



AES DRILLING FLUIDS

CHALLENGES

- Excess torque and drag in the Niobrara Chalk and Codell Sandstone limited weight on bit and casing runs to bottom
- Many lubricants compromise drilling fluid properties or induce excess foaming
- Maximize rate of penetration while effectively cleaning the wellbore

SOLUTION

- ENERLUBE drilling fluid lubricant added to the active system while drilling at an average concentration of 1 - 2% v/v in the curve and up to 6% v/v in the lateral
- 4% v/v ENERLUBE pills spotted in the curve and lateral prior to running casing

RESULTS

- Torque reduction of 4,000 to 5,000 ft-lbs
- No foaming or alteration of drilling fluid properties
- Directional drillers and operator representatives attribute ENERLUBE to the delivery of record wells

ENERLUBE⁺ lubricant drops torque 5,000 ft-lbs for smooth trips and casing runs in the DJ Basin

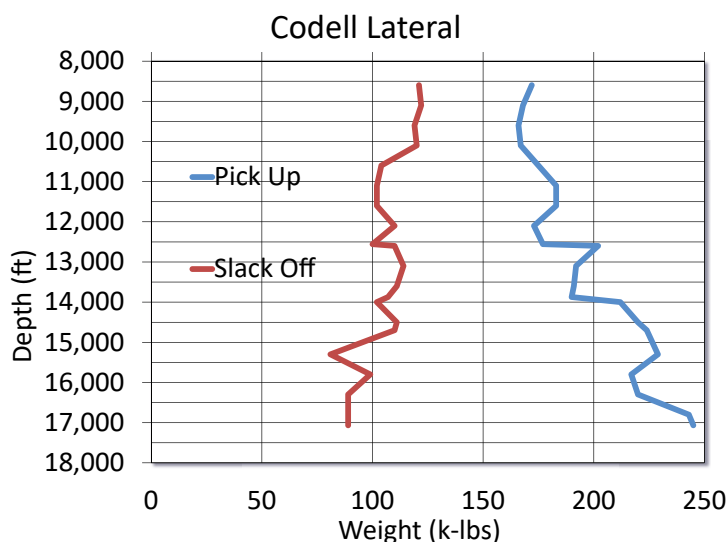
Strategic application of ENERLUBE in the low-solids non-dispersed water-based drilling fluid reduced torque and drag for improved directional drilling and casing runs

Overview

Throughout the DJ basin, operators continue to expand horizontal well drilling programs from traditional vertical wells into the Niobrara Chalk and Codell Sandstone formations. Laterals range from 4,000' to 9,500'.

Cost effective low-solids non-dispersed drilling fluid is the system of choice, but the higher friction factor limits drilling efficiency. Weight-on-bit critical for high rates-of-penetration and directional control was limited by elevated torque.

The client sought a lubricant additive to address the torque and drag issues without compromising other fluid properties. AES recommended ENERLUBE, which provided the necessary torque reduction to effectively deliver the wells. The pickup/slack off weights from the Codell lateral are show in the graph below.



Pick up and slack off weights using ENERLUBE in the Codell sandstone lateral

Details

ENERLUBE was added to the system at 2% v/v while drilling the curve. In the lateral, concentrations increased to 6% v/v.

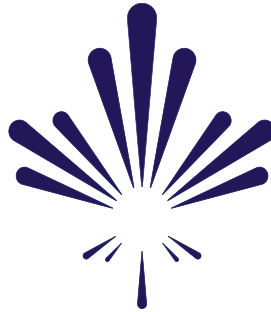
To insure a smooth casing run, 4% v/v pills of ENERLUBE were spotted in the curve while pulling out of the hole.

In both drilling and casing running applications, rig personnel noted the ENERLUBE performance as a key contributor to delivering record wells as torque reductions were recorded 5,000 ft-lbs below typical values.

Details (continued)

Typical properties at/near total depth for each well are shown in the table below.

Property At/Near TD	Codell Sandstone Well	Niobrara Chalk Well
Concentration	6.0% v/v	4.5% v/v
Rotating ROP	120 - 150 ft/hr	200 - 250 ft/hr
Sliding ROP	50 - 60 ft/hr	20 - 30 ft/hr
Pick Up Weight	245 k-lbs	235 k-lbs
Slack Off Weight	90 k-lbs	30 k-lbs
Drilling Torque	11 k-ft-lbs	15.6 k-ft-lbs
Off Bottom Torque	7.5 k-ft-lbs	13.2 k-ft-lbs
Depth (Open Hole Length)	17,117' (9,066')	17,328' (9,267')



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