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Production and Characterisation of Biodiesel from Fruit Rinds Waste Vegetable Waste and Performance Test in a Diesel Engine

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Abstract: Energy is an essential contribution to all divisions of a nation's economy. Till date the world by and large and India specifically is primarily reliant on oil based goods as wellspring of vitality. Presently the world is confronting real energy emergency. This energy emergency is because of two reasons; right off the bat the number of inhabitants on the planet has expanded quickly and furthermore the way of life of people has expanded. Because of quick increment in energy necessity, there is quick consumption of oil based commodities and it is evaluated that in next couple of decades the accessibility of oil based goods will be decreased significantly. This irreversible circumstance of energy front, drove us to search for the substitute wellspring of energies, which are sustainable in nature. Some of such energy assets are sun oriented vitality, wind vitality, geo warm vitality, tidal energy and bio vitality. But bio energy all sustainable power sources are regular in nature and hard to store for future. Vegetable oils are considered condition agreeable and carbon unbiased energizes as CO2 discharges from the ignition are reused by the vegetation in nature like plants, trees, creeps and so on, and these oils are inexhaustible and practical energy assets. Advancement of vegetable oils produces huge scale work and in addition gives energy security to our nation. We have effectively finished creating bio diesel utilizing vegetable waste and natural product skins and we have done different trademark tests on it, to be specific: 1) Flash and fire 2) Density 3) Specific gravity.

Keywords: Fruit rinds waste and vegetable waste, biodiesel, soxhlet, methyl esters, etc.

I INTRODUCTION

Considering where the world stands today we can see that energy is one of the greatest elements in charge of development of countries. Countries with predominant energy assets grow speedier than those with lesser assets. This development has prompted taking off energy requests which are met straightforwardly or in a roundabout way to a great extent by non-renewable energy sources. The current circumstance is with the end goal that the energy created is insufficient to take care of the demand. Likewise the energy part just takes into account the requirements of the created and the immature districts don't have entry to ordinary energy sources.

Energy request is conveyed among four wide areas: transportation, private, business, and modern. As far as oil utilize, transportation is the biggest division and the one that has seen the biggest development popular in late decades. This development has to a great extent originated from new interest for individual utilized vehicles fueled by inner burning motors. This segment additionally has the most elevated utilization rates and 55% of oil utilize around the world.

II METHODS OF EXTRACTION

A. EXTRACTION OF OIL FROM SOXHLET

Fig 1: Soxhlet extraction set up

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We have extracted the bio diesel from Fruit rinds and Vegetable wastes from Soxhlet process. In soxhlet process we have used 500gms of fruit rinds and vegetable wastes in the extractor, 1.5L methanol in the round bottom flask. After the extraction process, we have obtained 1.3L mixture of crude oil and methanol.

B. DISTILLATION PROCESS

In the distillation process we separated the crude oil and methanol. We obtained 300ml of crude oil and 1L of methanol.

C. PRODUCTION OF OIL METHYL ESTERS.

i. Analysis of oil

The vegetable oils are composed of triglycerides and Free fatty acids, FFA plays a vital role during the production of biodiesel. The FFA more than 2% decreases the yield of the final product. Therefore it is essential to find the FFA of the crude oil.

ii. Determination of free fatty acid content in the oil

We conducted the FFA test to find out the free fatty acid content present in the oil. The FFA content present in the oil was found to be 1.97

Since FFA is less than 2 % single stage process is

FFA Content = $\mathbf{28.2} * (\boldsymbol{normality\ of\ NaOH}) * (\boldsymbol{Titration\ value})\ (\boldsymbol{Weight\ of\ oil})$

FFA content = 28.2 × (0.1) × (0.7) (1)

FFA content = 1.97

D. TYPE OF PROCESS DEPENDS ON FFA

If FFA < 2% single stage process

If FFA > 2% Double stage process

Since FFA is less than 2 % single stage process is chosen.

i. Base catalyzed transesterification

Fig 2: Settling process of FFA

In base transesterification process, for 300ml of crude oil, 100ml of methanol and 2gms of NaOh was added and the mixture was transferred to a flask, which then was heated at 60'c and stirred for 2 hours. The mixture is then transferred into a separating tank and left for around 2 hours to separate the FFA from the oil.

ii. Methanol recovery from biodiesel

Fig 3: Methanol recovery from distillation process

The methyl esters obtained in the second stage is subjected to methanol recovery.

iii. Washing of methyl esters obtained from the previous stages

The obtained crude oil is washed with warm water for about 10 to 15 times to remove the glycerol present in the oil. The obtained yield was 200ml.

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Fig 4: Water wash

iv. Heating of biodiesel to remove moisture and methanol

Fig 5: Heating of biodiesel to remove moisture and methanol

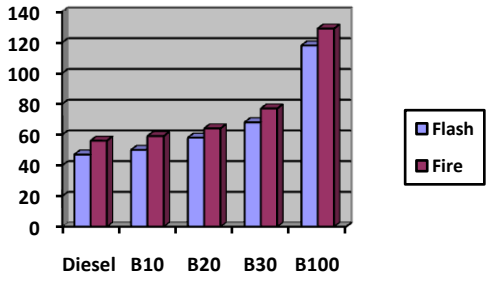
The obtained biodiesel after washing is heated to more than 100'c to remove the moisture content present in the biodiesel and also to remove the methanol entrained in it.

