Integrated Drilling and Logging Approach Maximizes Formation Reservoir Exposure

SYNERGY BETWEEN OPERATOR AND SERVICE PROVIDER PROVES TO BE WIN-WIN

GULF OF MEXICO

CHALLENGES

- Wellbore instability issues and tight hole problems
- Intermediate casing point selection above depleted reservoir
- Depleted reservoir section, severe mud losses in offset wells

SOLUTIONS

- Integrated pre-well technical planning teams covering multiple product lines
- Collaborative modeling solutions utilizing Drillworks® Predict software to create accurate PP/FG geomechanics
- Specific proprietary drilling and evaluation systems coupled with integrated in-house and real-time center (iROC) personnel, 24/7 support, solutions, and execution

RESULTS

- Controlled and contained wellbore stability issues
- Set intermediate casing right above depleted zone
- Drilled and logged the depleted reservoir section in one run, with no issues
- Completed well construction phase eight days ahead of schedule, with zero safety incidents
- Saved operator approximately USD 4 million
- Recovered an additional s5–10 million BOE

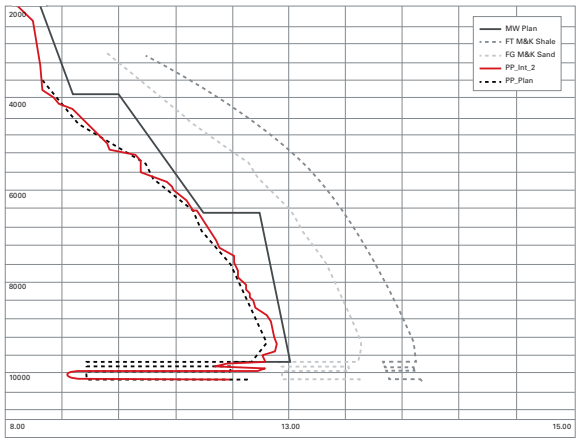
OVERVIEW

SAVED USD 4M

In the deepwater Gulf of Mexico, Stone Energy planned to drill and log a successful case wellbore into a set of Upper Tertiary (Miocene) target sands in a mature field within Mississippi Canyon Block 28. The operator worked with Halliburton integrated drilling and evaluation teams to align people and processes in order to create a collaborative environment. Well-defined communication protocols were implemented with an emphasis on listening to understand. Mutual agreement and understanding of the Pompano #4 wellbore basis of design and objectives led to the implementation of risk sharing within the entire well construction process.

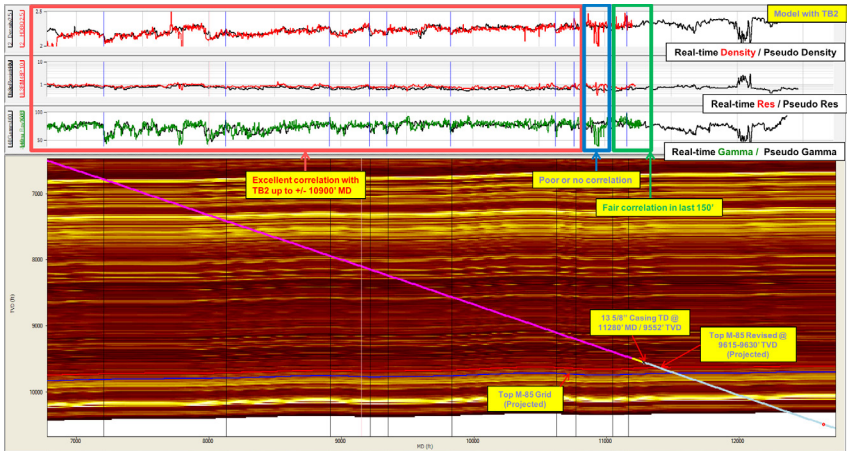
Through correct pre-well planning, bottomhole assemblies (BHAs) were optimized with preferred hydraulics, torque and drag, and bits and reamers specifically selected for all intervals. At the rigsite, specialized solids control equipment was installed and utilized. Casing that was designed for the well was properly permitted, and it arrived on site in a timely fashion. Landing of the 18-inch liner was completed ahead of schedule, with a minimal rat hole, by utilizing the TDReam™ at-bit reamer. Geomechanical studies supported by Drillworks® pore pressure/fracture gradient (PP/FG) models and collaborative planning enabled the operator to have a consistent sub-subsurface understanding of the challenges to correctly drill and log each interval. The potential wellbore instability issues were mitigated due to prosactive pore pressure analysis and by utilizing optimum fluid management control with the Baroid BaraECD® high-performance non-aqueous fluid system.

Stone Energy, Pompano #4 PP/FG



This chart shows an example of depleted reservoir targets, corresponding wellbore, and drilling pressures margins.

An additional 5–10 million BOE, which had been previously written off, were recovered due to the customer transitioning from discrete services to an integrated services model.



This image shows a geosteering log with modeled and real-time data displaying well trajectory to geostop before pressure regression to install intermediate casing and vector through target sands, stopping above OWC.

Formation compressional slowness from the logging-while-drilling (LWD) XBAT™ azimuthal sonic and ultrasonic LWD service was provided in lower wellbore sections, updating the geomechanical model for accurate real-time pore pressure prediction and analysis. The XBAT service was also utilized behind the 13-5/8-inch casing for top of cement evaluation (TOCE), satisfying the U.S. Bureau of Safety and Environmental Enforcement (BSEE) requirements to identify fully bonded pipe from free pipe. While geo-steering with the StrataSteer® service, the intermediate casing point was correctly geo-stopped before the upper target sand was intersected. The GeoTap® LWD formation pressure system provided numerous pressure tests over various depth intervals, leading to excellent fluid gradient determination in the main target sand package. The LWD ALD™ azimuthal lithodensity service delivered high-quality borehole images and caliper measurements in the 16-1/2-inch borehole section, providing dip analysis for geological correlation to seismic. Also, ALD imaging enabled the operator to resolve the interbedded shale/sand sequences at very good resolution and provided stratigraphic dip analysis for geological model correlation in the sand reservoir.

Challenges in this wellbore included shallow water hazards, wellbore instabilities, and inherent difficulties in setting intermediate casing above the sand targets and the depleted reservoir section. Utilizing the integrated team, with a designated focal point, allowed for the basis of design, data collection, analysis, modeling, and interpretation – leading to superior service execution that saved time and delivered the project under budget.

RESULTS

The Halliburton product service line's 24/7 support – both in-house and within the integrated real-time operation center (iROC) – ensured that every wellbore section, including the depleted reservoir interval, was drilled with minimal fluid losses and that the wellbore was at total depth (TD) before the oil-water contact (OWC). This maximized the reservoir exposure, enabling the well construction phase to be completed eight days ahead of the planned schedule (with zero safety incidents) and saving the operator approximately USD 4 million. An additional 5–10 million BOE, which had been previously written off, were recovered due to the customer transitioning from discrete services to an integrated services model.

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