



World Oil[®] HPHT
DRILLING, COMPLETIONS & PRODUCTION CONFERENCE

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HPHTConference.com

A Novel Cement Spacer System to Optimize Spacer Stability Performance in HTHP Wells

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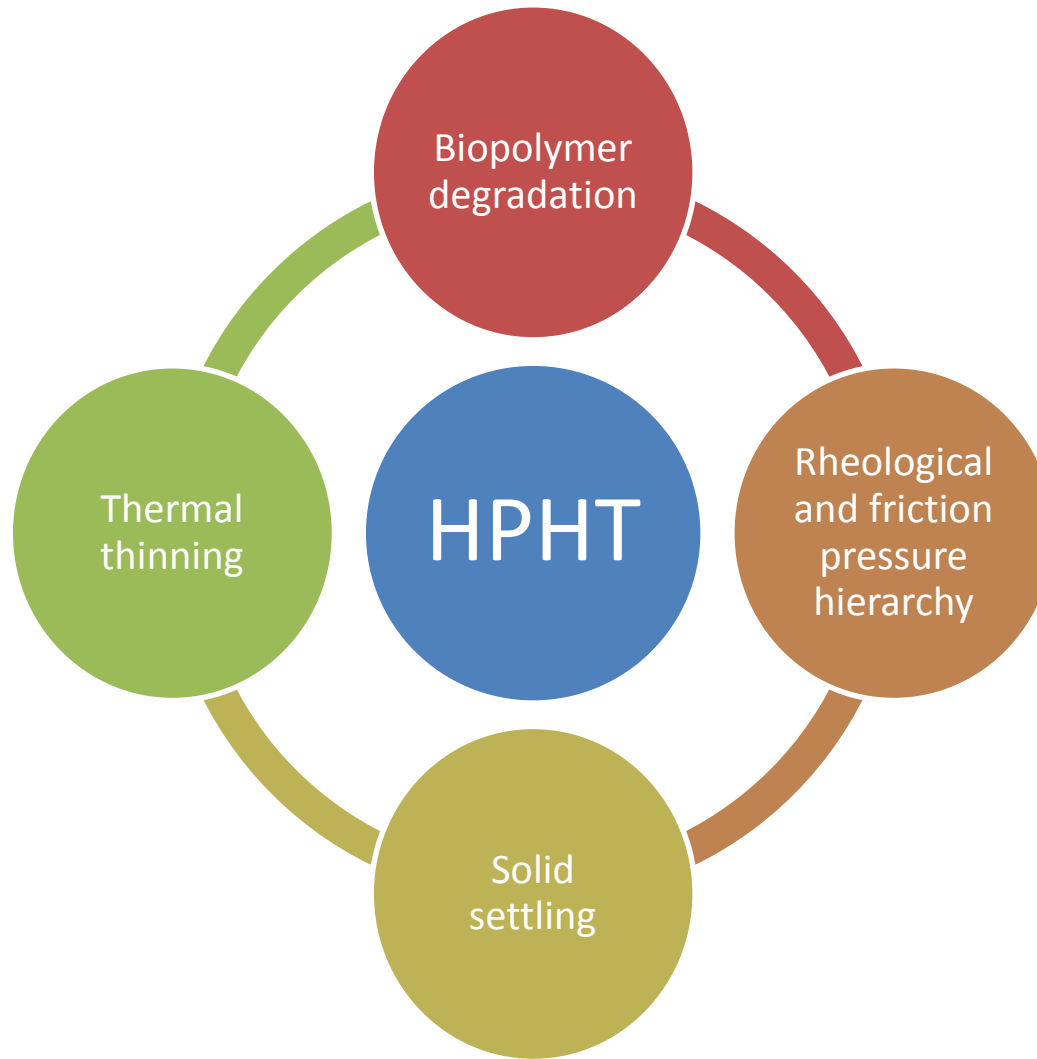
Baker Hughes, a GE company

