



Teros™ Low ECD Synthetic-Based Drilling Fluid System Successfully Completed 4-Mile Lateral Niobrara Wells Drilled in the DJ Basin, Colorado

Newpark's expertise and customized Teros™ drilling fluid system enables operator to successfully reach targeted depths with zero NPT.

CHALLENGE	SOLUTION	RESULT
<ul style="list-style-type: none"> • Campaign to drill 4 mile lateral for optimized production in the DJ Basin • Drill to a total depth of approximately 29,000 ft • Manage torque and drag • Manage ECD and hole-cleaning 	<ul style="list-style-type: none"> • A customized Teros™ Low ECD Synthetic-Based Drilling Fluid System • Teros system engineered with optimized rheology profile to maximize hole-cleaning and ECD management • KronoVis™ premium clay • TeroMod™ liquid rheology modifier 	<ul style="list-style-type: none"> • Reached target depth approximately 29,000 ft • Drilled horizontal sections that reached 4 miles in length • Average ROP of 3,269 ft/day • Drilling fluid rheology parameters were maintained in spec for hole-cleaning and ECD control

OVERVIEW

Beneath central Colorado and extending in a north-east direction into surrounding states, the Denver-Julesburg Basin, known as the DJ Basin, offers rich rewards of oil and gas. With the rise of horizontal drilling technology the Niobrara formation, once considered only a source rock for the DJ basin sands, has become the primary target for oil production in the basin. Originally drilled in short lateral intervals drilling techniques and technologies are being pushed beyond previously known limits.

A campaign of wells targeting the Niobrara formation were successfully drilled to a 4-mile lateral length in the DJ Basin of the Rocky Mountains with an average drilling rate of 3,269 ft/day. Teros™ low ECD synthetic-based drilling fluid was used with the key components of the system being KronoVis™ premium clay and TeroMod™ liquid rheology modifier, effectively controlling the rheology to minimize ECD and maximize hole-cleaning.

CHALLENGE

Drilling in the DJ Basin requires drilling into the producing rock formation horizontally as far as possible from a central drilling pad. Many of the typical well bore designs are planned with a 2 – 3 mile horizontal length. In this drilling project, the well design called for additional lateral length reaching out to a 4 mile lateral length (approximately 29,000 ft MD). Other shorter wells leading up to these long laterals had been drilled with this project anticipating higher torque and drag as well as difficult hole cleaning were expected, due to the very long lateral.

SOLUTION

The Teros™ synthetic-based drilling fluid was chosen to meet the requirements for high-temperature stability, hole-cleaning efficiency, and lower equivalent circulating densities (ECDs). During the drilling of wells preceding this project, rheology modifiers were considered to provide the required fluid properties. A combination of KronoVis™ premium clay and TeroMod™ liquid rheology modifier were



selected to ensure the necessary rheology under the anticipated downhole conditions. Targeting fluid properties specific to hole cleaning and ECD management would be used for these wells.

RESULTS

A combination of low plastic viscosity (PV) and a low-end rheology profile proven to support hole cleaning through the long lateral sections through turbulent flow and carrying capacity. Newpark employed the use of proprietary products designed for achieving the desired properties tailored for use in synthetic-based drilling fluids.

The PV and yield point (YP) properties were tightly controlled with minimum variation throughout the drilling process.

The programmed depth goals were achieved by drilling successful 4-mile lateral wells (approximately 29,000 ft), offering more potential production from the reservoir with each well. The average rate of penetration (ROP) was 3,269 ft/day.

