Ain Shams University
Faculty of Science
Geophysics Department

Geophysical and geological modelling of Kareem formation, Belayim land field, Sinai, Egypt.

A Thesis submitted for a partial fulfillment for the requirements of master degree in Geophysics

By

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(B. Sc. in Geophysics- Faculty of Science-Ain shams University, 2007)

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To
Geophysics Department
Faculty of Science, Ain Shams University

Cairo-2018

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Approval Sheet

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NOTE

The present thesis is submitted to Geology Department, Faculty of Science, Ain Shams University in partial fulfillment of the requirement for the degree of Master in Science in Geology.

Beside the research work materialized in this thesis, the candidate has successfully passed the final examinations of the post-graduate courses covering the following topics:

1. Geophysical Field Measurements.
2. Numerical analysis and computer programming.
3. Petrophysical properties of Rocks.
4. Advanced Well Logging.
5. Sedimentary basin Analysis.
6. Subsurface Geology.
7. Geophysical prospecting.
8. Fluid Dynamics.
9. Reservoir Evaluation.
10. Formation evaluation.

In fulfillment of the language requirement of the degree, the candidate also passed the final examination of a course in the English Language.

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Department: Geophysics

Faculty: Science

University: Ain Shams

ACKNOWLEDGEMENTS

First and foremost, I would like to thank God, whose many blessings have made me who I am today.

Great and deep thanks should go to **Professor Dr. Abd El Moktader Abd El-Aziz El Sayed**, Professor of Petrophysics, Geophysics Department, Faculty of Science, Ain Shams University for his tremendous efforts starting from setting the research theme and research scheme, follow up, research discussion and ending with accomplishing this work to come through in the best form.

Special thanks and gratitude to **Dr. Amir Maher Sayed Lala**, Assistant Professor of Geophysics, Geophysics Department, Faculty of Science, Ain Shams University for his help, supervision, advice, discussion, and guidance through this work for such a research to be as perfect as possible.

I would like also to acknowledge **Dr. Ahmed Salah**, Vice President of Egyptian Natural Gas Holding Company (EGAS) for Agreements and Exploration for his help, guidance, support, encouragement and providing me with all various materials and facilities needed for such a research to be as perfect as possible.

I would like also to acknowledge Dr.Nahla A. El Sayed, Assistant Professor of Geophysics, Exploration Department, EPRI, Egypt for her continuous help during the whole research work.

I would like also to thank. **Mohamed Samir Mohamed**, Petrophysics section head, Belayim Petroleum Company for her help and encouragement.

I'm also bound to give my due acknowledgement to **Belayim Petroleum Company** and **Egyptian General Petroleum Company** for providing a lot of data and material needed for the work.

Finally, I also should dedicate the success of this work to my father and my mother for their continuous encouragement to complete this work. I'll never forget the role played by the family.

ABSTRACT

The present study deals with a comprehensive seismic interpretation and available digital well-log data using computer program (IP software). Corresponding well-log data have been processed through computerized through available computer software.

The interpretation of seismic data was done by using SeisWorks software (Halliburton). Seismic data were integrated with well data, VSP data, and check shot data and well to seismic tie also applied which is a useful tool to detect exactly the response of the drilled anomaly in the seismic and to interpret it easily. Interpretation was also guided by some nearby surface geological models derived from surface geologic mapping in the Gulf of Suez by previous workers.

The lateral variations of the petrophysical characteristics are represented in the form of iso-parametric maps (effective thickness, shale content, effective porosity and hydrocarbon saturation). It is worth-mentioning that, also the litho-saturation cross-plots inferred from computer processed interpretation. The Vertical Profile for both Measured and Calculated Petrophysical Parameters were performed.

The petrophysical characteristics of Kareem Formation reflect the ability of these rock to store and produce hydrocarbon fluids. The measured effective porosity ranges between 2.0 to 17.0%, the shale content is ranged from 6 to 75% and hydrocarbon saturation ranges between 0 .0 - 80%, which reflect the studied reservoir characterization. Several petrophysical models were introduced in order to estimate some important reservoir parameters.

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LIST OF ABBREVIATIONS

AI	Acoustic Impedance
Cm	Centimeter
E	East direction
GWC	Gas water contact
HC	Hydrocarbon
Km	Kilo meter
Km^2	Square kilo meter
Ma	Million years ago
Ms	Millisecond
N	North direction

σ	Poisson's Ratio
RC	Reflectivity
S	South direction
Sw	Water saturation
TCF	Trillion cubic feet
TWT	Two way time
Vp	P-wave velocity
Vp/Vs	Ratio of P-wave velocity to S-wave velocity
Vs	S-wave velocity
VSP	Vertical seismic profile
W	West direction
Yr	Year
Zp	P-wave impedance
Zs	S-wave impedance
λ	Thermal conductivity
ρ	Density
3D	Three Dimensions
σ	Poisson's Ratio
Zp	P-wave impedance
KH	Horizontal permeability
KV	Vertical permeability
Vshale	Shale Volume
m	Cementation exponent
n	Saturation exponent
a	Tortuosity factor

INTRODUCTION

Belayim Land field is located in the central part of the Gulf of Suez, along the coast of the Sinai Peninsula. Together with Belayim Marine and Abu Rudeis Sidri fields, it forms the Abu Rudeis oil district operated by Petrobel Oil Company.

