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Waste Plastic Diesel

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Abstract: **The art of refining liquid hydrocarbons (crude oil) into diesel, gasoline, and fuel oils was commercially scaled decades ago. Unfortunately, refineries are technologically limited to accepting only a very narrow range of liquid hydrocarbons with very specific properties and minimal contaminates. Unrecyclable, hydrocarbon-based waste is a significant environmental problem increasing every year. According to the Environmental Protection Agency's 2010Facts and Figures report, over 92% of waste plastic is not recycled and with a growth rate of approximately 8% per year, there exists a critical need for a viable and environmentally sound, general purpose hydrocarbon-based recycling process. Hydrocarbon streams that fall outside of accepted refinery standards have traditionally been land filled or melted into products of low value. Environmental concern and availability of petroleum fuels have caused interests in the search for alternate fuels for internal combustion engines. Conversion of waste to energy is one of the recent trends in minimizing not only the waste disposal but also could be used as an alternate fuel for internal combustion engines. Waste plastics are indispensable materials in the modern world and application in the industrial field is continually increasing. In this context, waste plastics are currently receiving renewed interest. In the present paper waste plastic pyrolysis oil, waste plastic pyrolysis oil of petrol grade and diesel grade and its blend with diesel and petrol respectively has been introduced as an alternative fuel. In this study, a review of research papers on various operating parameters have been prepared for better understanding of operating conditions and constrains for waste plastic pyrolysis oil of both grade fuel and its blends fuelled in compression and spark ignition engine.**

Keywords: **Bio Diesel; Plastics; Pyrolysis process.**

1. INTRODUCTION

Plastics have become an indispensable part in today's world, due to their lightweight, durability, energy efficiency, coupled with a faster rate of production and design flexibility, these plastics are employed in entire gamut of industrial and domestic areas hence plastics have become essential materials and their applications in the industrial field are continually increasing. At the same time, waste plastics have created a very serious environmental challenge because of their huge quantities and their disposal problems[1]. Instead of biodegradation, plastics waste goes through photo-degradation and turns into plastic dusts which can enter in the food chain and can cause complex health issues to earth habitants, through the thermal treatment on the waste plastic the fuel can be derive[2], by adopting the chemical process such as Pyrolysis can be used to safely convert waste plastics into hydrocarbon fuels that can be used for transportation[3].

The process is really simple, it is similar to how alcohol is made. If you heat plastic waste in non oxygen environment, it will melt, but will not burn. After it has melted, it will start to boil and evaporate, you just need to put those vapors through a cooling pipe and when cooled the vapors will condense to a liquid and some of the vapors with shorter hydrocarbon lengths will remain as a gas. The exit of the cooling pipe is then going through a bubbler containing water to capture the last liquid forms of fuel and leave only gas that is then burned. If the cooling of the cooling tube is sufficient, there will be no fuel in the bubbler, but if not, the water will capture all the remaining fuel that will float above the water and can be poured off the water. On the bottom of the cooling tube is a steel reservoir that collects all the liquid and it has a release valve on the bottom so that the liquid fuel can be poured out. This device works on electricity (3 phase), it has six nichrome coils as heating elements and consumes a total of 6kW (1kW each coil). The coils are turned on and off by

three solid state relays, one for each phase, the relays are controlled by a digital thermostat with a temperature sensor just a bit below the lid, so that the vapor temperature can be monitored. You need to heat the plastic slowly to about 350 degrees and just wait till it does the magic. The process takes about 4 hours, but it can be shortened considerably by tweaking the design a bit. As I said, this makes a liquid fuel that can be used as multifuel, that means it can be used on diesel engines and also on gasoline engines, but we still need to test it will work on gasoline. It works for diesel engines just fine, that has already been tested.

2. CONCLUSION

The conclusion of this study is that plastic waste beside its negative impact for the environmental, it is has a beneficial impact as synthetic fuel. Synthetic fuel is more alike to diesel fuel according to its FBP and density. This synthetic fuel is friendlier than diesel fuel and it is viable to be use in diesel vehicles.

• Engine fuelled with waste plastic pyrolysis oil exhibits higher thermal efficiency up to 75% of the rated power for diesel engine.

• The exhaust gas temperature for waste plastic pyrolysis oil is higher than diesel engine performance.

• Unburned hydrocarbon emission of waste plastic pyrolysis oil is less than that of diesel for the different load.

• The NOx emission in waste plastic oil for diesel grade fuel of plastic oil varies from 192 ppm to 1268 ppm.

• CO emission increased by 5% in waste plastic oil compared to diesel operation.

• The CO2 concentration increases with increase in load, due to incomplete combustion

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