

# First Use of SpectraSphere Service in Middle East Confirms Movable Hydrocarbons in Tight Carbonates

Real-time fluid property analysis and LWD data deliver high-quality fluid information and minimize operational risks

## CHALLENGE

Assess the production potential of a reservoir in a tight carbonate formation with historically high sticking risk.

## SOLUTION

Use SpectraSphere\* fluid mapping-while-drilling service, along with the EcoScope\*† multifunction logging-while-drilling service, to reveal the presence of movable fluids in the low-permeability section of the reservoir.

## RESULTS

- Used mobility data obtained from pretests to adjust pumpout depths.
- Observed hydrocarbon breakthrough within 25–45 min of pumpout, significantly earlier than previously experienced in the area.
- Demonstrated good agreement between downhole fluid analysis (DFA) and data obtained after laboratory measurement.
- Observed three-phase fluids in captured flowline samples.
- Minimized known sticking risk due to the innovative stabilizer design and optimized mud weight.



## Evaluate production potential in tight formation with risky borehole conditions

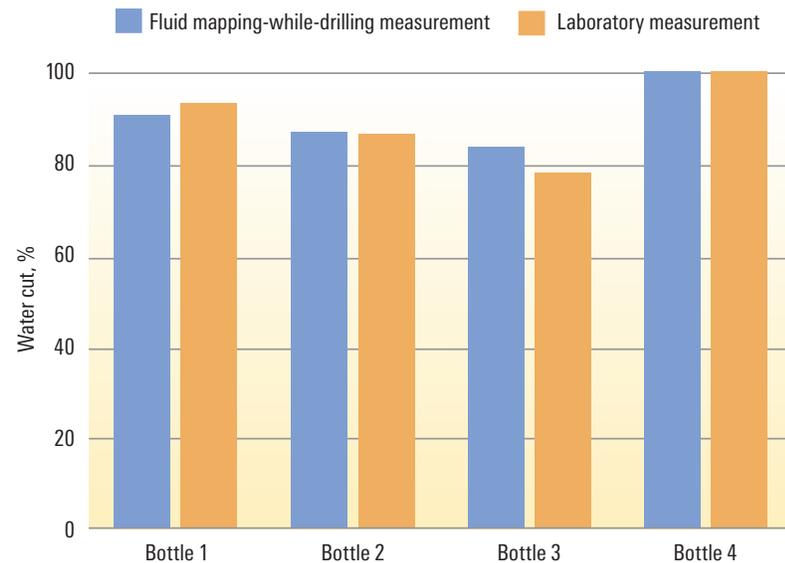
An operator working in the Middle East planned to drill a multilateral horizontal oil well to help assess the field's continued production potential. The operator sought to verify the presence of movable hydrocarbon into the 4- to 6-mD/cP section of the reservoir, confirming its production potential. Additionally, the operator collaborated with Schlumberger to overcome high-stick/slip conditions.

## Combine SpectraSphere and EcoScope services for real-time fluid and pressure data

Schlumberger recommended using the SpectraSphere service in combination with the EcoScope service, providing an opportunity for the first fluid mapping-while-drilling operation in the Middle East. Deployment would be in the 8½-in section and would enable measuring formation pressure and evaluating fluid properties while drilling. The proposal included several pretests that, to obtain formation pressure, would provide a mobility estimate prior to fluid analysis and sampling. It would also enable the mud weight to be adjusted according to data to minimize differential sticking risks.

## Validated drilling plans with pretest and DFA results

Schlumberger performed 16 pretests to obtain formation pressure and to estimate mobility prior to fluid analysis or sampling. Two initial pretests were taken in the gas zone to optimize the mud weight for the section, which verified that no adjustment was needed. The mobility measured during the pretests also enabled the identification of the optimal location for the first pumpout station. The operator initiated DFA operations at the target depth. Although the BHA had been on station for nearly 3 hours, it was successfully moved and no significant overpull was observed, despite the known high sticking conditions in this section of the reservoir.



The water-cut data obtained from the SpectraSphere service was shown in agreement with the data acquired through offsite laboratory testing, demonstrating that the fluid-mapping service delivers laboratory-quality data while drilling.

## CASE STUDY: Fluid mapping while drilling helps validate drilling decisions in multilateral horizontal well

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Hydrocarbon breakthrough was observed at the first sampling station within 25 minutes of pumpout. At the second sampling station, the hydrocarbon breakthrough was observed within 45 minutes of pumpout. Some gas was observed in the flowline, which most likely liberated out of the solution. This confirmed the ability of the SpectraSphere service to identify different fluid phases in complex flow regimes.

The estimated mobilities soon after drilling were around 6 mD/cP and 4 mD/cP, respectively. However, due to the ability of the SpectraSphere service to precisely control flow rate, formation fluid was pumped despite the very low mobility. Additionally, fluid mapping while drilling determined in real time that the fluid regime included three-phase flow. Based on data acquired during operations at previous sampling stations, the operator moved the BHA to the final sampling location. Efforts yielded three sampling bottles. The captured samples were subsequently tested in an offsite laboratory, and the water-cut measurements quantified in the laboratory showed good correlation with the measurements obtained through fluid mapping while drilling.

\*Mark of Schlumberger

<sup>1</sup> Japan Oil, Gas and Metals National Corporation (JOGMEC), formerly Japan National Oil Corporation (JNOC), and Schlumberger collaborated on a research project to develop LWD technology that reduces the need for traditional chemical sources. Designed around the pulsed neutron generator (PNG), EcoScope service uses technology that resulted from this collaboration. The PNG and the comprehensive suite of measurements in a single collar are key components of the EcoScope service that deliver game-changing LWD technology. Other company, product, and service names are the properties of their respective owners. Copyright © 2017 Schlumberger. All rights reserved. 15-DR-103338

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