



True™ Series Displacement Chemicals and ClearDepth™ Software Modelling Ensures Effective Cleaning of Wellbore & Riser During Ultra-Deepwater Completion, Gulf of Mexico

True™ Series Displacement Chemicals Offer Effective Mud Removal While Water-Wetting Tubulars in Preparation for Ultra-Deepwater Completion

CHALLENGE	SOLUTION	RESULT
<ul style="list-style-type: none"> • Perform SBM direct displacement in >9,500' water depth • Maximize displacement efficiency • Minimize post-displacement fluid system clean-up 	<ul style="list-style-type: none"> • Engineered True™ Series displacement chemical spacer train • ClearDepth™ displacement hydraulic modeling • Systematic WBCU filtration process 	<ul style="list-style-type: none"> • Effectively & safely displaced wellbore to completion fluid • Water-wet tubulars • Achieved or exceeded fluid cleanliness performance specifications

OVERVIEW

In the Gulf of Mexico, operators with ultra-deepwater assets face distinctive challenges when transitioning from drilling to completion phases, specifically during the displacement from drilling mud to completion fluid. Extreme water depths require large and longer marine risers making it problematic when cleaning up the wellbore and riser sections in a timely manner. A direct displacement is favored to accomplish the objectives of minimizing the volume and number of spacers pumped, maintaining hydrostatic control, and reducing rig circulating time. The selected rigs for these operations are ultra-deepwater, dual-activity drillships.

CHALLENGE

A major operator in the Gulf of Mexico required a solution to directly displace a 13.65 lb/gal KRONOS™ low-ECD synthetic based drilling fluid (SBM) to a 13.0 lb/gal CaBr₂ pure completion fluid on an ultra-deepwater well. The total volume of KRONOS™ to be displaced was 4,476 bbls. The water depth was 9,586' (2,922 meters) with the well depth reaching a PBD at 28,117' (8,570 meters). The operator set completion fluid cleanliness specifications for the displacement at <30 NTUs out of the well and solids content at <0.05%.

