

HALLIBURTON

iCem[®] Service

PDC ENERGY - EBUS

Date: Monday, March 11, 2019

Challenger 5N Production

Job Date: Tuesday, February 26, 2019

Sincerely,
Bryce Hinsch

Legal Notice

Disclaimer:

All information in this report is provided subject to the terms and conditions which govern the services provided by Halliburton. Halliburton personnel use their best efforts in gathering information and their best judgment in interpreting it, but any interpretation, research, analysis or recommendation furnished by Halliburton are opinions based upon inferences from measurements and empirical relationships and assumptions, which inferences and empirical relationships and assumptions are not infallible, and with respect to which professionals in the industry may differ. iCem 3D Displacement results are used to understand how fluids intermix during a cement job. Simulation and 3D displacement results are not intended as and should not be used as a replacement for bond logs in determining top of cement. Current 3D model calculations are known to model more volume than the input volume for standard cases due to known calculation improvements required. For rotational cases, the modeled volume will be impacted by the same calculations impacting the standard cases, as well as additional constraints imposed to make the calculation time required operationally feasible. Therefore, until further notice, 3D displacement results should not be used for replacement of a bond log, or used as an identifier of top of cement. HALLIBURTON IS UNABLE TO GUARANTEE THE ACCURACY OF ANY CHART INTERPRETATION, RESEARCH ANALYSIS, OR JOB RECOMMENDATION and any interpretation or recommendation is not for use of or reliance upon by any third party. The customer has full responsibility for any of its decisions which are based on the information provided in this report.

Table of Contents

1.0	Cementing Job Summary	4
1.1	Executive Summary	4
2.0	Real-Time Job Summary	9
2.1	Job Event Log	9
3.0	Attachments.....	12
3.1	PDC Energy Challenger 5N Production Chart	12

1.0 Cementing Job Summary

1.1 Executive Summary

Halliburton appreciates the opportunity to perform the cementing services on the **Challenger 5N** cement **production** casing job. A pre-job safety meeting was held before the job where details of the job were discussed, potential safety hazards were reviewed, and environmental compliance procedures were outlined.

Approximately 52 bbls of spacer were returned to surface.

Halliburton maintains a continuous quality improvement process and appreciates any comments or suggestions that you may have. Halliburton again thanks you for the opportunity to perform service work on this well. We hope to be your solutions provider for future projects.

Respectfully,

Halliburton Fort Lupton

The Road to Excellence Starts with Safety

Sold To #: 304535	Ship To #: 3839640	Quote #:	Sales Order #: 0905508049
Customer: PDC ENERGY-EBUS		Customer Rep:	
Well Name: CHALLENGER		Well #: 5N	API/UWI #: 05-123-45895-00
Field: WATTENBERG	City (SAP): KERSEY	County/Parish: WELD	State: COLORADO
Legal Description: SE NW-8-4N-64W-1388FNL-2431FWL			
Contractor: ENSIGN DRLG		Rig/Platform Name/Num: ENSIGN 152	
Job BOM: 7523 7523			
Well Type: HORIZONTAL OIL			
Sales Person: HALAMERICA\HX38199		Srvc Supervisor: Nikolaus Kornafel	

Job

Formation Name			
Formation Depth (MD)	Top		Bottom
Form Type	BHST		
Job depth MD	14060ft	Job Depth TVD	
Water Depth	Wk Ht Above Floor		
Perforation Depth (MD)	From		To

Well Data

Description	New / Used	Size in	ID in	Weight lbm/ft	Thread	Grade	Top MD ft	Bottom MD ft	Top TVD ft	Bottom TVD ft
Casing		9.625	8.921	36			0	1675		0
Casing		5.5	4.778	20			0	14060		0
Open Hole Section			8.5				2100	6340	0	0
Open Hole Section			8.5				6340	14060	0	0