Agenda

- Background
- Novel Cement Spacer System
 - Description
 - Application
 - Benefits
 - Laboratory results
- Conclusion

Cement Spacer System

- Pumped between drilling fluid and cement
 - Displacing the drilling fluid
 - Cleaning the pipe and wellbore
 - Improving cement bond
- Composition
 - Base fluid
 - Gelling agent
 - Weighting agent
 - Surfactant package



Novel Spacer System

Hierarchy

- Rheology
- Friction pressure gradient

Stability

- Static
- Dynamic

Efficiency

- Wettability
- Compatibility

Applications

- HPHT wells
- Vertical, highly deviated and horizontal wells
- Density range: 13 – 18 ppg
- Temperature range: 250 – 400 °F

Benefits

Performance at HPHT condition

- Superior
- Reliability

Viscosity

- Low at surface
- Maintain at BHCT

Solid settling

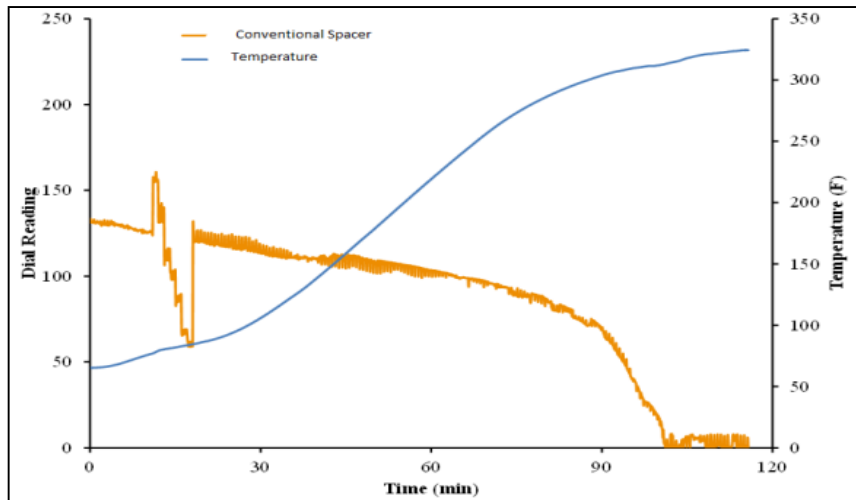
- Mitigated

Zonal isolation

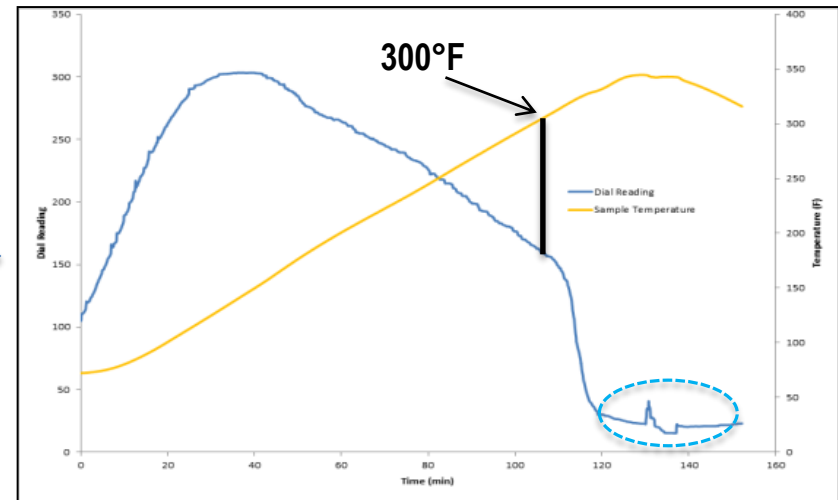
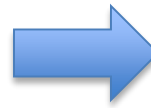
- Improved

