

Wellbore stability is the main issue for most of drilling area. There are many types of formation has high risk for stability. Salt formation can be the most dangerous one. An oil base drilling fluid systems is usually the only option for salt drilling, because of its stability and minimum reaction with salt. On the other hand, due to high cost, the oil based systems can not be an option. A water based super saturated salt saturated polymer drilling fluid provided stability and performance in a very challenging environment. The case has a high core recovery record among the area.

Situation:

The case is to achieve maximum core recovery in salt formation, which is unstable due to differential stress.

Well Information:

Interval drilled: 12 ¼ in hole for 651 m
 ~380 m 8 ½ in coring in salt formation
 Total Well Depth 1,550 m

Challenges and Problems:

- Anhydrate contamination above salt formation
- Active clay above salt formation
- Wellbore instability above salt formation and in salt formation
- Stability in salt saturation, which can alter due to crystallization with the increase in bottom hole temp.
- Hole geometry in salt formation
- Coring operation; highest recovery target.

Challenges and Solutions:

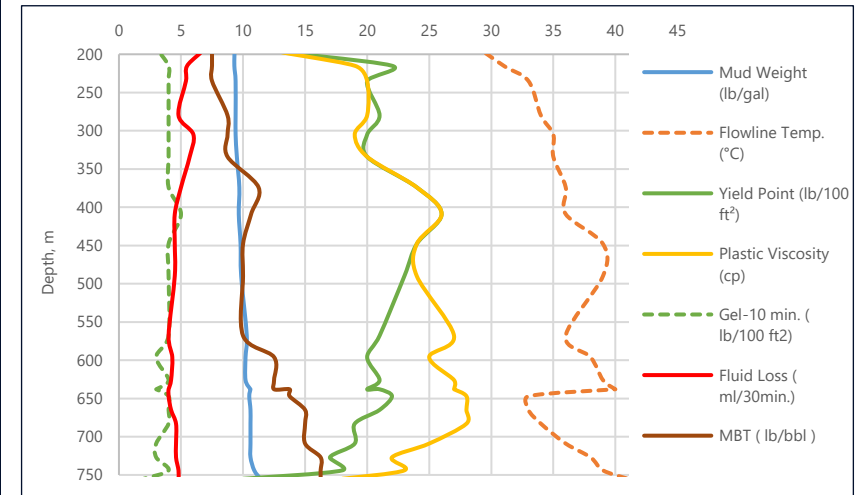
When it was necessary mud weight was increased to sustain wellbore stability. At 12 ¼ in section MW was increased up to 11.40 ppg due to drilling and salt addition to saturate mud. So that, wellbore was kept stable and with a minor contamination from anhydrate formation. Controlled API fluid loss under 5.0 cc/30 min during section. KCl, the main inhibition provider with the help of REOPAC LV, resulted to in gauge hole and minimum tipping problem. And no issue was observed due to the active clays. Started 8 ½ in section at 11.40 ppg MW and it was up to 12.50 ppg due to drilling and barite addition to mud. Controlled API fluid loss under 5.0 cc/30 min during section.

Slat formation erosion due to salt solubility in water-base mud. To minimize salt formation solution in drilling fluids, chloride content of the fluid was monitored and controlled at high temperatures.

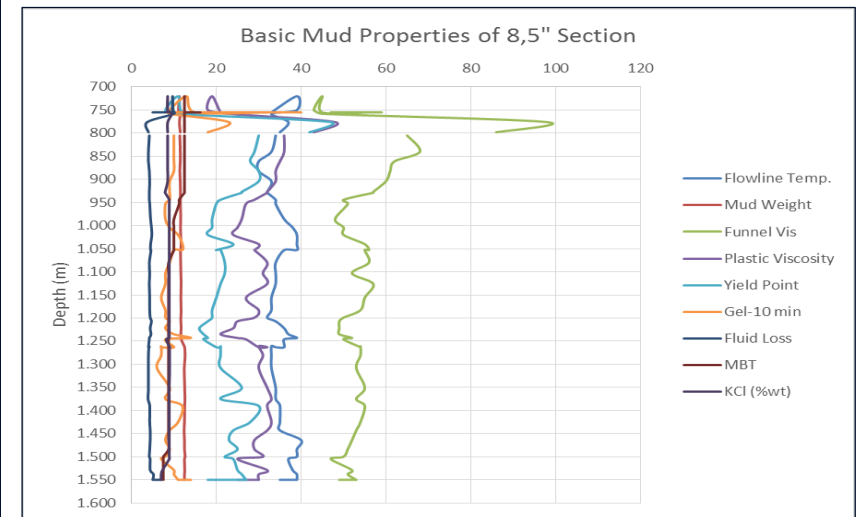
Results:

The system was pre-treated for clay inhibition and anhydrate contamination. Due to its low MBT values, anhydrate generated minimum problem. Ionic inhibition and encapsulation was enough to protect mud from clay and to protect formation from water phase of the mud. The system has been shown to control stability in clay, anhydrate and salt formations. No NPT was reported and the well drilled before planned The system have successfully contributed to the coring project, with nearly 99.9% core recovery and a trouble free hole.

12 ¼ in. section drilling with KCl & NaCl Saturated Polymer System



8 ½ in. section drilling with NaCl Saturated Polymer System





About SALT DRILL:

- An inhibitive anionic water based polymer fluid, which uses potassium chloride to provide high levels of shale control.
- Minimizing hole washouts, and maintain a good gauge hole with excellent wellbore stability
- Utiliz-ing the polymer encapsulation mechanism of shale inhibition
- The formulated system will exhibit good lubricity, and a low fluid loss with a thin filter cake.

General formulization of SALT DRILL used in the application is shown below.

Additive Name	Description	Function	Concentration (ppb)
KCl	Potassium Chloride	Shale Inhibition	25.6-33.3
NaCl	Sodium Chloride	Shale Inhibition, Weighting Agent	83.3
REOPAC LV	LV Polyanionic Cellulose	Filtration Reducer	1-3
AMYLOTROL	Modified Starch	Filtration Reducer	2-4
REOZAN D	Xanthan-Gum	Viscosifer	0.5-1.5
GEOCIDE T	Bactericide	Bactericide	%0.2
GEOCARB F	Calcium Carbonate	LCM, Weighting Agent	25
CAUSTIC SODA	Sodium Hydroxide	pH Control	0.25*
SODA ASH	Sodium Carbonate	Hardness Control	0.25*

* As needed