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"The influence of biodiesel fuel oil blend Java Callophylum innopillum performance and emissionson diesel engine single-cylinder "

Wahidin[1], Nasrul Ilminnafik[2], AgusTriono[3]

[1,2,3]Departement in mechanical engineering, University of Jember 15310

ABSTRACT: Because of the depletion of world oil reserves and the increasing environmental concerns, then the alternative fuel of choice in their use. Preparations of vegetable oils offer an attractive alternative fuel to be used as biodiesel. This work investigates the performance parameters of the engine and emission characteristics of direct injection diesel engines using biodiesel blends java Callophyllum inophyllum oil without engine modifications.That there be a fruit of biodiesel and oilseed (CI) or "Callophylluminophyllum" with low emission levels in diesel engines. The use of biodiesel in diesel motors CI single cylinder 7 HP with a range of rotation from 1000 to 2000 rpm with a load 5 kW without modification to the tool range 0-99.9% opacity meters and vibration meterModel VB-8200 with Velocity measurement: 200 mm / s Acceleration: 200 m / s Experiment is done by the system blending of 0%, 10%, 20%, 30%, 40% and 50% by not adding any equipment, biofuels are united in a tank with a blends as desired , Research and vibration emissions are lower than pure Biodiesel (B0). Lowest yield value of density / opacity below 0.2% and the value of vibration below 30 ms.

Keyword: Biodiesel, Calophylluminophyllum / Callophylluminophyllum oil, diesel engine, vibration, emissions

I. Introduction

One of the causes of global warming such as exhaust emissions from vehicles, especially cars with engine specifications diesel.At principles emission emphasis is on the use of clean fuels.once the use of biodiesel as a fuel for diesel engines is Callophylluminophyllum oil (CI). The performance parameters of the diesel engine, such as specific fuel consumption (BSFC), power brake (BP), brake torque and thermal efficiency of the brake, must be improved to reduce emissions [1] low emissions and engine performance that can be achieved by recirculating exhaust gas [2]. Observe the diesel engine performance and exhaust emissions in a single cylinder engine fueled high free fatty acid blendsCalophylluminophyllum biodiesel. CIB10 reduce CO and emission levels, although slightly higher NOx emissions were observed compared to diesel fuel. Adding some additives with CI biodiesel blends also reduce NOx emissions [3] Many researchers have investigated and compared danjatropha palm biodiesel with diesel fuel, while other studies compared the oil and Calophylluminophyllum (CI) biodiesel blended with diesel fuel [4 However, no research has been done that using C. inophyllum in eastern Java. biodiesel blended with diesel fuel. The purpose of this study, to observe the diesel engine combustion emissions using east java Callophylluminophyllum oil and its comparison.

II. Materials and Methods

a. Biodiesel production

Figure 1. The plant and fruit oils biodiesel

Biodiesel is done by transesterification using ultrasonic cleaner, because faster in getting oil biodiesel Callophyllum inophyllum .

Fig.2. Examples of biodiesel oil

The process of making biodiesel in accordance Callophylluminophyllum can be seen in the cycle presented below.

Fig.3. Biodiesel production process

Flow raw seed formation to be oil biodiesel can be made by transesterifikasi / separation.

b. characteristics of Biodiesel

Biodiesel plays an important role in helping to overcome the oil short life and environmental impact mitigation in the field of fuel worldwide [5]. Energy consumption has increased due to the common use of fossil fuels in power plants, transport vehicles, electric generators, mining equipment, and locomotives [6] .Biodiesel used as an alternative diesel fuel in transportation vehicles and manufactured from edible vegetable oils and [1]. It is biodegradable, oxygen, non-toxic, free sulfurberkelanjutan, and renewable, and can be used in diesel engines either in pure form or blended into diesel, without modifications to the engine [4].

The transesterification process used to produce oil and biodiesel CI [8], Callophylluminophyllum oil mixed with 25% methanol (V / V) and 1% KOH (w / w). In this process, a chemical reaction is obtained within 2 hours to maintain a constant temperature of 60^0C and stirring speed of 1000 rpm. After the completion of the first step, biodiesel poured into the funnel to separate glycerin from biodiesel; whole separation process took 12 hours. Once the reaction is complete, the bottom layer was withdrawn because it contains glycerin and some dirt. Methyl esters is washed with distilled water to remove dirt Value viscosity, flash point, pour point, oxidation stability, acid value, cetane index and calorific value, measured according to ASTM standard method. Saponification and Yodium value amount needed for the calculation of cetane number.

