

# DESIGN AND FABRICATION OF WASTE MANAGEMENT SYSTEM BY INCINERATION TECHNIQUE

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**Abstract** - Incineration is a waste treatment process that involves the combustion of organic substances contained in treatment". Incineration of waste materials converts the waste into ash, flue gas, and heat. The waste materials Incineration and other high temperature waste treatment systems are described as "thermal ash is mostly formed by the inorganic constituents of the waste, and may take the form of solid lumps or particulates carried by the flue gas. The flue gases must be cleaned of gaseous and particulate pollutants before they are dispersed into the atmosphere. In some cases, the heat generated by incineration can be used to generate electric power. The main parameters to be studied are stability under irradiation, swelling, fission gas release and chemical interactions in the fuel. Finally an incinerator is a unit or facility used to burn trash and other types of waste until it is reduced to ash.

**Keywords:** Incineration, thermal treatment, flue gas, irradiation, combustion, ash, organic substances, pollutants

## 1. INTRODUCTION

The first incinerators for waste disposal were built in Nottingham by Manlove, Allott & Co. Ltd. in 1874 to a design patented by Albert Fryer. They were originally known as destructors. Incineration with energy recovery is one of several waste-to-energy (WtE) technologies such as gasification, pyrolysis and anaerobic digestion. While incineration and gasification technologies are similar in principle, the energy product from incineration is high-temperature heat whereas combustible gas is often the main energy product from gasification. In some countries, incinerators built just a few decades ago often did not include a materials separation to remove hazardous, bulky or recyclable materials before combustion. Incinerators reduce the solid mass of the original waste by 80–85% and the volume (already compressed somewhat in garbage trucks) by 95–96%, depending on composition and degree of recovery of materials such as metals from the ash for recycling. Incineration can be used for treatment of clinical wastes and certain hazardous wastes where pathogens and toxins can be destroyed by high temperatures.

## 1.1 SOLID WASTE MANAGEMENT:

Solid waste is the unwanted or useless solid materials generated from combined residential, industrial and commercial activities in a given area. It may be categorized according to its origin (domestic, industrial, commercial, construction or institutional); according to its contents (organic material, glass, metal, plastic paper etc.); Management of solid waste reduces or eliminates adverse impacts on the environment and human health and supports economic development and improved quality of life. A number of processes are involved in effectively managing waste for a municipality. These include monitoring, collection, transport, processing, recycling and disposal.

## 1.2 WASTE REDUCTION AND REUSE

Waste reduction and reuse of products are both methods of waste prevention. They eliminate the production of waste at the source of usual generation and reduce the demands for large scale treatment and disposal facilities. Methods of waste reduction include manufacturing products with less packaging, encouraging customers to bring their own reusable bags for packaging, encouraging the public to choose reusable products such as cloth napkins and reusable plastic and glass containers, backyard composting and sharing and donating any unwanted items rather than discarding them. All of the Methods of waste prevention mentioned require public participation. In order to get the public onboard, training and educational programmes need to be undertaken to educate the public about their role in the process. Also the government may need to regulate the types and amount of packaging used by manufacturers and make the reuse of shopping bags mandatory.

## 2. WORKING PRINCIPLE

In our experiments, commercialize available shredded domestic wastes were procured and washed before pyrolysis. One of the most favorable and effective disposing method is pyrolysis, which is environmental friendly and efficient way. Pyrolysis is the thermal degradation of solid wastes at high temperatures in the absence of air (and oxygen). As the structure of products and their yields can be considerably modified by catalysts, results of pyrolysis in the absence of catalyst

were presented in this article Pyrolysis of waste plastics was carried out in an indigenously designed and fabricated reactor.

2D diagram shows the scheme of the process involved in the experiments and the photograph of the experimental set up respectively. Domestic wastes had been procured from the commercial source and stored in a raw material storage unit. Raw material was then fed in the reactor and heated by means of electrical energy. The yield commenced at a temperature of 350°C. The gaseous products resulting from the pyrolysis of the domestic waste is supplied through the copper tube. The water can be heated by the copper tube. This heated water will be used for various purposes. Then the burned domestic waste gas condensed in a water cooled condenser to liquid fuel and collected for experiments.

