
World Oil® HPHT
DRILLING, COMPLETIONS & PRODUCTION CONFERENCE
October 30–31, 2018
Norris Conference Centers – CityCentre, Houston, Texas
HPHTConference.com

Novel Synthetic Polymer based High temperature Drilling Fluid

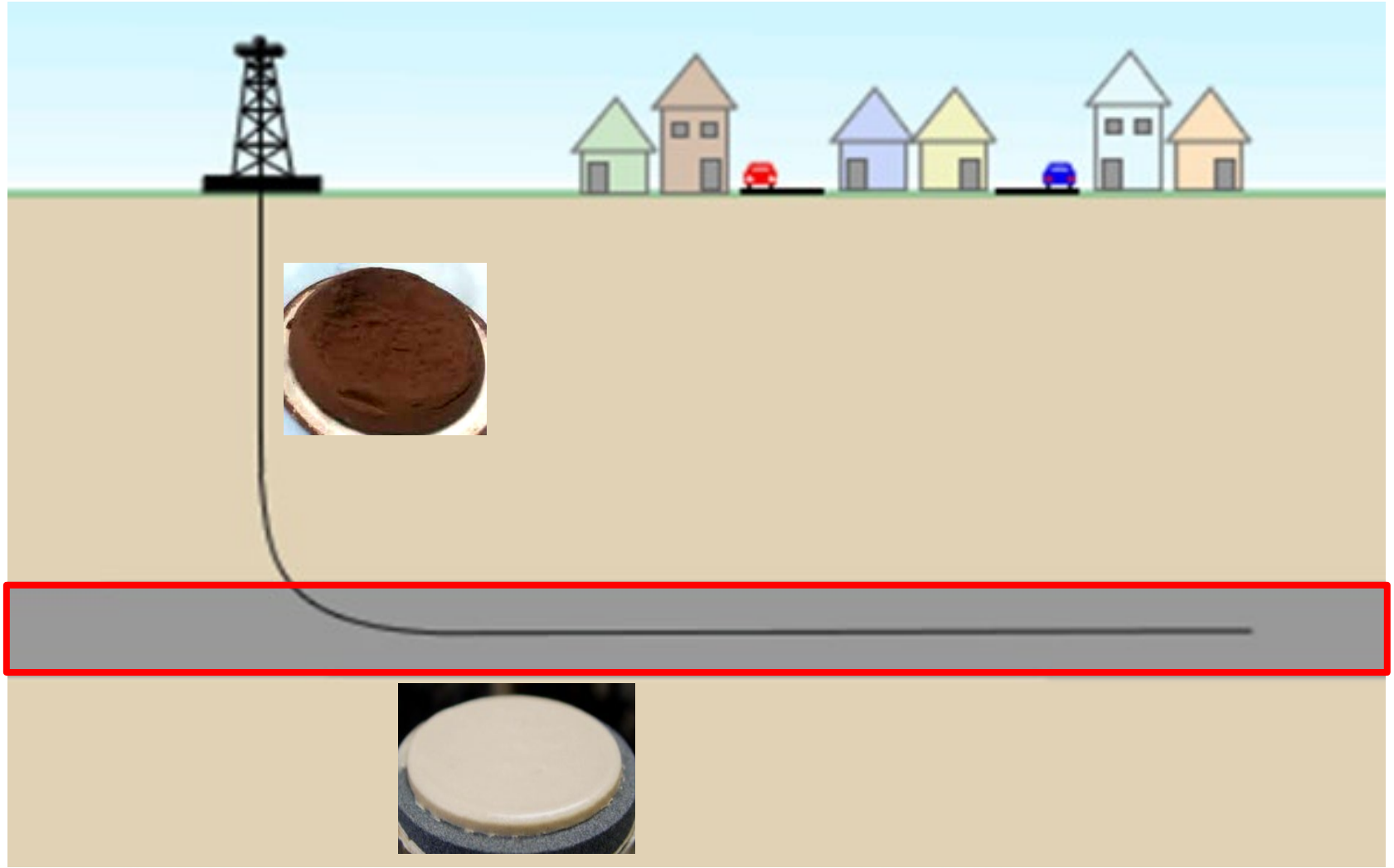
Balakrishnan P.

