شبكة المعلومات الجامعية

بسم اللّه الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

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بالرسالة صفحات لم ترد بالأصل

AIN SHAMS UNIVERSITY
FACULTY OF SCIENCE
GEOPHYSICS DEPARTMENT

Integrated Geophysical Evaluation of Ganna Field, North Bahariya Concession, Southeast of Abu El Gharadig Basin, Northern Western Desert, Egypt

A THESIS
Submitted for the Ph.D. degree in Geophysics

BY
MAHITAB ALI SAYED ALI
Master Degree in Geophysics
Ain Shams University 2017

To
Geophysics Department – Faculty of Science
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Cairo, 2020

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Ph.D. THESIS in Geophysics

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Abstract

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ABSTRACT

The Study area; Ganna field is a part of the North Bahariya concession that is located in the south eastern flank of Abu El Gharadig Basin in the northern part of the Egyptian Western Desert; about 150 km WSW of Cairo City. It covers an area of about 42 km² and is bounded by latitudes 29º 35' 00'' and 29º 38' 00'' N and longitudes 29º 21' 00'' and 29º 27' 00'' E. The primary productive horizons in Ganna field are the Upper Cretaceous formations Abu Roash "G" and "E" and Upper Bahariya. Therefore, the main purpose of this study is to identify the subsurface geological structures and evaluating the petrophysical properties for potential zones of Abu Roash "E" and "G" and Upper Bahariya in Ganna area using 2D seismic and available well data to achieve maximum hydrocarbon recovery.

Firstly, construction of the paleorelief, isopach and weighted "Clastics, Limestones and Shales" maps for all formations penetrated by the available wells to best knowledge of the depocenters of the basin, the thickness changes and the lithological contents which reflects depositional environments of the formations and to determine the tectonics affected the basin after its formation if the basin is in syndepositional stability or there is post depositional deformation occurred.

The second stage is the seismic data interpretation which was carried out for thirty 2D depth seismic lines in both strike and dip directions using Petrel® 3D Seismic Interpretation Software to provide detailed information about the subsurface structural geometry for the levels of interest (Top Khoman, Top Abu Roash "A", Top Abu Roash "E", Top Upper Abu Roash "G", Top Middle Abu Roash "G", Top Lower Abu Roash "G" and Top Upper Bahariya). Investigation of the interpreted seismic sections and depth structure contour maps reveal that the area is affected mainly by WNW-ESE and E-W oriented normal faults forming due to Jurassic to Early Cretaceous rifting are extended in the study area. Then, a 3D structural modeling was done to modify the trap in regard to fault structure. It also allows viewing and evaluating a structure model by displaying cross sections along any direction and through any well location of

the model's data base. The 3D model of Ganna field illustrates the same configuration and the same structural elements

The third part of this work was focused on the formation evaluation and hydrocarbon potentialities of Abu Roash "E" and "G" members and Bahariya Formation. The key for this analysis is the interpretation of the available logging data in order to extract a clear image about the petrophysical parameters of this analyzed member. The well log data analysis has been done using Interactive Petrophysics® (IP) Software. Firstly, Qualitative correlation (stratigraphic and structural) has been constructed passing through the available wells in Ganna field (Ganna-1, Ganna-4 ST, Ganna West-1, Ganna-3 and Ganna-6) to show the lateral continuity of the encountered reservoirs and to make a zonation for reservoirs and non-reservoir units in each formation based on log response and to determine the missing intervals due to faulting effect. Then, comprehensive quantitative petrophysical review was carried out for the available wells in Ganna field to determine the main petrophysical parameters for the encountered reservoir rocks like, net pay thickness, porosity, shale content, water and hydrocarbon saturation based on a number of equations and empirical formula. The results show that all reservoirs including Abu Roash "E", (Upper, Middle, Lower) Abu Roash "G" and Bahariya are containing hydrocarbon potential reservoir. The petrophysical parameters computation and results of the reservoir rocks are represented in a number of isoparametric maps to delineate the most effective sand zones, which include the volume of shale, effective porosity, water saturation, hydrocarbon saturation and net pay thicknesses.

Finally, constructing Lease maps for each reservoir zone. These maps are helpful for the future developing of the study area and a guide for the future exploration plan. Inspection of these maps reveals that, for Abu Roash "E" reservoirs, the promising sites for future hydrocarbon exploration are scattered in each reservoir level, for Upper & Middle Abu Roash "G" reservoir reveals that the central parts of the area are promising sites, for Lower Abu Roash "G" reservoir reveals that the central and western parts of the area, and for Upper Bahariya reservoirs reveals that the western parts of the study area are promising sites for future hydrocarbon exploration.

Reserves calculation was done for Ganna Field, Original Oil in Place (P50) total for Ganna Field is equal (57.265 MMSTB) and Recovery factor for Ganna Field is equal (9.68 %). So, Reserve is equal (5.543 MMSTB).

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