IOSR Journal of Engineering (IOSR JEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
PP 32-35

Production of diesel like Fuel from Waste Lube Oil Used in Microwave Flashed Pyrolysis

Mohd Sharique Ather[1], M. R. Dhawade[2], Noorul Ameen[3], Aakif Anjum[4]
[1,3,4]*(Department of Mechanical Engineering, MMANTC, Mansoora, Malegaon, India)*
[2]*(Department of mechanical Engineering,Dr.Rajendra Gode* Institute of Technology & Research, *Amravati)*

Abstract: *Now days it has been increasing awareness towards alternative fuel. By means of the procedure, some sample DLF are prepared. For increasing energy demand alternative fuel is relatively important. This paper presents a various factors affecting the production of diesel like fuel from waste lube oil by using flashed microwave flashed pyrolysis process. Oil solid waste (OSW) presents challenges and opportunities to societies in spite of their sustainability responsiveness and technological advances. A special emphasis is paid on waste generated from bike engine oil sources, which makes up a great percentage of our daily single-life cycle automobile products. It can also be recognized that the pyrolysis process offers a thrilling way to recuperate both the energetic and chemical worth of the waste oil by generating potentially helpful pyrolysis products appropriate for upcoming reuse. Additionally, this paper has discovered superior performance of the microwave pyrolysis method when compared to additional conventional methods of process, representing that it shows outstanding assure as a means for energy recovery from waste lube oil. Experimental studies on diesel engine are the outcome obtained from the experimental setup. Many researchers are trying to find a new development in the field of alternative fuel. certainly, this technique can decrease costs from imported technology from in a foreign country or produce alternative choice of energy from waste lube oil.*

Keywords: *Diesel-like fuel , emission, greenhouse gas ,Pyrolysis, Waste lube oil*

I. Introduction

WO is signifies a possible source of great significance of fuel and chemical feed stock [1]. During a year 36 million tons of car engine oil has wasted throughout the year in the world which results environmental hazard and disposal problem in a modern scenario [2]. In most of the countries favored disposal option and combustion through pyrolysis process have been reached to recycle this waste [3].Upsurge in energy mandate, severe emission norms and depletion of oil resources have led the researchers to find alternative fuels for internal combustion engines. The resulting pyrolysis gases were condensed into liquid state the yield and composition of the recovered and remaining incondensable gases were determined, and these were compared with the diesel. In this study, our main focus is on finding alternative fuel resources and utilizing them to eliminate their negative effects. Here I exhibit the applicability of microwave pyrolysis to recycle used bike engine oil. Waste oil was thermally cracked in a microwave-heated bed of particulate carbon, from which oxygen was excluded. Now a days rising interest in waste recycling, alternative treatments have been investigated with the aim of recovering both the energetic and chemical value of the WO. Pyrolysis systems have newly shown great potential as an economic and environmentally disposal method for WO [4-5]. Advantages of microwave-heated-pyrolysis have been explained in previous work [5] and will not be repeated here. In this process, WO is mixed with a highly microwave-absorbent material such as particulate carbon; as a result of microwave heating the oil is thermally cracked in the absence of oxygen into shorter hydrocarbon chains. The resulting gaseous products are subsequently re-condensed into pyrolysis oils of different composition liable on the characteristics of the input substances and reaction conditions.

II. Conversion Of Waste Engine Oil

Recycling of the waste lubricant oils and consuming of the products as fuels have become vital topics in current years for researchers. Petroleum resources are the key source for most of the lubricant oil. The used or waste oils can be refined and treated to produce fuels or lubricating oil base stock. On the other hand, the waste oils pose an environmental hazard due to both their metal content and other contaminants [6]. The high-volume waste oils can be turned into valuable fuel products by refining and treating processes. Altering of the waste oils into diesel-like fuels to be used in engines without disposing is very important. Consumption of the diesel-like fuels created from the waste lube oils, and blending of the created fuels reduce in consumption of petroleum based fuels, defending environment from toxic and hazardous chemicals [7]. It also saves of external exchange, decreases greenhouse gas emissions and improves regional development particularly in developing countries [8]. The very important Characteristics of any fuel are from the point of deciding whether the fuel can be used

