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Woodside Cuts Complex Simulation Runtime 63% Using INTERSECT Simulator and Petrel Platform

Integrated physics and industry-leading speed power efficient modeling of complicated operating and production conditions offshore Australia

CHALLENGE

Reduce high computational runtime for an accurate production forecast accounting for the complex field structure, reservoir heterogeneity, and coupling of the subsurface to the surface network.

SOLUTION

Recreate the conventional model in the Petrel* E&P software platform for seamless integration with the INTERSECT* high-resolution reservoir simulator to efficiently manage the complex field and production conditions via 16-way parallel processing.

RESULTS

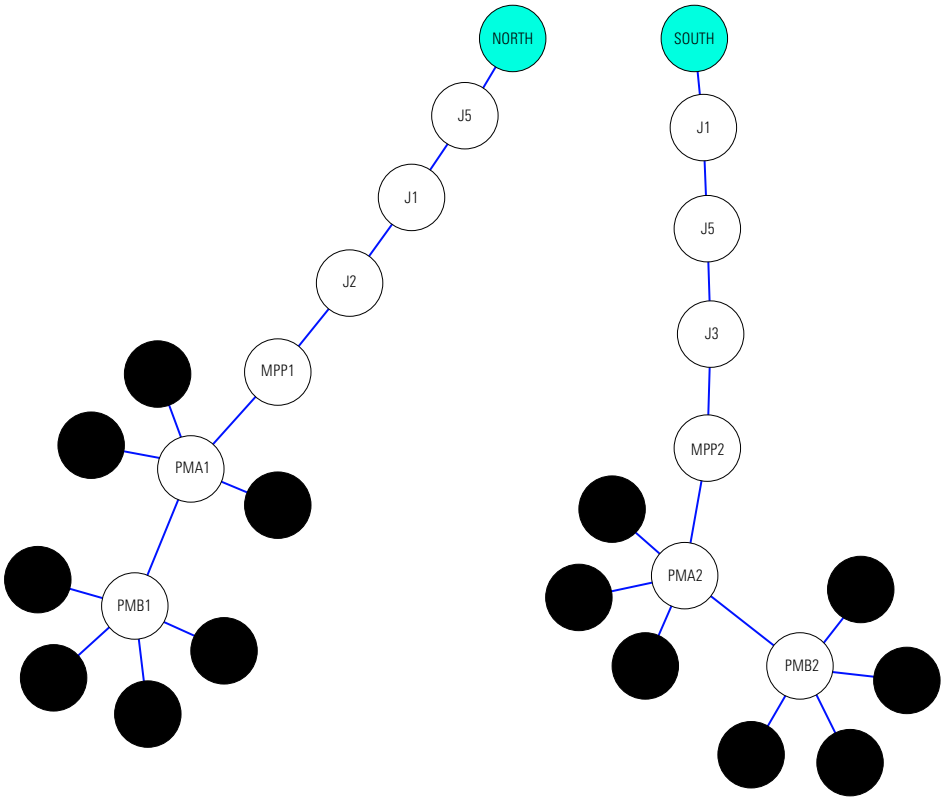
Reduced simulation time from 11 hours to 4 hours, enabling more complete, higher accuracy results for sidetrack planning and investigation of operating scenarios.

