Advanced Acoustic-Driven Geomechanics

Delivers Reliable Stress Profiles for Development Wells, Unlocks Superior Well Performance

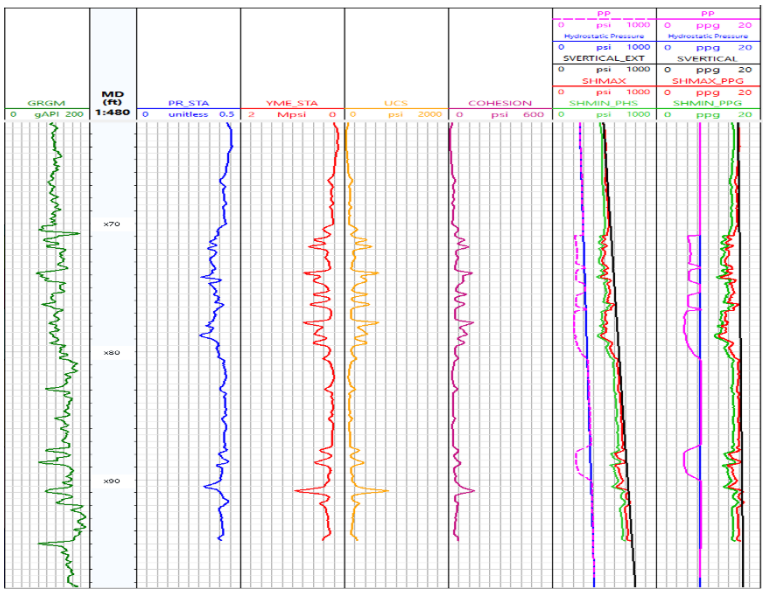

Image caption in TV Integrated acoustic, mechanical, and stress-profile logs used to calibrate the 1D geomechanics earth model, including pore pressure, vertical stress, and horizontal stress magnitudes.

Objectives

- Reduce uncertainty in in-situ stress characterization to improve well planning and completion design confidence.
- Provide a reliable geomechanics foundation to minimize drilling and stimulation risks.
- Improve visibility of horizontal stress magnitude and ratio to optimize hydraulic fracturing performance.
- Enable more reliable development planning through an integrated stress model.

Our Approach

- An integrated geomechanics workflow was implemented using acoustic data, borehole image logs, formation pressure tests, and laboratory rock mechanical measurements.
- Advanced acoustic processing was performed to derive stiffness coefficients and evaluate stress-induced anisotropy within the sandstone interval.
- A 1D geomechanics earth model was constructed to estimate the magnitude and orientation of the three principal stresses, with vertical stress derived from density integration and pore pressure constrained by formation pressure tests.

LOCATION
Indonesia

WELL TYPE
Land drilling rig, development, producer

FORMATION
Sandstone

PRODUCTS/SERVICES

- Compact™ cross-dipole sonic (CXD) tool
- Compact™ microimager (CMI)
- Compact™ formation pressure tester (MFTD)
- Compact™ dual laterolog (MDL) tool
- Interpretation and Evaluation Services (petrophysics and geomechanics)

Weatherford®

Advanced Acoustic-Driven Geomechanics

Delivers Reliable Stress Profiles for Development Wells, Unlocks Superior Well Performance

Our Approach

- Minimum horizontal stress (S_{hmin}) was calibrated using leak-off test (LOT) data, while elastic properties were cross validated with laboratory measurements.
- The advanced acoustic workflow was further used to constrain horizontal stress magnitudes and refine the maximum-to-minimum horizontal stress ratio beyond conventional isotropic assumptions.
- The final calibrated model was integrated into the customer's well planning workflow, providing a validated stress framework for operational decision making.

Value to Customer

- The horizontal stress ratio was determined to be 1.09 to 1.15, while the minimum horizontal stress (S_{hmin}) in the main reservoir was constrained to 12.5 to 15.0 ppg, reducing uncertainty in stress magnitude.
- The integrated analysis was applied to 9 wells across 2 fields, providing a robust, field-wide stress model across the main reservoir intervals.
- These results provided a validated foundation for well trajectory planning and optimization of multi-stage hydraulic fracturing, reducing the need for additional stress measurements and supporting data driven operational decisions.

Weatherford®