

Petrotechnical Interpretation Delineates Gas/Oil Contact to Optimize Geosteering in Shaly Sand Lateral

Expert evaluation of pressure-while-logging data and gradient analysis results helps WOC optimize well placement, Libya

CHALLENGE

Determine the exact gas/oil contact and identify the kickoff point to keep the drilling lateral within the oil zone.

SOLUTION

Acquire formation pressure data using the PressureXpress* reservoir pressure while logging service and perform gradient analysis to accurately delineate the gas/oil and water/oil contacts.

RESULTS

Kicked off at the right depth and drilled the horizontal section 100% within the oil zone; exceeded expectations such that the customer chose to run the PressureXpress service in all future wells in the field.

“I would like to acknowledge the great spirit of cooperation and dedication shown by the Schlumberger teams. Your experience in wireline support and log data processing and interpretation has given us the opportunity to learn from the expertise.”

M. E. El-Houni, PhD
Reservoir Division Superintendent
Waha Oil Company



Analyze petrophysical properties of shaly sandstone reservoir

Based in Tripoli, Libya, the Waha Oil Company (WOC) is engaged in crude oil and natural gas exploration and production. As part of WOC’s drilling campaign, the company planned to drill a horizontal well within a shaly sand lateral in Libya; before doing so, WOC wanted to perform petrophysical analysis to confidently determine the gas/oil contact. Pinpointing this location helps determine the kickoff point and keep the lateral section within the interval of interest. Kicking off at the optimal location also prevents entry into the gas and water zones and postpones future gas entry and water coning.

Measuring formation pressures and gradients is key to identifying the fluid type and delineating contacts. However, due to the shaly nature of the sands, conventional elemental analysis could not distinguish between the oil and gas zones. WOC experts worked in collaboration with Schlumberger petrotechnical experts to develop and deploy a solution.

Delineate zones with advanced interpretation of pressure data

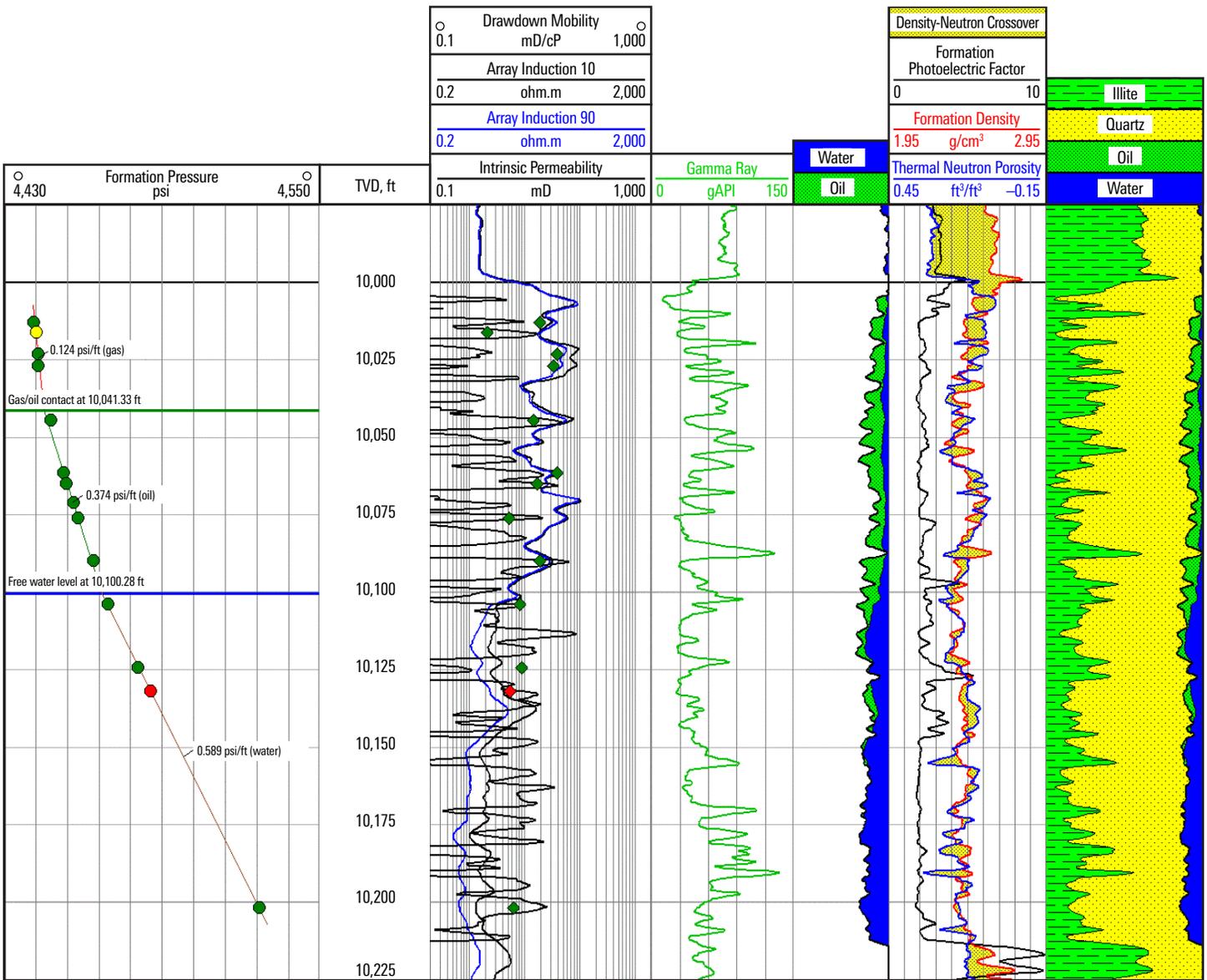
Schlumberger recommended acquiring formation pressure data across the reservoir interval using the PressureXpress service, a pressure-while-logging service that quickly generates a reservoir pressure survey for connectivity analysis, the pressure gradient for fluid density and fluid contact information, and fluid mobility data to aid in sampling-point selection. These data are the basis for accurate pressure profiles and mobility measurements that readily integrate with petrophysical, seismic, and conventional log data for a more complete reservoir picture.

Working as a team, Schlumberger petrotechnical experts and WOC engineers interpreted the results of the pressure-gradient analysis performed using the PressureXpress service. This interpretation enabled delineating the gas/oil and water/oil contacts, answers that could not be delivered using conventional analysis.

Efficiently drill 100% within target interval

Using the location of the gas/oil contact from the PressureXpress service results, Schlumberger petrotechnical experts delivered the information WOC needed to confidently kick off at the depth that would keep the horizontal section within the oil zone. With the success of this technique, WOC decided to replicate this method—expert petrotechnical interpretation of fast, accurate PressureXpress service measurements—in all of its future wells in the field.

CASE STUDY: Petrotechnical interpretation helps keep horizontal well 100% within shaly sand lateral, Libya



Interpreting PressureXpress service measurements identified the gas/oil contact in the shaly sandstone reservoir. Petrophysical evaluation of conventional elemental analysis often cannot reliably differentiate between oil and gas zones in shaly sands because shales contain clays, which strongly affect neutron porosity logs.