

HALLIBURTON

iCem[®] Service

PDC ENERGY - EBUS

Challenger 6N Production

Sincerely,
Meghan Jacobs

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 and Lab Report4

2.0 Real-Time Job Summary 9

 2.1 Job Event Log9

3.0 Attachments..... 12

 3.1 Challenger 6N Production – Job Chart with Events.....12

 3.2 Challenger 6N Production – Job Chart without Events13

1.0 Cementing Job Summary

1.1 Executive Summary

Halliburton appreciates the opportunity to perform the cementing services on the **Challenger 6N** 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 58 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 #: 3839597		Quote #:		Sales Order #: 0905522155					
Customer: PDC ENERGY-EBUS				Customer Rep: Chris McMullen							
Well Name: CHALLENGER			Well #: 6N		API/UWI #: 05-123-45893-00						
Field: WATTENBERG		City (SAP): KERSEY		County/Parish: WELD		State: COLORADO					
Legal Description: SE NW-8-4N-64W-1403FNL-2431FWL											
Contractor: ENSIGN DRLG				Rig/Platform Name/Num: ENSIGN 152							
Job BOM: 7523 7523											
Well Type: HORIZONTAL OIL											
Sales Person: HALAMERICA\HX38199				Srv Supervisor: Nicholas Cummins							
Job											
Formation Name											
Formation Depth (MD)		Top	1673ft		Bottom	14074ft					
Form Type				BHST							
Job depth MD		14072ft		Job Depth TVD		6908ft					
Water Depth				Wk Ht Above Floor		4ft					
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	3	9.625	8.921	36			0	1673		0	
Casing	3	5.5	4.778	20			0	14072		6908	
Open Hole Section			8.5				1675	6700			
Open Hole Section			8.5				6700	14074		6908	
Tools and Accessories											
Type	Size in	Qty	Make	Depth ft		Type	Size in	Qty	Make		
Guide Shoe	5.5	1		14072		Top Plug	5.5	1	WTHR		
Float Shoe	5.5					Bottom Plug	5.5	1	WTHR		
Float Collar	5.5	1		14043		SSR plug set	5.5				
Insert Float	5.5					Plug Container	5.5	1	HES		
Stage Tool	5.5					Centralizers	5.5		HES		
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	bbbl	12.5	2.71	18.8	6	
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	7.61	6	
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
3	ElastiCem	ELASTICEM (TM) SYSTEM	1080	sack	14.4	1.7	7.3	8	
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
4	MMCR Displacement	MMCR Displacement	20	bbbl	8.34			5	
0.50 gal/bbl		MICRO MATRIX CEMENT RETARDER, 5 GAL PAIL (100003781)							
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
5	Displacement fluid		291	bbbl	8.34			8	
Cement Left In Pipe		Amount	0 ft		Reason			Wet Shoe	
Mix Water:		pH 7	Mix Water Chloride:		<300 ppm		Mix Water Temperature:		70 °F
Cement Temperature:			Plug Displaced by:		8.33 lb/gal		Disp. Temperature:		70 °F
Plug Bumped?		Yes	Bump Pressure:		2481 psi		Floats Held?		Yes
Cement Returns:		0 bbl	Returns Density:		12.5 lb/gal		Returns Temperature:		
Comment									

2.0 Real-Time Job Summary

2.1 Job Event Log

Type	Seq. No.	Activity	Graph Label	Date	Time	Source	DS Pump Press (psi)	DH Density (ppg)	Comb Pump Rate (bbl/min)	Comments
Event	1	Call Out	Call Out	3/3/2019	14:00:00	USER				The crew was called out on 3/3/19 at 1400. The customer requested HES on location at 0000 3/4/19 RTP 0400.
Event	2	Depart from Service Center or Other Site	Depart from Service Center or Other Site	3/3/2019	23:00:00	USER				The crew held a pre journey safety meeting discussing the route and potential hazards while driving The supervisor called in a journey. The crew departed service center.
Event	3	Arrive at Location from Service Center	Arrive at Location from Service Center	3/4/2019	00:30:00	USER				The crew arrived on location safely. The rig was still running casing. The supervisor met with the Tool Hand and received numbers. TD 14,074', TP 14,072' 5 1/2" 20# HCP-110, FC 14,043', PC 1,673' 9 5/8" 36# J-55, TVD 6,908', OH 8 1/2", Mud 11.4 ppg. Upon arriving containment had not shown up yet. They were requested on location at 2300.They did not show up till 0200.
Event	4	Assessment Of Location Safety Meeting	Assessment Of Location Safety Meeting	3/4/2019	00:45:00	USER				Crew discussed all potential hazards on location.
Event	5	Pre-Rig Up Safety Meeting	Pre-Rig Up Safety Meeting	3/4/2019	02:15:00	USER				Crew held a safety meeting discussing the rig up procedure. Also all potential hazards associated with rigging up all HES equipment and lines.
Event	6	Rig-Up Equipment	Rig-Up Equipment	3/4/2019	02:50:00	USER				The crew rigged up all HES equipment and lines.
Event	7	Rig-Up Completed	Rig-Up Completed	3/4/2019	05:30:00	USER				Rig up completed, no one got hurt.
Event	8	Safety Meeting - Pre Job	Safety Meeting - Pre Job	3/4/2019	13:00:00	USER	-3.00	8.11	1.70	The crew and all personal involved with cement job discussed all potential hazards associated with job. Followed by the job procedure to ensure everyone understood the plan of action
Event	9	Start Job	Start Job	3/4/2019	13:21:31	COM1	-8.00	7.92	0.00	Started recording data from 11360070. We filled lines with 4 bbls of water at 3 bpm.
Event	10	Test Lines	Test Lines	3/4/2019	13:24:36	COM1	247.00	8.25	0.00	We pressure tested all HES lines to 5,000 psi. The pressure test passed.