Project Manager

MI SWACO, A Schlumberger Company

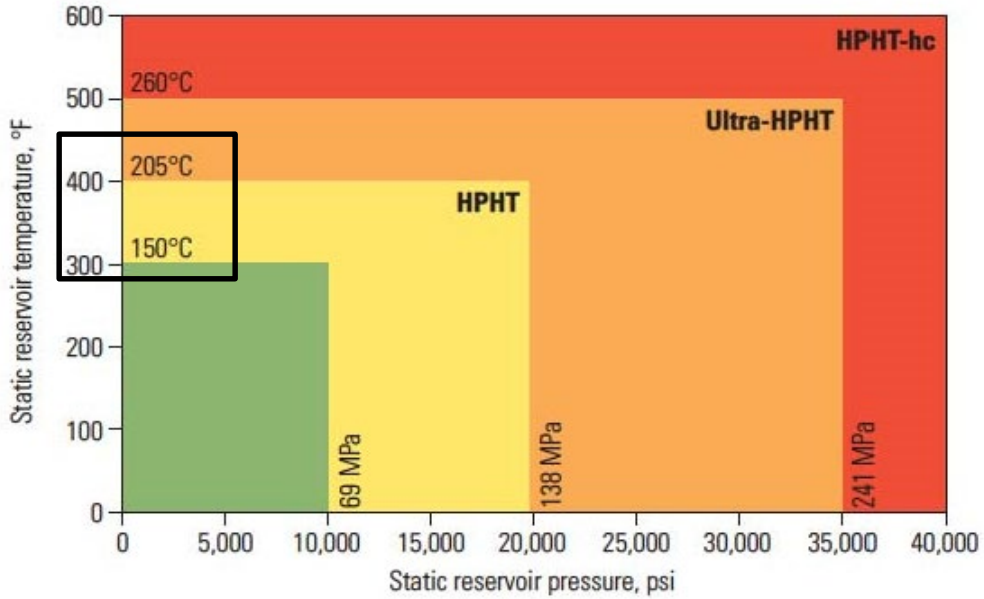
Schlumberger-Private

Drilling Fluid - Introduction



World Oil® HPHT
DRILLING, COMPLETIONS & PRODUCTION CONFERENCE

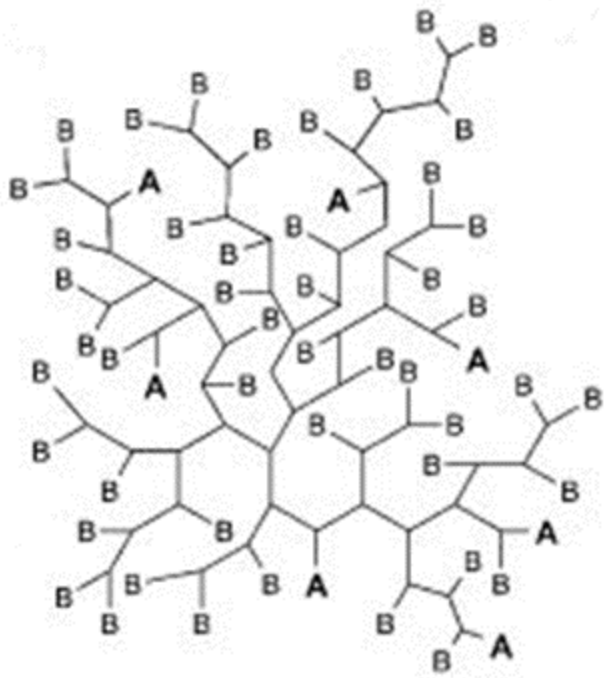
Drilling Fluid @ HT



Unstable vs Stable Fluid

Bad Fluid Loss vs Good Fluid Loss

HBSP based Drilling Fluid



Highly branched synthetic polymer (HBSP)

RDF Component	Function
Base Brine	Density
HBSP	Viscosifier / Fluid-loss control additives
pH Buffer	Maintain pH
Calcium Carbonate	Bridging

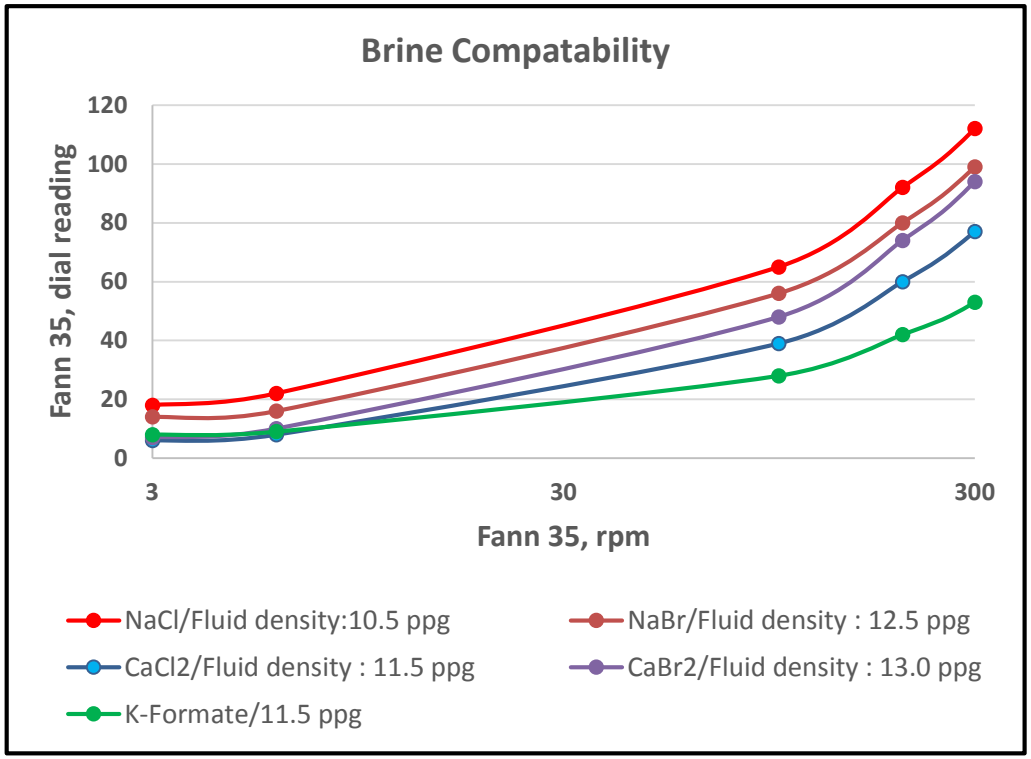
Evaluation:

