



Cairo University

EMPIRICAL MODEL FOR CURING CONDITIONS SELECTION LEADING TO THE OPTIMUM PROPERTIES OF CFRP

By

Ahmed Hatem Omar Abdel-Aziz Al-Khoribi

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY

in
Metallurgical Engineering

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GIZA - EGYPT
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Under the Supervision of

Prof. Dr. Nahed Ahmed Abdel-Raheem

Mining, Petroleum, and Metallurgy Department
Faculty of Engineering - Cairo University

Prof. Dr. Sawsan Fakhry Halim

National Institute of Standards (NIS)

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Approved by the Examining Committee

Prof. Dr. Nahed Ahmed Abdel-Raheem

(Thesis Main Advisor)

Prof. Dr. Sawsan Fakhry Halim
(National Institute of Standards)

(Advisor)

Prof. Dr. Mohamed Raafat El-Koussy

(Internal Examiner)

Prof. Dr. Samir Naguib Lawandy
(National Institute of Standards)

(External Examiner)

FACULTY OF ENGINEERING - CAIRO UNIVERSITY
GIZA - EGYPT
2019

Engineer: Ahmed Hatem Omar Abdel-Aziz Al-Khoribi
Date of Birth: 4 / 5 /1990
Nationality: Egyptian
E-mail: ahmedhatem19@gmail.com
Phone: 01066549404
Address: 33 Abo El-Feda Street
Registration Date: 1 / 3 / 2015
Awarding Date: 2019
Degree: DOCTOR OF PHILOSOPHY
Department: Mining, Petroleum, and Metallurgy Department



Supervisors:

Prof. Dr. Nahed Ahmed Abdel-Raheem (Thesis Main Advisor)
Prof. Dr. Sawsan Fakhry Halim (Advisor)
(National Institute of Standards)

Examiners:

Prof. Dr. Nahed Ahmed Abdel-Raheem (Thesis Main Advisor)
Prof. Dr. Sawsan Fakhry Halim (Advisor)
Prof. Dr. Mohamed Raafat El-Koussy (Internal Examiner)
Prof. Dr. Samir Naguib Lawandy (External Examiner)
(National Institute of Standards)

Title of Thesis:

Empirical Model for Curing Conditions Selection Leading to the Optimum Properties of CFRP

Key Words:

Epoxy, carbon fiber, polymer, mechanical properties, thermal properties

Summary:

In this thesis, an attempt has been made to optimize the curing process of carbon fiber reinforced polymer laminates by selecting the optimum curing conditions that led to optimum properties of CFRP materials. The studied properties were mechanical, thermal, and physical properties. It was shown that curing at 180 °C or lower, applying furnace cooling, raising resin-to-hardener ratio, and avoiding wetting the bottom side have reduced data variability, lowered thickness, and residual stress. Also, it was shown that curing at 115 min/105 °C has improved overall mechanical properties while curing at 125 min/130 °C has improved overall thermal properties.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Ahmed Hatem Omar Date:

Signature:

To:

my father, my mother, and my sister

my nieces, Lena and Tala

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