



Cairo University

PERMEABILITY PREDICTION MODEL BASED ON MULTIPLE REGRESSION TECHNIQUE FOR WELL LOG DATA

By

Hany Azmy Gamal Mahmoud Serag Eldien

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
PETROLEUM ENGINEERING

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Title of Thesis : **Permeability Prediction Model Based on Multiple Regression Technique for Well Log Data**

Key Words: Permeability Prediction Model; Multiple Regression Technique; Well Log Data

Summary :

The present work describes a methodology to evaluate well log parameters and its effect on permeability prediction through Multiple Regression Analysis. Permeability Prediction model has been built and applied to an oil field in Egypt using the available wells data for four wells containing wells log data and special core analysis. And finally, the model was validated by comparing the core permeability values and the calculated permeability values from the model which gave a high match degree, and the model was applied to a new well which has only well log data and the permeability values were predicted through the validated model.

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Table of Contents

ACKNOWLEDGMENTS	I
TABLE OF CONTENTS.....	II
LIST OF TABLES:	IV
LIST OF FIGURES:.....	VI
NOMENCLATURE	VII
ABSTRACT	VIII
CHAPTER ONE: INTRODUCTION.....	1
1.1 PERMEABILITY PREDICTION METHODS	2
1.2 STATEMENT OF THE PROBLEM	2
1.3 METHODOLOGY OF STUDY	3
CHAPTER TWO: BACKGROUND AND THEORY.....	4
2.1 PERMEABILITY MEASUREMENTS TECHNIQUES	4
2.1.1 Sidewall samples	4
2.1.2 Wireline logging correlations	4
2.1.3 NMR logs	5
2.1.4 Wireline formation testers	5
2.1.5 Drillstem tests	5
2.2 PERMEABILITY DETERMINATION	5
2.2.1 Pore [Micro] scale models	6
2.2.2 Field [Macro] Scale Models	10
2.2.2.1 Multiple Regression Analysis [MRA]	10
2.3 CONCEPT OF FLOW UNITS	14
2.3.1 Flow Unit Characterization Factors	15
2.3.1.1 Reservoir quality index [RQI]:	15
2.3.1.2 Flow zone indicator [FZI]:	15
2.3.1.3 Tiab flow unit characterization factor [HT].	16
2.3.1.4 Free fluid index [FFI]:	16
CHAPTER THREE: FIELD GEOLOGY.....	17
3.1 FIELD DESCRIPTION	17
3.2 GULF OF SUEZ GEOLOGY: AN OVERVIEW	18
3.3 MIOCENE	19
3.4 SOURCE ROCKS	22
3.4.1 Reservoir units	22
3.4.2 Migration of oil, seal, and trap	22
3.5 PRODUCING ZONES IN KAREEM FORMATION	22
3.6 HYDRAULIC FLOW UNITS IN THE KAREEM FORMATION	23
CHAPTER FOUR: METHODOLOGY AND RESULTS	26
4.1 DATA SET	27
4.2 FLOW UNIT ZONATION	30
4.3 EVALUATION OF LOG PARAMETERS AND DEVELOPMENT OF K PREDICTION MODEL:	31
4.4 RESULTS	34
4.5 ANALYSIS OF SINGLE WELLS	34
4.5.1 Well A3x results:	34

