بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني 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

A NEW PROCESS INTEGRATION AND INTENSIFICATION OF CUMENE PRODUCTION

By

ESRAA KHALED ALI DARWISH

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 ENGINEEERING

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2020

A NEW PROCESS INTEGRATION AND INTENSIFICATION OF CUMENE PRODUCTION

By

ESRAA KHALED ALI DARWISH

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. Dr. Fatma Al-Zahraa Ashour

Professor of Chemical Engineering
Chemical Engineering
Faculty of Engineering, Cairo University

Prof. Dr. Mohamed Amin El-Shahir

Professor of Chemical Engineering
Chemical Engineering
Faculty of Engineering, British University in Egypt

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2020

A NEW PROCESS INTEGRATION AND INTENSIFICATION OF CUMENE PRODUCTION

By

ESRAA KHALED ALI DARWISH

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. Dr. Fatma Al-Zahraa Ashour, Thesis Main Advisor

_____

Prof. Dr. Reem Mohamed Elttouney, Internal Examiner**

_____

Prof. Dr. Guzine Ibrahim El Diwani, External Examiner**
- Professor at National Research Center

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2020

Engineer: Esraa Khaled Ali Darwish
Date of Birth: 12 /02/ 1994
Nationality: Egyptian
E-mail: esraa.khaled@bue.edu.eg
Phone: +201009933375
Address: Shorouk City

Registration Date: 01/ 10 /2016
Awarding Date: / /
Degree: Master of Science
Department: Chemical Engineering

Supervisors: Prof. Dr. Fatma Al-Zahraa Ashour (Thesis Main Advisor)
Prof. Dr. Mohamed Amin El-Shahir (Advisor)
- Vice Dean for Research and Postgraduates studies, Head of Chemical Engineering. - Faculty of Engineering at The British University in Egypt

Examiners: Prof. Dr. Guzine Ibrahim El Diwani (External Examiner)
-Professor at National Research Center
Prof. Dr. Reem Mohamed Elttouney (Internal Examiner)
Prof. Dr. Fatma Al-Zahraa Ashour (Thesis Main Advisor)

Title of Thesis: A New Process Integration and Intensification of Cumene Production

Key Words: Pinch Technology, energy target, Cumene, Reactive Distillation, and Process Intensification.**)**

Summary:

In this Study, two plant designs for Cumene Production, Turton's Conventional process and Reactive distillation process were investigated. The conventional process was modelled using ASPEN HYSYS and the current HEN was revamped. Furthermore, a new design for the HEN was modeled using ASPEN Energy Analyzer. On the other hand the flow sheet for the Reactive Distillation process was modeled using ASPEN Plus using new chemical kinetics. Then an economic analysis was performed on both processes to identify the most optimum plant design to implement in Egypt.

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: Esraa Khaled Date: 6/10/2020

Signature: Esraa

Dedication

I dedicate this work to my parents; they were my biggest supporters.

Acknowledgments

In the Name of Allah, the Most Merciful, the Most Compassionate all praise be to Allah, the Lord of the worlds; and prayers and peace be upon Mohamed His servant and messenger. First and foremost, I must acknowledge my limitless thanks to Allah, the Ever-Magnificent; the Ever-Thankful, for His help and bless. I am grateful to some people, who worked hard with me from the beginning till the completion of the present research particularly my parents for their continuous support, guidance and inspiration. Second my supervisors Prof. Fatma, Prof. Mohamed Amin and Dr. Dina who have been always generous during all phases of the research, and I highly appreciate their efforts. I would like to take this opportunity to say warm thanks to all my beloved friends, who have been so supportive along the way of doing my thesis. I also would like to express my wholehearted thanks to my family for their generous support they provided me throughout my entire life and particularly through the process of pursuing the master's degree. Because of their unconditional love and prayers, I had the chance to complete this thesis.

Table of Contents

List of Tables

List of Figures