AES DRILLING FLUIDS

CASE HISTORY

107TH HORSE SHOE WELL: ZERO NON-PRODUCTIVE TIME USING AES VERT† OIL-BASED MUD FOR MARCELLUS OPERATOR

CHALLENGE

- Overcoming tight boundaries that restricted lateral length and typically required multiple pilot holes
- Navigating a 180° azimuthal turn across fluctuating stress regimes in the Marcellus Shale
- Managing extreme torque and drag across an extended reach wellbore totaling 23,465' MD

SOLUTION

- Deployed AES VERT, a high-performance oil-based system for superior lubricity and wellbore stability
- Maintained LGS < 10% and utilized predictive modeling to optimize ECD during the turn
- Precise density/pressure management ensure stability across the narrow fracture gradient

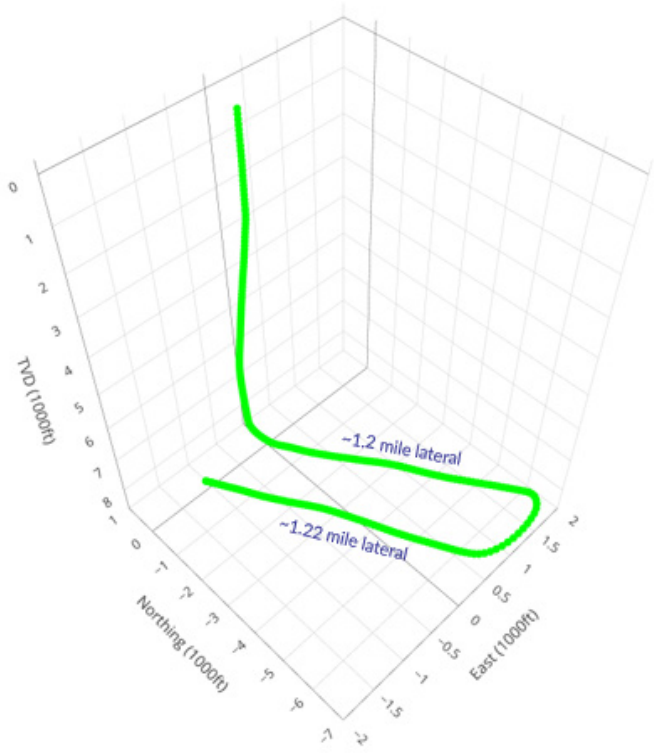
RESULTS

- Reached TD with minimal reaming and successfully landed production casing on elevators
- Maximized reservoir contact per surface location
- Completed the complex horseshoe design within lease constraints

OVERVIEW

An Operator in Sullivan county, Pennsylvania planned to drill a horseshoe well due to lease restrictions in the Marcellus formation. With more than 100 successful horseshoe wells drilled to date, AES Drilling Fluids utilized AES VERT oil-based-mud (OBM) system to complete the project.

The well was drilled successfully, which included a 1.2 mile outgoing leg , the u-turn section, and an additional 1.22 mile return leg lateral. 5 ½ in. production casing was run without issue on the elevators and cemented in place problem-free.



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DETAILS

An operator in Pennsylvania faced significant leasehold limitations that prevented traditional long-lateral development. Standard designs would have required multiple surface holes and short, inefficient laterals, leading to higher capital expenditures per foot of reservoir contact.

