

Removal of Flue Gases from Domestic Incinerator

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Abstract- *Every year, the average citizens of our country produces about half tone of waste, thus waste management is essential. Old waste management system based in the collection of mixed/sorted waste and transporting it a long way to disposal site has a significant negative impact on the environment and humans. Due to this the society requires some advance technique for waste management. The project is introducing a device which completely destroys the waste material namely Domestic Waste Incinerator which is an electric device. It contains a coil which is used to increase the temperature of the waste material and its surrounding. The project is to destroy the domestic waste by using pollution free device with no pollution and zero contact with human for health and hygiene. The device destroys the waste material by combustion process. During combustion process, the waste material is heated up to high temperature. This will convert the waste material into ash and some flue gases may release. The flue gases will harm the environment. Hence, to neutralize the flue gases, wet scrubber is used. This arrangement will make the device pollution free. The neutralized flue gases will pass through the chimney and then releases to the atmosphere. This will reduce the waste material as well as manual work and makes the environment healthy.*

Indexed Terms- *Wet scrubber, incinerator, flue gases, dioxin, and pollution free.*

I. INTRODUCTION

As the standard of living increases the quantity of waste generated also increases. The most effective way of dealing with this problem is to reduce amount of waste generated by using incinerator. In recent years incineration of solid waste has become era of the most widely used alternative of waste management by aid of combustion of both organic and inorganic solid waste categorized as municipal solid waste, bin medical waste, hazardous solid waste[1]. This process

is considered as strategic operation for waste reduction and disposal. Incineration is also described as a thermal treatment process. However, incineration does have its problem and one of the major and serious threads towards the environment and the society is the emission of the gases. Incineration is a process which is used to destroy organic waste by thermal oxidation of all the hazardous constituents in the waste [4]. In domestic incinerator waste material is burnt at temperature of 800°C to 1400°C. After burning the flue gases are exhausted and ash is collected in the tray. Due to burning of waste material at such high temperature some gases produce which causes pollution.

II. PROBLEM DEFINATION

The incineration process have major and serious problem towards environment as it releases flue gases. These gases causes pollution as well as it may affect human life. The gases contain oxides of nitrogen, and Sulphur, carbon dioxide, fine dust, hydrogen fluoride, toxins, such as dioxins, furans etc. Dioxins are serious by product which may destroy the immune system of human body and interface with the hormone regulation [2]. They can cause problem with reproduction, development, & immune system. They can also interrupt hormones & lead to cancer. Carbon dioxide is a toxic gas which increases the earth temperature and global warming. Increase in percentage of carbon dioxide in air causes melting of snow and hence there are increase in sea water level. Hydrogen fluoride immediately converts to hydrofluoric acid, which is highly corrosive and toxic. Exposure requires immediate medical attention. It can cause blindness by rapid destruction of the corneas. Sulphur dioxide affects the respiratory system, particularly lung function, and can irritate the eyes. Sulphur dioxide irritates the respiratory tract and increases the risk of tract infections. It causes coughing, mucus secretion and aggravates conditions such as asthma and chronic bronchitis. As we know

these gasses are harmful for the environment so it is necessary to destroy or remove these gasses before going to the environment.

III. METHODOLOGY

Flue gases can be neutralize by continuous sprinkling the solution of water & NaOH. First the waste material comes in primary chamber in which heating element is present which burns the waste material at a temperature of 800°C to 1400°C. After burning the gases are transferred to wet scrubber in which there is a solution of water and NaOH is present. There is a pump at the end of the scrubber which circulates the solution of water and NaOH. When gases enter to scrubber the solution of water and NaOH is sprinkle on the gas with the help of nozzle. When solution gets in contact with gases the gases get filtered.

IV. COMPONENTS

In air pollution control system there are three components wet scrubber, spray nozzle, pump as explained below.

