DEEP WATER

MATURE FIELDS

UNCONVENTIONALS

CASE STUDY

BaraKlean® Solutions and CFG™ Modeling Remediate Prior Issues, Enabling Successful Completion

UK NORTH SEA

CHALLENGES

Limited pit capacity and pump rates during displacement and the lack of hydraulics preparation threatened to complicate the wellbore cleanout process after a failed third-party attempt.

SOLUTIONS

Baroid optimized the displacement design in order to deliver efficient removal of inverted oil-based mud residue, using:

- CFG™ hydraulics modeling
- BaraKlean®-648 casing cleaner

RESULTS

BaraKlean® Solutions remediated prior issues and enabled the operator to install the completion assembly with no further delay.

OVERVIEW

An effective displacement and wellbore cleanup are typically achieved with a combination of chemistry, engineering, and best field practices. Failure to address any of these aspects can quickly consume additional fluids, logistics, and rig resources. When planning cleanup and displacement operations, the designer should anticipate issues such as cleaning efficiency, and should address equipment limitations and mitigate potential problems such as surface volumes.

A UK North Sea operator engaged a chemical service provider to conduct a displacement and wellbore cleanup. The operator ran a cleanup assembly that included a circulating sub designed to increase annular velocities in the upper section. However, the operation performed poorly, and large quantities of thick, contaminated oil-based mud (OBM) remained on the tubulars and settled out in the pit system (see photographs).

Baroid engineers were contacted in order to determine the causes of the poor cleanup and to recommend a process to achieve well cleanliness.

A successful cleanup should maximize contact with the cleanup train while maintaining the highest turbulent flow possible inside the production casing. In order to achieve these objectives, the limitations of rig systems, such as the pits and the mud pumps, must be considered.

An investigation revealed that no hydraulic modeling had been conducted. As a result, flow rates and annular velocities were poorly managed, and the circulating sub was activated too late to take advantage of its benefits. The cleanup train was almost out of the well before the velocities could meet their optimal rate. The critical cleaning pills were in laminar flow rather than in full turbulence.

OPTIMIZED HYDRAULICS: CRITICAL FACTOR IN SUCCESSFUL CLEANUP OPERATION

BaraKlean® Solutions provides a systematic engineered design process and access to a range of functional additives to provide a displacement program customized to the requirements of each well. Displacement operations are modeled and optimized using Baroid's Completion Fluids Graphics (CFG™) hydraulics simulation package.

Samples of the fluids used or in situ for the cleanup were sent to the Baroid laboratory in Aberdeen, Scotland. Using BaraKlean Solutions, several cleaning systems were tested on the samples of the viscous OBM residue. These cleaners were analyzed for their individual abilities to break down the residue. The operation itself was also investigated in depth, including pit usage, fluid preparation, and the planning process for the job execution.

CASE STUDY

The design of the displacement and subsequent execution using a displacement train based on BaraKlean®-648 casing cleaner confirmed the importance of running a simulation prior to the operation.

HAL74193

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Wellbore cleanup failure: Initial third-party wellbore cleanup failed to remove contaminated OBM residue due to a lack of planning.

The displacement design was modeled and simulated using the Baroid proprietary CFG software package. CFG software identified critical parameters, such as pump rates, circulating pressures, and annular velocities. The modeling outcomes demonstrated that applying effective hydraulics principles overcame the challenges of restricted pit space and pump capacity. With careful planning, preparation, and execution of the cleanup operation, the completion would have a better chance of success. Based on these learnings, it was clear that the initial operation was sub-standard.

Baroid presented a displacement design that would meet the specific challenges and ensure that performance criteria were identified before the operation and measured during the displacement.

The remedial wellbore cleanup operation was executed as planned, and the successful completion reinforced the high quality of the BaraKlean Solutions design.

SUCCESSFUL COMPLETION INSTALLATION AFTER BAROID REMEDIAL TREATMENT

The design of the displacement and subsequent execution using a displacement train based on BaraKlean-648 casing cleaner confirmed the importance of running a simulation prior to the operation. The efficient displacement design saved time, decreased interface volumes, maximized residue recovery, and minimized the amount of over-displacement.

After completing the remedial wellbore cleanup, the customer was able to continue with the planned completion. This was due to the failure to perform an effective cleanup on the first attempt.

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