National Conference on
"Role of Engineers in Nation Building" organized by VIVA Institute of Technology, Mumbai
(6th and 7th March 2020)
International Journal of Engineering Research & Science (IJOER)
ISBN:[978-93-5391-287-1] ISSN: [2395-6992] [Vol-6, Issue-3, March- 2020]

Preparation of diesel from plastic

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Abstract*—Plastic recycling has become an important issue in today. The waste plastic is produced in large amount. The study focus on the design and fabrication of a machine or setup to convert plastic waste into fuel as a means of waste recycling by means of a process called pyrolysis. It is a solution to problem of waste disposal. These discarded plastic are melted and evaporated first in the reactor up to 400 to 500 degrees. Then this heated plastics evaporates in absence of oxygen which turns it into vapour form. The vapour is then moved to a glass condenser. The condenser is to be selected as a glass type as it has low cost and also it won't react with the vapour of plastics and help it in cooling. After condensation the liquid fuel is collected in the receiver tank and the waste gas is taken out. The diesel fuel is than collected in a container from the receiver tank. The properties of obtained fuel is compared with standard properties.*

Keywords—diesel,environment, fuel, plastic, pyrolysis, waste

I. INTRODUCTION

Plastics are basically long hydrocarbon chained organic compounds synthesized from petroleum products. They came across 1862 and become popular in short time because of their wide usability in daily life. Their consumption has been occurring rapidly due to their ability to be simply formed, its light weight and non-corrosive nature. They are inexpensive, easy to store and transport, readily available and hence their usage is increasing which is not good for our environment as well as for us. We all know that plastic is not biodegradable and landfilling is not a suitable option for disposing plastic wastes because of their slow degradation rates and their remains they cause localized flooding, spoils soil and groundwater, affects animal life etc. Because of this factors, various regional and national governments have banned plastics.

As their disposal is the main concern of government nowadays, various recycling and recovering methods have been used to minimize the environmental impacts and to reduce the damage of plastic wastes. Out of them pyrolysis is one of the promising method to recycle waste plastics which involves heating of plastics at elevated temperatures such as 400-600 degree Celsius in the absence of oxygen in a closed container and then cool it by using a condenser to produce fuels. The output we get can be divided into liquid fraction, gaseous fraction and solid residues. Catalysts such as y-zeolite or natural zeolite are used for better results and to improve the quality of the products. The plastics are of different types such as PP (polypropylene), PE (polyethylene), PS (Polystyrene), HDPE (high density polyethylene), LDPE (low density polyethylene), PVC (polyvinyl chloride) etc.

II. PROBLEM DEFINATION

2.1 Problem statement: -

The use of plastics has become one of the biggest environmental problems, as plastic waste does not degrade or degrades at a very slowly which leads to continuous accumulation in landfills. So there must be some ways to get rid of these large amount of plastics in order to transform it into some useful contents. Pyrolysis is one of the process by which we can convert plastic waste into diesel. Pyrolysis is heating of the plastics in absence of oxygen in order to produce fuel. Heated in absence of oxygen as to

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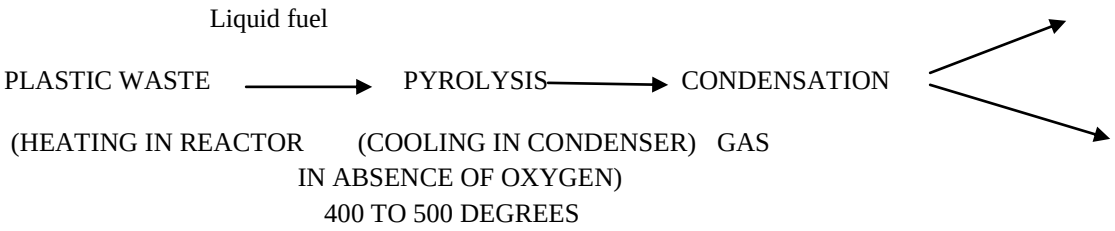
prevent it from burning. Adding various types of catalysts may also increase and improve the process. Thus two universal problems that are problems of plastic waste and problems of fuel shortage will be tackled.

2.2 Objectives: -

1. To convert the plastic waste into diesel
2. By using pyrolysis process and proper condensing plastic can be converted into diesel
3. The main objective is to turn the massive plastic waste that is present into some useful purpose.
4. To develop and fabricate the pyrolysis unit to produce liquid fuel from plastic waste.
5. Compare the properties of diesel fuel produced

III. PROPOSED METHOLOGY

3.1 Pyrolysis process



3.2 Process flow:-

1) Collection and segregation of plastic
2) Feeding plastic into reactor
3) Heating of plastic in absence of oxygen
4) Moving of liquid vapour into condenser
5) Condensation of vapour in glass condenser
6) Collection of liquid in collector tank

IV. MATERIAL

4.1 Various Parts Material and Types

TABLE 1
TYPES OF PLASTICS TO BE USED AND ITS APPLICATIONS

Parts	Material / Type
Outer Tank, Reactor Tank	Mild steel
Condenser	Borosilicate Glass
Heater	Nichrome Ceramic Heater
Pipes	Stainless Steel
Temperature Controller	SELEC TC513
Temperature Sensor	J Type Thermocouple
Siemens Power Contactor	Air Break Power Contactor

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TABLE 2
TYPES OF PLASTICS TO BE USED AND ITS APPLICATIONS

Type Of Plastics	Use
POLYESTER	Textile Fiber.
PET (polyethylene terephthalate)	Carbonated Drink Bottle, Plastic Film.
PE (polyethylene)	Supermarket Bags, Plastic Bottles.
HDPE (High density polyethylene)	Milk Jugs, DetergentBottle, Thicker Plastic Film, Pipes.
PVC (poly vinyl chloride)	Agriculture (Fountain) Pipe, Guttering Pipe, Window Frame, Sheet For Building Material.
PS (polystyrene)	Foam Use For Insulation Of Roof And Wall, Disposal Cups, Plates, Food Container, Cd And Cassette Box.
PP (polypropylene)	Bottle Caps, Drinking Straws, Bumper, House Ware, FiberCarpeting And Rope.

