



Lost Circulation Material

BARAFLAKE® acid-soluble lost circulation material (LCM) pill cures losses in deepwater carbonate reservoir

Location: Offshore Angola, West Africa

Overview

An offshore operator in Angola had concerns about significant lost circulation while drilling a reservoir section composed of faulted carbonates during its exploration drilling program. The operator requested an innovative fluid solution that would reduce costly and time-consuming mud losses and offer an alternative to cement.

Testing

At Baroid laboratories, extensive testing was performed on pill formulations consisting of acid-soluble lost circulation materials (LCMs) that would effectively seal parallel slot sizes of 1,500, 2,500 and 3,000 microns. These slot sizes were deemed indicative of the fault sizes that could be encountered in the reservoir.

When the recommendation was delivered, BARAFLAKE® acid-soluble flaked calcium carbonate was integral in the design of the lost circulation material (LCM) pills, and this was further supplemented with an array of BARACARB® particle sizes covering a D50 of 25- to 600-micron size distribution.

While drilling the 12-1/4” interval, the well was shut in due to a gain. A decision was made to circulate out the kick through the choke line, which resulted in a lost circulation incident. After a series of ongoing losses, the static loss rate of 90 bph was reduced to 0 bph after pumping a 100-bbl LCM pill formulated as shown in the table on the next page.

The pill was displaced from the drillstring in stages as follows:

- 40 bbl = loss rate reduced to 48 bph
- 90 bbl = loss rate reduced to 0 bph

The well was then shut in and observed for 10 hours. No further losses were recorded during that time.

CHALLENGES	SOLUTIONS	RESULTS
Reduce costly mud losses in carbonate reservoir	Spot a BARAFLAKE acid-soluble LCM pill in the loss zone	Loss rates up to 90 bph were stopped by pumping a series of BARAFLAKE LCM pills, resulting in an overall cost savings of US\$1.2 million

When five more stands were pulled, the losses began again, with a static loss rate at 90 bph. An identical pill was then pumped with losses being completely cured after the entire 100-bbl volume exited the drill pipe.

Over the next 24 hours, a further 160 bbl were pumped as part of two pills. The losses returned each time the drillstring was pulled farther out of hole. It was later agreed that, with the absence of a slight squeeze, the LCM was being disturbed and partially removed from the fracture openings each time pipe movement occurred.

Forty-eight hours after pumping a total of 460 bbl of the BARAFLAKE LCM pill, the losses were completely cured.. This allowed the drillstring to be pulled out of hole. The well was logged and the liner was run successfully.

Prior to pumping the first LCM pill, it took 19 hours of rig time to combat the losses. Approximately 860 bbl of INNOVERT® oil-based drilling fluid were lost the first day. Overall, 1,883 bbl of drilling fluid was lost. The LCM pill cured losses and enabled the operator to avoid a costly cementing job.

The BARAFLAKE LCM pills resulted in an overall cost saving of US\$1.2 million. Costs could have increased dramatically if a cementing job through the bottomhole assembly (BHA) had failed, and this would have threatened the continuation of the whole well.

PRODUCT	CONCENTRATION (ppb)
BARACARB 25	18
BARACARB 400	18
BARACARB 600	18
BARAFLAKE Medium	40
BARAFLAKE Coarse	26

Lost circulation material (LCM) pill concentration