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EXPERIMENTAL STUDY OF KEROSENE ADDITIVE TO WASTE OIL BIODIESEL FOR USING AS ALTERNATIVE DIESEL FUEL

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Abstract:

The biodiesel used in this paper is produced by using transesterification reaction between waste oil and methanol to reduce the cost, using NaoH as catalyst , a blending of kerosene and biodiesel were carried out to investigate their properties characterization of the biodiesel blends with kerosene were (density, viscosity, flash point, pour point, cloud point, cetane index). Biodiesel blends with kerosene in proportion at (5:95, 15:85, 25:75, 35:65, 50:50). The results showed, the blending of biodiesel with kerosene enhanced the requirement of this fuel as a substituted of diesel fuel, kerosene can play a role to reduce the flash point and viscosity and reduce the characteristics of cold flow properties of biodiesel and suitable fuel for air blast atomizer burner.

Key Words: Biodiesel, Waste Oil, Transesterification, Blending & Cold Flow

Introduction:

The problem of environmental in the world nowadays become increasing especially for air that surround on us. It is because the increasing number of industries that using combustion as their alternative way to produce high mass of production, economical and easy in engine maintenances. Diesel engine are very good combustion for heavy industries because it produce higher torque, but disadvantages of diesel fuel combustion produce hazardous toxic and be harmful for health[1]. Biodiesel is a renewable resource that can be made from plant oil or vegetable oil such as palm oil, jatropha, curcas, soybean, rapeseed, sun flower and waste oil. Biodiesel is a renewable liquid fuel that can be produced by using transest-erification process of oil and alcohol with catalyst Figure (1) [3, 4].

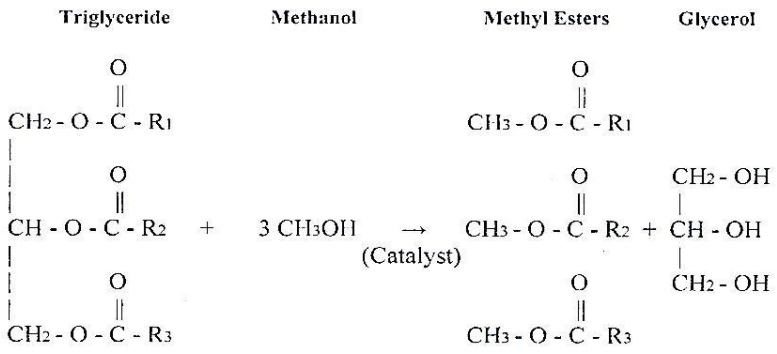

Figure 1: Stoichiometry transesterification of triglyceride into a fatty acid and glycerol utilizing Methanol [2]

As well as the problems of diesel fuel there is problem with diesel vehicle operation in cold weather when this conventional diesel fuel can gel also biodiesel has same gel problem [5-8]. There are two important cold weather parameters define operability for diesel fuels and biodiesel, cloud point (temperature where crystals first

appear), pour point (lowest temperature where fuel is observed to flow). Viscosity and flash point of diesel fuel and biodiesel are very important parameter of atomization and spray combustion quality in internal combustion engines and burners, viscosity play a role to determine the droplet size and flash point determines the ignition point of fuel vapor. The aim of this study investigates of the certain ratio of kerosene biodiesel mixture to substituted diesel fuel [9-11].

Materials and Methods:

The biodiesel used in this research produced from waste oil and methanol by transesterification process, in combustion laboratory, mechanical engineering department, University of Technology using biodiesel reactor, made locally by the researcher figure 2. The biodiesel produced is conforms to the ASTM D-6751standard. Kerosene obtained from Al-Dura refinery.

