IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 6, May 2023

# Extraction of Bio Diesel from Waste Cooking Oil and to Determine the Efficiency of Bio Diesel

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***Abstract:*** *In recent years, there has been a steadily increasing in the number of solid wastes because of the increasing human population and urbanization. Solids are including industrial waste, agricultural waste, forest waste and waste bio- products. The study also includes examination of physical and chemical properties such as pH value, viscosity, density, flash point, fire point and acid values on the produced biodiesel as well as on the conventional diesel for comparison. The study revealed that the properties of the bio-diesel are very close to the conventional diesel.*

***Keywords:*** Conventional Diesel, Urbanization, Steadily, Chemical Properties.

## I. INTRODUCTION

We are living on twenty first century and already running out of fuel. Inflation in the market, recent devastating earth-quakes, and floods all are playing against the human civilization. And the main reason for this is global warming. Scientists are assuming that the rate of earth quake and flood has increased dramatically in the recent years, which is somehow related to global warming Global warming is the biggest and the most devastating man-made phenomenon the earth has ever experienced, and its consequences are far too dangerous than itself. The word itself says its meaning rise of global temperature of earth, and it has now become a chain reaction. It all started when we live in the pre industrialised world.

## II. BIODIESEL

An A diesel engine (also known as a compression-ignition engine) is an internal combustion engine that uses the heat of compression to initiate ignition to burn the fuel, which is injected into the combustion chamber. This contrasts with spark-ignition engines such as a petrol engine (gasoline engine) or gas engine (using a gaseous fuel as opposed to gasoline), which uses a spark plug to ignite an air-fuel mixture. The engine was developed by Rudolf Diesel in 1893. The diesel engine has the highest thermal efficiency of any regular internal or external combustion engine due to its very high compression ratio. Low-speed diesel engines (as used in ships and other applications where overall engine weight is relatively unimportant) can have a thermal efficiency that exceeds 50 percent. The diesel internal combustion engine differs from the gasoline powered Otto cycle by using highly compressed hot air to ignite the fuel rather than using a spark plug (compression ignition rather than spark ignition).

### A. Bio Fuel Generation:

Bio fuels for transport are commonly addressed according to their current or future availability as first, second or third generation bio fuels (OECD/ IEA 2008). Second and third generation bio fuels are also called “advanced” bio fuels. I)First-generation bio fuels are commercially produced using conventional technology. II)Second-generation bio fuels can be produced from a variety of non-food sources. III)Third-generation bio fuel: Algae fuel, also called oil gas, is a bio fuel from algae and addressed as a third-generation bio fuel (OECD/IEA 2008).

## III. TRANSESTERIFICATION OF NON-EDIBLE OIL

Transesterification is the process of separating the fatty acids from their glycerol backbone to form fatty acid esters (FAE) and free glycerol [Meher, et al., 2006; Morrison and Boyd, 2005; Abhullah, etal, 2007].

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Fatty acid esters commonly known as biodiesel can be produced in batches or continuously by trans esterifying triglycerides such as animal fat or non-edible oil with lower molecular weight alcohols in the presence of a base or an acid catalyst. This reaction occurs stepwise, with monoglycerides and diglycerides as intermediate products. The transesterification process of converting non edible oils to biodiesel. The energy thus saved increases thermal efficiency, cooling losses and exhaust losses from the engine. The thermal efficiency starts reducing after a certain concentration of biodiesel. Flash point, density, pour point, certain number, calorific value of biodiesel comes in very close range to that of mineral diesel.

**A. Selection of Oil**

WASTE COOKING OIL: Biodiesel from waste cooking oil (WCO) can reduce the cost of biodiesel production since the feedstock costs constitutes approximately 70-95% of the overall cost of biodiesel production. Although biodiesel cannot entirely replace petroleum-based diesel fuel, there are at least five reasons that justify its development.

## IV. ENGINE PERFORMANCE READING AT DIFFERENT LOAD OF BIO DIESEL

TABLE I: ENGINE PERFORMANCE READING DIESEL

| S.No | LoadW1Kg | LoadW2Kg | Load W1-W2Kg | NetLoadW | Speedin rpm | Time taken | TFC | BPKw | FPKw | IPkw | SFCKg/kw-hr | Mech | B.T | I.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 7 | 3 | 4 | 39.24 | 1405 | 48 | 0.63 | 0.59 | 0.1 | 0.69 | 1.069 | 85.51 | 7.52 | 8.80 |
| 2 | 12 | 4 | 8 | 78.48 | 1360 | 37 | 0.82 | 1.15 | 0.17 | 1.32 | 0.713 | 87.12 | 11.27 | 12.94 |
| 3 | 16 | 5 | 11 | 107.91 | 1210 | 32 | 0.95 | 1.41 | 0.21 | 1.62 | 0.67 | 88.01 | 11.92 | 13.70 |

