

CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

This final year project title is Development of Solar Oven Incorporating Thermal Energy Storage Application. This project is intended to see the performance improvement resulted from optimization and modification to the feature and characteristic of the solar oven.

A solar oven or solar cooker is a device which uses sunlight as its energy source. They use no fuel and they cost nothing to run. Solar cookers are a form of outdoor cooking and are often used in situations where minimal fuel consumption is important, or the danger of accidental fires is high. Common solar cooker solely dependent on the sun radiation which is an inconsistent variable from the effect of changing weather and directly causing the oven cannot function at optimal performance. To overcome this problem, solar oven with the application of thermal energy storage will be produced and hope it is could maintain the heat distribution in the oven even in sudden decrease of solar radiation.

1.2 PROBLEM STATEMENT

Solar oven generally solely depending on the sun radiation which is not consistent variable from the effect of changing weather and this situation will directly cause the oven cannot be a function at optimal efficiency. Cooking with the sun has become a potentially viable substitute for fuel-wood in food preparation in much of the developing world. Solar cooking is one possible solution but its acceptance has been

limited partially due to some barriers. Solar cooker cannot cook the food under low radiation condition. That drawback can be solved by the storage unit associated with in a solar cooker. So that food can be cooked at low radiation condition. Therefore, in this paper, an attempt has been taken to summarize the investigation of the solar cooking system incorporating with thermal energy storage.

1.3 PROJECT OBJECTIVES

The first objective of this project is to design and fabricate a functional solar oven. This solar oven will be fabricated using wood as a main body. The container part from aluminum inside the solar oven will act as rack to hold the food container and energy storage application.

The second objective is to integrate thermal energy storage into the design to store energy and for longer and better heat distribution in the oven. This application will prevent oven from losing heat during the drop of solar radiation due to changing weather condition.

The last objective of this project is to study the characteristics and performance of the system. After the fabrication process done, the solar oven will be tested and go through analysis to determine the performance such as cooking rate and temperature rate.

1.4 PROJECT SCOPE

In this project, the fabrication and analysis was held in the Mechanical Laboratory and the area of the UMP. The scopes of the study are as follows:

Design a solar oven that incorporates thermal energy storage. The design is made by doing some modification of the available design in the market. The design also needs to meet specific specification such as the solar oven unit can be rotated vertically to optimize heat radiation through into the oven.

Review on type of thermal energy storage available and feasibility to be used in the solar oven. There are two types of thermal energy storage in consideration between latent heat storage like phase change material or sensible heat storage such as stone.

Fabrication the solar oven system using selected material. Fabrication will be held in the Mechanical Laboratory. All the material is provided by Material Store and some material need to be buying separately in the market.

Conduct a performance analysis of the solar oven to determine the efficiency, maximum heat temperature and cooking rate. It is important to determine these performances in order to achieve the objective of this project and overcome the problem statement.