Figure 2: The reactor used to biodiesel products

The mixture of biodiesel with kerosene carried out in the ratios (0:100, 5:95, 15:85, 25:75, 35:65, 50:50). The blending operations conducted by mixing biodiesel with kerosene with certain ratio (5-50%).The mixtures of biodiesel and kerosene were characterized for their properties according to (ASTM) in laboratories of Mechanical engineering department University of Technology . The results were compared with the regulated specification for diesel fuel**.** Alsousing an air blast atomizer burner, was synthesized by the researcher to check a sample of these blending figure (3)

Figure 3: Air blast atomizer burner (left): Flame sample of alternative fuel (right)

Result and Discussion:

The results of specifications for the blending of biodiesel and kerosene are tabled in Table (1).From results density and viscosity of biodiesel blend to kerosene decreases as

addition of kerosene increased. Density affects burner performance because fuel injection pumps meter fuel by volume, not by mass. These parameters are related to combustion process, which is highly dependent on the quality of atomization. From results compared with the specification of diesel fuel, all density results meet the specification requirement of diesel fuel range between 0.815 and 0.870.

Table 1: properties of biodiesel and kerosene mixtures

Proper.	Blending Range							Limits
	0:100	5:95	15:85	25:75	35:65	50:50	100:0	
Density kg/m^3	875	868	861	855	849	837	807	815-870
Viscosity cSt	4.92	4.84	4.25	3.95	3.45	2.76	1.38	2-5
Flash Point C^0	176	135	105	70	66	62	45	Min60 diesel Min100 biodiesel
Cloud Point C^0	4	3	3	1	-2	-4	-	Max 18
Pour Point	2	0	-1	-2	-4	-5	-7	Max 18
Cetane Index	67.4	67.1	65.3	62.1	59.2	52.5	-	48-67

The viscosity of liquid fuel is an important characteristic because it determines the flow through pipelines, injector nozzles. From table (1), it was observed in all viscosity values of blending, Kerosene play a roles to reduce the viscosity of biodiesel.

Flash point of a fuel is the lowest temperature at which the fuel can form an ignitable mixture with air. The characteristic results of flash point values for the biodiesel blended fuels with kerosene are shown in Table (1). The results showed that a decrease in flash point as the kerosene content increased. So the addition of kerosene can enhance the properties of biodiesel by reduce the flash point of biodiesel.

The flash point of biodiesel-kerosene oil blends at all proportions were found to meet the specification requirement of diesel fuel [13].

Cloud point and pour point have been used to characterize the cold flow operability of diesel fuels in the petroleum industry.

The cloud point is a good parameter for quality control in the operation burners in low temperatures [13]. Pour points are useful or a good indicator for characterizing the suitably of a fuel for large storage and pipeline distributions [13].

From results, it was observed that cloud point and pour point decreases as increasing proportion biodiesel-kerosene blend, therefore cloud point and pour point of biodiesel-kerosene oil blends at all proportions were found to meet the specification requirement of diesel fuel. So the addition of kerosene can enhance the properties of biodiesel by reduce the cloud point and pour point of biodiesel.

Kind of oil using to produce biodiesel is very important parameter to determine the cloud and pour point, because saturated oil have higher melting points and temperatures of crystallization and in cold temperature they will crystallize before the mono-unsaturated and polyunsaturated oil [14].

Cetane number is a measure of a fuel's ignition delay. This is the time period between the start of injection and start of combustion (ignition) of the fuel. From results of cetane number values for the biodiesel blended fuels with kerosene are shown in Table 1 showed decrease in cetane number as the kerosene content increased.

The cetane number of biodiesel-kerosene oil blends at all proportions were found to meet the specification requirement of diesel fuel. Cetane number should not be considered alone when evaluating diesel fuel quality. Another properties also very important and should be included such as density, flash point, stability, etc. In colder weather, cloud point and pour point are very important factors.

Conclusion:

From the properties of biodiesel blended with kerosene below the significant conclusions:

1. Using biodiesel produced from waste oil reduced the cost of the substituted fuel.
2. The tested of properties for biodiesel and kerosene mixture meet with diesel fuel specification requirements.
3. Kerosene reduce the characteristics of cold flow of biodiesel.
4. Kerosene improving the quality of biodiesel by reducing flash point therefore can be using these blending in high speed diesel engines.
5. Kerosene additives to biodiesel help to enhance the atomization of biodiesel fuel to get better combustion.
6. Kerosene enhanced chemical and physical properties of biodiesel.
7. For overall blends of biodiesel and kerosene can be using as an alternative fuel instead of diesel fuel.

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