

“Design and Fabrication of Setup for Plastic Waste to Useful Products”

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ABSTRACT

Plastic is form by Artificial in laboratory by using polymerization reaction hence its decomposition is very difficult waste plastic are only to reuse reprocessed in following application like waste plastic is converted into fuel , bricks, constriction of flexible pavement , road constriction etc. In the world waste plastic management cost is around \$2800/ton. In the design and fabrication of useful products used plastic Pyrolysis process for conversion of waste plastic into fuel after the process some molten form of plastic remaining this used for manufacturing high strength plastic bricks. The Pyrolysis reaction is done in a presence of catalyst and activated charcoal at 300-350°C.

Keyword: - plastic pyrolysis, plastic bricks high strength

1. Plastic waste and Problems:-

Plastic is material which are not decomposed after damage it well be only to reuse hence plastic is major problem for environment and human following are problems:

- According to a recent study performed by the Environmental Protection Agency (EPA) approximately billion of tons of waste plastic are generated in the world every year.
- Statistics show that approximately 10% of this plastic is recycled, 25% is incinerated and the remaining 65% is dumped in landfills.
- The cost of waste plastic management is around \$2800/ton of waste plastics.
- After burning of plastic it release harmful gases which affect on environment and human being.

1.1 Definition of Plastic:-

Plastic are polymer. Its definition of a polymer is something made of many units. Polymer are chain of high molecular weight substance usually are made of carbon, hydrogen , oxygen and silicon. Together all process known as polymerization process.

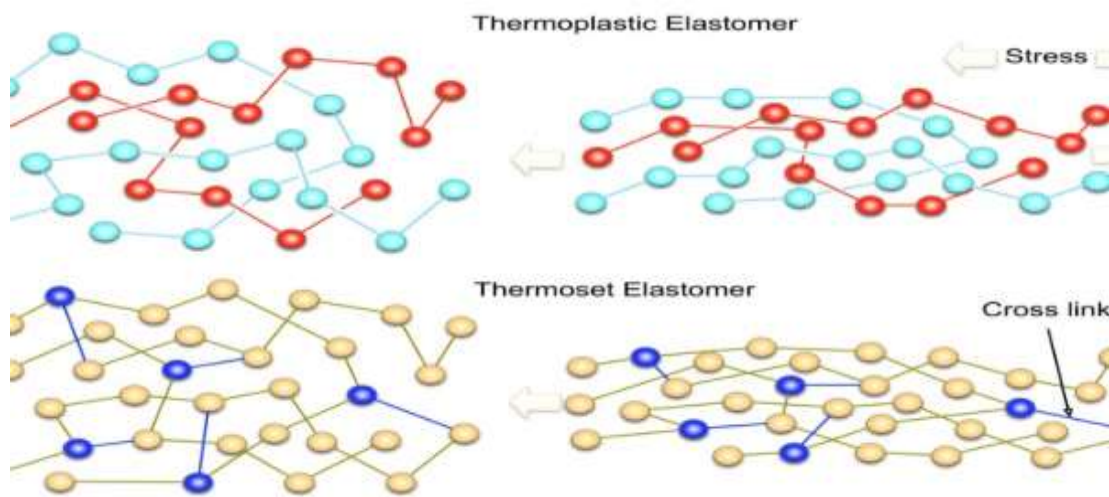
1.2 Types of plastic:

a) **Thermosetting polymer :-**

Harden permanently when heated. Covalent cross links (10-50% of) formed during heating. Cross linking hinder bending and rotation. Thermoset are harder, dimensionally stable, and more brittle than thermoplastic.

b) Thermoplastic polymer :-

Thermoplastic became soft when it will get heated, that is it will become hard when it is cool and become soft when it is heated reversibly. At elevated temperatures inter chain bonding is weakened allowing deformation at low stresses. Most of the thermoplastic is of linear polymers and some branched Structures.



1.3 Type of waste plastic :-

- i. Industrial plastic waste.
- ii. Municipal plastic waste.
- iii. Medical plastic waste.

1.4 Defining the problem :-

- Now a day by day resource of crude oil reduces and so it also increases cost of fuel.
- Alternative to the crude oil.
- Most of people all over the world use plastic products and due to this environmental pollution increases.

