



بسم الله الرحمن الرحيم

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ملاحظات : لا يوجد





Cairo University

**PRACTICAL TECHNICAL COMPARATIVE STUDY WITH
ECONOMIC INDICATORS FOR CARBON DIOXIDE
EMISSIONS SEQUESTRATION IN EGYPT, APPLICATION
IN AN OIL FIELD IN WESTERN DESERT**

By

AHMED ABDEL-AZIZ MAHMOUD ELMEZAIN

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
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Title of Thesis:

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WESTERN DESERT

Key Words:

Carbon Dioxide; sequestration; microalgae; enhanced oil recovery; injection

Summary:

This thesis discussed firstly the environmental situation of CO₂ emissions and the global coalition to counteract the problem of climate change then a simple review about different pathways to sequester emitted CO₂, followed by a SWOT analysis to select best pathways applicable in Egypt, two pathways were adopted; biological sequestration and geological sequestration. For both pathways, technical model and economic calculations were proposed.

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 Abdel-Aziz Mahmoud El-Mezain

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Signature:

Dedication

I wish to dedicate this work to the humanity; everybody seeks to live in a cleaner environment, everybody keen to make whatever it should be to combat climate change. I'm happy to zoom in and speak to the Muslim community for whom I belong, they should bear on their shoulders – as they used to do in the previous eras- the target of driving humans towards peace and prosperity. I also wish to dedicate this work to my sincere wife who stands beside me in every situation through our life.

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Table of Contents

DISCLAIMER.....	I
ACKNOWLEDGMENTS.....	III
DEDICATION.....	II
LIST OF TABLES.....	VIII
LIST OF FIGURES.....	IX
NOMENCLATURE	X
ABSTRACT.....	XI
CHAPTER 1 : INTRODUCTION	1
1.1. CLIMATE CHANGE AND WHAT INCENTIVES BEHIND RESEARCH IN IT	1
1.2. ORGANIZATION OF THE THESIS	2
CHAPTER 2 : LITERATURE REVIEW	3
2.1. INTRODUCTION	3
2.1.1. TACKLING THAT GLOBAL PROBLEM.....	3
2.1.2. CARBON DIOXIDE UTILIZATION PATHWAYS FOR CCU	3
2.2. RELATED WORK.....	5
2.2.1. MICROALGAE CULTURING FOR CARBON DIOXIDE CAPTURE AND BIO-REFINERY.....	5
2.2.1.1. ALGAL GROWTH AND CARBON DIOXIDE CAPTURE	6
2.2.1.2. HARVESTING AND DEWATERING OF MICROALGAE	7
2.2.1.3. BIOREFINING	8
2.2.1.3.1. YIELD OF ALGAE OILS	8
2.2.1.3.2. OPTIONS OF BIOREFINING	8
2.2.2. CARBON DIOXIDE WAYS OF STORING	10
2.2.2.1. ENHANCED OIL RECOVERY	11
2.2.2.1.1. PROCESS STEPS/ FLOW CHART.....	12
2.2.2.1.2. MECHANISM	13
CHAPTER 3 :THEORETICAL APPROACH OF CARBON DIOXIDE INJECTION.....	14
3.1. SWOT ANALYSIS TO SELECT BEST SEQUESTRATION PATHWAYS.....	14
3.2. SOME THEORETICAL DATA ABOUT CARBON DIOXIDE INJECTION	14
3.2.1. TARGET STORAGE BASINS	14
3.2.1.1. SALINE AQUIFERS.....	15

3.2.1.2.	DEPLETED PETROLEUM RESERVOIRS	16
3.2.1.3.	UNMINEABLE COALBED SEAMS	17
3.2.1.4.	CARBON DIOXIDE STORAGE IN GEOTHERMAL UNDERGROUND SYSTEMS AS AN ALTERNATIVE TO WATER	17
3.2.1.5.	CARBON DIOXIDE INJECTION IN DEEP WATERS IN OCEANS.....	17
3.2.2.	SELECTION CRITERIA OF INJECTION SITE	17
3.2.2.1.	GEOLOGY CRITERIA.....	18
3.2.2.2.	LOCAL GEOTHERMAL GRADIENT AND ITS INTER- RELATIONSHIP WITH CARBON DIOXIDE PHASE BEHAVIOR, REQUIRED INJECTION DEPTH AND MINIMUM REQUIRED INJECTION PRESSURE.	18
3.2.2.3.	GEO-HAZARDS AND TECTONIC STABILITY.....	18
3.2.2.4.	HYDRO-DYNAMISM OF UNDERGROUND FORMATIONS	19
3.2.2.5.	POLITICAL AND SOCIETAL CRITERIA	19
3.2.2.6.	ECONOMIC CRITERIA OF SITE SELECTION	20
3.2.3.	CARBON DIOXIDE BEHAVIOR IN THE SELECTED RESERVOIR.....	20
3.2.3.1.	<i>CARBON DIOXIDE BEHAVIOR TO ENHANCE RECOVERY</i> [24].....	20
3.2.3.2.	INDUCED SEISMICITY.....	21
3.2.4.	CALCULATION OF RESERVOIR CAPACITY FOR CARBON DIOXIDE STORAGE.....	21
3.2.5.	OPERATIONAL ASPECTS OF CARBON DIOXIDE INJECTION.....	21
3.2.5.1.	WELL TYPE AND INJECTION RATE.....	21
3.2.5.2.	CARBON DIOXIDE PURITY	21
3.2.6.	REVENUES FROM OIL AND GAS RECOVERY BY CARBON DIOXIDE INJECTION	22
3.3.	CARBON DIOXIDE IN FIELD 2 FIELD IN WESTERN DESERT FOR ENHANCED OIL RECOVERY.....	22
3.3.1.	OVER VIEW ABOUT COMPANY X RESERVOIRS.....	22
3.3.2.	GEOLOGIC CRITERIA OF THE SELECTED RESERVOIR FOR INJECTION	22

