شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

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

شبكة المعلومات الجامعية

بعض الوثائق الأصلية تالفة

بالرسالة صفحات لم ترد بالأصل

ENERGY ANALYSIS AND PROCESS OPTIMIZATION OF CDU FOR PRODUCTS REDISTRIBUTION

By

MARWA AHMED ABU-ELMAGD EL-SADEK

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
2020

ENERGY ANALYSIS AND PROCESS OPTIMIZATION OF CDU FOR PRODUCTS REDISTRIBUTION

By

MARWA AHMED ABU-ELMAGD EL-SADEK

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

Dr. Fatma Hanafi Ashour

……..

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

Dr. Sahar Mohamed El Marsafy

……..

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

Dr. Mamdouh Ayad Gadalla

……

Professor of Chemical Engineering
Chemical Engineering Department
Faculty of Engineering, Port Said
University

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2020

ENERGY ANALYSIS AND PROCESS OPTIMIZATION OF CDU FOR PRODUCTS REDISTRIBUTION

By

MARWA AHMED ABU-ELMAGD EL-SADEK

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 Hanafi Ashour, **Thesis Main Advisor**

_____

Prof. Dr. Mamdouh Ayad Gadalla, **Advisor**
Professor of Chemical Engineering- Faculty of Engineering- PSU

_____

Prof. Dr. Mahmoud Abdel Hakim Elrefaey, **Internal Examiner**

_____

Prof. Dr. Mohamed Amin Elshahir Sadek, **External Examiner**
Vice Dean for Research and Postgraduate Studies
Faculty of Engineering- BUE

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2020

Engineer's Name: Marwa Ahmed Abu-Elmagd El-Sadek
Date of Birth: 01/12/1980
Nationality: Egyptian
E-mail: Eng.marwa.npc@gmail.com
Phone: 0122-0632907
Address: Naser St., SUEZ, EGYPT

Registration Date: 01/10/2013
Awarding Date: …/…/2020
Degree: Master of Science
Department: Chemical engineering

Supervisors:

Prof. Dr. Fatma Hanafi Ashour (Thesis Main Advisor, CUFE)
Prof. Dr. Sahar Mohamed El Marsafy (Advisor ,CUFE)
Prof. Dr. Mamdouh Ayad Gadalla (Advisor, PSU)

Examiners:

Prof. Dr. Fatma Hanafi Ashour (Thesis Main Advisor, CUFE)
Prof. Dr. Mamdouh Ayad Gadalla (Advisor, PSU)
Prof. Dr.Mahmoud Elrefaey (Internal examiner, CUFE)
Prof. Dr. Mohamed Amin Elshahir Sadek (External examiner, BUE)

Title of Thesis:

ENERGY ANALYSIS AND PROCESS OPTIMIZATION OF CDU FOR PRODUCTS REDISTRIBUTION

Key Words:
Revamping; CDU; Optimization; Process Adjustment; HYSYS

Summary:
The present study introduces a general methodology based on rigorous simulation and optimization framework that targets both the distillation column and the heat exchanger network to maximize the use of existing equipment. The revamping includes multiple objective functions such as capacity enhancement, energy savings, emissions reduction and profit improvement. An actual CDU Egyptian refining plant has been considered for this study, a simulation model and validation are initiated via case study by ASPEN HYSYS to generate different operating scenarios which are able to optimize the operating conditions according to the products specifications, without any change in equipment design at constant crude feed rate. Also; these models were being subjected to energy analysis to choose the best model in energy saving and reduction CO_2 emission. ASPEN ENERGY ANALYZER was applied to create energy analysis for each generated scenario by using pinch analysis, generating composite curve, grand composite curve and utility composite curve.

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: Marwa Ahmed Abu-Elmagd El-Sadek Date: .. /.. /….

Signature:

Acknowledgement

The authoress deeply appreciates Dr. Fatma Hanafi Ashour, Professor of Chemical Engineering - Faculty of Engineering - Cairo University for her supervision, continuous advice, valuable comments and unfailing aid all through the study work.

The authoress also would like to express her gratitude and appreciation to Dr. Sahar Mohamed El Marsafy, Professor of Chemical Engineering - Faculty of Engineering - Cairo University for her continuous supervision and support all through the work, delightful comments and constructive suggestions without which this work wouldn't have been completed.

Special thanks to Dr. Mamdouh Ayad Gadalla, Professor of Chemical Engineering - Faculty of Engineering - Port Said University for his demonstration, assistance, collaboration, remarks and guidance all through the learning process of this master.

Also, I would like to thank my colleague Doaa Abd El Sabour, process engineer at Nasr Petroleum Company for her continuous help and support.

Many thanks to my beloved ones, who have supported me throughout this entire process; both by keeping me harmonious and helping me put pieces together. I will be grateful forever for your love.

Thanks are also extended to all the staff members of Chemical Engineering Department of the Faculty of Engineering at Cairo University for their encouragement.

Table of Contents

List of Tables