Case History

Cleansorb™ ORCA™ Breaker Treatment successfully applied to achieve optimized well productivity, US Gulf Coast Land

ORCA™ breaker technology successfully removes CleanDrill™ HD RDF filter cake in US Gulf Coast Land 4-well production campaign.

CHALLENGE	SOLUTION	RESULT
• **Mix breaker on location ensuring clean tanks and pits** • **Design ORCA for WBM breaker treatment to facilitate total removal of filter cake** • **Prevent risk of hole collapse due to excessive exposure to acid during clean-up**	• **ORCA FG3 delayed acid precursor** • **GBC-1 catalyst/buffer** • **LyoStar starch breaker** • **LyoZan Plus xanthan breaker** • **Detailed evaluation of breaker to ensure delayed acid generation and unimpaired production**	• **>85% Return Permeability achieved in lab testing** • **Minimum delay of 4 hours before breaker activation achieved** • **Breaker treatment successfully deployed on 4-production wells** • **Unimpaired control over well production maintained due to effective removal of filter cake**

OVERVIEW

A 4-well open hole horizontal drilling and completion production campaign was planned to be drilled to a total depth of 9,358ft (2,852 m) with a 3,608 ft (1,100 m) reservoir section length of 90° lateral 6 1/8" hole. The reservoir section was drilled with Newpark's CleanDrill™ HD divalent brine-based reservoir drill-in fluid (RDF), with a mud weight of 10.6 ppg.

CHALLENGE

Newpark was selected by an operator in North America to design and execute an integrated completion solution combining CleanDrill™ HD RDF with a compatible and effective ORCA™ delayed breaker fluid treatment designed to efficiently remove the RDF filter cake with minimal damage to the reservoir formation. Well productivity can be compromised if the filter cake is not removed both uniformly and completely. After evaluating the expected reservoir challenges, the operator and Newpark team established the benchmarks essential for the design of an applicable technical and cost-effective breaker fluid solution:

- Minimize formation damage
- Bottom Hole Static Temperature 164°F (73°C)
- 200-600 mD reservoir permeability
- Formulate a delayed action breaker treatment compatible with the RDF that would effectively remove all components of the filter cake to ensure unimpaired production.
- Delayed breaker initiation time of 4 hours minimum
- Build all fluids on location.

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Case History

SOLUTION

Following Newpark's extensive lab testing, the operator and Newpark fluid specialists selected a specially tailored Cleansorb™ ORCA™ breaker treatment fluid designed to target and remove all components of the low solids CleanDrill HD RDF filter cake.

Compatibility and performance of the breaker formulations on the CleanDrill HD RDF were rigorously tested together to achieve maximum performance and enhanced return permeability. The test data confirmed the selection of the following ORCA™ filter cake breaker treatment for water-based drill-in fluid (WBM):

ORCA FG3™ acid precursor– generates organic acid over time and temperature to remove acid soluble components of filter cake. Delayed generation allows for the entire breaker to be placed across the open hole before dissolution of the filter cake is initiated.

LyoStar TM starch specific enzyme – catalyst that facilitates the specific degradation of the starch component of the filter cake that binds the bridging solids, allowing the residual filter cake to be removed by the acid which is generated by ORCA FG3

LyoZan TM Plus xanthan specific enzyme – Attacks and partially degrades xanthan polymer present in the filter cake, reducing the integrity of the filter cake and exposing the calcium carbonate component to acid generated by ORCA FG3

GBC-1 ™ – controls and catalyses the reaction rate of the breaker, facilitating uniform removal of the filter cake

ORCA for WBM Formulation

Component	Function	% v/v
4% KCl Brine	Base Fluid	88
Orca FG3	Acid Precursor	10
GBC-1	Buffer	1.3
LyoStar	Enzyme	0.5
LyoZan Plus	Enzyme	0.2

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Breaker flowthrough testing was performed to confirm delayed breakthrough time of the ORCA breaker and effective removal of the RDF filter cake – see Figure 1 below. Formation Response testing was performed on a core with similar lithology and permeability of the planned reservoir. The RDF and ORCA breaker soak tested at anticipated downhole temperature and pressure resulted in a 70% return permeability production- see Figure 2 below.

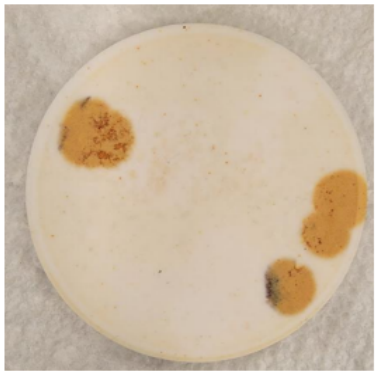
Breaker Number	Units	8.83 lb/gal Breaker
WB RDF Density	lb/gal	10.6
Temperature	°F	164
Initial pH	-	5.51
Post Soak pH	-	3.19
Production	%	87.5
Photo		

Figure 1: Breaker Results of Flowthrough Test

70%
Production

Mud Cake Before Breaker

Mud Cake After Breaker

Figure 2: Formation Response Tester; Mud Cake on Core Face Before and After Breaker Soak Resulting in 70% Production

RESULTS

The reservoir section of this 4-well production campaign was drilled and completed in accordance with plan, with zero issues or fluids-related downtime. All fluids, including the CleanDrill HD, ORCA for WBM breaker treatment and displacement pills were built on location to provide better logistical management and reduced risk of contamination.

ORCA for WBM employed in-situ acid generation, allowing for full placement of the breaker across the entire open-hole, ensuring uniform removal of the filter cake while greatly reducing the risk of formation collapse due to the potential for over-acidizing. The LyoStar and LyoZan components of the ORCA for WBM formulation specifically target and degrade the polymer components, degrading the strength and structure of the filter cake and exposing the calcium carbonate component to the acid generated by the ORCA FG3.