

Saudi Arabia: FORMIX RDF extended to 340° F with PTS 200 to successfully drill HT wells

“The FORMIX* Dual formate RDF formulated with PTS-200* thermal extender exceeded customer expectations, allowing the operator to drill, log, and complete two HT wells trouble free.”

Scott Etheridge, M-I SWACO Project Engineer

Well Information

Location	Onshore Saudi Arabia, Shedgum Field
Well Type	Directional 75°-85°
Interval drilled- Well 1.....	1,875 ft (572 m) 5 7/8 in hole 15,063 ft to 16,938 ft (4591-5163 m)
Interval drilled- Well 2.....	1,260 ft (384 m) 5 7/8 in hole from 15,248 ft to 16,508 ft (4648 – 5032 m)
Maximum expected temperature.....	340° F (171° C)
Density required.....	1.38 – 1.41 s.g. (11.5 ppg to 11.8 ppg)

The Situation

The customer wanted to test a temperature stabilizer to extend the temperature limitations of its non-damaging water based reservoir drill-in fluid (RDIF) systems in an environment with high thermal gradients. Two candidate wells were identified for field trials. The expected bottom hole temperatures were between 315° F (157° C) and 340° F (171° C). The operator required an alternative to the current formulation which relied on Polyanionic Cellulose (PAC) to control HTHP above 300° F (149° C).

The operator requested M-I SWACO to formulate and confirm an RDIF thermally stable to 340° F (171° C) to drill the Pre-Khuff Sandstone Reservoir in Saudi Arabia. The high angle lateral would be completed with an open hole screen completion. At TD, multiple logging runs were planned. After logging, the fluid would have to be cleaned to acceptable solids content before running screens.

The Solution

Lab testing confirmed PTS-200 temperature stabilizer significantly reduced the degradation of polymers and fluid loss additives currently utilized in RDIF formulations. M-I SWACO recommended a Mixed Sodium-Potassium Formate RDF formulation or FORMIX utilizing PTS-200 to extend the thermal temperature limitations of standard system components, FloTROL* ARAMCO premium starch Derivative and XC Polymer. The initial treatment of 2 lb/bbl PTS-200 with supplemental treatments of 0.5 lb/bbl before trips was determined to be sufficient in providing an overall stable rheology. Bottoms up samples would be tested for HTHP fluid loss at BHT of 325° F (163° C) and 340° F (171° C), respectively.

The Results

Well 1 – 5 7/8 in. hole drilled from 15,063 to 16,938 ft with dual sodium/potassium formate fluid.

- Increased density from 86 to 88 pcf (11.5 to 11.8 ppg) with no problems while drilling ahead to TD.
- No PAC was required during the interval. Fluid testing on B/U samples after trips showed no thermal degradation of the fluid.
- The average concentration of PTS-200 was 2.4 lb/bbl. The FLO-TROL ARAMCO concentration was maintained at 5.4 lb/bbl for the well. Offset wells in the area showed much higher average concentrations of XC Polymer and Premium Starch (8-12 lb/bbl) without the PTS-200 temperature extender.
- The HTHP values averaged half of what the operator was expecting.
- No hole instability or differential sticking tendencies were observed during the drilling, logging, or completion of this interval.

Well 2 – 5 7/8 in. hole drilled from 15,248 to 16,508 ft with dual formate fluid recycled from Well 1.

- The MW was maintained 87 pcf and the fluid remained stable for the entire interval.
- No PAC was used in this interval. HTHP was measured on B/U samples at 340° F (171° C). No thermal degradation was observed.
- HTHP averaged 7.5 mls for the interval, with a minimum reading of 5.8 mls @ 340° F (171° C). This represents two to three times lower values than the average HTHP readings taken between 280° F and 300° F (138-149° C) from offsets.

For both trials, the customer's field representatives and technical laboratory verified the mud parameters and fluid checks.

The Detail

Summary Table	API FL (mls)	HTHP FL @ BHT (mls)	PTS-200 Conc. (lb/bbl)	FLO-TROL Conc. (lb/bbl)
PLAN	< 4	< 15	2 - 4	6 - 8
WELL 1 – BHT 325° F	1.0	8.7	2.4	6.0
WELL 2 – BHT 340° F	1.0	7.5	2.1	5.5

Questions? We'll be glad to answer them.

If you'd like to know more about the PTS-200 product and how it's performing for our other customers, please call the M-I SWACO office nearest you.



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P.O. Box 42842
Houston, Texas 77242-2842
www.miswaco.slb.com
Email: questions@miswaco.slb.com