Offshore Operator Avoids Potential Kick, Improves Depth Control with Real-Time Acoustic Data, Gulf of Mexico

Operator saves an estimated USD 300,000 with a customized BHA that included a new large-hole multipole sonic-while-drilling service

**Mitigate exploration drilling challenges in Gulf of Mexico**

As part of an appraisal campaign in the GOM, an operator spudded a second well. Although the predrill seismic velocity was of good quality, the SonicScope multipole sonic-while-drilling service was needed to determine the onset of a regional pressure ramp with better precision. Real-time pore pressure estimates from measured sonic data had proved more precise than those predicted from resistivity measurements. Resistivity had previously been the only available measurement for predicting pore pressure due to the large hole size in the shallow section of the well. Finally, creating a synthetic well tie by transforming resistivity to velocity had historically been problematic in this gas-prone area of the GOM. The operator sought to acquire a high-quality acoustic dataset to eliminate these operational gaps while meeting any directional or other drilling objectives.

**CHALLENGE**
Reduce pore pressure and depth uncertainty from predrill models in known geopressed area in the Gulf of Mexico (GOM).

**SOLUTION**
Deploy a BHA with a PowerDrive X6* RSS, arcVISION* array resistivity compensated service, and SonicScope* multipole sonic-while-drilling service to mitigate depth uncertainty and help manage drilling operations.

**RESULTS**
- Tracked an anticipated pressure ramp in real time to enable accurate seismic tie-in and setting of the 17½-in casing 100 ft shallower than planned.
- Avoided a potential kick to save an estimated USD 200,000 to 300,000 in mitigation-related drilling costs.

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The SonicScope 900 service delivers reliable compressional data in 26-in tophole sections.
Deploy BHA with LWD technology to achieve directional drilling and geological objectives

Because the planned well path would cross a seismically-mapped sand layer, it was important to land the 17¾-in shoe carefully and use real-time pore pressure modeling on the rig to avoid the pressure ramp and mitigate risk. Before drilling, Schlumberger recommended that the operator deploy the SonicScope service, paired with the arcVISION service, across the 26-in, 18⅛-in × 21-in, and 16½-in × 19-in sections to capture high-quality LWD measurements. This would be the first time the service was run in the 26-in section worldwide.

To further increase the likelihood of operational success, disciplines such as directional drilling, acoustics, LWD measurements, and data interpretation were integrated into the BHA design. To maintain directional control of the well, Schlumberger also recommended the PowerDrive X6 RSS.

The arcVISION and SonicScope services were paired to achieve the operator’s objectives. The BHA design also included options for 21- and 19-in Rhino XS* hydraulically expandable reamers, a 26-in Xplorer Expanded* soft-formation milled tooth drill bit, 18¼-in MDi716LBPX PDC bit, and 16½-in SDi716MHP PDC bit from Smith Bits, a Schlumberger company. Operations commenced per the predrill plan, and the operator tracked the location of the anticipated pore pressure ramp in real time.

The use of the SonicScope service enabled an accurate seismic tie-in to a nearby well, which showed a possible 60-ft depth discrepancy in the pressure ramp’s location. With this information, the operator decided to set the 17¾-in casing 100 ft shallower to avoid drilling into the pressure ramp.

The high-resolution seismic tie, coupled with the real-time pore pressure prediction, enabled the operator to prevent a potential kick situation near the 17¾-in shoe, saving an estimated USD 200,000 to 300,000 in drilling costs (between 4 and 6 hours to mitigate the kick in a best-case scenario).

The operator used the high-quality acoustic measurements obtained using the SonicScope service to skillfully implement real-time pore pressure estimation. This helped the operator to confirm predrill models and help avoid a potential kick through better depth control. The multipole sonic-while-drilling capabilities of the SonicScope service provided results that exceeded those achieved using alternative technologies in comparable situations.

Monopole and quadrupole acoustic data derived from the SonicScope 900 service, as shown here, reduced operational risk.

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