Case History

Cleansorb ORCA™ Breaker Treatments Mitigate Losses & HSE Concerns, and Result in Higher-than-Expected Production, Offshore Romania

A combination of CleanDrill™ Reservoir Drill-In Fluid (RDF) and Cleansorb™ filter cake treatment, supported by Newpark's extensive offshore experience, ensures successful completion of five well project

CHALLENGE	SOLUTION	RESULT
• Successfully drill and complete 5 Open Hole Gravel Pack (OHGP) wells • Meet the strict Romanian offshore environmental regulations • Maintain wellbore stability	• CleanDrill™ Reservoir Drill-In Fluid (RDF) • ORCA HA™ Acid Precursor • LyoZan™ xanthan breaker enzyme • LyoStar™ starch breaker enzyme	• Breaker treatment performed for 4 of the 5 gas wells • Higher-than-expected production rate • Mitigated losses • Mitigated environmental, health and safety issues

OVERVIEW

Newpark implemented the minimally damaging CleanDrill™ monovalent brine-based Reservoir Drill-in Fluid (RDF) system together with Cleansorb ORCA™ Filter Cake Breaker Treatment for an operator in offshore Romania, leveraging off extensive offshore experience to successfully complete the deviated five-well project.

The reservoir section was successfully drilled using the RDF system on schedule with no incidents. The specially formulated Filter Cake Breaker Treatment removed the filter cake as per design and in full compliance with the local environmental regulations, respecting the strict Environmental requirements requested by the Operator.

The RDF solution provided by Newpark protected the reservoir integrity, ensuring an Open Hole Gravel Pack (OHGP) operation could be performed successfully. The Filter Cake Breaker Treatment - specifically designed around well conditions, the RDF formulation and required soak time - successfully removed the filter cake, resulting in production rates above the estimated levels.

CHALLENGE

The challenge presented was designing an effective water-based RDF system compatible with the reservoir formation properties, building a high-quality filter cake on disk to bridge efficiently, keeping the fluid loss below 3ml at 500 psi differential and facilitating maximum efficiency of the Filter Cake Breaker Treatment.

Another part of the challenge was to use products which met the strictest requirements of the Romanian Environmental offshore regulations and having a simplified fluid recipe which was easily mixed, avoiding the use of strong acid to reduce the HSE risks. Maintaining wellbore stability while pumping the breaker treatment and avoiding losses to the formation while spotting the breaker pill were also critical to the

success of the project. To mitigate the well control risks, the Filter Cake Breaker Treatment was designed to begin production of in-situ organic acids after 6-10 hours at expected bottom hole temperature. The delayed development of a less aggressive acid treatment was also beneficial in preventing corrosion damage to the sand control screens.

Well	Well 1 (vertical)	Well 2 (deviated)	Well 3 (deviated)	Well 4 (deviated)
TD (m MDBRT)	1175	1871.4	1446.2	1273.5
Completion Brine density	1.16	1.16	1.16	1.16
Reservoir length (m)	40.3	62.9	42.2	39.5
Reservoir type	Claystone -Sand	Claystone -Sand - Siltstone	Sand	Claystone -Sand - Siltstone
BHT (Celsius)	34	39	38	37

SOLUTION

Following successful use of the CleanDrill RDF, the filter cake needed to be removed as uniformly as possible across the whole of the production interval to maximize the production rate and net present value (NPV) of the wells.

To provide the perfect solution for this project, Cleansorb ORCA Filter Cake Breaker Treatment based on in-situ acid production and polymer-specific enzyme treatments was utilized for filter cake cleanup.

Cleansorb patented second generation in-situ acidizing filter cake treatments allow polymer breakers to be combined with acid precursors in a single treatment fluid, resulting in a dual attack on the polymers and the carbonate present in the filter cake.

Other products utilized for the filter cake breaker included the following:

- Base brine of NaCl and KCl
- Liquid organic precursor ORCA® HA
- GBC-1 liquid catalyst to accelerate the rate of acid production and buffer initial fluid pH
- LyoZan® – liquid xanthan breaker enzyme
- LyoStar® – liquid starch breaker enzyme
- Incorr – liquid corrosion inhibitor

All the above products have CEFAS – OCNS Gold band status with no substitution warnings.

Newpark have previously demonstrated experience using this technology on offshore operations in Australia, where the field results showed a significant increase in production, ranging from 18% to 68%.

