

A Review on Experimental Study on Performance of Four Stroke Diesel Engine using Waste Plastic Bio-Diesel Blends

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Abstract— In this study, production, performance and emission characteristics of methyl esters of Oleander, Kusum and Bitter Groundnut oil in a transportation diesel engine were studied. Oleander oil methyl esters (OOME), Kusum oil methyl esters (KOME) and bitter Groundnut Oil Methyl Esters (BGOME) were prepared by transesterification process. The effects of three methyl esters on engine performance and exhaust emissions were examined at different engine speed and full load condition. An interesting alternative to fossil fuel for Diesel engines is the use of Diesel-like oil from plastic wastes: such a solution yields the double advantage of recovering the valuable energy content of wastes, as well as of mitigating the disposal problem of the very large amount of plastic wastes produced by both domestic and industrial activities.

Key words: Traffic Pattern, Congestion Control, Reliability, Data Loss, Efficiency, Accuracy, Information Technology

I. INTRODUCTION

A. What is Mixing, Blending?

- “Mixing is the process of thoroughly combining different materials to produce a homogenous product.”
- The mixture is generally a combination of dissimilar materials, e.g. coal ash and cement are blended in a specified ratio to produce Pozzocrete cement.
- In other cases, a chemically homogenous material may be mixed to produce a uniform lot of a desired weight/volume with consistent particle size distribution, color, texture, and other required attributes.
- Blending may refer to the process of mixing. Blending (alcohol production), a technique to produce alcoholic beverages by mixing different brews.
- Mixing and Blending are the most demanding unit operations in the chemical process industries. Industries such as pharmaceutical and foods also rely heavily on mixing and blending technology
- Diesel engines are the most widespread power generation units, thanks to their high fuel conversion efficiency, reliability and robustness.
- Typically, they run on fossil fuels, but the interest in the use of alternative energy sources has been strongly increasing in the last years, in order to address the concerns about the future petroleum availability and the associated volatility of fossil fuels price.
- An interesting proposition is the production of Diesel-like oil from wastes: such a solution yields the double advantage of recovering the valuable energy content of wastes, as well as of mitigating the disposal problem.
- The typical wastes yielding high heating values, so that can be conveniently converted into engine fuel are: waste

cooking oil (WCO), waste lubricating oil (WLO), and waste plastics (WP).

B. What is Bio-Fuel?

- A biofuel is a fuel that is produced through contemporary biological processes, such as agriculture and anaerobic digestion, rather than a fuel produced by geological processes such as those involved in the formation of fossil fuels, such as coal and petroleum, from prehistoric biological matter.
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C. What is Bio-Diesel?

- Biodiesel, a diesel fuel substitute that can be made from a variety of oils, fats, and greases, is of interest to farmers for a number of reasons.
- In addition, biodiesel produces less air pollution (exhaust emissions) than diesel made from fossil fuels.
- Due to the high viscosity of biodiesel compared with that of conventional diesel fuel, biodiesel is usually used as a blend with the diesel fuel. In this case, the blending ratio of the biodiesel into diesel has a great effect on the combustion characteristics of biodiesel– diesel mixture.

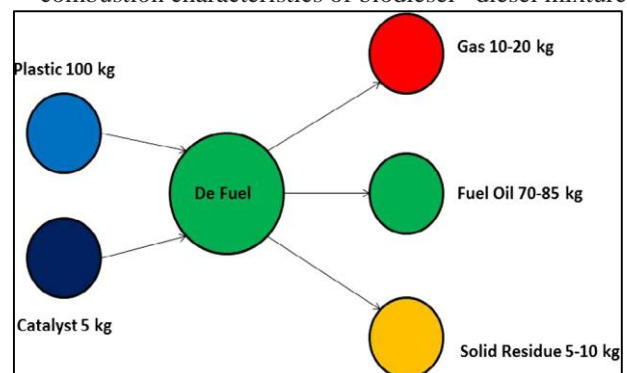


Fig. 1: Mass balance of the oil production process

D. Waste Plastic Oil

- Compression ignition (CI) engines are widely used for transportation, automotive, agricultural applications and industrial sectors because of their high fuel conversion efficiencies and relatively easy operation. These wide fields of usage lead to increasing requirements of petroleum-derived fuels. The depletion of petroleum reserves and increasing demand also induce a steep rise in fuel prices.