4.5.2 Well A4x results:	40
4.5.3 Well A5x results:	46
4.5.4 Well A6x results:	49
CHAPTER FIVE: DISCUSSION AND DATA ANALYSIS.....	56
5.1 WELL A3x:	56
5.2 WELL A4x:	58
5.3 WELL A5x:	59
5.4 WELL A6x:	61
5.5 INTEGRATED HFU DISTRIBUTION ACROSS KAREEM FORMATION:	62
5.6 MRA MODEL PREDICTION:	65
5.7 MODEL VALIDATION:	67
5.8 FINAL LOGEST MODEL EQUATION FOR SIX PARAMETERS :.....	70
5.8.1 Final Logest Model Equation for Five Parameters:	71
5.8.2 Final Logest Model Equation for Four Parameters:	71
5.9 MRA MODEL APPLICATION ON WELL A2x:	71
CHAPTER SIX CONCLUSIONS AND RECOMMENDATIONS	75
6.1 CONCLUSIONS	75
6.2 RECOMMENDATIONS:	76
REFERENCES.....	77
APPENDIX A: CORE VERSUS MODEL PERMEABILITY PROFILE FOR WELL A3X.....	80
APPENDIX B: CORE VERSUS MODEL PERMEABILITY PROFILE FOR WELL A4X	82
APPENDIX C: CORE VERSUS MODEL PERMEABILITY PROFILE FOR WELL A5X.....	84
APPENDIX D: CORE VERSUS MODEL PERMEABILITY PROFILE FOR WELL A6X.....	86
ملخص البحث.....	89

List of Tables

TABLE 2-1 PERMEABILITY CORRELATIONS DEVELOPED BASED ON THE PORE AND GRAIN PROPERTIES.	6
TABLE 2-2 PERMEABILITY CORRELATIONS DERIVED USING WELL LOG PARAMETERS.....	7
TABLE 2-3 VARIABLES OF THE ADDITIONAL REGRESSION STATISTICS [29]	12
TABLE 2-4 PROPERTIES TYPICALLY NEEDED TO DEFINE A FLOW UNIT.	14
TABLE 4-1 CORE ANALYSIS, AX OIL FIELD	29
TABLE 4-2 THE COMBINATIONS AND THE NUMBER OF TRIALS.....	32
TABLE 4-3 THE COMBINATIONS OF 2 AND 3 PARAMETERS	32
TABLE 4-4 THE COMBINATIONS OF 4 AND 5 PARAMETERS	33
TABLE 4-5 ZONATION DATA FOR WELL A3X	36
TABLE 4-6 THE COEFFICIENTS OF DETERMINATION R^2 FOR TWO WELL LOG PARAMETERS EVALUATION FOR WELL A3X.....	37
TABLE 4-7 THE COEFFICIENTS OF DETERMINATION R^2 FOR THREE WELL LOG PARAMETERS EVALUATION FOR WELL A3X.....	38
TABLE 4-8 THE COEFFICIENTS OF DETERMINATION R^2 FOR FOUR WELL LOG PARAMETERS EVALUATION FOR WELL A3X.....	39
TABLE 4-9 THE COEFFICIENTS OF DETERMINATION R^2 FOR FIVE WELL LOG PARAMETERS EVALUATION FOR WELL A3X.....	39
TABLE 4-10 THE COEFFICIENTS OF DETERMINATION R^2 FOR SIX WELL LOG PARAMETERS EVALUATION FOR WELL A3X.....	40
TABLE 4-11 ZONATION DATA FOR WELL A4X.....	42
TABLE 4-12 THE COEFFICIENTS OF DETERMINATION R^2 FOR TWO WELL LOG PARAMETERS EVALUATION FOR WELL A4X.....	43
TABLE 4-13 THE COEFFICIENTS OF DETERMINATION R^2 FOR THREE WELL LOG PARAMETERS EVALUATION FOR WELL A4X.....	44
TABLE 4-14 THE COEFFICIENTS OF DETERMINATION R^2 FOR FOUR WELL LOG PARAMETERS EVALUATION FOR WELL A4X.....	45
TABLE 4-15 THE COEFFICIENTS OF DETERMINATION R^2 FOR FIVE WELL LOG PARAMETERS EVALUATION FOR WELL A4X.....	45
TABLE 4-16 THE COEFFICIENTS OF DETERMINATION R^2 FOR SIX WELL LOG PARAMETERS EVALUATION FOR WELL A4X.....	46
TABLE 4-17 ZONATION DATA FOR WELL A5X.....	46
TABLE 4-18 THE COEFFICIENTS OF DETERMINATION R^2 FOR TWO WELL LOG PARAMETERS EVALUATION FOR WELL A5X.....	48
TABLE 4-19 THE COEFFICIENTS OF DETERMINATION R^2 FOR THREE WELL LOG PARAMETERS EVALUATION FOR WELL A5X.....	48
TABLE 4-20 THE COEFFICIENTS OF DETERMINATION R^2 FOR FOUR WELL LOG PARAMETERS EVALUATION FOR WELL A5X.....	49
TABLE 4-21 THE COEFFICIENTS OF DETERMINATION R^2 FOR FIVE WELL LOG PARAMETERS EVALUATION FOR WELL A5X.....	49
TABLE 4-22 ZONATION DATA FOR WELL A6X.....	52
TABLE 4-23 THE COEFFICIENTS OF DETERMINATION R^2 FOR TWO WELL LOG PARAMETERS EVALUATION FOR WELL A6X.....	53
TABLE 4-24 THE COEFFICIENTS OF DETERMINATION R^2 FOR THREE WELL LOG PARAMETERS EVALUATION FOR WELL A6X.....	54