Extensive laboratory testing for this project showed the ORCA Filter Cake Breaker Treatment is efficient and compatible with both the reservoir conditions and the CleanDrill RDF chosen. Compared to HCl treatments, ORCA provides significant health, safety, and environmental benefits, and can be mixed at the rig site without the need for specialized mixing and pumping equipment

Newpark was able to provide the complete solution required for this project (Drilling-RDF-Completion-Chemical Clean Up-Breakers), leveraging Newpark's offshore experience and Service Advantage including laboratory testing and technical support, backed by an efficient logistics infrastructure and a first-class Liquid Mud Plant facility.

Case History

RESULTS

After drilling, the wells were displaced to a solids-free blend of NaCl and KCl brine. The Wire Wrapped Screens (WWS) were set in this brine system. After performing the Gravel Pack, the ORCA Filter Cake breakers were spotted across the production zone and allowed to soak.

The ORCA Filter Cake Breaker Treatment was used in four of the five gas wells. The four gas wells were successfully displaced to the planned volumes with no losses during placement.

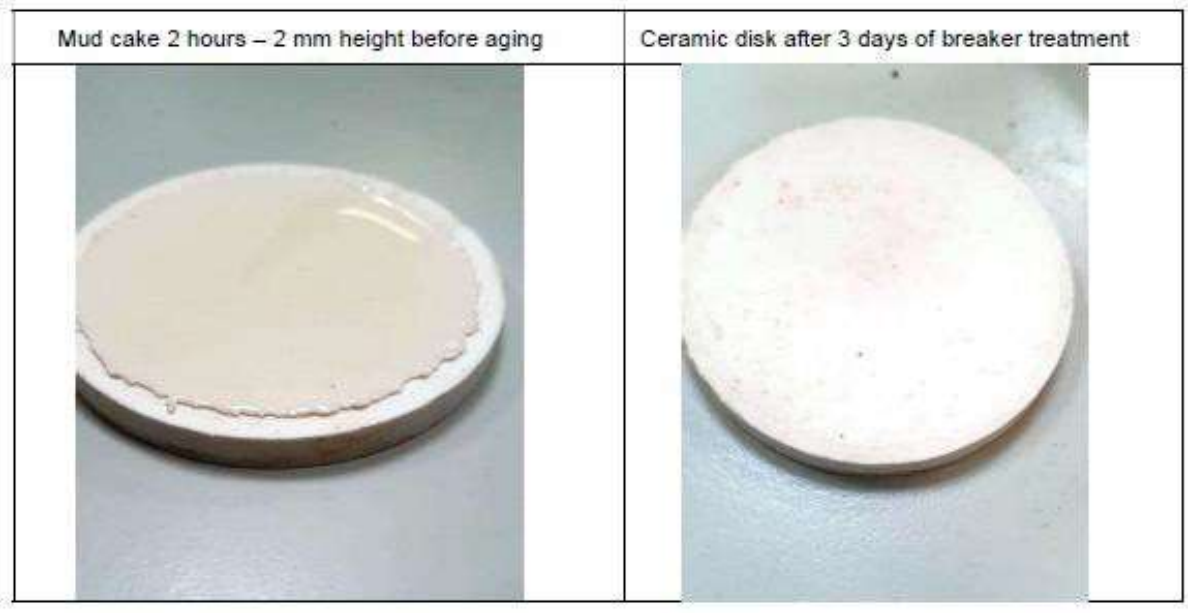
The integrated fluid solution based on the synergy between the drilling fluid, RDF, and Filter Cake Breaker Treatment eliminated the need for any additional cleanup runs (no solids were identified during well testing) or acid treatment jobs.

This led to a complete filter cake removal and successful completion, resulting in a higher-than-expected production rate.

In addition, environmental, health and safety issues were mitigated using organic acid precursors instead of HCl acid.

Time was saved due to the ease of mixing and spotting the ORCA Filter Cake Breaker Treatment directly after performing the gravel pack, avoiding the need for any additional remedial operations.

Well	Well 1 (vertical)	Well 2 (deviated)	Well 3 (deviated)	Well 4 (deviated)
TD (m MDBRT)	1175	1871.4	1446.2	1273.5
Time from mixing to pumping(min)	40	40	45	40
Reservoir length (m)	40.3	62.9	42.2	39.5
Reservoir type	Claystone - Sand	Claystone - Sand -Siltstone	Sand	Claystone - Sand -Siltstone
BHT (Celsius)	34	39	38	37
Soak time (h)	312	240	216	311
Solid content in produced fluid (%)	0%	0%	0%	0%
% Increase of production	30%	40%	46%	33%



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