Introduction

Pyrolysis process becomes an option of waste-to-energy technology to deliver bio-fuel to replace fossil fuel. The advantage of the pyrolysis process is its ability to handle unsorted and unused plastic. The pre-treatment of the material is easy. Plastic is needed to be sorted and dried. Pyrolysis is also nontoxic or non-environmental harmful emission unlike incineration. In this investigation, plastic waste (poly propylene) are utilized for pyrolysis to get fuel oil that has comparable physical properties as the energizes like petroleum, diesel and so on. Converting waste plastics into fuel hold great promise for both the environmental and economic scenarios. The heat loss was very high leading to low conversion efficiency. In this electric heater as source of heat enclosed in a ceramic blanket insulator which reduced the heat loss and increased the efficiency.

The performance study for the different blends of the plastic oil was been tested on twin cylinder 4-stroke engine and it was found that the performance parameters such efficiency & emission was within marginable limit. The Project deals with the extraction of oil from the waste plastics termed as plastic pyrolysed oil which can be marketed at much cheaper rates compared to that present in the market.

OBJECTIVES

- To build up the reason for the improvement and execution of waste plastics reusing with the use of environmentally sound technologies (EST). To advance asset protection and ozone depleting substances
- To reduce the dependency on gulf countries for fossil fuels, thereby contributing to the economic growth of the country.
- To collect the household plastic waste from different places.
- To develop and fabricate the pyrolysis unit to produce liquid fuel from plastic waste. To purify the produced liquid fuel by water washing method.
- To conduct the different experiments to determine the different properties of liquid fuel.
- Compare the properties of liquid fuel with diesel fuel.

Methodology

The plastic chips were washed, dried, and fed into a pyrolysis reactor unit. The pyrolysis reactor used in this process was in cylindrical chamber. The reactor was placed inside the electric heater. The heater has a capacity of 3Kw which is insulated by glass wool

Distillation process

About 250ml of fuel is poured in a round bottom flask and mounted on a heater. The temperature of heater is maintained at around 70 degree Celsius with the help of thermostat. Water in and water out is provided for condensation.

Performance Test setup & Exhaust Gas Re-Circulation

The experimental test system is as exposed in the below diagram. It includes 4-stroke, 4- cylinder diesel engine is to be tested for performance, is couple to hydraulic dynamometer with swinging field dynamometer and with load all by
universal coupling. The engine is water cooled. The course of action is made for the accompanying estimations of
the setup. The complete frame and instrumentation is mounted on anti-vibration mounts and separate control panel

Results and Conclusions

Comparison Of Fuel Properties

<table>
<thead>
<tr>
<th>Sl. NO.</th>
<th>Properties</th>
<th>Plastic Oil</th>
<th>Petrol</th>
<th>Diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Density (Kg/m$^3$)</td>
<td>760</td>
<td>740</td>
<td>832</td>
</tr>
<tr>
<td>2</td>
<td>Calorific value (KJ/Kg)</td>
<td>47528.55</td>
<td>45800</td>
<td>45500</td>
</tr>
<tr>
<td>3</td>
<td>Kinematic viscosity (m$^{2}$/s) @ 40°C</td>
<td>$1.99 \times 10^{-6}$</td>
<td>$2.1 \times 10^{-6}$</td>
<td>$2.5 \times 10^{-6}$</td>
</tr>
<tr>
<td>4</td>
<td>Flash Point (°C)</td>
<td>28</td>
<td>29</td>
<td>48</td>
</tr>
<tr>
<td>5</td>
<td>Fire Point (°C)</td>
<td>32</td>
<td>33</td>
<td>55</td>
</tr>
</tbody>
</table>

Comparison table for different blends

<table>
<thead>
<tr>
<th>Sl no</th>
<th>Data</th>
<th>Diesel</th>
<th>For B10 blend</th>
<th>For B20 Blend</th>
<th>For B30 Blend</th>
<th>For B40 Blend</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Load</td>
<td>10.7</td>
<td>10.7</td>
<td>10.73</td>
<td>10.74</td>
<td>10.74</td>
</tr>
<tr>
<td>2</td>
<td>Speed in rpm</td>
<td>1821</td>
<td>1810</td>
<td>1814</td>
<td>1807</td>
<td>1791</td>
</tr>
<tr>
<td>3</td>
<td>Brake power in KW</td>
<td>7.28</td>
<td>7.24</td>
<td>7.25</td>
<td>7.22</td>
<td>7.16</td>
</tr>
<tr>
<td>4</td>
<td>Specific fuel consumption in kg/KW.hr</td>
<td>0.27</td>
<td>0.25</td>
<td>0.25</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td>5</td>
<td>Brake thermal efficiency in %</td>
<td>32.0</td>
<td>32.9</td>
<td>39.90</td>
<td>37.71</td>
<td>31.65</td>
</tr>
</tbody>
</table>

we can conclude that pyrolysis of plastic into fuel can solve both the problem of plastic waste management as well as
shortage of fossil fuel if plant is set up at the commercial level. The parametric study for the different blends of distilled
plastic oil such as B10, B20, B30 and B40 we tried out of which B20 give the best results in terms of efficiency,
economy and emissions.

The LDPE plastic was heated in a closed atmospheric conditions by sequential pyrolysis technique such as
higher bond of carbon hydrogen atom at broken down into simpler molecules and the resulting oil was separated and
the following properties were measured flash point, fire point, density, viscosity, calorific value and specific gravity
and it is tabulated and the Comparative Study Was Performed In Blends Of Oil.

Scope of Future Work

1. It can be used as alternate source of fuel in diesel engines.
2. It can be used as a fuel in diesel generators.
3. It can be used for heating in sugar industry, steel industry, etc.
4. It can be used for heating boilers.
5. The application of this project could help in reducing the dependency on the gulf countries and promote a
step towards innovation.
6. The waste plastic after distillation can be reused for construction purpose can be mixed there and the
research also carried out for converting into ink.
7. Different catalyst can be tried out which can enhance the power output and within the suitable emission
limits.
8. Different materials for the reactor can be utilized which has high thermal conductivity at the core and utilise
for enhancing the efficiency of the reactor.
9. Power loss equipment and more of electronic components such as solenoid motors and actuators can be
used for further research work.

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