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STUDY ON PROCESSING OF WASTE PLASTIC OIL FROM MICRO PLASTIC WASTE COLLECTION TO PREPARE BIO DIESEL

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Abstract:
The plastic industry, owing to its use in a wide variety of sectors, such as the automotive, construction, electronics, healthcare, and textiles, is amongst the fastest growing markets. In enhancing the standard of living of human beings, plastic plays a vital role. In one way plastic are quoted as key of innovation of many products and in various sectors with the rapid growth of population the demand for consumption of plastics has been increased The fuel prepared is blended with mixtures of oxygenated compounds to test the performance of the fuel. In this work, biodiesel blends (B10, B20, B30, and B40,) And properties of after finding with conventional diesel to analyze whether biodiesel could be used as an alternative fuel in place of conventional diesel in diesel engines.
Keywords: biodiesel , blends properties. Waste Plastic Oil

1.0 Introduction

Plastics have been one of the materials with the speediest development in light of their extensive range of utilizations because of flexibility and relatively minimal effort. Since the span of life of plastic items is moderately little, there is a quick plastics waste stream that achieves every year to the last beneficiaries making a serious natural issue The use of bio fuels in diesel engines was first demonstrated using peanut oil, in 1990, by the inventor of diesel engine, Rudolf Diesel but further development activities were not seriously undertaken due to the availability of petroleum reserves then Depleting nature of fossil fuel reserves and growing environmental and health concerns have paved a way for alternate fuels that are renewable and environmental friendly Biodiesel fuel attracted more attention as an alternative renewable fuel that has a less effect on environment and can be blended with conventional diesel in different proportions to directly use in the existing diesel engines without any modifications. Most of the biodiesel related research works show that biodiesel decrease the effective engine power and PM, HC, COx emissions, except NOx4-20 . Little effort is found in the research of finding engine performance and emission characteristics by varying the blending proportion.. The results showed that all emissions of biodiesel blends were lower than that of conventional diesel, except NOx emissions. Some others26-30 investigated the emission characteristics of various biodiesel blends under different load conditions, and found reduced CO emissions, increased NOx emissions and increased smoke opacity at higher loads. In this research work, biodiesel is produced from mango seed oil through transesterification process and biodiesel blends (B10, B20, B30, and B40,) are prepared. Emissions (CO2, CO, NOx and HC emissions and smoke opacity) of conventional diesel are first obtained in a four stroke diesel engine under different load conditions (0 kg, 4 kg, 8 kg, 12 kg, 16 kg and 20 kg). Emissions of biodiesel blends are, then, obtained. The results are discussed and compared to know whether biodiesel could replace conventional diesel from environmental aspect.

Advantages of bio diesel:

There are many technical advantages of bio diesel fuel:

- It extends engine life and reduces the need for preservation (bio-diesel have good lubricating qualities than fossil fuel)

- It is innocuous to handle, being minor harmful, major bio degradable, and having a higher Flash point,
- It reduces some exhaust emissions (although it may, in some circumstances, advance others).

2.0 LITERATURE REVIEW

Elmo C. Rapsing[1] The study focused on the design and fabrication of a waste plastic oil converter as an effort in finding environment-friendly means of waste recycling. It is an alternative solution to increasing problem of waste disposal by converting waste plastics into a resource **M. Z. H. Khan, M. Sultana [2]** the thermal pyrolysis of mixed plastic leads to the production of fuel oil which is a valuable resource recovery. It also reduces the problem of disposal of waste plastic. In this work, thermal pyrolysis of waste plastic is carried out because use of catalyst is costly and regeneration of catalyst is a difficult task **Mantesh Basappa Khot, S Basavarajappa [3**] In this study, plastic wastes (low density polyethylene) were used for the pyrolysis to get fuel oil that has the same physical properties as the fuels like petrol, diesel etc. Pyrolysis runs without oxygen and in high temperature of about 300°C. **Sheela chakradhari, Gopal Sahu** [4] An engineering approach to improve the overall waste incineration efficiency is to separate pyrolysis from actual combustion and burnout processes of the waste. In industrial scale schemes, external separation requires pyrolysis reactors whilst firing products [5] the waste plastics are depolymerisation, pyrolysis, thermal cracking and distillation to obtain different value added fuels such as petrol, kerosene, and diesel, lube oil etc. Converting waste plastics into fuel hold great promise for both the environmental and economic scenarios. **Gaurav, Madhukar M, Arunkumar [6]** the plastic waste conversion into energy was developed through innovation advancement and extensive research. Since plastics were part of petroleum, the oil produced through the pyrolysis process was said to have high calorific value that could be used as an alternative fuel

3.0 METHODOLOGY:

In this research a closed combustion chamber is employed to heat the waste plastic by the help of electronic heater. The closed combustion chamber is made air tight with the help of covering lid. a pipe of suitable diameter is fitted on the lid up the transparent plastic bottle .the transparent plastic bottle is also made air tight so that the flue gases should not be leaked. Transparent plastic bottle is half filled with water; above the water level a tap is provided to collect the fuel from the combustion chamber

Preparation of west plastic oils:

The apparatus consists of a reactor-furnace system in which the furnace temperature was maintained constant using a PID controller. At the outlet of reactor, a condenser was attached to condense the vapours coming out of it. The condensed liquid was collected in a collecting jar at the end of condenser. The plastic shreds is filled in a reactor of 300 ml and the reactor is kept in the furnace for heating at constant temperature, where the maximum yield of liquid product is obtained. When the reaction starts, vapours coming out of reactor through the provided outlet are condensed in a condenser. Water is circulated as a cooling medium in the condenser via a pump as shown in figure The condensed vapours are collected in a container as the liquid product whereas there is some amount of non-condensable gases which are simply left out