3.3.3.	BEHAVIOR OF INJECTED CARBON DIOXIDE IN LOWER SAFA.....	23
3.3.4	INJECTION PATTERN, WELLS DESCRIPTION AND SELECTION.....	24
3.3.5	FLOW LINE SELECTION.....	24
3.3.6.	MATERIAL SELECTION.....	25
3.3.7.	SIZE AND THICKNESS SELECTION OF FLOWLINE AND DOWNHOLE COMPLETION.....	25
3.3.8.	PRESSURE DROP IN INJECTION SYSTEM.....	28
3.3.9.	FLOW LINE SIZE CALCULATION	30
3.3.10.	CARBON DIOXIDE GAS COMPRESSOR SELECTION.....	30
3.3.11.	CRP (CO ₂ REMOVAL PLANT) & FIELD 2 ACID GAS CONTENT TO DETERMINE NEED FOR DEHYDRATION AND REMOVAL OF OTHER IMPURITIES.....	31
	CHAPTER 4 PROCEDURES, MATERIALS AND APPARATUS.....	33
4.1.	MICROALGAE CULTIVATION ON CARBON DIOXIDE, LAB EXPERIMENT...33	
4.1.1.	MATERIALS AND METHODS.....	33
4.1.1.1.	MICROALGAE AND CULTURE MEDIUM	33
4.1.1.2.	EXPERIMENTAL SETUP AND CULTIVATION CONDITIONS.....	33
4.1.2.	GROWTH MONITORING AND ASSESSED PARAMETERS	36
4.1.2.1.	MICROALGAL DRY WEIGHT	36
4.1.2.2.	LIPID EXTRACTION	36
	CHAPTER 5 RESULTS AND DISCUSSION	38
.5.1	EOR PROJECT ECONOMICS; COST AND REVENUE.....	38
5.2.	RESULTS OF LAB EXPERIMENTATION OF MICRO ALGAE CULTIVATION..38	
5.2.1.	RELATIONSHIP BETWEEN ALGAE GROWTH RATE VERSUS TIME AND VARIATIONS IN CARBON DIOXIDE CONCENTRATIONS.....	39
5.3.	DISCUSSING LAB ALGAL CULTIVATION EXPERIMENT RESULTS, WHAT ARE THE BEST RECOMMENDED CULTIVATION PARAMETERS.....	41
5.4.	IMPLEMENTING MICROALGAL CULTIVATION PROJECT IN COMPANY X..42	
5.4.1.	COMPANY X PRODUCTION PLANTS QUALIFIED FOR CARBON DIOXIDE REUSE.....	42

