

EnduraDril Fluid Improves ROP and Reduces Drilling Hours by 25%, Bakken

Produced-brine-based fluid outperforms OBM in the vertical section and mimicks OBM in the curve while eliminating a bit trip.

CHALLENGE

Maximize drilling efficiency using a produced-brine water-based mud (WBM) to drill the intermediate rather than oil-based mud (OBM).

SOLUTION

Drill the entire intermediate with EnduraDril* inhibitive divalent water-based drilling fluid which outperforms OBM in the vertical and mimics OBM performance in the curve.

RESULTS

- Drilled fourteen intermediate sections using a brine-based fluid
- Increased ROP approximately 25% and reduced on-bottom hours 24% compared to most recent OBM offset wells
- Increased ROP from surface shoe to kickoff point by as much as 66% on a well-to-well comparison versus OBM
- Eliminated confined-space entry for pit cleaning, increasing safety and efficiency
- Reduced total cost for solids control and disposal, haul-off, and drilling fluid, as well as rig time to drill the intermediate by 30%



Operator sought to drill intermediate well sections using a produced brine WBM instead of OBM

A Bakken operator wanted to drill the entire intermediate section of a well with a brine-based WBM rather than using OBM. However, due to high divalent ion content, produced water makes formulating drilling fluid with the necessary properties to drill the intermediate section very difficult using traditional, WBM products.

In addition, saltwater flows are frequently encountered in the Bakken when penetrating offset disposal well zones. OBM is less capable of handling saltwater flows, as saltwater intrusion disrupts rheological properties and emulsion stability of oil-based fluids. Resolving this can be expensive and commonly results in disposal of expensive whole OBM.

Brine-based drilling fluid offered ROP increase and operational benefits

Schlumberger recommended using EnduraDril fluid to drill both the vertical and the curve for these wells. EnduraDril fluid chemistry works with existing produced water to create a rheological profile like OBM—yet is free of solids, unlike OBM weighted with barite. Solids-free fluid brings multiple operational benefits and eliminates the need to change fluid type between the vertical and the curve sections.

Encountering saltwater disposal wells can cause rheological complications when drilling with OBM. EnduraDril fluid is brine-based, which means rheological problems caused by saltwater flows from disposal wells are easy to mitigate, unlike drilling with OBM. OBM can have significant viscosity and rheological degradation when exposed to saltwater, and the remedy can be costly. Depending on the salinity of saltwater inflow, however, EnduraDril fluid's density can be minimally impacted. Viscosity dilution, if encountered, is easily treatable.

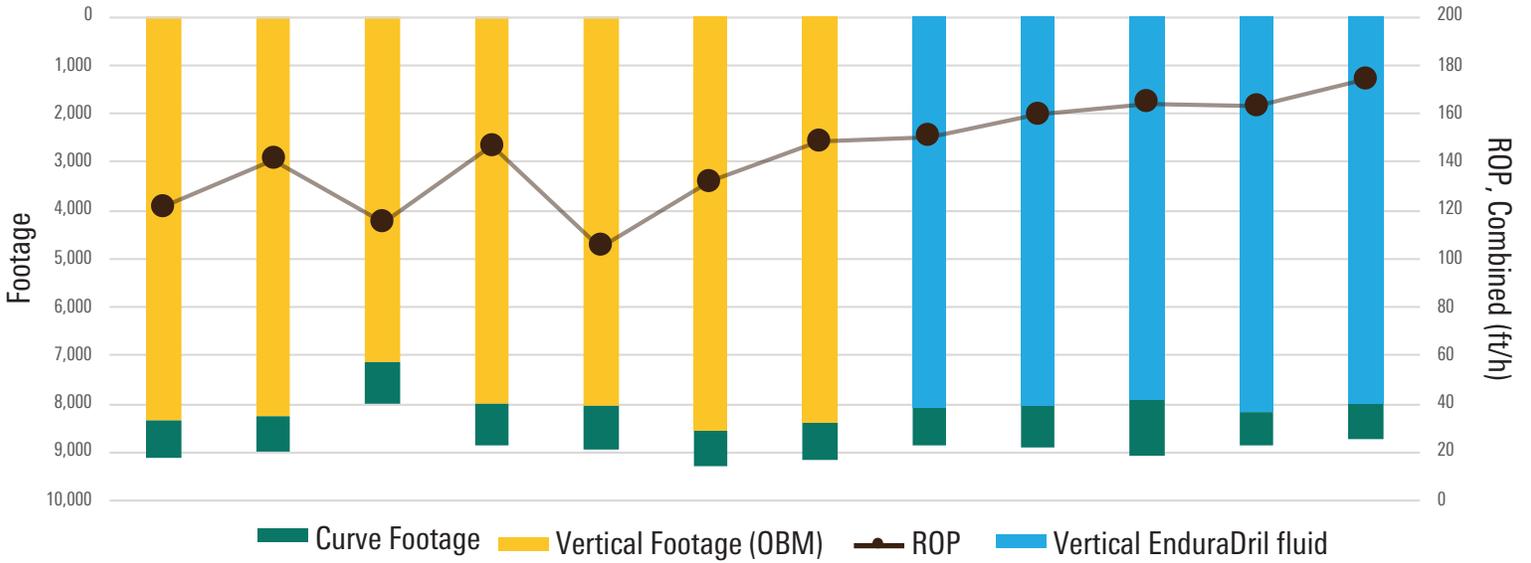
Achieved 25% ROP increase, lowered costs, increased safety, and consistently eliminated pre-planned bit trips

Fourteen intermediate sections were drilled using the EnduraDril fluid and casing was run to total depth in each. All these wells reached kickoff point with a single BHA, saving time by eliminating a trip per well. ROPs increased approximately 25% and on-bottom hours were reduced 24% compared to the most recent offset wells drilled with OBM. ROPs from the surface shoe to the kickoff point were as much as 66% higher in a well-to-well comparison with wells drilled using OBM. The curves were drilled with similar performance times and ROPs. The result was faster and more efficient drilling of intermediate sections with no reduction in wellbore quality or stability.

Operationally, EnduraDril fluid enabled a safer, more streamlined workflow. Confined space entry to clean the pits when transitioning between drilling fluids was eliminated, increasing efficiency and safety. The need for costly "mud fuel" diesel to dilute and maintain OBM density was also removed. The operator's total costs for solids control and disposal, haul-off, and drilling fluid and rig time to drill the intermediate, was reduced by 30%.

CASE STUDY: EnduraDril increases intermediate section ROPs by 25% while increasing safety.

Combined Vertical and Curve ROP,
OBM vs. EnduraDril



Across consecutive wells, EnduraDril fluid delivered continuous outperformance over OBM.

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