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A REVIEW ON COMPARISON OF ENGINE NOISE WITH BLENDING RATIO OF BIO-DIESEL AND ORDINARY DIESEL

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***Abstract*— To find out the effect of bio-diesel on the four stroke single cylinder diesel engine combustion noise, we will take a different blended ratio of bio-diesel B5, B10, B15, B20 and compare all these blended ratio of bio-diesel with traditional diesel at different load conditions and also noted the noise of different fuel with the help of noise-meter. After performing whole experiment, we will find which fuel has the lowest noise ratio and best for use. In this paper, we have given review on the comparison of blending ratio of bio-diesel and ordinary diesel.**

Keywords— **Bio-diesel, cylinder, fossil fuel, diesel.**

I. INTRODUCTION

The modern economy of a nation is particularly subjected to non-renewable fossil fuels such as petroleum, natural gas, coal with applications in heavy trucks, electric generators, mining equipments, locomotives and power plants. This steadily increasing consumption of energy is not supportable because of the unequal geographical distribution of fossil fuels and also issues related to economy, geopolitical and environment. In particular, fossil fuels such as natural gas, petroleum and coal are non-renewable and also petroleum's price is rising day by day. Furthermore, the utilization of fossil fuels acquires a high level of emissions of greenhouse gas which is producing pollution in the environment. Besides, the noise produced by traffic of rail and road unfavorably influences health of human. Around 20% of the number of inhabitants of the European Union experiences inadmissible levels of noise. Hence the research must be done so as to reduce the level of noise of diesel engines. [1]

The country's economic growth s expanding day by day, alongside this, need for transportation is moreover expanding. This is mostly because of urbanization and population. But the resources of fuel are diminishing gradually. To deal with this interest for existing fuel, it is essential to take into account alternative fuel, which can be utilized as a substitute of existing fuel. The research on "Biodiesel" is esteemed to be basic in the present world. The "biodiesel" term regularly alludes to ethyl esters and fatty acid methyl produced using vegetable oils. Biodiesel has been considered as a perfect option fuel for diesel fuel. Biodiesel is a fuel which is environment friendly and has potential to give performance results of engine. [2]

The rest of the paper is organized as follows. The introduction about biodiesel is discussed in section II, experimental set-up is presented in section III, experimental procedure is discussed in section IV, survey about biodiesel and noise reduction is given in section V and concluding remarks are given in section VI.

II. BIO-DIESEL

Bio-diesel is also called green fuel which is obtained from vegetable oils and organic fat oil. The oil which is used for making bio diesel is obtained from Rape seed, (mainly used in Europe country) Soya bean (Argentina and USA) Palm (Asian and Central American country). Bio-diesel is non toxic, sulphur free, biodegradable, eco- friendly renewable fuel which is widely used in Europe country and particulate emission from the engine which will help in meeting rigorous automotive rule. It is derived from renewable organic material and certain reduced harmful emission when it burnet as compared to conventional diesel. Due to this property it's received attention as green source of energy and hence we can say development of bio-diesel industry would strengthen domestic industrialization in specially, rural economic of developing countries India and would generate significant rural employment. It can be direct used in diesel engine by adding it to the conventional fuel this process is called as a blending process. Moreover it is more convenient to add and store in single cylinder diesel engine. India is the largest agricultural country and uses many single cylinder engines for agricultural purposes. Due to make up of single cylinder these engine create lots of noise. These engines noise is the big challenge for single cylinder engine making companies. To overcome from this problem we are using blended bio-diesel for the engine and find out the effect of bio diesel on single cylinder diesel engine noise.

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III. Experimental Set Up

The experiment is conducted on a single cylinder four stroke engine, water cooled, stationery diesel engine computerized test rig with rated power 7 KW/10.4 HP used in agricultural equipment used for commercial purpose. The engine and dynamometer interface to control panel and which is connected to the computer. The computer test rig is used for recording parameter how much fuel flow, engine rpm, load acting on the engine etc. and also a sound measuring device is connected to the one side of the engine. Whole the procedure should be performed inside the soundproof room to avoid from unwanted atmospheric noise.