TABLE 4-25 THE COEFFICIENTS OF DETERMINATION R^2 FOR FOUR WELL LOG PARAMETERS EVALUATION FOR WELL A6X	55
TABLE 4-26 THE COEFFICIENTS OF DETERMINATION R^2 FOR FIVE WELL LOG PARAMETERS EVALUATION FOR WELL A6X	55
TABLE 4-27 THE COEFFICIENTS OF DETERMINATION R^2 FOR SIX WELL LOG PARAMETERS EVALUATION FOR WELL A6X	55
TABLE 5-1 WELL A3X WELL LOG COMBINATIONS` RESULTS.....	57
TABLE 5-2 WELL A4X WELL LOG COMBINATIONS` RESULTS.....	58
TABLE 5-3 WELL A5X WELL LOG COMBINATIONS` RESULTS.....	60
TABLE 5-4 WELL A6X WELL LOG COMBINATIONS` RESULTS.....	61
TABLE 5-5 COEFFICIENTS OF MRA LINEST MODEL.....	62

List of Figures

FIGURE 3-1 AX FIELD MAP [GOOGLE EARTH].	17
FIGURE 3-2 OIL PRODUCTION FOR ASE FIELD	18
FIGURE 3-3 GEOLOGICAL CROSS-SECTION THROUGH THE SOUTH CENTRAL GULF OF SUEZ.	19
FIGURE 3-4 GENERAL STRATIGRAPHIC COLUMN FOR THE EASTERN DESERT GULF OF SUEZ.	21
FIGURE 3-5 STRUCTURAL MAP FOR THE FIELD.	24
FIGURE 3-6 FAULTS MAP FOR THE FIELD.	25
FIGURE 3-7 LOG INTERPRETATIONS FOR KAREEM RESERVOIR PROPERTIES.	25
FIGURE 4-1 FLOW CHART PRESENTING DATA ANALYSIS AND PROCESSING METHODOLOGY APPLIED IN THE PRESENT WORK	28
FIGURE 4-2 WELLS PROFILE ACROSS THE FIELD	29
FIGURE 4-3 RQI VS. ΦZ PLOT FOR WELL A3X.	35
FIGURE 4-4 CUMULATIVE FLOW CAPACITY VS. STORAGE CAPACITY FOR WELL A3X	35
FIGURE 4-5 CUMULATIVE FLOW CAPACITY VS. DEPTH FOR WELL A3X.....	36
FIGURE 4-6 CUMULATIVE FLOW CAPACITY VS. STORAGE CAPACITY FOR WELL A4X [SHAGAR ZONE].....	40
FIGURE 4-7 CUMULATIVE FLOW CAPACITY VS. STORAGE CAPACITY FOR WELL A4X [RAHMI ZONE].....	41
FIGURE 4-8 CUMULATIVE FLOW CAPACITY VS. DEPTH FOR WELL A4X [SHAGAR ZONE]	41
FIGURE 4-9 CUMULATIVE FLOW CAPACITY VS. DEPTH FOR WELL A4X [RAHMI ZONE]	42
FIGURE 4-10 CUMULATIVE FLOW CAPACITY VS. STORAGE CAPACITY FOR WELL A5X.....	47
FIGURE 4-11 CUMULATIVE FLOW CAPACITY VS. DEPTH FOR WELL A5X	47
FIGURE 4-12 CUMULATIVE FLOW CAPACITY VS. STORAGE CAPACITY FOR WELL A6X [SHAGAR ZONE]	50
FIGURE 4-13 CUMULATIVE FLOW CAPACITY VS. STORAGE CAPACITY FOR WELL A6X [RAHMI ZONE]	50
