

A new discovery in the GNN area achieved multi-targets hydrocarbon-bearing zones

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introduction

Petrogulf Misr concession consist of (Geisum and Tawilla fields) is located at the southern entrance of the Gulf of Suez approximately 40 km north of Hurghada city, the North Geisum field is located at the Northern part of the concession.

The GNN area 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.

The stratigraphic sedimentary section of North Geisum Field overlying the Precambrian Basement consists mainly of a series of formations that range in age from Early Cretaceous to Recent.

(NUKHUL, Nubia and Kareem are the oil-bearing zones.

The 3D seismic survey was acquired in 2008 by Grand Geophysical Egypt Ltd. And then Processed by PGS (PSTM), followed by Western Geco Re-processing (PSDM) which used in the interpretation.

The GNN area was discovered in 2019 after drilling the GNN-3 and then drilled the GNN 4, 5, 6, 7, 8 and 9.

New Seismic interpretation done to explore the Eastern structure of main producing block and proposing the GNN-11 well, which led to discovering another closure block confined Nukhul, Kareem Miocene formations and pr-Miocene Nubia sand formation with oil potential, the well recorded multi target hydrocarbon zones.



Seismic Interpretation workflow and Mapping

- The main objective is to integrate seismic data with the geological data through the seismic interpretation, Fault interpretation, Horizon Interpretation and Mapping.
- The Seismic interpretation comprised all seismic cubes specially the Tomo version of 3D Seismic data as PSDM with wells data encountered in the area. Also, this interpretation was fulfilled using the in-lines, cross lines, diagonal lines, slices and auto-lines generated from the random sets in different orientations and directions to verify the subsurface structural and stratigraphic image.
- The seismic interpretation is based on 3D seismic Depth cube, the reflectors have been identified and picked top Kareem, Nukhul Sand, Nukhul Shale, Thebes and Nubia in depth domain. All depth maps are created based on this dataset which was calibrated at the borehole derived geological marker depths.
- All available well data were integrated with seismic data interpretation, which include the dip meter data (dip direction and magnitude) is varied 8°-30° to 40° for Miocene and Pre Miocene Fm respectively. These data are very important in the interpretation of the Pre-Miocene seismic reflectors in the area which has the low-quality seismic data.
- The structure of area is mainly consisting of series of NW-SE clysmic normal faults forming several blocks. It revealed that the structure of North North Geisum area is a titled fault block trending northwest-southeast (three-way dip closures) at the main Block Clysmic Trend, where North North Geisum area consist of NW-SE Clysmic Trend and NE-SW Cross fault trend as shown in structure contour maps.



Seismic data used in constructing the Structure model



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Use thickness map and magnetic map as a guide tool in identify the structure image

Variance attribute applied on 3D seismic data PSDM (Tomo version)



New Structure contour maps Based on new interpreting the 3D Seismic Tomo version



Seismic sections Dip line 11425 and 10925



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Seismic sections Dip line 10725 and 10525





Seismic sections Strike line 10920 and 9820



Wells recommendation and proposal GNN-11Pro

The exploratory well (GNN-11)

is proposed to be drilled in the eastern block of North North Geisum area, To explore Miocene sandstone (Nukhul sand) as a primary target and the secondary target includes the exploration of Pre-Miocene sandstones (Matulla/Nubia) and appraising the Miocene sandstones (Kareem sand) in the same block.

The GNN-4ST well penetrate around 21ft Measured thickness of Kareem Sandstone (Shagar sandstone) (11 TVT) as oil bearing in this block as indicated from LWD (GR- Resistivity) logs. The GNN-11 well proposed location is expected to penetrate Nukhul sand at depth ± 1890m TVDss, Kareem Fm at depth ± 1595m TVDss, Matulla Fm at depth ± 2400mTVDSS.

In GNN-11 well, the Pre-Miocene sandstone (Matulla sand) is proposed to be penetrate above 2440m TVDss, higher than the water up to (W.U.T) level.



GNN-11 Proposal (Pre-drilling)



GNN-11 Proposal (Post-drilling)



GNN-11 Proposal (Post-drilling)





The GNN-11 Results

The final results after drilling the GNN-11 show a very good discovery for multi-hydrocarbon zone bearing as follow. GNN-11 drilled normal stratigraphic section as per prognosis and penetrated top Kareem lower than prognosis with 160m tvdss but with oil potential then penetrated fault from Rudeis into Nukhul sand @ -1883m tvdss as per prognosis.

GNN-11 drilled Brown Lst (part of Nukhul, Thebes, Esna & Sudr Fms were missed) then drilled normal succession down to Basement (Top Matulla higher than the prognosis with 485m tvdss)).

GNN-11 encountered 50m tvd net pay sand with average \emptyset : 18 % & average SW: 10% within Pre-Miocene sand section and 15m tvd net pay (\emptyset : 12 & SW: 37 %) within Nukhul sand in addition 2.5m tvd net pay of Kareem Shagar (\emptyset :10 & SW: 37 %).

Working on to construct 3D tatic model;

3D static model integrate different disciplines of Input data which lead to minimize the risking and enhance the field development plan.



3D Static Model Workflow

Build detailed 3D static model to get a better control during the volumetric hydrocarbon estimation, by integrating different disciplines of Input data (seismic and well logging data), until output of an 3D static Grid of the reservoir characterization to the simulation.





Faults, Horizons and Zones of 3D Grid



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Geometrical, facies, Porosity and SW 3D distributions



Construct properties map to be used in block evaluation and minimize risking

