EFFICIENCY STUDY OF A SINGLE DAY SMOKE DRYER

This thesis was submitted to the Department of Chemical & Process Engineering at University of Moratuwa, Sri Lanka in partial fulfillment of the requirement for the degree of

MASTER OF SCIENCE IN POLYMER TECHNOLOGY

Rathnayake. W. G. I. U.

DEPARTMENT OF CHEMICAL & PROCESS ENGINEERING,

UNIVERSITY OF MORATUWA,

SRI LANKA.

2010

DECLARATION

I do hereby declare that the work reported in this project report was exclusively carried out by me under the supervision of Dr. Susantha Siriwardena and Dr. Shantha Walpalage. It described the results of my own independent research except where due reference has been made in the text. No part of this project report has been submitted earlier or concurrently for the same or other degree.

Date: 13/09/2010

....

Signature of the candidate

(Rathnayake. W. G. I. U.)

To the best of our knowledge above particulars are correct.

UOM Verified Signature

RUBBER RESEARCH INSTITUTE, TELAWALA ROAD, RATMALANA

.....

Supervisor

Dr. Susantha Siriwardena,

Head,

Raw Rubber Process Development & Chemical Engineering Department, Rubber Research Institute,

Sri Lanka.

Co-Supervisor

Dr. Shantha Walpalage,

Senior Lecture,

Department of Chemical & Process Engineering,

University of Moratuwa,

Sri Lanka

This report is dedicated to

MY PARENTS

ALL MY TEACHERS

MY BELOVED WIFE

&

MY LITTLE DAUGHTER VINETHMEE

ACKNOWLEDGEMENTS

I wish to express my deep sense of gratitude to my supervisors Dr. Shantha Walpalage (Senior Lecture, Department of Chemical & Process Engineering, University of Moratuwa) and Dr. Susantha Siriwardena (Head, Raw Rubber Process Development & Chemical Engineering Department, Rubber Research Institute) who have always been approachable, helpful and extremely patient in their guidance throughout my research project.

I consider it as a pleasant occasion to acknowledge Dr. A. G. T. Sugathapala who has given kind and patient guidance, encouragement and valuable assistance throughout the research project.

My special thanks go to Head of the Department, Chemical & Process Engineering, University of Moratuwa, Director, Rubber Research Institute, Sri Lanka and Head of the Department, Mechanical Engineering, University of Moratuwa, for giving me unrestricted instrumental facilities during the execution of research project. Sincere thanks are also due to other staff members of the University of Moratuwa and Mr. Sarath Siriwardena, Mr. A. K. D. Warnajith, at Rubber Research Institute who helped me in many ways.

Also my sincere thanks go to Mrs. Maddumage and her kind employers at the "*Sixteen Acre Estate*" at Padukka who gave me a great support during this research project.

I take this opportunity to express my sincere thanks to all personalities who could not mention here name by name for helping me in various ways.

I would like to thank my beloved wife Niwanthi who has always behind me patiently during the period of execution of the research project.

Indrajith Rathnayake

CONTENTS

List of Tables

List of Figures

ABSTRACT

The energy utilization and the time required to dry RSS using conventional type smoke house are significantly high. Also the conventional type smoking-room used for producing RSS gives large differences of temperature and velocity; these result in non-uniform drying of the rubber sheets. In a conventional smokehouse, the energy losses due to loading and unloading of the sheets as well as time required for complete dryness is very much high.

A Compact, well insulated drying unit with multipurpose gravel layer was designed and fabricated new operational practices for efficient energy utilization of Ribbed Smoke Sheet (RSS) Drying were also introduced. The overall drying performance was evaluated in term of drying efficiency and firewood consumption. Quality of the end product was also evaluated. A comparison also made against the performance of conventional smoke house. Social issues also compared with conventional system. The new system reduces the drying period from 5 days to one day, while space requirement also reduce by the same percentage when comparing with the conventional smoke house.

No Significant difference of the quality of sheets dried using SS drying system against sheets dried in conventional smoke house was observed. However, dirt content in the sheets dried in the new system is lower tan that dried in a conventional system. The Single day Smoke dryer (SS dryer) has the efficiency of 51.7%, it is a very good value compared with a conventional smoke dryer which has the efficiency of 31%. The most interested feature of the SS dryer is the low space utilization compared with the conventional type smoke house and also the time requirement for fabrication of the SS dryer is very short. In addition to the above advantages, the dryer can be operated by one person and the health issues are very limited to compare with the conventional smoke house.