V. EXPERIMENTAL SETUP

The setup consist of a reactor tank, the outer tank, stainless steel pipes for transfer of medium, glass condenser, heating element and the electrical parts. The plastic is heated in the reactor tank by use of the heater. The heater used is a 3000 watt 230V

heater. The heater consist of magnetic stainless steel ceramic and Nichrome material. It reaches up to the maximum temperature of 450 degree Celsius. The outer tank and the reactor tank material is mild steel. The condenser used is of glass material. The condenser is Borosilicate Glass Condenser Graham type 500mm Long. The sensor used is M8 J type thermocouple with stainless steel as main sensing element. The wires used are 1.5mm 2.5mm and 3mm core wires. The insulation used is….

For electrical circuit a contactor, MCB, sensing element and temperature controller is used. The temperature controller is selec TC513 series with maximum controllable limit as 500 degree Celsius.

5.1 Electrical Circuit :-

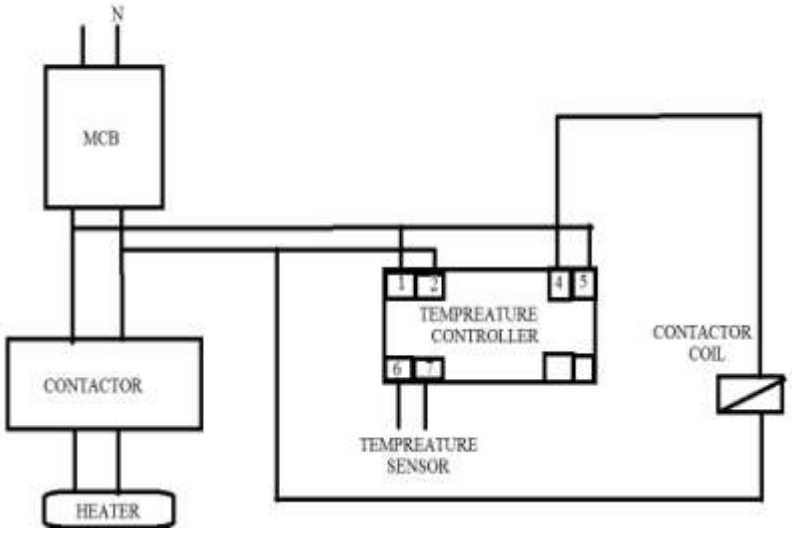

FIGURE 1:Heater and sensor connections circuit

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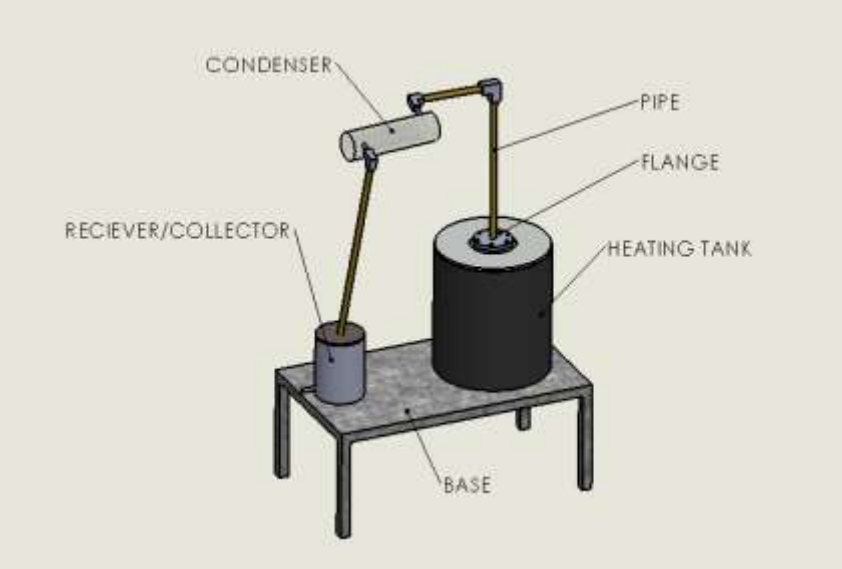

FIGURE 2:Solid model of the setup

VI. CONCLUSION

In this we tried to focus on the process known as pyrolysis to convert plastic waste into useful forms with the least possible components and cost. The process involves heating of polymeric material under atmospheric pressure using inert atmosphere. The types of plastic studied for are PP, PS, PE, PVC, PET, HDPE, LDPE, etc. After the trial we successfully generated the vapour by heating the oxygen in absence of oxygen. We found that these vapour of plastic are flammable. The vapour when lighten up provides burning effect. Further these vapour will be cooled in condenser to form fuel.

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