

CHAPTER

5

PORTABLE INCINERATOR FOR DOMESTIC USAGE

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5.1 INTRODUCTION

Incineration is known as “thermal treatment” involves combustion process of organic material contained in waste substances. Waste material from domestic usage can be converted into heat, ash, and flue gas through the incineration process. In some industries, the heat generated from the combustion of waste material is used to generate electric power. It is important to clean the ash that is formed by the inorganic elements of the waste during the combustion process before they are released into the atmosphere. In this project, a portable incinerator is designed to manage the disposal of waste material produced from domestic usage. The process of incineration begins with the feeding of the waste to the combustion chamber for the combustion process till the releasing the emission of flue gas that has less percentage of dioxins and furans. The incinerator consists of an air pollution controller device to reduce the harmful substances from the fly ash.

5.1.1 Problem Statement

Waste combustion causes bad effects on the environment but still, many people practicing open burning to dispose of their domestic waste.

A portable incinerator that suitable for domestic usage could be useful for every household.

5.1.2 Objective

The objective of this project is to design and develop a portable incinerator that can reduce air pollution that comes from the incineration process.

5.1.3 Scope and Limitation

This study focuses on people who live in places with less systematic municipal waste handling systems like islands or rural areas so that they can dispose of their domestic waste properly.

5.2 DESIGN PROCESS

This section explains the conceptual design process.

5.2.1 Problem Identification

Problems are identified by performing critical background research and by understanding concepts from similar products. The focus is on waste disposing behaviour, domestic waste, waste combustion, incinerating process, and environmental concerns.

5.2.2 Product Design Specification

A portable incinerator is a device used to burn municipal waste material in a compact size chamber. It can be taken to places and is very useful for domestic use. To reduce harmful smoke and the flue gas from the waste combustion, the use of air pollution control device and good airflow design of the portable incinerator is necessary. Criteria for the portable incinerator were determined from background research and

studies on the existing product in the market. Before proceeding to the final design, the following product design specification (PDS) for the portable incinerator is listed:

(1) Performances

This device can burn waste up to 30 kg per operation. It can be used in an open area where people can easily access it. One air control emission device is used to reduce the volume of pollutants in the flue gas incinerator. It should operate in the range of 600–1000°C for complete combustion. It can reduce the weight of waste by up to 90%.

(2) Maintenance

The air filter needs weekly cleaning to keep the effectiveness of the device. Weekly removal of the lumps of melted plastic and cleaning of the grates. Monthly inspection on the brickwork for thermal damage is also needed.

(3) Ergonomics

The access for the waste is 750 mm (width) $\times$ 400 mm (height). It has a handlebar and four wheels to ease relocation and a glass window for fire control and safety inspection during the burning process. The waste access can be used as waste storage when the incinerator is not operating.

(4) Size

The size is 1200 mm (length) $\times$ 900 mm (width) $\times$ 1800 mm (height), and 200 mm diameter for the smoke chimney.

5.2.3 Functional Analysis

Figure 5.1 shows the functional structure for the product mechanism. The first function is to combust, i.e., to burn and reduce the volume of waste through the combustion process with high temperatures. Secondly, to allow the airflow and supply to the incinerator. The rotational turbulence enriches the combustion chamber with surplus oxygen which results in a more complete burn.