Optimize Well Paths to Reduce Rig Time and Drilling Costs

Case study: Using operational excellence and 3D technology, PETRONAS Carigali Baram FDP optimized drill paths, saving USD 500,000 per well in offshore Malaysia.

Challenge
Build an iterative process for well path design, and use new data and interpretations to rebuild 3D models.

Solution
Optimize well paths during drilling operations by using Petrel® software to produce 3D models that take into account subsurface uncertainty and lead to early detections of deviations from predrill analysis.

Results
Drilled nine wells in the Baram field with significant savings in rig time estimated at USD 4,500,000.

Develop models of a faulted, stacked reservoir
The offshore Baram field near Sarawak, Malaysia, consists of faulted, stacked reservoirs in which precise well placement is necessary. To develop models of the Baram field, the PETRONAS Carigali Baram FDP team determined that an iterative process using subsurface data integration was essential to successful well path design. The engineers needed the capability to rebuild the models quickly using new data and interpretations. For this purpose, the Petrel software suite was used for developing models of the Baram field’s subsurface.

Faults and stacked reservoirs in the Baram field, offshore Sarawak, Malaysia.
Identify optimum primary drainage points for the anchor reservoirs

Initially, optimum drainage points were identified for the anchor reservoirs; i.e., reservoirs having the highest potential stock tank oil initially in place (STOIIP). These anchor points were selected using reservoir structure and properties data and seismic attribute maps. Reservoir engineer recommendations were also incorporated. When wells were anchored to the primary drainage points, well paths were optimized in an iterative manner to determine the best compromise between easily drilled well paths and secondary pay.

The model-query and display options in the Petrel package played an important role in producing final prespud well datasheets and predrill reviews.

Optimum drainage points having the highest STOIIP were selected using cross sections highlighting the stacked reservoirs, along with reports and map views accenting reservoir structure.
Update models rapidly

During drilling operations, progress was monitored by frequently loading real-time LWD data and updates of marker correlations to nearby wells. Significant deviations from predrill plans were detected early, permitting simple, cost-saving corrective actions.

After reaching the TD of each well, the PETRONAS Carigali Baram FDP team loaded the recorded LWD data and correlated the markers to the other wells in the field. Using the Petrel workflow manager, a 3D model was then rebuilt, incorporating the latest data. This process allowed engineers to refine drilling operations on subsequent wells.

Reservoir models were rapidly updated as new data or interpretations became available.

During operations, drilling progress was monitored by frequently loading new real-time LWD data and updating marker correlations to nearby wells.
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Use 3D reservoir models to optimize well plans

Well plans were optimized using 3D models that took the Baram field's subsurface uncertainty into account. The excellent subsurface data integration and workflow features of the Petrel software package allowed rapid revisions of reservoir models to be made as new data or interpretations became available. As each well was drilled, the Petrel data were used to finalize well completion plans.

Using the Petrel suite, coupled with operational excellence, during drilling operations in the Baram field helped the PETRONAS Carigali Baram FDP team save an estimated USD 4,500,000 in rig time for nine wells.

E-mail sisinfo@slb.com or contact your local Schlumberger representative to learn more.