

Vertical Seismic Profile Helps Operator Improve Resolution of 3D Seismic Data

Objectives

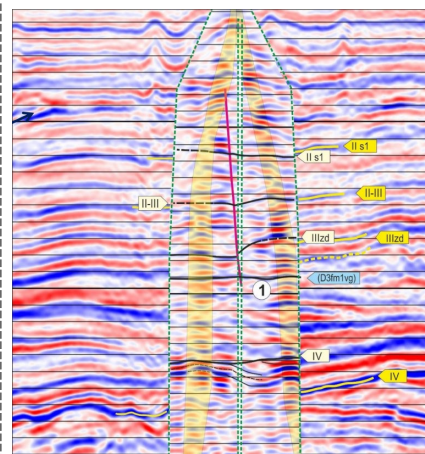
- Quantify seismic attributes and calibrate surface seismic data to increase 3D seismic data resolution before drilling deep exploration wells in northern Russia.
- Estimate the extent to which changes in vertical transverse isotropy (VTI) affect seismic data mapping.

Our Approach

- Weatherford seismic experts met with the operator to discuss objectives and review seismic resolution details. To obtain better depth correlations with existing seismic data, the team recommended a vertical seismic profile (VSP). In addition, the Weatherford team proposed a walkaway VSP to obtain high-resolution seismic through the deviated section of the well.
- At the wellsite, Weatherford crews deployed geophone arrays in the well and positioned the energy source above the receivers to obtain a zero-offset VSP.
- Weatherford crews used 875 shotpoints to obtain a detailed, 304-level walkaway VSP in the deviated section of the well. The crews conducted this survey by positioning acoustic receivers in the well while activating shotpoints progressively farther away from the well.
- The crew recorded acoustic waveforms and obtained good-quality data during each stage of the VSP acquisition process. The data was then processed and presented to the operator to improve their seismic maps.

Value to Customer

- VSP interpretation results helped to significantly improve the accuracy of the customer's 3D seismic data. Walkaway VSP modeling and anisotropy modeling results helped the operator to decrease uncertainty and improved depth correlations in their mapping projects.
- VTI anisotropy was calculated using VSP results and showed significant changes in vertical seismic velocity in comparison with cross-dipole acoustics results.
- These measures helped the customer to develop future exploration strategies and to calibrate and improve the quality of 3D seismic data.
- The Weatherford borehole seismic crew conducted the zero-offset and walkaway VSPs safely and efficiently. The entire job was completed in 11 days instead of 30 days, as originally estimated by client.



Walkaway VSP data (center) is superimposed on surface seismic data to show improved detail and to aid in depth correlation.

LOCATION

Northern Russia

WELL TYPE

Onshore oil exploration

CASING SIZE

7 in.

TOTAL DEPTH

16,000 ft (4,877 m)

PRODUCTS/SERVICES

Wireline services

Borehole seismic services

