

**MODELING OF CLAY ROOF TILES DRYING PROCESS TO  
MINIMIZE WARPING AND CRACKING**

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**October 2018**

## DECLARATION

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The above candidate has carried out research for the Masters under my supervision.

Name of the supervisor: Prof. Mahinsasa Narayana

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Date.....

## ACKNOWLEDGEMENTS

I wish to express my deepest appreciation to my supervision Prof. Mahinsasa Narayana, Department of Chemical & Process Engineering, University of Moratuwa for necessary advices, invaluable guidance, supervisions and offering there valuable time throughout my M.Sc. Research study.

Special thanks go to Eng.Mr. Kapila Pieris, Research Fellow NERD Center, for offering me this valuable research that they involve.

I would like to express my sincere gratitude to Eng. Mr.D.D Ananda Namal, Director General of NERD Center, for granting permission and allocating funds to carry out this research and his valuable guidance to make this research success.

My sincere appreciation goes to Dr. Aruna Warahena who currently working in the Department of Manufacturing Technology, University of Vocational Technology, Rathmalana.

My journey of becoming a Masters has finally culminated. It was't an easy task through the untiring support of my wife and family, finally I have done it.

## Abstract

The main drawback of traditional open rack type natural tile drying process is that in low humid windy seasons the rate of moisture removal will be high and due to formation of high moisture content gradient in side the tile warping/cracking is taking place. On the other hand in high humid rainy season the drying rate becomes very low and the drying time will become very high which is non tollarable within the tile production process.

With this background NERDC is in the process of developing a tunneltype drier in which the temperature and RH could be controlled. Then the intention is to control these parameters in side the drier so as to maintain the optimum drying condition i.e the maximum drying rate without warping/cracking. To achieve this objective a model has to be developed to interpret the drying rate related to R.H and Temperature of the drying environment and the moisture content of the tile. Once this model is developed and if the maximum allowable drying rate for not warping/cracking is known RH, Temperature in side the dryer could be maintained to achieve the maximum drying rate.

Although a literature survey was done a proper model for clay roof tile drying was not found. So, mathematical model with a few unknown constants was developed by using fundamental concepts. Subsequently laboratory tests were conducted to find out the unknown constants of the developed mathematical model.

The model was verified by using the results obtained at the tile drier (tunel) developed by NERDC at Waikkala . These tests were carried by maintaining R.H and Temperature in side the drier for which warping/cracking was not observed. Therefore by using these results although the model was verified the optimum drying conditions cannot be interpreted. For that interpretation maximum possible drying rates for particular moisture contents of the tile has to be foundout by a separate experiment.

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## **Aim**

To find out the optimum drying temperature and relative humidity of the dryer which leads to minimizing of warping effect.

## **Objective**

1. To study the mechanism of warping & cracking in relation to drying rate.
2. Development of a mathematical model for drying rate of tiles.

## **Methodology**

1. By literature survey and basic knowledge interpreting the mechanism of warping, cracking, in the tile drying process.
2. Carrying out drying tests in the laboratory and development of the drying model
3. Verifying the model by using the test results from Waikkala drier.

## Nomenclature

$K_0$  – Arbitr constant

$K_1$  – Constant

$M$  – Weight of the tile

$\dot{M}$  – Rate of moisture removal

RH – Relative humidity

$V_p$  – Vapor pressure at particular RH and Temperature