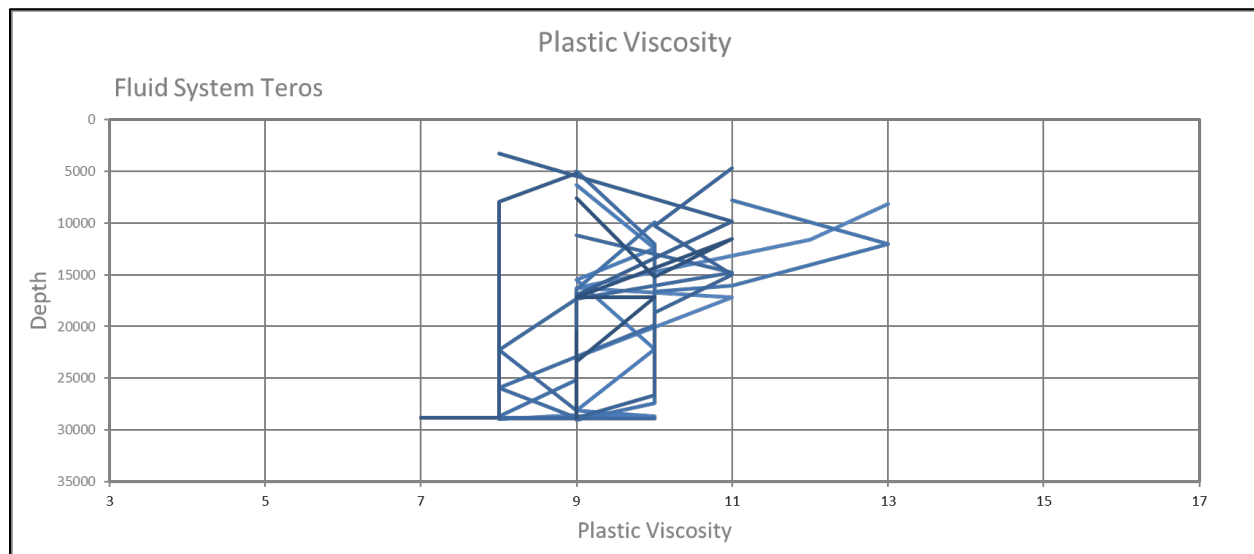


Figure 1: PV was maintained through the lateral with minimum variation fundamental to ECD management.

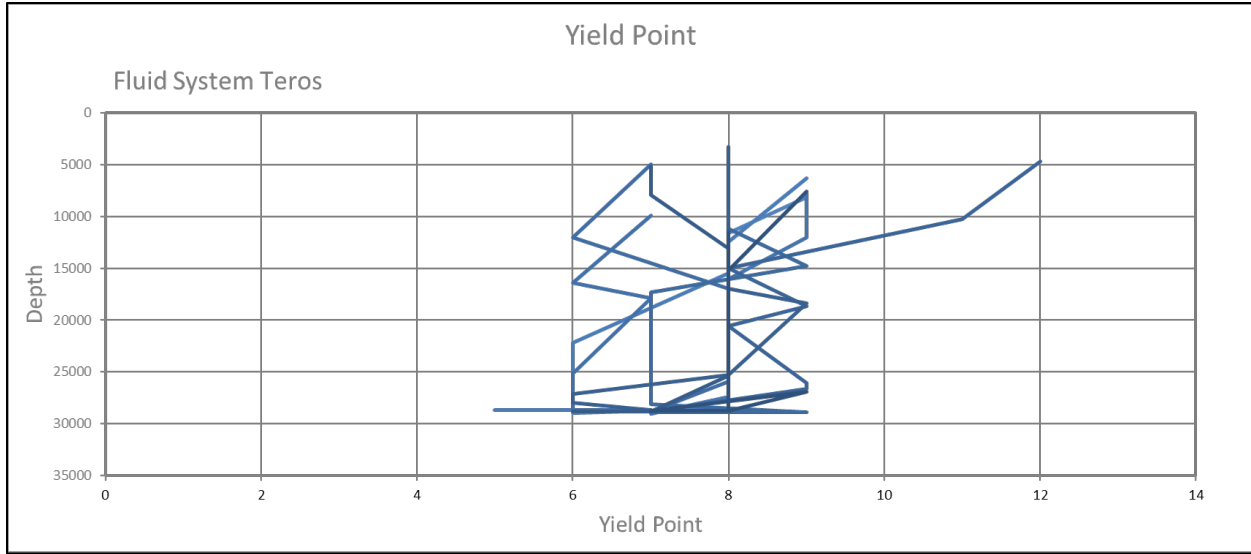


Figure 2: YP management was also key to allowing the fluid to remain in turbulent flow while also suspending solids for removal from the wellbore.