Experimental specification:

Table -1 Experimental Specification

Engine Type	Four stroke, single cylinder, water cooled diesel engine
Rated power	7KW/10.4HP@1500 rpm
Cylinder bore	102 mm
Cylinder stroke	115 mm
Compression stroke	17:5:1

Characteristics of Fuels:

Table -1 Characteristics of Fuel

Fuel properties	**Density at 15°C (kgm^{-3})**	**Kinematic viscosity at 40°C (mm^2S^{-1})**	**Flash point (°C)**	**Calorific value ($MJ.Kg^{-1}$)**
B5	823.45	2.960	60	47.25
B10	828.88	3.213	61	48.177
B15	834.23	3.466	60	48.12
B20	839.62	3.772	62	45.177
Traditional Diesel	820.23	2.627	58	49.445

In this experiment, we are using five types of fuel B5, B10, B15, B20 traditional diesel. In B5 fuel we blend five percentage of bio-diesel with traditional diesel. In B10 fuel we blended 10 percentage of bio-diesel with traditional diesel. In B15 fuel we blended a 15 percentage of bio-diesel and 85 percentage diesel. In B20 we blended 20 percentage bio diesel blended with diesel. Traditional diesel is obtained from fossils.

IV. Experimental Procedure

In this experimental setup, we are using B5, B10, B15, B20, Traditional diesel in the engine.

- First of all we are using B5 fuel in engine then applied different load condition at different rpm on the engine and note all the parameters.
- In second step we are using B10 fuel for the engine then applied different load conditions at different rpm on the engine and note all the parameters
- In third step we are using B15 Fuel for the engine then applied different load conditions at different rpm on the engine and note all the parameters.
- In fourth step we are using B20 fuel for the engine then applied different load conditions at different rpm on the engine and note all the parameters
- In fifth step we are using traditional diesel for engine then applied different load conditions at different rpm on the engine and note all the parameters

After this we apply design of experiment on the all parameters which are obtained from experimental procedure and find out which fuel ratio will provide an optimal result.

V. Related Work

Jianguang He et al, [6] investigated the characteristic of combustion noise in a non-road diesel engine, tests with different bio-diesel ratio fuel were conducted. According to the cylinder pressures of 100 consecutive combustion cycles, combustion noise was analysed. The results showed that, with the increase of blended bio-diesel ratio, both the maximum cylinder pressure and the maximum rate of pressure rise all have increasing trends. The level of cylinder pressure at frequency of 1000 Hz increases with blended bio-diesel ratio. In the test with B50 fuel, the biggest value of combustion noise appears and its value is about 0.5 dB (A) bigger than that of diesel at full load. The blending of bio-diesel has a dual effect on combustion noise which contributes to the increase of combustion noise and the reduction of it.

M. Gazon et.al [7] studied the results about the effects of engine coolant temperature and injection timings on the combustion process and on the combustion noise at idle condition. A modern direct injection Diesel engine equipped with a common-rail injection system and piezoelectric injectors was used.They found that the combustion noise is very sensitive to both the coolant temperature and the dwell

time between the pilot and the main injection, but its evolution did not follow a simple way. When the coolant temperature reached 40◦C, there was a jump of combustion noise. In this case, the combustion of the pilot injection occurs at TDC, creating a high-pressure derivative and consequently a high combustion noise. The same phenomenon was observed with the change of dwell time between the pilot and the main injections. The combustion noise reaches its maximum level when the combustion of the pilot injection occurs at TDC.

Evangelos G. et al,[8] instrumented test bed installation was developed by them in order to study the transient performance and combustion noise emissions of a truck, turbocharged diesel engine. A fast response combustion noise-meter was employed for measuring combustion noise radiation during a variety of acceleration and load increase tests experienced during daily driving conditions.

Ping, W., et.al, [9] The sources of the combustion noise of DI (direct injection) diesel engine were investigated in their study. The maximum combustion pressure, maximum pressure rise rate, high frequency pressure oscillation in combustion process and their effects on diesel engine combustion noise were discussed. Fuel pilot injection technology was applied, the effects of fuel pilot injection timing, fuel pilot injection quantity, were analysed. Main factors affecting the combustion noise were analysed specially. The results showed that pilot injection strategy should consider the pilot injection quantity and the interval time between the pilot injection and main injection under different conditions to optimize the target.