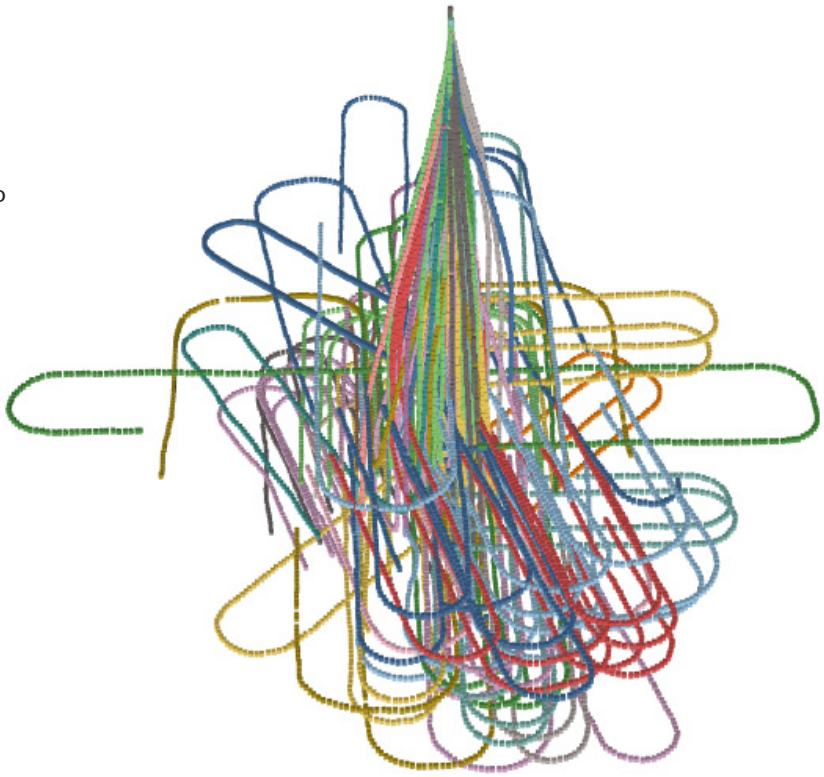
To maximize drainage efficiency, the operator proposed a horseshoe (U-turn) wellbore—an advanced geometry involving an initial lateral leg followed by a 180-degree azimuthal turn and a second, parallel return leg. This design doubled reservoir exposure from a single vertical section but introduced technical risks. Complex geomechanics were expected as the turn required traversing both maximum and minimum horizontal stress orientations, increasing the risk of wellbore breakout. Torque and drag (T&D) concerns required managing friction factors over a 23,000'+ MD path with a high-angle 180-degree turn. Efficient cuttings transport was required during the turn and return legs where annular velocities and pipe eccentricity fluctuate. AES Drilling Fluids collaborated with the operator to deploy AES VERT, a robust conventional oil-based system. The strategy focused on high-performance lubricity to manage T&D and stringent rheological control to maintain wellbore integrity across varying stress regimes.The 9-⅝ in. intermediate casing was set at 2,034' MD. After drilling the vertical section to 7,707' MD, the wellbore was displaced to AES VERT† OBM.

The kick-off point (KOP) of the curve/out-bound leg section was established at 7,842' MD, with the curve landing at 8,850' MD (8,439' TVD). The outbound leg was drilled using a 12.4–12.7 lb/gal mud weight. Fluid properties were tightly managed with an 80/20 Oil-Water Ratio (OWR) with High-Pressure/High-Temperature (HPHT) fluid loss maintained at 10–12 cc/30 min.

The critical 180-degree azimuthal turn commenced at 14,950' MD. During this transition, the engineering team prioritized low gravity solids (LGS) management, maintaining levels below 10% v/v to ensure optimal equivalent circulating density (ECD) control. The turn was successfully completed at ~17,000' MD while maintaining vertical stability within a narrow TVD window. The second leg was extended to a total depth of 23,465' MD. To counteract the loss of ECD-related stabilization once pumps were stopped, the mud weight was strategically increased to 13.2 lb/gal prior to pulling out of the hole (POOH). This move provided the necessary hydrostatic support to prevent breakout in the high-stress turn section.

The technical precision of the AES VERT† OBM system facilitated completion of the drilling phase. The drilling assembly was POOH with minimal reaming required, confirming superior hole cleaning and filter cake quality. The production casing was successfully run on elevators to TD without incident and cemented according to plan. By utilizing advanced hydraulics modeling and maintaining strict control over rheology and LGS (8% v/v at TD), the operator avoided the costs of a second vertical wellbore.

The successful execution of this horseshoe well allowed the operator to maximize production footage within a constrained lease, resulting in significant cost savings per well and significant reduction in surface footprint.



3-D directional plot of every well AES Drilling Fluids has drilled (100+) across most US Land active drilling basins