Laboratory Testing

HPHT Rheology Tests



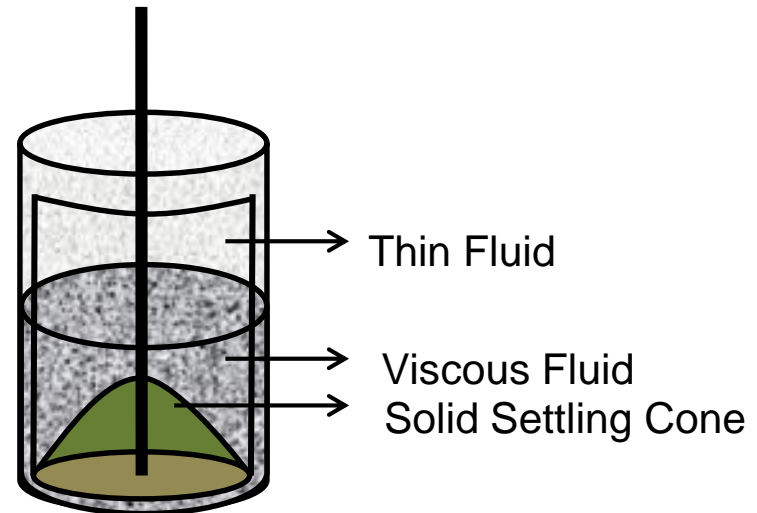
Conventional Spacer



Novel Spacer

Dynamic Settling Tests

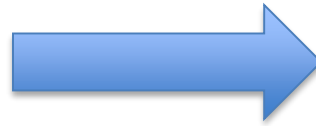
- The stability of cement spacer while pumping it downhole



Dynamic Settling Tests



Conventional Spacer



Novel Spacer

Rheology Tests

	300 RPM	200 RPM	100 RPM	60 RPM	30 RPM	6 RPM	3 RPM
Dial reading at ambient	199	151	98	71	50	23	16
Dial reading at 330 °F	57	43	27	19	14	10	10

