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# Insitu Density Sensor Measurements Identify Fluid Composition and Contacts

## Downhole fluid analysis of channel sands in Nigeria deepwater appraisal well based on Quicksilver Probe focused extraction

### CHALLENGE

Dynamically investigate formation fluid density at reservoir conditions in an appraisal well drilled with oil-base mud.

### SOLUTION

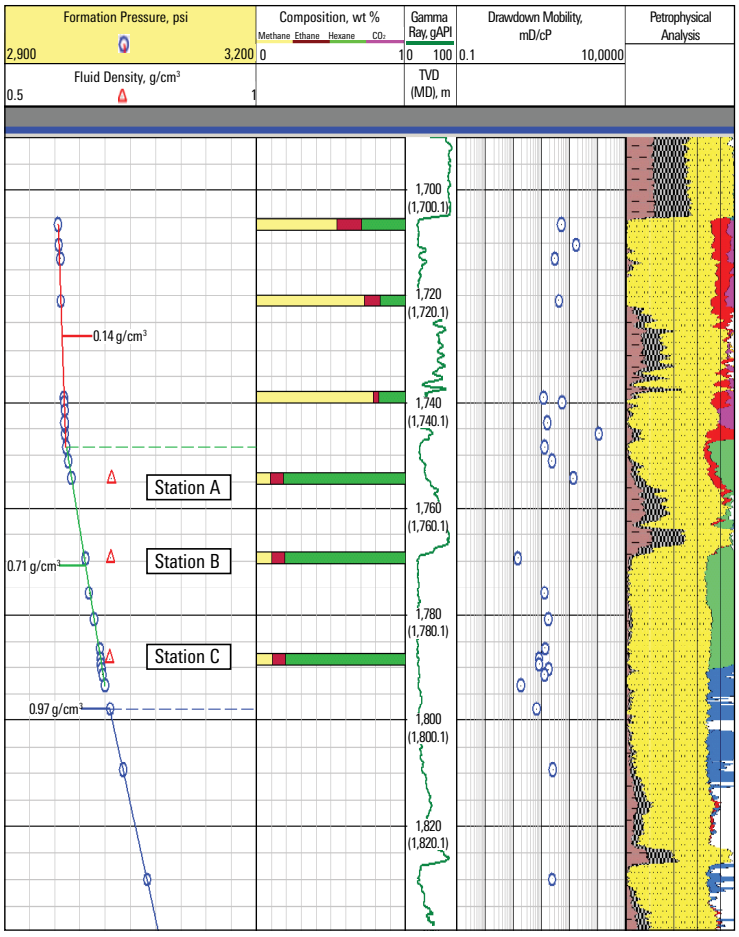
Combine InSitu Density* reservoir fluid density sensor with Quicksilver Probe* focused extraction to obtain accurate density measurements under flowing conditions and conduct downhole fluid analysis.

### RESULTS

Acquired accurate density data input for real-time downhole fluid analysis to optimize the logging investigation and subsequent operations.

### The importance of accurate fluid density information

Determining fluid density is a primary objective of formation evaluation because that measurement significantly influences field production and economics. The ability to obtain quantitative fluid density measurements at reservoir conditions and in real time from a deepwater vertical appraisal well drilled with oil-base mud would improve understanding of the formation fluids and the reservoir for optimizing a subsequent drillstem test.




*Downhole fluid analysis during openhole logging provided the operator with critical insight to the fluid density, formation pressure, and the pressure gradient along with downhole compositional analysis and fluid mobility values.*

## Downhole insight in real time

The InSitu Density sensor was deployed with innovative Quicksilver Probe focused extraction, which diverts filtrate-contaminated fluid to the perimeter of the probe to collect pure reservoir fluid into the extraction flowline. The separation of pure reservoir fluid makes it possible to accurately conduct downhole fluid analysis, even in oil-base mud. Under flowing conditions, the InSitu Density sensor uses dual resonance modes to directly compute density from resonator-fluid interaction, with the measurement quality assessed against standard-fluid characterization parameters.

The toolstring was also configured with optical fluid analyzers, conducted pressure pretests, and collected PVT fluid samples.

## Oil zone confirmed and characterized

InSitu Density sensor's measurements shown from three sampling stations in the oil zone are consistent and comparable with values determined by pressure gradient analysis and were confirmed by subsequent PVT sample analysis. Because real-time measurement of fluid density directly yields the slope of the pressure gradient, the fluid contacts can be readily identified. The log shows three pressure gradients, corresponding to gas, oil, and water and all in pressure communication. There are no indicators of compartmentalization or compositional grading.

The composition of the oil was also determined in real time by downhole fluid analysis of the fluid density measurements and optical spectrometry data.

With this information available during logging, the operator was able to rapidly assess the fluid composition and location of fluid contacts to guide the operation and then design a drillstem test.

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