



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكرو فيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم



شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



MONA MAGHRABY



UPGRADING OF METHYL ESTER FOR PRODUCTION OF HIGHER VALUE PRODUCTS BY FRACTIONAL DISTILLATION

By

Zeinab Ibrahim Tawfik Ahmed

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
GIZA, EGYPT
2021

UPGRADING OF METHYL ESTER FOR PRODUCTION OF HIGHER VALUE PRODUCTS BY FRACTIONAL DISTILLATION

By
Zeinab Ibrahim Tawfik Ahmed

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

Under the Supervision of

Prof. Fatma Ashour

Dr. Hussein Mohamed Hussein

.....

.....

Professor of
Chemical Engineering
Faculty of Engineering, Cairo University

CEO, Arogas Company

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2021

UPGRADING OF METHYL ESTER FOR PRODUCTION OF HIGHER VALUE PRODUCTS BY FRACTIONAL DISTILLATION

By
Zeinab Ibrahim Tawfik Ahmed

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

Approved by the
Examining Committee

Prof. Fatma Ashour, Thesis Main Advisor

Prof. Ehab Fouad Abadir, Internal Examiner

Dr. Mahmoud Gamal El-Din Badran, External Examiner

Former Chairman of the Board Directors of the Egyptian Abu Al Houl Company for Oils and Detergents

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2021

Engineer's Name: Zeinab Ibrahim Tawfik Ahmed
Date of Birth: 9/5/1991
Nationality: Egyptian
E-mail: Zeinab.ibrahim@windowslive.com
Phone: 01094628606
Address: Sheikh Zayed, 8th district, Villa 39
Registration Date: 1/10/2014
Awarding Date:/....../2021
Degree: Master of Science
Department: Chemical engineering
Supervisors:



Prof. Fatma Ashour
Dr. Hussein Mohamed Hussein (CEO Arogas Company)

Examiners:

Dr. Mahmoud Gamal El-Din Badran (External examiner)
Former Chairman of the Board Directors of the Egyptian Abu
Al Houl Company for Oils and Detergents
Prof. Ehab Fouad Abadir (Internal examiner)
Prof. Fatma Ashour (Thesis main advisor)

Title of Thesis:

UPGRADING OF METHYL ESTER FOR PRODUCTION OF HIGHER VALUE
PRODUCTS BY FRACTIONAL DISTILLATION

Key Words:

Fatty acids methyl esters; winter grade fuel; biosurfactant, MES.

Summary:

The main source of the rising problem of Greenhouse Gas emissions and its impact on climate change is caused mainly by fossil fuels, which directed the focus of many researchers towards alternative biofuels.

The aim of this research is to produce specialized cuts from the fatty acid methyl ester, namely: fatty acid methyl ester sulfonate (MES) and a winter fuel additive as replacements to the crude oil based linear alkyl benzene and the current cold weather diesel additives.

The work done, first investigated the production of MES through a set of lab experiments starting with the production of the fatty acid methyl ester as an intermediate product using the sulfonation reaction of used cooking oil and oleic acid in the presence of sodium bisulfite. This was followed by the separation of the reaction products, for which the surface tension was tested and compared to its equivalent commercial surfactants and found below standard.

As a complementary part, an alternative method of separation was tested using Hysys 8.8 simulation program. The simulation involved utilizing a distillation tower to separate the required MES and winter fuel additive from the fatty acid methyl ester inlet. The tower design and operating conditions were optimized until the maximum separation efficiency was achieved.

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: Zeinab Ibrahim Tawfik Ahmed

Date: / /2021

Signature:

Acknowledgments

First, I would like to express my sincere gratitude for my advisor Prof. Fatma Ashour for her continuous support, motivation, patience, and immense knowledge. The door to Dr. Fatma office was always open whenever I ran into a trouble spot or had a question about my research or writing.

Second, special thanks to my second advisor Dr. Hussein Mohamed Hussein for his support, patience, and guidance.

Third, I would like to thank Dr. Mahmoud Badran for his care and support at the beginning of the thesis.

In addition, I thank Dr. Mohamed El-Naggar for the continuously provided encouragement. He was always willing and enthusiastic to assist in any way he could throughout the research project.

Moreover, I would like to thank the following people for helping with this research thesis project: Representatives from the Indian institute of petroleum, Dr Anjain Ray, Dr Jyoti Porwal for their willingness to impart their knowledge.

Finally, I must express my very profound gratitude to my parents for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without them. Thank you.

