

# UTILIZATION OF WASTE PLASTIC TO ELECTRICITY USING PYROLYSIS PROCESS

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**Abstract** - The Project is based on disposing plastic waste and converting it in form of electrical energy. In this paper, design and development of waste plastic to useful electricity is presented. Professional assemblies which are generally developed makes them quite expensive and in feasible for low budget applications. One important process of such systems is that of pyrolysis. Around the world, one million plastic drinking bottles are purchased every minute, while up to 5 trillion single-use plastic bags are used worldwide every year. In total, half of all plastic produced is designed to be used only once and then thrown away.

In this work various parameters to design and manufacture are studied. This model is hence developed by overall optimizing these parameters. Finally what amount of plastic would produce how much electricity would be looked upon? So in this project we aim to utilize this thrown plastic usually treated as waste to produce useful amount of "ELECTRICITY" along with "CARBON BLACK" and majorly pyrolysis oil when further treated can be used as "FUEL"

**Key Words:** Plastic Waste, Pyrolysis, Carbon Black, Mechanical Energy, Electrical Energy.

## 1. INTRODUCTION

India generates 1, 00,000 metric tons of waste per day. In these waste, plastic is found in abundant amount. Plastic is essential part of the human life but at the same time has some ill effects on environment. In urban life, waste management plays important role. As a developing country, the demand of energy is rising day by day which results in electric supply shortage. With depleting non-renewable resources and increasing demand there is an urgency to find alternative. To overcome on this serious matter, it was necessary to find out alternative means of production of energy.

## 1.1 MOTIVATION

The current load shedding in the country has worst effects in our daily life. As a developing country, there is more demand of electricity.

In urban region, waste production is huge and it is necessary to manage waste. Hence, to solution for the current scenario is generating energy and other usable product by treating the waste in optimum way. The plastic disposed on daily basis is either recycled or is being dumped on dumping ground. The recycling process is not implemented on large scale as it requires extra efforts and cost. Thus dumping is preferred (in sea or open ground). This dumped plastic is burned without safety openly on ground as plastic degradation takes 1000's of years. Having said this machine will not only reduce this hazardous waste but will also be implement in useful energy formation in short period of time.

## 1.2 HISTORY

Plastic pollution is caused due to the accumulation of the waste plastic material in the environment. Plastic is a non-bio-degradable substance. It doesn't get disposed of in the soil or water and its effect is worse when burnt. It is thus a challenge to dispose it off. It remains in the environment for hundreds of years and causes air, water and land pollution. It is hazardous for the humans, animals as well as the plants. Several animals, birds and marine creatures die due to plastic pollution each year. All they need to do is to gather these and throw them away. However, little do they realize that this waste is not disposed of so easily? It continues to remain in the environment and harm us adversely. It is high time we must realize the harmful effects of plastic pollution and contribute our bit towards bringing it down.

### 1.3 ABOUT THE MACHINE

This portable, compact unit uses basic working principle that is to convert municipal solid waste to energy. The uniqueness of our machine is it utilizes 100% waste that is in order to ignite plastic instead of using non-renewable sources like coal or kerosene we prefer using pallets, biomass, paper, coconut shells etc. Adding on, electricity produced can be stored through stabilizer to batteries.

### 2. WORKING

The Portable unit's aims to utilize plastic waste (which is non-degradable & space occupying) to a useful form of energy. Along with energy production, we also obtain pyrolysis oil and carbon black as by-products. This is done by using pyrolysis process.

#### 2.1 HEATING CHAMBER

The cylindrical shaped chamber with a manhole through which we can introduce our input waste material. Below heating chamber, all the necessary arrangements are done for heating. This chamber is heated up to 180 to 200 °C. We use municipal dry waste to attain required temperature.

#### 2.2 PYROLYSIS CHAMBER

The pyrolysis process is carried out here using anti-oxidant "ZEOLITE (ZSM5)". This anti-oxidant is used because it yields maximum gaseous output which is required for the project. Also it is cost effective and easily available. The chamber gets gaseous substance as an input from the heating chamber and later on by adding anti-oxidant all the oxygen content is vanished.

#### 2.3 TURBINE AND GENERATOR

A turbine is arranged in such a manner that all the output discharge is directly imparted on the turbine by using a nozzle arrangement. Once the required amount of pressure is build up the valve is manually opened so that the pressure is released on the buckets of the turbine causing it to rotate with more R.P.M. The generator converts the mechanical energy to electrical energy. Further, we can use stabilizer to get constant energy supply and store it in battery unit.



**Figure -1:** Assembled Model Unit

### 3. METHODOLOGY

1. After the overall idea of the project was decided the designing stage began with sketching of basic design & then the main design was started. A total of 3 design prototypes were made.
2. After design was ready and materials were decided, we went for procurement of required materials, parts and components. The MS hollow pipes were bought pre-cut for required dimensions.
3. All the safety valves and nozzle components were bought and checked to see if in working order
4. Fabrication of the main body included processes such as drilling, welding, and brazing and grinding was later assembled. Later it was ensured that all joints are leak proofed.
5. Additional safety and nozzle valves were fitted.
6. The model was now tested and readings (voltage and ampere) were noted. During the first run if any problems faced were noted down & rectified immediately.
7. Few more test runs were carried out before finalizing the project.

#### 4. CONCLUSIONS

The portable unit uses waste plastic as input to utilize it effectively to generate electrical energy, carbon black and further pyrolysis oil. The problem of shortage of electricity is also resolved to some extent. Though it is time consuming but it is economical and compact size is comfortable to use in every working condition.

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