AIN SHAMS UNIVERISTY
FACULTY OF SCIENCE
GEOPHYSICS DEPARTMENT

TECTONIC SETTING AND POTENTIAL HYDROCARBON EVALUATION USING THE SEISMIC AND MAGNETIC DATA IN RAMADAN FIELD - SOUTHERN PART OF THE GULF OF SUEZ - EGYPT.

A Thesis submitted for the Doctor of Philosophy Degree
(Ph.D.) of Science in Geophysics

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NOTE

The present thesis is submitted to the faculty of science, Ain Shams University for the Doctor of Philosophy Degree (Ph.D.) of Science in Geophysics.

Beside the research work materialized in this thesis, it contains a technical ideas applied by using the most modern software and the latest exploration and development tools, to be useful for research field study and technical applications due to many of the ideas assembled to achieve the objective of the study, using the Geological, Geophysical methods

In addition to the 3D Static model to evaluate the area of South Ramadan Field as an example of the south Gulf of Suez (SGOS).

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It gives me pleasure to be working in **PICO INTERNATIONAL PETROLEUM CO**., South Ramadan Field one of the fields owned by PICO so all possible data for the area was available for our study.

I am unaware of wards 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.

All official ways to obtain the data were done, starting from the approval of **(PICO, South Ramadan) Companies** And **THE EGYPTIAN GENERAL PETROLEUM CORPORATION acceptance.**

ABSTRACT

The southern part of the Gulf of Suez contains all elements of entrapment (source rock, reservoir and cap rock) to be one the most prolific hydrocarbon generation zone especially in Kareem, Nukhul and Pre-Miocene Formations.

The southern part of Gulf of Suez is one of the important areas for evaluation and study, to explore the hydrocarbon migration locations.

We have focused the evaluation and study in South Ramadan field as a case study in the south part of the Gulf of Suez due to the following reasons:

a) South Ramadan Concession field is located offshore in the Southern part of the Gulf of Suez-Egypt.
b) It is 15 km. to the East-Northeast of "Ras Gharib City" and about 15 km. to the northeast of Ras Shukheir Field Base.
c) In general it is located in the most prolific part of the Gulf of Suez. It is surrounded from the north by Ramadan, from the east by El-Morgan, from the south by LL87 and from the west by ESMA/LL87 Development fields.

In the present study for the South Ramadan field the surface beneath salt cover, this is lead to several problems due to masking the subsurface layers, conjugated zones cause several deviations in fault pattern, dip direction and amount in addition the field suffer from old and poor 2D seismic data.

The traditional interpretation for the old 2D seismic data creates untrustworthy maps as it cannot reveal the picture beneath the salt section additionally not accurate due to multiples and ringing affected on the seismic data.

The purpose of the study is to solve these problems by using new seismic data in the depth domain to construct new accurate structural maps tight with regional geological data,

By interpreting magnetic data that cover the area of study, to make a regional evaluation for the main faults that influence on the structure setting of the field.

Moreover revised from stratigraphy point of view, and identify the hydrocarbon potentialities area to integrate the data in 3D Static model represent the subsurface layers from structure and the reservoir characterization point of views.

So; we use new vintage of 3D seismic data migrated in the depth domain to introduce new interpretation and create new seismic attributes, as the seismic imaging in depth domain is the most powerful tool in delineating the surface zones beneath the salt bulge cover the field area.

Using all available well data and seismic data, besides that utilized the advantage of software facilities of (Geological and Geophysical studies with integration of advanced software for 3D static model), and previous studies contribute to understand some points.

Using Charisma® and Petrel® software gave a great support to achieve the study and minimize a lot of the previous problems, in addition to new modern technology for analysis of every piece of data has been applied to make use of the integration between the seismic data and well data.

After solving these problems, accurate maps for stratigraphic, structural and hydrocarbon potentialities of South Ramadan oil field have been established honoring the seismic and well data tight with regional geology. These accurate results have been inputted in building 3D static model which represents the most mature phase, to correlate and confirm the results in order to detect the best area to be drilled.

The final results show excellent progress in the area development plan from technical and economic points of view, as it shows new attribute technique to enhance the subsurface image and help to identify structure features and depositional environments, Seismic interpretation and mapping indicate that the structure of South Ramadan Field represent a typical rift structural setting within the transfer zone between two major rift segments with different regional dip regimes. This transfer is located between the southern Gulf of Suez structural province with regional southwest dip regime and the central structural province with regional northeast dip regime, which are consequently have opposite directions of fault throws northeast and southwest directions respectively. It classified as conjugate zone and characterized by gentler structural dip of Miocene and Pre-Miocene Formations as a result of the competition between the two different regional dip regimes.

3D Static model is an integrated procedures for 3 dimensional static modeling and visualization of the reservoir starting from input of seismic and well logging data until output of an upscale geological model for export to reservoir simulator, these procedure involved two main stages which are structure framework and petrophysical modeling.

Well proposals had been introduced to detect and identify the valuable blocks to explore and developed to add significant potential to the field reserve.

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CHAPTER 1

INTRODUCTION

1.1 GENERAL

The visualization of seismic consists of transferring waves of sound or compression at a place of a ground downward to subsurface, producing the reflected pulsation on the boundaries among the sub Zones inside the subsurface horizons and eventually arrival to the ground surface. The coming times and strengths of the reflections initially are recorded by an arranging of geophones that are positioned precisely through the region of concern, thereafter are handled and processed by supercomputer workstation and programs that create a set of subsurface displays. Lastly, a provisional geophysicist analysis these pictures to build an imaginary model of the ground sub Zones, the modeling phase which normally designs on other accessible information for the location area. (after Blache-Fraser 2004)

In Petroleum work, the three-dimensional (3D) seismic vintage is a very important technique to discover and identify the layers of bearing gas and oil reservoirs. As well very valuable in finding structure trap where hydrocarbon may be existing. Moreover, seismic data can be utilized to generate a fully 3D view that possibly can illustrate the subsurface characters and features. Such as, the collected data from drilling and sampling produce “point” data. Conceptual models can be built by interpolation of these points to construct some sub-layers features. (after Dix, C.H., 1955)