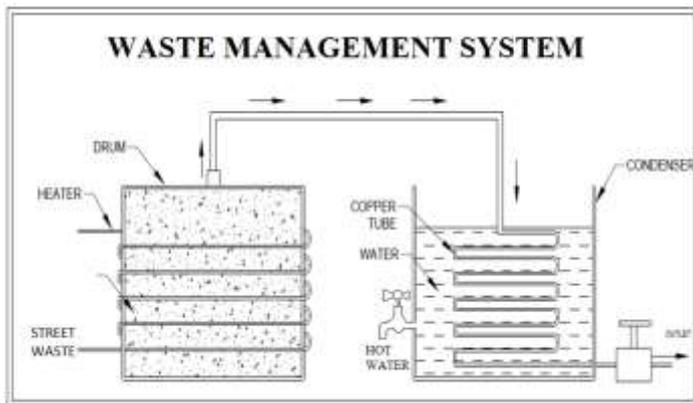


Fig 1 – Waste Management System

### 3. MATERIAL DESCRIPTION:

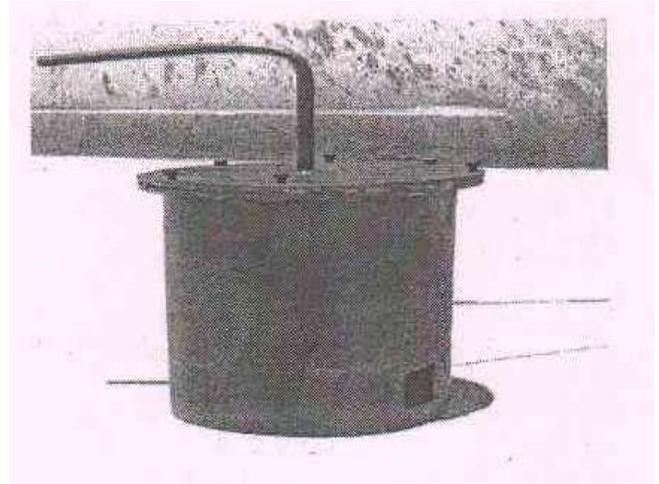
#### 3.1 REACTOR

This is a stainless steel tube of length 145mm, internal diameter 37mm, outer diameter 41mm sealed at one end and an outlet tube at the other end. The reactor is placed inside the furnace for external heating with the raw material inside for internal heating. The reactor is heated by electrical heating to temperature of about 500°C and more.



#### 3.2 FURNACE

The furnace provides the heat the reactor needs for pyrolysis to take place, it has a thermocouple to control the temperature. A furnace is a device used for high-temperature heating. The name derives from Greek word Fornax, which means oven.



#### 3.3 CONDENSER

It cools all the heated vapour coming out of the reactor. It has an inlet and outlet for cold water to run through its outer area. This is used for cooling the vapour. The gaseous hydrocarbons at a temperature of about 350°C are condensed to about 30-35°C.

In systems involving heat transfer, a condenser is a device or unit used to condense a substance from its gaseous to its liquid state, by cooling it. In so doing, the latent heat is given up by the substance, and will transfer to the condenser coolant. Condensers are typically heat exchangers which have various designs and come in many sizes ranging from rather small (hand-held) to very large industrial-scale units used in plant processes.



### 3.4 HEATING ELEMENT

A heating element converts electricity into heat through the process of resistive or Joule heating. Electric current passing through the element encounters resistance, resulting in heating of the element. Unlike the Peltier Effect this process is independent of the direction of current flow.

### 3.5 COPPER TUBES

Copper tubing is most often used for supply of hot and cold tap, and as refrigerant line in HVAC systems. There are two basic types of copper tubing, soft copper and rigid copper. Copper tubing is joined using flare connection, compression connection, or solder. Copper offers a high level of corrosion resistance, but is becoming very costly.



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