CERTIFICATION OF APPROVAL

CFD Simulation of Multipurpose Solar Dryer

by

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Approved by,

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CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

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ABSTRACT

A multipurpose solar dryer, capable of drying food products and also products such as timber and wastes was modeled using FLUENT. This dryer incorporates the usage of solar energy by direct and indirect solar drying during times when solar radiation is available. When there is lack of solar radiation especially during rainy days or during the night, biomass energy is used as an auxiliary method. This project focuses on experimental investigation on the actual solar dryer model and numerical simulation to evaluate the thermo fluid process in the dryer. Results focusing on flow patterns and temperature distribution are considered. Experiments are conducted based on 3 modes which are by solar energy, by flue gas directly from biomass burner and by clean warm air through heat exchanger in the biomass burner. Experiments were carried out without any products used for drying to test the performance of the solar dryer. For solar drying mode, experiment was conducted for 8 hours while for both the biomass modes, experiments was conducted for 2 hours each. Based on experiments, flue gas produces the most heat compared to solar energy and clean, warm air. Numerical simulations of the multipurpose solar dryer were carried out based on 2 modes which are drying by solar energy and biomass energy. Simulations were conducted based on certain experimental parameters and simulation results obtained were compared with experimental results to justify effectiveness of model. Based on simulation result, drying by biomass energy is the most effective method with temperature at drying chamber up to 324.080 K compared to drying by solar energy having temperature at chamber of 310.6636 K. However, both these temperatures are sufficient to dry products.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES