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A Review Paper on Biodiesel

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Abstract:-- **Now days increases the demand of petroleum products because of increasing industrialization and uses of automobile. Due to this increases the rate of petroleum products. The fossil fuels quantity is limited on the earth. So it is necessary to find out an alternative fuel. There are many researchers are doing their research on alternative fuel and they are developed an alternative fuel i.e. Biodiesel. Biodiesel is produced from transesterification and esterification process. For production of biodiesel various raw materials are used such as Vegetable oils, Animal fats and Short chain alcohols. Also various crops are used for biodiesel production such as Jatropha, Undi, Castor, Karnja, Soya bean, Sunflower, Palm, Corn, Jojoba, Cotton, Moha etc. Biodiesel is prepared from renewable resources, so it having less emission than petroleum products.**

Keywords:-- **Biodiesel, Emission, Performance, Transesterification Process**

I. INTRODUCTION

Fossil fuels are one of the major sources of energy. Energy is the basic need for economic development of any country. In today's world fossil fuels are the major source of atmospheric pollution. Coal is the single largest source of energy in India and after that comes is petroleum, about two third of petroleum products imported from Oil and Petroleum Exporting Countries. In India increasing industrialization, transportation, mechanization and motorization due to that rate of energy consumption is increases. India is the sixth biggest country in the world and second highest country in Asia in terms of energy demand. India imports petroleum product from other countries. In India coal is the most important & abundant fossil fuel, due to it satisfies 55% of India's energy need. Thirty per cent of commercial energy requirements are met by petroleum products, nearly 7.5 per cent by natural gas and 3.5 per cent by primary electricity. In India rural areas depends upon traditional sources of energy such as animal dung, biomass, firewood. The usage of traditional sources of energy is estimated at around nearly 47 per cent of total primary energy use. Biodiesel is the product one gets when organically derived oil such as vegetable oil or animal fat chemically reacts with an alcohol to produce a fatty acid alkyl ester. Biodiesel is alternative to be used in diesel engine, because it has similar properties to the traditional fossil diesel fuel and substitute conventional fuel with none or very minor engine modification. One of the gorgeous features of biodiesel is its biodegradability and being more ecofriendly than the fossil fuels. Emissions such as total hydro carbons (HC), nitrogen oxide (NOx) and carbon monoxide (CO) are usually found to suggestively low with biodiesel as compared to petroleum diesel. Biodiesel has a more complete combustion than the petroleum products due to increased oxygen content in the flame coming from the biodiesel molecules. The following raw materials are used for production of biodiesel such as Jatropha, Undi, Castor, Karnja, Soya bean, Sunflower, Palm, Corn, Jojoba, Cotton Moha etc. Biodiesel is defined as fatty acid methyl or ethyl esters made from edible and non-edible oils and animal fats. It contains no petroleum, but it can be blended at any level with petroleum diesel to create a biodiesel blend or can be used in its pure form. Biodiesel has similar physico-chemical properties of fossil fuels and it has high viscosity and poor volatility are the major limitation of vegetable oils for utilization of fuels in diesel engine.

II. LITERATURE REVIEW

Carmen Leonor Barajas Forero [1] In this paper they have produced biodiesel by using castor seed, they are used Transesterification process of castor oil with basic catalyst and single reaction method. In this paper author was found that efficiency of production of biodiesel range is 80-82%.For finding the result, author was used three blends such as B10 (Biodiesel-10%, Petroleum diesel-90%), B20 (Biodisel-20%, Petroleum diesel-80%), B100 (Pure Biodiesel) and its performance compared with pure diesel. Pure biodiesel has highest flash point and ignition point. A higher flash point interprets into higher level of safety in flammable transport and storage. Petroleum diesel was compared with blends of biodiesel mixture; it was observed that pure biodiesel showed highest combustible expenditure. This difference is determined by the higher density of biodiesel since there will be higher quantity of mass available to petroleum diesel. Castor oil mostly used

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in winter conditions due to their properties indicates very low pour point (-450C) and cloud point (-230 C).