III CHARACTERISATION OF BIODIESEL

i. Flash Point (Pensky Martin Closed Cup)

The most minimal temperature at which the vapour of a burnable fluid can be made to touch off quickly in air is recognized as the glimmer indicates and corresponds ignitibility of fuel. Low glimmer point can demonstrate lingering methanol staying from the transformation procedure. The glimmer point is frequently utilized as a distinct normal for fluid fuel and it is additionally used to describe the fire risks of fluids. "Streak point" alludes to both combustible fluids and flammable fluids.

We carried the experiment in Martin Pensky closed cup apparatus and it can be seen from diagram 1 that fire point continues expanding with mixes. For immaculate biodiesel (B100) it was observed to be 138°C. Henceforth every one of the mixes are observed to be agreeable.



Graph 1: Flash and Fire temperature in °C

ii. Viscosity

Kinematic density is the resistance offered by one layer of liquid over another layer. The consistency is vital in deciding ideal dealing with, capacity, and operational conditions. Fuel must have reasonable stream attributes to

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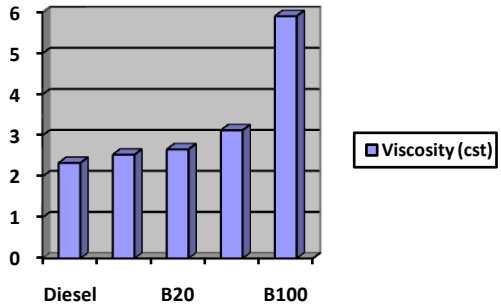
guarantee that a sufficient supply achieves injectors at various working temperatures. High density can bring about fuel stream issues and prompt slow down out. The viscometer shower is utilized to keep up right steady temperature for assessing Kinematic density of biodiesel.

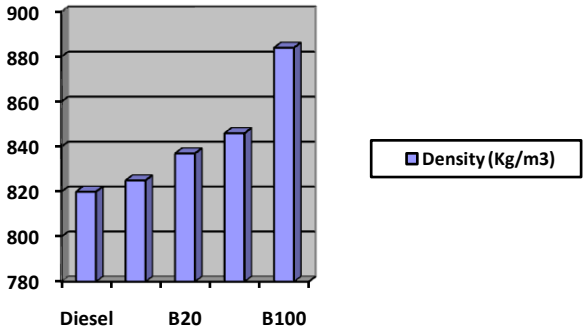


Graph 2: Viscosity in cst

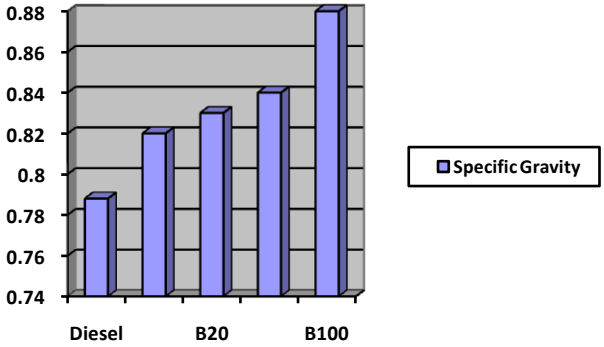
We used Ostwald viscometer to determine the viscosity of the obtained oil. Viscosity continues expanding with mixes. For biodiesel according to ASTM particulars the consistency can be in the scope of 1.9-6.0. The consistency territory for biodiesel from vegetable waste and fruit rinds and its diverse mixes is observed to be in the scope of 2.53-5.91. Consequently the viscosity is observed to be tasteful.

iii. Density and specific gravity

The density of a material is characterized as its mass per unit volume. The image frequently utilized for density is ρ (Rho). Particular gravity is the proportion of the density (mass of a unit volume) of a substance to the density (mass of a similar unit volume) of a reference substance. The reference substance is dependably water for fluids and air for gasses. Since we know that density is the ratio of mass by volume, therefore we measured the mass of 50ml of oil and we observed that the density keeps on increasing with blends in the range of 825 – 884Kg/m^3.



Graph 3: Density in Kg/m^3



Graph 4: Specific gravity

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IV TABLE OF COMPARISION

Properties	Diesel	B100	B10	B20	B30
Density (Kg/m3)	820 - 950	884	825	837	846
Specific Gravity	0.788	0.884	0.825	0.837	0.846
Viscosity (CST)	2.36	5.91	2.53	2.66	3.12
Flash (ºC)	47	138	60	68	78
Fire (ºC)	56	147	69	76	87

V RESULTS AND DISCUSSIONS

COMPARISION WITH **ASTM** STANDARDS

SL NO	Properties	Standard	Range	Obtained
1	Flash point (°C)	ASTM D93	>130 *	138
2	Kinematic Viscosity (Cst) at 40°C	ASTM D445	1.9-6.0	5.91
3	Density (Kg/m^3)	ASTM D792	870 - 900	884
4	Specific gravity	ASTM D4052	0.87-0.90	.884

From the above table we can see that the obtained properties matched with ASTM standards.

VI CONCLUSIONS

In this review, oil is removed from Vegetable waste and natural product skins and is created by transesterification prepare. The created biodiesel is mixed with diesel in 10%, 20% and 30% extents and the analysis of characterization test revealed that the results obtained satisfy the ASTM standards. Hence we conclude that the bio diesel produced can be used as an alternative fuel.

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