



## True Series™ Displacement Chemicals in Ultra-Deepwater Conditions Effectively Clean Wellbore Beyond Operator's Targets

True Series Displacement Chemicals Offer Effective Synthetic-Based Mud Removal While Water-Wetting Tubulars in Preparation for Completion Operations

CHALLENGE	SOLUTION	RESULT
<ul style="list-style-type: none"> <li>• Perform direct displacement of SBM in &gt;8,088' water depth</li> <li>• Maximize displacement efficiency</li> <li>• Minimize post-displacement fluid system clean-up</li> </ul>	<ul style="list-style-type: none"> <li>• Engineered True™ Series displacement chemical spacer train</li> <li>• ClearDepth™ displacement hydraulic modeling &amp; WBCU tools</li> <li>• Systematic WBCU filtration process</li> </ul>	<ul style="list-style-type: none"> <li>• Effectively &amp; safely displaced wellbore to completion fluid</li> <li>• Water-wet tubulars</li> <li>• Achieved or exceeded fluid cleanliness performance specifications</li> </ul>

GULF OF MEXICO

### OVERVIEW

In the Gulf of Mexico, operators with deepwater assets face unique challenges when transitioning from drilling to completion phases, specifically during the displacement from drilling mud to completion fluid. These extreme water depths require large marine risers making it problematic when cleaning up the wellbore and riser sections. A direct displacement is preferred to accomplish the objectives of minimizing the volume and number of spacers pumped, maintaining hydrostatic control, and reducing rig circulating time.

The selected rig for the operation was the Noble Globetrotter II - an ultra-deepwater, dual-activity drillship.

### CHALLENGE

A major operator in the Gulf of Mexico required a solution to directly displace a 10.0 lb/gal KRONOS™ low-ECD synthetic based (SBM) to a 10.1 lb/gal CaCl<sub>2</sub> completion fluid on an ultra-deepwater subsea well. The total volume of KRONOS to be displaced was 4,300 bbls. The water depth was 8,088' (2,465 meters), with the well depth reaching a PBDT at 21,185' (6,457 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 used lab-tested chemistry and formulated the specific displacement chemical spacer train that separated the SBM from the completion fluid, and provided water-wetting to the tubulars; modeled the displacement hydraulics with ClearDepth™ that optimized the pump rates, annular velocities, and spacer contact times; relied on Archer wellbore cleanup (WBCU) tools that were sequenced and placed for physical cleaning of the wellbore and riser; and incorporated the use of Pro-T high-flow filtration equipment that allowed for rates up to 30 bpm which kept pace while the riser was boosted.

### SOLUTION

While the drilling mud was circulated and conditioned to specifications prior to displacement,





the rig surface fluid handling system was thoroughly cleaned of residual SBM for receiving completion fluid. A True Series spacer train was formulated with Newpark’s TrueClean blended solvent/surfactant used in both the weighted transition and cleaning spacers. These concentrations were customized to the specific drilling mud being displaced.

Spacer	Type	Description	True Series Products	Density	Volume
1	Thinning	Base Oil		6.8 lb/gal	125 bbls
2	Transition	Weighted solids-free	TrueClean [solvent/surfactant]	10.6 lb/gal	432 bbls
3	Cleaning	Weighted cleaning	TrueClean [solvent/surfactant]	10.0 lb/gal	325 bbls
4	Viscous	Weighted viscosified	TrueCell [liquid HEC] TrueClean [solvent/surfactant]	10.6 lb/gal	155 bbls

The choke, kill, and boost lines were displaced to completion fluid at 6-9 bpm using base oil and cleaning spacers. The spacers and brine were pumped down the workstring at 9-13 bpm until spacer train and brine above PBL. The displacement spacer train was followed by 4,500 bbls of 10.1 lb/gal CaCl<sub>2</sub>. As the tail end of the viscous spacer passed above the BOP, the riser was boosted for the remainder of the displacement at 22 bpm.

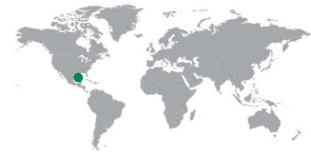
During the displacement, the workstring and WBCU tool assemblies were rotated at less than 30 rpm. Similarly, the workstring was reciprocated when possible between 60-120 feet per minute once the displacement spacers were removed from the workstring. Due to the available pit space, all surface completion 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, the BOPs were jettted, and the riser boosted for a final circulation. Once the initial clean completion fluid returned to surface, Newpark’s TrueFloc™ flocculant treated brine volume was reverse circulated through the well.

## RESULTS

All spacers returned to the surface as expected based on bbl/stroke calculations. The total displacement time from filling the service lines with brine to the fluid clarity endpoint was less than 17 hours. In addition, there were less than two well volumes circulated. The final fluid clarity endpoint result was NTUs in an acceptable range with less than 0.01% solids out of the well, exceeding the operator’s specified target.

The use of specific chemistries coupled with reliable hydraulics modeling, robust WBCU tools and proper filtration resulted in a successful displacement.

# Case History



Riser Cleaner  
Magnet 7,942'



9.875" Casing  
Scraper 16,692'



9.875" Casing Brush  
16,685'



7.625" Casing  
Scraper 21,180'



7,625" Casing Brush  
21,173'