TABLE II: ENGINE PERFORMANCE READING BIODIESEL 5%

| S.No | LoadW1Kg | LoadW2Kg | Load W1-W2Kg | NetLoadW | Speedin rpm | Time taken | TFC | BPKw | FPKw | IPkw | SFCKg/kw-hr | Mech | B.T | I.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 7 | 3 | 4 | 39.24 | 1430 | 26 | 0.59 | 0.60 | 0.11 | 0.71 | 0.98 | 84.50 | 8.39 | 9.93 |
| 2 | 12 | 4 | 8 | 78.48 | 1369 | 41 | 0.75 | 1.16 | 0.18 | 1.34 | 0.65 | 86.56 | 12.77 | 14.75 |
| 3 | 16 | 5 | 11 | 107.91 | 1225 | 35 | 0.88 | 1.43 | 0.22 | 1.65 | 0.62 | 86.66 | 13.41 | 15.48 |

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TABLE III: ENGINE PERFORMANCE READING BIODIESEL 10%

| S.No | LoadW1Kg | LoadW2Kg | Load W1-W2Kg | NetLoadW | Speedin rpm | Time taken | TFC | BPKw | FPKw | IPkw | SFCKg/kw-hr | Mech | B.T | I.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 7 | 3 | 4 | 39.24 | 1432 | 56 | 0.56 | 0.61 | 0.12 | 0.73 | 0.92 | 83.56 | 9.16 | 10.96 |
| 2 | 12 | 4 | 8 | 78.48 | 1376 | 43 | 0.73 | 1.17 | 0.19 | 1.36 | 0.62 | 86.02 | 13.38 | 15.67 |
| 3 | 16 | 5 | 11 | 107.91 | 1238 | 37 | 0.85 | 1.44 | 0.23 | 1.67 | 0.59 | 86.22 | 14.24 | 16.53 |

TABLE IV: ENGINE PERFORMANCE READING BIODIESEL 15%

| S.No | LoadW1Kg | LoadW2Kg | Load W1-W2Kg | NetLoadW | Speedin rpm | Time taken | TFC | BPKw | FPKw | IPkw | SFCKg/kw-hr | Mech | B.T | I.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 7 | 3 | 4 | 39.24 | 1445 | 61 | 0.52 | 0.614 | 0.13 | 0.744 | 0.85 | 82.52 | 10.44 | 12.65 |
| 2 | 12 | 4 | 8 | 78.48 | 1384 | 46 | 0.69 | 1.173 | 0.20 | 1.373 | 0.59 | 85.43 | 15.03 | 17.60 |
| 3 | 16 | 5 | 11 | 107.91 | 1247 | 41 | 0.78 | 1.45 | 0.24 | 1.69 | 0.54 | 85.79 | 16.44 | 19.16 |

TABLE V: ENGINE PERFORMANCE READING BIODIESEL 20%

| S.No | LoadW1Kg | LoadW2Kg | Load W1-W2Kg | NetLoadW | Speedin rpm | Time taken | TFC | BPKw | FPKw | IPkw | SFCKg/kw-hr | Mech | B.T | I.T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 7 | 3 | 4 | 39.24 | 1468 | 72 | 0.45 | 0.62 | 0.14 | 0.76 | 0.73 | 81.57 | 12.65 | 15.51 |
| 2 | 12 | 4 | 8 | 78.48 | 1402 | 53 | 0.61 | 1.186 | 0.21 | 1.396 | 0.51 | 84.95 | 17.85 | 21.01 |
| 3 | 16 | 5 | 11 | 107.91 | 1255 | 48 | 0.67 | 1.46 | 0.25 | 1.71 | 0.46 | 85.38 | 20.01 | 23.43 |

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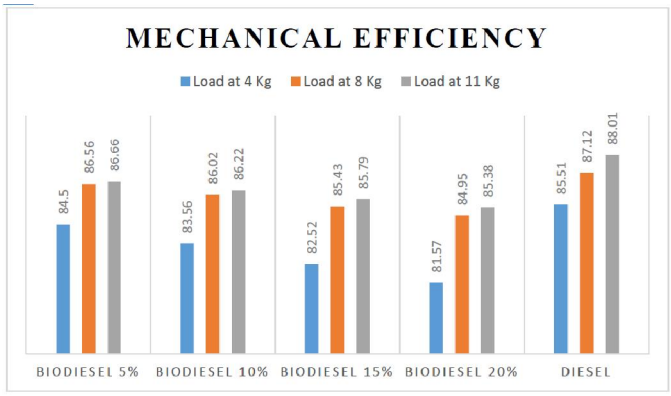


