Ain Shams University

Faculty of Science

Geophysics Department

3D Seismic Reflection and Well Log Data Analysis for Reservoir Characterization at Oligocene Sands, Nile Delta, 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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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.

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كلية العلـــــوم

قسم الجيوفيزياء

تحليل البيانات السيزمية الانعكاسية ثلاثية الابعاد وتسجيلات الابار لخواص خزان الاوليجوسين الرملي بدلتا النيل-مصر

رسالة مقدمة من

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لاستكمال متطلبات الحصول على درجة الماجستير فى العلوم فى الجيوفيزياء

إلى

قسم الجيوفيزياء

كلية العلوم- جامعة عين شمس

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القـاهرة – 2013

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و كذلك أشكر الهيئات الآتية:

1) **الهيئة المصرية العامة للبترول**
2) **شركة British Petroleum**

Acknowledgments

Dedication

Fist and forever thanks to Allah who guided me to bring this thesis to the light.

I wish to express my deep and grateful thanks to Prof. Dr. Abd Elnaser Mohamed Helal, Professor of Geophysics, Geophysics Department, Faculty of Science, Ain Shams University, for valuable and leading comments in this work, reading and reviewing the manuscripts.

I would like to express my sincere thanks to Dr. Azza Abd El-Latif El-Rawy, Lecturer of Geophysics, Geophysics Department, Faculty of Science, Ain Shams University, for supervising, providing me with the idea of attributes, supporting me with some research papers needed for this study, reading and reviewing the manuscripts.

I wish to express my sincere gratitude and heart-felt thanks to Mr. Paul J. Boucher, Senior Geophysicist, British Petroleum Company, for his generous efforts, critical comments, providing the ideas, reviewing manuscripts.

I would like to express my deep and grateful thanks to Dr. David R. Cowper, Exploration Manager, East Nile Delta, British Petroleum Company, for providing the data, his encouragement, useful leading and generous advice.

I would sincerely like to thank Mr Mohamed Reda Osman, Senior Petrophysicist, British Petroleum Company, for his help and support in petrophysics section.

I would like to express my great appreciation to British Petroleum Company Exploration team for their help in the different used softwares in this work.

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 petroleum industry is increasing its focus on the exploration of reservoirs in deep-water clastic systems (specifically turbidite sands). These sedimentary environments represent major hydrocarbon targets in numerous areas of the world among them the Nile Delta basin that has undergone a complex geological history, due to it is location on the active northern margin of the African plate. The study area is located approximately 60 km offshore from the central Nile Delta, and is in water depths ranging from 70 m to 100 m.

The principal objective of the current work is the studying the reservoir characteristics of the main reservoirs of Oligocene (Rupelian) section and identifying the depositional elements of these reservoirs by integrating different types of data such as seismic, cuttings, cores and well logs.

The study of reservoir characteristics of main reservoirs (O15 and O18 reservoir packages) of Rupelian section have be executed through several steps :1) mapping main flooding surfaces of the interested interval, base of Rupelian section, top and base of reservoir packages, 2) construction of attribute maps and images by using colored inversion (CI) and reflectivity volumes, then identification of architectural elements of individual reservoir packages (O15 and O18) of the early Oligocene (Rupelian) interval and building O15 and O18 depositional models 3) Evaluation of petrophysical properties of early Oligocene interval (pre-O20 interval) then studying reservoir characteristics and rock quality based on previously calculated petrophysical properties, cuttings description and core analysis. 4) Integrating well data analysis and attribute-based depositional models for reservoir characterization then investigating the reservoir connectivity.

The constructed time maps show a large four-way anticline with a NE-SW bounding fault parallel to Rosetta fault trend, affecting the Rupelian section.

O15 depositional model shows eastern and western lobe complexes which might be fed by one or two feeding systems. O18 depositional model displays amalgamated lobe complex at the western part of the area, part of lobe complex (may be) at the central part and

channelized lobe complex at the eastern part of the study area which might be fed by one or more different systems.

The results of integrating well data analysis and attribute-based depositional models of O18 and O15 reservoir packages show different seismic facies and different lobe complexes at X1-well-OH and X2-well-OH. O18 individual sand units penetrated by both wells exhibit different water saturations. O18 reservoir package at the X1-well-OH does not in pressure communication with the O18 reservoir package at the X2-well-OH.

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