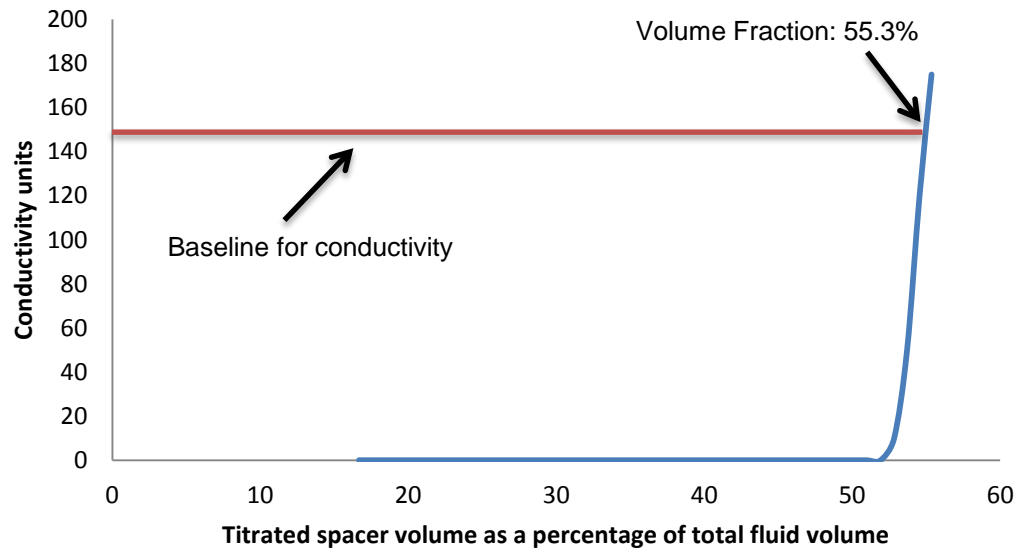


Grace M3600 Rheometer



Chandler 7600 Rheometer

Wettability Tests



After Wettability Test

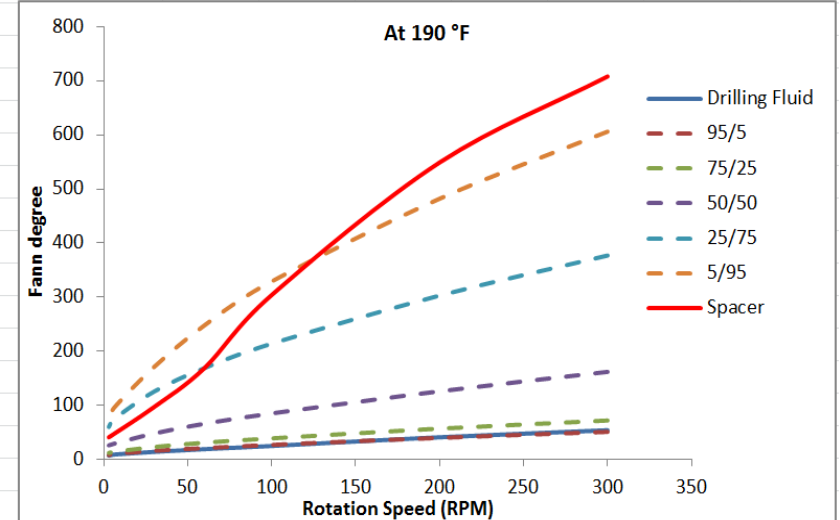
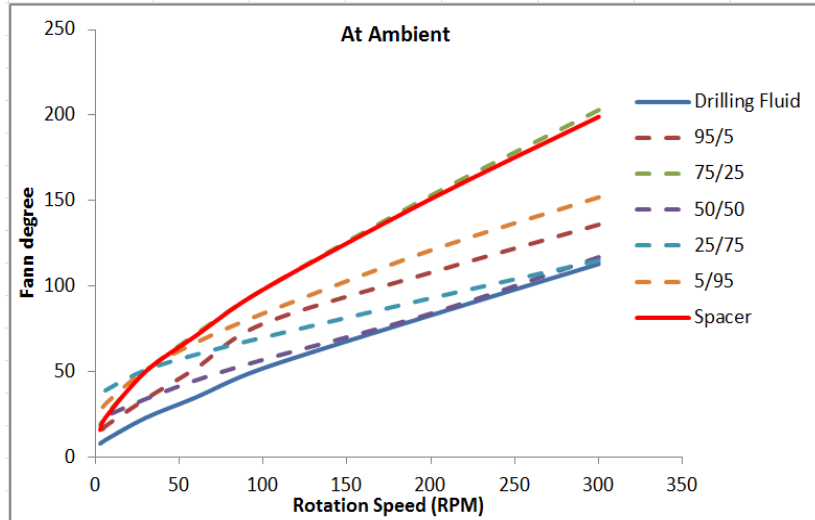


After Water Rinse



Compatibility Tests

RPM	300	200	100	60	30	6	3		RPM	300	200	100	60	30	6	3
Drilling Fluid	113	83	52	35	23	10	8		Drilling Fluid	54	41	25	19	14	9	7
95	136	108	78	52	34	18	14		95	51	40	27	21	16	10	8
75	203	153	98	72	50	24	19		75	72	57	39	31	23	14	12
50	117	84	57	45	34	24	23		50	162	126	85	66	48	29	26
25	115	93	70	60	51	39	36		25	377	303	214	169	126	74	60
5	152	121	84	67	51	31	26		5	606	482	329	248	171	95	74
Spacer	199	151	98	71	50	23	16		Spacer	708	549	304	169	97	47	41



Conclusion

- A novel cement spacer has been developed demonstrating
 - Good rheological profile
 - Thermal stability at HPHT conditions
 - Good compatibility with various drilling fluids and cement
- This system has been utilized on several field jobs with much success

Acknowledgements

Questions

