

HALLIBURTON

iCem[®] Service

PDC ENERGY - EBUS

Date: Thursday, April 19, 2018

Fern 11V-304 Production

Job Date: Monday, March 12, 2018

Sincerely,
Bryce Hinsch

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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-304** 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.

No spacer was seen 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 #: 3791976		Quote #:		Sales Order #: 0904699353	
Customer: PDC ENERGY-EBUS				Customer Rep: Chris McMullen			
Well Name: FERN			Well #: 11V-304		API/UWI #: 05-123-44581-00		
Field: WATTENBERG		City (SAP): GREELEY		County/Parish: WELD		State: COLORADO	
Legal Description: NW NW-11-5N-65W-321FNL-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	15135ft		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	1668	0	1668
Casing	0	5.5	4.778	20	BUTTRESS	HCP110	0	15135	0	6799
Open Hole Section			8.5				1668	15142	1668	6799

Tools and Accessories

Type	Size in	Qty	Make	Depth ft	Type	Size in	Qty	Make
Guide Shoe	5.5			15135	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 ft ³ /sack	Mix Fluid Gal	Rate bbl/min	Total Mix Fluid Gal	
1	Mud Flush III (Powder)	Mud Flush III	50	bbl	8.4			5		
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
2	CLEANSPACER III	CLEANSPACER III	50	bbbl	12	2.27		5	
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/min	Total Mix Fluid Gal
3	13.2# ElastiCem	ELASTICEM (TM) SYSTEM	1844	sack	13.2	1.57		8	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/min	Total Mix Fluid Gal
4	MMCR Displacement	MMCR Displacement	30	bbbl	8.34			9	
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/min	Total Mix Fluid Gal
5	Displacement fluid	Fresh Water	327	bbbl	8.34			9	
Cement Left In Pipe		Amount	0 ft		Reason			Wet Shoe	
Comment Did not see MF to surface. Est. TOC-2487. Rig held pressure on Back Side for 8hours with cement head attached.									

HALLIBURTON

Rockies, Brighton

Lab Results- Primary

Job Information

Request/Slurry	2459236/3	Rig Name	ENSIGN 152	Date	08/MAR/2018
Submitted By	Bryce Hinsch	Job Type	Production Casing	Bulk Plant	Brighton
Customer	PDC Energy	Location	Weld	Well	Fern 11V-304

Well Information

Casing/Liner Size	5.5 in	Depth MD	15116 ft	BHST	104°C / 220°F
Hole Size	8.5 in	Depth TVD	6802 ft	BHCT	82°C / 180°F
Pressure	4000 psi				

Cement Information - Primary Design

Cement Properties

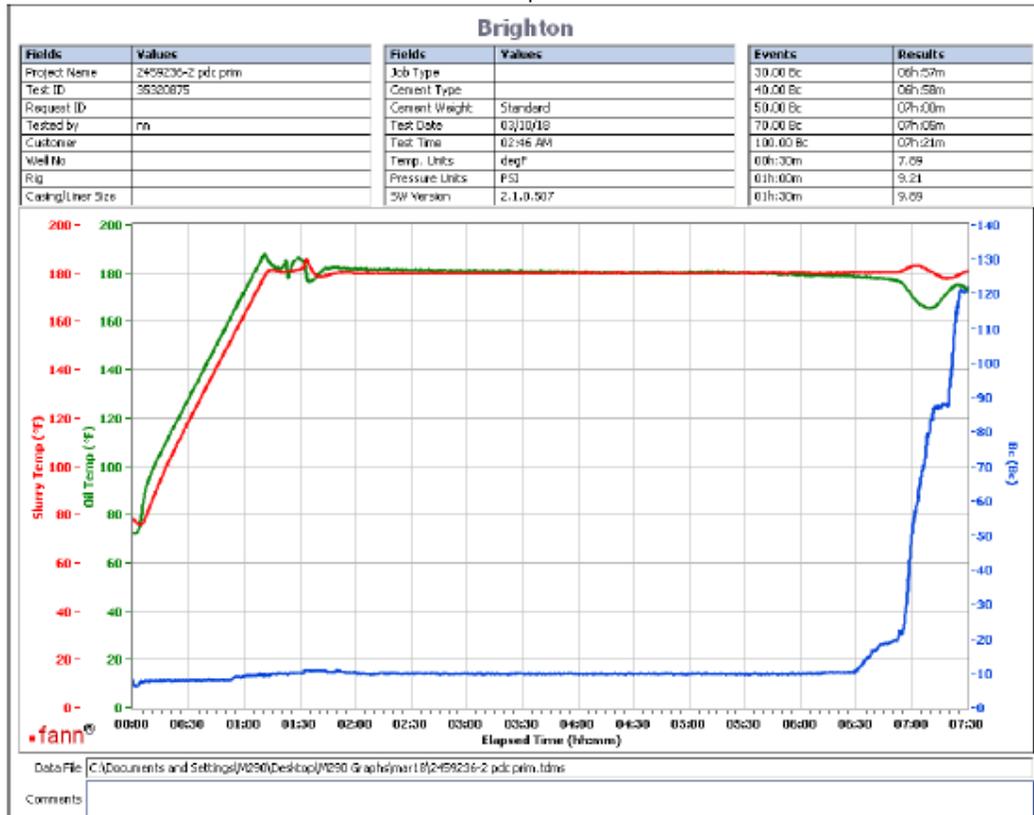
Slurry Density	13.2	lbm/gal
Slurry Yield	1.57	ft ³ /sack
Water Requirement	7.52	gal/sack

