

Revealing the True Subsurface Image of Nile Delta, Offshore Egypt

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Abstract

The purpose of the designing the new West Nile Delta (including Raven concession) seismic strategy was to minimize risk and optimize recovery through planning and delivering development wells on fit-for-purpose seismic data. Evaluation of the vintage seismic data at Raven concession has brought up the major shortcomings mainly in imaging through unrealistic subsurface with unexpected structures. All this has lowered the confidence in planning of any future steps based on the available data. However, recent technology improvements in the processing domain including Full-wave inversion (FWI) and advanced depth-migration algorithms (e.g. reverse time migration RTM) could help to unlock the potential of the old data and extend its lifetime. The Raven field multi-azimuth (MAZ) dataset used for the study is a conventional streamer data 640 km² in size. It contains three evenly distributed sets of azimuths acquired at 0, 60 and 120 degrees, which went through a detailed processing sequence including seismic preconditioning, Full Wave Inversion followed by reflection tomography to update the velocity model then depth migration using both Kirchhoff pre stack depth migration (KPSDM) and Reverse Time Migration (RTM) algorithms. We have demonstrated a successful approach for building a high- resolution earth model using an acoustic 3D FWI workflow together with reflection tomography, which has helped with the convenient processing workflow to produce the following results:

- Building a high-resolution earth model that successfully captured the shallow- velocity details and provided a better understanding of the overburden hazards along with better input to pore pressure prediction.
- Obtain a more geological plausible image for the deep section compared with the legacy data.
- Improve the tie between the final stack and the well data, which helped to reduce the drilling risks and uncertainty.
- Proof of the success of our FWI technology in the Middle East market (Elbadry et al.2015), which demonstrated our leading technology in this market.