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Performance Evaluation of Jatropha Blends in DI Diesel Engine with Nano additives

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Abstract : In the present world it is basic to locate another fuel source because of the expanded industrialization and consumption of normal assets. The strategy for acquiring biodiesel from different sources and mixing them with diesel is embraced in numerous financially created and creating nations around the globe. This paper explores the usage of jatropha mix with diesel in DI-diesel motor. The presentation and ignition attributes of mixes 5%, 10%, 15% and 20% jatropha with perfect diesel. It is discovered that the mixes of biodiesel like jatropha with flawless diesel could substitute in the spot of unadulterated diesel and be utilized as a substitute wellspring of fuel sooner rather than later, hence sparing the common assets for the future age. Execution parameter like brake warm proficiency, explicit fuel utilization, demonstrated productivity, volumetric effectiveness, mechanical proficiency, brakespower is assessed and last end is drawn. As an inexhaustible, manageable and elective fuel for pressure start motors, biodiesel rather than diesel has been progressively fuelled to ponder its impacts on motor exhibitions and ignition qualities in the ongoing 10 years. Be that as it may, these examinations have been seldom evaluated to support comprehension and promotion for biodiesel up until this point. From these reports, the impact of biodiesel on motor power, economy, solidness and burning and the relating impact components are reviewed and dissected in detail.

IndexTerms - BMEP, Direct Injection, EGR, IMEP,Nano fluid

I. INTRODUCTION

The oil fuel exhaustion moving quick step by step and thus the cost of oil fuel climbs have had an extreme effect on the power and transport segments, likewise on the national and universal economy. The importance of biodiesel increments bit by bit because of the consumption of oil saves and improve in ecological concerns[1]. Neem oil is on-palatable oil and it is accessible in gigantic surplus amounts in South Asia. The neem oil generation in India is assessed to be 30,000 tons for each annum. Vegetable oils are naturally cordial and it may give an attainable substitute to diesel since these are inexhaustible in nature. Different non-palatable oils, for example, Neem oil, jatropha, elastic seed, mahua, squander cooking and cotton seed oils, are examined for their reasonableness to diesel motor fills. The primary burden of the biodiesel is its high creation cost because of the mind-boggling expense of vegetable oil, which records for practically 78% of the biodiesel generation.

The esters of vegetable oil are non-lethal, biodegradable and inexhaustible elective diesel fuel is accepting consideration.23.1% with biodiesel, which is 6% lower than that of diesel at full motor burden condition.[3] The higher thickness and lower calorific estimation of esters direct to the lower brake warm proficiency and motor exhibitions. In the advanced society having much advancement in innovation there is additionally some issues identifying with a substitute wellspring of fuel to continue the transportation part for the future generation. Any way our reliance is on diesel and oil for fueling the transportation segment and on the off chance that these proceeds, at that point this could undermine our vitality asset, influence our economy and even influence our condition so seriously that it might even take several years for a seed to grow. Along these lines we are looking for a substitute wellspring of fuel to have a supportable economy. This is conceivable with the utilization of Biodiesel which is an inexhaustible wellspring of vitality. In spite of the fact that it is unimaginable to expect to run a DI diesel Engine on 100% biodiesel like jatropha with no significant alterations in the by and by accessible motor, when mixed with diesel in different extents it would make the world marvel with its Eco-accommodating nature. Biodiesel is only long-chain alkyl esters which is gotten from creature fat and plant seeds. They are viewed as carbon sinkas they retain 78.5% of carbon in the environment as they consume and even considered as cleaner than petroleum derivatives.

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The utilization of waste oil biodiesel has demonstrated an expansion of 4.75% in fuel thickness contrasted with unadulterated diesel and furthermore there was a 13.43% abatement in calorific estimation of fuel and 7.24% for unused oil biodiesel. The biodiesel indicated improvement in thepower, warm proficiency, torque and decrease in the particular fuel utilization. The investigation on the utilization of waste cooking oil from cafés and discovered that through transesterification process unadulterated biodiesel could be created. Their investigation on ignition qualities with various mixesand different pressure proportions demonstrates that with increment in pressure proportion the torque for all mixes increments and in opposite the BSFC diminishes and with expanded mixes the BSFCincrements at all pressure proportions. The start deferral is lower for biodiesel.