- Brine Compatibility
- Stability
- Fluid Loss
- Stress Testing
- Breaker/Corrosion tests

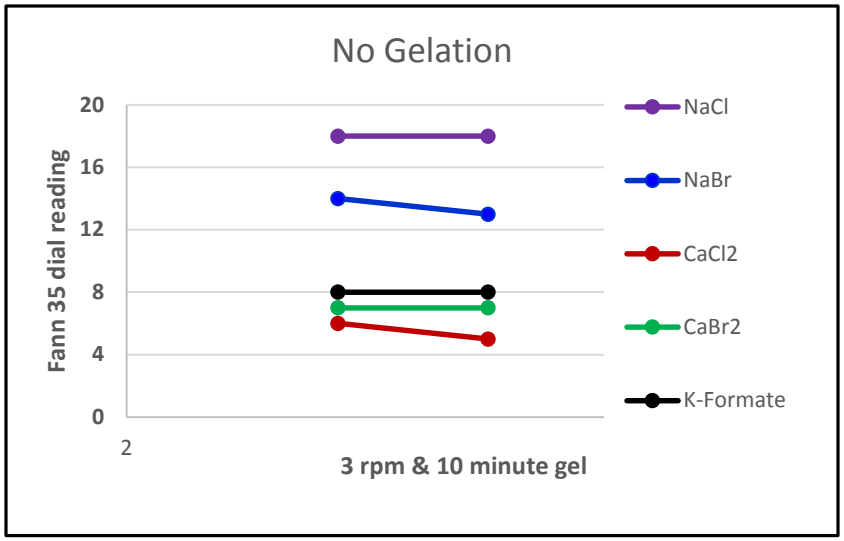
World Oil® HPHT
DRILLING, COMPLETIONS & PRODUCTION CONFERENCE

Brine Compatibility

HBSP is compatible with most of the conventional completion brine.

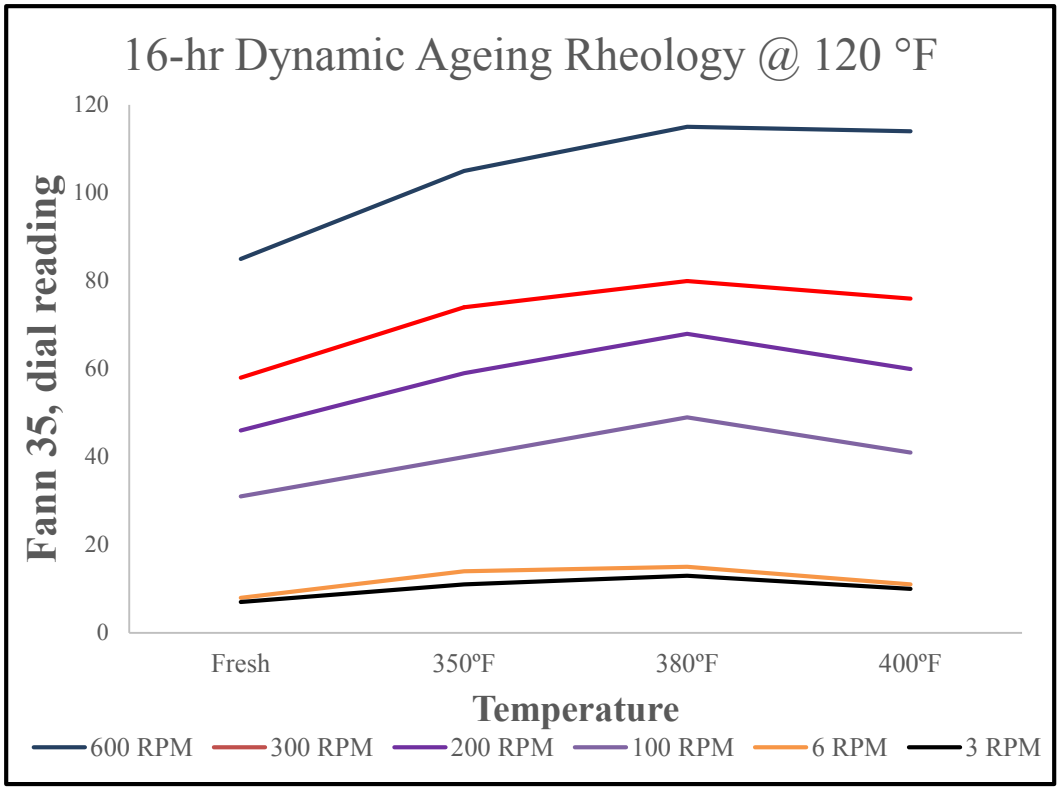


Generally high temperature water based mud has high gelation tendency but HBSP based system has no gelation potential.

