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Performance evaluation of neem oil blends biodiesel for diesel engine

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ABSTRACT
The demand for a sustainable and environmentally friendly alternative energy source has increased in recent years. Experiments were carried out for identifying that neem oil is suitable biodiesel in VCR diesel engine. Results shows that indicated power, break power, mechanical efficiency and torque of neem oil blends (NBF5, NBF10, NBF15 and NBF20) is similar to diesel. Exhaust carbon and nitrogen percentage of neem oil blends is lower than diesel.
Keywords: Biodiesel, Mechanical efficiency and Diesel engine

I. INTRODUCTION

In recent years, the number of vehicles has rapidly increased, and as a result, the fossil fuel, which is a limited resource in nature, is consumed by these vehicles and rapidly depletes. To overcome this situation, biofuel, play a crucial role to make balance and reduce the quantity consumption of fossil fuel. There are different types of biofuels that exist in nature which must be investigated via the research community in terms of engine performance, pollution, and availability. Therefore, blends of biofuels and diesel are used in diesel engines. The diesel engine can be efficaciously run, deliver high overall performance, controlled pollutant emissions, and decrease consumption of diesel fuel by adding biofuel with diesel, and they're blend as fuel in a CI engine. Many researchers [1-5] identify that biodiesel is very much suitable for diesel engine applications.

II. EXPERIMENTAL SET-UP AND APPARATUS

The experiments are conducted on VCR diesel engine. These types of engines are extensively utilized for research purposes. The diesel engine technical details are mentioned in theTable 1 of smoke opacity. The instruments utilized as a part of this testing are tuned periodically considering the unsteadiness of all parameters. The research engine test arrangement is shown in Fig. 1 Investigations on single cylinder four stroke diesel engines based on neem oil as biodiesel were performed to analysis the engine performance parameters. In experiment's an engine was run on diesel and neem oil blends (NBF5, NBF10, NBF15 and NBF20) at different load. NBF5 (5% neem oil and 95% diesel), NBF10(10% neem oil and 90% diesel), (NBF15 15% neem oil and 85% diesel) and NBF20 (20% neem oil and 80% diesel)

Table 1 Specifications of the diesel engine arrangement

Power/speed	3.50 kW /1500 rpm
Cylinder bore	87.50 mm
Stroke length	110.00 mm
Connecting Rod length	234.00 mm
Number of Cylinders	1
Swept volume	661.45 cc
Compression Ratio	12:1to 22:1
Orifice Diameter	20.00 mm
Orifice Coeff. Of Discharge	0.60
Dynamometer Arm Length	185 mm
Fuel Pipe diameter	12.40 mm

Fig. 1. Photographic view of experimental engine setup.

EXPERIMENTAL RESULT OUTCOMES

Figure 2 shows than variation of indicated power with differents load and different blends (NBF5, NBF10, NBF15 and NBF20).The results shows that indicated power of differents blends was similar to diesel.

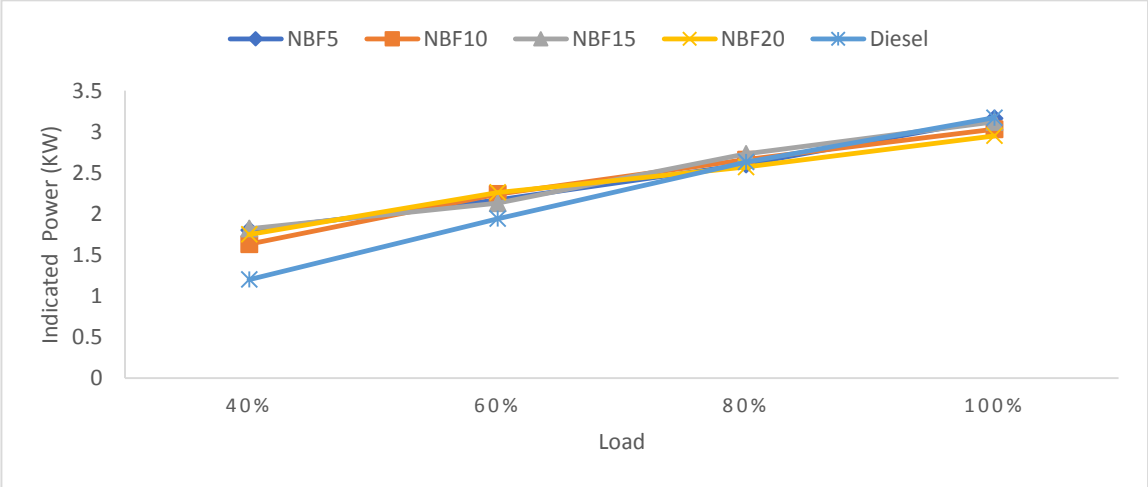

Figure 2 Variation of indicated power with different load

Figure 3 shows than variation of break power with differents load and different blends (NBF5, NBF10, NBF15 and NBF20).The results shows that break power of differents blends was similar to diesel.

