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PLASTICS INTO FUEL CONVERSION

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ABSTRACT

Plastics have woven their way into our daily lives and now pose a tremendous threat to the environment. Over a 100million tones of plastics are produced annually worldwide, and the used products have become a common feature at overflowing bins and landfills. Though work has been done to make futuristic biodegradable plastics, there have not been many conclusive steps towards cleaning up the existing problem. Here, the process of converting waste plastic into value added fuels is explained as a viable solution for recycling of plastics.

Thus two universal problems such as problems of waste plastic and problem of fuel shortage are being tackled simultaneously. In this study, plastic wastes 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 which is why a reactor was fabricated to provide the required temperature for the reaction. The waste plastics are subjected to 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.

I. INTRODUCTION

Plastics are an integral part of our modern life and are used in almost all daily activities. Since plastics are synthesized from non-renewable sources and are generally not biodegradable, waste plastics are the cause of many of the serious environmental problems the world faces today. However, waste plastics can become a source of enormous energy with the correct treatment.

In recent years, huge amounts of waste plastic are available in municipal solid waste (MSW) and many places. With an annual increase rate of approx 50%, in 1995, the production of plastic in the world had reached 150 million tons.

According to information the yield of waste plastic is 100 million tons.

Various type waste plastic use now a days. Established technology can convert waste plastics into a renewable source of hydrocarbon fuel.

This technology plans to acquire waste plastics from City / Local Municipalities and Recycling Facilities. For plastic fuel production purposes the plastics can be collected as commingled or separated into different categories.

Another source of large amounts of waste plastic is floating on our oceans and seriously damaging the ecosystem and the environment.

A new set of emerging technologies is helping to convert non-recycled plastics into an array of fuels, crude oil and industrial feedstocks. ... Then the non-recycled plastics (or residuals) are shipped to a plastics-to-fuel facility, where they are heated in an oxygen-free environment, melted and vaporized into gases.

II. METHODOLOGY

Pyrolysis process for conversion of waste plastic into fuel Pyrolysis is the chemical decomposition of organic substances by heating the word is originally coined from the Greek-derived elements pyro "fire" and lysys "decomposition". Pyrolysis is usually the first chemical reaction that occurs in the burning of many solid organic fuels, cloth, like wood,and paper, and also of some kinds of plastic.

Anhydrous Pyrolysis process can also be used to produce liquid fuel similar to diesel from plastic waste. Pyrolysis technology is thermal degradation process in the absence of oxygen. Plastic waste is treated in a cylindrical reactor at temperature of 300ºC – 350ºC.

Now a days plastics waste is very harmful to our nature also fo human beings .plastic is not easily decomposable its affect in fertilization, atmosphere,mainly affect on ozone layer so it is necessary to recycle these waste plastic into useful things .so we recycle this waste plastic into a useful fuel.

The first successful oil well in North America was established in Oil Springs, Ontario, Canada in 1858. The field is still in production although quantities are low.

The history of the petroleum industry in the United States goes back to the early 19th century, although the indigenous peoples, like many ancient societies, have used petroleum seeps since prehistoric times; where found, these seeps signaled the growth of the industry from the earliest discoveries to the more recent.

Petroleum became a major industry following the oil discovery at Oil Creek Pennsylvania in 1859. For much of the 19th and 20th centuries, the US was the largest oil producing country in the world. As of October 2015, the US was the world's third-largest producer of crude oilIndians had known of the oil in western Pennsylvania, and had made some use of it for many years before the mid-19th century. Early European explorers noted seeps of oil and natural gas in western Pennsylvania and New York. Interest grew substantially in the mid-1850s as scientists reported on the potential to manufacture kerosene from crude oil, if a sufficiently large oil supply could be found.

Gasoline was around before the invention of the internal combustion engine but for many years was considered a useless byproduct of the refining of crude oil to make kerosene, a standard fuel for lamps through much of the 19th century.

III. COMPERISION LDPE OIL WITH PETROL AND DIESEL OIL

Fuel properties	LDPE	PETROL	DIESEL
Density	530.35 kg/m3	711 to 737 kg/m3	820 to 900 kg/m3
Viscosity	0.652 poise	1.5 to 4 poise	1 to 3.97 poise
Specific gravity	0.655	0.82	0.81 to 0.96
Flash point (°C)	24	22	26
Fire point (°C)	28	25	29
Cloud point (°C)	Below 0	1 to 3	2.5 to 4
Pour point (°C)	-2 ° C	-4 to -20	-2 to-12
Colour	Pale yellow	Brown transparent	Dyed blue

IV. EMISSION CHARACTERISTICS

An experimental study on diesel grade fuel of waste plastic oil show that, Unburned hydrocarbon varies from 36ppm at low load to 58 ppm at full load, It is noticed that the concentration of the hydrocarbon of waste plastic oil is little higher than diesel the reason behind increased unburned hydrocarbon in waste plastic oil is may be due to higher fumigation on rate and non availability of oxygen relative to diesel.

Diesel has emission of hydrocarbon on 57% and the waste plastic emission characteristics on 63% , Co2 varies from 2.40% volume. at low load to 7.60% volume. at full load for different blends, An experimental study on diesel grade fuel of waste plastic oil is co2 varies from 0.08% volume. at low load to 0.10% volume, at full load for different blends. Here the CO2 emission of waste plastic oil is higher than diesel. The reason behind increased CO2 emission is incomplete combustion due to reduce in cylinder temperatures.

V. LIMITATIONS

1.High Carbon monoxide emissions compared to that of currently available diesel in the market.

2.High emissions at lesser loads compared to that of higher load working engines.

3.For efficient use of diesel grade fuel of waste plastic, blending it with normal diesel is necessary.

VI. RESULT AND DISCUSSION

By heating the close combustion chamber with heater of two thousand Watts

A temperature range of 200 to 350 degree Celsius we get approx 560 ml fuel oil.By heating of combustion about 45 minutes the layer of oil appears on the water level. After two hour we get 500 ml of fuel oil. By using 10 ml of this fuel in 100 cc Bajaj Discover bike its runs bike one minute, at average speed of 45 km/h. it is concluded that the waste plastic Pyrolysis oil represents a good alternative fuel.

VII. CONCLUSION

By using this fuel oil in 100 cc Bajaj Discover bike it increases effeciecy of bike by 15 to 20% as compared to petrol used in the bike.

Engine fueled with waste plastic oil exhibits higher thermal efficiency.

By comparing the density of HDPE oil with petrol its gives approximately same value. Also comparing the density of LDPE oil WITH diesel oil its gives approximately same value. It could be concluded, that thermal pyrolysis of plastic waste leads to the production of fuel oil, valuable resource recovery and reduction of waste problem.

Thermal pyrolysis of waste plastic waste has also several advantages over other alternative recycling methods. It has been shown that the conversion at lower temperature in the presence of catalyst into liquid is a feasible process.

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