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Design & Implementation Of Solid Waste Management Using Incinerator

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ABSTRACT

Incineration is the main waste-to-energy form of treatment. It is a treatment technology involving destruction of solid waste by controlled burning at high temperatures. It is accompanied by the release of heat. This heat from combustion can be converted into energy. Incineration is a high-quality treatment for Municipal Solid Waste (MSW), very useful in big or crowded cities, because it reduces the quantity and volume of waste to be land filled. The environmental conditions of the incineration process must be very precise to make it environmentally safe. The larger portion of the investment required is due to environmental measures such as emissions control. When choosing incineration as an alternative, the following issues should be considered: volume/quantity of waste produced, heat of combustion of waste, site location, dimensions of the facility, operation and maintenance costs and investment. An investigation, to develop a design solution in order to minimize the environmental and health impacts of waste in the developing village, is reported here.

Keywords: Incineration, Treatment, Technology and Municipal solid waste.

1. INTRODUCTION

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); or according to hazard potential (toxic, non-toxin, flammable, radioactive, infectious 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.

- Investigate the current waste strategies and its environmental and health impacts
- Design and develop an Integrated Solid Waste Management System

The scope of the project is constrained to applications of appropriate and sustainable technologies. Appropriate technology takes environmental, ethical, cultural, political, and economical aspects into consideration when designing for an intended community. Sustainable development is a strategy to preserve the environment for future generations in the design process. Appropriate technology, in conjunction with sustainability, is largely a design parameter for the project.

2. METHODOLOGY

Figure 1 shows the Methodology of the study.

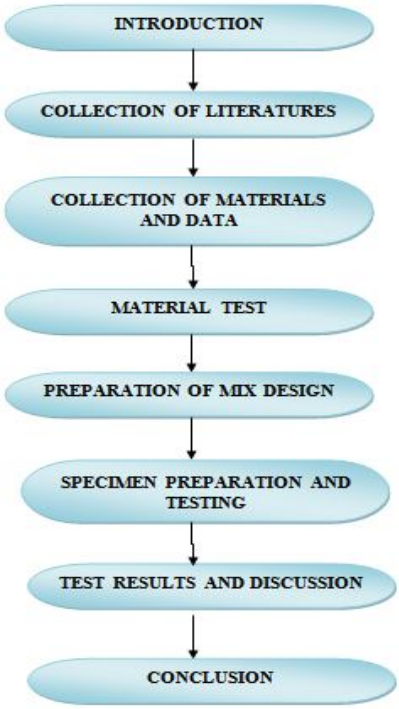

Figure 1 Methodology

3. SOLID WASTE

Before introducing solid waste management, let's start with a discussion of the material being managed solid waste. Solid waste refers to the range of garbage arising from animal and human activities that are discarded as unwanted and useless. Solid waste is generated from industrial, residential and commercial activities in a given area, and may be handled in a variety of ways. As such, landfills are typically classified as sanitary, municipal, construction and demolition or industrial waste sites.

3.1 Types of Solid Waste

Depending on the source of waste, solid wastes can be mainly divided into three categories. They are

- Municipal solid waste:
- Domestic waste
- Commercial waste
- Community waste
- Construction waste
- Institutional waste

3.2 Solid Waste Generation

An indication of how and where solid wastes are generated is depicted in a simplified form in Fig. Both technological processes and consumptive processes result in the formation of solid wastes. Solid waste is generated, in the beginning, with the recovery of raw materials and thereafter at every step in the technological process as the raw material is converted to a product for consumption. Generation of solid waste during technological processes involving mining, manufacturing and packaging. The process of consumption of products results in the formation of solid waste in urban areas as shown in Figure.3.1. In addition, other processes such as street cleaning, park cleaning, waste-water treatment, air pollution control measures etc. also produce solid waste in urban areas. A society receives energy and raw material as inputs from the environment and gives solid waste as output to the environment as shown in Fig. In the long-term perspective, such an input-output imbalance degrades the environment.

3.3 Types of Incinerators

There are three main types of combustion technologies in commercial practice:

- Rotary Kiln,

- Moving Grate
- Fluidized Bed.

3.3.1 Rotary Kilns

Figure 2 shows the Rotary Kilns.