FIGURE 4-14 CUMULATIVE FLOW CAPACITY VS. DEPTH FOR WELL A6X [SHAGAR ZONE].....	51
FIGURE 4-15 CUMULATIVE FLOW CAPACITY VS. DEPTH FOR WELL A6X [RAHMI ZONE].....	51
FIGURE 5-1 CROSS SECTION FOR THE CORED WELLS.	64
FIGURE 5-2 TWO MODELS [LINEST AND LOGEST] VS. CORE PERMEABILITY FOR ALL WELLS.	66
FIGURE 5-3 APPLICATION OF TWO MODELS [LINEST VS. LOGEST] WITH CORE PERMEABILITY.....	67
FIGURE 5-4 MRA MODEL APPLICATION ON WELL A3X	68
FIGURE 5-5 K CORE VS. K CALCULATED BY MODEL FOR WELL A3X	68
FIGURE 5-6 MRA MODEL APPLICATION ON WELL A4X	69
FIGURE 5-7 MRA MODEL APPLICATION ON WELL A5X	69
FIGURE 5-8 MRA MODEL APPLICATION ON WELL A6X	70
FIGURE 5-9 K CALC. BY MRA MODEL FOR WELL A2X	72
FIGURE 5-10 CUMULATIVE FLOW CAPACITY VS. STORAGE CAPACITY FOR WELL A2X [SHAGAR ZONE]	73
FIGURE 5-11 CUMULATIVE FLOW CAPACITY VS. DEPTH FOR WELL A2X [SHAGAR ZONE].....	73
FIGURE 5-12 CUMULATIVE FLOW CAPACITY VS. STORAGE CAPACITY FOR WELL A2X [RAHMI ZONE]	74
FIGURE 5-13 CUMULATIVE FLOW CAPACITY VS. DEPTH FOR WELL A2X [RAHMI ZONE].....	74

Nomenclature

Symbol	Description
K	Permeability, mD
ϕ	Porosity
Φ_e	Effective Porosity
Φ_z	The pore volume to grain volume ratio
GR	Gamma Ray
PEF	Photo Electric Effect
Rt	Deep Induction log, True Resistivity
RHOB	Density Log
DST	Drill Stem Test
NMR	Nuclear Magnetic Resonance
FU	Flow Unit
FZI	Flow Zone Indicator
RQI	Reservoir Quality Index
T	Tortuosity
S_{vp}	The internal surface area per unit of pore volume
S_{vgr}	The total area exposed within the pore space per unit of grain volume
PIA	Petrographic Image Analysis
MRA	Multiple Regression Analysis
ANN	Artificial Neural Network
R^2	Coefficient of Determination
HFU	Hydraulic Flow Unit
RRT	Reservoir Rock Typing
H_T	Tiab Flow Unit Characterization Factor
FFI	Free Fluid Index
S_{wir}	Irreducible Water Saturation
BOPD	Barrel oil per day
SMLP	Stratigraphy Modified Lorenz Plot
Fm	Cumulative Flow Capacity
ϕ_m	Cumulative Storage Capacity