been given that the higher engine speed (rpm) given higher engine power. The extending mixture weight was as per growing force. The fuel usages attempt result for settled burden assortment speeds and settled speed-assortment loads have been given that extending mixture weight given extended of fuel use for the diesel engine.

14. John samuelkoppula, Sreenivasulu (2012) A way of thinking was delivered for the assessment of diesel engine in-barrel systems and consuming. For generation of diesel consuming methodology an organized KIVA-3V code was delivered by combining two particularly endorsed models into the standard code. The procedure of various implantations has been researched for the engine concerned and has been found to decrease un-burned-through HC and CO with immaterial NOx discipline. Present assessment test work has been never really down the surge and execution characteristics of a lone chamber 3.67 kW pressure turn over engine fuelled with mineral diesel and diesel-biodiesel blends at a mixture weight of 200 bar that the CO transmissions were hardly higher, HC releases lessened from 12.8 % for B20 and 2.85 % for B40, NOx outpourings reduced up to 39 % for B20 and 28 % for B40. The efficiency lessened insignificantly for blends in assessment with diesel. The BSEC was insignificantly more for B20 and B40.

15. Kurbet S.N., Dr. Vinay V. Kuppast, (2011) The examination of execution, surge and consuming characteristics of amla biodiesel Amla biodiesel was another non-agreeable feedstock for diesel engine. The exploratory result shows that HRR and barrel weight for biodiesel was seen to be not as much as diesel. To the extent execution, B25 shows the best results when stood out from various blends. As biodiesel content additions in fuel, vapor spread decreases. As demonstrated by natural perspectives, biodiesel used as a fuel in a diesel engine was advantageous. An assessment was led to review the different open model used for showing of CI engines An overall report has moreover been finished with preliminary endorsement to exhibit the comparability with different showing approach. Some ideal logical information boundary has been proposed by the examination of different showing approach as far as possible the NOx outpouring and buildup improvement to make diesel engine more eco-obliging.

16. RamanaMurty Naidu, S.C.V., Raju (2012) In inside start engines, exhaust gas dissemination (EGR) is a nitrogen oxide (NOx) surges decline framework used in petrol/gas and diesel engines. EGR works by reusing somewhat of an engine's exhaust gas back to the engine barrels. This debilitates the O2 in the moving toward air stream and gives gases torpid to consuming to go about as wipes of start warmth to diminish peak in-chamber temperatures. NOx was conveyed in a flimsy band of high barrel temperatures and loads. In a fuel engine, this inactive vapor ousts the proportion of combustible issue in the barrel. In a diesel engine, the exhaust gas replaces a part of the excess oxygen in the pre-start mix. Since NOx shapes essentially when a mix of nitrogen and oxygen was exposed to high temperature.

17. Sahin, F. what's more, Salman, M. S., (2012) An exploratory assessment was done dependent on "A Critical Review of Exhaust Recirculation Gas System for CI Diesel Engine. Preliminary outcomes exhibit that the crisp EGR was a lot convincing than the hot and widely appealing EGR for the diminishing of NOx surge The extension in temperature of EGR gases causes to extend the consuming temperature which prompts increase in course of action of NOx. The Volumetric capability was moderately same in all of the cases and the brake specific fuel use was carry down at 7% of ISObutonal with 22.65% of EGR.

18. DhanalakshmiSridevi V (2012)A test is never really effect of exhaust gas circulation system on engine execution and release EGR structure was arranged and a short time later produced by considering assurance of engine. Single barrel four stroke electronic diesel engine was picked for layout. Speculative examination was done to design EGR system. At productive satisfaction of arrangement work it was typical that made EGR system will work effectively. A test assessment was coordinated to watch the effect of vapor gas re-seminar on the exhaust gas temperatures and exhaust murkiness The test arrangement for the proposed tests was created on a two-chamber, facilitate implantation, air-cooled, pressure turn over engine. A cross section of assessments was coordinated for watching the effect of different measures of EGR on exhaust gas temperatures and fogginess.

III METHODOLOGY

According to the objectives of the present work mentioned in the chapter 2 the experimental setup need to have the following additional provisions apart from the basic functions of an engine test rig.