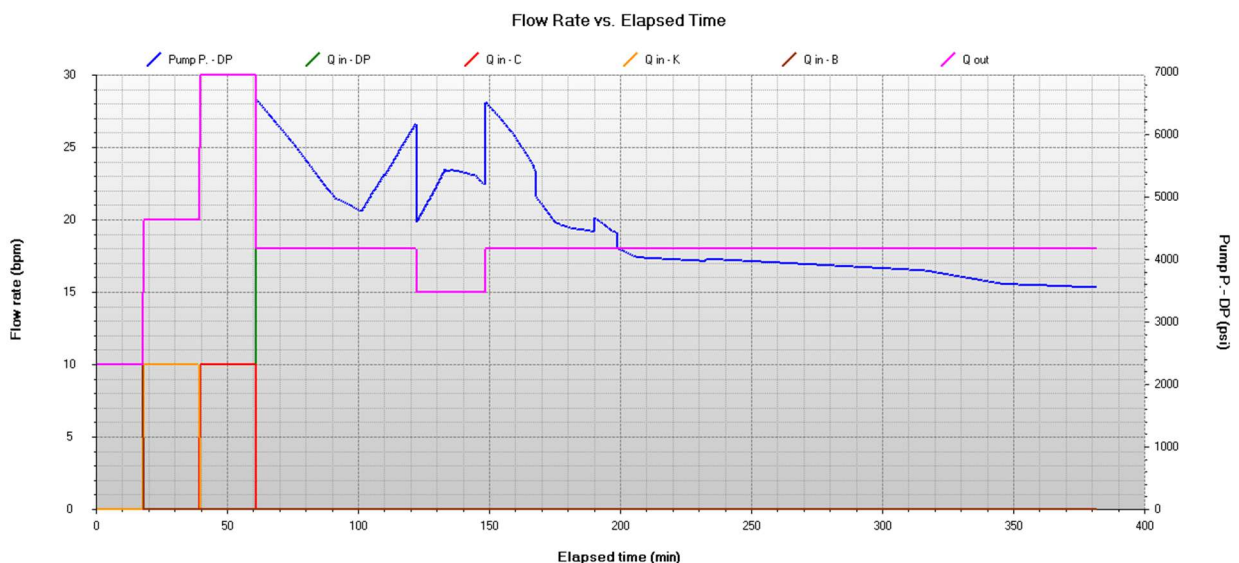
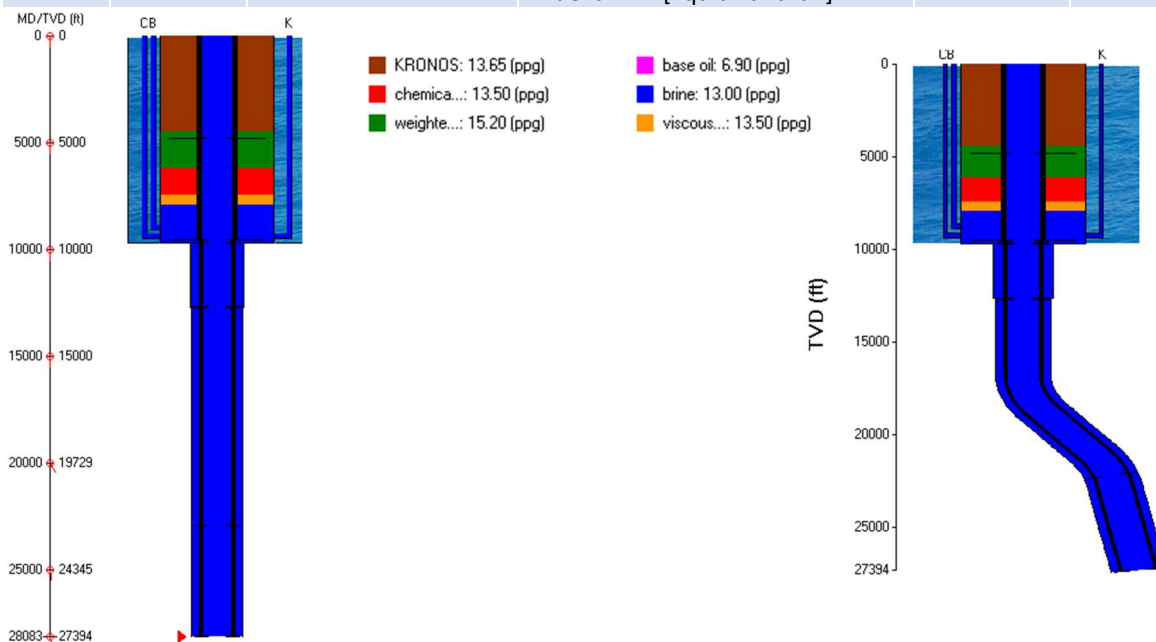
Newpark utilized lab tested chemistry and formulated the specific displacement chemical spacer train to transition from the SBM drilling fluid to the completion fluid and provided water-wetting to the tubulars. Using Newpark's proprietary software ClearDepth™, the displacement was modeled to optimize the pump rates, annular velocities, and spacer contact times. The utilization of wellbore cleanup (WBCU) tools were sequenced and placed for physical cleaning of the wellbore and riser and the high-flow filtration equipment allowed for the completion brine pump rates to be maintained up to 30 bpm for fluid cleanliness specifications while the riser was boosted.



SOLUTION

The rig surface fluid handling system was thoroughly cleaned of residual SBM in preparation to receive completion fluid while the drilling mud was circulated and conditioned to specifications prior to displacement. A True™ Series spacer train was formulated with TrueClean™ blended solvent/surfactant utilized in both the weighted transition and cleaning spacers. These concentrations were customized to the specific drilling fluid being displaced.

