

HALLIBURTON

iCem[®] Service

PDC ENERGY - EBUS

Fern 11V-334 Production

Sincerely,
Meghan Jacobs

Legal Notice

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1.0 Cementing Job Summary

1.1 Executive Summary

Halliburton appreciates the opportunity to perform the cementing services on the **Fern 11V-334** 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 30bbbls of MudFlush Spacer 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 [Ft. Lupton]

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Cementing Job Summary

The Road to Excellence Starts with Safety

Sold To #: 304535	Ship To #: 3792020	Quote #:	Sales Order #: 0904721823							
Customer: PDC ENERGY-EBUS		Customer Rep: Chris McMullen								
Well Name: FERN	Well #: 11V-334	API/UWI #: 05-123-44588-00								
Field: WATTENBERG	City (SAP): GREELEY	County/Parish: WELD	State: COLORADO							
Legal Description: NW NW-11-5N-65W-351FNL-688FWL										
Contractor:		Rig/Platform Name/Num: Ensign 152								
Job BOM: 7523 7523										
Well Type: HORIZONTAL OIL										
Sales Person: HALAMERICA\HX38199		Srvc Supervisor: Nicholas Roles								
Job										
Formation Name										
Formation Depth (MD)	Top	Bottom								
Form Type		BHST								
Job depth MD	15174ft	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	1637	0	1637
Casing	0	5.5	4.778	20	BUTTRESS	HCP110	0	15174	0	6803
Open Hole Section			8.5				1637	15175	1637	6803
Tools and Accessories										
Type	Size in	Qty	Make	Depth ft		Type	Size in	Qty	Make	
Guide Shoe	5.5			15174		Top Plug	5.5		HES	
Float Shoe	5.5					Bottom Plug	5.5		HES	
Float Collar	5.5					SSR plug set	5.5		HES	
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	Mud Flush III (Powder)	Mud Flush III	50	bbl	8.4			4		
42 gal/bbl		FRESH WATER								
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	

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Cementing Job Summary

2	CLEANSPE R III	CLEANSPACER III	50	bbl	12	2.27		4	
0 gal/bbl		FRESH WATER							
Fluid #	Stage Type	Fluid Name	Qty	Qty UoM	Mixing Density lbm/gal	Yield ft3/sack	Mix Fluid Gal	Rate bbl/mi n	Total Mix Fluid Gal
3	13.2# ElastiCem	ELASTICEM (TM) SYSTEM	1854	sack	13.2	1.57		6	7.52
7.52 Gal		FRESH WATER							
0.40 %		HALAD(R)-344, 50 LB (100003670)							
0.35 %		HR-5, 50 LB SK (100005050)							
Fluid #	Stage Type	Fluid Name	Qty	Qty UoM	Mixing Density lbm/gal	Yield ft3/sack	Mix Fluid Gal	Rate bbl/mi n	Total Mix Fluid Gal
4	MMCR Displacement	MMCR Displacement	30	bbl	8.34			8	
0.25 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/mi n	Total Mix Fluid Gal
5	Displacement fluid		306	bbl	8.34			8	
Cement Left In Pipe		Amount	0 ft			Reason		Wet Shoe	
Comment Got 30bbls Mud Flush spacer back. Estimated TOC-2150', TOS-1030'.									

2.0 Real-Time Job Summary

2.1 Job Event Log

Type	Seq. No.	Activity	Graph Label	Date	Time	Source	DH Density (ppg)	Comb Pump Rate (bbl/min)	Backside Press (psi)	PS Pump Press (psi)	Comments
Event	1	Call Out	Call Out	3/22/2018	08:00:00	USER					Called out by Service Coordinator for O/L at 1300
Event	2	Depart Yard Safety Meeting	Depart Yard Safety Meeting	3/22/2018	11:45:00	USER					Held meeting with all personnel in convoy to discuss directions and hazards associated with drive, all fit to drive.
Event	3	Depart from Service Center or Other Site	Depart from Service Center or Other Site	3/22/2018	12:00:00	USER					Journey Management prior to departure
Event	4	Arrive at Location from Service Center	Arrive at Location from Service Center	3/22/2018	13:00:00	USER					Upon arrival met with company man to discuss job details and calculations, performed hazard hunt and site assessment.
Event	5	Pre-Rig Up Safety Meeting	Pre-Rig Up Safety Meeting	3/22/2018	13:15:00	USER					Discussed rigging up hazards and procedure according to HMS.
Event	6	Other	Other	3/22/2018	14:00:00	USER					Water test- PH-6, Chlor-0, Temp-85.
Event	7	Safety Meeting - Pre Job	Safety Meeting - Pre Job	3/22/2018	15:00:00	USER	8.45	0.00	1.00	1.00	Held safety meeting with all job associated personnel to discuss job procedure, hazards and stop work authority.
Stage	2	Start Job	Start Job	3/22/2018	15:21:54	COM4	8.46	0.00	1.00	-1.00	TD-15175', TP-15174' 5.5" 20#, FC-15140', TVD-6803', OH-8.5", SURF-1637' 9.625" 36#, MUD-10.2#
Event	8	Test Lines	Test Lines	3/22/2018	15:24:51	COM4	8.36	0.00	3.00	119.00	Pumped 5bbls fresh water to fill lines, closed manifold and performed 500psi k/o function test, proceeded to perform 5th gear stall at 1450psi, continued to bring pressure up to 5000psi. Pressure stabilized and held with no leaks.
Stage	3	Pump Spacer 1	Pump Spacer 1	3/22/2018	15:34:49	COM4	8.41	3.60	81.00	470.00	Pumped 50bbls fresh water with 200lbs Mud Flush III with 10g of D-air at 5bpm