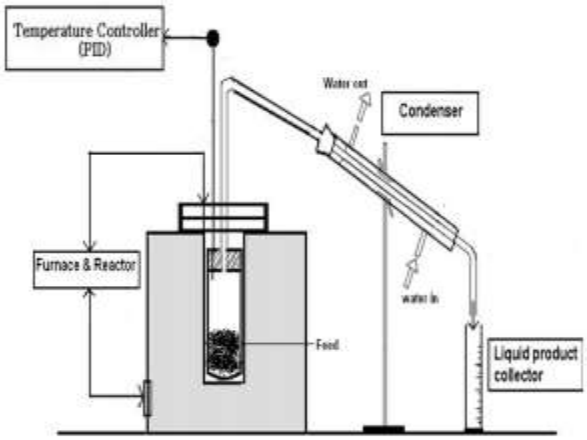

Fig: Extraction process setup for plastic oil.

The liquid product collected contains oily water and liquid-oil. Oily water is basically water with some dissolved hydrocarbons. Oily-water and liquid-oil is further separated by difference in their density.

4.0 EXPERIMENTAL ANALYSIS:

The main aim of the experimentation is to check feasibility of biodiesel in C.I. engine fuelled with diesel-biodiesel blends with more fractions and 100% biodiesel. This work on engine performance and emission in second phase, optimizing work for finding the optimum diesel-biodiesel blend properties.

Blends preparation procedure:

The preparation biodiesel blends was dried finally to be ready to use. This biodiesel is proportionally mixed with the conventional diesel to make biodiesel blends (B10, B20, B30, B40, and B50). The emissions tests were conducted in a single cylinder, four-stroke, diesel engine, attached to a brake drum diameter with spring-loaded adjustments. The engine load was varied, from 0 kg to 20 kg with 4 kg increments, by changing the position of rope adjustments. The exhaust pipeline was connected to a smoke detector and a flue gas analyzer, capable of detecting smoke opacity and emissions level of COx, NOx and hydrocarbons. A burette attached contains the test fuel, either conventional diesel or biodiesel blends. The experiment was started by filling conventional diesel fuel in the burette. The engine was started with no load and was allowed to run a while to reach its rated speed of 1500 rpm. Fuel consumption per minute, torque, emissions and smoke opacity were noted. The engine was operated under no load for the first 20 minutes and for each load the engine was operated long enough to stabilize the condition From the observed readings, from the different parameters

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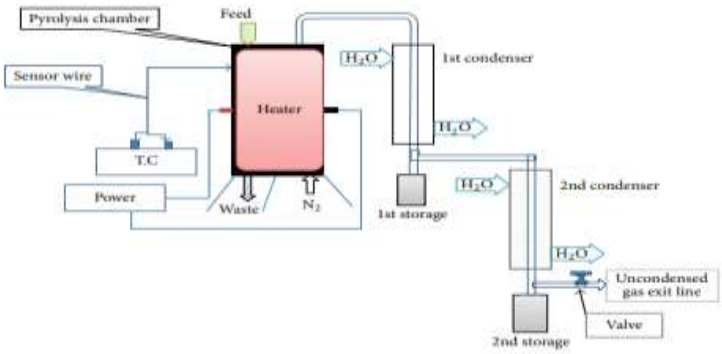

Figure: Schematic representation of experimental setup.

4.0 RESULTS:

Engine performance and emission characteristics of unmodified biodiesel fueled diesel engines are highly influenced by their ignition and combustion behavior. In this study, emission and combustion characteristics were studied when the engine operated using the different blends (B10, B20, B30, and B40)

Different Bio diesel blends properties:

Property	Reference diesel	B10	B20	B30	B40
Flash point °C	68	75	86	97	110
Kinematic viscosity 40°C, mm^2/s	3.18	3.21	3.26	3.31	3.35
Density 15°C, kg/m^3	832	835	839	843	848
Calorific value MJ/kg	44.8	43.6	42.2	41.7	40.3

It has been observed that the brake thermal efficiency for all test fuel is increasing with the increase in applied load. It happens due to a reduction in heat loss and increase in power developed with increase in load BTE of all the blendings is higher than diesel except few loads reason is the calorific value .Calorific value of pure Diesel is higher as compared to all blendings

Conclusion:

To analyze the performance combustion and emission characteristics of diesel – plastic oil blends on diesel engine. However, there are other issues such as kinetics of plastic oil, effects of combustion improvers and engine modifications that are to be considered for in depth analysis of combustion using plastic oil blends. In this work, emissions characteristics were investigated for various biodiesel blends derived from vegetable oils to test whether biodiesel blends are really a better alternative fuel to environment compared to conventional diesel. Biodiesel was first produced from vegetable oil and the biodiesel blends of B10, B20, B30, and B40, were prepared. Emission tests were conducted for conventional diesel and biodiesel blends, in a four stroke diesel engine. B10 and B20 show comparatively less emissions compared to that of B30, and B40 However, NOx emission is more in all biodiesel blends compared to that of conventional diesel. NOx emissions rise to higher values from B10 to B40 more rapidly and this could be a serious problem in biodiesel production, especially, when the market for biodiesel is increasing. Thus, it is concluded that biodiesel may now be considered as a good alternative fuel as it is renewable, but it cannot be considered as a complete solution to replace conventional diesel unless technological improvements are developed to reduce NOx and other emissions.

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