MATURE FIELDS

CASE STUDY

Operator Achieves 99.5 Percent Run Efficiency in Complex Carbonate Reservoir

EARTHSTAR® ULTRA-DEEP RESISTIVITY SERVICE GEOMAPS MULTIPLE OIL SATURATION LAYERS AND FLUID CONTACTS, AND HELPS EXECUTE DIRECTIONAL PLAN WITHIN PAY ZONE

SOUTHEAST ASIA

CHALLENGES

- Provide greater reservoir understanding for drilling operations in a complex carbonate reservoir
- Enable operator to drill 8½-inch lateral drain with minimal undulation for ease of running the completion string
- Achieve all LWD requirements across the target interval

SOLUTION

- EarthStar® ultra-deep resistivity service, which is proven to detect and map reservoir structure and fluid boundaries up to 225 feet (68 meters) from the wellbore
- A detailed pre-well model to predict expected tool responses in various structural scenarios, including a range of possible fluid resistivity contrasts

RESULTS

- EarthStar ultra-deep resistivity service was able to geomap the complex carbonate reservoir and multiple resistivity layers
- Delivered all the long 8½-inch sections within a +/- 5-foot (1.5-meter) TVD window
- Successfully drilled each hole section in a single run, with the downhole drilling and logging tools achieving 99.5 percent run efficiency
- Helped define the oil-water contact depth

OVERVIEW

A major oil and gas operator in southeast Asia drilled extended-reach smart wells for oil recovery in a narrow 10-kilometer x 2-kilometer (6.2-mile x 1.2-mile) carbonate pinnacle reservoir. These thin oil rim development wells were challenging because of high uncertainty in reservoir structural depth and production performance, with no history or comparable analogues as reference. Additionally, the horizontal well placement was targeted at the middle of the oil zone, with a specific standoff from the gas-oil contact, which had high true vertical depth (TVD) uncertainty.

The key performance indicators (KPIs) for these wells included:

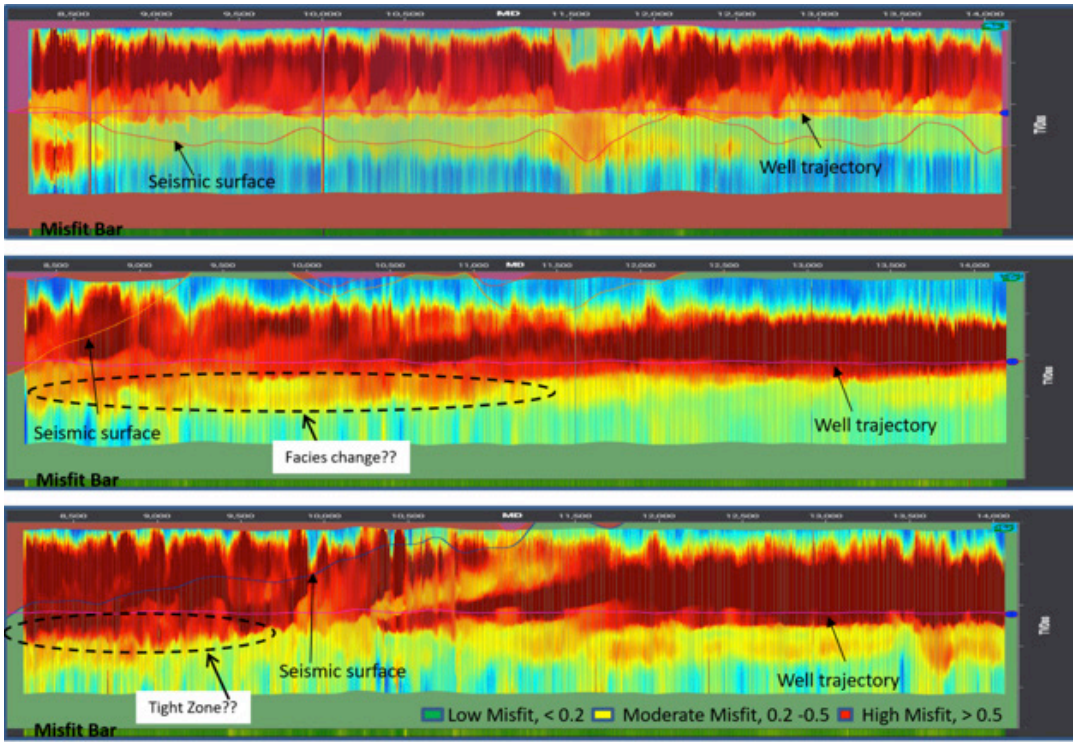
- Drilling the 8½-inch lateral drain with minimal undulation for ease of running the completion string
- Achieving all logging-while-drilling (LWD) requirements across the target interval
- Delivering flawless execution with minimum non-productive time

EARTHSTAR SERVICE ENHANCES RESERVOIR UNDERSTANDING

The Halliburton Sperry Drilling team recommended the EarthStar® ultra-deep resistivity service, which features a high signal-to-noise ratio arising from state-of-the-art engineering. This technology is proven to detect and map reservoir structure and fluid boundaries up to 225 feet (68 meters) from the wellbore. For this particular operation, the EarthStar service resolved multiple complex fluid boundaries, delineating the gas-oil boundary and also resolving two distinct low-resistivity signatures – thus defining the oil-water contact. Additionally, a detailed pre-well model, using multiple offset wells and various possible geologic structural models, further assured the operator that the EarthStar service would be able to resolve the targets clearly.

ACCURATE WELL PLACEMENT AND GEOMAPPING MAXIMIZE ASSET VALUE

The 12¼-inch hole sections of the Phase 1 drilling campaign were landed geometrically at the mid-point of the thin oil rim, based on a base-case, gas-oil contact. Thereafter, the long 8½-inch horizontal sections were drilled with minimal undulation within the +/- 5-foot (1.5-meter) TVD target window, as specified by the operator, to facilitate running the completion string. The wells were executed efficiently with each hole section being drilled in a single run. The downhole drilling and logging tools achieved 99.5 percent run efficiency.



Multi-layered EarthStar® ultra-deep resistivity inversion shows detailed mapping of the complex carbonate structure.

The ultra-deep resistivity inversion mapped the extent of the thin oil rim, and helped to reduce positional uncertainty. It was also able to resolve a tight zone that streaked across the south and north carbonate pinnacles, and the oil-water boundary. These inversion results will help the client in terms of well placement optimization for the future development of wells within this field.

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