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Integration of Well Log Evaluation and Seismic Attribute Analysis and its Impact on the Reserve Estimation for Some Reservoirs on the North East, Onshore Wells Nile Delta

A thesis submitted for the degree of Master of Science as a partial fulfilment
for the requirements of Master degree of Science in Applied Geophysics

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Note

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

Besides the research work materialized in this thesis, the candidate has attended six post-graduate courses for one year in the following subjects:

1. Geophysical field measurements
2. Numerical analysis and computer programming
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4. Formation Evaluation and Reservoir Evaluation
5. Subsurface Geology and Geophysical Prospecting
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Abstract

The Nile Delta basin is a highly prolific gas and condensate province with discoveries from different plays. Proven reservoirs within the Nile Delta cone vary in age from Oligocene to Pleistocene. Exploration activities started in 1947 by Standard Oil Company of Egypt that carried out a number of reconnaissance gravity surveys. In 1967, the International Egyptian Oil Company (IEOC) drilled the Abu Madi-1 well and made the first gas discovery from the Messinian Abu Madi Formation in the onshore Nile Delta. The Messinian is considered as one of the favored plays in the Nile Delta due to its relatively shallow depth and relatively normal pressure. In 2004, El Wastani Petroleum Company drilled El Wastani East-2 well situated in the West El Manzala concession and encountered hydrocarbons in the Messinian Abu Madi Formation. The company has focused on this play and made a series of discoveries.

This study involves seismic interpretation and petrophysical evaluation of a number of wells in the West El Manzala area. The seismic interpretation concludes the presence of two 4-way dip closures dissected by a series of normal faults. Seismic amplitude extractions show the presence of high amplitudes within parts of the study area which reflect the reservoir presence.

Petrophysical evaluation on wells in the study area shows the presence of hydrocarbons within the Messinian Abu Madi sands with good reservoir parameters. Analysis of the Modular Dynamic Tester data confirms the presence of hydrocarbons. Observations on the seismic amplitude

extractions and the petrophysical evaluation results led to the following conclusions:

- 1- There is good negative correlation between VSH and RMS amplitude, where areas of low VSH content correspond to areas of high amplitude anomalies.
- 2- There is fair correlation between net sand thickness and RMS amplitude.
- 3- There is fair correlation between HC saturation and RMS amplitude.
- 4- It is difficult to establish a correlation between seismic amplitudes and porosity. This may be because porosity is affected by a number of factors like shaliness of the rock, compaction and cementation.

From the volumetric calculations, it is clear that the eastern closure at the Lower Abu Madi level holds the highest volumes of hydrocarbons (97 bcf mean inplace gas), while the western closure of the Lower Abu Madi and the eastern closure of the Upper Abu Madi hold less volumes (51 bcf and 2.9 bcf inplace gas respectively).

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