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Performance Test on Canola Oil Using Bio-Diesel Blends

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***Abstract*— *Now days the world is presently confronted with fossil fuels depletion and environment degradation. Search for alternative fuel which promises a harmonious environmental preservation has become highly pronounced in the present scenario. Vegetable oil's physical and chemical properties are close enough to the mineral and may also used as alternative to the diesel. But long term use of vegetable oil may also have some problem, so we have to modify the bio-diesel. Transesterification process is formed effective for vegetable oil formulation as fuel. Canola oil is modified into bio-diesel using chemical process of transesterifcation (alkaline catalyzed).detailed engine test are been carried out in performance characteristics of canola oil bio-diesel.*

***Keywords*— *Alternative fuel, canola oil, diesel engine performance characteristics, Transesterification.*

I. Introduction

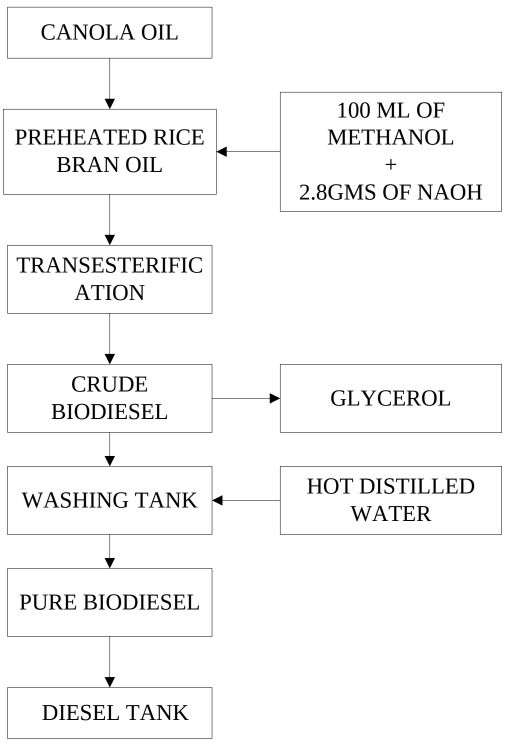
Fossil oil resources are being widely exploited, due to the rapid development of the global economy and the ever-growing number of vehicles. Excessive exploitation and utilization of fossil oil can damage the environment. Therefore, although people in modern society live in comfortable environments, they must endure the inconveniences caused by air pollution, including global warming, the greenhouse effect, acid rain, fog, haze, and volatile organic compounds. ious advantageous characteristics It has been reported that biodiesel can be used in diesel engines without (or with only minor) engine modifications . Diesel engines are widely used in trucks and commercial vehicles because they have the advantages of large power output and fewer exhaust emissions. Although diesel engines produce lower hydrocarbon (HC) and carbon monoxide (CO) emissions than gasoline engines, their higher nitrogen oxides (NOx) and particulate matter (PM) emissions are a problem . However, the bio fuel produced from animals and plants can reduce PM emissions due to its inherent characteristics. Biodiesel is a green renewable fuel that produces only carbon dioxide (CO2), and can be absorbed by plants as they grow, making bio fuels carbon neutral. Thus, using bio fuels can significantly reduce global warming and the greenhouse effect However, pure bio fuel cannot be widely used in diesel engines, due to its high viscosity and density. Diesel engines experience many problems when pure bio fuels are used, including injector nozzle clogging and plastic tube and pad corrosion.

II. Experimental Procedure

2.1 Preparation of Biodiesel Blends

One litre of canola oil was taken in a conical flask. The oil in the flask was then heated on a heating plate up to a temperature of 130°C. 2.8 gms of sodium hydroxide (NAOH) as base catalyst and 200 ml of methanol was then mixed with the oil. The preheated oil mixture was then heated at a constant temperature of 60º C for 1 hours and stirred at 400 RPM. After 2 hours of constant stirring the mixture was poured into a separating funnel for glycerol to settle down.