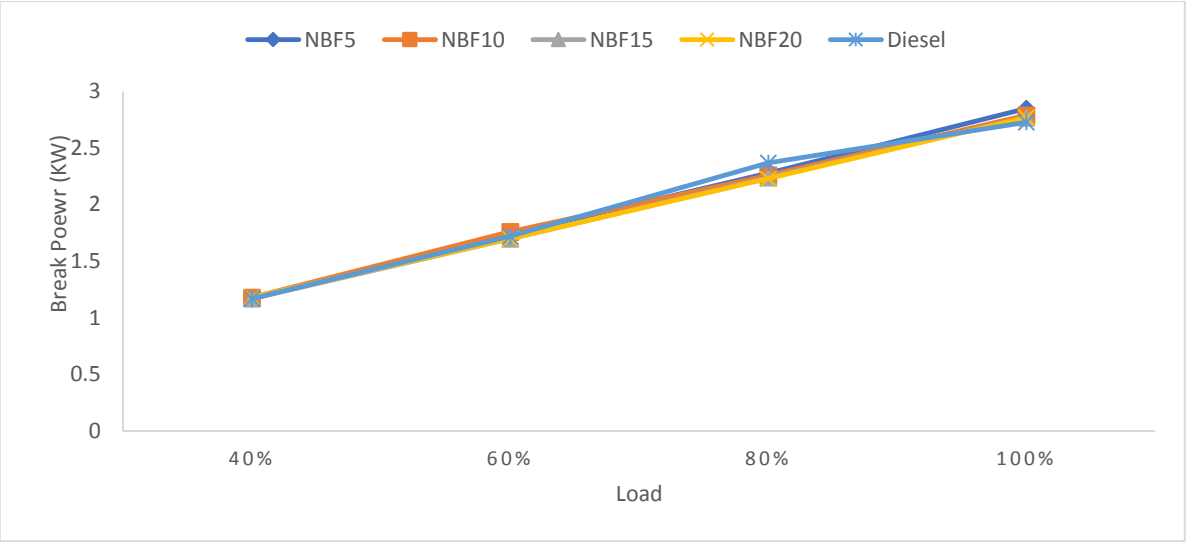

Figure 3 Variation of break power power with different load

Figure 4 shows than variation of mechanical efficeiency with differents load and different blends (NBF5, NBF10, NBF15 and NBF20).The results shows that mechnical efficencey of differents blends was similar to diesel.

