



Kronos™ CW Non-Aqueous Flat Rheology Drilling Fluid Successfully Drills Challenging Carbonate Reservoir Sections, Offshore Middle East

Newpark's expertise and customized formulation of Kronos™ CW flat rheology drilling fluid allowed the operator to successfully drill challenging offshore well

CHALLENGE	SOLUTION	RESULT
<ul style="list-style-type: none"> Narrow margin drilling environment Extended 27-day logging program 	<ul style="list-style-type: none"> Kronos™ CW (Critical Wells) flat rheology non-aqueous drilling fluid 	<ul style="list-style-type: none"> Well was drilled and logged successfully without significant operational difficulty

OVERVIEW

Newpark Fluids Systems were invited by an operator in the Middle East to perform an offshore trial with its next generation Kronos™ CW (Critical Wells) flat rheology non-aqueous drilling fluid (NAF).

Kronos CW is a second generation system with specific applications in high overbalance, narrow margin well design. Flat rheology is the term used to describe NAF behavior that is nearly constant, independent of temperature and pressure effects present in challenging drilling environments.

The constant rheology characteristics of the Kronos system are designed to address drilling issues (such as equivalent circulating density (ECD) management, downhole losses, hole cleaning, sag mitigation) through optimal control of fluid rheological properties in complex, narrow margin environments.

Over the course of the whole trial, the fluid's properties were recorded across various temperatures and benchmarked to client's KPI's to understand behavior at different sections of the well.

CHALLENGE

Kronos CW also needed to be configured both as a standard drilling fluid as well as a reservoir drill-in fluid (RDF) without any significant product addition. Previous generations of NAF have been further developed to meet these types of new challenges.

An extended 27-day logging and formation evaluation program was undertaken at the end of the drilling activity, which required the Kronos CW drilling fluid system to remain stable, without any detrimental settling of the entrained solids.

SOLUTION

Newpark developed the next generation Kronos CW flat rheology non-aqueous drilling fluid to meet rigorous performance parameters and maintain well control in a variety of challenging drilling conditions, at different temperatures ranging from 60 - 400°F (15 - 205°C) downhole. The customizable fluid system has a rheological profile that translates to a reduction in surge pressures, ECD, downhole losses and barite sag, while also improving hole cleaning efficiency when drilling at high rates of penetration (ROP).

Case History



Kronos CW has been developed for well profiles with narrow ECD windows that were previously considered too challenging to drill. Additionally, the potential for fluids-related non-productive time (NPT) had to be mitigated, such as from fluid reconditioning, differentially stuck pipe, pressure-induced losses due to excessive ECD, or formation breakdown due to excess surge pressures.

Kronos CW is also tolerant of different weight material types, allowing it be configured as an RDF.

To demonstrate the capability of the fluid, the development team designed formulations to simulate a wide range of wellbore temperatures, oil-water ratios, and fluid densities. Successful formulations were tested at densities of 11.4 - 19.3 lbm/gal (1.36 - 2.3 SG) and at temperatures up to 350°F (177°C). Testing was undertaken to determine the fluid system's response to numerous contaminants that could be encountered during all drilling operations as well as those specific to offshore drilling within the region.

To display and evaluate the consistent rheological behavior of the fluid, select measurements are taken at a series of temperatures and pressures when available to observe the fluid's condition. From these measurements, a set of flat rheology criteria are established:

Less than 30% deviation of low-shear yield point (LSYP), yield point (YP), and gel strengths at lowest temperature and highest temperature: 60°F (16°C) and 150°F (66°C)

- 10 min gel < 1.7 times 10-second gel
- 30 min gel < 1.3 times 10-minute gel
- PV at 60°F < 2.5 times PV at 150°F

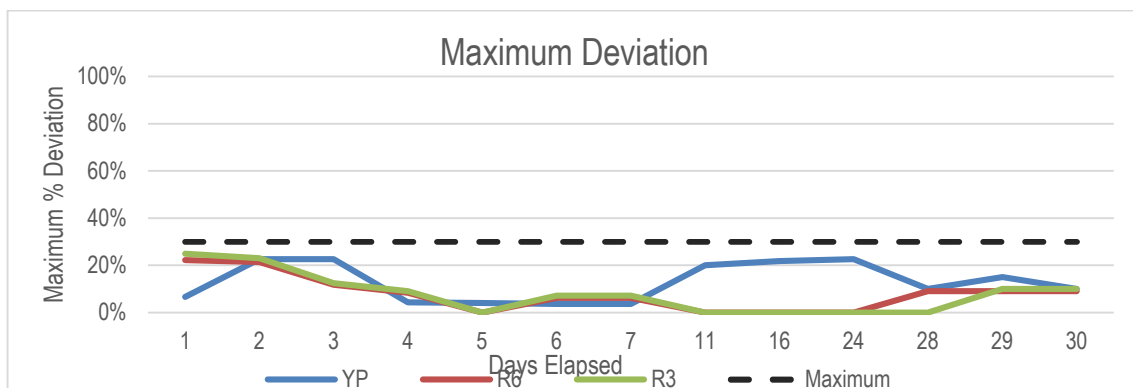


Figure 1. Maximum deviation of selected rheological properties from 60F to 150F

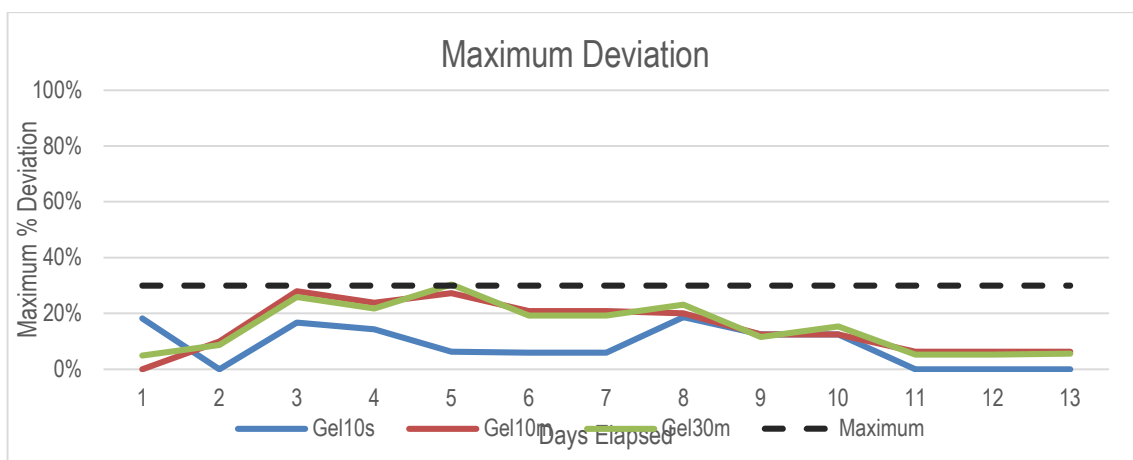


Figure 2. Maximum deviation of gel strengths from 60°F to 150°F



RESULTS

The Kronos drilling fluid system proved to be the optimal choice for its outstanding performance - with ECD management, mitigating downhole losses, ensuring excellent hole cleaning and mitigating sag - in complex, narrow margin environments.

The interval was drilled and logged successfully without significant operational difficulty, including all formulation evaluation targets, proving a stable fluid with good filter cake quality.

Flawless operational execution ensured that 100% of drilling KPIs were achieved and the Kronos CW drilling fluid system achieved all performance targets

The drilling fluid properties remained stable during the extended 27-day logging operations performed after drilling operations had been completed, exhibiting a stable fluid system, with no barite sag recorded.