

# ConocoPhillips (Grissik) Ltd. Uses Customized High-Performance WBF System to Drill High-Temperature Deviated Well

HYDRO-GUARD® HT ENGINEERED WATER-BASED FLUID SUPPORTS SHALE INHIBITION, RHEOLOGY PROFILE, AND LOW STANDPIPE PRESSURE WHILE DRILLING PLUS SAG STABILITY UNDER PROLONGED STATIC CONDITION

INDONESIA

## CHALLENGE

- » Drill through reactive, over-pressurized shales
- » Withstand high temperature (260-275° F).
- » Mitigate sag tendency, hole cleaning issues, and torque & drag in 55-degree inclination, with 13.2-13.5 ppg mud density
- » Maintain standpipe pressure below 5,000 psi
- » Reduce waste management costs experienced with synthetic OBM

## SOLUTION

Engineer a WBF system to provide SOBMLike performance, including:

- » Customized HYDRO-GUARD® HT – high-performance water-based fluid
- » Chemical additives to optimize high-temperature stability, without altering the rheological profile, and to provide long-term sag resistance:
  - » BaraVis® W-637
  - » BaraThin W-678

## RESULTS

- » Reached an average ROP of 62 ft/hr (18.9 m/hr) (equivalent to offset well using SOBMLike), with no shale inhibition or torque & drag issues
- » Maintained stable rheological and HTHP fluid loss properties, with no thermal degradation in high temperature
- » Endured 21 days static time with minimum to no barite sag tendency, and with 13.2-ppg mud density, 260° F BHST, and 55-degree angle
- » Saved customer approximately USD 1.0 MM, by eliminating hazardous waste treatment

## OVERVIEW

ConocoPhillips (Grissik) Ltd. was seeking a mud system alternative for drilling a 12.25-in. intermediate section in one of their Suban Field wells in South Sumatra, Indonesia. Due to a relatively high pressure of 4,000 psi, a mud density of 13.0-13.5 ppg was required to successfully drill the section. The anticipated bottomhole static temperature (BHST) was 260-275° F, with a pump pressure limitation of 5,000 psi maximum. The well was planned to have up to a 54/55-degree angle of inclination, within a ± 3,280-ft (± 1,000-m) length of the Telisa Shale formation.

## CHALLENGE

In the region's offset wells, intermediate sections are normally drilled using synthetic oil-based mud (SOBM), which poses no major risks concerning shale stabilization, high-temperature exposure, insufficient lubricity, poor hole cleaning, high standpipe pressure, or barite sag in a deviated angle. However, the cuttings and leftover SOBMLike present other concerns, from environmental and hazardous waste cost management perspectives. In this drilling campaign, ConocoPhillips challenged Halliburton Baroid to provide a suitable water-based mud (WBM) system that would match the performance of SOBMLike, while minimizing impact to the environment and lowering waste management costs.

## SOLUTION

A customized HYDRO-GUARD® HT water-based fluid was formulated in the Baroid laboratory, introducing BaraVis® W-637 and BaraThin W-678 into the chemical mixture as the main viscosifier and thinner, respectively, to control the rheology in the system. Both additives worked synergistically with other components in the HYDRO-GUARD formulation to improve HPHT fluid loss control at 280° F, without affecting the rheological profile. This engineered solution was designed to support the drilling operation of a high-angle well, in both dynamic and static conditions.



*Bottomhole assembly on surface at Suban Field.*

## RESULTS

In the Suban Field application, HYDRO-GUARD HT provided shale stabilization and lubricity, enabling a high rate of penetration (ROP) with low torque & drag. Rheological profiles were relatively low with acceptable  $\tau_0$ , ensuring sufficient hole cleaning at a high inclination angle, and within the allowable standpipe pressure threshold. No hole cleaning issues occurred during drilling, circulating, and pipe tripping operations.

The HYDRO-GUARD HT mud system also proved to be stable during an unexpected 21-day static period due to rig shutdown during a Covid-19 outbreak. Following this period, the density of the mud after bottom-up demonstrated minimum to no barite sagging tendency.

Additionally, HYDRO-GUARD HT provided in-situ dewatering and cuttings handling process benefits. By processing the WBM cuttings and waste on location, the customer eliminated transportation and hazardous waste treatment costs that are usually incurred by a SOBM system.

Overall, ConocoPhillips was satisfied with the result, and this HYDRO-GUARD HT is now their benchmark performance for drilling the Telisa Shale formation.



*Cuttings from the shaker clearly showing preserved condition with cutter marks on surfaces.*

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