A SEMINAR REPORT ON BIODIESEL

**DEPARTMENT OF CHEMICAL ENGINEERING**

**IET LUCKNOW**



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1. INTRODUCTION

1.1 Introductory idea of biodiesel

India is a high energy importing nation where maximum percent of our energy is supplied

by imported fuels since 2006. The diversification of kinds and sources of primary fuel is

becoming vital energy issues in the country .

But the common fossil fuels are not so plentiful and there is a chance to run out

eventually. If an alternative can be found that would convert. plant material to usable

fuels it would demonstrate the green chemistry principle of using renewable starting

materials such as substances derived from the growing plants rather than materials like

fossil fuels that are irreplaceable in short term.

One such process is the manufacture of ‘Bio diesel’ an alternative to diesel fuel from veg

etable. oil.

Dr. Ruddolf Diesel developed first engine to run on vegetable. oil in 1895 . He

demonstrated his engine at world Estimation is 1900 using peanut as fuel. Before world

war II bio diesel was introduced in south Africa to power heavy duty vehicles. Of late,

environmental and economic concern has renewed the interest in biodiesel throughout

the world, especially in Europe where it is in use from 20 years.

In this regard, biomass energy like biodiesel fuel from waste edible oil is thus

becoming attractive due to the environmental and energy policies for promoting

sustainable development and environmental pollution mitigation. Of the many energy

productions from food wastes or food processing wastes, especially in waste edible oils,

seem to be attractive based on bioresource sustainability, environmental protection and

economic consideration. The energy obtained from waste edible oils is a from of

renewable energy and in principle, utilizing this energy does not add carbon dioxide,

which is one of the major green house gases to the atmospheric environment, in contrast

to fossil fuels. Due to extremely low content of sulphure and nitrogen in the food waste

its direct utilization as fuel in the combustion utilities (e.g internal combustion engine)

generally generates less environmental pollution and health risk as compared to fossil fuels.

It is well known that the hydrocarbon in the diesel fuels includes a diversity of paraffins,

olefins, napthenes and aromatics. Therefore carbon numbers of theses hydrocarbons

present in the diesel fuels are mostly in the ranges of 12-22. Due to its high energy

conversion and power output in diesel energy conversion and power output in diesel

engines, diesel fuel has been extensively used in heavy trucks, city transport bus, electric

generator farm equipment, etc on the otherhand, edible oil including vegetable oil and

animal fats are principally glycerides (i.e triglycerides) formed from the glycerol and

higher fatty acids(C12-C22) such as Lauric , myristic, palmitic , stearic , oleic, linolenic

& linoleic acids. By way of transesterfication, the reaction of triglycerides with alcohol

(e.g methanol) under the caustic catalyst (e.g potassium hydroxide) is processed to

produce glycerol and monoalkyl esters which are known as biodiesel and can be

potentially used as alternative diesel fuel in compression ignition (diesel) engines. Bio

diesel, one of green fuels and / or clean energies is compatible with traditional petroleum

based diesel and both can be completely blended without any stratification. From the

view point of its chemical composition and properties, bio-diesel fuels are biodegradable,

low toxic and emit less air pollutants than hydrocarbon based diesel.. However the use of

biodiesel shall face to its high cost relative to petroleum- based oils, and some problems

related to decrease power output and torque force and to the increase in NO x emissions

with increasing biodiesel content in the blends.

1.2 Role of oil to synthesize biodiesel

The catalytic conversion of waste edible oil by the transesterification process into

biodiesel fuel has the advantage of both economic and environmental benefits. In this

regard the biodiesel fuel has been demonstrated to be successfully produced from waste

edible oils by an alkali- catalyzed transesterification process and can be considered as

alternative fuels in diesel engines and other utilities. Because of increasing trend in crude

oil, prices, limited resources in fossil fuels and environmental concern in ambient air

quality, the objective of this paper will give a comprehensive review on the potential

feasibility and regulatory incentives for promoting biodiesel production.

The main subjects covered in this paper are described in the following key elements.