685psi.											
Stage	4	Pump Spacer 1	Pump Spacer 1	3/22/2018	15:47:11	COM4	8.41	0.00	83.00	366.00	Pumped 50bbls 12# 3.16y 20g/s Clean Spacer at 5bpm 643psi.
Stage	5	Pump Lead Cement	Pump Lead Cement	3/22/2018	15:57:20	COM4	11.97	5.60	130.00	663.00	Pumped 1854sks or 518bbls 13.2# 1.57y 7.52g/s Elasticem at 8bpm 560psi. Cement blend did not mix well with 6x5 recirculating tub. Blend would pack off and become unmixable. Pumped at mostly 5-7bpm, however according to bbl counter on pump truck we were about 150bbls over calculated. Cement mix water was very close to procedure and volume pumped according to schedule.
Event	9	Check Weight	Check Weight	3/22/2018	16:25:25	COM4	13.32	5.10	200.00	133.00	Weight verified with pressurized mud scales.
Event	10	Check Weight	Check Weight	3/22/2018	16:53:24	COM4	13.05	6.20	318.00	205.00	Weight verified with pressurized mud scales.
Event	11	Check Weight	Check Weight	3/22/2018	16:59:57	COM4	13.04	6.20	335.00	200.00	Weight verified with pressurized mud scales.
Event	12	Check Weight	Check Weight	3/22/2018	17:07:20	COM4	13.29	6.20	343.00	296.00	Weight verified with pressurized mud scales.
Event	13	Check Weight	Check Weight	3/22/2018	17:11:33	COM4	13.11	4.30	276.00	96.00	Weight verified with pressurized mud scales.
Event	14	Check Weight	Check Weight	3/22/2018	17:23:16	COM4	12.65	3.50	75.00	55.00	Weight verified with pressurized mud scales.
Event	15	Check Weight	Check Weight	3/22/2018	17:50:50	COM4	13.34	7.40	428.00	354.00	Weight verified with pressurized mud scales.
Event	16	Check Weight	Check Weight	3/22/2018	17:50:55	COM4	13.32	7.40	424.00	409.00	Weight verified with pressurized mud scales.
Event	17	Shutdown	Shutdown	3/22/2018	18:05:05	USER	15.03	0.00	162.00	15.00	Rig blew down iron to wash up pit, once clean, pumped 5bbls fresh water to clean through pumps and lines.
Event	18	Drop Top Plug	Drop Top Plug	3/22/2018	18:17:40	COM4	8.09	0.00	117.00	-15.00	Dropped by HES supervisor, witnessed by company man.

Stage	6	Pump Displacement	Pump Displacement	3/22/2018	18:17:44	COM4	8.09	0.00	119.00	-14.00	Pumped 336bbbls fresh water with 15g MMCR in first 30bbbls, 15g staclear and 5g biocide throughout.
Event	19	Bump Plug	Bump Plug	3/22/2018	19:13:20	COM4	8.17	0.00	18.00	2588.00	Slowed down to 4bpm at 310bbbls away, final circulating pressure-2050psi, bump pressure-2560psi
Event	20	Pressure Up Well	Pressure Up Well	3/22/2018	19:17:09	USER	8.20	2.00	18.00	3368.00	Pressured up to sheer at 3970psi, continued to pump 5bbbls at 4bpm 1980psi.
Event	21	Check Floats	Check Floats	3/22/2018	19:19:18	USER	8.11	0.00	20.00	1228.00	Released pressure and got 1.5bbbls back to pump. Floats held.
Stage	7	End Job	End Job	3/22/2018	19:20:47	COM4	8.10	0.00	17.00	10.00	Got 30bbbls Mud Flush spacer back. Estimated TOC-2150', TOS-1030'.
Event	22	Safety Meeting - Pre Rig-Down	Safety Meeting - Pre Rig-Down	3/22/2018	19:30:00	USER	8.09	0.00	31.00	9.00	All HSE present. Discussed red zone areas and trapped pressure hazards. Watch for suspended loads and rig down procedures, including hand placement, lifting techniques, and swing radius.
Event	23	Pre-Convoy Safety Meeting	Pre-Convoy Safety Meeting	3/22/2018	20:45:00	USER					All HSE present and fit to drive. Aware of directions and hazards.
Event	24	Depart Location for Service Center or Other Site	Depart Location for Service Center or Other Site	3/22/2018	21:00:00	USER					Pre journey management prior to departure.