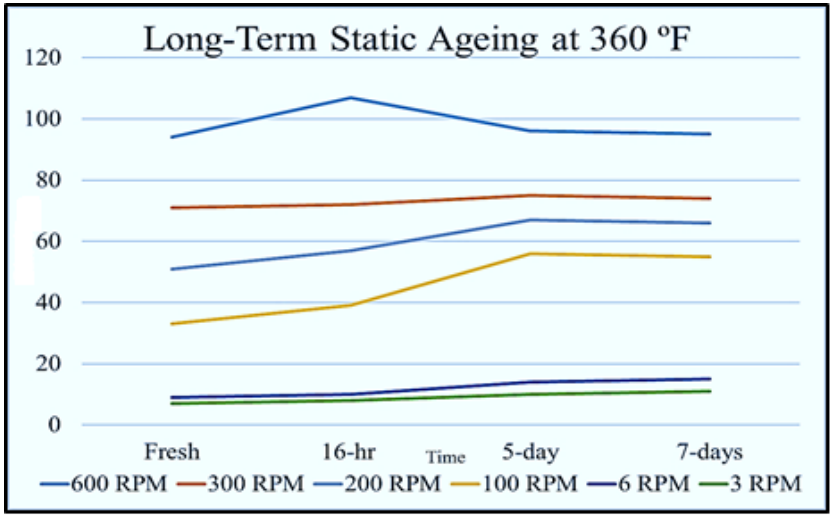


HPHT Stability

Excellent stability at HPHT conditions;
the system was tested up to 400 °F

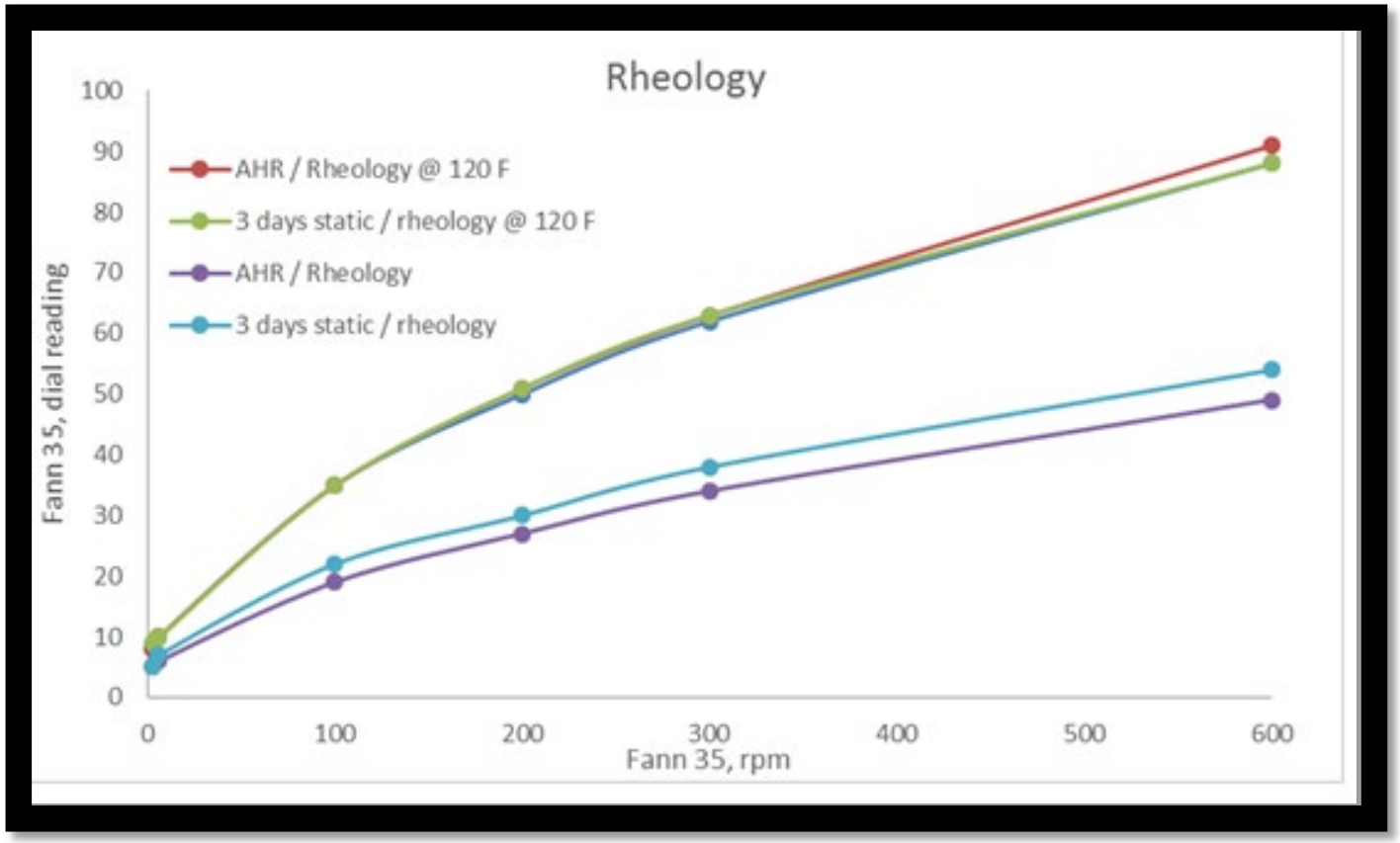


The system was tested for long term stability (7 days) for logging application, long interval drilling, screen running fluid, etc.



HPHT Stability

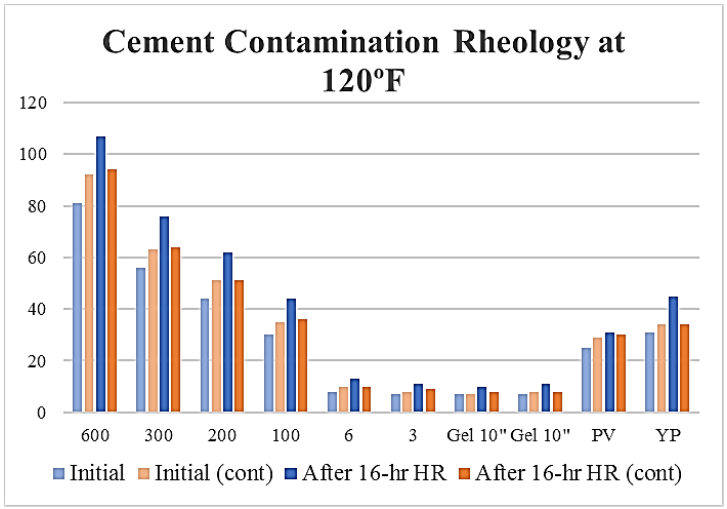
Density : 12 ppg; Temperature : 360 °F



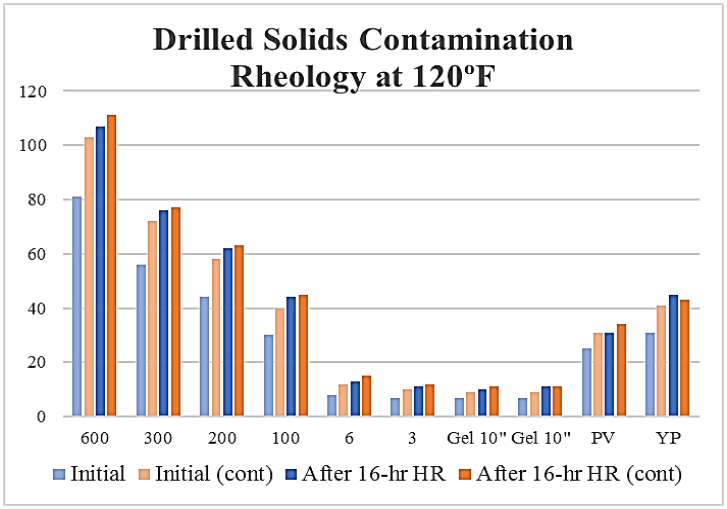
The system has excellent low end rheology at temperature.

