POLYFUEL

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Abstract— Plastic is one of the most important and daily required things. Plastic helps us a lot such as we use plastic to brush are teeth, we use plastic to fix bone, and in many more. Since plastic is very cheap and light in weight it is therefore mostly preferred thing. The paper basically is showing the possibility of obtaining fuel from the plastic materials waste recycling and also the comparison of the obtained results with those specific to commercial diesel fuels. This concept of recycling is a priority in countries with an important technological breakthrough and having at the same time major concern related to environment protection. If processing is rigorously controlled by the pyrolysis of plastic polymeric materials following the thermal degradation reaction one can obtain at the final:

1) A gaseous blend which contains saturated and unsaturated hydrocarbons.
2) A liquid that contains a mixture of saturated and unsaturated and unsaturated hydrocarbon.
3) A solid residue that contains mainly carbon.

The liquid phase having properties close to the diesel fuel that can be used as fuel for Diesel engines

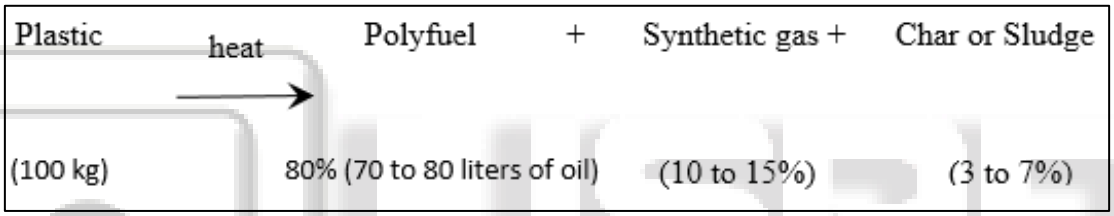
Keywords: Poly-fuel, plastic

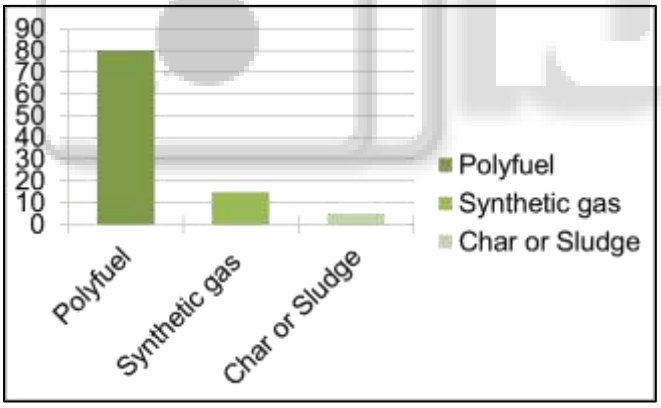
I. INTRODUCTION

A. Pyrolysis:

The frequency at which molecules vibrates is directly proportional to the temperature of molecules. During pyrolysis the largely molecules of plastic is breakdown into smaller molecules. Plastic is hard to breakdown and we have to break it down with the help of catalyst. Catalyst is a chemical which speed up the reaction and it does not get involved in it.

Process reaction:





B. Plastic

Plastics is the term commonly used to describe a wide range of synthetic or semi-synthetic materials that are used in a huge and growing range of applications. Everywhere you look, you will find plastics. We use plastic products to help make our lives cleaner, easier, safer and more enjoyable. We find plastics in the clothes we wear, the houses we live in, and the cars we travel in. The toys we play with, the screens we watch, the IT tools we use and medical equipment we benefit from all contain plastics.

Plastics are organic materials, just like wood, paper or wool. The raw materials used to produce plastics are natural products such as cellulose, coal, natural gas, salt and, of course, crude oil.

The term ‘’plastic’’ is derived from the Greek word "plastikos", meaning fit for molding. This refers to the material’s malleability, or plasticity during manufacture, which allows it to be cast, pressed, or extruded into a variety of shapes - such as films, fibres, plates, tubes, bottles, boxes, and much more.

C. Crude Oil

Crude oil is a naturally occurring, unrefined petroleum product composed of hydrocarbon deposits and other organic materials. A type of fossil fuel, crude oil can be refined to produce usable products such as gasoline, diesel, and various other forms of petrochemicals. It is a nonrenewable resource, which means that it can't be replaced naturally at the rate we consume it and is, therefore, a limited resource.

- Crude oil is the raw natural resource that is extracted from the earth and refined into products such as gasoline, jet fuel, and other petroleum products.
- Crude oil is a global commodity that trades in markets around the world, both as spot oil and via derivatives contracts.
- Many economists agree that crude oil was and remains the single most important commodity in the world as it is the primary source of energy production.

