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Thermo Fuel

Virendra Pal Singh[1], Nitish Kumar[2], S.P. Madnawat[3]
[1]*Department of Chemistry, Neelam College of Engineering & Technology, Agra – 283122, Uttar Pradesh, India*
[2]*Department of Mechanical Engineering, Neelam College of Engineering & Technology, Agra – 283122, Uttar Pradesh, India*
[3]*Department of Chemistry, R.B.S. College, Agra, Uttar Pradesh, India*

Abstract: ***Now a day the increasing levels of technology, the recent decade's maintenancebecome a challenging task among theengineers. Saving economy has become the task of highestpriority in our generation. Environmental degradation and depletion of oil reserves are matters of great concern around the world. Developing countries like India depend heavily on crude oil. Diesel being the main transportation fuel in India, finding a suitable fuel alternative to diesel is an urgent need. Waste plastic pyrolysis oil is suitable for compression ignition engines and more attention is focused in India because of its potential to generate large-scale employment and relatively low environmental degradation. Plastics have now become indispensable materials in the modern world and application in the industrial field is continually increasing. The properties of the oil derived from waste plastics were analyzed and found that it has properties similar to that of diesel. In this Waste plastics from municipal solid waste were collected. It was being sorted based on the types like (HDPE, LDPEand PVC etc.) They were graded into nearly uniform size by crusher, cutter & shredder. The graded feed was heated just to melt it so that extraneous impurities such as hard metal, clay, sand, glass etc. settles in the bottom of the melter, which was removed periodically. Engine fueled with waste plastic oil exhibits higher thermal efficiency upto 80% of the full load and the exhaust gas temperature was higher at all loads compared to DF operation. In this paper we briefly discuss replacement of diesel with waste plastic fuel oil and its effect on the engine performance.***

Keywords: Waste Plastic, Diesel Engine, Pyrolysis, Thermal Efficiency, Liquefaction, Condensation.

I. INTRODUCTION

Waste plastic has become a very serious environmental problem due to increase use of plastic. Waste plastic being non degradable possess disposal problems and also it cannot be easily recycled and it results in it quality degradation during recycling. Plastic waste goes through total photo degradation and turns into plastic dust which enters in food chain and causes complex health issues to Habitats. Waste plastic is mostly dispose in landfills and sea which results in land pollution and water pollution.The art of conversion of plastic to useful fuels was scaled but there was narrow possibility towards this. Plastic contains large majority of organic polymers which are made up of carbon and other elements. It is made up of large link of repeat units. Various processes like gasification, pyrolysis can be used to convert plastic which is longer hydrocarbon into smaller units of hydrocarbon like naphtha, diesel etc. Thermo fuel is a process of converting waste selected plastic into useful fuel. The process which we are using for conversion of waste plastic is Pyrolysis. Pyrolysis is process of chemical decomposition of any organic material at relative temperature in absence of oxygen. Many researchers have been done on this with and without the use of catalyst. Plastics are ―one of the greatest innovations of the millennium and have certainly proved their reputation to be true. There are a numerous ways that plastic is and will be used in the years to come. Waste plastics contribute to great environmental and social problems due to the loss of natural resources, environmental pollution, depletion of landfill space on the one hand and demands of environmentally-oriented society on the other hand. The fact that plastic is lightweight, doesn't rust or rot, low cost, reusable and conserves natural resources is the reason for which plastic has gained this much popularity.

A. Conversion Methods For Thermofuel

There are two methods of conversion of plastic into fuel as follows:

1) Pyrolysis (without O_2)
2) Random Depolymerisation (with O_2)

B. Pyrolysis

Pyrolysis is the process of thermal degradation of plastic without oxygen. Where we heated the plastic in a chamber. Due to absence of oxygen plastic is directly convert into the gas which gases we are cooled by suitable method. For this process we need temperatures about 350^{o}C to 500^{o}C which can be reduced by suitable catalyst.

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II. SELECTION OF PLASTIC

Resin	Thermo Fuel System Suitability
Polyethylene (PE)	Very Good
Polypropylene (PP)	Very Good
Polystyrene (PS)	Very Good (Gives ExcellentFuel Properties).
ABS Resin (ABS)	Good. Requires Off-Gas Counter Measure.
Polyvinylchloride(PVC)	Not Suitable, Should BeAvoided.
Polyurethane (PUR)	Not Suitable, Should BeAvoided.
Fiber ReinforcedPlastics(FRP)	Fair. Pre-Treatment RequiredTo Remove Fibers.
PET	Not Suitable, Should BeAvoided.

A. Experimental Procedure

The Pyrolysis is an advanced conversion technology that has the ability to produce a clean high calorific value hydrocarbon from waste plastic. The detailed procedure is given below:

1) Take 1 kg of waste plastic(LDPE, HDPE) cut it into small piece and dry it.
2) The waste plastic is put inside the reactor after drying.

Fig.: Experimental Setup of Thermo Fuel.