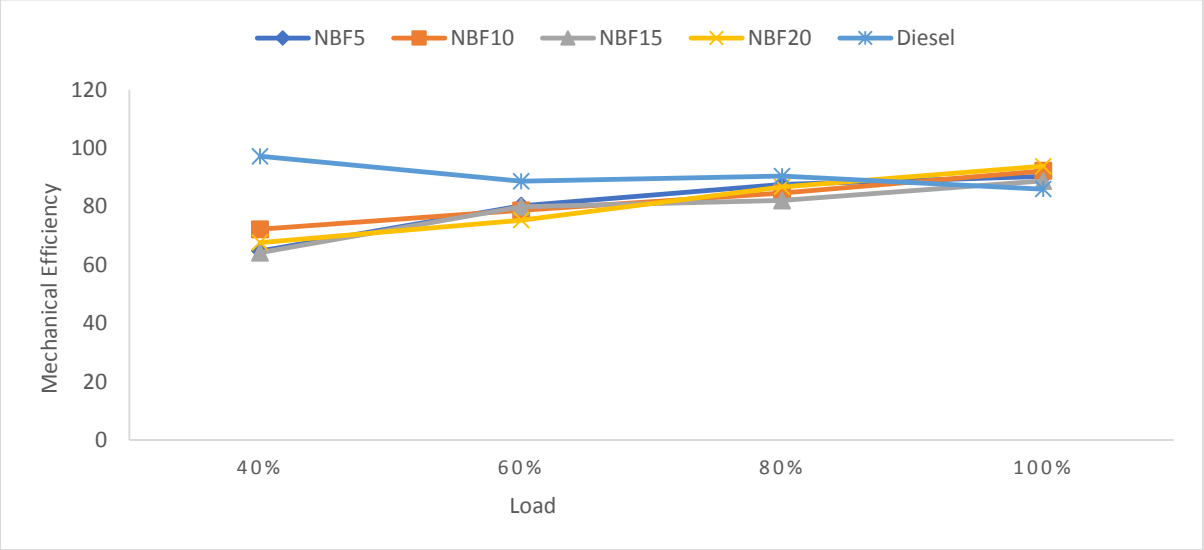

Figure 4 Variation of mechnical efficiency with different load

Figure 5 shows than variation of generated torque with differents load and different blends (NBF5, NBF10, NBF15 and NBF20).The results shows that generated of differents blends was similar to diesel.

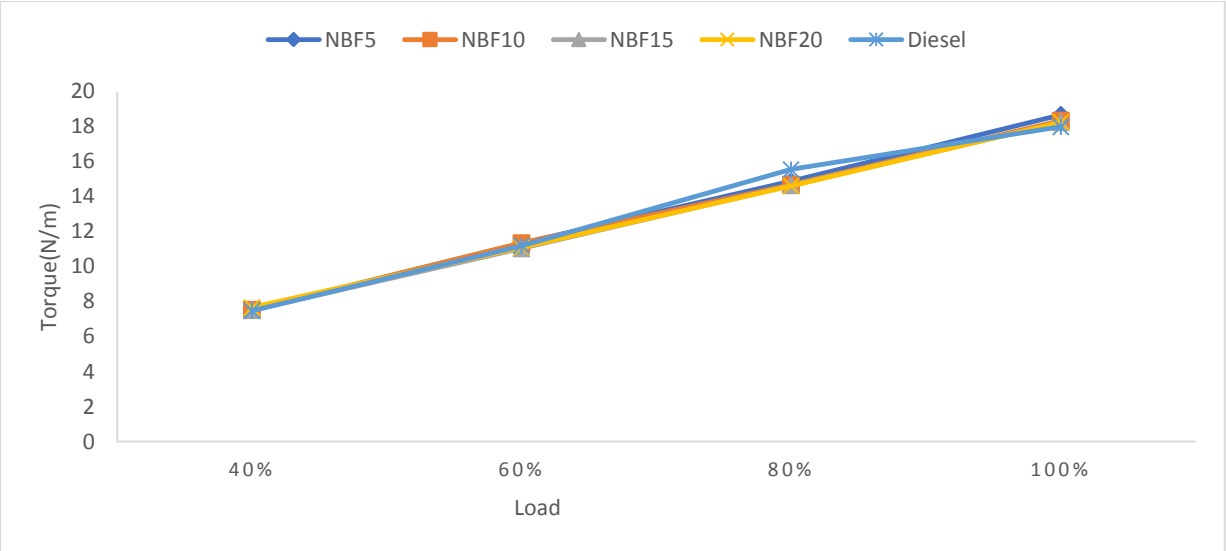

Figure 5 Variation of generated torque with different load

Figure 6 shows than variation of exhaust carbon percentage with differents load and different blends (NBF5, NBF10, NBF15 and NBF20).The results shows that exhaust caron percantage of differents blends was less than diesel.

