Case Study

Real-Time Seismic Waveforms Guide
Key Exploration Drilling Decisions in East Asia

Accurately geostopping wellbore at critical casing point near top of overpressured formation enables successful completion

Challenge
Set casing within 20 m of top of key formation in offshore exploration well despite uncertainty about formation depth.

Solution
Use seismicVISION® seismic-while-drilling service for casing point selection.

Results
- Geostopped wellbore within 10 m of key formation top at a TVD of approximately 3,000 m.
- Avoided time and expense of contingency strings.

The seismicVISION service enabled the operator to accurately select the casing point and avoid penetrating the overpressured formation.

Select casing point
An operator drilling an offshore exploration well in East Asia expected to encounter a key formation at about 3,000 m TVD. Because the formation was suspected of being overpressured, the operator’s objective was to set casing within 20 m of its top. That objective would have been difficult to achieve using conventional 2D surface seismic, which had a depth uncertainty of ±100 m.

Acquire seismic data while drilling
The seismicVISION seismic-while-drilling service provided checkshots that enabled drilling to be geostopped within 10 m of the formation top. Checkshots were acquired at planned levels during the acoustically quiet periods while connections were made. A standard three-air-gun cluster deployed at surface was used as a source. As the wellbore neared the formation top, checkshots also were acquired at mid-stand levels.

The checkshots were processed from windowed real-time waveforms transmitted uphole by mud pulse telemetry, and real-time depth updates were calculated while drilling. A real-time corridor stack processed from the waveforms showed seismic position, and geostopping decisions were guided by depth projections to the key formation, which were extrapolated from look-ahead (reflectivity) information.

These seismicVISION raw real-time waveforms were sent uphole during drilling. The first arrivals (P-waves) were very clear, even inside the casing, enabling real-time depth updates.
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Once the seismicVISION service acquired five successive openhole levels, a real-time corridor stack image was generated and then continually updated after each additional level was acquired. This real-time seismic composite shows the bit 53 m above the key formation top and a seismic sensor look-ahead of about 200 m. The real-time gather converged on the key formation, allowing a simple extrapolation to predict depth.

Save time and expense
Use of the seismicVISION service enabled the operator to geostop the wellbore less than 10 m from the top of the overpressured formation. This accurate casing point selection allowed successful construction of the well to TD—without the time and expense of contingency strings.

The seismicVISION real-time checkshots were also used with Schlumberger visualization software to update a predrill model, showing the actual depth of the key formation top (red horizon) to be shallower than the pre-drill predicted depth of the formation top (yellow horizon).

Contact your local Schlumberger representative to learn more.

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