The Belayim Land Development area is operated by Petrobel Operating Company on behalf of the concession shareholders EGPC 50% and IEOC Prod B.V. 50%.

Belayim Land is a multilayer field with several separated sandstone reservoirs interbedded with shales and anhydrite intercalations, ranging from Lower to Upper Miocene Age and named (Zeit Fm, South Gharib Fm, Hammam Faraun Mbr, Feiran Mbr, Sidri Mbr, Kareem Fm, and Rudeis Fm.

From a structural point of view the field can be described as a N-S trending anticline (10 Km long and 4 Km wide) cut by 2 main fault systems. The main faulting system is parallel to the coast and is related to the rifting of Gulf of Suez while a secondary NW-SE trend subdivides the structure in several sectors. As a result, this complex structural setting is characterized by the presence of several independent structural blocks. On the west side of the structure there is communication with its offshore analogue, Belayim Marine Field. The two fields resulted to be in dynamic communication through a common aquifer.

The field was discovered at the beginning of 1954 and it was put on production on September 1955. Water injection started in 1985 when the field was already partially depleted, with volumes suitable to balance liquid withdrawal.

CHAPTER 1

INTRODUCTION

1.1. Location of the Study Area:

Belayim Land Field is one of the large oil fields in the Gulf of Suez. It located in the central part on the eastern coast of the Gulf of Suez, south of Abu Rudeis town (Fig. 1.1).

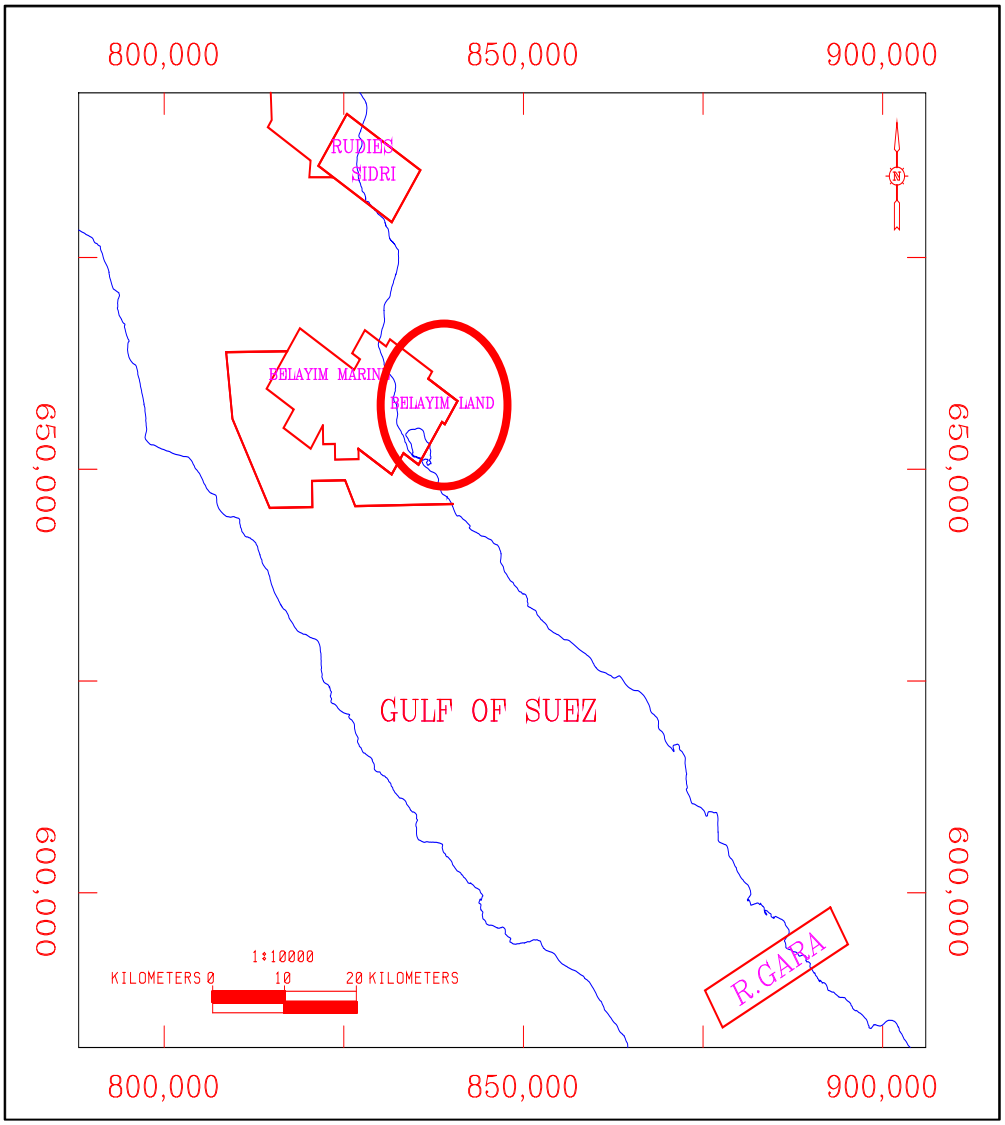

Fig.(1): Location Map of the Study Area:.