for preferred application or not. Therefore, some characteristics of the produced diesel-like fuel shows that some of the parameters of density, boiling point, viscosity, flash point and lower heating value are in the standard values of the diesel oil or reasonably close to the standard values. But, sulfur amount is considerably higher than that value. It should be decreased below the value of 50 ppm.Refining and treating processes turned waste oil into the valuable fuel. Without disposing it is very important to Converting of the waste oils into diesel and gasoline-like fuels [09-10]. Use of the diesel and diesel-like fuels formed from the waste lubricant oils, and blending of the formed fuels with gasoline or turpentine reduction in consumption of petroleum based fuels, defending environment from toxic and hazardous chemicals [6]. In developing countries especially for enhance regional development in those countries It also saves of foreign exchange, reduces greenhouse gas emissions.[8].The study of [09-10] the authors used a recycling system for the waste lubricant oil. A recycling system was designed and manufactured in industry to purify waste oil from dust, small continued by increasing the reactor temperature with electronic control unit in order to pass to the distillation process after the pyrolysis process. The vaporized fuel due to heating process was condensed through condenser in which water was used as cooling fluid. After the fuel become liquid, it was stored in fuel storage tank. Properties and distillation of the produced fuel should be tested to determine whether it can be used in a diesel engine or not, and they should also be compared with the diesel fuel commonly used in diesel engines. The produced fuel was segregated into light and heavy fuels according to characteristics and distillation test results, since some amount of the produced fuel was lighter than diesel fuel. That is why it was necessary to segregate the light fuel from the heavy fuel to eliminate detrimental effects of these fuels on an engine.

III. Experimental Setup

The experimental apparatus and technique established and used during this exploration have been defined in detail in previous work [5], though reforms were made to the apparatus to improve the collection and quality of pyrolysis-oils and non-condensable-gases generated from the pyrolysis. Enhancements were reached by installing a mixed-cellulose-ester-membrane filter to remove any metallic solid residues trapped in the pyrolysis-volatiles before they pass through the condensation system. Briefly, microwave-heated pyrolysis of WO was performed in a bell-shaped quartz reactor filled with 1 kg of waste lube oil, which is stirred and heated by a 2 kW microwave oven over a range of pyrolysis temperatures (250 to 700ºC) and purge gas flows to understand the influence of these process conditions on the final pyrolysis oils obtained; N2 purge-gas was vented through the system to maintain the apparatus in an inert nitrogen atmosphere. WO sample was continuously added to the reactor at a constant feeding rate of about 1kg over a period of about 2 hours as soon as the target pyrolysis temperature was achieved. The vaporized fuel due to heating process was condensed through condenser in which water was used as cooling fluid. After the fuel become liquid, it was stored in fuel storage tank. Properties and distillation of the produced fuel should be tested to determine whether it can be used in a diesel engine or not, and they should also be compared with the diesel fuel commonly used in diesel engines. The produced fuel was segregated into light and heavy fuels according to characteristics and distillation test results, since some amount of the produced fuel was lighter than diesel fuel. That is why it was necessary to segregate the light fuel from the heavy fuel to eliminate detrimental effects of these fuels on an engine. Gases, solids, and vapors generated in the pyrolysis reaction, termed generally as pyrolysis volatiles, leave the reactor, and either condenses into pyrolysis oil or is sampled as non-condensable-gases before vented from the system. The yield of residue material, pyrolysis oil, and non-condensable gases were settled down in bell shaped reactor .The reactor is the most central part of the recycling system, since pyrolitic distillation or thermal treatment of the waste oil is performed in the reactor. It has a cylindrical shape with dimensions of 15 cm in diameter and 25 cm in height. It has a capacity that will be able to produce 3 L of fuel. This volume is enough to do all tests, which include characteristics of the fuel, performance and emissions. The reactor was isolated with glass wool with a thickness of 3.5 cm to minimize heat loss from the reactor. It includes a mixer and microwave heating system.Heating Rate should be controlled by control panel.