Due to the increase in the price of the petroleum based oil and the environmental

concerns about pollution coming from the car gases, biodiesel is becoming a developing

area of high concern. There are different ways of production, with different kinds of raw

materials: refine, crude or frying oils. Also there are different types of catalyst basic one

such as sodium or potassium hydroxides, acids such as sulphuric acid, ion exchange

resins, lipases and supercritical fluids.

One of the advantages of this fuel is that the raw materials used to produce it are natural

and renewable. All these type of oils come from vegetables or animal fat, making it

biodegradable and nontoxic.

2. WHAT IS BIODIESEL

Biodiesel can, in theory, be used in all diesel engines. However, due to the parts attached to the diesel engine, some manufacturers do not approve engines running on 100% biodiesel. Biodiesel’s chemical name is "Fatty-Acid Methyl Ester". This fancy name means it is a simple molecule made from vegetable oil. This fuel has a high energy content and a proper viscosity “willingness to flow” to be used in all diesel vehicles and equipment. It’s made from a naturally grown crop making its energy from the sun.

W hat is NOT Biodiesel

Look Carefully! Many companies and groups improperly use the word biodiesel to describe diesel fuel replacement products they have developed. This creates significant confusion for consumers looking to purchase and use biodiesel. Some of these alternatives have not been properly tested and could lead to damage to vehicles. Below is some information to help distinguish real biodiesel from imposters.

What biodiesel IS NOT

* Biodiesel is not vegetable oil.
* Biodiesel is not vegetable oil diluted with solvents, i.e. diesel fuel or alcohols.
* Biodiesel is not vegetable oil with “special additives” to make it run better.
* Biodiesel is not vegetable oil refined through a conventional oil refinery process.
* Biodiesel is not vegetable oil refined through thermal depolymerization (renewable diesel).
* Biodiesel is not a fuel that requires costly modifications to your diesel engine (straight vegetable oil).
* Biodiesel is not crude methyl esters which have not been refined or minimally refined.

Unlike biodiesel, none of the fluids listed above have undergone renewable fuel certification, emissions or toxicity testing, or long-term reliability testing in engines and vehicles.

TRANS - ESTERIFICATION PROCESS

The trans-etherification process is carried out in order to reduce the viscosity of the oil by removing the fatty acid present in it.100ml mixture of NAOH and methanol is take in a burette and added to the raw jatropha oil with a constant interval of 30min. during addition of the mixture the temperature should be maintained between 50°C - 60°C. If the temperature exceeds beyond this limit the oil could catch fire since methanol ignites at very low temperature.

When all the mixture of methanol and NAOH is added to the raw jatropha oil it is allowed to settle in the container for 10hrs. After this there will clear separation on glycerol and the ester which is the required oil (Biodiesel) .

The final test which proves that the oil is undergone good Trans - esterification is by its golden colour formation and the smell which should not have any occurrence of the alcohol used in process. The picture below shows the difference between raw jatropha oil and trans- esterified oil.

FABRICATION OF EGR

External EGR, using piping to route the exhaust gas to the intake system where it is inducted into the succeeding cycles, has emerged as the preferred current approach. This methodology was followed in our project.

The engine exhaust and intake manifold was modified so as to enhance the EGR set. The constraints involved in the fabrication of EGR are as follows:

* Effective cooling has to be enforced for good performance of EGR since gas at 500-600°C can’t be let into engine.
* Effective throttling has to be maintained so as to allow required gas inside the cylinder.
* The exhaust has to be modified and the following condition has to be acquired, so as to use the AVL 437C Smoke meter.
* The temperature at the position of measurement should be maintained between 200 - 250°C.
* The pressure at the position of measurement should be maintained between 6075mm of manometer.
* Exhaust gas should be taken at an angle of 135° so as to have accurate readings.

