COMPUTATIONAL FLUID DYNAMICS (CFD> SIMULATION OF TRIPLE EXPOSURE SOLAR OVEN

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ABSTRACT

This study presents the simulation study on triple exposure of solar oven, which inspired on design features from common solar oven that has been used widely by some places in this world. Lack of utilizing renewable energy is contributed on this study to find a new solution to maximize utilization of renewable energy in our daily life. The objective of this project is to determine the distribution of temperature air inside of solar oven for a period of time. CAD drawing is done by using CATIA V5R17 based on the reality of triple exposure solar oven. This triple exposure represent that the glass oven have three surfaces to be exposed on solar radiation. The simulation is conducted using Computational Fluid Dynamic (CFD) software, CD ADAPCO STAR-CCM+. There are essentially three stages in STAR-CCM+ simulation process: meshing, simulation and analysis. The model of meshing process is based on solar radiation model and laminar model. This model is assumed in a steady-state condition and three dimensional CFD calculations were applied. The duration time of the solar oven exposed to the solar radiation is due to the total normal daylight time which estimated from 8 am to 6 pm. Therefore, the CFD simulation is simulate by each an hour from the total hour was exposed to the solar radiation. In order to validate the CFD results, experimental of triple exposure solar oven was conducted to obtain the result which is done by the others. The results distribution of temperature air inside of triple exposure solar oven by CFD shows a fairly good agreement with the theoretical results due to average of percentage error is below than 10%. The results obtained will be useful as additional database on the study of triple exposure solar oven.

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CHAPTER 3 METHODOLOGY