Numerous specialists have utilized jatropha oil as a fuel in DI diesel motor and the accompanying ends havebeen made: Jatropha oil, diesel and their mixes showed comparable exhibition and emanation attributes under practically identical working conditions. The brake explicit fuel utilization diminishes with an expansion in burden for every one of the fills. The expansion in level of JTME in the mix builds the brake explicit fuel utilization on account of the lower warming estimation of JTME when contrasted with the diesel. The Brake Thermal Efficiency (BTE) of JTME-diesel mixes diminishes with an expansion in level of JTME in the mixes. The reduction in warm proficiency with an expansion in extent of JTME is because of prior beginning of burning than for diesel, which expands the pressure work. The warm productivity of CI motor relies upon the pressure proportion and the fuel-air proportion. With a fixed pressure proportion, the warm productivity chiefly depends just on the fuel-air proportion. The Brake Thermal Efficiency (BTE) of biodiesel was somewhat lower than that of diesel at100% burden condition. Since the motor works under steady infusion advance, the littler start postponement of JTME prompts commencement of burning much before TDC. This expands the pressure fill in just as warmth misfortune and subsequently lessens the effectiveness of the motor.Lower mixes of Tobacco Seed Oil Methyl Ester (TSOME) conveyed marginally higher torque and power than mineral diesel at full burden because of its somewhat higher thickness and consistency however at halfway motor burdens, somewhat lower power yield, torque and warm productivity was watched. BSFCwas seen to increment with expanding extent of biodiesel in the fuel. Brake warm effectiveness of most elevated among all the test energizes. All mixes showed higher warm effectiveness than that of diesel.

II. EXPERIMENTAL PROCEDURE

The experiments are conducted on a single cylinder, direct injection, variable compression, high speeddiesel engine. Specifications of the engine are given in Table At the rated speed (1500 RPM), the engine develops approximately 3 kW power output. The engine is coupled to an eddy current dynamometer. A mass flow sensor is used to find the mass flow rate of air enter into the cylinder. A non-contact PNP sensor is used to measure the engine RPM. A PNP sensor gives a pulse output for each revolution of the crankshaft. The frequency of the pulses is converted into voltage output and connected to the computer. Torque is measured using a load cell transducer. The transducer is a strain gauge base. The output of the load cell is connected to the load cell transmitter. The output of the load cell transmitter isconnected to the USB port through interface card. Overall sensor setup is connected to DAS setup. DASis directly plugged to computer by means of usb port. Exhaust from the engine is partly send back to the inlet manifold by appropriate piping, regulator, and pressure gauge setup.

ENGINE SPECIFICATION

Engine Type	Air cooled
Bore	80 mm
Stroke Length	110 mm
Cubic Capacity	0.553 lit
Compression Ratio	16.5
Brake Power	3.7 kw, 5HP
Rated Speed	1500 rpm
Specific Fuel Consumption	245 g/kw-h

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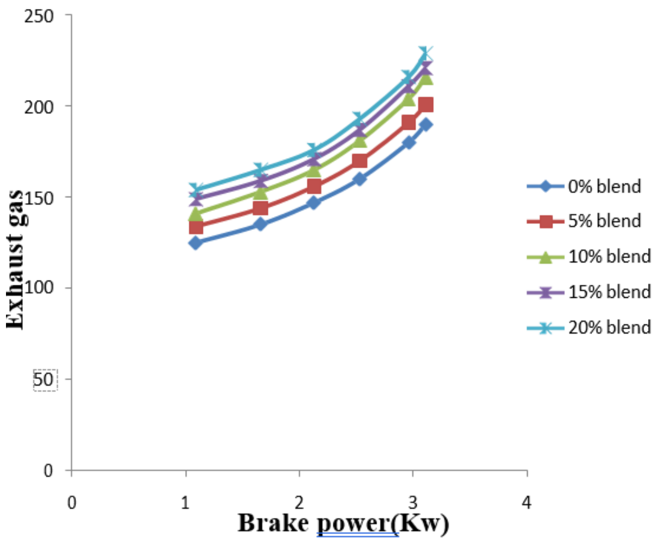
PHOTOGRAPHIC VIEW OF ENGINE SETUP