- Variable compression ratio.
- Variable injection pressure.
- Provision to induce gaseous fuel as the present experiment requires CNG to induce in the combustion chamber.
- Compatibility to work on bio-fuels.
- Exhaust gas Re-circulation

To determine the performance at the various running conditions the following measurement provisions are needed.

- Measurement of fuel consumption.
- Measurement and regulation of the gas flow.
- Measurement of temperature at various points of fuel and gas.
- Measurement of load.
- Measurement of air flow

IV EXPERIMNTAL METHODOLOGY

To reach the objectives of the research work and to obtain the outcomes that explain the behaviour of the engine, the experimental methodology is designed as below.

•The engine is run under normal diesel and the combinations B10, B15 and B20 and the values of the outcomes are noted.

•The above mentioned combinations of fuels are run under variant injection pressures of 200 bar, 220 bar and 240bar.

•All the above given combinations and injection pressures are run at substitution of CNG through induction method. The CNG composition is maintained as 6LPM, 8LPM, and 10LPM at each of the above combinations and the readings are noted.

•All the above mentioned combinations are iterated at different compression ratios 16, 17 and 18 of the engine.

•All above combinations are basically conducted at different load conditions.

The readings at all the above conditions are noted, computed and compared with that of standard running condition and with each other so that the best combination and the best running condition can be obtained.

ENGINE SPECIFICATIONS

Technical specifications	
Model	TV1
Make	Kirloskar Oil Engines
Type	Four stroke, Water cooled, Diesel
No. of cylinder	One
Bore	87.5 mm
Stroke	110 mm
Combustion principle	Compression ignition
Cubic capacity	0.661 liters
Compression ratio	3 port 17.5:1
Peak pressure	77.5 kg/cm2
Direction of rotation	Clockwise (Looking from flywheel end side)
Max. Speed	2000 rpm
Min. idle speed	750 rpm
Min. operating speed	1200 rpm
Fuel timing for std. engine	230 BTDC
Valve timing	Inlet opens BTDC 4.50 Inlet closes ABDC 35.50 Exhaust opens BBDC 35.50 Exhaust closes ATDC 4.50
Valve clearance Inlet	0.18 mm
Valve clearance Exhaust	0.20 mm
Bumping clearance	0.046" – 0.052"
Lubricating system	Forced feed system
Power rating	1. Continuous 7/1500 hp/rpm 2. Intermittent 7.7/1500 hp/rpm
Brake mean effective Pressure at 1500 rpm	6.35 kg/cm2
Lubricating oil pump	Gear type
Lub. oil pump delivery	6.50 lit/min.
Sump capacity	2.70 liter
Lub. Oil consumption	1.5% normally exceed of fuel
Connecting rod length	234 mm
Overall dimensions	617 L x 504 W x 877 H
Weight	130 kgs

V INVESTIGATIONS ON SUITABILITY OF KARANJA BLENDS

In the wake of going through all the exploratory strategy and directing various cycles according to the test procedure as referenced in the part three, critical outcomes are drawn and introduced that are appeared in this section. The introductions of the outcomes are done in a characterized way of steps for the better comprehension of the conduct of the motor at all the test conditions.

The principle base of the analysis is Karanja oil. For this situation the exhibition, burning, and discharge attributes of the Karanja oil at different blends with diesel is introduced at gauge of 200 bar consistent infusion pressure, standard pressure proportion of 17 and with no CNG replacement at various stacking conditions.

VI PERFORMANCE PARAMETERS

The performance characteristics are examined on diesel engine with various injection pressures and also with different blends. The performance parameters as follows like Brake thermal efficiency, Brake specific fuel consumption and volumetric efficiency.

BRAKE THERMAL EFFICIENCY

Brake warm effectiveness is a significant exhibition boundary of an IC motor, it decides or assesses the appropriateness of a specific running condition. The figure 4.1 shows the varieties of brake warm effectiveness for different replacements of Karanja in diesel at different stacking conditions. The BTE at 75% burden for appraised IOP of 200 bar is 23.71% for B20 when contrasted with 22.21, 17.81, 19.91, 24.93% with B15, B10, B5 and unadulterated diesel. BTE increments with the increment in load because of appropriate burning which is helped by expanded in-chamber temperatures, in like manner improved vaporization of fuel coming about in expanded BTE.