Field complexity and model size contribute to high computational runtime

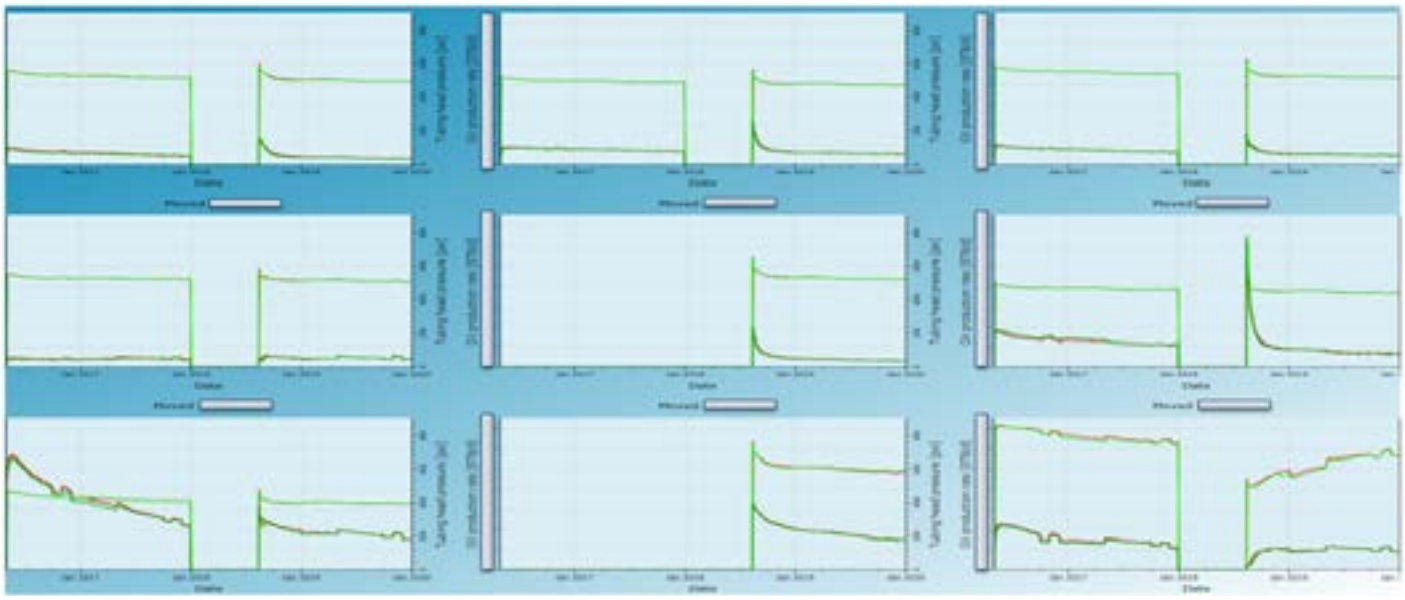
An offshore oil field, located 50 km from the North West Cape, Western Australia, was discovered in 1998, with oil production started in 2008. The 17 API saturated oil is extracted from a thin oil rim using multilateral horizontal wells supported by water injection into the aquifer and gas injection into the primary gas cap. The water depth at the field is 350 m, and the subsea wells are tied back to the FPSO through two manifolds.

Operator Woodside Energy Limited had constructed a calibrated high-resolution conventional black oil simulation model for the field's life cycle through 2038. Based on a 7-year production history, the wells were set to prediction mode, as constrained by a surface network. Production operations and well control were modeled using advanced implemented action keywords.

The field's complex structure, highly heterogeneous reservoir, and rim production sandwiched between a strong aquifer and gas cap posed numerous modeling challenges for Woodside. Runtime was lengthy for the fine-scale simulation that was necessary to accurately predict the impact of water coning and gas cusping on field production performance. This information was also critical for planning the placement of new sidetracks.



The simulator network solver configuration was used to efficiently model network controls.



The INTERSECT simulator delivered results nearly 3 times faster than the conventional model without compromising fidelity.

INTERSECT simulator powers timely parallel performance and scalability

To go beyond the capabilities offered by current-generation simulators, Schlumberger proposed using the INTERSECT high-resolution simulator to improve both accuracy and efficiency in field planning and management. Leveraging minimum 16-way parallel core processing, the INTERSECT simulator combines physics and performance to significantly reduce runtime for even the most detailed models. The seamless interconnection of the INTERSECT simulator to Petrel Reservoir Engineering enables true integration in modeling complex-geology wells and fields while honoring detailed reservoir characterization. This approach is not deterred by the challenging conditions for the field: model size, reservoir complexity such as hysteresis, sophisticated production strategy, and restrictions on the dynamic tubing head pressure.

Runtime cut to 4 hours using INTERSECT simulator from 11 hours with conventional approach

A 2008–2020 native case for the field was created in the Petrel platform to replace—and extend—the conventional model. INTERSECT Field Management and a simulator network solver were used to seamlessly and efficiently run the INTERSECT simulator from the Petrel platform. With its 16-way parallel processing and extensive scalability, the INTERSECT simulator honored the complexity of the field's geology and production operations while delivering results in only 4 hours, instead of 11 for the conventional model. The accuracy of the simulation was confirmed by the identical results at the field and well level.

By using the INTERSECT simulator to achieve an accurate production forecast within a significantly reduced timeframe, Woodside was able to make confident decisions for production operations and designing new wells.

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