

# Saturn Radial Probe Collects Fluid and Measures Pressure at 0.05-mD/cP Mobility in 6-in Caspian Sea Well

Oil samples and extended buildup in only 4.5-h total time on station in subsalt carbonate reservoir saves rig time and mitigates operational risk

## CHALLENGE

Efficiently obtain valid pressure data and fluid samples in an overpressured, tight, laminated reservoir.

## SOLUTION

- Deploy the 5-in version of the Saturn\* 3D radial probe to reliably induce and sustain flow via the industry's largest flow area and zero sump.
- Include the InSitu Fluid Analyzer\* real-time downhole fluid analysis (DFA) system in the tester string for representative fluid characterization at reservoir conditions.

## RESULTS

Informed continued appraisal operations by successfully measuring pressure data and collecting two low-contamination fluid samples at 0.05-mD/cP mobility, which is too low for conventional probes to function properly and above the differential pressure limit for a dual packer, within stringent time constraints.



## Efficient formation testing for overpressured 6-in section in an exploration well

An operator drilling its first exploration well into the subsalt carbonate reservoir of an offshore field in the Caspian Sea had no prior information about formation permeability and fluid properties. The reservoir was expected to be overpressured, and consequently a high mud weight of 2.0 g/cm<sup>3</sup> was used to drill the 6-in section. Conducting wireline formation testing to gain pressure and fluid data from the reservoir was critical for deciding whether to proceed with the appraisal campaign. However, the testing and sampling operation would need to be conducted with maximum efficiency, not only in consideration of the sticking risk posed by extended station times but because drilling time was limited due to weather conditions.

## The 5-in-diameter radial probe with the industry's largest flow area

In consideration of the limited capability of conventional single probes to effectively perform formation testing operations in low-permeability carbonate rock and the long station times and operational risk associated with using a dual packer, Schlumberger recommended using the 5-in Saturn 3D radial probe for more effective fluid extraction. The four self-sealing elliptical ports of the Saturn probe have the industry's largest inlet flow area of 59.49 in<sup>2</sup> for this hole size, which brings pressure measurement and sampling to previously inaccessible reservoirs. The combination of zero sump and the fully circumferential inlet enables quickly establishing flow and removing mud filtrate, leading to representative DFA and sample capture.

The InSitu Fluid Analyzer system was integrated in the MDT\* modular formation dynamics tester string to conduct real-time DFA on the samples to confirm fluid purity and measure fluid properties at reservoir conditions for establishing early understanding.

## Successful sampling at 0.05-mD/cP mobility, where conventional probes cannot function

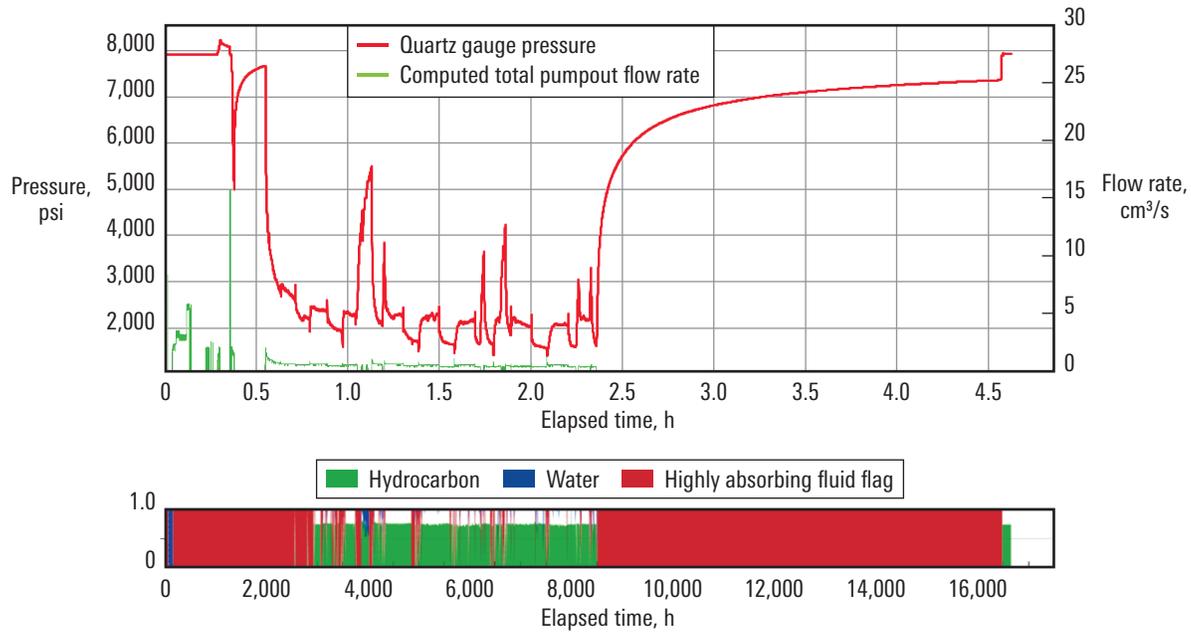
Two downhole oil samples were successfully collected from the zone of interest, with the differential pressure ranging from 5,500 psi to a maximum of 6,500 psi, which is well outside of the operating range for a dual-packer configuration for formation testing. Following sampling, the formation pressure was measured by allowing an extended buildup. The mobility was calculated to be 0.05 mD/cP, which is outside the operating range of a conventional single probe. This wealth of critical information was acquired within only 4.5 h on station, mitigating the risk of sticking and minimizing rig time.



*The Saturn 3D radial probe is available in 5-, 7-, and 9-in diameters to bring efficient flow performance to a wide range of well sizes.*

## CASE STUDY: Wireline formation testing with 5-in Saturn probe at 0.05-mD/cP mobility, offshore Kazakhstan

Deployment of the 5-in Saturn 3D radial probe made it possible to collect the first formation oil sample in this field from the subsalt reservoir. On the basis of the pressure and fluid characterization data obtained, the operator had sufficient information to continue exploration and appraisal work in the area.



Pressure measurement and concurrent optical monitoring of the fluid extracted by the 5-in Saturn probe confirmed low sample contamination at a station with 0.05-mD/cP mobility.

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