

Petrel Reservoir Engineering and ECLIPSE Simulator Improve the Static Model for Production Simulation

Thorough data QC enables Alamein Petroleum Company to proceed with confident model initialization, history matching, and field development planning

CHALLENGE

Prepare input data and conduct quality control (QC) for the static reservoir field model of the Horus field, Egypt.

SOLUTION

- Use Petrel* Reservoir Engineering software and OFM* well and reservoir analysis software with the ECLIPSE* industry-reference reservoir simulator to develop and manage the input data for model initialization.
- Perform QC of the static model within the Petrel E&P software platform.

RESULTS

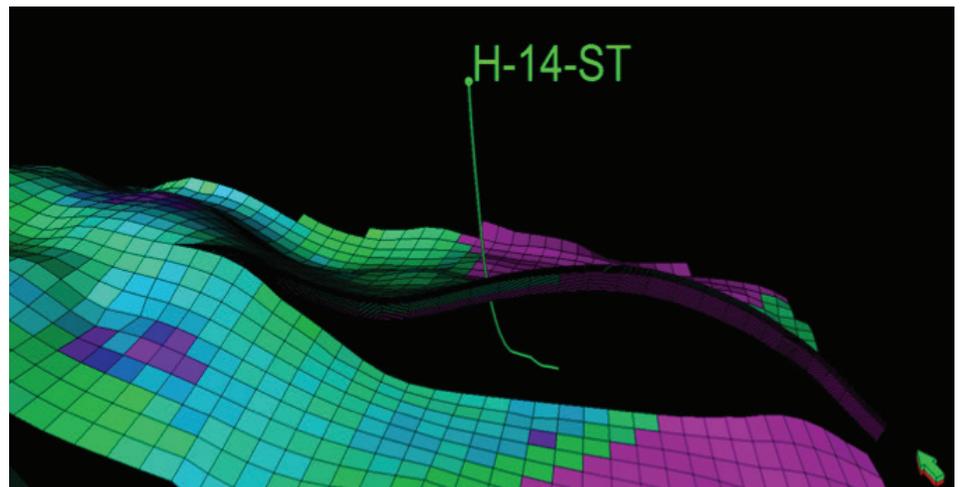
- Identified the most representative static models.
- Verified pressure isolation of the main northern block.
- Defined need to update the structural model.
- Established the distribution uncertainty range for future history matching.
- Finalized all input data for model initialization.

Prepare data and QC model for future reservoir simulation

The Alamein Petroleum Company sought to develop an accurate field development plan for the Abu Roash Formation, one of two producing dolomite and dolomitic limestone reservoirs in Horus field, Egypt. However, several challenges developed when preparing input data for future model simulations and performing QC of the static model. The type of data available for analysis was not ideal, but typical. There were two competing geologic models, uncertainty concerning pressure communication between compartments, no core analysis for rock characterization, unrepresentative PVT tables due to water injection, commingled production in some wells, and unpredictable access to workover histories.

