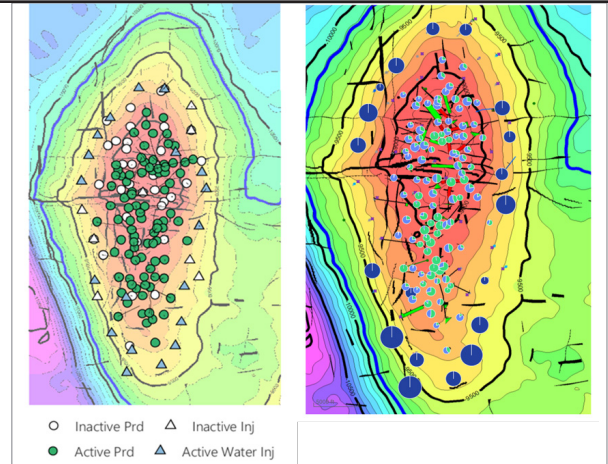


SpeedWise Reservoir Opportunity Shortens the Decision-Making Cycle to Support Oil Gains in a Middle East Carbonate Field

RESULTS

- Delivering feasible and actionable inventory only took four weeks and involved ten personnel-weeks.
- The asset team was rewarded with much shorter decision cycles and smarter decisions than the labor-intensive, traditional simulation approach that offers unpromised returns.
- A new SRO-driven horizontal drilling campaign targeted the remaining oil by maximizing reservoir contact and optimizing drawdown for controlling the water cut from potential coning and channeling problems. This increased EURF to the level of similar fields and reservoir benchmarks.



Structure maps showing the location of inactive and active wells (left) and the relative rates of production and injection (right).

APPLICATIONS

SpeedWise® Reservoir Opportunity*

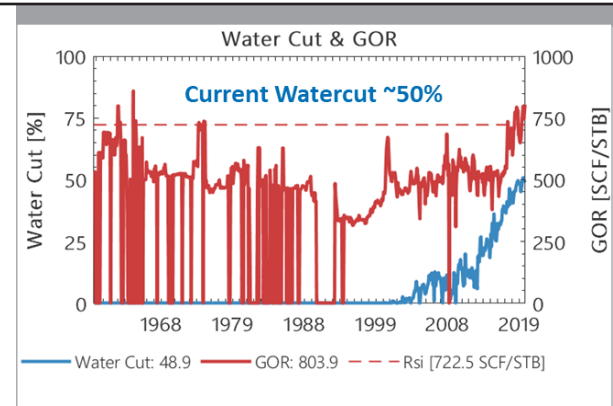
CUSTOMER

National Oil Company operating in a Middle East carbonate Field

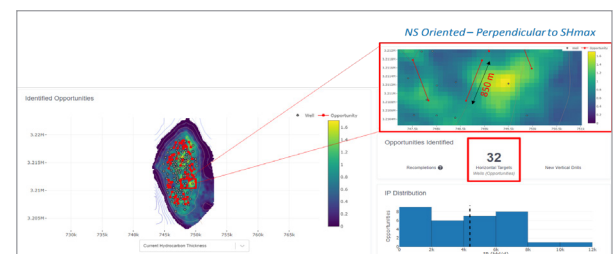
CHALLENGE

The asset is a well-connected, highly faulted, mature carbonate oil field with over 50 years of production history and 90 active producers (mainly vertical well development), under an active waterflood. Previous reservoir management and recent drilling strategy resulted in a rapid decline in oil production over the past three years, well below peak production (recorded near 200 MSTB/D). In that period, the average oil rate per well dropped by 40%, and the field water cut increased from 30% to 50%. It was impossible to achieve the expected ultimate recovery factor (54%) with the existing development plan, and the asset team was looking into horizontal drilling to increase recovery per well and improve well economics. Although the team had recently drilled a few horizontal pilot wells to test the idea and gather information, there was no systematic approach to creating a robust development plan with horizontal wells.

The team initially used the traditional reservoir simulation approach. However, they recognized that building and calibrating the simulation model would take at least a year to complete, and the robustness of the final model was not guaranteed due to inherent uncertainty in the geomodel and complexity linked to carbonate reservoirs.



Field GOR and water cut through time shows a rapid increase in water over the past 20 years. In the last 3 years the field water cut has jumped from 30% to 50% and the average oil rate/well has dropped by 40% over the same period.