The figure 4.1 clarifies unadulterated diesel is acquired 24.93% of Brake warm effectiveness at 75% burden. The B20 mix which has been closer to the unadulterated diesel. Variety between unadulterated diesel and B20 is 1.22%. Similarly the exhibition variety somewhere in the range of B20 and B15 is 1.5%. The B5 and B10 which are the little substitute's karanja have a disintegration of execution contrasted with that of unadulterated diesel. At part load conditions brake warm proficiency is differing with the replacement of Karanja, a little change. At higher burdens it is seen that the B15 and B20 are closer to the presentation of unadulterated diesel when contrasted with B5 and B10

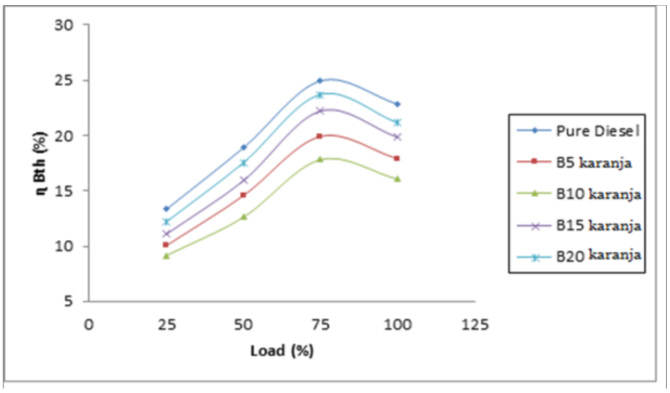

Figure 2Load Vs Brake thermal efficiency.

Brake Specific Fuel Consumption

Brake Specific fuel utilization is another significant boundary that decides the exhibition of any motor. It is the particular amount of fuel used to create a unit of force. The Figure 4.2.shows the BSFC decreases with expansion in load up to 75% and afterward 100% burden little additions in all cases at different Blends of Karanja and Diesel.

The BSFC at 75% burden for evaluated IOP of 200 bar is 0.37 kg/kW-hr for B20 when contrasted with 0.42, 0.56, 0.49, and 0.38 kg/kW-hr with B15, B10,B5, and unadulterated diesel. BSFC diminishes with the expansion in load because of appropriate ignition. The BSFC for 100% are higher than 75% is 0.41, 0.47, 0.63, 0.53, and 0.38 kg/kW-hr for B20, B15, B10, B5, and Pure Diesel. The BSFC is expanded with expanding load at 100% in light of the infusion of less amount of fuel because of its higher thickness and lower warming worth. The oxygenated biodiesels may prompt the less fatty burning coming about in higher BSFC.

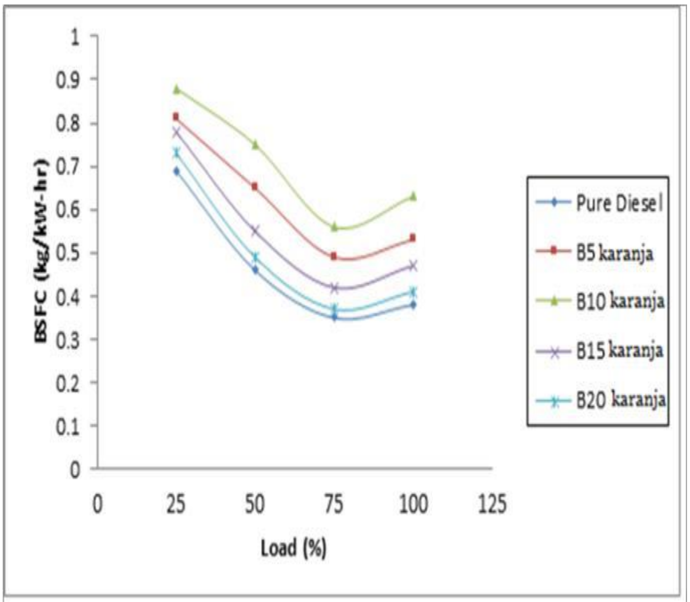

Figure 3Load Vs Brake specific fuel consumption.

VOLUMETRIC EFFICIENCY

The volumetric efficiency is the breathing capacity of the engine, good volumetric efficiency indicates healthy engine. The figure 4.3 shows the volumetric efficiency at various blends, theoretically the liquid fuels have a little effect on the volumetric efficiency. It is observed that in the blend B5 volumetric efficiency at different percentage of loads is almost near to pure diesel.