Operation Test Results Request ID 2459236/2

Thickening Time - ON-OFF-ON

10/MAR/2018

Test Temp (degF)	Pressure (psi)	Reached in (min)	30 Bc (hh:mm)	50 Bc (hh:mm)	70 Bc (hh:mm)	100 Bc (hh:mm)	Start Bc	Stirring before stop (mins)	Static Period (min)	Peak reading (BC)
180	4000	70	6:57	7:00	7:05	7:21	6	82	10	11



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2.0 Real-Time Job Summary

2.1 Job Event Log

Type	Seq. No.	Activity	Graph Label	Date	Time	Source	DH Density <i>(ppg)</i>	Comb Pump Rate <i>(bbl/min)</i>	DS Pump Press <i>(psi)</i>	Pump Stg Tot <i>(bbl)</i>	Comments
Event	1	Call Out	Call Out	3/12/2018	05:00:00	USER					Called out by Service Coordinator for O/L at 0930
Event	2	Depart Yard Safety Meeting	Depart Yard Safety Meeting	3/12/2018	08:15:00	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	3/12/2018	08:30:00	USER					Journey Management prior to departure
Event	4	Arrive at Location from Service Center	Arrive at Location from Service Center	3/12/2018	09:30:00	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	3/12/2018	09:45:00	USER					Discussed rigging up hazards and procedure according to HMS.
Event	6	Other	Other	3/12/2018	10:15:00	USER					Water test- PH-6, Chlor-0, Temp-85.
Event	7	Safety Meeting - Pre Job	Safety Meeting - Pre Job	3/12/2018	13:00:00	USER	8.36	0.00	0.00	37.30	Held safety meeting with all job associated personnel to discuss job procedure, hazards and stop work authority.
Event	8	Start Job	Start Job	3/12/2018	13:16:13	COM4	8.36	0.00	1.00	37.30	TD-15142', TP-15135' 5.5" 20#, FC-15107', TVD-6799', OH-8.5", SURF-1668' 9.625" 36#, MUD-10.4#
Event	9	Test Lines	Test Lines	3/12/2018	13:18:53	COM4	8.28	0.00	92.00	40.90	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.
Event	10	Pump Spacer 1	Pump Spacer 1	3/12/2018	13:24:58	COM4	8.29	0.60	206.00	0.00	Pumped 50bbls fresh water with 200lbs Mud Flush III with 5g of D-air at 5bpm 385psi.
Event	11	Pump Spacer 2	Pump Spacer 2	3/12/2018	13:37:12	COM4	8.26	0.00	243.00	50.30	Pumped 50bbls 12# 2.27y 12.4g/s Clean Spacer at 5bpm 453psi.
Event	12	Pump Lead Cement	Pump Lead Cement	3/12/2018	13:49:11	COM4	11.93	4.80	557.00	44.80	Pumped 1844sks or 516bbls 13.2# 1.57y 7.52g/s Elasticem at 8bpm 560psi.
Event	13	Check Weight	Check Weight	3/12/2018	13:52:59	COM4	13.33	4.50	585.00	14.90	Weight verified with pressurized mud scales.
Event	14	Check Weight	Check Weight	3/12/2018	14:17:18	COM4	13.20	7.00	330.00	143.40	Weight verified with pressurized mud scales.
Event	15	Check Weight	Check Weight	3/12/2018	14:39:07	COM4	13.23	7.50	323.00	294.90	Weight verified with pressurized mud scales.
Event	16	Drop Top Plug	Drop Top Plug	3/12/2018	15:31:48	COM4	8.23	0.00	5.00	628.80	
Event	17	Pump Displacement	Pump Displacement	3/12/2018	15:31:54	COM4	8.23	0.00	6.00	0.00	Pumped 335bbls fresh water with 15g MMCR in first 30bbls, 15g staclear and 5g biocide throughout.
Event	18	Bump Plug	Bump Plug	3/12/2018	16:23:42	COM4	8.26	0.00	2548.00	338.20	Slowed down to 4bpm at 300bbls away, final circulating pressure-2060psi, bump pressure-2550psi Held for 5min test.
Event	19	Pressure Up Well	Pressure Up Well	3/12/2018	16:26:57	USER	8.24	3.90	1975.00	340.20	Pressured up to shear at

											3686psi, continued to pump 5bbls at 4bpm 1800psi.
Event	20	Check Floats	Check Floats	3/12/2018	16:28:47	USER	8.22	0.00	1439.00	345.10	Released pressure and got 2bbls back to pump. Floats held.
Event	21	End Job	End Job	3/12/2018	16:30:14	COM4	8.28	0.00	2.00	345.10	Did not see MF to surface. Est. TOC-2487. Rig held pressure on Back Side for 8hours with cement head attached.
Event	22	Safety Meeting - Pre Rig-Down	Safety Meeting - Pre Rig-Down	3/12/2018	16:45:00	USER	8.11	4.00	62.00	394.40	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	3/12/2018	17:45:00	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	3/12/2018	18:00:00	USER					Pre journey management prior to departure.

3.0 Attachments

3.1 PDC Fern 11V-304 Production Job Chart