Tools and Accessories

Type	Size in	Qty	Make	Depth ft	Type	Size in	Qty	Make
Guide Shoe	5.5			14060	Top Plug	5.5	1	WTHRFRD
Float Shoe	5.5				Bottom Plug	5.5	1	WTHRFRD
Float Collar	5.5				SSR plug set	5.5		
Insert Float	5.5				Plug Container	5.5	1	HOWCO
Stage Tool	5.5				Centralizers	5.5		

Fluid Data

Stage/Plug #: 1									
Fluid #	Stage Type	Fluid Name	Qty	Qty UoM	Mixing Density lbm/gal	Yield ft3/sack	Mix Fluid Gal	Rate bbl/min	Total Mix Fluid Gal
1	12.5 lb/gal Tuned Spacer III	Tuned Spacer III	60	bbl	12.5	2.74			

Fluid #	Stage Type	Fluid Name	Qty	Qty UoM	Mixing Density lbm/gal	Yield ft3/sack	Mix Fluid Gal	Rate bbl/min	Total Mix Fluid Gal	
2	Gasstop B1	GASSTOP (TM) SYSTEM	625	sack	13.2	1.55		6	7.61	
3	ElastiCem	ELASTICEM (TM) SYSTEM	1040	sack	14.4	1.7		8	7.3	
4	MMCR Displacement	MMCR Displacement	30	bbl	8.34					
0.50 gal/bbl		MICRO MATRIX CEMENT RETARDER, 5 GAL PAIL (100003781)								
5	Displacement fluid		256.3	bbl	8.34					
Cement Left In Pipe		Amount	45 ft		Reason			Shoe Joint		
Mix Water:		pH 7	Mix Water Chloride:		0 ppm		Mix Water Temperature:			65 °F
Cement Temperature:			Plug Displaced by:		FRESH WATER		Disp. Temperature:			
Plug Bumped?		Yes	Bump Pressure:		2600 psi		Floats Held?			Yes
Cement Returns:		0	Returns Density:				Returns Temperature:			
<p>Comment Released pressure to check floats and got 2.0 barrels back to the truck</p> <p>Got 52 bbls of spacer and 0 barrels of cement back to surface. Estimated top of GasStop Latex Cement was about 2100-2200 feet. Estimated top of ElastiCem Tail cement was about 6300-6400 feet.</p>										

2.0 Real-Time Job Summary

2.1 Job Event Log

Type	Seq. No.	Activity	Graph Label	Date	Time	Source	DS Pump Press <i>(psi)</i>	DH Density <i>(ppg)</i>	Comb Pump Rate <i>(bbl/min)</i>	Pump Stg Tot <i>(bbl)</i>	Comments
Event	1	Event	Callout	2/25/2019	10:00:00	USER					O/L time 16:30. verify equipment and materials before leaving the yard
Event	2	Safety Meeting	Safety Meeting	2/25/2019	14:00:00	USER					Pre-trip safety meeting and then depart in route to location. Journey called in and approved.
Event	3	Safety Meeting	Location Safety Meeting	2/25/2019	15:30:00	USER					Assesment of location, and pre rig up risks and hazards.
Event	4	Event	Meet with customer representative	2/25/2019	16:30:00	USER					TD 14105' OH 8.5" TP 14060' WSS 14071' TVD 6827' PREVIOUS CASING 9.625" 36LB @1675' MW 11.5 PPG water tested temp 65 deg ph7 chlorides less than 300 sulfates less than 200
Event	5	Safety Meeting - Pre Job	Safety Meeting - Pre Job	2/25/2019	23:45:00	USER	-12.00	8.52	0.00	6.90	discuss job procedure and hazards with Halliburton staff and 3rd party employees
Event	6	Start Job	Start Job	2/26/2019	00:06:28	COM4	-14.00	8.33	0.00	6.90	
Event	7	Test Lines	Test Lines	2/26/2019	00:10:02	COM4	109.00	8.61	0.00	9.60	Pumped 3 barrels of water to fill lines, shutdown, closed valves, performed 500 PSI electronic kick out function test, continued with 5th gear stall out test at 2500 PSI, then proceeded to bring pressure to 6500