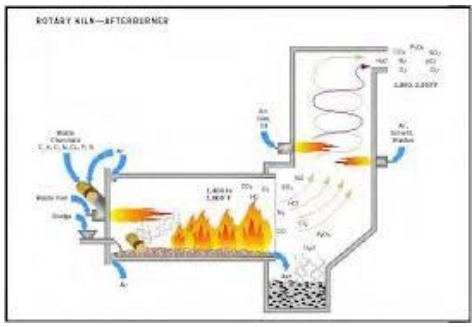

Figure 2 Rotary Kilns

A rotary kiln are commonly used for combusting industrial and hazardous wastes, but is also used in some municipal solid waste incinerators. The principle design consists of two thermal treatment chambers: a slightly inclined primary chamber where waste is fed in (together with inlet of hot exhaust air with oxygen), rotated and thermally decomposed by the heat radiation from the secondary chamber: the re-combustion chamber positioned at the rear of the kiln where the decomposition air and the rest waste is completely burnt with the supply of secondary air. Rotary kiln have the advantage of producing a low level of NOx and thermal destruction of hazardous chemicals.

3.3.2 Moving Grate

Figure 3 shows the Moving grate.

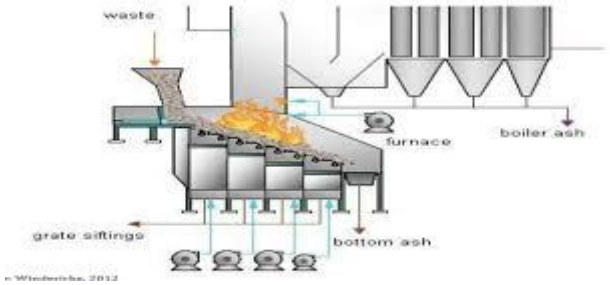

Figure 3 Moving Grate

A moving grate is a typical combustion design of a municipal solid waste incinerator. Waste is dropped by a crane on to the descending grate, which moves into the combustion chamber and eventually moves down to drop the burnt residuals into an ash pit at the other end of the grate .The moving grate is a metallic porous bed, allowing primary combustion air to flow through from the bottom. Secondary combustion air is supplied by nozzles from above the grate, facilitating a complete combustion by the introduction of turbulence.

3.3.3 Fluidized Bed

Figure 4 shows the Fluidized bed.

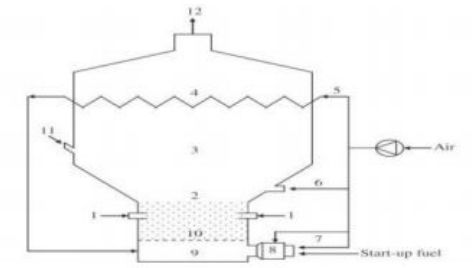

Figure 4 Fluidized bed

Fluidized bed combustion has recently increased in application in municipal solid waste incinerators, although it is still mainly used for the combustion of hazardous waste. There are different types of fluidized bed combustors (bubbling, rotating and circulating fluidized bed), but the principle of the design remains the same: waste particles are suspended by the upward flow of combustion air injected from beneath so that it seems like a fluid, by which the turbulence created enhances uniform mixing and heat transfer hence an increased combustion efficiency. The advantage of fluidized bed technology is the enhanced combustion efficiency, however the pre-condition of that is the homogenization of waste inputs in size as well as in heat value, which requires extensive pre-treatment of waste including typically size reduction and mixing.

4. SALEM DISTRICT

Salem District is a district of Tamil Nadu state in southern India. Salem was the biggest district before separating Dharmapuri in Tamilnadu. The district was now separated into Dharmapuri, Krishnagiri, Namakkal as individual district. Salem is the district headquarters and other major towns in the district include Attur, Mettur Sankagiri and Edappadi. Salem two thousand years ago is evident from the discovery of silver coins of the Greek Emperor Tiberices Claudices Nero (37-68 A.D.) in Koneripatti of Salem in 1987. It was ruled by Mazhavar King Kolli Mazhavan and kings Adhiyamaan and Valvil Ori of sangam age. It comes under Kongu Nadu & Mazhanadu a vast region dated 2nd century BC. Salem was the largest district of Tamil Nadu. It was bifurcated into Salem – Dharmapuri districts in 1965 and Namakkal district in 1997. Figure 5 shows the salem district.

Figure 5 Salem district

5. CONCLUSION

Incineration is the volume reduction process, now a days, it has a lot of scope for waste management. A low cost incinerator can be constructed and to utilize the by products obtained effectively. The by products evolved are released into the atmosphere which causes acid rain, infectious diseases and wastage of heat energy. The attempt is made to utilize these by products effectively for the welfare of living beings. An optimization control system of waste incinerator for power generation is proposed. The process control procedure is divided into different parts effectively in terms of the demands of municipal solid waste incineration process control unit, and each part can work independently without other parts to be affected.

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