D. Crude oil to plastic process:

The journey petroleum takes to become a plastic product is fascinating. There are 8 different steps it takes for petroleum to become plastic.

1) First, the petroleum is drilled and transported to a refinery.

2) Crude oil and natural gas are refined into ethane, propane, and hundreds of other petrochemical products. Of course, fuel for your car is refined through crude oil.
3) Ethane and propane are "cracked" into ethylene and propylene, using high-temperature furnaces.
4) A catalyst is combined with ethylene or propylene in a reactor, resulting in "fluff." Fluff is a powdered material (polymer) resembling laundry detergent.
5) Fluff is combined with additives in a continuous blender.
6) The polymer is fed to an extruder where it is melted.
7) Melted plastic is cooled then fed to a pelletizer that cuts the product into small pellets.
8) Pellets are then shipped to customers and manufacturers.

E. Plastic to crude oil:

1) Collection of waste plastic from people from there society.
2) Separate the waste plastic into different categories depending upon the type. (the plastic scrap which is collected can hard or soft it can be done on the its type 1, 2 , 3 and soon).
3) Then the cleaning of the dust is done with the help of blower.
4) Now the plastic is put in aglo machine where it is shredded and small granules of plastic is formed.
5) This help to melt the plastic easy and the process become faster.
6) Now, the granules of plastic is put is reactor with catalyst zeolite.
7) The catalyst increases the speed of reaction without getting involve in the reaction.
8) The whole process is done in absence of oxygen (i.e., anaerobic process).
9) The burner is on and between 150 to 200`C plastic starts to melt.
10) 380 to 400`C plastic depolymerizes into oil which is further filtered and stored in containers and some in bottles.
11) The gas which is released is flammable and the is stored in cylinders.
12) The which is stored in cylinder is filtered since some of the harmful gases' dioxins and many more.
13) The carbon black which is left at the end is used in road material and is also stored carefully.

F. Effect of Temperature on Product Yield:

The products are separated into gas, oil, and char residue by pyrolysis of waste plastic. About 38.5% of WPPO was obtained at temperature 330°C. The oil percentage increased constantly to 76.0% at 425°C. The gases produced through plastic pyrolysis consist principally of hydrogen (H_2), carbon dioxide (CO_2), carbon monoxide (CO), methane (CH_4), ethane (C_2H_4), and butadiene (C_4H_6), with trace amounts of propane ($CH_3CH_2CH_3$), propene ($CH_3CH{=}CH_2$), n-butane ($CH_3(CH_2)_2CH_3$), and other miscellaneous hydrocarbons.

II. ADVANTAGE:

1) Waste plastic could be used as fuel after pyrolysis.
2) The fuels produced from pyrolysis do not contain Sulphur.
3) The waste plastic to fuel conversion plant produces clean fuel which does not need further cleaning.
4) Eliminates hazards of land pollution by waste plastic.
5) The end products can be used for generating electricity.
6) The cost of the fuel formed is very less.
7) Easy to store and transport.
8) The Sulphur contain produced is very less.

III. DISADVANTAGE:

The only disadvantage is that it requires some energy at the beginning for conversion.

IV. COMPARISON OF DIESEL AND WASTE PLASTIC FUEL:

Property	Waste plastic oil	Diesel
Density at 300C in gm/cc	0.8355	0.840
Ash content, %	0.00023	0.045
Gross calorific value (kJ/jg)	44.340	46.500
Kinematic viscosity. Cst at 40C	2.52	2.0
Cetane number	51	55
Flash point, °C	42	50
Fire point, °C	45	56
Carbone residus, %	82.49	26
Sulphur content, %	0.030	0.045
Distillation temperature, °C at 58%	344	328
Distillation temperature, °C at 95%	362	340

V. APPLICATION OF FUEL PRODUCED FROM PLASTIC:

1) Fuel is utilized in heavy oil generators for generating electricity.
2) Used in refining factories for additional processing.
3) It also serves as heating material in variety of process.
4) This fuel can be used in many factories for e.g., electricity, ceramic industries among other to facilitate the production processes.

VI. CONCLUSION

The Converting the waste plastic into liquid fuel resolves the two problems simultaneously i. e. Plastic waste recycling and the fuel demand in developing countries. The waste plastic cracking can be done easily by using the low-cost catalyst like zeolite. Fuel yield can be raised by varying the process parameters. This fuel was found to be similar to the commercial diesel used in automobiles. So, this fuel which is termed as "Polyfuel" can be an alternative

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