5.4.2.	MICROALGAE SELECTION; WHAT ARE THE RECOMMENDED STRAINS?.....	42
5.4.3.	SELECTION OF POND.....	45
5.4.3.1.	POND TYPE; WHY RACEWAY POND SHALL BE SELECTED.....	45
5.4.3.2.	RACEWAY POND DESIGN; MECHANICAL CONFIGURATION	45
5.4.4.	POND AREA / LAND REQUIREMENT AND POND LOCATION.....	46
5.4.5.	HEAT BALANCE CALCULATIONS TO JUDGE WHETHER GREENHOUSES OR HEATERS ARE REQUIRED OR NOT	46
5.4.5.1.	DESIGNS APPROACHES OF CARBON DIOXIDE INFLUENT ENTRY INTO THE SYSTEM	49
5.4.6.	CULTURE MEDIA	49
5.4.7.	DILUTION REQUIREMENT FOR THE HIGH CARBON DIOXIDE CONCENTRATION.....	50
5.4.8.	MICRO ALGAL BIOMASS PRODUCTION	50
5.4.9.	CONVERSION OF THE PRODUCED BIOMASS INTO BIOFUELS.....	50
5.4.10.	MICRO ALGAE CULTIVATION PROJECT; SUMMARY OF KEY DESIGN PARAMETERS AND ECONOMICS	51
	CHAPTER 6 CONCLUSION AND RECOMMENDATIONS.....	54
6.1.	EXTRA REQUIRED RESEARCH FOR MICROALGAL CULTIVATION.....	54
6.1.1.	EXTRA RESEARCH IS REQUIRED FOR EOR, POINTS MY RESEARCH MISSED:	54
6.1.1.1.	THREE MAJOR FLOODING PARAMETERS THAT SHOULD BE ASSESSED BEFORE A CARBON DIOXIDE FLOODING PROJECT [24].....	
6.1.1.2.	CARBON DIOXIDE INJECTION REQUIRED LABORATORY TESTS [24]	54
	REFERENCES.....	55
	APPENDIX A: ECONOMIC MODEL FOR MICROALGAE CULTIVATION PROJECT AT COMPANY X	58
	APPENDIX B: ECONOMIC MODEL FOR CARBON DIOXIDE-EOR PROJECT AT COMPANY X	63
	الملخص.....	أ

List of Tables

TABLE 1.1: SOURCES OF CARBON DIOXIDE EMISSIONS	2
TABLE 2.1: LIGHT PENETRATION DEPTH (CM) INTO CULTURES OFNANNOCHLOROPSIS SP.....	7
TABLE 2.2: COMPARISON OF GEOLOGICAL SEQUESTRATION OPTIONS....	10
TABLE 3.1 SWOT ANALYSIS TO SELECT BEST SEQUESTRATIONPATHWAY.....	14
TABLE 3.2: DESCRIPTION OF WELLS SELECTED FOR INJECTION.....	23
TABLE 3.3: EPRI CARBON DIOXIDE SAMPLE ANALYSIS	29
TABLE 4.1: K&C- MEDIUM COMPONENTS (KESSLER & CYGAN, 1970).....	31
TABLE 5.1: ECONOMIC CALCULATIONS FOR REQUIRED EOR COSTS.....	35
TABLE 5.2: LAB MICROALGAL EXPERIMENTATION RESULTS.....	36
TABLE 5.3: PRODUCTS OF SOME MICROALGAE SPECIES.....	40
TABLE 5.4: OIL CONTENT AND HABITAT OF SOME MICROALGAE.....	40
TABLE 5.5: ADVANTAGES & DISADVANTAGES OF SOME STUDIEDMICROALGAE.....	41
TABLE 5.6: COMPARISON BETWEEN PHOTOBIOREACTORS ANDRACEWAYS.....	41
TABLE 5.7: DIESEL PRODUCTION IN FIELD 2 PROJECT FOR DIFFERENTSEQUESTRATION PERCENTAGES OF CARBON DIOXIDEEMITTED EMITTED.....	47
TABLE 5.8: SUMMARY OF MAIN POINTS IN BIOLOGICAL CULTIVATION INFIELD2.....	48
TABLE 5.9: FIELD 2 BIOLOGICAL CULTIVATION COSTS	49
TABLE A.1: CULTIVATION OPERATION ASSUMPTIONS FOR FIELD 2.....	55
TABLE A.2: CULTIVATION INVESTMENT ASSUMPTIONS	56
TABLE A.3: TOTAL INVESTMENT COST FOR MICRO ALGAE CULTIVATIONPROJECT.....	57
TABLE A.4: LOAN PAYMENT SCHEDULE	57
TABLE A.5: CASH FLOW CALCULATIONS	58
TABLE B.1: INJECTION BUSINESS ASSUMPTIONS FOR FIELD 2	59
TABLE B.2: INJECTION INVESTMENT ASSUMPTIONS	60
TABLE B.3: TOTAL INVESTMENT COST FOR INJECTION PROJECT	60
TABLE B.4: LOAN PAYMENT SCHEDULE	61
TABLE B.5: CASH FLOW CALCULATIONS	61