TEST PROCEDURE:

1. The room temperature was noted down first.
2. Required quantities of blends were prepared according to their ratios by volume.
3. The fuel in the fuel tank, the supply of cooling water, level of lubricant in the sump as indicated by the dipstick and no load on the engine were checked before starting the engine.
4. The engine was started and allowed to run at no load for about 10 minutes to warm up and attain steady state. The speed of the engine was measured using a tachometer and it was adjusted to the rated speed of 1500 rpm by adjusting the governor connected to the fuel pump.
5. The fuel was then supplied from the burette by opening the metering valve. By noting the change in level of fuel in the burette, the time taken for 10cc of fuel consumption was noted using a stop watch.
6. The desired cooling water flow rate was obtained by adjusting the valve and was kept constant throughout the experiment.
7. The inlet and outlet temperatures of the cooling water are noted. The temperature of the exhaust gas was noted.
8. The full load of the engine was distributing equally so as to run at least five trials during the test from zero load (0 amps) to full load (12 amps). The set up readings were taken and tabulated.
9. The emissions are measured using the Flue gas analyzer, AVL 437C Smoke meter for all the combinations of biodiesel with HSD.
10. The manometer readings are also noted.
11. All the above readings were taken for various loads with applying and without applying EGR.

Electrical loading arrangement was used for loading the engine. All parameters relating to the engine performance were observed from the reading. Such parameter as,

1. Brake power
2. Fuel consumption rate, Specific fuel consumption
3. Fuel power
4. Brake thermal efficiency, indicated thermal efficiency

3. Benefits of Biodiesel

Biodiesel has many environmentally beneficial properties. The main benefit of biodiesel is that it can be described as ‘carbon neutral’. This means that the fuel produces no net output of carbon in the form of carbon dioxide (CO2). This effect occurs because when the oil crop grows it absorbs the same amount of CO2 as is released when the fuel is combusted. In fact this is not completely accurate as CO2 is released during the production of the fertilizer required to fertilize the fields in which the oil crops are grown. Fertilizer production is not the only source of pollution associated with the production of biodiesel, other sources include the esterification process, the solvent extraction of the oil, refining, drying and transporting. All these processes require an energy input either in the form of electricity or from a fuel, both of which will generally result in the release of green house gases. To properly assess the impact of all these sources requires use of a technique called life cycle analysis. Our section on LCA looks closer at this analysis. Biodiesel is rapidly biodegradable and completely non-toxic, meaning spillages represent far less of a risk than fossil diesel spillages. Biodiesel has a higher flash point than fossil diesel and so is safer in the event of a crash.

According to ASTM- biodiesel is defined as mono alkylesters of long chain fatty acids (FA) derived from renewable lipid feedstocks for use in compression ignition (diesel) engine. Biodiesel is produced through a transterification reaction of natural oil triglycrides with a short chain alcohol in the presence of a catalyst (KOH & NaOH).

4. Environmental Issues

The raw materials for biodiesel production are vegetable oils, animal fats and short chain alcohols. The oils most used for worldwide biodiesel production are rapeseed (mainly in the European Union countries), soybean (Argentina and the United States of America), palm (Asian and Central American countries) and sunﬂower, although other oils are also used, including peanut, linseed, safﬂower, used vegetable oils, and also animal fats. Methanol is the most frequently used alcohol although ethanol can also be used.

Since cost is the main concern in biodiesel production and trading (mainly due to oil prices), the use of non-edible vegetable oils has been studied for several years with good results.

Besides its lower cost, another undeniable advantage of non-edible oils for biodiesel production lies in the fact that no foodstuffs are spent to produce fuel [4]. These and other reasons have led to medium- and large-scale biodiesel production trials in several countries, using non-edible oils such as castor oil, tung, cotton, jojoba and jatropha. Animal fats are also an interesting option, especially in countries with plenty of livestock resources, although it is necessary to carry out preliminary treatment since they are solid; furthermore, highly acidic grease from cattle, pork, poultry, and ﬁsh can be used.

Although the properties of oils and fats used as raw materials may differ, the properties of biodiesel must be the same, complying with the requirements set by international standards.

Microalgae appear to be a very important alternative for future biodiesel production due to their very high oil yield; however, it must be taken into account that only some species are useful for biofuel production.

