Wellbore Cleanout / Displacement

BaraKlean®-648 casing cleaner helps remove wax in wellbore cleanout limited by low pit and pump rate capacities

Location: South Coast, United Kingdom

Overview

A customer recently attempted to perform a workover on a well located in the UK. During the operation, the customer encountered large quantities of wax that obstructed initial circulations and trips.

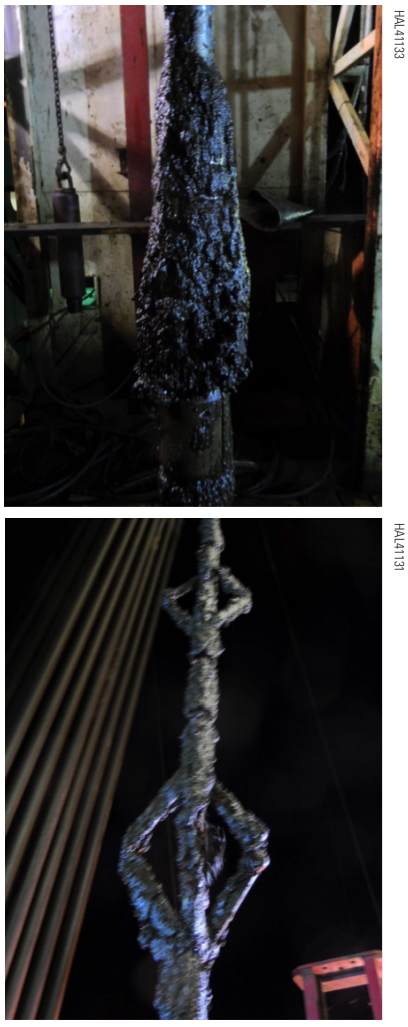
After killing the well and pulling the lower completion assembly, the customer contacted Baroid to request wellbore cleanout assistance prior to running replacement completion tools. A scraper assembly had been used to clean up the casing, but this proved ineffective, appearing to smear the wax rather than remove it (see photos of original completion assembly).

The small workover rig had limited pit and pump capacity available for the operation. No solids control equipment was available, so there was only one attempt possible at the cleanup operation with no option to circulate on a closed system. In addition, being a live well, it was essential to maintain well control at all times throughout the operation. The aim of the cleanup operation was to maximize the contact time of the pills while attempting to achieve the highest turbulent flow possible within the casing.

Halliburton's Solution

As this was the first cleanup of this type for the customer in this field, the Critical First Well Execution Process was implemented, ensuring that performance criteria were identified before the operation and measured during the displacement.

A wax sample was sent to the Baroid laboratory in Aberdeen, Scotland, for testing with a range of solvents. The solvents' individual abilities to break down the wax were compared on a static and agitated basis.



Wax accumulations on the original completion assembly, recovered during a workover operation

CHALLENGE	SOLUTION	RESULT
The pit system and pump rate limitations during displacement threatened to complicate the wellbore cleanout process.	The optimized design incorporated BaraKlean®-648 casing cleaner and base oil in order to deliver efficient removal of wax residue.	The heavy wax deposits were dissolved and removed from all surfaces, and the replacement completion assembly was installed with no issues.

Application of the Baroid technical and black book design processes demonstrated that a combination of base oil and BaraKlean®-648 casing cleaner was identified as the most effective solution. BaraKlean-648 cleaner provides strong solvent action and high cleaning capacity, and was ideally suited to the technical constraints presented by this application.

As shown in the test result photos, the BaraKlean-648 cleaner was by far the most successful product at breaking down the wax.

The displacement design featuring a combination train of base oil and a BaraKlean-648 cleaner was optimized using modeling and simulation in Baroid's CFG™ proprietary software package. The software simulated critical parameters such as pump rates, circulating pressures, and annular velocities.

At the maximum achievable flow rate of only 5 bbl/min, the contact times and annular velocities were found to be lower than best practice would dictate. Due to these limitations, the pill volumes and the operations were optimized in order to maximize the cleaning action.

The challenges presented by the restricted pit space and pumps were overcome by careful planning, preparation, and execution of the operation. The components in the displacement train benefited the operation and maximized the efficiency of the displacement. Waxy deposits, which previous efforts had failed to remove, were now dislodged and dissolved from the well, and were recovered from the returns for disposal.

Economic Value Created

After completing the wellbore cleanup, the customer was able to continue with the planned acid stimulation work scope. This involved the running of inflatable packers through the wellbore before running the final electric submersible pump (ESP) completion assembly. Tripping operations, which had previously been hindered by wax deposits, were completed without any further issues or obstructions.

After a series of failed mechanical cleanups, the Baroid fluid solution eliminated the need for several round trips and provided the opportunity to run the new completion at the first attempt, ultimately saving time.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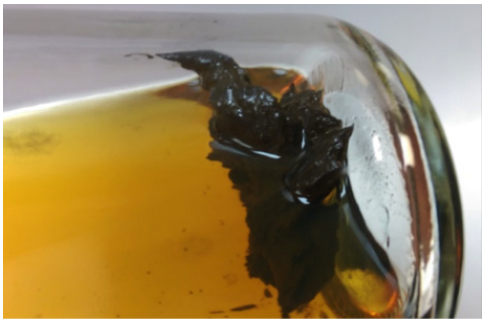
Typical wax sample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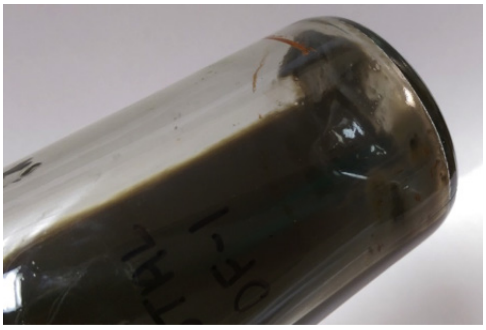
Wax after 10-minute agitated soak in solvent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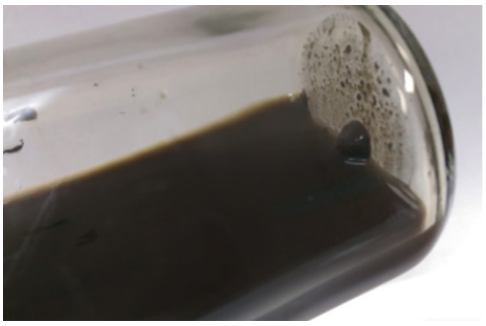
Wax after 10-minute agitated soak in base oil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Wax after 10-minute agitated soak in BaraKlean®-648 cleaner