List of Figures

FIGURE 1.1: GHG DISTRIBUTION BY TYPE OF GHG GAS	1
FIGURE 2.1: DIFFERENT USAGE PATHWAYS WAYS OF CARBON DIOXIDE...	4
FIGURE 2.2: COMPARISON BETWEEN CARBON DIOXIDE PATHWAYS.....	5
FIGURE 2.3: SCHEMATIC OF A TYPICAL RACEWAY POND DESIGN.....	7
FIGURE 2.4: PATHWAYS BIOFUEL PRODUCTION FROM MICROALGALBIOMASS	9
FIGURE 2.5: PRODUCTS DISTRIBUTION IN THE THREE APPROACHES OFMICROALGAL BIOMASS REFINERY.....	9
FIGURE 2.6: SOME GEOLOGICAL STORAGE OPTIONS FOR CARBONDIOXIDE.....	10
FIGURE 2.7: ILLUSTRATION OF THE MULTISCALE ASPECTS OF CARBONDIOXIDE STORAGE SCIENCE.....	11
FIGURE 2.8: SCHEME OF THE TOTAL PROCESS OF SEQUESTRATION.....	12
FIGURE 2.9: POST-INJECTION DISPERSION OF CARBON DIOXIDE IN THERESERVOIR.....	12
FIGURE 3.1: TIME SCALES FOR CARBON DIOXIDE INJECTION TRAPS.....	15
FIGURE 3.2: CARBON DIOXIDE PHASE BEHAVIOR.....	18
FIGURE 3.3: STRATIGRAPHIC COLUMN OF PAY ZONES FOR EACHRESPECTIVE FIELD IN COMPANY X	25
FIGURE 3.4: RESERVOIR MAP OF FIELD 2 FIELD... ..	26
FIGURE 3.5: WELL SCHEMATIC OF D14H GAS WELL.....	27
FIGURE 3.6: IDEALIZED FORMATION STRENGTH RESPONSE.....	28
FIGURE 4.1: EXPERIMENTAL SETUP OF CARBON DIOXIDESEQUESTRATION ON MICRO ALGAE.....	32
FIGURE 4.2: SEPARATED LIPIDS AFTER CENTRIFUGATION.....	34
FIGURE 4.3: PUMP AND DRAGGER TUBE FOR CO ₂ SAMPLING	34
FIGURE 5.1: MONITORING ALGAE GROWTH ALONG INCUBATION PERIODOF SCENEDESMUS SP. AT DIFFERENT CONCENTRATIONS OFCARBON DIOXIDE	36
FIGURE 5.2: MONITORING ALGAE GROWTH ALONG INCUBATION PERIODOF CHLOROCOCCUM SP. AT DIFFERENT CONCENTRATIONSOF CARBON DIOXIDE	37
FIGURE 5.3: TIME COURSE FOR LIPID CONTENT OF SCENEDESMUS SP. ATDIFFERENT CONCENTRATIONS OF CARBON DIOXIDE	37
FIGURE 5.4: TIME COURSE FOR LIPID CONTENT OF CHLOROCOCCUM SP.AT DIFFERENT CONCENTRATIONS OF CARBON DIOXIDE.....	38
FIGURE 5.5:A- DESIGN OF RACEWAY POND, B-DESIGN OF GREENHOUSELAYER.....	42
FIGURE A.1: BLOCK FLOW DIAGRAM; INPUTS AND OUTPUTS FROMCULTIVATION PROJECT.....	55
FIGURE B.1: BLOCK FLOW DIAGRAM; INPUTS AND OUTPUTS FROMINJECTION PROJECT	59

Nomenclature

BBL: oil barrel
BCF: billion cubic feet
Btu hr⁻¹ ft⁻² °F⁻¹: British Thermal unit/ (hour.square feet. degree fahrenheit)
capex: capital costs
CBL cement bond log
CCS: carbon capture and sequestration
CCU: carbon capture and utilization
Carbon Dioxide: Carbon Dioxide
Company X: Oil company in Egypt
CRP: Carbon Dioxide removal plant
DCA: decline curve analysis
ECBM: enhanced coal bed methane
EOR/EGR: enhanced oil recovery/ Enhanced gas recovery
EPC: engineering, procurement and construction
EPRI: Egyptian petroleum Research Institute
FIELD 2: specific field in company X
G/L: gram per liter
GDP: gross domestic product
GHG: green house gases
GT: gigatonnes
HCPV: hydrocarbon pore volume
InSAR: Interferometric Synthetic Aperture Radar
IOC: international oil company
IPCC: the united nations intergovernmental parties of climate change
KUSD: thousand USA dollars
L.E. Egyptian pound
MENA: middel east and north africa
MJ/m².day: mega joule/ square meter.day
mmscf/d: million standard cubic feet per day
MPA: mega pascal
MtCO_{2e}: mega tonne Carbon Dioxide equivalent
OOIP/OGIP: original oil in place/ original gas in place respectively
opex: operational costs
PBR: photobioreactor
PFD: process flow diagram
PSI: pound per square inch
PVC: Polyvinyl Chloride
R&D: research and development
SS: stainless steel
SWOT: strength-weakness-opportunities-threats
Tc: critical temperature
TRL: technological readiness
USIT; ultra sonic imaging tool
VDL variable density log