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SIMULATION OF HEAT REMOVAL FOR AIR DISTRIBUTION UNIT WITH PARALLEL FIN USING AIR AT VELOCITY OF 1 M/S

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ABSTRACT

Solid waste generation is a major concern in today's vast population as a result of economic development, rapid urbanisation and industrialisation. There are too much solid waste generated to the extent that the landfill sites is not practical anymore so an alternative disposal method should be taken which is waste to energy technology (WTE) and focusing on incineration method. The study is conducted mainly because of one part of air nozzle which is air duct cannot handle heat stress due to high operating temperature of incinerator. In order to overcome the problem, cooling media which is air is added between insulator and nozzle. The objectives of the study are to study the air distribution pattern in the incinerator and to improve the heat removal through simulation of air distribution unit with parallel fin using air using Computational Fluid Dynamics (CFD) simulation. The study have some limitation to achieve the desired outcome such as using ANSYS 15.0, use common air nozzle design, use rotary kiln incinerator and many more. Studies on the past researcher's research is done based on the major aspect which are solid waste, waste to energy technologies (WTE) and computational fluid dynamics (CFD). The simulation is conducted through four main steps started with specify and modelling the design, undergoing meshing process, conducting solving process and last but not least analysing the obtained result to determine the desired outcome. Result from the simulation shows that presence of cooling media, fin and changes in surface area greatly affect the temperature and turbulence intensity distribution in the air nozzle. Cooling media absorb the excess heat stress from the surrounding that can cause the nozzle to be bend. Parallel fin really help to mix and distribute the air and heat evenly throughout the nozzle which resulted to a better turbulence intensity. Changes in the surface area also affect the turbulence intensity where the turbulence is more intense at that specific point of change. Last but not least, some suggestion can be done to improve the results of the simulation such as use spiral fin or apply water as cooling media.

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CHAPTER ONE

INTRODUCTION

1.1 Background Study

Malaysia is located in the central part of Southeast Asia with a total landmass of 328,550 km^2 and population approximately to 27 million which equal to population density of 79.87 km^2 (Abd Kadir et al., 2013). According to Manaf (2009), Malaysia's population rate has been increasing steadily at a rate of about 600,000 per annum (2.4 %) since 1994 and will keep increasing years by years.

Figure 1.1: Map of Peninsular and East Malaysia (Manaf et al., 2009)

Over the 20 years, Malaysia has achieve impressive economic growth and in a process to align itself with others developed countries such as United Kingdom and South Korea. Due to the vast population resulted from consumption patterns, economic development, rapid urbanisation and industrialisation, there is also one major problem that increase simultaneously with population which is solid waste generation (Tan et al., 2015).

Waste can be defined as unavoidable materials for which there is currently no near future economic demand and for which treatment and / or disposal may be required. In simple word, waste is an unused object that requred treatment or disposal.