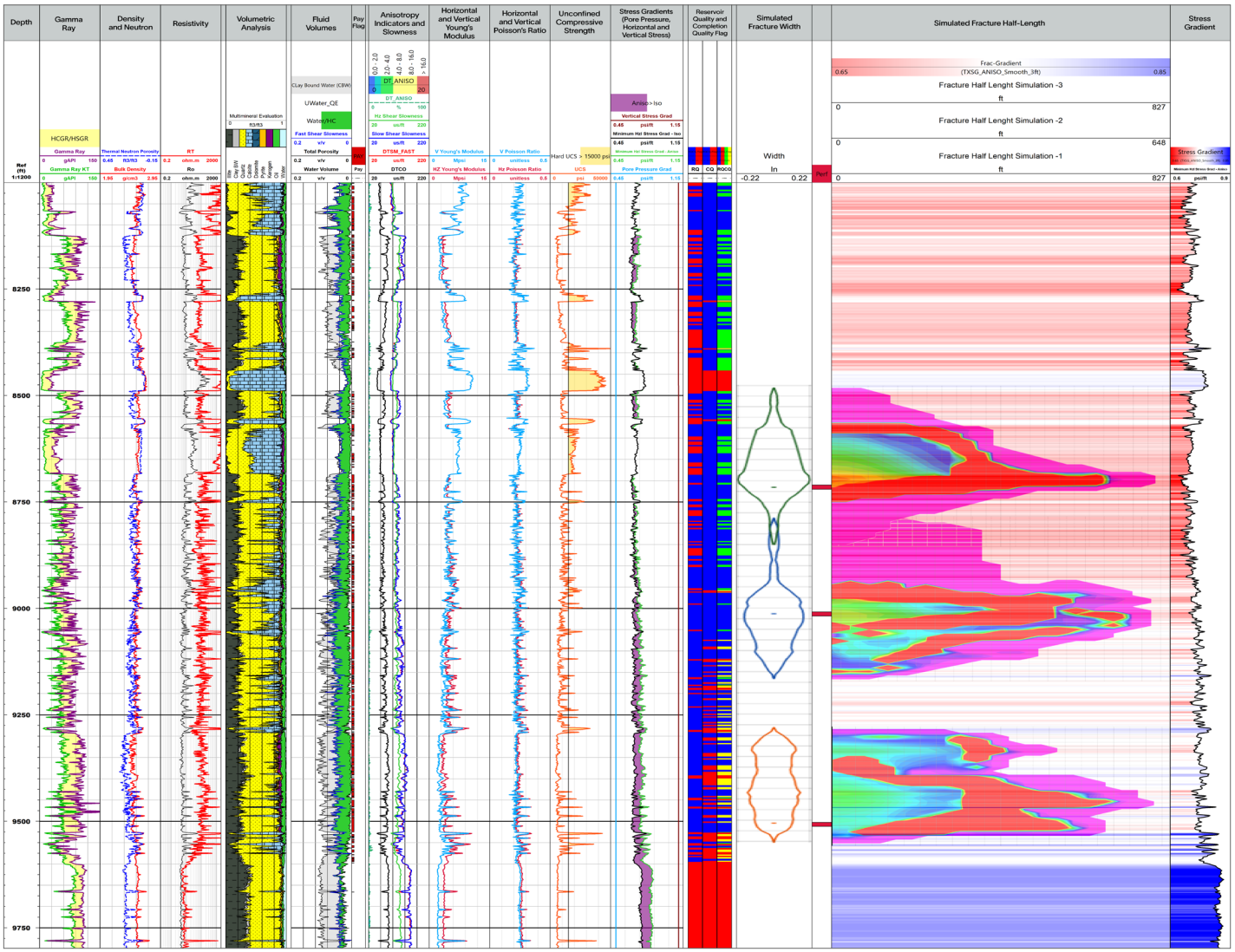
Lateral landing point advisor

Anisotropic rock properties for stress profile and petrophysical logs



Integrated plot displaying reservoir quality, completion quality, and landing simulation with fracture width and height.

Applications

Stress profiles are used to understand the variations in the reservoir quality (RQ) and completion quality (CQ) of rock across the vertical well. Depth intervals are selected that become potential landing points for fracture containment and productivity testing.

In unconventional reservoirs, there is often uncertainty around the best place to land a horizontal well, vertically stacked development, or both. It is critical to know which specific landing points can be targeted in an unconventional play. These points may contain several pay intervals that cannot be targeted by a single horizontal well because of reservoir heterogeneity. This often manifests itself in the form of stress barriers.

It's important to understand how many vertically stacked horizontal wells need to be drilled. Identifying potential landing zones to avoid is also important, for example, an interval close to water.

How it improves performance

- → Increases production by selecting the best interval to land to maximize stimulation volume
- → Reduces the probability of water zones or unintentional height growth
- → Explores multiple landing scenarios prior to drilling a single lateral well
- → Optimally exploits the reserves from the entire vertical pay zone stacks in an economical way

How it works

For unconventional wells, the lateral landing point advisor workflow combines the petrophysical analysis with rock mechanical properties to provide the information necessary to evaluate the quality of the rock surrounding the well. RQ is usually dependent on petrophysical outputs such as clay volume, effective porosity, and total organic carbon (TOC). RQ is combined with CQ indicators such as minimum horizontal stress, Young's modulus, and Poisson's ratio to indicate rock strength and fracturability. The formation intervals with the best combination of good RQ and CQ are selected. A full 3D planar hydraulic fracture simulation is performed. This makes it possible to identify and rank the reservoir sections most appropriate for landing, steering, and hydraulically fracturing the horizontal production well.

Inputs

- Conventional openhole logs (gamma ray, dual axis calipers, neutron gamma density, and resistivity)
- Lithology analysis and total organic carbon (TOC) results from spectroscopy logs
- Transverse isotropic properties, dipole shear anisotropy, and shear radial profiling results
- Image log analysis for drilling-induced features and sedimentological information
- Pore pressure
- Stress calibration from micro-hydraulic fracturing or extended leakoff testing
- Presence of natural fractures from image log analysis, dipole sonic anisotropy, Stoneley fracture analysis, or sonic far-field imaging
- Well mechanical diagram and trajectory
- Rock strength and anisotropic elastic properties from laboratory core test results
- Daily drilling reports and completion history

Takeaways

- Integrates the geomechanics, petrophysics, reservoir pressures, and geological features to feed the stimulation modeling and lateral landing planning
- Assesses the quality of the reservoir and completion using quality flags and hydraulic fracturing simulation.
- Ranks the most likely landing zones and identifies those zones that should not be attempted

Learn more

Velez, E., et al.: "Integrating Pilot and Lateral Open hole Measurements for Lateral Landing Point Assessment and Hydraulic Fracture Design—A Case Study from the Delaware Basin," SPWLA 60th Annual Logging Symposium, The Woodlands, Texas (June 2019) SPWLA-2019-BBBB https://doi.org/10.30632/T60ALS-2019_BB

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