Table No. 1 Properties of Castor oil Biodiesel

Properties	Petroleum diesel	B10	B20	B100
Sp. Gravity	0.8610	0.8643	0.8703	0.9268
Density Kg/m^3	861.0	864.3	870.3	926.8
Kinematic Viscosity Mm^2/s	3.81	4.54	4.97	15.98
Flash Point ^0C	68.3	85.3	88.7	190.7
Heating Value KJ/Kg	47216.4	44427.6	44780.4	37900.8
Copper Strip Corrosion	1 a	1 a	1 a	1 b
Carbon Residue % mass	0	0.009	0.007	0.037
Cloud Point ^0C		-5	-7	-23
Pour Point ^0C	-6	-26	-30	-45

A.B.M.S. Hossain et al. [2] They have prepared biodiesel from waste sunflower cooking oil. In that research paper author concluded that the no difference between the pure sunflower cooling oil(PSCO) and waste sunflower cooking oil(WSCO) for producing a biodiesel. Acid value and viscosity of waste sunflower cooking oil is higher than that of pure sunflower cooking oil. At optimal condition production of biodiesel from sunflower cooking oil volumetric oil to methanol molar ratio is 1:6 and 1% of KOH at 400C. From that produced biodiesel is a good quality within the array of standard method specifications and the production yield is apt. up to approximately 99% under optimum conditions. This research represented that the production of biodiesel from PSCO and WSCO has no significant difference

Table No. 2 Properties of PSCO & WSCO

Properties	PSCO	WSCO
Acid Value, mg KOH/g oil	0.1	1.6
Viscosity, mm^2/s at 40^0C	5.8	9.5

Sanjaykumar Dalvi et al. [3] In this paper they have prepare biodiesel from Undi seed by using In-situ transesterification process. In this process extraction of oil from undi seeds cannot be done. These seeds are grinded into fine powder and this grinded powder mixed with methanol and ethanol this mixture stirrer continuously. Subsequently gives heat to this mixture at 600c for 60minutes. After that separation of biodiesel blend is takes place by using vacuum filtration. From that process they was found that, this process is Eco-friendly because harmful reagents such n-hexane is not used in this procedure.

Deshpande D. P. et al. [4] They have produce biodiesel from castor oil using acid base catalysts. It was produce biodiesel by transesterification process from castor oil for that process use different two catalysts namely sulfuric acid and sodium hydroxide. From that process author was check different performance parameters of castor oil biodiesel for different variables are Residence time, Oil to methanol ratio, Catalyst concentration and Reaction temperature. After performing the process they was found following results:

i. When Sulphuric acid use as catalyst then the reaction time increases from 30 minutes to 45 minutes viscosity of castor oil biodiesel decreases from 16.56cSt to 11.28cSt and viscosity of castor oil biodiesel increases further with increasing time. Hence optimum reaction time is 45 minutes.

ii. 1:10 Oil to Methanol mole ratio is optimum for castor oil biodiesel production using Sulfuric acid as a catalyst.

iii. For sulfuric acid as a catalyst reaction temperature increases from 300C to 500C it was observed that , viscosity of castor oil biodiesel decreases from 15.22cSt to 11.28cSt and for sodium hydroxide as catalyst

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at same temperature viscosity of castor oil biodiesel is increases from 13.1cSt to 18.25cSt.

iv. Viscosity of castor oil biodiesel is decreases from catalyst concentration 0.5wt% of sulfuric acid to 3 volume% of sulfuric then it is increases with increasing catalyst concentration, lowest value of kinematic viscosity is 11.28cSt. For sodium hydroxide catalyst viscosity of castor oil biodiesel decreases from catalyst concentration 0.5wt% of sodium hydroxide as a catalyst and then increases further with increasing catalyst concentration, lowest value of kinematic viscosity is 13.10cSt.

Mulayam Singh et al. [5] They have prepared the biodiesel by using jatropha oil. In this paper author was analyze different properties of biodiesel. It was take test on diesel engine of speed 1500 rpm with governor mechanism and for three different fuels that are pure diesel, pure jatropha oil and pure biodiesel. From that test it was found that, the mechanical efficiency of the engine while using pure biodiesel is more than the conventional pure or petroleum diesel and also mechanical efficiency is increases with increasing percentage of pure biodiesel. It was also found that the measured properties of biodiesel are similar to or closure to the pure diesel fuel as per ASTM.