Due to increase in percentage of blend there is an increase in post combustion residuals, which leaves less space for incoming charge into the combustion chamber.

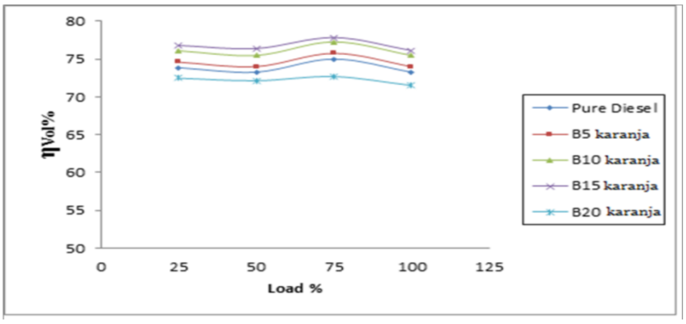

Figure 4Load Vs Volumetric efficiency.

COMBUSTION PARAMETERS

In this combustion parameter investigations, the results are carried out at different injection pressure with various biodiesel blends at different load conditions like 25%, 50%, 75% and 100%. According to combustion characterization the degree of crank angle is analyzed.

CYLINDER PRESSURE VS. CRANK ANGLE (P-Θ DIAGRAMS)

The variety of chamber pressure with wrench plot for PD, B5, 0, B15, and B20 with 25% burden condition is shown figure 4.4. The chamber pressure increments with expansion in mix rate. At brought down heap of 25% for unadulterated diesel, B5, B10, B15, and B20, the most extreme chamber pressure is 45.51, 41.4, 42.31, 43.9, and 45.25 bar acquired. The chamber pressure for B20 at 25% burden condition was 0.54bar not exactly that of PD, which has been near the chamber pressing factor of unadulterated diesel.

The variety of chamber pressure with wrench plot for PD, B5, B10, B15, and B20 with half burden condition is appeared in figure 4.5. The chamber pressure increments with expanding mix rate, however when contrasted with unadulterated diesel chamber pressure diminished. At brought down heap of half for unadulterated diesel, B5, B10, B15, and B20 is 48.53, 44.53, 45.55, 46.84, and 48.11 bar got. The chamber pressure for B20 at half burden condition was 0.42bar not exactly that of PD, which has been near the chamber pressing factor of unadulterated diesel.Figure shows the variation of cylinder pressure with crank angle for PD, B5, B10, B15, and B20 with 75% load condition. The cylinder pressure increases with increasing blend percentage, but when compared to pure diesel cylinder pressure decreased. At lowered load of 75% for pure diesel, B5, B10, B15, and B20 is 51.32, 48.65, 48.7, 49.69, and 50.86 bar obtained. At 75% load condition the cylinder pressure obtained for B20 is near to pure diesel. Figure.shows the variation of cylinder pressure with crank angle for PD, B5, B10, B15, and B20 with 100% load condition. The cylinder pressure increases with increasing blend percentage, but when compared to pure diesel cylinder pressure decreased. At full load of 100% for pure diesel, B5, B10, B15, and B20 is 52.53, 50.57, 50.78, 51.89, and 51.99 bar obtained. The cylinder pressure for B20 at 100% load condition was 0.54bar less than that of PD, which has been very close to the cylinder pressure of pure diesel.Peak pressure values raises with change of loading from 25 to 75% due to the increase of pilot fuel mass and this results in elevated heat release. Peak pressure is dependent on the portion of energy liberated through premixed combustion, which in turn governed by the delay period. At full load condition there is substantial decrease of peak pressures with pure diesel, B20, B15, B10, and B5 for a given injection opening pressure because of the less burning of fuel, late combustion caused due to decreased combustion duration and delay period.