World Oil® HPHT
DRILLING, COMPLETIONS & PRODUCTION CONFERENCE

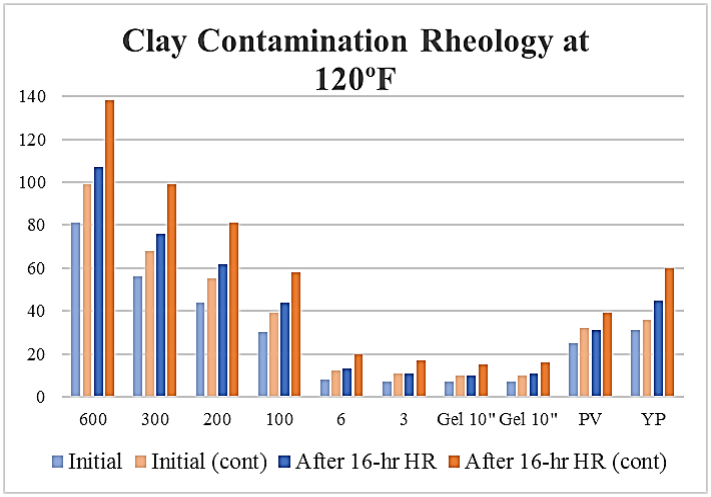
Contamination / Stress Test



10 lb/bbl Cement Class H contamination



4% Drilled solids contamination

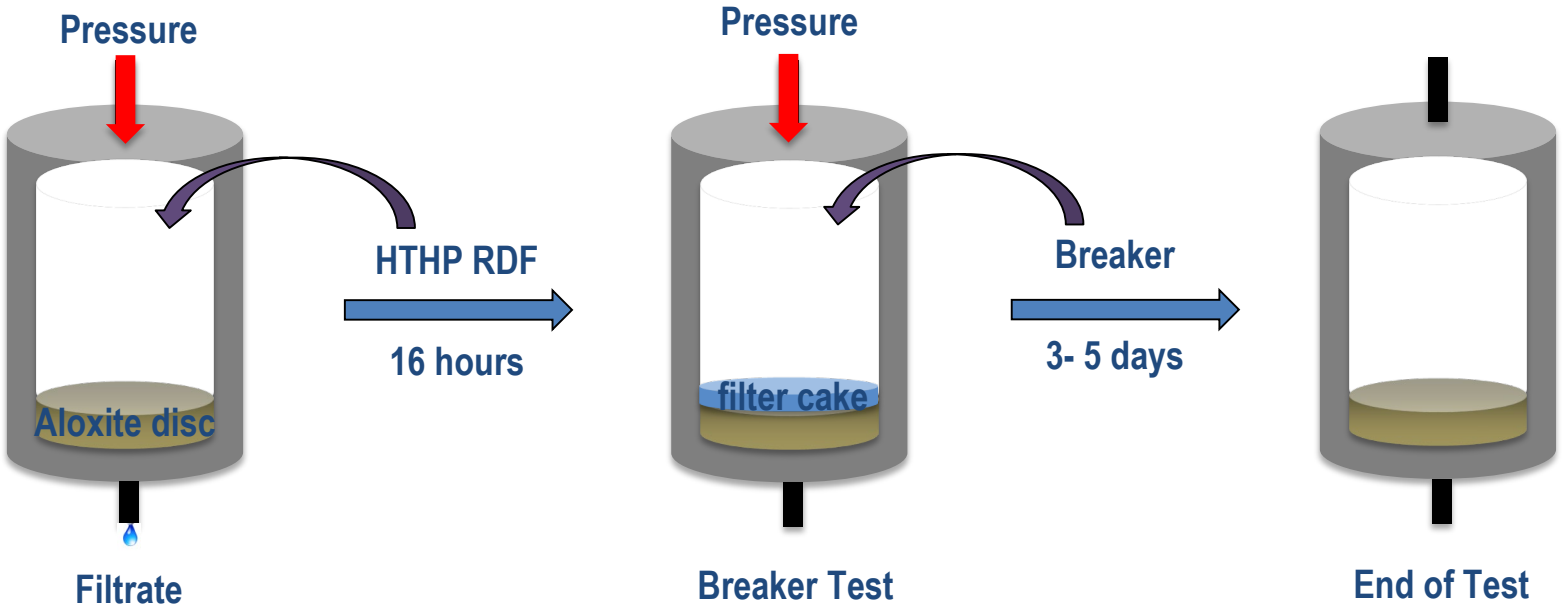


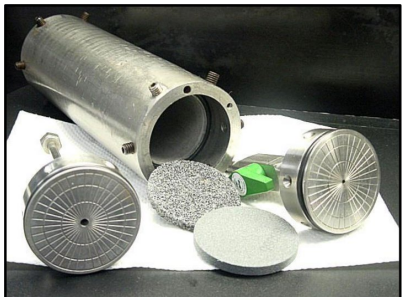
5 lb. /bbl. Highly Reactive clay

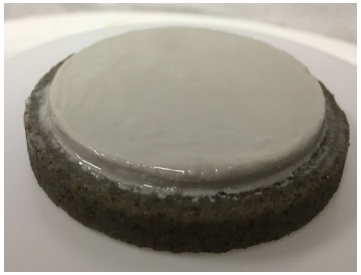
HBSP based system can tolerate drill solids, sea water, cement, CO_2 contaminations. Reactive clay increase the rheology but shale inhibitor/rheology thinner stabilize the rheology