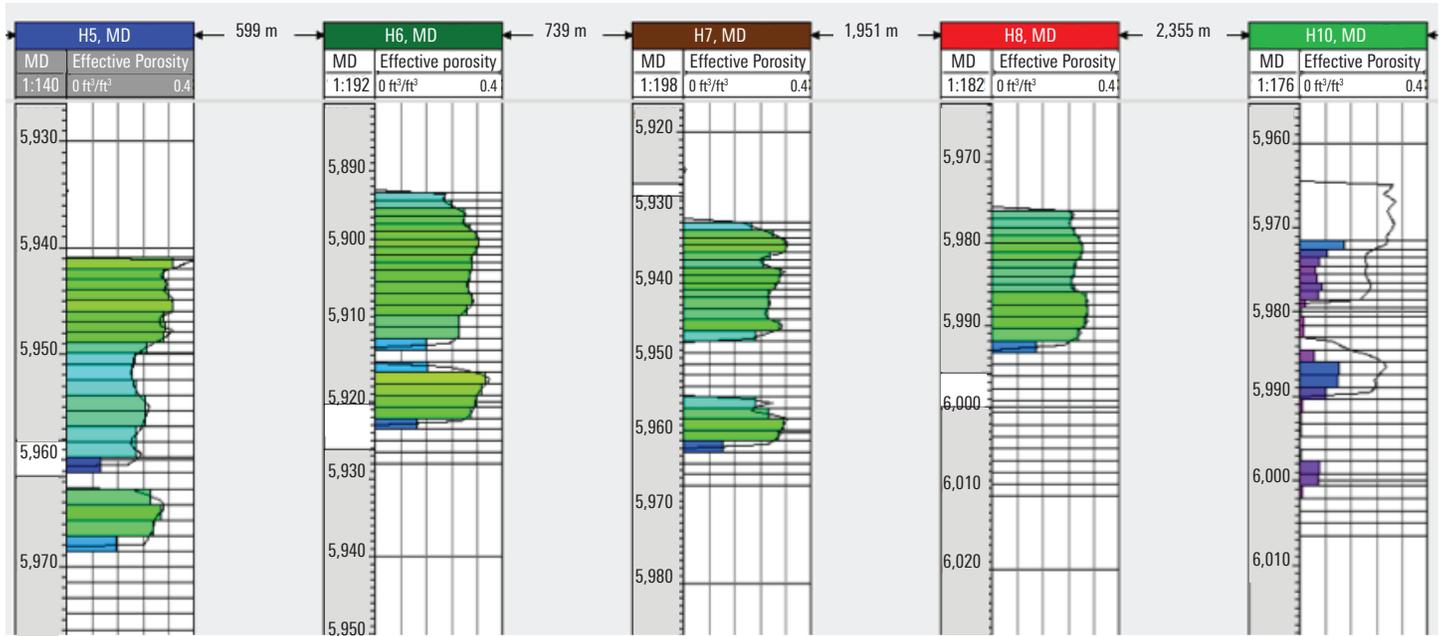
Use the Petrel platform and ECLIPSE simulator to manage, develop, and QC data

Schlumberger recommended using Petrel Reservoir Engineering (RE), OFM software, and the ECLIPSE simulator to manage, develop, and process fluid and reservoir properties from well logs, well tests, production data, and simulated data, incorporating this data and results into a unified project dataset. In the absence of core data in this project, analysis of well logs generated special core analysis (SCAL) data to characterize the dolomite and dolomitic limestone facies. For each facies, these data were then used to derive averaged relative rock permeability by normalization and denormalization processing. In addition, use of the Leverett-J function, available within the Techlog* Saturation-Height Modeling (SHM) module, derived the averaged capillary pressure information. Correction and interpretation of MDT* modular formation dynamics tester data verified fluid contacts, pressures, and fluid gradients for evaluating communication between the two field compartments. The Alamein reservoir engineering team coordinated access to the workover history reports and used the ECLIPSE simulator's pressure volume temperature index to generate the new representative equation-of-state model that simulated a predictive PVT model, taking into account reservoir fluid behavior with water injection.



Deviation survey showing evidence of static model inaccuracy, where the well is not in contact with the formation, indicating conflict with actual data.



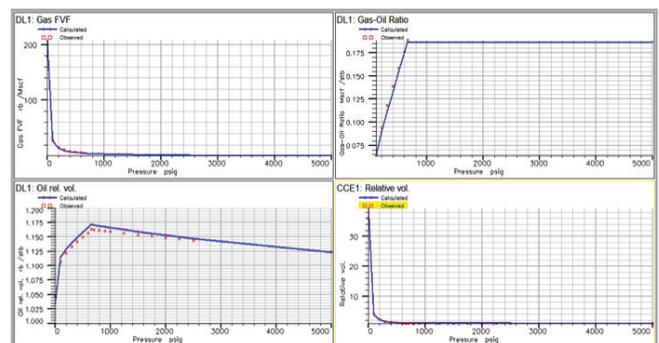


Significant discrepancy between porosity model versus porosity log during QC.

When all input data were prepared, evaluation of the two competing static models and overall QC was performed in the Petrel platform using log well tops and pay-zone contact areas to compare with the static models.

Identified and improved representative static model through Petrel platform QC process

The completed preparation of input data and analysis produced new useful information where it previously did not exist, establishing which static model to use. Formation test results show no communication between the two field compartments, thus removing the southern compartment from the modeling. In comparing the static model with real data, the mismatch of well tops and reservoir contact areas in the eastern part of the static model also points to needed structural changes in that static model. Also, a large difference between upscaled model porosity and log porosity occurred in one well. The permeability data derived from the flow zone index (FZI) analysis revealed the uncertainty of the relative permeability curve end points, adding the benefit of knowing the distribution uncertainty range for initial water saturation, residual oil saturation, and sidewall core saturation, rendering it available for use in the future history-matching process.



Match of observed PVT model calculated using the PVT index.



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