

Integrated High Resolution Static Model Build in Challenging Carbonates, Kuwait

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Summary

Mauddud Formation is a major oil-producing reservoir in Raudhatain Field of North Kuwait. The Mauddud Formation is an early Albian in age and it was generated an environment of the shallow-water carbonate and consists of Grainstones, Wackestones and Mudstones deposited in ramp settings.

In Raudhatain field (RAMA) is undertaking massive development efforts with planned enhancement in Oil production. Reservoir description and distribution of rock properties in 3D space are challenging due to inherent reservoir heterogeneity, in this case primarily driven by depositional and diagenetic patterns.

Reservoir Studies Team has been challenged to increase the production from several key Kuwait oil fields. To achieve this goal, Kuwait Oil Company has partnered with Schlumberger to rebuild integrated model with Petrophysics, Geophysics, and Geology and Reservoir data of the Mauddud Reservoir. The original model was required to minimize challenges in new infill locations, increase Oil recovery factor and detect water breakthrough to minimize water production. One of the key issues in creating RAMA reservoir model is integration of all available data in identifying the horizontal permeability, reservoir heterogeneity and identification of thief zones.

A fine Geological grid model with 35M cells, 10 Geological horizons has been built to characterize the Mauddud reservoirs of the RAMA field including the permeability from PLT logs combined with petrophysical and lithological / facies data to add more understanding of the distribution of reservoir properties. Log response group methodology and the undeveloped area in the Saddle (structurally low area) has been modelled for the first time in Raudhatain Field. This combined study utilizes the available data and cutting-edge technology using Geo2Flow which resulted in fluid compartmentalization and free water level identification. STOOIP has been upgraded and unlocking potential in new segments of the developed field.

The original model was built based on vertical/Deviation wells (345) which lead to discrepancies in the structural interpretation. The new update has been carried out including all horizontal wells to minimize the uncertainty in the structure framework.

Theory / Method / Workflow

The objective of this study is to update a 3D reservoir model for this field using the available and new G&G data as following:

Update the structural framework with new well data

Update the 3D facies and 3D property model with existing workflow

Establish STOIP volume in the reservoir

This model will be used in the construction of simulation model of the Mauddud reservoir in Raudhatain Field

Integrate 2 fields data to create consistent merged structure for structurally low area in between (Saddle)

Development a workflow for property distribution to capture in the best way the lateral and vertical heterogeneity of the reservoir capable to be used in the simulation

Results, Observations, Conclusions

- The updated structural model has proven very realistic for the current wells and can be utilized for 100s of horizontal wells planned in the coming years.
- The facies modelling workflow is designed to integrate all available data available of Mauddud Reservoir in Raudhatain Field and built a realistic model that honor the input data.
- The petrophysical modeling of porosity, permeability, water saturation by using workflow and parameters of the data analysis; which represent the heterogeneity and movement of fluids in the reservoir.
- The volumetric results matches the results of the production and dynamic data of the reservoir.
- The property model is representing the heterogeneity of the reservoir
- The new Workflow reduced 30% the time necessary to necessary to deliver a high-quality static model ready to Dynamic simulation.
- The Workflow generated earlier available can be applied in other reservoirs with many horizontal wells.
- The new Workflow promotes communication and synergy between disciplines.

Novel/Additive Information

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