MATURE FIELDS

CASE STUDY

Operator Gains Valuable Insight into Complex Subsurface Geology of Alaska's North Slope

STRATASTAR™ AZIMUTHAL ELECTROMAGNETIC SERVICE INVERSION PROVIDES DETAILED GEOLOGICAL STRUCTURE

ALASKA

CHALLENGE

- Increase understanding of shallow marine subsurface geology
- Gather real-time downhole data via LWD measurements
- Accurately steer the BHA through 10,000-ft-long horizontal section of a complex reservoir
- Gain operator's confidence in deploying innovative technology

SOLUTION

Run two independent systems and correlate results between the new and existing technology tools:

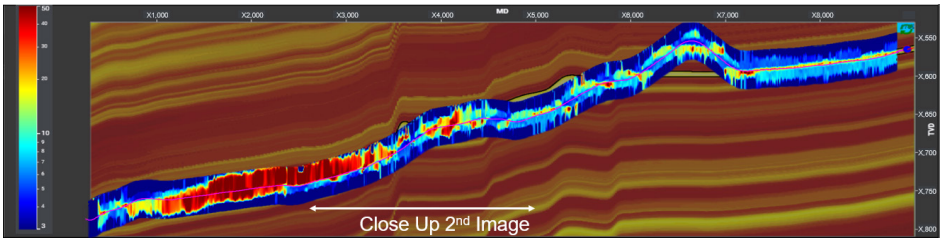
- StrataStar™ deep azimuthal resistivity service — leveraging advanced, real-time inversion processing to deliver accurate reservoir and fluid boundary mapping
- A well-established azimuthal deep resistivity system — with reliance on gamma-ray sensors

RESULT

- Revealed formation variation in sand thickness and lateral variability, confirming consistency with depositional environment
- Achieved perfect correlation of deep resistivity measurements between the StrataStar service and established azimuthal resistivity system
- Proved to operator the new service's dependable performance in a complex reservoir environment

OVERVIEW

A shallow marine depositional environment can create a complex, laterally variable sequence of thin productive sands and non-productive silts and shales. The precise mapping of these layers while drilling optimizes the well path, enhancing reservoir understanding and increasing exposure to the producing sand units. The Halliburton Sperry Drilling StrataStar™ service is designed to deliver these benefits using deep azimuthal resistivity measurements, which, when combined with advanced inversion processing, maps reservoir and fluid boundaries up to 30 ft (±9 m) from the wellbore.



1D inversion canvas of the complete lateral section showing the distribution of high (red) and low (blue) resistivity 25 ft (±9 m) above and below the wellbore. The vertical scale is exaggerated with a horizontal-to-vertical distance ratio of 8.

CHALLENGE

The early adoption of azimuthal electromagnetic logging-while-drilling (LWD) technology by an operator of Alaska's North Slope necessitated winning confidence in the expected results. Using this complex reservoir as a proving ground, the new StrataStar service was deployed alongside an existing azimuthal resistivity tool in a 6¾-in. bottom hole assembly (BHA) to steer a 10,000-foot-long (3048-meter-long) horizontal section with a goal to verify comparable, if not better, downhole data.

The field trial plan was to directly compare the deep resistivity measurements throughout the LWD execution, while also correlating the wellbore data of the advanced StrataStar service mapping capabilities with traditional techniques, such as gamma-ray sensors.

SOLUTION

The StrataStar deep azimuthal resistivity service was proposed by Halliburton Sperry Drilling for its ability to provide a detailed, high-resolution inversion canvas in real time, which was ideal for conducting a rapid, reliable assessment of the Alaska North Slope subsurface geology. The solution also enabled accurate well placement decisions to optimize the well path—even in the complex marine deposits of this reservoir.

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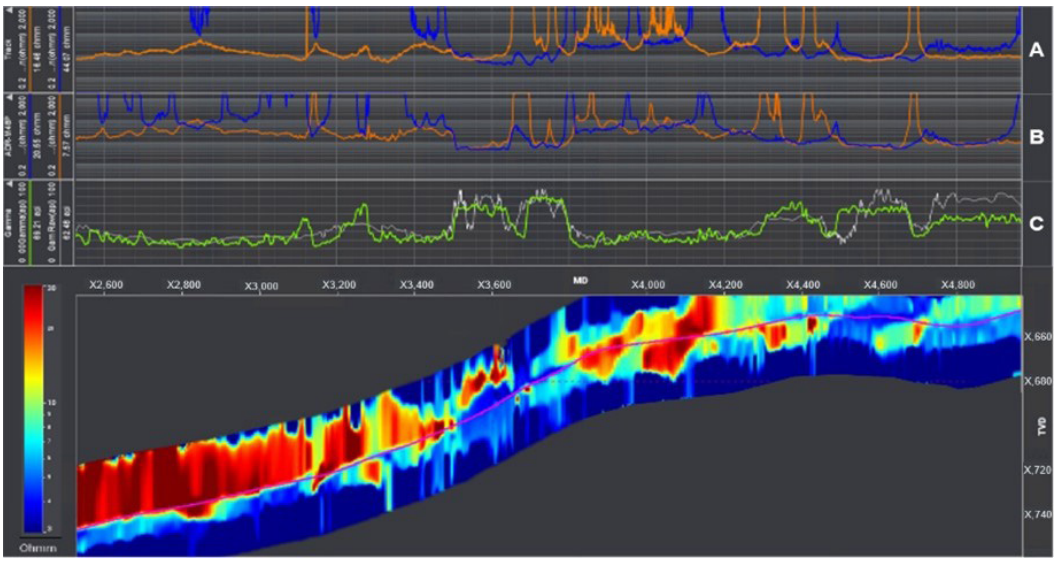

StrataStar inversion data compared to gamma ray and to a second independent deep azimuthal resistivity tool. The vertical scale is exaggerated with a horizontal-to-vertical distance ratio of 8. Track A and B show the upper (blue) and lower (orange) 500 KHz attenuation from the 82-in. (2 m) and 48-in. (1.2 m) spacings, respectively, of the established azimuthal resistivity tool. Track C shows upper (green) and lower (white) gamma ray.

RESULT

The StrataStar service trial demonstrated perfect alignment of inversion data with the established independent tool, while providing additional high-value details, such as multiple resistivity boundaries and a clear, easy-to-understand representation of the geology. Specifically, the new mapping capability revealed variations in sand thickness and lateral variability in the formations consistent with the depositional environment. The outstanding results obtained by this early StrataStar service deployment opportunity gave the operator high confidence of the performance and operational benefits for its singular application in other fields and environments.

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