Propertys	Units	ASTM Methode	Diesel	CIB 10	CIB 20	CIB 30
Density at 40^0C	Kg/m^3	D4052	834,7	825.6	830.3	839.4
Dinamic Viscosity at 40^0C	mPa s	D445	0,8064	2.5864	2,8044	
Kinematic Viscosity at 40^0C	mm^2/s	D445	3.4926	3.7318	3.7986	3.8952
Kinematic Viscosity at 100^0C	mm^2/s	D445	1.358	1.4485	1.4786	1.4975
Flash Point	^{0}C	D93	68.5	72.3	73.1	74.6
Cetaqne Number			48	50	51	
Monirul 2016						

Propertys	Units	ASTM Methode	Diesel	CIB 10	CIB 20	CIB 30	CIB 40	CIB 50
Density at 40°C	Kg/m^3	D88	830,2	845,7	852,3	855,1	865,2	867,8
Kinematic Viscosity at 40°C	cst	D88	3,4532	3,6789	3,6326	3,6573	3,7053	3,7512
Flash Point	°C		69	68,5	60,5	53,4	52,3	50,9

Table 1. Characteristics of previous research and the research is done

c. Research methods

Biodiesel Callophylluminophyllum is the oil yield of the plants that process into fuel for diesel engines. BiosolarlinophyllumCallophyllum oil can not evaporate at a certain temperature and unlike other petroleum. Biodiesel inophyllumCallophyllum oil containing sulfur at high enough levels and quality of biodiesel has a cetane number which is quite high as well. Applications inophyllumCallophyllum oil biodiesel technology is in high speed diesel engines, but still experiencing problems because of this inophyllumCallophyllum oil biodiesel will have a higher viscosity and density so that the resulting detonation in diesel engines.

With all of the above then stimulated a system for direct injection diesel engine diujikarakteristik to determine the performance characteristics of Biodiesel oil atuCallophylluminophyllum to standard diesel oil. Before Callophylluminophyllum oil biodiesel used in diesel engines will first test the physical characteristics determine the composition of biodiesel fuel oils such inophyllumCallophyllum. In penggujian is make use of the two fuels, namely: Biodiesel oil Callophylluminophyllum and Diesel oil / fossil, All such fuel will be mixed in accordance with the percentage of each that B10%, B20%, B30%, B40% and B50% and diesel by pure 10-40 bar. The pressure of the test will be used as a reference forusing inophyllumCallophyllum oil biodiesel in diesel engines.

d. Test equipment

Experimental tests carried out by using a diesel engine the engine silinder.Kecepatan varies from 1000 rpm to 2000 rpm under full load. Vibration testing is done with a vibration tester V 2800 with a max range of 200 ms Figure 4 shows the schematic diagram of the test.

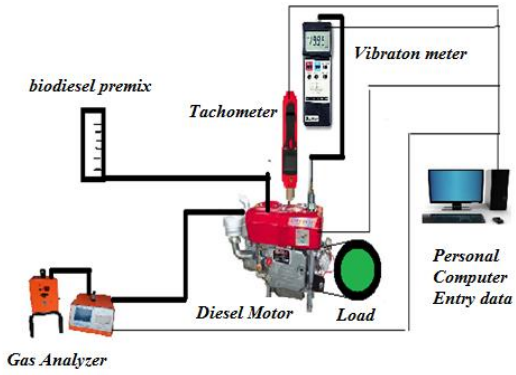

Figure 4. Schematic of testing

III. Results and Discussion

3.1. Vibration

Research conducted at the Solar Pure (B0) as shown in Table 1, a comparison with the results of research made at the B10 and B20. Round one cylinder stationary diesel used according to the SOP is 1000 rpm.

