Improved Seismic Data Enhances Lateral Completion Design Quality in Texas

Uniq system data quality enables stress characterization

**CHALLENGE**
An operator, seeking to improve production, performs characterization; however, the field’s existing seismic data quality proves insufficient, impacting completion quality decisions.

**SOLUTION**
Uniq* integrated point-receiver land seismic system enables full-azimuth dense point-receiver data acquisition, depth imaging, and advanced azimuthal anisotropic processing.

**RESULTS**
Uniq system delivers uplift to resolution and signal-to-noise levels, enhancing fault and fracture definition, and enabling stress field characterization.

Wells in this Texas, USA prospect had exhibited limited production relating to what was interpreted to be limestone karst-related porosity. The operator intended to improve production by employing the latest technology including advanced seismic reservoir characterization. Results using legacy conventional seismic data were not adequate to enable detailed interpretation or reliable fracture characterization and porosity prediction.

"This is the best data I have ever seen. Uniq acquisition allowed our company to obtain the signal-to-noise levels required to run azimuthal anisotropy analyses. The correlation with our past drilling results was excellent and resulted in a buy-in from our completion engineers for subsequent redesign of current and future laterals—which have since shown excellent agreement between azimuthal stress and anisotropy fields and quality of completions."

Oil Company Senior Project Geophysicist

The wide-azimuth point-receiver data enabled azimuthal anisotropy mapping. The operator’s reservoir engineers were able to correlate this with historic completion quality, and use it to enhance future completions planning.
A new 3D seismic program was designed and acquired utilizing the UniQ integrated point-receiver land seismic system. 18,000 broadband point receivers were deployed in a wide-azimuth configuration to enable anisotropy analysis. Dense sampling with a receiver interval of 20 ft enabled high-end noise attenuation routines.

MD-Sweep* [maximum displacement sweep] design methodology was also used to provide the most energetic low frequencies possible from the vibrator. A 2-100-Hz sweep delivered enhanced low frequencies, resulting in better penetration and improved resolution. The time and depth domain structural processing of the seismic data showed considerable uplift in signal-to-noise ratio and resolution. Fault definition in particular was significantly enhanced.

The full azimuth dataset with high signal to noise enabled azimuthal processing to characterize the stress state of the reservoir. The resulting anisotropy map correlated well with previous high- and low-quality completions in the area. The operator’s reservoir engineers were then able to redesign current and future completions to specifically target zones with predicted high completion quality.

UniQ point-receiver acquisition delivered enhanced bandwidth versus the legacy conventional seismic data.