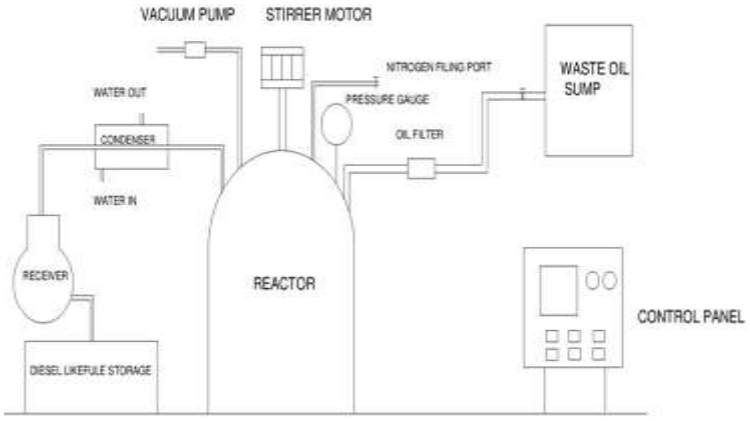

Fig.1. Schematic Diagram of Microwave Pyrolysis Distillation

IV. Results And Discussion

Characteristics of any fuel is very essential as per the point of described application. Hence as a result some of the properties of diesel are shown in the figure no 1, like Density at 15°C (kg/m3) , Viscosity at 40°C (mm2/s), Flash point (°C) Sulfur (ppm), Water (mg/kg), Lower heating value (kJ/kg) , Temperature at 250°C, max. volume (%v/v) , Temperature at 250°C, min. volume (%v/v) and Volume at 95%, max. temperature (°C) in the composition of Diesel .

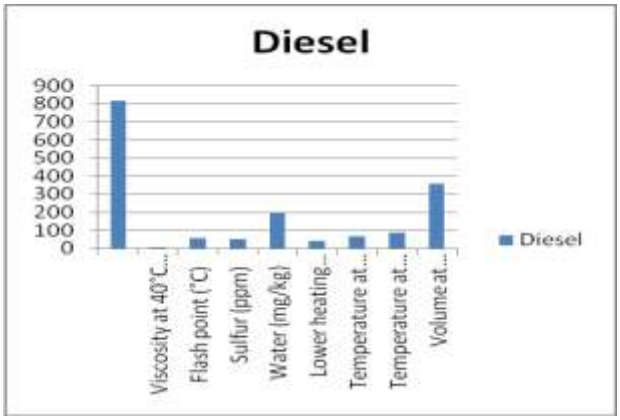

Fig. 2 Properties of diesel

In figure 2 all the respective properties which stated in above figure 1 is consider for diesel like fuel

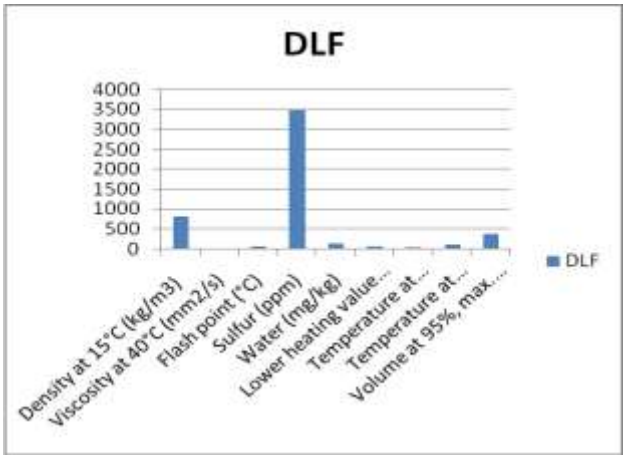

Fig.3 Properties of diesel like fuel

In figure 3comparision of above stated properties are given which shows all properties are nearly equal to the diesel accept sulfur content. In diesel like fule the sulfur content is acceded up to 3500 ppm. It should be decreased below 50 ppm.

