INVESTIGATION OF THE DIFFERENT METHODS FOR HEAT STORAGE AS PART OF A NOVEL SUSTAINABLE GREENHOUSE APPROACH

By

Esraa Mohamed Rashad Nasr ElMitainy

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
CHEMICAL ENGINEERING

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Under the Supervision of

Prof. Dr. Mai Mohamed Kamal Eddeen	Dr. Ahmed Fayez Nassar
…………………………	…………………………………
Professor Chemical Engineering Department Faculty of Engineering, Cairo University	Associate Professor Chemical Engineering Department Faculty of Engineering, Cairo University

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Approved by the
Examining Committee

____
Prof. Dr. Mai Mohamed Kamal Eddeen Fouad, Thesis Main Advisor

____
Prof. Dr. Tarek Mohamed Moustafa, Internal Examiner

____
Prof. Dr. Martin Buchholz, External Examiner
Professor at the Technical University of Berlin

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Engineer: Esraa Mohamed Rashad Nasr ElMitainy
Date of Birth: 14/03/1988
Nationality: Egyptian
E-mail: esraa.elmitainy@gmail.com
Phone: +202 37601518
Address: 7 Abu Bakr Al Sediq St., Giza, Egypt
Registration Date: 1/10/2010
Awarding Date: / /
Degree: Masters of Science
Department: Chemical Engineering

Supervisors:

Prof. Dr. Mai Mohamed Kamal Eddeen Fouad
Dr. Ahmed Fayez Nassar

Examiners:

Prof. Dr. Mai Mohamed Kamal Eddeen (Thesis Main Advisor)
Prof. Dr. Tarek Mohamed Moustafa (Internal Examiner)
Prof. Dr. Martin Buchholz (External Examiner)
Professor at the Technical University of Berlin

Title of Thesis:

Investigation of the Different Methods for Heat Storage as Part of a Novel Sustainable Greenhouse Approach

Key Words:

Heat Storage; Greenhouse; Soil; Phase Change Material

Summary:

This thesis investigates two heat storage methods to be used as a part of a greenhouse system that aims to achieve water desalination and climate control inside the greenhouse enclosure. The first method tested is the utilization of the greenhouse ground as a heat storage medium, in the course of this work two typical Egyptian soils, clay and sand based, were investigated using different pipe materials as heat transfer mediums. While the second method is an experimental study to use a phase change material which is sodium carbonate hydrated salt after stabilization with charcoal particles to prevent salt precipitation. The obtained study results showed that although the sand based soil stored a larger amount of heat than the clay based soil, it was still not enough for the targeted greenhouse application. And the phase change material mixture showed signs of salt sedimentation with repeated heating and cooling.

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Dedication

To my Mother, wishing she was here.
To my Father, for getting me here.

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