Flax:

Flax [12] is a plant of temperate climates, with blue ﬂowers. Linen is made with the threads from the stem of the plant and the oil from the seeds is called linseed oil, used in paint manufacture. Flax seeds have nutritional value for human consumption since they are a source of polyunsaturated fatty acids necessary for human health. Moreover, the cake left over, following oil extraction, is used as a livestock feed.

The plant adapts well to a wide range of temperature and humidity; however, high temperatures and plentiful rain do not favor high yields of seed and ﬁber.

Flax seeds contain between 30 and 48% of oil, and protein content is between 20 and 30%. It is important to remark that linseed oil is rich in polyunsaturated fatty acids, linolenic acid being from 40 to 68% of the total.

Safﬂower:

Safﬂower adapts well to dry environments. Although the grain yield per hectare is low, the oil content of the seed is high, from 30 to 40%. Therefore, it has economic potential for arid regions. Currently, safﬂower is used in oil and ﬂour production and as bird feed.

There are two varieties, one rich in mono-unsaturated fatty acids (oleic acid) and the other with a high percentage of polyunsaturated fatty acids (linoleic acid). Both varieties have a low content of saturated fatty acids.

The oil from safﬂower is of high quality and low in cholesterol content. Other than being used for human consumption, it is used in the manufacture of paints and other coating compounds, lacquers and soaps.  
It is important to note that safﬂower oil is extracted by means of hydraulic presses, without the use of solvents, and reﬁned by conventional methods, without anti-oxidant additives.

The ﬂour from safﬂower is rich in ﬁber and contains about 24% proteins. It is used as a protein supplement for livestock feed.

5. Problems brought by Biodiesel

As biodiesel is gaining considerable global attention & market. Standard are vital for its commercialization & market introduction.

Biodiesel is a fuel which is made from the organic oils. So, different group of scientists tried their best to synthesize the biodiesel from different sources like rape seed oil, soybean oil, fractionated lard & restaurant grease, waste palm oil, waste cooking oil, used frying oil, olive oil, sunflower oil, recycled cooking oil. Not only the variation in raw materials but optimization of process parameters can also be done by a host of scientists. Otara concentrated on transesterification from triglycerides when Klass et. al & krawezyk reported the transesterification of biomass from renewable energy sources. Fukuda,

& Grabosky, et al pointed the esterification of triglyceride by alkali metal used when alcohol transesterification was doe by Demirbas, et al.

Beside them analysis of fuel contents and properties of biodisel also attain the site of other group of scientist like Lin,et al ,Barnwal, et al, Tsai,et al, Chow, et al.

Synthesis of biodiesel from vegetable oil is gaining considerable global attention & market. The quality of biodiesel is an inherent property coming out form the raw materials for example from vegetable oil or animal fat or namely the contents of ester, partial glycerides, total glycerol etc.

Different types of vegetable oils are used by previous researchers. literature survey reveals that palm oil contains better fuel properties yet very little literature survey have been revealed on this field. Moreover according to the market price crude palm oil is the cheapest example of vegetable oil which can be used as a source of biodiesel.And India is the second largest producer of palm oil.

. 6. Biodiesel Samples

As mentioned above biodiesel can be produced from straight vegetable oil, animal oil/fats, tallow and waste oils. There are three basic routes to biodiesel production from oils and fats:

* Base catalyzed transesterification of the oil.
* Direct acid catalyzed transesterification of the oil.
* Conversion of the oil to its fatty acids and then to biodiesel.

. Almost all biodiesel is produced using base catalyzed transesterification as it is the most economical process requiring only low temperatures and pressures and producing a 98% conversion yield. For this reason only this process will be described in this report.

