Halliburton Drilling Solution Helps Operator Maximize Reservoir Contact

ROVARY STEERABLE SYSTEM, AND HIGH-PERFORMANCE FLUID AND BIT SYSTEMS OPTIMIZE DRILLING IN SUPER LATERAL

DELAWARE BASIN, NEW MEXICO

OVERVIEW

A 3.14-mile (5.05-kilometer) lateral in New Mexico’s Delaware Basin area of the Permian Basin presented drilling challenges at several points. Efficient, trouble-free drilling of the 16,575-foot (5052-meter) lateral required low equivalent circulating densities (ECDs) to mitigate losses, and to promote high fluid stability during long trips, along with minimal torque and drag. With a total measured depth (TMD) of 26,785 feet (8164 meters), this was the longest well in the area at the time of completion. The lateral was successfully drilled using a customized oil-based organophilic clay-free fluid system paired with an intelligent rotary steerable system (RSS), a mud motor, and a next-generation PDC drill bit. It was anticipated that the added lateral length would significantly improve recovery with only a minimal increase in cost.

CHALLENGES

» Achieve effective hole cleaning in large-bore intervals
» Prevent barite sag
» Maintain ECD control in narrow-margin drilling operations
» Capture 50 percent more reserves vs. a 2-mile (3.2-kilometer) lateral with only a 20 percent increase in costs
» Maintain deviation from center line where average was 3.03 feet (1 meter) up/down and 73 feet (2.4 meters) left/right

SOLUTION

» A customized clay-free BaraXcel™ high-performance NAF system
» iCruise® intelligent RSS matched with an 8½-inch GeoTech® PDC drill bit, in addition to a NitroForce™ high-flow, high-torque motor

RESULTS

» Prevented barite sag, minimized surge pressure, and mitigated torque and drag
» Delivered excellent hole cleaning and ECD control
» Achieved field record for measured depth: 26,785 feet (8164 meters) MD/10,470 feet (3191 meters) true vertical depth (TVD)
» Successfully completed 16,575-foot (5052-meter) lateral for maximum reservoir contact
» Accurately placed well 100 percent in the target

CHALLENGES

Improving well economics and optimizing wellbore geometries were key to realizing the return on investment (ROI) and efficiency gains expected from the exceptionally long lateral. Multiple challenges were confronted. The fluid system had to address a narrow pore pressure/fracture gradient window and alleviate risk of lost circulation. It also had to provide effective hole cleaning and minimize torque and drag in the lateral. Long trip times called for robust suspension properties that would prevent barite sag, and also for a rapid gel-to-flow transition to minimize surge pressure when circulation was initiated. Accurate steering control and reliable bit performance were central to drilling the long lateral at a high rate of penetration (ROP), with little deviation, and landing it precisely on target.

SOLUTION

The Halliburton drilling solution included the BaraXcel™ high-performance non-aqueous fluid (NAF) system; the iCruise® intelligent RSS for fast drilling and accurate wellbore placement; a NitroForce™ high-flow, high-torque motor; and an 8½-inch GeoTech® PDC drill bit.

The BaraXcel fluid system had already been used in the field to successfully drill 13 wells with super laterals with MDs over 21,000 feet (6401 meters). Of those wells, nine were drilled to 24,000 feet (7315 meters) MD or longer.
Previous field history plus extensive lab testing confirmed that the BaraXcel high-performance NAF could help prevent barite sag during long static periods while tripping, ensure effective hole cleaning, minimize surge pressure when breaking circulation, and mitigate torque and drag. During drilling operations, the Baroid technical and field teams closely monitored fluid properties and treatment concentrations to ensure that the BaraXcel high-performance system was fully optimized for the wellbore conditions.

RESULTS
The engineered BaraXcel fluid system delivered excellent hole cleaning and ECD control throughout the lateral section. No lost circulation incidents occurred while drilling the lateral, and torque and drag remained within normal acceptable ranges. The iCruise intelligent RSS drilled a total of 12,672 feet (3862 meters) of the planned 16,575-foot (5052-meter) lateral. The longest run achieved 8,162 feet (2488 meters), where, on average, the deviation from centerline was 3.03 feet (1 meter) up/down and 7.9 feet (2.4 meters) left/right. The iCruise RSS steered accurately, placing the well 100 percent on target – maximizing reservoir contact, setting the record for the longest lateral drilled in the Permian Basin, and helping the operator maximize asset value. The additional reservoir footage that was gained significantly increased estimated reserves, yet cost only 20 percent more than the 2-mile (3.2-kilometer) laterals drilled previously.