Schlumberger-Private

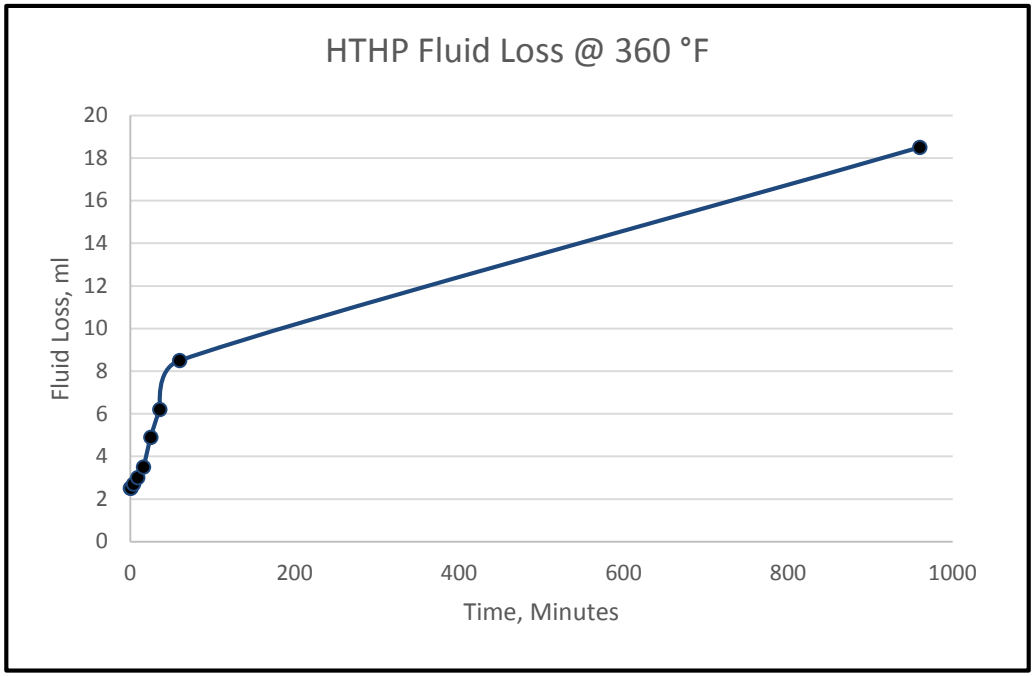
Filter Cake Formation and Breaker Treatment



