

# Blended Diesel with Rapeseed Oil : An Alternative Substitute for Conventional Fuel

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**Abstract :** This paper describes various tests which have been conducted at ambient and load conditions. There are many of researchers went on with various biodiesel fuels for three decades to favor understanding and popularization for biodiesel so far. This experimental work involves carrying out performance and combustion parameters when it is operated with a blended fuel of Diesel and rapeseed oil .The effect of performance are brake thermal efficiency,specific fuel consumption and mechanical efficiency.All these results implied that the blended diesel with rapeseed could be used as a substitute for conventional fuel.

## 1. Introduction

Due to depletion of fossil fuels and increase of automotives on road is the main reason for the researchers in the field of alternative fuel.Vegetable being the first alternative fuel for a compression ignition engine, later it produced serious problems,like clogging in the nozzle, slower combustion and more emissions.Hence the extract of vegetable oil known as biodiesel was tested as the alternative fuel in dieseleengine[1-11]. The various fuels tested were Jatropa andNeem etc. India being a developing country,researchers were keen interest about testing non-edible oils for the research on alternative fuels.In this work, trans esterification process has been used for extracting biodiesel from rapeseed oil. Methanol has been used as reactant and KOH has been used as the catalyst.

**Table 1.** Various properties ofDiesel and rapeseed oil

Properties	Diesel	rapeseed oil
Flashpoint °C	64	57
Firepoint °C	76	67
Viscosityat 40 °C	2.84 cSt	2.83 cSt
Calorificvalue (MJ/kg)	43.36	40.84

## 2. Experimental Setup

The experimental setup consists of a KirloskarTAF and also consists of alternator. The load is controlled by load cell. Air is flows through an airflow sensor which measures the amount of air taken. Fuel consumption readings were measured with help of a fuel sensor. AVL 444 gas analyzer can be used to measure the emissions of hydrocarbon, carbon monoxide, carbon dioxide and oxides of nitrogen from the exhaust pipe.



Figure 1. Experimental Setup



Figure 2. Gas Analyzer

3.

Blend	CO	HC	NO <sub>x</sub>	CO <sub>2</sub>
Details	%	PPM	PPM	%

### Results and discussion

Diesel fuel and a blend of rapeseed oil were used in this research work.

Table.2 : Engine Performance Analysis

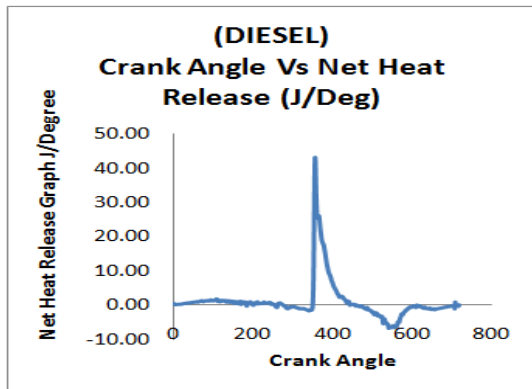
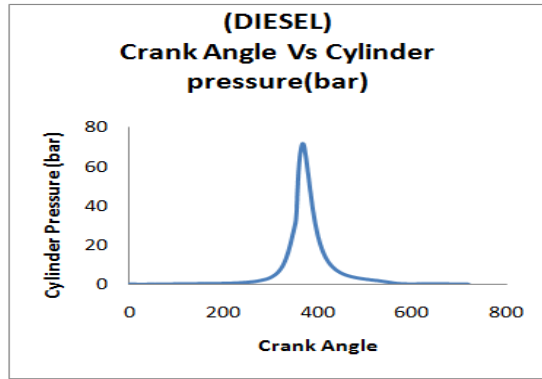
Blend Details	Total fuel consumption (TFC) kg/h	Specific fuel consumption (SFC) kg/kWh	Brake power (BP) kW	Indicated Power (IP) kW	Mechanical efficiency ( $\eta_M$ ) %	Brake thermal efficiency ( $\eta_{BT}$ ) %	Indicated thermal efficiency ( $\eta_{IT}$ ) %
Diesel	1.34	0.29	5.16	6.38	74.98	33.62	44.62

Table.3 Mechanical Efficiency

Blend Details	Brake power (BP) kW	Indicated thermal efficiency ( $\eta_{IT}$ )
Diesel	5.16	43.6
rapeseed oil	4.82	42.8

Diesel	0.238	48	2084	9.68
rapeseed oil	0.178	39	2186	9.36

### Combustion characteristics details:



**Table.4.** Engine EmissionsData

### Conclusions

The purpose of the present research is to conduct the comparative analysis of the effect of Diesel fuel (80vol%) and rapeseed oil (20vol%) The experimental investigation has dealt with the production of biodiesel from rapeseed oil and performance evaluation on blends of biodiesel at various loads. The fuel properties like density, flash point, viscosity and calorific value of the rapeseed oil blends are very similar to diesel and therefore diesel may be well replaced by biodiesel in future. Based on the experimental results, the following conclusions were made. 10% of rapeseed oil showed significantly better thermal efficiency and consumption with diesel. Concerning to emission report, the HC and CO and CO<sub>2</sub> emissions level have been considerably reduced for rapeseed oil compared with regular diesel. Therefore, it was concluded that HC and CO and CO<sub>2</sub> emission reduction is possible when rapeseed oil is used in a constant speed single cylinder diesel engine without any modifications.

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