1. Wet scrubber

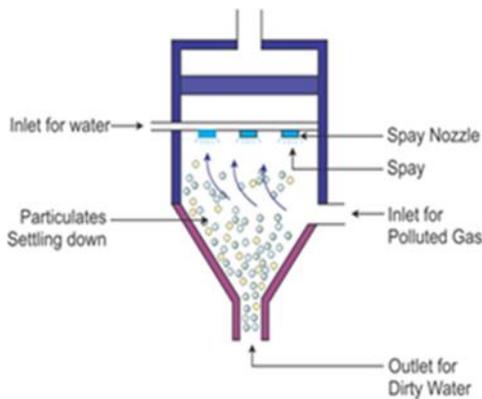


Fig 1.Wet scrubber

The main component of the air pollution controlling system is wet scrubber as shown in figure no.1. Wet scrubber is effective air pollution control device for removing particles or gases from industrial exhaust streams. A wet scrubber operates by introducing the dirty gas stream with a scrubbing liquid typically water gases are collected in scrubbing liquid.

2. Spray nozzle



Fig 2.Spray nozzle

A nozzle is a device designed to control the direction or characteristics of a fluid flow (especially to increase velocity) which it exits (or enters) an enclosed chamber or pipe as shown in figure no. 2. A nozzle is often a pipe or tube of varying cross sectional area, and it can be used to direct or modify the flow of a fluid (liquid or gas).

3. Pump



Fig 3.Pump

A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action as shown in fig no.3. Pumps operate by some mechanism (typically reciprocating or rotary), and consume energy to perform mechanical work moving the fluid. Pumps operate via many energy sources, including manual operation, electricity, engines, or wind power, come in many sizes, from microscopic for use in medical applications to large industrial pumps.

V. WORKING

Quantity of around 1 kg of waste put into the device through the inlet. Commencement of combustion takes place. The waste material is heated and burned with a heating filament. This heating filament is coiled between a ceramic cast, to avoid any kind of contact within itself. As the coil turns red hot and goes upto a temperature of 800°C to 900°C, it is to be contained in container. Flue gases generated due to burning will find its way out through the exhaust pipe. After being fully burnt these waste material will turn into very light-weighted residue of ash which is conveyed out of the system no type of clogging or blockage causes. In the end, the bottom of this device have an outlet pipe, removing the ash particles from the device. Outlet pipe is further connected to the sewage line, which makes sure that this residue is not causing any type of contact, thus creating a cleanser surrounding. Section model of domestic waste incinerator is as shown in figure no. 4.

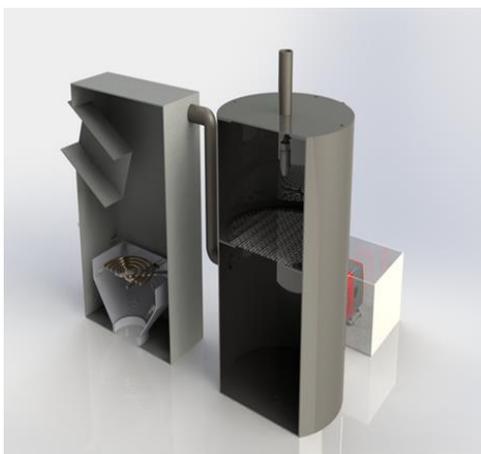


Fig 4.Domestic waste incinerator

The working of domestic waste incinerator is as explained below:-

1. The collection of waste material is in collector.
2. When the collector is filled with 1 kg of waste material. The heating process will start.
3. This may convert the waste material into ash and exhaust gases. The ash will get removed from combustion chamber manually.
4. As well as exhaust gases comes into wet scrubber. The air pebbles are placed to restrict the dust particles and impurities. This will restrict the dust and allow flue gases to rise upward.

5. There is a reservoir of water and NaOH at the bottom of the wet scrubber. The solution will get circulated continuously by pump. Pump increases the pressure of the solution and this solution will be sprinkled on the exhaust gases through spray nozzle.
6. The solution will decrease the temperature of the hot exhaust gases and also neutralizes the flue gases. It eliminates the harmful constituents from the exhaust gases.
7. The sprinkled solution again falls down on reservoir.

CONCLUSION

The waste generated should be destroyed completely. The reduction in physical work of cleaning workers. The exhaust gases from the incinerator should be neutralized. The exhaust gases from the incinerator should not harm the environment & it should get the certification of pollution free system. The process of removal of flues gases should be cost effective & efficient. The device should be pollution free & economical. Maintain the health & hygiene in society. After using this system 60% of toxic gasses can get neutralized.

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