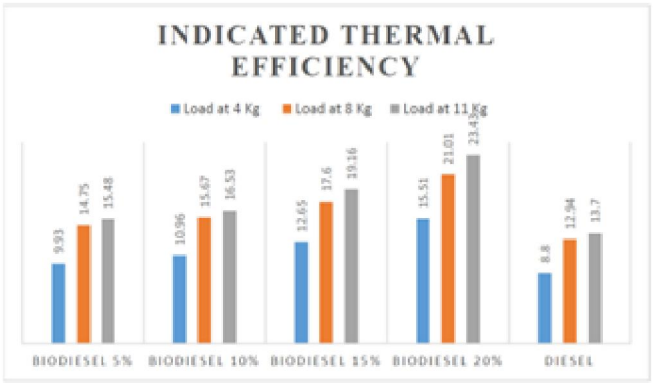


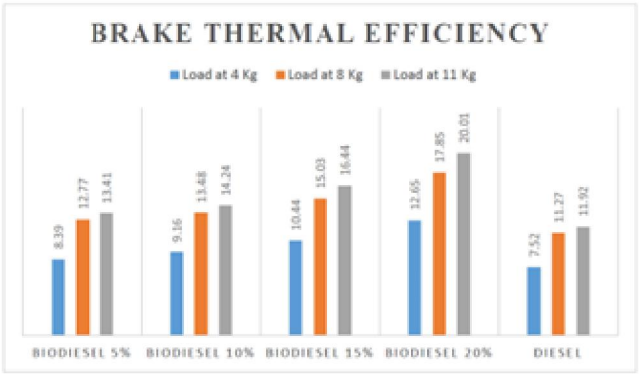


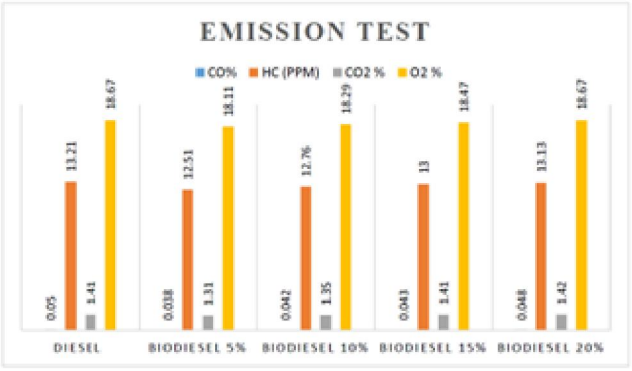

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## V.EMISSION TEST

This paper aims at investigating the performance and emissions of a diesel engine using bio-oil emulsions obtained from biodiesel as fuel. Emulsions of 5%, 10%, 15%, 20% were prepared by mixing respectively 5%, 10%, 15%,20% with 95%, 90%, 85%, 80% of diesel by volume. Fuels were tested in a mono cylinder diesel engine for their performance as fuel. Engine test results showed comparable performance for all the emulsions of biodiesel with BD (base diesel). There is a considerable reduction in smoke and NOx emissions with the emulsions of biodiesel as compared to BD at all power outputs. It was concluded that biodiesel obtained from can be used up to 20% by volume as partial replacement of diesel by making emulsions with comparable performance with diesel. To use biodiesel as soul fuel, the fuel and engine need further modifications. Particularly in the southern regions of India the availability of seeds is very high. It finds no useful applications.

TABLE V

| FUEL TEST | CO% | HC(PPM) | $CO_2$% | $O_2$% |
|---|---|---|---|---|
| DIESEL | 0.05 | 13.21 | 1.41 | 18.67 |
| Biodiesel5 % | 0.038 | 12.51 | 1.31 | 18.11 |
| Biodiesel1 0% | 0.042 | 12.76 | 1.35 | 18.29 |
| Biodiesel1 5% | 0.043 | 13.00 | 1.41 | 18.47 |
| Biodiesel2 0% | 0.048 | 13.31 | 1.42 | 18.67 |

**Benefits:**

Biodiesel has a number of advantages over diesel, including a higher cetane number, lower ash percentage, and lower carbon residue. It also features improved engine ignition and emission performance. Biodiesel is a domestically produced, clean-burning, renewable substitute for petroleum diesel. Using biodiesel as a vehicle fuel increases energy security, improves air quality and the environment, and provides safety benefits.

## VI. CONCLUSION

During this study we find that use of Biodiesel in diesel engine reduces the percentage of emitted pollutants, hence with increasing quantity of biodiesel Emission of HC and CO decreases. In this experiment waste cooking oil is taken as non-edible oil and mixed with methanol makes biodiesel and this biodiesel used in diesel engine instead of diesel to get the results about performance and emission of HC (hydrocarbons) & CO (carbon monoxide). So, we find quantity of HC & CO reduced with increasing quantity of biodiesel. But this quantity of pollutants increases with load increasing.

## ACKNOWLEDGMENT

Our product will be a true viable and sustainable alternative for petrol diesel fuels while demonstrating cost effectiveness, and at the same time addressing the mounting economical concerns of our market-space customers. Because Biodiesel is produced from domestically produced plant oils or waste fats, switching from Petroleum-based diesel to Biodiesel decreases dependence on foreign petroleum, reduces net greenhouse gas emissions, and provides tangible benefits for the domestic economy.

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