U. Santhan Kumar et al. [6] In this study they have compare performance, combustion and emission characteristics of corn oil blend with pure diesel. For observing the above characteristics they have use experimental setup consists of a single cylinder four stoke diesel engine, coupled with electrical dynamometer. Corn oil blend is prepared from transesterification process. In this process corn oil mixed with methanol by the alkaline catalyst Potassium Hydroxide (KOH). This reaction takes place at 60 minute, and then biodiesel is formed. For experimental study author was use four blends namely B15 (Biodiesel-15% and Pure diesel-85%), B30 (Biodiesel-30% and Pure diesel-70%), B45 (Biodiesel-45% and Pure diesel-55%) and B60 (Biodiesel-60% and Pure diesel-40%). From that blend B15 gives maximum brake thermal efficiency i.e.28.07% also brake specific fuel consumption (BSFC) is 0.31kg/kw-hr, which is lower than other blends and pure diesel. Emissions like Co2 and HC are less for all the blends of corn oil than pure diesel.

Thembi Sithole et al. [7] They have focused on production of biodiesel from waste vegetable oils. They have produced the biodiesel by using transestrifcation process and base catalyst for this process is MgO/ZrO2. They have take results of conversion of waste vegetable oil to biodiesel at different reaction temperatures and reaction time. It is found that conversion of waste vegetable oil to biodiesel is increases with increase in reaction time and reaction temperature. A.K. Goswami et al. [8] In this paper author compares characteristics of pure soya bean oil and its various blends with petroleum diesel. By using transesterification process the soya bean oil is converted into biodiesel with the help of CaOH pellet as a catalyst.They have found that B10 (Biodiesel-10% and pure diesel-90%) and B30 (Biodiesel-30% and Pure diesel-70%) gives better result. For that blends kinematic viscosity simultaneously increases. B100 (Pure Biodiesel) gives poor results for diesel index. From overall view of this paper only B10 is best feasible alternative fuel.

Table No.3 Comparison of miscellaneous properties

Properties	Pure Diesel	B10	B30	B100	Soya bean oil
Specific Gravity at 15^0C	0.83	0.84	0.85	0.87	0.92
API Gravity	37.5	35.5	34.8	29.6	21.63
Cetane No.	50	46	36	18	-
Flash Point ^{0}C	68	71	75	92	-
Fire Point ^{0}C	71	73	79	96	-

Amol Patil et al. [9] In this paper they have examine different engine parameters for different load. They have used cottonseed oil and maize oil biodiesel as fuel for C I engine. After performing the test they was found following result:

- Brake specific fuel consumption of pure diesel is less as compared to cottonseed and maize oil biodiesel.
- Brake thermal efficiency of pure diesel is less as compared to cottonseed and maize oil biodiesel.
- Indicated thermal efficiency of pure diesel is less than cottonseed and maize oil biodiesel.

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- Volumetric efficiency of cottonseed oil biodiesel is more than the maize oil biodiesel and pure diesel.
- Mechanical efficiency of pure diesel, cottonseed oil and maize oil biodiesel is almost same and varies with load.
- Hydrocarbon emission of pure diesel is more than cottonseed oil and maize oil biodiesel.

R. Sattanathan [10] They have produced the biodiesel from castor oil and check its performance and emission test. From this paper the author found that best biodiesel molar ratio of methanol to oil is 9:1 and best blend is B25 because it having less hydrocarbon (HC) emission than other blends. So B25 blend of castor oil is best alternative fuel for diesel.

Vikas S. Patil et al. [11] In this paper they have focused on the review of Biodiesel. They have found that production of Biodiesel from castor oil is most effective and it reduces the cost of Biodiesel.

III. CONCLUSION

- 21st century has been facing many problems like energy sustainability, environmental problems and rising fuel prices so it is necessary to find out an alternative fuel i.e. Biodiesel.
- Biodiesel is prepared from renewable resources, so it having less emission than petroleum products.
- The biodiesel is one of the significant fuel that can be replaced to diesel fuel and it can be used in diesel engine with none or very minor engine modification.

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