شبكة المعلومات الجامعية

بسم اللّه الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

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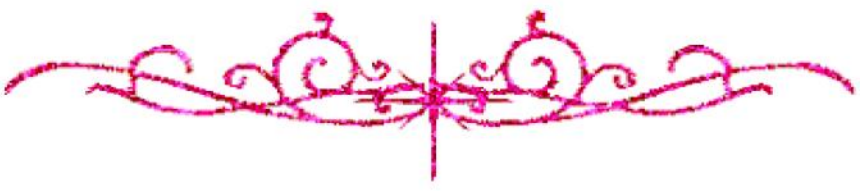

بالرسالة صفحات
لم ترد بالأصل

3D Structure and Stratigraphic Evaluation for Hydrocarbon Enhanced Recovery Tersa Oil Field, El-Fayum area, Western Desert, Egypt

A THESIS

Submitted for Doctorate of Philosophy Degree of Science in Geophysics

By

MOHAMED EHAB ABU-SINNA

To

Geophysics Department, Faculty of Science, Ain Shams University

Supervision

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Deputy CEO for Exploration

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(2020)

APPROVAL SHEET

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ACKNOWLEDGMENTS

My deep thanks to God to achievement this work. I would never have been able to finish my dissertation without the guidance of my committee professors, help good friends, and support my family. I would like to thank Petrosilah and Merlon international oil companies, as same as the EGPC staff, for the permission and support

I would like to express my deepest gratitude to my supervisors, for their effort, support and guidance. I would like to thank Prof. DR. Salah El-Din Abdel Wahab, Professor of geophysics, for his excellent guidance, caring and patience. I would like to express my deepest gratitude to my Professor Prof. DR. Mohammed Shokry Farag, Professor of geophysics, for his excellent guidance. I would also like to express my deep thank to Dr. Ahmed Zakaria Consultant of Geophysics, for his great effort, support, help, guidance and encouragement. I would like to thank Mr. Alaa Abd El Fatah El Battal for support, help and encouragement

I would like express my warm thanks, to my father, Dr. Ehab Abu-Sinna, consultant of Orthopedic Surgery, my mother, Dr. Fawzia El-Bassieony, consultant of genecology, my sister Rania, and my brothers, Eng. Ahmed and Eng. Ayman and their families, my wife, Dr. Noha Fahim, my daughters Aseel and karma, for their encouragement and support.

I'm grateful for the friends there for me, I would like to thank, Mrs. Irene Tadros, chief geophysicist of Merlon Oil Company for her support and encouragement. I would like to thank Geo. Salah Mansor my colleague for his support, effort and brilliant discussions we had which adding a value to my dissertation. My special thanks, for best friends, Ismail El Wakeel and Mohamed Salma for their help and support.

ABSTRACT

Tersa oil field lies within El Fayum concession west of River Nile in the northeast portion of the Western Desert Egypt. It is one of the producing fields for Petrosilah Company in El Fayum concession, the field surrounded by many other productive fields to the South, Southwest and West directions. It includes eight wells, in an area of 200 km² with good distribution over the area of study. The field starts production with the exploratory well Tersa-1X in March 2009 and considered as a discovery well followed by another discovery NE Tersa-1X well. The field has a several geophysical and geological challenge at different stages of the development plan represented in tracking the extension of hydrocarbons pays and expecting the reservoir parameter.

Tersa oil field is considered as a part of Gindi Basin, in which different tectonic deformation events affect and controlling the potentiality of the area. Structural geometry configuration through the interpretation of high resolution PSTM-3D seismic reflection data as well as the available drilled wells which play a good role to define the different deformation, integrated with the seismic attributes analysis to better visualize the structural elements and to detect any stratigraphic features in the area. Structural analysis delineates a great deformation zones in the area, including a different sets of fault orientation. In addition, the presence of both the strike slip component and the basin inversion with the presence of stratigraphic features channel system, which are controlling the reservoir distribution and field productivity, which is under development phase nowadays.

Seismic interpretation process starts with matching the available well data with seismic data through creating the synthetic seismogram, four wells used for this match and to identify the lithostratigraphic units in the area. Seismic interpretation including picking the main horizon and identifying the structural elements performed over Tersa field. Mapping the picked horizon in time domain to establish TWT maps,

analyze the average and interval velocities to be used for the depth conversion process, and to create a set of depth maps which better describe and representing the subsurface.

Attributes analysis used for long time to detect and delineate more structural and stratigraphic features which included in the reflection seismic data, a number of attributes analysis performed on the 3D seismic data of Tersa oil field including geometry, physical, Spectral Decomposition and hybrid attributes types. The results confirmed the structural pattern of the seismic interpretation process in addition, accumulation of sand channel detected and delineated at Upper and lower reservoir zones of the Abu Roash “G” Member using the flattened time slices at each level.

Reservoir characterization represents the key for enhanced recovery factor, as a recent discovered field the well design development plan plays significant role to preserve the reservoir life time and maximize the productivity. To better understanding of reservoir condition a petrophysical model is required, in addition it would demonstrate the relation between the acquired surface seismic data and the E-logs which recorded along the drilled wells around the field.

Seismic Inversion operation, shows the specific reservoir properties, within the impedance domain, it is performed through a workflow integrating all available data into one model, which offer a deep vision into the field potentiality, with the specific properties of the field data, which enhance and raise the success ratio the plan for any development operations in future. A post stack Model-Based technique were applied on the Tersa oil field 3D seismic data, integrated with the recorded sonic, density and velocity well logs and the main wells in the area. The results show the acoustic impedance distribution over Tersa oil field for the main reservoirs which reflect the relation with the isopach maps, sand/shale ratio and density distribution maps over the main reservoirs. The comparison of the amplitude-frequency spectrum

between the original seismic data and the inverted seismic data shows and reflects the effect of the inversion process on the frequency content, the inverted data extended the seismic data to a lower frequency range. Correlate the results with main productive wells for each reservoir level to predict the most promising area for exploration and development.

The work plan tries to reach beyond the conventional development theory, and to arrive at a delineation for complicated distribution of oil plays with rapid change of facies at the reservoir level. The planned work tries to suggesting a development plan to optimize the production rate, tracing the extension of the current discovered stratigraphic elements and find any other elements, identification of new prospect to apprise and development of the area of study.

CONTENTS

CHAPTER III : SEISMIC INTERPRETATION

CHAPTER IV: 3D SEISMIC ATTRIBUTES