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

CORROSION OF WELDED CARBON STEEL PIPES IN OIL PRODUCTION FIELDS AND ITS MITIGATION

By

Mazen Mahmoud Mohamed El Morsy

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
Chemical Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2020

CORROSION OF WELDED CARBON STEEL PIPES IN OIL PRODUCTION FIELDS AND ITS MITIGATION

By
Mazen Mahmoud Mohamed El Morsy

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
Chemical Engineering

Under the Supervision of

Prof. Dr. Omar E. Abdel Salam

……..

Professor of Chemical Engineering
Faculty of Engineering, Cairo University

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2020

CORROSION OF WELDED CARBON STEEL PIPES IN OIL PRODUCTION FIELDS AND ITS MITIGATION

By
Mazen Mahmoud Mohamed El Morsy

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
Chemical Engineering

Approved by the
Examining Committee

_____
Prof. Dr. Omar E. Abdel Salam, Thesis Main Advisor

_____
Prof. Dr. Nabil Abdel Moneum, Internal Examiner

_____
Prof. Dr. Abdel Ghany El-Hosry, External Examiner
Professor of National Research Center, Cairo, Egypt

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2020

Engineer's Name: Mazen Mahmoud Mohamed
Date of Birth: 12/6/1980
Nationality: Egyptian
E-mail: mazen1261980m@yahoo.com
Phone: +201094821678
Address: 5 Al-Halia School St. Giza

Registration Date: 10/2012
Awarding Date: 9/7/2020
Degree: Doctor of Philosophy
Department: Chemical Engineering

Supervisors:

Prof. Omar E. Abdel Salam

Examiners:

Prof. Omar E. Abdel Salam (Thesis main advisor)
Prof. Nabil Abdel Moneum (Internal examiner)
Prof. Abdel Ghany El-Hosry (External examiner)
(Professor of National Research Center, Cairo, Egypt)

Title of Thesis:

Corrosion of Welded Carbon Steel Pipes in Oil Production Fields and its Mitigation

Key Words:
Corrosion; Preferential weld; Flow induced; Carbon steel; Oil

Summary:

In oil production fields, corrosion of welded carbon steel pipes frequently occurs in areas near welds. Corrosion in other areas may take place at a lower frequency and with a lower detrimental effect. In this thesis, a field survey is conducted of eight oil petroleum fields over a period of seven years. Testing of specimens of carbon steel welded joints is carried out under simulated conditions. This study investigates the predominated corrosion damage mechanisms in welded carbon steel pipes. It examines the critical factors triggering corrosion mechanisms and the techniques for corrosion monitoring and mitigation. Flow-induced corrosion and preferential weld corrosion were found to be the most effective mechanisms compared to pitting and microbiologically induced corrosion. Detrimental factors of corrosion mechanisms include flow rates and changes in process parameters of pH, fluid resistivity, and some anion concentrations. The corrosion mitigation was achieved by increasing the dosage of injected corrosion inhibitors.

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: Mazen Mahmoud Mohamed Date: … /… /…

Signature:

Acknowledgments

I would like to express my sincere appreciation of Prof. Dr. Omar E. Abdel Salam, whose encouragement, guidance and support throughout this journey enabled me to develop a profound understanding of this research.

I offer my regards and blessings to all of those who supported me in any respect during the completion of this thesis.

Table of Contents

List of Tables

List of Figures