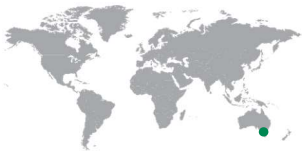
Case History



Formate Drilling Fluid System Results in Improved ROP, Increased Hole Stability and Reduced Torque and Drag, Onshore Australia

Newpark's customized Formate fluid improves ROP, maintains inhibition, reduces torque while minimizing formation damage and environmental impact

CHALLENGE	SOLUTION	RESULT
• Successfully drill a reactive clay-containing interval • Environmentally sensitive area required the drilled cuttings to be compostable	• Engineer a solids-free, biodegradable formate fluid to drill the intermediate and production intervals	• Successfully drilled the interval ahead of schedule • 30% reduction of planned drilling days • 22% reduction in casing time • Cuttings easily compostable • Minimal formation damage

OVERVIEW

An operator drilling in the Iona/Otway Basin of Australia was preparing to drill a gas storage well with a 12.25" intermediate and 8.5" production interval. The well pad in question was located within a gas plant and dumping of cuttings and waste drilling fluids on the ground was prohibited.

CHALLENGE

Drilling this well presented two specific sets of challenges. In the intermediate interval, reactive clays in the Pember and Paarte formations would be encountered; offset wells had experienced issues with differential sticking, wellbore instability, and tight hole sections.

In the reservoir interval, formation damage would need to be minimized, so solids content would need to be limited if not eliminated such as to prevent fines invasion into the target reservoir. Additionally, the S-shape well profile which consisted of a build to 60˚ and drop to 51˚ provided additional torque and drag concerns.

The location of the well also required specific consideration for the environmental impact of the fluid. All cuttings would be hauled off and composted, so chloride content would need to be minimized to allow for improved biodegradation.

SOLUTION

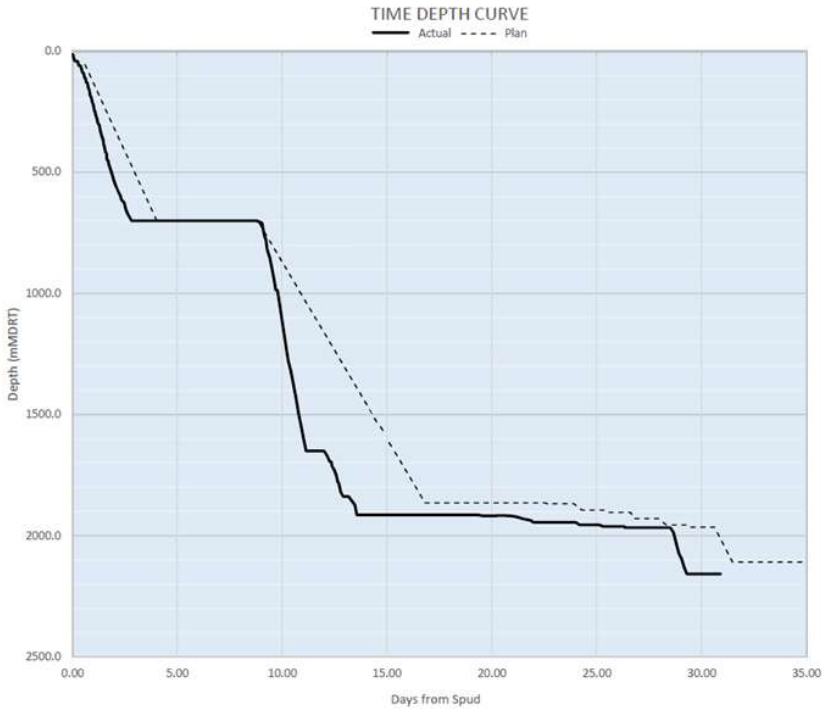
The formate mud system was chosen as it offered the following benefits:

- Potassium Formate is a non-hazardous, biodegradable, environmentally friendly, Chloride-free source of shale-stabilizing potassium ions
- Improved biodegradation of cuttings compared to Chloride brine-based fluids
- The Sodium and Potassium Formate acted as a High Temperature stabilizer, which increased the thermal stability of the organic polymers

NEWPARK FLUIDS SYSTEMS

- Formates have a lower corrosion rate compared with Chloride salts
- Compatible with reservoirs (resulting in low skins)
- Excellent hydraulic performance with reduced ECD and surge/swab pressures
- Superior lubricity to other water-base fluid options, often rivalling comparable non-aqueous (oil-based) fluids

RESULTS



Overall, this mud system achieved good hole stability, adequate inhibition, and superior environmental and reservoir performance.

The mud weight required was up to 10.5ppg. This was achieved using Sodium Formate (10.7ppg) and Potassium Formate (13.1ppg), eliminating the need for Barite. This eliminated the potential for weight material sag in the highly deviated wellbore.

Rate of Penetration (ROP) in the intermediate interval greatly exceeded expectations, resulting in 30% reduction of days drilling vs. planned.

As a preventative measure, the mud system was treated with 0.8% AvaGreen Lube prior to running the 9 5/8" casing in the intermediate interval. The combination of the lubricious nature of the Formate fluid along with the addition of AvaGreenLube resulted in a 9 5/8" Casing run that was finished 22% ahead of planned time.

The reservoir interval flowed back without issue, indicating minimal deposition of fines or filter cake.

The biodegradation of cuttings from this well was also noted, with the Formate cuttings being able to compost months more quickly than comparable fluids due to the absence of Chloride ions which negatively impact cuttings composting operations.