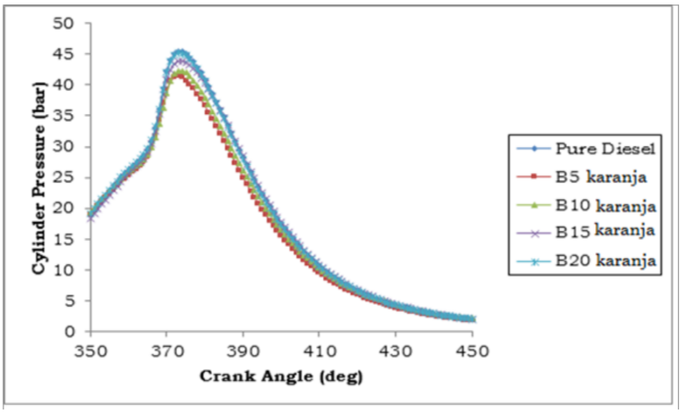

Figure 5 Crank Angle at 25% load Vs Cylinder Pressure

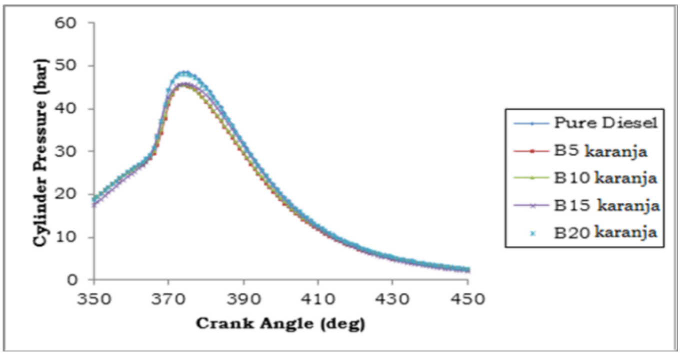

Figure 6Crank Angle at 50% Vs Cylinder Pressure

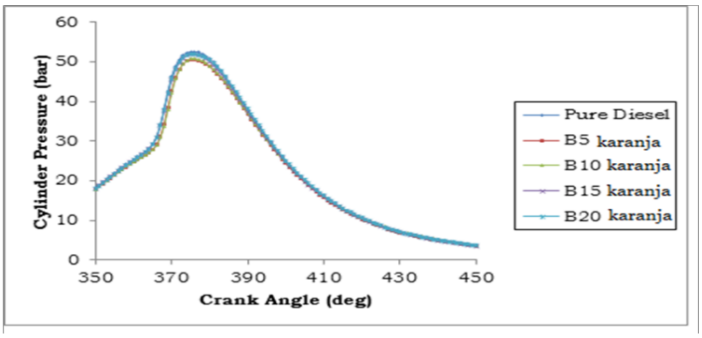

Figure 7Crank Angle at 75% Load Vs Cylinder Pressure.

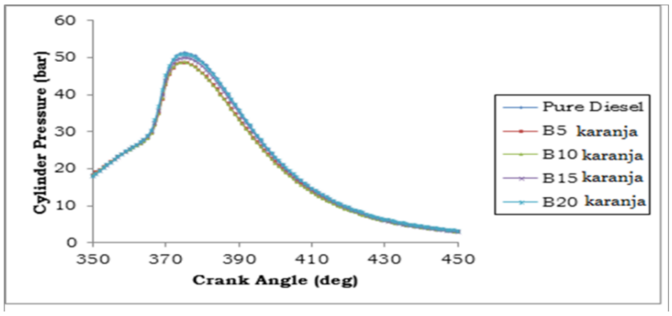

Figure 8Crank Angle at 100% Load Vs Cylinder Pressure.

VII CONCLUSIONS

The huge ends are drawn after the examination of the aftereffects of the four cases. The impact on the different execution parameters, for example, Brake warm proficiency, volumetric productivity and BSFC, outflows, for example, oxides of carbon, oxides of Nitrogen, un-utilized Oxygen and un-consumed hydrocarbons are estimated and analyzed on running states of different Karanja mixes in Diesel, CNG acceptance extents into the motor, fluctuating fuel infusion weights and pressure proportions are to the grounds are given as underneath.

The blends of karanja in the diesel under standard conditions have shown distinct performances at various loads, B20 is best of all the other blends as the brake thermal efficiency and BSFC equal to that of pure diesel. With 8lpm CNG, B20, the engine showed very close performance to the diesel engine, operating at 90% rated load, to avoid knocking rich mixture, the CNG flow rate is limited to 10lpm.

At part load conditions, 50% diesel in the fuel can be replaced by B20 for same performance.

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