

BRIDGEFORM system stabilized shale, saving operator \$7 million USD

An operator planned to drill a 12 ¼ in. x 13-in. section through the troublesome Hordaland shale in the Norwegian sector of the North Sea. Unstable clay present in the Hordaland can result in tight hole when tripping, pack-off tendencies, and the potential for stuck pipe.

The main wellbore was drilled to 8,973 ft (2735 m) total depth using **CARBO-SEA™ low-toxicity oil-based mud**. There was a gradual increase, up to 5% volume, in the amount of breakout cavings from the formation. The cavings were predominantly blocky and tabular, and ranged in size from .4 to 1.2 in. (1 to 3 cm), indicating breakout or failure of the shale formation.

There was packoff at the 13 ¾ in. shoe while circulating the hole clean. Once circulation was regained, a 150% increase in the volume of blocky breakout cavings was observed. The drillstring had to be back-reamed and lubricated out of hole.

The 9 ⅝ in. x 10 ¾ in. casing became stuck while running into the open hole. While circulating and trying to pass the obstruction the hole packed off. The

casing run had to be aborted and casing was pulled out of hole. A clean-up run was attempted and the same issues were encountered at the same depths. The operator decided to cement and sidetrack the wellbore.

The Baker Hughes, a GE company (BHGE), Drilling and Completion Fluids team was challenged to provide an environmentally-acceptable wellbore strengthening solution to ensure a stable wellbore for running and cementing casing in the 12 ¼ in. x 13 in. section. Considering these challenges and the strict environmental regulations, BHGE recommended the **BRIDGEFORM™ single-sack wellbore strengthening system**.

The BRIDGEFORM system consists of a micronized sealing polymer combined with additional wellbore stabilizers that reduce pore pressure transmission by sealing and plugging micro-fractures in shale and low-porosity sands. The system mitigates the risk of differential sticking, as well as losses to lower pressured formations, while stabilizing shale.

Challenges

- Case and cement 12 ¼ in. x 13 in. section
- Unstable formation resulting in cavings, tight hole, and packoffs
- Problems pulling bottomhole assembly out of hole

Results

- Drilled, cased, and cemented two troublesome wells in the 12 ¼ in. x 13 in. shale section
- Approximately \$7 million USD savings in rig time and mud costs



The 12 ¼ in. x 13 in. sidetrack was drilled using CARBO-SEA and 10 sacks per hour of the BRIDGEFORM strengthening system to 9,035 ft (2754 m) TD with no wellbore stability issues. The 9 5/8 in. x 10 ¾ in. casing was run to 9,009 ft (2746 m) and cemented successfully.

Based on the success of the sidetrack, the addition of 10 sacks per hour of the BRIDGEFORM system was again used

on the next well. The 12 ¼ in. x 13 in. section was drilled to TD and casing was run and cemented with no wellbore stability issues.

With no sidetracking required on the 12 ¼ in. x 13 in. section of the second well, the operator saved approximately \$7 million USD in rig time and mud costs.

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