After 1days settled down glycerol was separated and removed. Remaining is methyl ester (biodiesel) of canola oil (Yield 90%) which was further purified by washing with hot distilled water for removal of excess NAOH, methanol and water.



2.2 Properties of Biodiesel Comparison with Diesel

Properties	**Unit specification**	**Specification of biodiesel (bis India)**	**Canaol oil B100**	**Diesel**
Density	Kg/m^3	860-900	832	830
Viscosity	Mm^2	3.5-5	1.983	2.20
Flash point	°C	>100	110°C	68
Fire point	°C	-	135°C	59
Calorific value	Mj/kg	-	39.45	44.49

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III. EXPERIMENTAL SET UP

3.1 Engine Performance Evaluation

Evaluation of the engine performance is described as

- Specifications of the engine
- Engine performance evaluation procedure
- Performance Parameters evaluation

3.1.1 Experimental testing engine

Fig. 3.1. Photograph of testing engine.

Performance tests for the stable Diesel-biodiesel are carried out on a computerized single cylinder four stroke direct injection variable compression ratio engine. The No modification or alteration has been made in the engine. The experimental setup consists of a variable compression ratio engine is coupled to an eddy current dynamometer. A computerized data acquisition system is used to collect, store and analyze the data during the engine testing.

TABLE 3.1. Specifications of the engine.

Engine type	**Single cylinder four stroke constant speed water cooled diesel engine.**
Rated power	3.50kw @ 1500rpm
Bore	87.50mm
Stroke	110mm
Compression ratio	18:1
Swept volume	661.45 cc
Model of injection	Direct injection
Dynamometer	Eddy current dynamometer
Cooling system type	Water cooled

IV. RESULTS AND DISCUSSION

RATIO (B10)

Torque (Nm)	**BP (kW)**	**FP (kW)**	**IP (kW)**	**BMEP (bar)**	**IMEP (bar)**	**BTHE (%)**	**ITHE (%)**	**Mech Eff. (%)**
0.25	0.04	10.75	10.79	0.05	12.58	1.01	265.39	0.38
3.82	0.62	1.05	1.67	0.73	1.95	13.39	35.99	37.19
7.18	1.17	0.00	-14.81	1.36	-17.26	20.13	-254.87	0.00
10.99	1.78	3.46	5.24	2.09	6.16	0.00	0.00	33.92

Air Flow (kg/h)	**Fuel Flow (kg/h)**	**SFC (kg/kWh)**	**Vol Eff. (%)**	**A/F Ratio**
27.47	0.30	15.77	76.62	91.93
27.26	0.35	0.61	76.07	78.18
26.99	0.50	0.43	75.52	54.19
26.66	0.60	0.34	75.38	44.60

BLEND RATIO (B15)

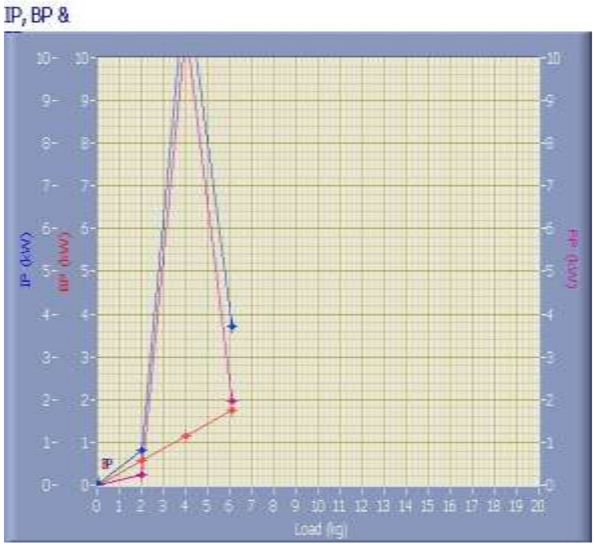
Torque (Nm)	**BP (kW)**	**FP (kW)**	**IP (kW)**	**BMEP (bar)**	**IMEP (bar)**	**BTHE (%)**	**ITHE (%)**	**Mech Eff. (%)**
0.12	0.02	0.21	0.23	0.02	0.27	0.54	6.65	8.18
3.56	0.57	0.78	1.35	0.68	1.60	14.10	33.28	42.38
7.21	1.16	1.15	2.31	1.37	2.73	19.94	39.69	50.25
10.92	1.74	3.11	4.85	2.07	5.79	24.89	69.52	35.80