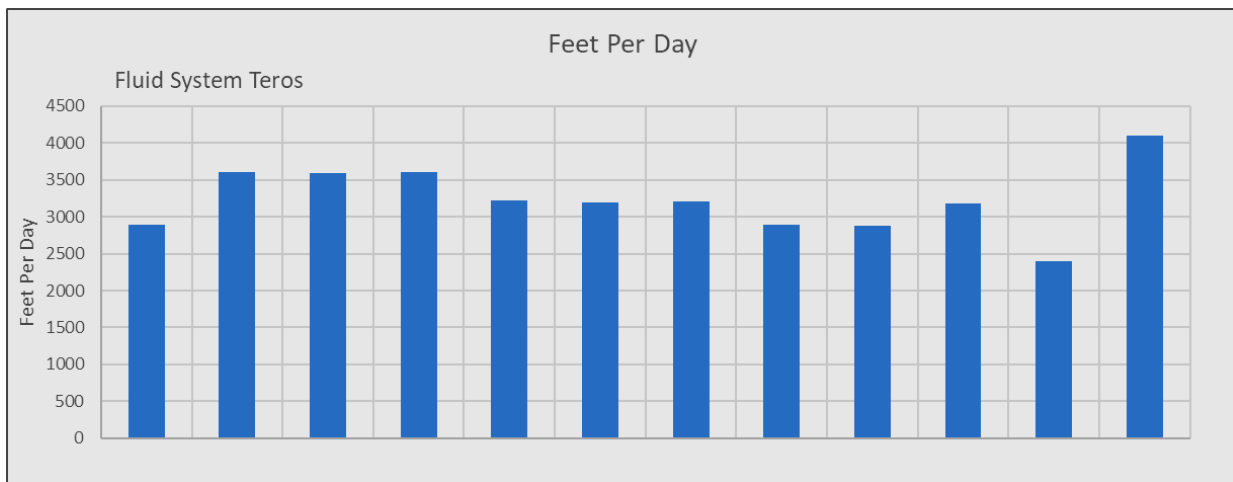


Figure 3: Average footage of 3,269 ft per day including the casing run time for the 4-mile laterals using the Teros synthetic-based drilling fluid system.

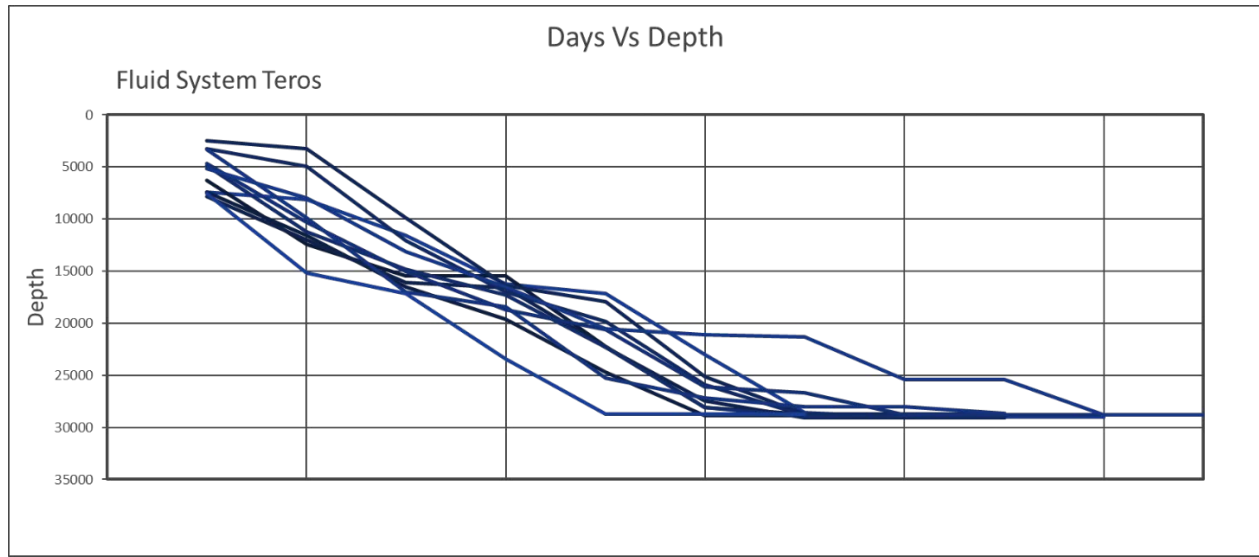


Figure 4: Days vs depth chart shows minimal issues in drilling and running casing through the lateral.