Rashpetco Extends Development Plan by Updating Model in the Petrel Platform, Offshore Egypt

Seismic-to-simulation model enhances prospect evaluation workflow to support new drilling campaign in declining Sienna field

**CHALLENGE**
Plan a new drilling campaign for a field with declining gas and increasing water production.

**SOLUTION**
Update the field model through a seismic-to-simulation assessment in the Petrel® E&P software platform, perform history matching, and recalculate reserves.

**RESULTS**
Successfully drilled new wells and removed others as guided by the updated model and reevaluated volume calculations.

“Petrel is the convenient tool for Rashpetco team collaboration, especially for the prospect evaluation team. We are looking forward to further impressive output.”

Ashraf Yehia Elamir
Exploration Assistant Chairman
Rashid Petroleum Company

Complex geology poses challenges for continued development of Sienna field
Rashid Petroleum Company (Rashpetco) wanted to define a development plan for Sienna field, which is located to the northeast of the West Delta Deep Marine (WDDM) area, offshore Egypt. Declining gas production and the beginning of water production made it imperative that a development plan be finalized quickly. However, obtaining reliable volume calculations would require updating the model for this complex reservoir.

The depositional scenario for the Sienna channels is similar to that of other Upper Pliocene channels of the WDDM area. The field comprises a western branch, which is a channel confined to a canyon cut, and an eastern branch of channel and sheet sands that have spilled from the western branch. Complex turbidite facies fill the channels. Seismic attribute maps and cubes indicate that channel sands are the main gas-bearing facies. Associated splays and overbank deposits contain smaller, but still economic, amounts of gas. The main challenge to modeling is the compartmentalization that resulted from the complex depositional history.

**Seismic-to-simulation reassessment produces integrated, scalable model**
Schlumberger and Rashpetco recognized that a reassessment based on all available data would be needed to plan a new drilling campaign for the field. Rashpetco selected the Petrel E&P software platform to support the collaborative multidisciplinary seismic-to-simulation workflow needed to update the field model.

The Petrel platform enables a multidisciplinary seismic-to-simulation workflow.

Software
Following data entry and preparation, geoscientists performed formation correlation, facies and fault interpretation, 2D and 3D seismic attribute extractions, and geobody extraction. A time-domain structure model was constructed with input from reservoir engineers for grid building, compartmentalization, and gridding QC. This time-domain model was used as a container for seismic attribute maps and inversion cubes. Multidomain accessibility in the Petrel platform enabled using the field dataset for velocity modeling and domain conversion to convert the structure model to depth.

In the next step of property modeling, the seismic cube and the inversion cubes clearly showed the main depositional environment of the canyon, which was captured by the extracted geobody. The canyon turbidite facies consist of sand and shale deposits in channels, thin beds, overbank features, and slumps, and they vary in reservoir quality. Sequential indicator simulation was chosen as the modeling algorithm. The simulation was based on a data analysis probability curve using the $V_p/V_s$ inversion cube to capture the heterogeneity. Use of a multipoint statistics algorithm and neural networks gave further details to the model, which is highly suitable for turbidites.

Accurate determination of facies distribution in this complex lithology was critical for obtaining reliable values for the petrophysical parameters—porosity, water saturation, net-to-gross, and permeability—that were used in volume calculations and simulation. Uncertainty and sensitivity analyses were also performed, in particular for the depth of contacts and property distributions. Shale volume was used for fault seal analysis and determining the fault transmissibility. Properties were validated in a blind test, with confirmation by simulation history matching. Finally, very close static and dynamic volumes were calculated.

**Data integration and multidisciplinary collaboration provide direction for field development**

This was the first time for Rashpetco that field data from all the disciplines had been combined into a single platform. The resulting Sienna model in the Petrel platform is the most up-to-date model of the field, and it is being used for field development. The model predictions have been confirmed in new wells drilled, and some wells have been removed from the development plan based on the updated model.

Facies distribution mapping using the model aids further development in Sienna field.