Sonangol EP Applies Integrated Workflow to Optimize Field Development Plan

Petrel platform and ECLIPSE simulator enable robust field development plan with integrated modeling-to-simulation workflow

**CHALLENGE**
Efficiently investigate well placement, completion, and field management strategies to select the best options for optimizing development of a complex channel depositional environment in a field susceptible to marginal conditions.

**SOLUTION**
Integrate data to rapidly generate drillable well targets and operational guidance using the Petrel* E&P software platform with subsequent evaluation by numerical simulation in the ECLIPSE* industry-reference reservoir simulator.

**RESULTS**
- Improved decision-making and operational capabilities through reservoir modeling and simulation.
- Optimized development plan.
- Assessed major uncertainties and identified risks to develop mitigation measures.
- Created a reservoir simulation center and established best practices for future studies.

**Field development optimization for a complex depositional environment**
Sonangol EP manages oil and gas concessions in Angola across an area exceeding 5,000 km². Given the strong link between oil production and government finances, it is key for Sonangol EP to ensure that national resources are managed efficiently. Field development plans of operating companies are therefore closely reviewed for potential optimization. On average, each Sonangol EP engineer is responsible for overseeing activities in 3 to 5 blocks, with 5 to 10 fields and multiple satellite reservoirs in each block.

As the concessionary and key partner of a northeastern asset in Angola, Sonangol EP wanted to thoroughly investigate field development options, including the impact of dynamic uncertainties, and optimize recovery for the field, which was in the planning stage of field development.

The asset is located in an Upper Miocene structure consisting of a sequence of turbidite channels. To efficiently validate proposed field development options and generate new optimized plans within short timeframes and with limited resources, Sonangol EP needed an integrated modeling-to-simulation workflow.

**Comprehensive review of data, models, and proposed plans**
Working with Schlumberger, Sonangol EP decided that integrated workflows using the Petrel E&P software platform and ECLIPSE industry-reference reservoir simulator—along with expert consulting support from Schlumberger—would help achieve its goals.

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CASE STUDY: Sonangol EP optimizes field development with the Petrel platform, Angola

The Petrel platform brings disciplines together using a shared-earth approach, enabling workflow standardization for more informed decisions with a clear understanding of opportunities and risks. A wide range of petroleum engineering features are accessible through the Petrel platform, from multilateral well placement in geologically connected volumes to the integration of reservoir and surface facilities constraints.

Using the Petrel platform, Sonangol EP assessed the reservoir structure with seismic interpretation and conducted a quality check of rock type and initial water saturation distributions. Calibration of the model to data from special core analysis, well tests, pressure measurements with the MDT* modular formation dynamics tester, and fluid sample analysis was also confirmed.

Reservoir management optimization establishing a simulation center of excellence

The field’s marginal condition made it imperative to minimize the costs associated with drilling and the large handling facilities. With guidance from Schlumberger experts, Sonangol EP engineers performed an optimization study including different well types and varied surface facilities production constraints. Sensitivity analysis was used to quantify the impact on oil production of key uncertainty parameters, such as skin factor and permeability in each geological body.

The automated workflows in the Petrel platform and seamless link to the ECLIPSE simulator using parallel technology made this study possible in hours as opposed to days, as was previously the case. As a result, more time was available for in-depth studies, enabling systematic improvement of the overall oil recovery factor for the different development scenarios and scaling down the surface fluid-handling facilities by a factor of 2.

Sonangol EP benefited from a comprehensive technology transfer and capability development program based on the workflows used in this study. The company addressed multiple challenges with respect to data quality, recovery plan optimization workflows, and faster execution times for reservoir simulation runs. A process for capturing knowledge and best practices has also been initiated and will be regularly updated when similar studies are conducted.

Sonangol EP has approved investment in a large simulation cluster that will pave the way for the development of local content and studies. This will enhance collaboration with other national and international partners, as well as optimize management of the oil and gas assets of Angola.

Oil production rates for the various scenarios considered the optimal production constraints.

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