3) The rector must design to with stand high temperature about 350^{o}C to 500^{o}C.
4) It has an inlet at the top for collecting the vapours.
5) Start the burner for heating the reactor and measure the temperature. When the temperature reaches 150^{o}C the vapours start to come down to the condenser. The heating is continued for about 1-2 hours. After 2 hours the plastics are decomposed.
6) At the time large carbon molecules are break into smaller molecules.
7) The top reactor inlet is connected with the spiral condenser where the vapours are condensed. Finally the fuels from condensed vapours are collected.
8) Approximately 500-600ml of thermo fuel will be collected from per kg of the waste plastic.

Initial Reactor | **Final Reactor**

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Successful Working Condenser

III. COLLECTION OF LIQUID FUEL

As the plastics are reduced, the gases are collected and cooled, yielding liquid fuel. This liquid fuel or crude oil is a complex mixture that has to be separated in a fraction chamber to form gasoline and diesel.

IV. APPLICATIONS

A. The distillate is designed to operate in a diesel engine where it is injected into the compressed, high-temperature air in the combustion chamber and ignites spontaneously. Thermo Fuel is perfectly suited to any standard application.

B. Thermo Fuel is extremely high in lubricity. In diesel engines some components like fuel pumps and injectors are lubricated by the fuel, so good lubricity is a key element in reducing wear on these parts.

V. CONCLUSION

Thermo Fuel is a truly sustainable waste solution, diverting plastic waste from landfills, utilizing the embodied energy content of plastics and producing a highly usable commodity that is more environmentally friendly than any conventional distillate. The Thermo fuel system converts these waste plastics into high-grade "green" distillate fuel.

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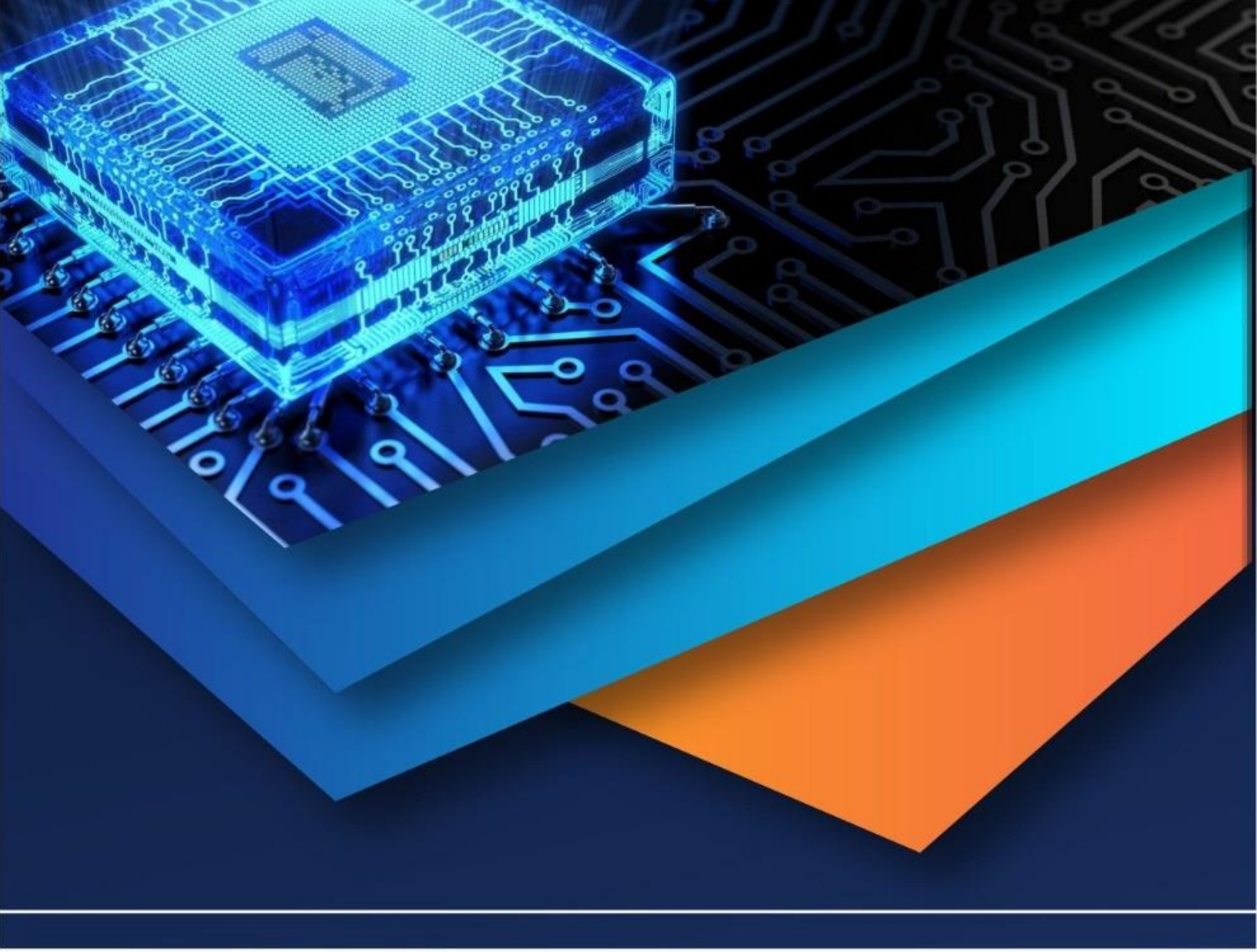

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