On B10 (10% bio diesel 90% diesel) vibration measurement results obtained at 1750 rpm

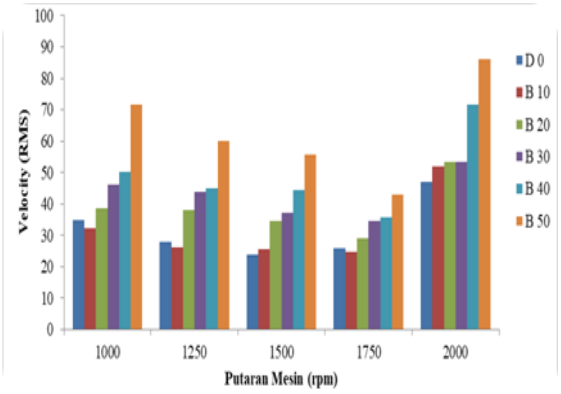

Figure 5. Graph Velocity biodiesel blending at various rounds of machine

Results of vibration measurement
The resulting vibrations that occur with the lowest value there at 1750 rpm variations diangka 24.8.

3.2. Emission measurements

Diesel exhaust emissions analyzer with readings read and Opacity coefficient which is read is the value of the concentration of light penetrate. Great numbers show the value of the high intensity which means the higher the resulting thickness of the light it hard to penetrate and vice versa.

The resulting value coefficient with the value of a concentration of less than 20% with opacity value below 40% occurred in B10 (10% Bio Diesel 90% Solar) vibrations that occur with the lowest score is on variations of 1750 rpm diangka 25 with a value of density and opacity value below 20% and close to zero.

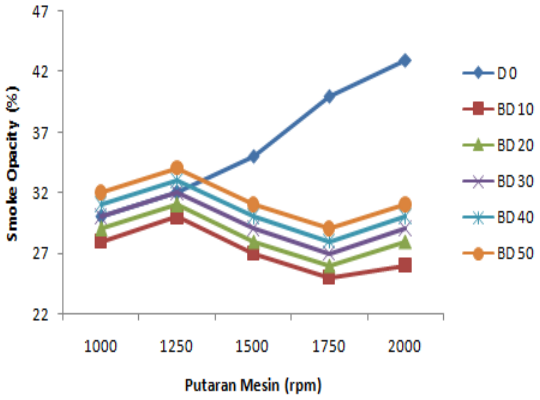

Figure 6. Opacity of exhaust with biodiesel blending at various rounds of machine

3.3. Exhaust gas emissions

3.3.1. Carbon Monokside (CO)

CO is one of the compounds formed during the intermediate stages of fuel and was formed mainly due to incomplete combustion of fuel. If the result is complete combustion, CO is converted to CO2. If combustion is incomplete due to lack of air or gas temperature is low, CO is formed. In the case of biodiesel, CO emissions lower than diesel, because some of the contents of supplemental oxygen, which converts CO into CO2dan result in complete combustion of the fuel [9]. In another study, it has been reported that the higher cetanemunbers of biodiesel mixture; Results at a lower likelihood of the formation of a rich fuel and thus reduce CO emissions [10]

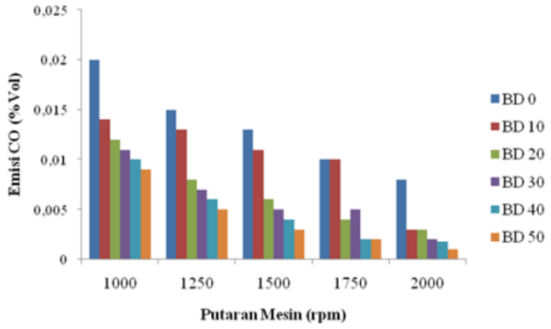

Figure 7. CO Emissionson some mixture of biodiesel and diesel.

CO emissions at 2000 rpm, is presented in Fig. 6. The lowest value obtained in the BD 50 in this condition trhotle state of 80% with a value of 1%.

3.3.2. Hydrocarbons(HC)

When the oxygen content of the fuel mixture increases, it requires less oxygen for combustion. However, the oxygen content of fuel is the main reason for more complete combustion and a reduction in HC emissions. Furthermore, a higher cetane number of biodiesel fuel mixture reduces the combustion delay, and such reduction has also been associated with a decrease in HC emissions [12-13]; has been reported that oxygen compounds provided dicampuran improve fuel oxidation and thus reduces HC emissions [14]

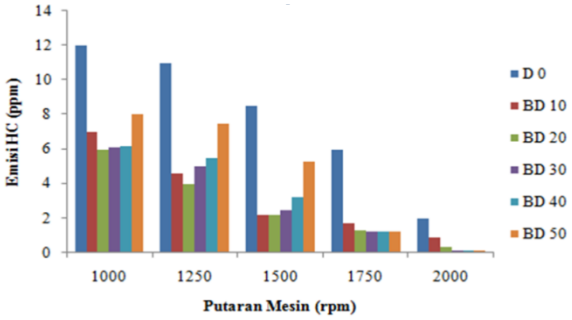

Figure 8. HC Emissions on some mixture of biodiesel and diesel.