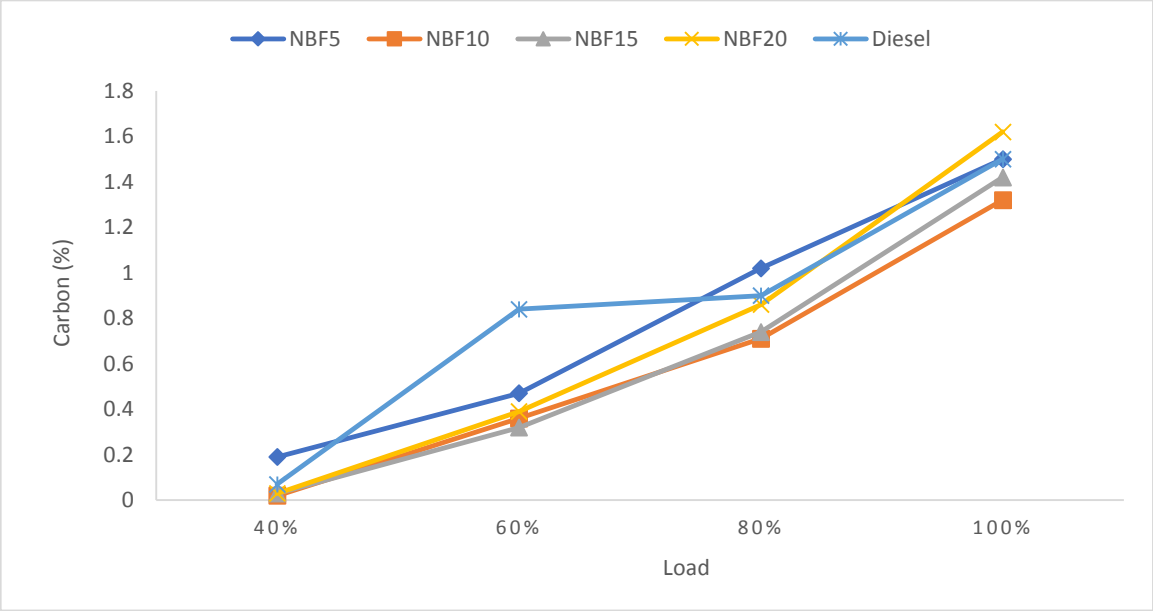

Figure 6 Variation of exhaust carbon with different load

Figure 7 shows than variation of exhaust nitrogen percentage with differents load and different blends (NBF5, NBF10, NBF15 and NBF20).The results shows that exhaust nitrogen percantage of differents blends was less than diesel.

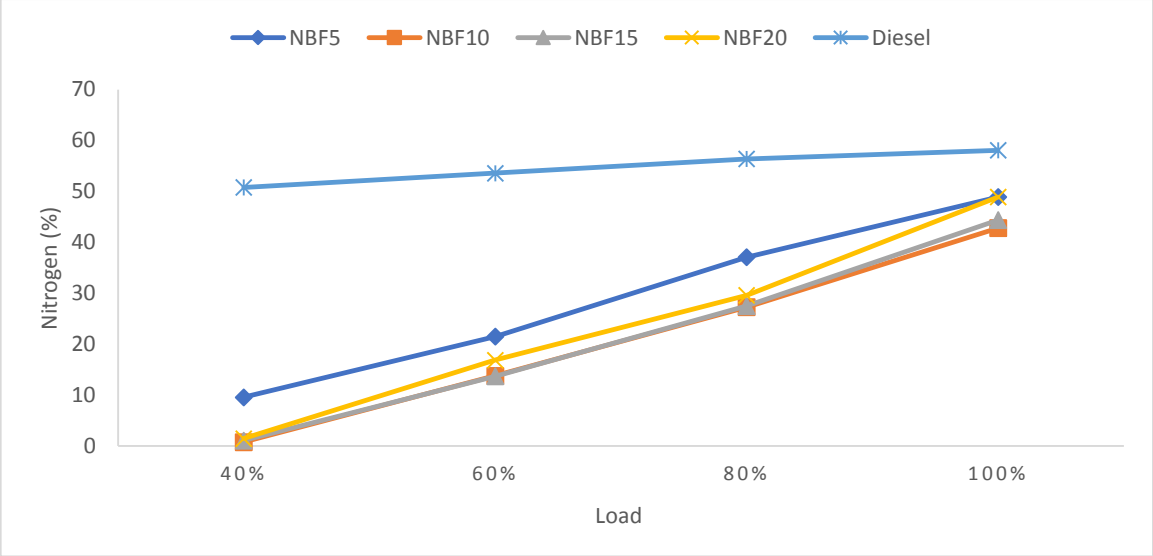

Figure 7 Variation of exhaust nitrogen with different load

III. CONCLUSION

The performance parameters of VCR diesel engines are investigated. Experiment conducted on diesel engine at different loads and different different blends (NBF5, NBF10, NBF15 and NBF20). Based on results following conclusion can be drawn

- Neem oil used as biodiesel is a safe alternative fuel to replace traditional petroleum diesel.
- The variation of indicated power indicates that the indicated power of neem oil blends (NBF5, NBF10, NBF15 and NBF20) is almost similar to diesel at different load.
- There is some deviation in mechanical efficiency for neem oil blends (NBF5, NBF10, NBF15 and NBF20) than diesel.
- From the results it is observed that neem oil blends (NBF5, NBF10, NBF15 and NBF20) and diesel generate similar torque.
- From the results it is observed that all neem oil blends (NBF5, NBF10, NBF15 and NBF20) have lower exhaust carbon than diesel fuel.
- From the results it is observed that all neem oil blends (NBF5, NBF10, NBF15 and NBF20) have lower exhaust nitrogen than diesel fuel.

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