

FEASIBLE STUDY OF DIESEL AND BIO DIESEL: A REVIEW

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Abstract— *Environmental concern and availability of petroleum fuels have caused interest in the search for alternative fuels for internal combustion engine. Many alternate fuels are tried by various researches. Based on literature review it is found that for diesel engine Bio Diesel is most promising fuel. In this project works prospects and opportunities of utilizing 100% biodiesel and increasing biodiesel-diesel blend ratio as fuel in diesel engine is going to be studied by varying compression ratio. Also based on experimentation an optimum blend and engine parameters are to be suggested for obtaining better performance and emission control. Biodiesel present a very promising scenario of functioning as alternative fuels to fossil diesel fuel. The properties of these can be compared favorably with the characteristics required for internal combustion engine fuels specially diesel engine. Experiments were performed for three compression ratio i.e. 14, 16 and 18 using biodiesel diesel blends i.e. B10, B20, B30, B40, B60, B80 and pure biodiesel with load variation from no load to full load and compared with base cases i.e. engine using diesel as a fuel. The parameters which studied are in performance brake power, brake specific fuel consumption and brake thermal efficiency, in emission carbon monoxide, carbon dioxide, nitrogen oxide and unburned hydrocarbon of diesel engine. It was observed that out of three compression ratios i.e. 14, 16 and 18, compression ratio 18 results of brake thermal efficiency, brake specific fuel consumption and brake power as better results and emission for it was also lower except nitrogen oxide. In diesel-biodiesel blend, B20 having a better performance out of all combination of test fuel and emission of carbon monoxide (CO), carbon dioxide (CO₂), unburned hydro carbon (HC) and oxides of nitrogen (NO_x) decrease. Also same trend was observed for engine running with 100% biodiesel. As per the literature survey B20 (20%biodiesel and 80% diesel) is best in performance compare to other blends. Similar results were observed but emission is reduced. Diesel engine is running smoothly with 100% biodiesel by compromising on performance parameters i.e. brake power, brake thermal efficiency and brake specific fuel consumption.*

Keywords— *Biodiesel, Biodiesel-Diesel Blend, Varying Compression Ratio*

INTRODUCTION

Increasing trend of modernization and industrialization. Most of the developing countries import crude oil to meet their increasing energy demands. For this reason, a major portion of their hard earnings is spent on purchasing petroleum products. Awareness of the acute shortages of crude oil started from the worldwide fuel crisis in the 1970s. After that, significant attention was drawn to the improvement of alternative fuel sources. Besides this attention towards the energy crisis, today another important concern for us is the degradation of the environment due to fossil fuel combustion. Exhaust gases such as carbon monoxide (CO), sulphur dioxide (SO₂), and nitrogen oxides (NO_x) are responsible for the greenhouse effect in the atmosphere, which in turn causes global warming.

RATIONALE -

In this scenario the interest in this world to invent substitute fuels for the diesel engines. So there are vegetable oil is favorable option as it has many advantages. It is reusable, eco friendly, and cheaper to make and easily produce in villages, where there is no acute need for modern form of energy [4]. Some institution and research organizations they produced bio diesel with properties that very close to use of diesel. Such types of fuels are already in use due to compatibility, largely because of cheaper as compare to diesel and continued availability to the future. In addition the international pressure to reduce the carbon dioxide emitting hydrocarbons has made it essential to examine the properties of different green energy fuels, having potential in of using these in diesel engines [23]. While biodiesel has much gain over diesel fuel, but there are many problems that need to address, such as its higher flash point, high viscosity, and poor cold flow properties, lower calorific value, poor oxidative stability and sometimes its moderately higher secretion of nitrogen oxides. As a result many fuels are being scrutinized auxiliary for fossil fuels, especially diesel vegetable oils may give one such substitute and their potential has been test in the past few years by several researchers.

Some benefits of biodiesel listed below.

- (1) It decreases the dependency on imported petroleum.
- (2) It is regenerative and underwrites less to global warming than petroleum fuel due to its closed carbon cycle. In the initial feedstock can grow time to time and most of the carbon in the fuel was uniquely removed from the air by the plant.
- (3) It imparted good engine performances and can use without engine modification.
- (4) It imparted a production of more vegetable oils and animal fats so the economy of rural areas increases.
- (5) It is biodegraded and harmless.
- (6) It demonstrate lower combustion profile, specially SO_x

Biodiesel can be stored just like the petroleum diesel fuel and hence does not require separate infrastructure. It can be stored for long periods in closed containers but the container must be protected from direct sunlight, low temperature and weather. The biodiesel-diesel blends should be stored at temperature at least higher by 15 deg C that the pour point of the fuel.