The Transesterification process is the reaction of a triglyceride (fat/oil) with an alcohol to form esters and glycerol. A triglyceride has a glycerine molecule as its base with three long chain fatty acids attached. The characteristics of the fat are determined by the nature of the fatty acids attached to the glycerine. The nature of the fatty acids can in turn affect the characteristics of the biodiesel. During the esterification process, the triglyceride is reacted with alcohol in the presence of a catalyst, usually a strong alkaline like sodium hydroxide. The alcohol reacts with the fatty acids to form the mono-alkyl ester, or biodiesel and crude glycerol. In most production methanol or ethanol is the alcohol used (methanol produces methyl esters, ethanol produces ethyl esters) and is base catalysed by either potassium or sodium hydroxide. Potassium hydroxide has been found to be more suitable for the ethyl ester biodiesel production, either base can be used for the methyl ester. A common product of the transesterification process is Rape Methyl Ester (RME) produced from raw rapeseed oil reacted with methanol.

The figure below shows the chemical process for methyl ester biodiesel. The reaction between the fat or oil and the alcohol is a reversible reaction and so the alcohol must be added in excess to drive the reaction towards the right and ensure complete conversion.

A successful transesterification reaction is signified by the separation of the ester and glycerol layers after the reaction time. The heavier, co-product, glycerol settles out and may be sold as it is or it may be purified for use in other industries, e.g. the pharmaceutical, cosmetics etc.

Straight vegetable oil (SVO) can be used directly as a fossil diesel substitute however using this fuel can lead to some fairly serious engine problems. Due to its relatively high viscosity SVO leads to poor atomisation of the fuel, incomplete combustion, coking of the fuel injectors, ring carbonisation, and accumulation of fuel in the lubricating oil. The best method for solving these problems is the transesterification of the oil.

The engine combustion benefits of the transesterification of the oil are:

* Lowered viscosity
* Complete removal of the glycerides
* Lowered boiling point
* Lowered flash point
* Lowered pour point

The catalyst is typically sodium hydroxide (caustic soda) or potassium hydroxide (potash). It is dissolved in the alcohol using a standard agitator or mixer. Reaction. The alcohol/catalyst mix is then charged into a closed reaction vessel and the oil or fat is added. The system from here on is totally closed to the atmosphere to prevent the loss of alcohol.

The reaction mix is kept just above the boiling point of the alcohol (around 160 °F) to speed up the reaction and the reaction takes place. Recommended reaction time varies from 1 to 8 hours, and some systems recommend the reaction take place at room temperature. Excess alcohol is normally used to ensure total conversion of the fat or oil to its esters. Care must be taken to monitor the amount of water and free fatty acids in the incoming oil or fat. If the free fatty acid level or water level is too high it may cause problems with soap formation and the separation of the glycerin by-product downstream.

Once the reaction is complete, two major products exist: glycerin and biodiesel. Each has a substantial amount of the excess methanol that was used in the reaction. The reacted mixture is sometimes neutralized at this step if needed. The glycerin phase is much more dense than biodiesel.

7. Biodiesel Background

FLASH POINT:

It is the temperature at which the fuel becomes a mixture that will ignite when exposed to a spark of flame. It is found that the flash pt of the biodiesel are 173 , 180,175,169 0C respectively for the four samples and in general it is higher than general diesel fuel having value of 70 0 C. So, it is safer than diesel.

It was found that flash pt of biodiesel increased as per the percentage of trighlyceride content.

VISCOSITY:

Viscosity is the measure of a material's resistance to flow. Viscosity is a result of the internal friction of the material's molecules. Materials with a high viscosity do not flow readily; materials with a low viscosity are more fluid.SO, it is a Measure of the fluidity of a substance.

Viscosity affects injector lubrication and fuel atomization. Fuels with low viscosity may not provide sufficient lubrication for the precision fit of fuel injection pumps or injector plungers resulting in leakage or increased wear. Fuel atomization is also affected by fuel viscosity. Diesel fuel with high viscosity tend to form larger droplets on injection which can cause poor combustion and increased exhaust smoke and emissions.The viscosity of biodiesel is found to be in the range of 4.52 to 4.76.Which is in agreement with viscocity of diesel (2.2 to 5.3 cSt at 40C).

ASH CONTENT:

Ash content is the nonvolatile inorganic matter of a compound which remains after subjecting it to a high decomposition temperature.

