Ain Shams University
Faculty of Science
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Static Modeling and Petroleum System Analysis at Port Fouad Marine Field, Eastern Mediterranean, Egypt

A Thesis submitted for the degree of Master of Science as a partial fulfillment for the requirements of Master degree of Science in Applied Geophysics.

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Cairo – 2018

Note

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

Beside the research work materialized in this thesis, the candidate has attended ten post-graduate courses for one year in the following topics:

1) Geophysical Field Measurements.
2) Numerical Analysis and Computer Programming.
3) Petrophysical Properties of Rocks.
4) Advanced Well Logging.
5) Formation Evaluation.
6) Reservoir Evaluation.
7) Surface Geology.
8) Geophysical Prospecting.
9) Sedimentary Basin Analysis.
10) Fluid Dynamics.

He successfully passed the final examinations in these courses. In fulfillment of the language requirement of the degree, he also passed the final examination of a course in the English language.

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Acknowledgment

Fist and forever thanks to Allah who guided me to bring this thesis to the light and for all that I have been given.

I wish to express my deep and grateful thanks to Prof. Dr. Abdullah Mahmoud El Sayed Mahmuod, Associate Professor of Geophysics, Geophysics Department, Faculty of Science, Ain Shams University, for supervising and valuable comments in this work, reading and reviewing the manuscripts.

I would like to express my sincere thanks to Dr. Azza Mahmoud Abd El-Latif El-Rawy, Lecturer of Geophysics, Geophysics Department, Faculty of Science, Ain Shams University, for supervising and valuable comments in this work, reading and reviewing the manuscripts.

I am unaware of words meaningful enough to adequately express the deep sense of gratitude that I wish to convey to my family for their patience, fortitude and understanding. Their love and devotion kept me going and I am extremely grateful to them for their encouragement and support.

Abstract

The off-shore Nile Delta is one of the most promising areas for gas exploration and production in Egypt and the Middle East. The present study deals with evaluation of the gas-bearing sand intervals at the off-shore Nile Delta of Egypt using the available geological and geophysical datasets.

The data set comprise logs of 4 wells and 25 seismic lines that are selected from 3D seismic cube. The well logs also including pressure measurement and one well contains geochemical analysis data.

The available data are analyzed to understand the structural configuration of the studied area using the seismic lines to study the possible reasons behind the dryness of some wells and for determining the different petrophysical and geochemical parameters that necessary for reservoir and source rocks evaluation, focusing on The middle to late Miocene sediments (Wakar and Sidi Salim Formations)

This study reveals the presence of multi gas-bearing sand zones in Wakar S1 level and Sidi Salim Formation, with good hydrocarbon potential, encountered at different depth levels. The comprehensive petrophysical analysis of these zones show that S1 level attains good reservoir parameters in all wells except in PFM S-1 well which is dry, while S2 and S3 levels are either shaled out or water bearing in the study area. However, Wakar S1 level exhibits unique characteristics; in terms of the good porosity (18 to 30%), low shale volume (Vsh<10%) and high gas potentiality (40 to 92%), which it attains.

The analysis of pressure data is concerned mainly with locating the different fluid contacts, determining the pressure gradients of the gas-bearing zones, and detecting the different hydrocarbon densities. Pressure gradient ranges of 0.091 to 0.325 psi/ft are indicated for Wakar S1 level.

The analysis of geochemical data reveals that both Wakar and Sidi Salim Formations are immature fair potential source rocks with poor generating capability throughout the area of study, however the high gas potentiality of Wakar Formation which proved that the hydrocarbon accumulation is due to the biogenic activities that accompanied by deltaic environments.

Key words:

Wakar Formation, Port Fouad, PFM SE-1, Well Logs, Pressure Analysis, 1D Basin Modeling

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