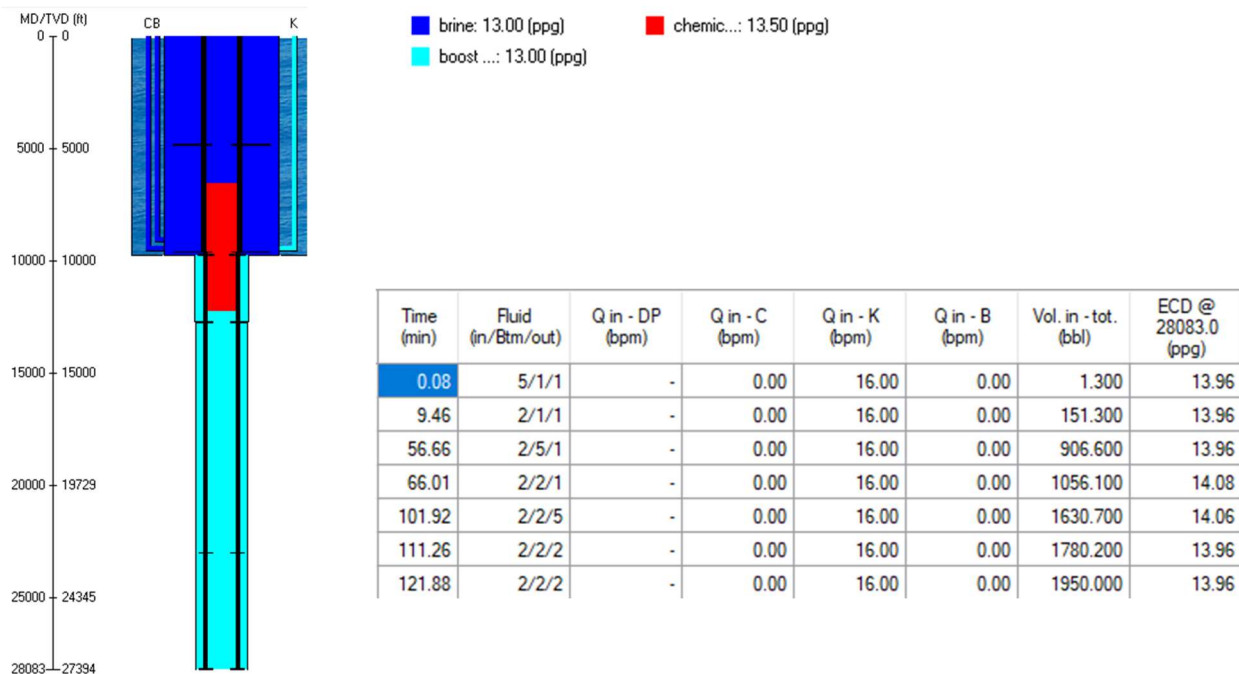
Spacer	Type	Description	Products	Density	Volume
1	Transition	Weighted push	TrueClean™ [solvent/surfactant]	15.2 lb/gal	540 bbls
2	Cleaning	Weighted cleaning	TrueClean™ [solvent/surfactant] TrueCell™ [liquid HEC]	13.0 lb/gal	410 bbls
3	Viscous	Weighted viscosified	TrueClean™ [solvent/surfactant] TrueZan L™ [liquid xanthan]	14.1 lb/gal	168 bbls





The choke, kill, and boost lines were first displaced to completion fluid at 7.5-9.5 bpm using base oil and cleaning spacers. The spacers were pumped down the workstring at 14-18 bpm. The displacement spacer train was followed by 5,662 bbls of 13.0 lb/gal pure CaBr₂. The pump rate was 18 bpm until the tail end of the viscous spacer passed above the BOP at which point the remainder of the displacement occurred at 25-30 bpm.

During the displacement the workstring and WBCU tool assemblies were rotated between 70-80 rpm. Similarly, the workstring was reciprocated between 60-120 feet/minute once the displacement spacers were out of the workstring. Due to the available pit space all surface completion fluid was filtered prior to the displacement to avoid the need to filter while displacing. The riser was then boosted. A short-trip was performed followed by the BOPs being jetted and the riser boosted for a final circulation. Once the initial clean completion fluid returned to surface a TrueFloc™ flocculant treated lead brine volume was reverse circulated down the kill line around the well.



RESULTS

All spacers returned to surface when expected based on bbl/stroke calculations. The total pumping time for the initial displacement was 9.5 hours. The total displacement time from filling the service lines with brine to the final fluid clarity endpoint was <34 hours. This equated to a little over 3 well volumes circulated. The final fluid clarity endpoint result was 27 NTUs and <0.01% solids out of the well, which satisfied the specified targets established by the operator.



Riser Cleaner Brush
4,821'



Riser Cleaner Bucket
4,821'



Riser Cleaner Brush
9,575'



Riser Cleaner Scraper
12,651'

The use of specific chemistries coupled with reliable hydraulics modeling and proper filtration resulted in multiple successful displacements.