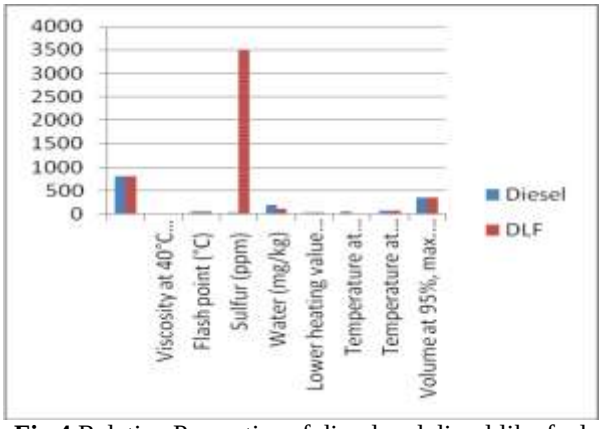

Fig.4 Relative Properties of diesel and diesel like fuel

V. Conclusion

Oil in present-day a major hazard to today's society and environment. Over 36 million tons of oilis dumped into the oceans annually, killing species of oceanic life as well as land pollution and Animal. Though mankind has awoken to this threat and responded with developments in creating degradable oil, there is still no conclusive effort done to repair the damage already caused. In this regard, the catalytic pyrolysis studied here presents an efficient, clean and very effective means of removing the debris that we have left behind over the last several decades. By converting waste lube oil to fuel, we solve two issues, one of the large oil seas, and the other of the fuel shortage. This dual benefit, though will exist only as long as the waste lube oil last, but will surely provide a strong platform for us to build on a sustainable, clean and green future. By taking into account the financial benefits of such a project, it would be a great boon to our economy.

References

[1]. Kim, S. S.; Kim, S. H., Pyrolysis kinetics of waste automobile lubricating oil, *Fuel* **2000,** *79*, 1943-1949.
[2]. Rac A, Vencl A., Ecological and technical aspects of the waste oils influence on environment, *The 3rd International Conference on DIPRE 2012 ,Vol. 12*, 1-7
[3]. Brinkman, D. W.; Dickson, J. R.; Wilkinson, D. , Full-Scale Hydro treatment of Polychlorinated Biphenyls in the Presence of Used Lubricating Oils, *Environ. Sci. Technol.* **1995,** *29*, 87-91.
[4]. Lam, S. S.; Russell, A. D.; Chase, H. A. , Microwave pyrolysis, a novel process for recycling waste automotive engine oil, *Energy 2010, 35*, 2985-2991.
[5]. Lam, S. S.; Russell, A. D.; Chase, H. A. , Pyrolysis using microwave heating: a sustainable process for recycling used car engine oil, *Ind. Eng. Chem. Res. 2010, 49*, 10845-10851.
[6]. Nerin C, Domeno C, Moliner R, Lazaro MJ, Suelves I, Valderrama J, Behavior of different industrial waste oils in a pyrolysis process: metals distribution and valuable products, *J. Anal. Appl. Pyrol. 55:* 2000,171-183.
[7]. Bhaskar T, Uddin MA, Muto A , Recycling of waste lubricant oil into chemical feedstock or fuel oil over supported iron oxide catalysts, *Fuel 83:9e13*, 2004
[8]. Demirbas A, Demirbas I, Importance of rural bioenergy for developing countries, *Energy Convers. Manag. 48*, 2007, 2386-2398.
[9]. Arpa O, Recep Y, Zeki A , Experimental investigation of the effects of diesel-like fuel obtained from waste lubrication oil on engine performance and exhaust emission, *Fuel Process. Technol. 91:* 2010,1241-1249.
[10]. Arpa O, Yumrutas R, Alma MH , Effects of turpentine and gasoline-like fuel obtained from waste lubrication oil on engine performance and exhaust emission, *Energy 35*:, 2010, 3603-3613.