Air Flow (kg/h)	**Fuel Flow (kg/h)**	**SFC (kg/kWh)**	**Vol Eff. (%)**	**A/F Ratio**
27.81	0.35	8.45	76.71	79.76
27.65	0.40	0.64	76.24	69.41
27.39	0.50	0.43	75.58	55.01
26.97	0.00	0.00	74.94	0.00

BLEND RATIO (B20)

Torque (Nm)	**BP (kW)**	**FP (kW)**	**IP (kW)**	**BMEP (bar)**	**IMEP (bar)**	**BTHE (%)**	**ITHE (%)**	**Mech Eff. (%)**
0.07	0.01	0.01	0.02	0.01	0.02	0.32	0.56	58.02
3.62	0.57	0.23	0.80	0.69	0.96	14.10	19.76	71.37
7.25	1.15	10.71	11.86	1.38	14.25	21.94	226.75	9.67
11.08	1.74	1.98	3.72	2.11	4.49	25.02	53.37	46.89

Air fuel (kg/h)	**Fuel Flow (kg/h)**	**SFC (kg/kW)**	**Vol Eff. (%)**	**A/F Ratio**
27.12	0.30	26.51	76.60	90.77
26.93	0.35	0.61	76.36	77.25
26.84	0.45	0.39	76.29	59.87
26.64	0.60	0.34	76.09	44.58



BLEND RATIO (B20)

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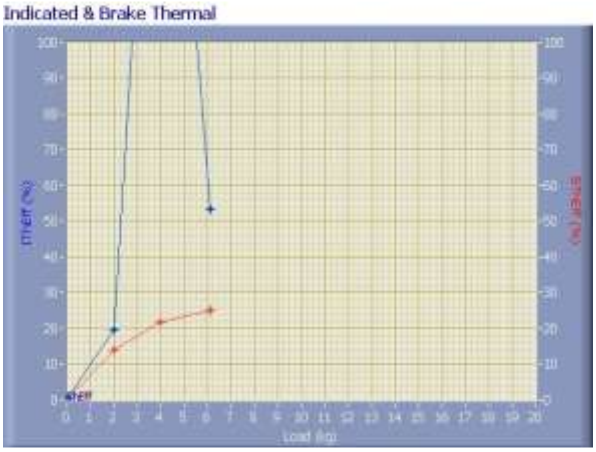

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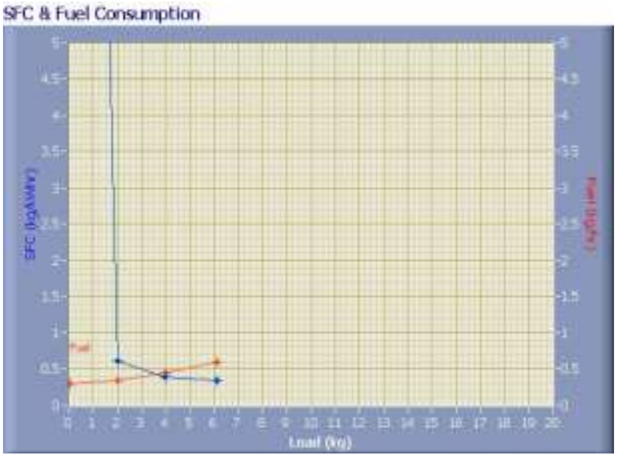