III. RESULTS AND DISCUSSION

3.1 Brake thermal efficiency

The blend of 5%, 10%, 15% and 20% of biodiesel with neat diesel gives lesser efficiency than the neat diesel. From the figure the blends 5%, 10%, 15% and 20% is 12%, 10%, 6% and 3% higher than that of neat diesel at full load (3.0 kw). Due to reduction in heat loss. This is due to better mixture formation as a result of high volatility, lower viscosity and lower density of blended fuels. The exhaust gas temperatures are shown below



3.2 Volumetric efficiency:

The variation of volumetric efficiency with brake power at various blends of jatropha biodiesel of the engine is compared with neat diesel. There is a decrease in the volumetric efficiency in all jatropha blends.Volumetric efficiency observed for B0, B5, B15 and B20, fuel shown in fig. Volumetric efficiency indicates lesser deposition of carbon particles inside the engine cylinder. Even at higher loadings the value has been on higher side for all the fuels indicating availability of

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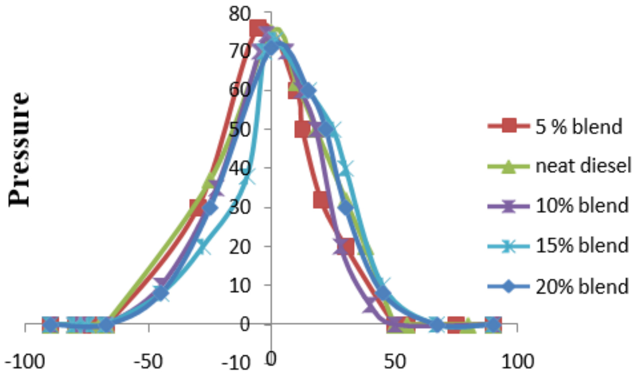
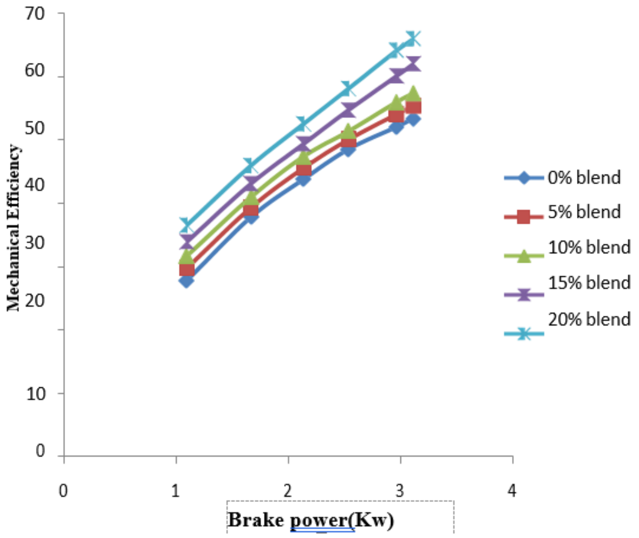
sufficient amount of air required for proper combustion. It is attributed to the lower formation and its subsequent lesser deposition inside the engine cylinder.



3.3 Mechanical efficiency:

The relation between engine load and mechanical efficiency for different blends of jatropha bio- diesel, are shown in fig.The figures show mechanical efficiency of engine operated with jatropha bio- diesels are allmost the same efficiency, but little bit less than the neat diesel. The reason for decrease ofmechanical efficiency is increase of heat input. Heat input is Increased because calorific value is decreased and density is increased.



CONCLUSION:

The present study has dealt with the production of biodiesel from Pongamia oil, measurement ofproperties and performance evaluation on blends of biodiesel at various loads. The following conclusions can be drawn. The fuel properties like density, flash point, viscosity and calorific value of B10, B20 are very similar to diesel and therefore diesel may be well replaced by biodiesel in near future. This makes the fuel to become the “On Farm Fuel” where farmer can grow his own resource, convert to biodiesel and use in agricultural sets itself without the need of any diesel for blending. The low efficiencymay be due to lowvolatility, slightly higher viscosity and higher density of the biodiesel of Pongamia oil, which affects mixture formation of the fuel and thus leads to slow combustion.
The combustion characteristics of single cylinder compression ignition engine fueled with Jatropha biodiesel and its blends have been analysed and compared to the standard diesel fuel. Based on the experimental results, the following conclusions are obtained. The brake thermal efficiency of Jatropha biodiesel blends is higher than that of diesel at all load conditions. At low load condition, the specific fuel consumption of Jatropha B20 was low when compared to diesel unlike all other blends.

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