Ash is a measure of the amount of metals contained in the fuel. High concentrations of these materials can cause injector tip plugging, combustion deposits and injection system wear.The ash content of biodiesel is found to be 0.0052 -0.0083.and that of diesel is 0 .01.which is also the same for the synthesized biodisel .

POUR POINT:

It is the Lowest temperature at which an oil will pour or flow under certain prescribed conditions.It is a measure of the ability of a diesel fuel to operate under cold weather conditions. Defined as the temperature at which the amount of wax out of solution is sufficient to gel the fuel when tested under standard conditions (ASTM D97)The Pour point is 3ºC (5ºF) above the point at which a chilled lubricant shows no movement at the surface for 5 seconds when inclined. This measurement is especially important for oils used in cold conditions.For biodiesel it is 60C.and for gasoline diesel it is 2-4 0 C. for the synthesised kind it is found to be 6.

PHOSPHOROUS CONTENT:

Is depending much on production method for the oil. Phosphorus is dangerous for the engine due to its abrasive function. When the oil is cold pressed or refined normally the content of phosphorus is within the limits.The phosphorous content of biodiesel ranges from 0.0002 -0.0004.General diesel has phosphorous content from 0.0006 -0.0007. synthesised kind is found to be in this range.

SULPHUR CONTENT:

Sulphur reduces the function of catalysts and causes SOx emissions like Diesel engines. Normally vegetable oil does not contain sulphur.It is a measure of particulate emissions in diesel engine exhaust.Sulphur content of biodiesel is from 0.031 -0.045.where as gasoline diesel has a value of 0.05 -0.2. Synthesised kind is found to be in this range.

ACID VALUE:

The amount of free acid present in fat as measured by the milligrams of potassium hydroxide needed to neutralize it is the acid value. As the glycerides in fat slowly decompose the acid value increases. The acid value for biodiesel is1.2 -1.8.For general diesel the acid no is 0.02. Synthesised kind is found to be in this range.

The oil is taken in a porcelain or silica crucible of about 30 ml capacity with one or two glass beads to prevent bumping during heating. The crucible is placed in a skidmore iron crucible of capacity 65-82 ml containing sand so that the level of the two crucibles are same. The skidmore crucible is placed in a bigger iron crucible containing sand so that the level of all the crucible are same. The entire arrangement is placed on a sand and covered with a hood with a chimney. The heating is done with a meker type burner.

Initially, it is heated strongly so that ignition starts within 10+1 minutes marking the pre ignition period. When smoke appears over the chimney the burner is tilted so that the sides of the crucible are heated and the vapours burn. The flame is so adjusted that the vapours burn uniformly and the burning period is 13+ minutes. When vapour cease to burn and no more blue smoke is observed the burner is readjusted to heat at the bottom as in the beginning and heating is continued to red hot for exactly 7 minutes. Thus, the total

heating period is 30+2 minutes. After heating, the arrangement is allowed to cool until no smoke appears. The hood is then removed and the porcelain crucible is cooled in a dessicator and weighted.

APPLICATIONS OF BIODIESEL

* Motor fuel
* Biodiesel as self-contained renewable fuel has been applied in Diesel engines for decades.
* Fuel additive / biocomponent
* Biodiesel is used as fuel additive for several reasons. some of them are:
* To increase and speed-up the deployment of vehicle. Biodiesel is used as an alternative fuel .
* underground mining
* Diesel-powered equipment is used in underground mines because it is more powerful and mobile than electric-powered equipment. However, diesel emissions in the enclosed environments of underground mines pose a significant health hazard to mine workers.
* oil spillage remediation
* Biodiesel has excellent biodegradability in soil and ground water. It is even used to help clean up mineral oil slicks.

8.BIODIESEL: THE FUTURE OF BIODISEL

Biodiesel resources can provide energy security with the upsurge in economic activities, India is consuming over a whopping 127 million tonnes of crude oil a year and is forced to import about 70 per cent of its needs. The current yearly consumption of diesel alone is approximately 40 million tonnes in India constituting about 40 per cent of all petrol products.

In the current scenario, exploring energy alternatives in the form of bio-fuels, namely, ethanol and biodiesel assumes top priority.