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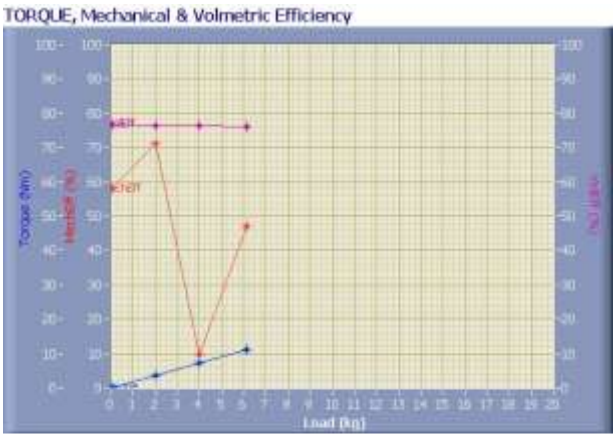

BLEND RATIO (B20)

V. Conclusion

This project is a detailed summary and the review of the application of canola oil biodiesel to engine based on fuel performance (density, viscosity, calorific value) engine performance and combustion characteristics our finding are summarized below.

- COB can be used as a good alternative fuel and can be used in diesel engines without engine modifications.
- Based on engine combustion performance B20 is a qualified alternative fuel compared with other COB blends.

This project reviewed the findings of various blended ratios of COB fuels in a variety of complex experimental conditions. The optimum mixing ratio of biodiesel and optimum engine parameters were obtained. This project will serve as a valuable reference for the development and application of COB to diesel engines and the design of engines.

References

[1] Murari Mohon Roy, Majed Alawi, and Wilson Wang, "Effects of Canola biodiesel on a DI diesel engine performance and emissions", *International Journal of Mechatronics Engineering IJMME-IJENS*, vol. 13, no. 02, pp. 46-53, 2013.

[2] D. Subramaniam, A. Murugesan, and A. Avinash, "Comparative estimation of C.I. engine fuelled with methyl esters of punnai, neem and waste cooking oil", *International Journal of Energy and Environment*, vol. 4, issue 5, pp. 859-870, 2013.

[3] Sandeep Kumar Duran, Maninder Singh, and Hardeep Singh, "Karanja and rapseed biodiesel: An experimental investigation of performance and combustion measurement for diesel engine", *International Journal of Science & Engineering Research*, vol. 6, issue 1, pp. 295–299, 2015.

[4] P. Sreenivas, Venkata Ramesh Mamilla, and K. Chandra Sekhar, "Development of biodiesel from castor oil", *International Journal of Energy Science*, pp. 192-197, 2011.

[5] U. Santhan Kumar and K. Ravi Kumar, "Performance, combustion and emission characteristics of Corn oil blended with diesel", *International Journal of Engineering Trends and Technology (IJETT)*, vol. 4, issue 9, pp. 3904-3908, 2013.

[6] G. Dwivedi, S. Jain, and M. P. Sharma, "Diesel engine performance and emission analysis using biodiesel from various oil sources—Review," *J. Mater. Environ. Sci*., vol. 4, pp. 434–447, 2013.

[7] J. Xue, T. E. Grift, and A. C. Hansen, "Effect of biodiesel on engine performances and emissions," *Renewable and Sustainable Energy Reviews*, vol. 15, issue 2, pp. 1098–1116, 2011.

[8] V. Manieniyan and S. Sivaprakasam, "Experimental analysis of exhaust gas recirculation on Di diesel engine operating with biodiesel," *International Journal of Engineering and Technology*, vol. no. 3, issue no. 2, 2013.

[9] A. B. M. S. Hossain and M. A. Mekhled, "Biodiesel fuel production from waste canola cooking oil as sustainable energy and environmental recycling process", *Australian Journal of Crop Science*, vol. no. 4, issue no.7, pp. 543-549, 2010.

[10] Rachel Burton and Greg Austic, "Preparation and characterization of biodiesel produced from recycled Canola oil", *Energy Science Journal*, vol. no. 2, pp. 113-118, 2009.

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