											PSI. pressure stabilized and held with no leaks.
Event	8	Pump Spacer 1	Pump Spacer 1	2/26/2019	00:23:28	COM4	-6.00	7.80	0.00	0.00	Pumped 150 barrels of 12.5 PPG 2.74 yield 16.9 gal/sk tuned spacer, at 8 bpm 900 PSI
Event	9	Drop Bottom Plug	Drop Bottom Plug	2/26/2019	00:27:57	COM4	556.00	12.36	4.00	13.40	bottom plug dropped by HOWCO supervisor. Witnessed by company man.
Event	10	Check Weight	Check Weight	2/26/2019	00:27:59	COM4	530.00	12.36	4.00	13.50	Weight verified with pressurized mud scales
Event	11	Pump Lead Cement	Pump Lead Cement	2/26/2019	00:48:35	COM4	654.00	13.36	8.10	0.10	Pumped 625 SKS/ 173bbbs 13.2PPG 1.55 yield 7.61 gal/sk of gasstop lead cement at 8 bpm 740 PSI
Event	12	Check Weight	Check Weight	2/26/2019	00:49:19	COM4	638.00	13.40	8.10	6.00	Weight verified with pressurized mud scales
Event	13	Check Weight	Check Weight	2/26/2019	00:52:18	COM4	622.00	12.97	8.10	30.20	Weight verified with pressurized mud scales
Event	14	Pump Tail Cement	Pump Tail Cement	2/26/2019	01:10:33	COM4	780.00	13.22	8.10	177.90	Pumped 1040 SKS/ 315bbbs 14.4PPG 1.70 yield 7.30 gal/sk Elasticem Tail cement at 7 bpm 630 PSI
Event	15	Check Weight	Check Weight	2/26/2019	01:19:21	COM4	704.00	14.57	7.00	63.40	Weight verified with pressurized mud scales
Event	16	Drop Top Plug	Drop Top Plug	2/26/2019	02:10:23	COM4	-5.00	9.23	0.00	364.30	rig blew down iron with air. Top plug dropped by HOWCO supervisor. Witnessed by company man.
Event	17	Pump Displacement	Pump Displacement	2/26/2019	02:10:28	COM4	-5.00	9.25	0.00	364.30	Poured 10 Gal of MMCR into the first 20 barrels of displacement. and 10 gallons of biocide through

											the rest of displacement. Pumped 311 bbls of fresh water displacement at 8 bpm.
Event	18	Pre-Convoy Safety Meeting	Bump Plug	2/26/2019	03:00:00	USER	2578.00	8.31	0.00	313.30	Slowed down at 280 bbls away to 3 bpm. Final circulating pressure 2150 psi. bump pressure 2600 psi.
Event	19	Pressure Up Well	Pressure Up Well	2/26/2019	03:01:26	COM4	2611.00	8.30	0.00	313.30	Held Pressure for a minute, then pressured up to the shift the plug and pump a 5 barrel wet shoe
Event	20	Other	Other	2/26/2019	03:06:01	COM4	14.00	8.27	0.00	319.90	Released pressure to check floats and got 2.0 barrels back to the truck. floats held.
Event	21	End Job	End Job	2/26/2019	03:06:24	COM4	12.00	8.26	0.00	319.90	Got 52 bbls of spacer and 0 barrels of cement back to surface. Estimated top of GasStop Latex Cement was about 2100-2200 feet. Estimated top of Elasticem Tail cement was about 6300-6400 feet.
Event	22	Pre-Rig Down Safety Meeting	Post-Job Safety Meeting (Pre Rig-Down)	2/26/2019	03:10:00	USER					Pre-rig down safety meeting discussing hazards.
Event	23	Pre-Convoy Safety Meeting	Depart Location Safety Meeting	2/26/2019	06:00:00	USER					Travel risks assessed and discussed. called in a journey and had it approved