Event	11	Pump Spacer 1	Pump Spacer 1	3/4/2019	13:33:50	COM1	511.00	12.29	2.60	We pumped 150 bbls of spacer at 6 bpm, pressure was at 400 psi. 12.5 ppg 2.72 yield 16.8 gal/sk. We verified density using pressurized scales.
Event	12	Drop Bottom Plug	Drop Bottom Plug	3/4/2019	14:02:35	COM1	104.00	12.49	1.70	Tool hands witnessed plug drop.
Event	13	Shutdown	Shutdown	3/4/2019	14:03:29	COM1	131.00	3.17	0.00	We shutdown to verify that the plug left the plug container.
Event	14	Pump Cement	Pump Cement	3/4/2019	14:07:59	COM1	46.00	13.31	2.30	We pumped 173 bbls (625sks) of lead cement at 8 bpm, pressure at 560 psi. 13.2 ppg 1.55 yield 7.61 gal/sk. We used pressurized scales to verify density.
Event	15	Check Weight	Check Weight	3/4/2019	14:08:42	COM1	66.00	13.60	2.20	The sample weighed 13.35 ppg.
Event	16	Pump Tail Cement	Pump Tail Cement	3/4/2019	14:36:42	COM1	359.00	14.17	5.20	We pumped 327 bbls (1080 sks) of tail cement at 8 bpm, pressure was at 780 psi. 14.4 ppg 1.70 yield 7.30 gal/sk. We used pressurized scales to verify density.
Event	17	Shutdown	Shutdown	3/4/2019	15:24:17	COM1	114.00	3.41	0.00	Shutdown to load top plug and blow air from the rig floor to wash up tank. Then washed pumps and lines to wash up tank.
Event	18	Drop Top Plug	Drop Top Plug	3/4/2019	15:33:18	COM1	78.00	1.39	0.00	Tool hands witnessed plug drop.
Event	19	Pump Displacement	Pump Displacement	3/4/2019	15:33:22	COM1	65.00	4.13	0.00	We pumped the calculated displacement of 311 bbls. With MMCR in the first 20 bbls and biocide throughout till the last 50 bbls. At 5 bpm until we caught pressure. Then picked our rate up to 8 bpm. We adjusted rate as needed.
Event	20	Shutdown	Shutdown	3/4/2019	15:53:29	USER	1996.00	8.59	8.00	Shutdown and release pressure due to leaking chicksan at the top of the standpipe. Rubber o-ring had become damaged and was replaced.
Event	21	Bump Plug	Bump Plug	3/4/2019	16:43:19	COM1	2489.00	8.55	2.90	We bumped the plug, final circulating pressure was 2,481 psi. We pressured up to 2,900 before shutting down for a 5 min casing test.
Event	22	Other	Pressure Up and Check Floats	3/4/2019	16:48:07	COM1	3472.00	8.53	3.90	We pressured up to 3,854 psi at 2 bpm to shift wet shoe sub. The proceeded to pump a 5 bbl wet shoe at 4 bpm. Released pressure to check floats, floats held 2 .5 bbls back to the truck.

Event	23	End Job	End Job	3/4/2019	16:51:57	COM1	7.00	8.52	0.00	Cement job complete estimated top of Tail cement 6,064'. Estimated top of Lead cement 1,824'. We approximately got 58 bbls of spacer to surface.
Event	24	Pre-Rig Down Safety Meeting	Pre-Rig Down Safety Meeting	3/4/2019	16:52:00	USER	5.00	8.53	0.00	Crew held a safety meeting discussing the rig down procedure. Also all potential hazards associated with rigging down all HES equipment and lines.
Event	25	Rig-Down Equipment	Rig-Down Equipment	3/4/2019	17:00:00	USER	-14.00	8.47	0.00	The crew rigged down all HES equipment and lines.
Event	26	Rig-Down Completed	Rig-Down Completed	3/4/2019	18:20:00	USER				Rig down completed no one got hurt.
Event	27	Pre-Convoy Safety Meeting	Pre-Convoy Safety Meeting	3/4/2019	18:30:00	USER				The crew held a pre journey safety meeting discussing the route and potential hazards while driving The supervisor called in a journey.
Event	28	Depart Location for Service Center or Other Site	Depart Location for Service Center or Other Site	3/4/2019	18:35:00	USER				Nick Cummins and crew would like to thank you for your business, and choosing Halliburton Cement! Please feel free to call if you have any questions.