

Walkabove VSP Recorded by Using UltraTRAC Tractor Conveyance in Well Deviated 86°, Deepwater Angola

Time-depth and waveform data from four aligned VSI versatile seismic imagers place well trajectory on surface seismic survey and reveal faults

CHALLENGE

Efficiently record high-quality triaxial vertical seismic profile (VSP) data in both the open- and cased hole sections of a well deviated up to 86°.

SOLUTION

Convey multilevel configuration of VSI* versatile seismic imagers by using the UltraTRAC* all-terrain wireline tractor to record a walkabove VSP survey that accounts for the geometry of the deviated well.

RESULTS

Accurately tied the well to surface seismic surveys and mapped faults and stratigraphic features on the basis of the accurate time-depth data, corridor stack, and high-resolution VSP images obtained efficiently and at lower risk with UltraTRAC tractor conveyance.



VSP in a highly deviated deepwater well

High-quality VSP data was needed to accurately position the trajectory of a deepwater development well offshore Angola on the surface seismic survey. The operator also wanted to improve efficiency and reduce risk for the logging operation, which is conventionally pipe conveyed in highly deviated wells.

Efficient conveyance in open and cased wells, at any deviation

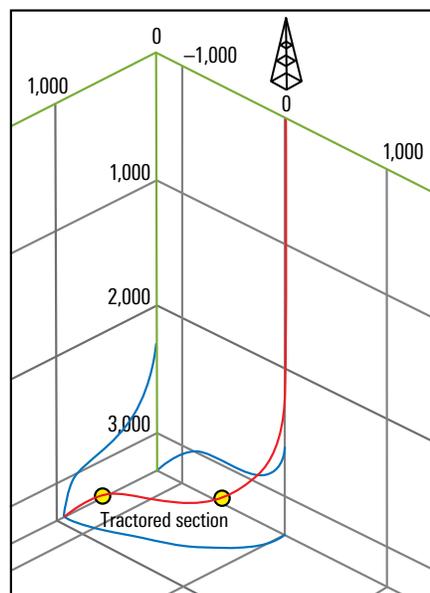
The UltraTRAC all-terrain wireline tractor delivers the farthest reach in the industry by combining the highest tractor force available with reverse tractoring, dynamic suspension, and active traction control. In addition to its low sensitivity to well conditions, the UltraTRAC tractor is customized for the number and configuration of drive sections, which are fitted with wheel diameters and proprietary designs optimized for the well geometry and borehole conditions. By eliminating routine deployment on coiled tubing and drillpipe conveyance in both open and cased holes, the UltraTRAC tractor simplifies and streamlines wireline operations to reduce cost, time, and risk.

Superior-quality walkabove VSP that meets reservoir geophysics objectives

Schlumberger job planning integrated geophysical and operational parameters to determine that configuring the UltraTRAC all-terrain tractor with eight drives was the most efficient approach to conveying four VSI imagers for recording a walkabove VSP survey. The VSI imagers' shuttles were aligned and conveyed downhole with stiff bridles, and a triple G-Gun source deployed from a support vessel was positioned and controlled using the Q-Borehole* integrated borehole seismic system, including the SWINGS* seismic navigation and positioning system and the in-

sea TRISOR* acoustic source control element. Perfect synchronization of the vertical-incidence shots above the optimally coupled VSI imagers enabled recording wideband 5- to 120-Hz data at the reservoir level with excellent vector fidelity. The measured direct seismic wave incidence angles at the triaxial sensors of the VSI imagers accurately matched the well deviation, confirming the vector fidelity of the VSI imagers' sensors in this configuration.