India stands to benefit from the use of biodiesel through improving air quality with the reduction of harmful vehicle (trucks, busses and cars) emissions. These emissions are costly in that there is an apparently causal relationship between illnesses such as asthma and an

increased the risk of life threatening diseases. The prominent use of biodiesel in Auto's is another use where biodiesel can reduce petroleum emissions and dependence. Many farms have disappeared in recent years and could produce soy for biodiesel.

CHALLENGES OF BIODIESEL AS AN ALTERNATIVE FUEL

At high temperatures, biodiesel can oxidize if air is present, causing the formation of acids and solids, which can corrode and plug fuel system components. Additives can help prevent this deterioration. Much as vegetable oils become cloudy in the refrigerator, biodiesel will form wax at cold temperatures. These wax crystals plug fuel filters, so flow-improving additives are necessary in cold weather. Biodiesel crops yield comparatively less energy per unit of crop area than that available for ethanol crops.

Advantages of bio diesel

There are many technical advantages of bio diesel fuel:

- It extends engine life and reduces the need for preservation (bio-diesel have good lubricating qualities than fossil fuel)
- It is innocuous to handle, being minor harmful, major bio degradable, and having a higher Flash point,
- It reduces some exhaust emissions (although it may, in some circumstances, advance others).
- Bio diesel is an efficient, hygienic, 100% natural energy substitute to petroleum fuels. As well as the many advantages of bio diesel fuel include the following: safe for use in entirely conventional diesel engines, approach the same performance and engine robustness as petroleum diesel fuel, non-flammable and non-toxic, reduces tail pipe emissions, observable Smoke and noxious fumes and redolence.

BLEND PROPERTIES

The proper operation of an engine depends on a number of fuel properties. Viscosity, density, CN, heating value, flash point, pour point, and so on are the most significant properties of the fuel, a fuel should meet the limits defined by various standards like ASTM, EN, ISO, and so on. Among them, ASTM is widely used. Fuels whose properties' values lie within the standard limits provide smooth engine performance and emissions. At present, the blending of two or more fuels has become very popular because it improves the fuel properties. In this section, the properties of diesel and the most widely used diesel blend, that is, biodiesel–diesel blend, in CI engines are discussed. Biodiesel can be blended with diesel in any proportion to improve the qualities of the fuel. However, with regard to the differences in the physical and chemical properties of various types of biodiesel, biodiesel–diesel blends may have different physicochemical properties, which in turn affect the engine performance and pollutant emissions produced. Therefore, the researchers analysed and studied the quality of biodiesel–diesel blends with regard to several aspects such as properties of the blend, blending ratio, and storage time.

- Kinematic viscosity
- Density
- Cetane number
- Calorific value
- Flash point

COMBUSTION CHARACTERISTICS

Combustion characteristics are an important distinction of a fuel, on which the engine performance and emission characteristics are strongly depend. The effectiveness of the combustion process can be explained based on a few parameters such as in-cylinder pressure, ignition delay.

- Ignition delay
- Cylinder pressure
- Heat release rate

PERFORMANCE CHARACTERISTICS

Engine performance is the next parameter that indicates whether or not an engine is widely acceptable. Brake power, brake specific fuel consumption (BSFC), and brake thermal efficiency (BTE) are the performance indicators for engines. In this section, which reviews the performance characteristics in terms of power, the BSFC and BTE of diesel engines using biodiesel–diesel blends are presented along with some brief discussion and a performance comparison between diesel and biodiesel–diesel blends is also shown in tabular.

- Power
- Brake-specific fuel consumption
- Brake thermal efficiency

EMISSION CHARACTERISTICS

Emissions in CI engines consist of hydrocarbons (HCs), carbon monoxide (CO), NO_x, and particulate matter (PM). The use of biodiesel–diesel blends in CI engines has been proven to lead to low emissions of PM, HC, and CO as well as higher emissions of NO_x compared to diesel fuel. However, the emissions level varies from one engine to another and is dependent on the operating conditions of the engine, fuel quality.. In this section, a review of emission characteristics in terms of the HC, CO, NO_x, and PM emissions of diesel engines using biodiesel–diesel blend is presented along with some brief discussion.

- HC emission
- CO emission
- NO_x emission

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