Shibata, G., et.al, [10] In this study, an engine noise analysis was conducted by engine tests and simulations. The engine employed in the experiments was a supercharged single cylinder DI diesel engine with a high pressure common rail fuel injection system. The engine noise was sampled by two microphones and the sampled engine noise was averaged and analyzed by an FFT sound analyzer. The engine was equipped with a pressure transducer and the combustion noise was calculated from the power spectrum of the FFT analysis of the in-cylinder pressure wave data from the cross power spectrum of the sound pressure of the engine noise. The parameters investigated in the engine tests were the maximum rate of pressure rise, intake pressure by the supercharger, intake oxygen content by EGR, and the fuel injection timing, in all experiments the engine speed was maintained at 1600 rpm. The engine noise and combustion noise were sampled under 69 different test conditions and the data were compared with the results of the simulation. The engine test results show that the maximum rate of pressure rise is most strongly related to combustion noise, and that the combustion duration and the maximum value of the heat release rate (ROHRmax) are the second and third most important parameters in the generated noise. To discuss the results of the simulation, the heat release histories were approximated by Wiebe function, and the simulated combustion noise was calculated from the fitted curves of the heat release and coherent transfer function. To investigate the accuracy of the simulated combustion noise, the simulation data were compared with the engine test data. Further, the simulation makes it possible to determine, for example, changes in the CA50 with the same combustion phases, something that cannot be achieved by actual engine tests. The results of the simulations showed that the combustion noise has a maximum condition for CA50 and is closely related to the degree of constant volume conditions and the thermal efficiency. The simulation also suggests the possibility of reductions in combustion noise with extensions in the combustion duration by EGR. Further, the engine tests showed that a combustion noise of 6.3 dBA at 0.33 MPa IMEP can be achieved.

Jung, I., et.al, [11] The source of the combustion noise of diesel engines was investigated in their study. In the development of exhaust emission and combustion noise, we must optimize the injection parameters at the cell where engine noise cannot be measured. To solve this problem, it is necessary to identify a method for developing combustion noise through in-cylinder pressure measurements. It is known that the combustion noise of a diesel engine is generated mainly in the phase of premixed combustion and depends on the rate at which the pressure increases. The combustion noise was analyzed by measuring the in-cylinder pressure and engine noise. Their results showed that the combustion noise has a low correlation with the maximum rate of pressure increase. For this reason, a new index called the combustion noise index was developed based on the cylinder pressure level.

Mohammed Faizan Shaikh et.al [14] Bio-diesel is an alternative fuel which can be utilized as a part of diesel in engines of diesel either in unadulterated form or by mixing it with diesel fuel. The most critical benefit of the biodiesel is that, it is source of energy which is renewable. Moreover, it likewise tends to lessen the level of pollution which in turns diminishes the effect of global warming. The physical conduct of engine of compression ignition plays vital role in automobile. The paper includes, correlation of behaviour of vibro-acoustic for engine of diesel utilizing bio-diesel, traditional diesel and its mixes at diverse conditions of load. The four stroke engine of single cylinder is utilized for the experimentation. The results of examination demonstrate that with increment in biodiesel blends percentage, vibration and noise diminishes similarly for a large portion of the conditions.

Daming Huang et.al [15] Because of the expanding consciousness of the exhaustion of resources of fossil fuel and issues related to environment, biodiesel got to be more appealing in the current years. The production of biodiesel is an important and promising research field since the relevance it picks from the rising price of petroleum and its advantages related to environment. This paper surveys the history and late advancements of Biodiesel, incorporating the diverse sorts of

biodiesel, the characteristics, and economics and processing of industry of Biodiesel. The use of biodiesel in industry of automobile, the difficulties of development of industry of biodiesel and the policy of biodiesel are also discussed in it.

Dornelles, H et.al, [16] The renewable fuels have gotten more consideration in the most recent couple of decades since the demand of fuel is expanding constantly. In this situation, fuels from vegetable oils are rising as an interesting alternative. In this study, biodiesel produced from cooking oil used was contemplated. A few centralizations of biofuel were tested for evaluating their characteristics of combustion and performance i.e. 7% (B07), 17% (B17), 52% (B52), and 100% by volume of Biodiesel (B100) on traditional diesel. The tests were directed in a single cylinder four-stroke compression ignition engine. The concentration of biodiesel in the blends had impact on the performance of engine by expanding consumption of fuel because of its lessened value of heating. What's more, bigger divisions of biodiesel on traditional diesel introduced higher pinnacle of release of heat.

VI.CONCLUSION

In this paper, we will use blended ratio of bio-diesel in single cylinder diesel engine to minimize the noise of the engine we will conduct a experiment on different blended fuel ratio and compare with the traditional diesel and find out the which fuel will produce less noise and which fuel will more noise when engine is fully loaded.

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