



Measurement Logging-While-Drilling

GeoTap[™] IDS sensor saves two days of rig time and an estimated US\$1.5 million in Angola deepwater well

Location: Angola

Overview

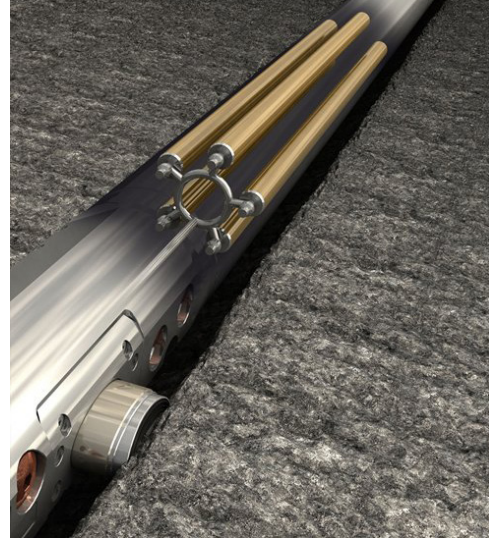
In a deepwater operation with water depth of over 3,397 ft (1,035 m) in Angola, the operator faced a challenge to maximize production from a reservoir with little detailed information. This operation in Angola involved the usual drilling challenges associated with deepwater environments, as well as substantial logistical constraints. Even with combining these challenges, Sperry Drilling successfully managed to deliver the first LWD sampling service to the client with samples of representative reservoir fluids.

CHALLENGES	SOLUTIONS	RESULTS
<ul style="list-style-type: none"> Retrieve and analyze reservoir characterization, identify coring points, and take at least three pressure measurements 	<ul style="list-style-type: none"> ABG[™]/AFR[™] sensors used for geo-stopping ALD[™]/CTN[™] sensors help for reservoir evaluation GeoTap[™] IDS for formation pressure testing and fluid sample capturing 	<ul style="list-style-type: none"> Successfully identified coring points. Successfully measured six pressure points
<ul style="list-style-type: none"> Make real-time monitoring and decisions on contamination levels while pumping at an offsite location 	<ul style="list-style-type: none"> InSite Anywhere[™] and Insite[®] data exchange installed in customer's office 	<ul style="list-style-type: none"> Analysis of real-time data by client/ Sperry Drilling team at an offsite location reduced decision-making time of pumping/cleaning and to start sampling
<ul style="list-style-type: none"> As the first LWD sampling service in Angola, take at least three bottles of formation fluid in reservoir targeting 20 percent, 10 percent, and < 5 percent filtrate contamination in a deepwater well 	<ul style="list-style-type: none"> GeoTap IDS service to successfully capture formation fluid 	<ul style="list-style-type: none"> After temperature correction, bubble point measurement matches with post-mortem lab measurement Fluid cleaning efficiency: contamination levels were in agreement with client's filtrate contamination standard and were sufficient for proper thermodynamic study Obtained four samples with contamination levels ranging from 3.3 percent to 8.1 percent

LWD penta-combo service successfully identified coring points and obtained fluid samples

To maximize reservoir evaluation, Sperry Drilling recommended a penta combo service that included an azimuthal deep resistivity (ADR™) sensor for deep resistivity; an azimuthal lithodensity (ALD™) sensor and a compensated thermal neutron (CTN™) sensor for porosity and density analysis; an azimuthal focused resistivity (AFR™) sensor, along with an at-bit gamma (ABG™) sensor, to provide resistivity and gamma imaging for geostopping; a dual gamma ray (DGR™) sensor for gamma measurements; and the GeoTap™ IDS sensor for formation testing and fluid sampling.

The initial LWD combo set was drilled without the GeoTap IDS sensor to a total depth (TD) of 8,478 ft (2,584 m) and successfully identified coring points for the operator, with the ABG and AFR sensors identifying the top boundary of the reservoir. Then, the GeoTap IDS sensors was added to the LWD combo to log and drill to final TD of 9,183 ft (2,799 m). During this final section, multiple pressure tests were taken to determine the mobility and best depth to capture fluid samples, as analysis and decisions were made at the operator's office.



As the first LWD sampling service in Angola, the GeoTap IDS sensor successfully captured four fluid samples with contamination levels satisfying the client's requirements.

GeoTap IDS sensor proves to be a better option compared to equivalent wireline service in a deepwater operation

Fluid sampling and pressure-volume-temperature (PVT) analysis allow the operator to reveal formation details to aid with reservoir quality, production facility designs, and refining requirements. In deepwater operations, fluid sampling while drilling is optimal to minimize mud filtrates to the formation and contamination level in the samples, saving hours of deepwater rig time because of less cleaning or pump-out time. The GeoTap IDS sensor collected four samples with only 3.3 percent to 8.1 percent contamination, satisfying the operator's requirements in a very reduced time. The client claimed that these results enable the company to "forecast potential substantial rig-time savings on some future operations." As the client was satisfied with the GeoTap IDS fluid samples, the operator saved an estimated two days of rig time in comparison with the wireline service, estimating a total savings of US\$1.5 million.