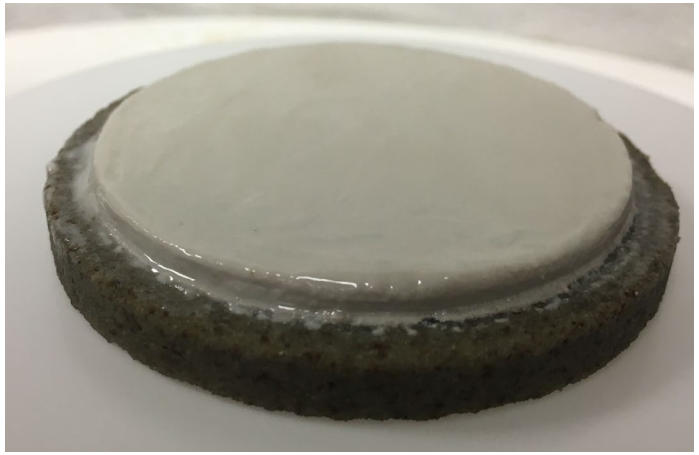




HPHT Fluid-Loss Control



HPHT Fluid-loss at 360 F and 500 psi

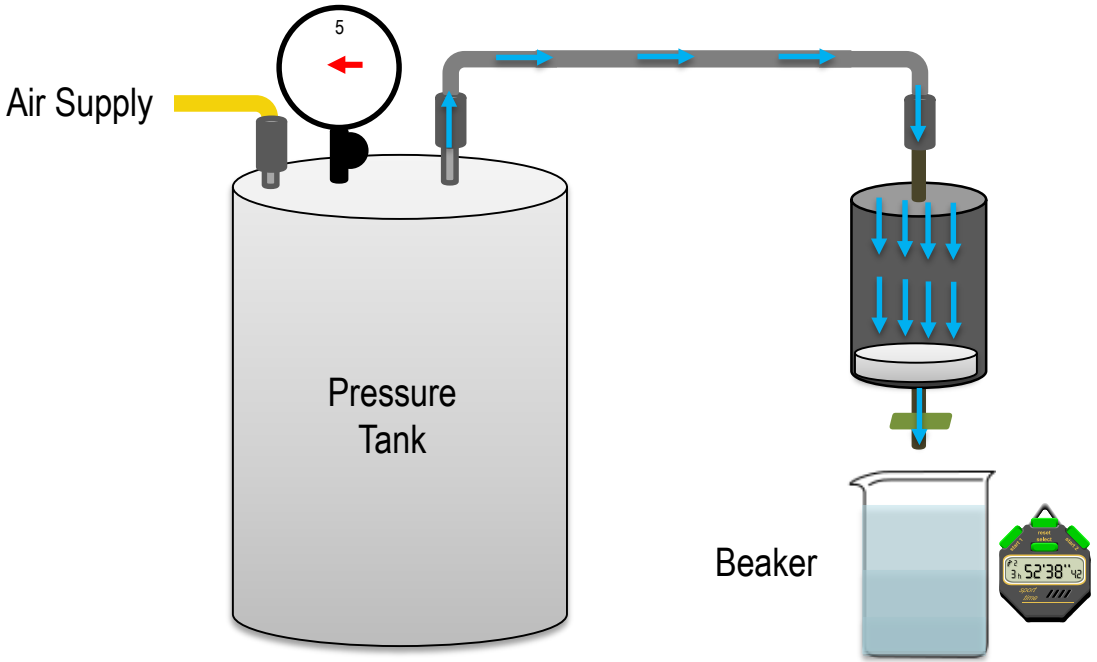


16-hour Filter cake

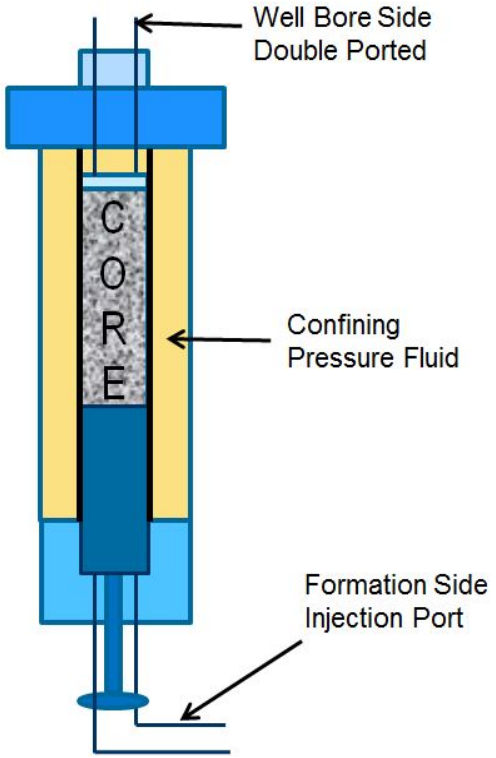
Schlumberger-Private

Study the Breaker Efficiency

1. Flowback



2. Return Perm



Schlumberger-Private

Breaker

Breaker Components

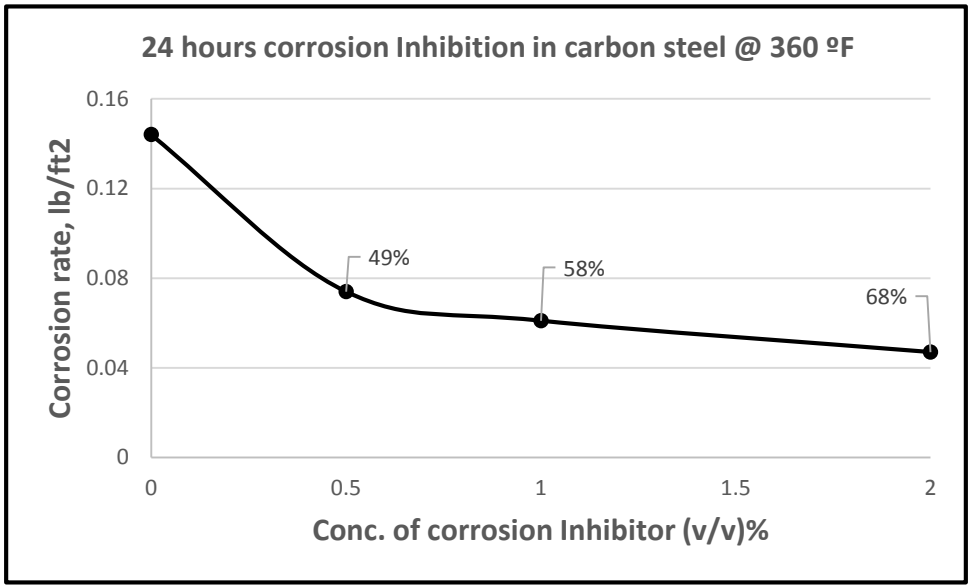
- Base brine for density
- Chelants/Acid for carbonate removal
- Acid Precursor for HBSP based filter cake dispersant
- Oxidizers to break the backbone of the HBSP

Breaker Results

- Flow back is greater than 70%
- Return permeability is greater than 70% with solid laden system w/o breaker
- Return permeability is greater than 80% with solid laden system with breaker

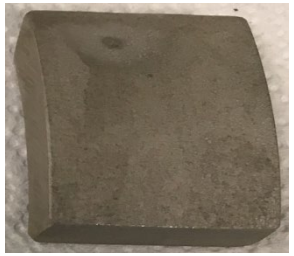
Schlumberger-Private

Breaker Corrosion



HT Corrosion Inhibitor reduce the acid corrosion significantly and also efficient for long duration.

Inhibited Breaker System Corrosion Rates (360 ºF); 1% CI			
Metallurgy	Exposure Time	Weight % Loss	Corrosion Type
Q125	60-day	8.9 %	General Corrosion
2535	60-day	0.7 %	General Corrosion



Schlumberger-Private

Field Trials

1. HT Coil Tubing Drilling Fluid in Indonesia – Temperature : 330 °F
2. HT drilling fluid in Australia – Temperature : 350 °F
3. HT drilling fluid in Abu Dhabi – Temperature : 380 °F

Conclusion

- New brine-based HPHT RDF is compatible with most of the oilfield brines
- Excellent long-term stability at high temperature conditions between 300 °F and 400 °F
- New system can be used to drill through cement and contamination with drilled solids is tolerated
- A breaker package is capable of removing the filtercake
- Corrosion inhibitor package decreases the corrosion potential of the breaker on the most common completion metallurgies
- Successfully drilled HT wells using the new system

Schlumberger-Private