The SRO module to identify horizontal targets used constraints on the targets' azimuths (NS orientation) to maximize reservoir contact. Lateral targets were also constrained to development targets of 500-1,000 meters.

*US Patent Pending

SOLUTION

In pursuit of an alternative approach that could deliver faster and more accurate results, the asset team utilized SpeedWise Reservoir Opportunity technology to systematically identify and inspect horizontal targets. The search covered both shorter laterals that could be accessible as a side-track from existing wells to minimize water encroachment, and longer laterals that that could be drilled as new wells. The overall search strategy was to identify the top of the reservoir, increasing reservoir contact and maximizing standoff from water-oil contact. More than ten scenarios were produced to account for uncertainty in crucial parameters, namely the geomodel and water-oil contact surface.

To further support the development plan, minimize water production, maximize water injection efficiency, and improve pressure support, a proprietary waterflood management technology from QRI was utilized; this is an innovative solution based on critical physics and data-driven models that have been deployed globally in many oil fields to manage active waterfloods and optimize well controls.

RESULTS

After filtering based upon geo-engineering attributes and rigorous vetting by domain experts, the final catalog consisted of 32 horizontal targets, ranging from 500m to 1000m in lateral length with a minimum spacing of 20 acres. After careful consideration, the top five options in the base scenario were selected for execution in the short term with an estimated total oil gain of 40 MSTB/D.

The new SRO-driven horizontal drilling campaign targeted the remaining oil by maximizing reservoir contact and optimizing drawdown for controlling the water cut from potential coning and channeling problems. This increased EURF to the level of similar fields and reservoir benchmarks.

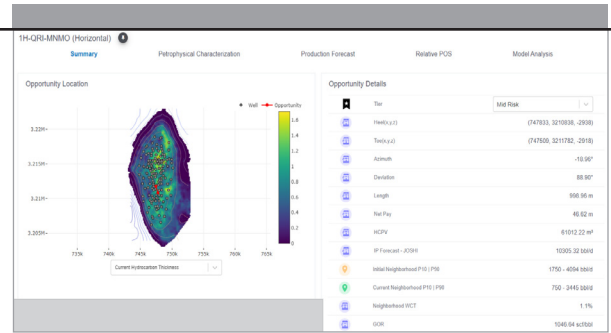
BENEFITS

Delivering feasible and actionable inventory only took four weeks and involved ten personnel-weeks. The asset team was rewarded with much shorter decision cycles and smarter decisions than the labor-intensive, traditional simulation approach that offers unpromised returns.

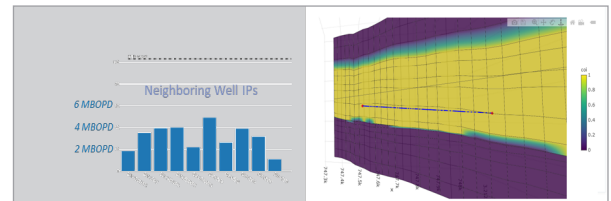
	Previous Workflow	SRO
Completion Time	12 months	4 weeks
Person Months Spent	30 months	10 weeks
# of Scenarios	1 case	10 cases

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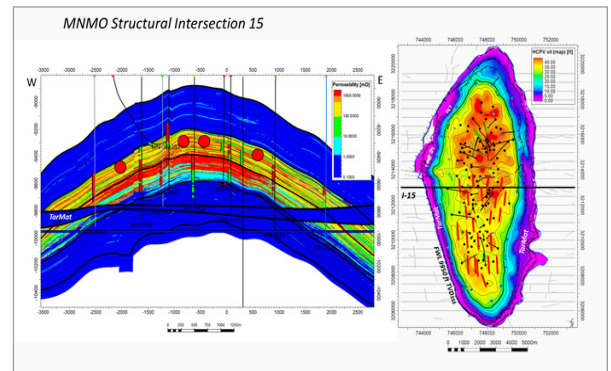
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Summary tab of one of the horizontal targets shows the location (left) and a table of information (right) that includes well orientation, length, expected net pay and oil volume, as well as initial production (IP) forecast and surrounding neighborhood water cut and GOR.



Other visualization tabs include information such as neighborhood IPs (left, under "Production Forecast" tab), and cross section (right, under "Model Analysis").



The client chose to take these lateral target locations into their software to further review and vet the locations.