2. The pyrolysis/ Thermal degradation:-

The waste plastic is sorted based on the physical properties such as hardness, softness, films etc. Size reduction is carried out using shredder and cutter and graded to uniform size. The graded feed is mixed and fed to the melting vessel through a pre heater feeder and heated to 174-250 C. The impurities such as clay, metal, glass etc. settles at the bottom and sent to water column for separation of HCl gas and gaseous hydrocarbons. The molten plastic is send to main reactor which is maintained at (300-350) C and atmospheric pressure. The reaction takes place in presence of coal and catalyst to convert the molten plastic into hydrocarbons. The gaseous hydrocarbon shell be condensed and separated into liquid and gas streams.

2.1 Comparison between regular gasoline and plastic waste fuel:-

Properties	Regular gasoline	Plastic waste fuel
Colour, visual	orange	Pale yellow
Specific gravity at 280C	0.7423	0.7254
Specific gravity at150C	0.7528	0.7365
Gross calorific value	11210	11262
Net calorific value	10460	10498
API gravity	56.46	60.65
Sulphur content (by mass)	0.1	<0.002
Flash point 0C	23	22
Pour point 0C	<-200C	<-200C
Cloud point	<-200C	<-200C

Table -1: Comparison between regular gasoline and plastic waste fuel

2.2 Plastic bricks manufacturing:-

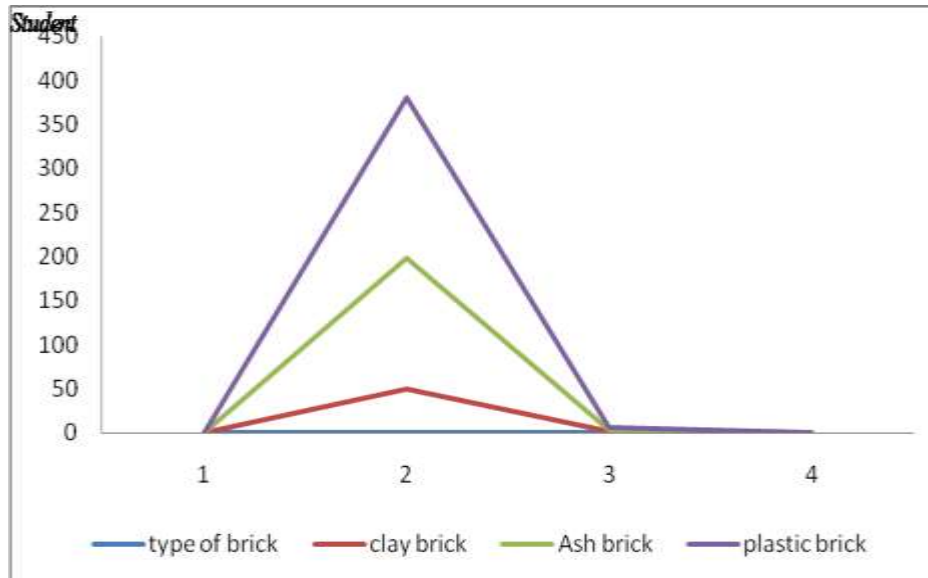
Step1: All waste plastic are collected and heated up to melting point of plastic in furnace.

Step2: Equal grain size sand is mixed with molten form of plastic and steer continuously.

Step3: All molten heated material is put in to the mould.

Step4: 40 to 60 minutes set and to form hard high strength brick are collect from mould



Fig.2.2 Plastic bricks**3. Compression strength comparison graph between clay, ash, and plastic bricks****Fig.3 Load Vs compression strength****4. CONCLUSIONS**

According to the current statistics, there is continuous rise of consumption and thus cost of petroleum oil, although there has been a temporary drop in demand growth due to the international financial crisis. International Energy Outlook 2008 reports the world consumption of petroleum oil as 84 million barrels per day and that of natural gas as 19 million barrels oil equivalent per day. This way, the oil and gas reserve available can exhausted only in upcoming years. On the other hand, the utility of plastics cannot be reduced due to its wide field applications and thus results in increase in plastics waste.

The amount of different plastic wastes produced may be well treated with suitably designed method to produce plastic bricks and fuel from residual plastic by adding some catalyst. This method of utilizing waste plastic should be superior in all respects such as ecological and economical aspects. It would also take care of hazardous plastic waste and reduce the load on import of crude oil. The analysis of different methods described in paper indicate mechanical recycling is widely adapted method by different countries, however gradually the catalytic pyrolysis of plastic to fuel is gaining momentum and being adopted in different countries recently due to its efficiency over other process in all respects.

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