HC emissions for diesel fuel and biodiesel fuel mixture at 2000 rpm at 80% throttle position is shown in Gambar.7. Compared with diesel fuel, HC reduction at 2000 rpm and 100% throttle position obtains the figure 13.7% to BD 50 and 20% for BD 10.

3.3.3.Nitrogenokside (NOx)

Nitrogen oxides .Emisions to mix found to be higher than diesel fuel. The formation of NOx emissions greatly depend on the equivalence ratio, oxygen concentration and temperature burned gas.MenurutBeatriceetal. [15] and Songetal. [16] increased oxygen levels increases the maximum temperature during combustion, and thus increases the formation of NOx.

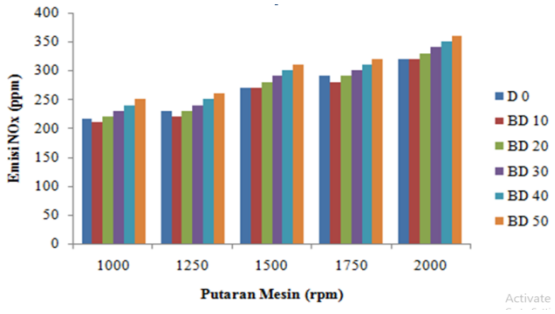

Figure 9. Increased NOx emissions at some of the mixture of biodiesel and diesel

3.4. Specific fuel consumption

Good engine performance in terms of fuel economy is reflected by bsfc parameter. To a mixture of biodiesel fuel, the heating value is found sedikitl high ore to fuel diesel. This is due to the lower heating value and a higher density of the mixture. It jugadiketahui that biodiesel contains oxygen, which results in a lower heating value [17].

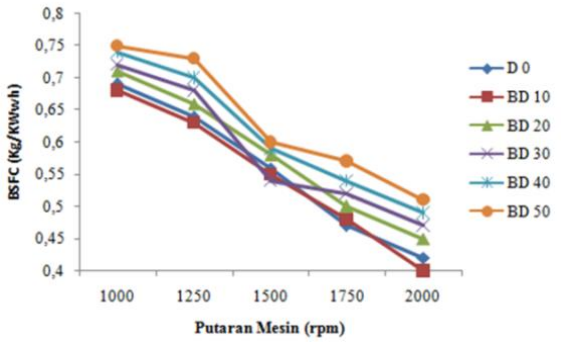

Figure 10. Consumption of fuel on some mixture of biodiesel and diesel.

Figure 10. Presenting the specific fuel consumption (bsfc) for clean diesel fuel and biodiesel mixtures as a function of engine speed. So for the energy output samadari machine, requiring fuel flow greater mass, which increases bsfc to compensate for the reduced chemical energy in the fuel [18,19]. The average increase in bsfc compared with diesel fuel was found at 0.50% in the BD 50 and 0.4% in the BD 10 with trotle position 100%.

IV.Conclusions

This experimentalis a research engine performance and emissions that use diesel fuel as a base and a biodiesel mixture of BD 10, BD 20, BD 30, BD 40 and BD 50. The experimental results of this research work can be summarized as follows.
The values bsfc for higher biodiesel mixtures in comparison with diesel fuel for heating the values of the lower and higher density. In terms of engine exhaust gas emissions, while Decreased HC and CO, CO2 and NOx emissions Increased to SW 10 and SW 20 when Compared with diesel fuel in the engine operating conditions.

Resultsshowedthatwiththeincreaseofbiodieselintheblends, theHCemissionsdecrease duetothehigheroxygencontentof biodieselthatprovidedmorecompletecombustionincombus- tionregion.

The COemissionsdecreasedwithbiodieselusage.ReducedCO emissionsweremaintained, probably, thanks to the oxygen inherentlypresentinbiodiesel.

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