- On the other hand, their exhaust emissions, such as soot and nitrogen oxide (NO_x) are harmful to natural environment and living beings. Much effort is being paid worldwide to reduce the soot, carbon monoxide (CO), hydro-carbon (HC) and Nox emissions from diesel engines. Biodiesel is an alternative for diesel, Plastics are durable and takes a long time degrade because of the molecular bonds in the plastic are so strong and it is resist to natural processes of degradation. In INDIA we still finding the best way to reduce trash and air pollution problems simultaneously.
- There are examples of pollution from plastic such as burning plastic can release toxic fumes, burning the plastic polyvinyl chloride (PVC) may create dioxin and the manufacturing of plastics often creates large quantities of chemical pollutants.

II. LITERATURE REVIEW

C.A.Rinaldini et. al (2013) [1] were researched on Performance, emission and combustion characteristics of an engine running on waste plastic oil. They were concluded that at full load, the volumetric fuel rate is lower with WPO: as a consequence, also the output torque and power are lower. The specific fuel consumption was found to decrease using WPO at low and mid speeds and slightly increase at high speeds. The WPO global efficiency is always higher. Also there are the same performance obtain when the pump delivers the same volume of the fuel, but WPO BSFC is always lower due to the lower density. Running on WPO, soot emission are always significantly lower, with a difference up to 50% at full load.

M. Mani et. al.(2011) [2] were researched on characterization and effect of using waste plastic oil and diesel fuel blends in C.I engine. They were worked with various parameters like cylinder pressure, cylinder peak pressure, brake thermal efficiency, Exhaust gas temperature etc. And they were checked that behavior of parameters by taking one and more experiment value. And results that the peak cylinder pressure for WPO-DF blends is high due to longer ignition delay. Longer ignition delay of WPO-DF blends results in higher cylinders peak pressure compared to DF. At higher load, with higher peak pressure and hence temperature NO_x level increase. Also that the concentration of hydrocarbon of WPO-DF blends is marginally higher than DF and CO emission of WPO-DF blends is higher than DF.CO₂ produced while using WPO-DF blends lower than DF. This may be due to late burning of fuel leading to incomplete oxidation of CO. Smoke emission, exhaust gas temperature & brake thermal efficiency are higher than DF.

Viswanath K. Kaimal et. al (2016) [3] were also investigated on the effects of using DEE additive in a DI diesel engine fuelled with waste plastic oil and they were concluded that the maximum brake thermal efficiency noted is 30.9% for diesel, whereas for plastic oil it is 27.5%. Also Brake thermal efficiency increases steadily with increase in the diethyl ether blend ratio. Peak pressure also reduces with increase in the amount of DEE in the blend when compared to neat plastic oil. The higher heat release for plastic compared to other fuels. Also increase smoke in the exhaust for plastic oil. The NO_x emission for diesel at full load is 4.29 g/kW h and for plastic it is 6.18 g/kW h and UHC (Unburned

hydrocarbon) emission is higher. The amount of CO reduced by 9%, 24%, and 32% respectively for PD5, PD10 and PD15.

Pawar Harshal R. et al.(2013) [4] Were worked on the making of the waste plastic pyrolysis oil and used as alternative fuel for CI engine. They were successfully make this oil from the process. And also this oil used for the blending in CI engine fuel with different blending ratio.

J. Devaraj et al. (2015) [5] were investigated of performance,emission and combustion characteristic of waste plastic pyrolysis oil blended with diethyl ether used as for diesel engine and concluded that this oil is very suitable for the diesel engine without modification on the engine. The brake power for waste plastic oil is more than the diesel. HC emission were found increase with addition of DEE with WPPO. The CO emission are lower in case of DEE blends than that of WPPO.

III. CONCLUSION

From the above study, it's concluded that

- 1) The specific fuel consumption was found to decrease using WPO at low and mid speeds and slightly increase at high speeds.
- 2) Also there are the same performance obtain when the pump delivers the same volume of the fuel, but WPO BSFC is always lower due to the lower density.
- 3) The CO emission are lower in case of DEE blends than that of WPPO.
- 4) HC emission were found increase with addition of DEE with WPPO.
- 5) Smoke emission, exhaust gas temperature & brake thermal efficiency are higher than DF.

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