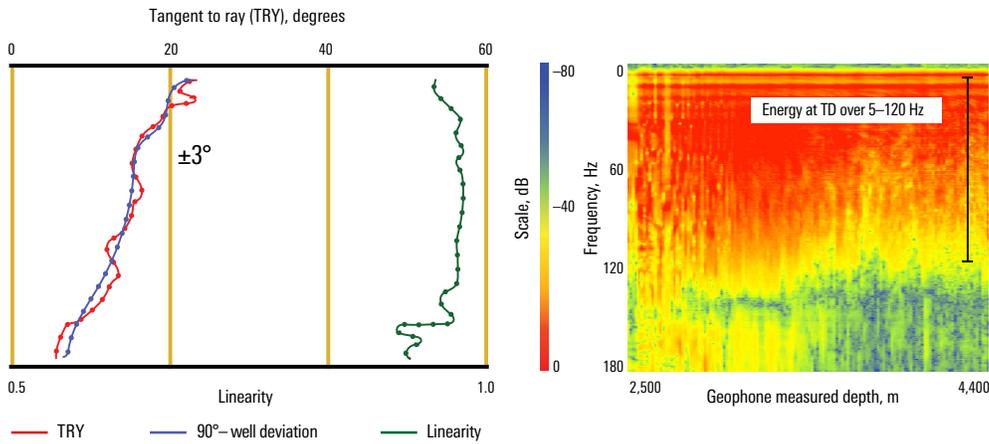
The accurate time-depth data obtained with the precise walkabove geometry was used to produce a VSP corridor stack and high-resolution 2D VSP image below the wellbore. This information was key for positioning the well on the surface seismic survey in time. Robust well-to-seismic tie analysis was conducted, and previously undetected faults and other stratigraphic features were identified.



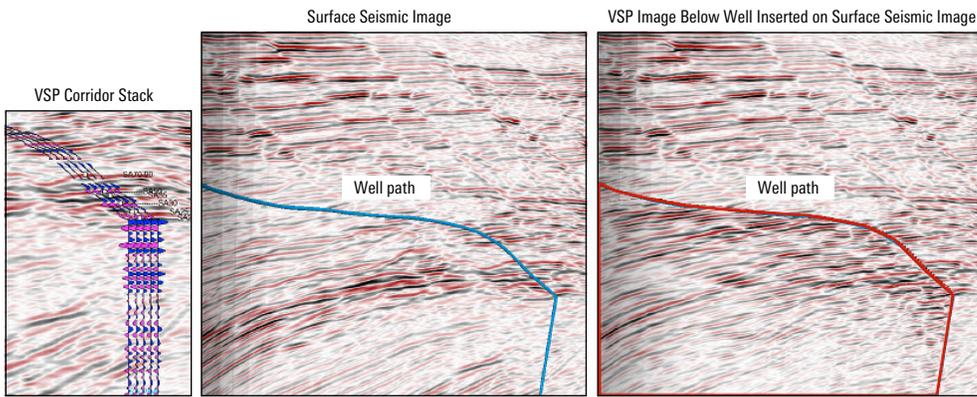
— TVD, m — MD — Trajectory projections

Conveyance by the UltraTRAC all-terrain tractor delivered the VSI imagers to TD for recording the survey through open hole and the highly deviated cased hole section.

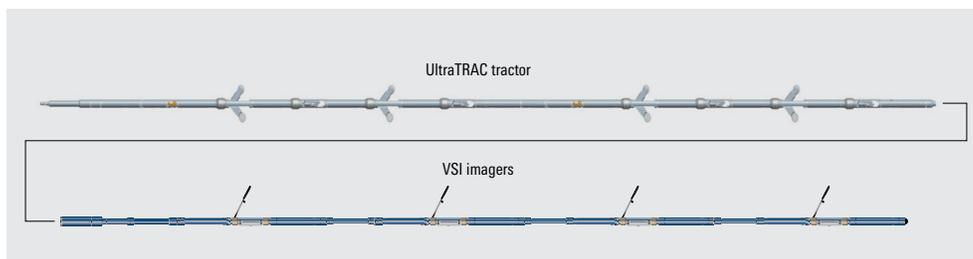
CASE STUDY: UltraTRAC tractor conveys VSI imagers for deviated-well VSP, deepwater Angola



The triaxial vector fidelity display in real time (left) and signal bandwidth (right) recorded by the VSI imagers were not affected by the stiff bridles. The SWINGS system's positioning of the source ensured that all shots were fired at vertical incidence, well within the 10-m tolerance radius.



The walkabove VSP enabled positioning the well trajectory in time on the surface seismic survey and obtaining a VSP corridor stack and high-resolution image below the well.



The four axially aligned VSI imagers were spaced with stiff bridles at 15.12-m intervals for conveyance using an eight-drive UltraTRAC tractor.

slb.com/vsi

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