Biodiesel, derived from the plants (bearing oils) like palm, sunflower, rapeseed, canola or Jatropha Curcas, can be used as a substitute or an additive to diesel. Biodiesel can provide power similar to conventional diesel and thus can be used in diesel engines. Biodiesel is non-toxic and environment friendly as it produces substantially less carbon monoxide and the combustion gases contain no sulphur dioxide and unburnt hydrocarbons.

CANCER RISK REDUCED

Because of these properties cancer risks and neonatal defects are reduced. Biodiesel mixed (5-20 per cent) with conventional diesel can extend engine life. It has good potential for rural employment generation.

RETURN ON INVESTMENT

For an optimal capacity of 10,000 TPA of biodiesel, the capital cost for oil extraction and transesterification would be Rs.20,000/tonne capacity. The return on investment (ROI) has been arrived at 15 per cent pre tax on the capital cost. The efficient storage of biodiesel resources can provide energy security to the country. Biodiesel can safely be stored for up to 6 months. The existing storage facilities and infrastructure for petrol and diesel can be used for the biodiesel with minor alterations.

India has vast stretches of degraded land, mostly in areas with adverse agro-climatic conditions, where species of jatropha,canola,palm etc can be grown easily. Use of 11 million hectares of wasteland for jatropha ,palm cultivation can lead to generation of a minimum of 12million jobs. Production of bio-fuel from plant materials is a major step toward harnessing one of the world's most-prevalent, yet least-utilised renewable energy resources. India, with its huge waste/non-fertile lands, has taken a well-noted lead in biodiesel production from plant materials cultivated in these waste lands for sustainable industrial development.

Alcohols that can be used in biodiesel production are those with short chains, including methanol, ethanol, butanol, and amylic alcohol. The most widely used alcohols are methanol (CH3OH) and ethanol (C2H5OH) because of their low cost and properties. Methanol is often preferred to ethanol in spite of its high toxicity because its use in biodiesel production requires simpler technology; excess alcohol may be recovered at a low cost and higher reaction speeds are reached. The comparison between the two alcohols is summarized in Box.

It must be remembered that in order for biodiesel to be a fully renewable fuel, it should be obtained from vegetable oils and animal fats, together with an alcohol that is produced from biomass, such as bioethanol, instead of being a petrochemical product. Several countries are carrying out research towards this objective, such as Spain and Brazil.

9.CONCLUSION

In order to make the world greener , the renewable resource are used to replace non renewable starting materials. So an alternative way is required to convert the biomass based energy to useable fuel. It is the principle of green chemistry.

This process deals with the manufacture of biodiesel an alternative to diesel fuel from vegetable oils.

Biodiesel is a fuel made from organic oils & chemically known as free fatty acid methyle ester (FAME) depending on the general characteristic value of the common vegetable oil found in he market it is found that palm oil is the best alternative to produce the biodiesel due to its high carbon content, could point , kinetic viscosity & relative density.

. Moreover, it is the relatively cheaper in the market.

Alkali transesterification procedure is adopted for the conversion & then the synthesized biodiesel is used for characterisation .Due to larger fatty acid carbon chain of raw material the produced biodiesel contains high carbon content & cetane no. Testing indicated that there will be some problem with palm biodiesel in operating with low temperature due to having higher pour point perhaps due to greater degree of saturation .

But high flash point & high viscosity indicate a high level of safety for biodiesel.

It is biodegradable & non-toxic in nature. The finished product may be less cost effective than conventional diesel with respect to the present market price. So, this can be burnt in normal diesel engine just like the usual diesel.

* Biodiesel is eco-friendly.
* Biodiesel is clean burning alternative fuel.
* Biodiesel contain no petroleum, but can be blended with conventional diesel fuel.
* These fuel can be used in any diesel engine without any modification.
* Biodiesel is degradable , non toxic and free from sulphur and lead.
* Biodiesel provide superior lubricating properties and help to extend engine life.
* India’s target is to achieve 20 % substitution of HSD till 2012.

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