

# HALLIBURTON

iCem<sup>®</sup> Service

## **PDC ENERGY-EBUS**

Date: Monday, April 23, 2018

## **Fern 11V-234 Production**

Job Date: Wednesday, March 28, 2018

Sincerely,  
**Tyler Hill**

## Legal Notice

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## 1.0 Cementing Job Summary

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### 1.1 Executive Summary

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Halliburton appreciates the opportunity to perform the cementing services on the **Fern 11V-234** 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.

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**

*The Road to Excellence Starts with Safety*

<b>Sold To #:</b> 304535		<b>Ship To #:</b> 3791915		<b>Quote #:</b>		<b>Sales Order #:</b> 0904737103				
<b>Customer:</b> PDC ENERGY-EBUS				<b>Customer Rep:</b> Chris McMullen						
<b>Well Name:</b> FERN			<b>Well #:</b> 11V-234		<b>API/UWI #:</b> 05-123-44582-00					
<b>Field:</b> WATTENBERG		<b>City (SAP):</b> GREELEY		<b>County/Parish:</b> WELD		<b>State:</b> COLORADO				
<b>Legal Description:</b> NW NW-11-5N-65W-366FNL-688FWL										
<b>Contractor:</b>				<b>Rig/Platform Name/Num:</b> Ensign 152						
<b>Job BOM:</b> 7523 7523										
<b>Well Type:</b> HORIZONTAL OIL										
<b>Sales Person:</b> HALAMERICA\HX38199				<b>Srv Supervisor:</b> Steven Markovich						
<b>Job</b>										
<b>Formation Name</b>										
<b>Formation Depth (MD)</b>		<b>Top</b>		<b>Bottom</b>						
<b>Form Type</b>				<b>BHST</b>						
<b>Job depth MD</b>		15152ft		<b>Job Depth TVD</b>						
<b>Water Depth</b>				<b>Wk Ht Above Floor</b>						
<b>Perforation Depth (MD)</b>		<b>From</b>		<b>To</b>						
<b>Well Data</b>										
<b>Description</b>	<b>New / Used</b>	<b>Size in</b>	<b>ID in</b>	<b>Weight lbm/ft</b>	<b>Thread</b>	<b>Grade</b>	<b>Top MD ft</b>	<b>Bottom MD ft</b>	<b>Top TVD ft</b>	<b>Bottom TVD ft</b>
Casing		9.625	8.921	36			0	1634	0	0
Casing	0	5.5	4.778	20	BUTTRESS	HCP110	0	15152	0	0
Open Hole Section			8.5				1634	15159	0	0
<b>Tools and Accessories</b>										
<b>Type</b>	<b>Size in</b>	<b>Qty</b>	<b>Make</b>	<b>Depth ft</b>		<b>Type</b>	<b>Size in</b>	<b>Qty</b>	<b>Make</b>	
Guide Shoe	5.5			15152		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		HES	
Stage Tool	5.5					Centralizers	5.5		HES	
<b>Fluid Data</b>										
<b>Stage/Plug #: 1</b>										
<b>Fluid #</b>	<b>Stage Type</b>	<b>Fluid Name</b>	<b>Qty</b>	<b>Qty UoM</b>	<b>Mixing Density lbm/gal</b>	<b>Yield ft3/sack</b>	<b>Mix Fluid Gal</b>	<b>Rate bbl/min</b>	<b>Total Mix Fluid Gal</b>	
1	Mud Flush III (Powder)	Mud Flush III	50	bbl	8.4					
42 gal/bbl		<b>FRESH WATER</b>								

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	CLEANS PACER III	CLEANS PACER III	50	bbl	12	2.27			
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	1855	sack	13.2	1.57		6	7.53
7.53 Gal		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
4	MMCR Displacement	MMCR Displacement	50	bbl	8.34				
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		278	bbl	8.34				
Comment Bumped plug at 328bbs away, final lifting pressure was 2170psi. Brought pressure 500psi over and held. Before burst WSS pressure was 2880. Kicked in pumps to shear WSS, WSS sheered at 3941psi. Pumed a 5bbl wet shoe at 4bbls/min. Estimated Top of Cement at 2454'									

## HALLIBURTON

Rockies, Brighton

## Lab Results- Primary

## Job Information

Request/Slurry	2462814/1	Rig Name	ENSIGN 152	Date	25/MAR/2018
Submitted By	Tyler Hill	Job Type	Production Casing	Bulk Plant	Brighton
Customer	PDC Energy	Location	Weld	Well	Fern 11V-234

## Well Information

Casing/Liner Size	5.5 in	Depth MD	15184 ft	BHST	101°C / 214°F
Hole Size	8.5 in	Depth TVD	7000 ft	BHCT	82°C / 180°F
Pressure	4000 psi				

## Cement Information - Primary Design

## Cement Properties

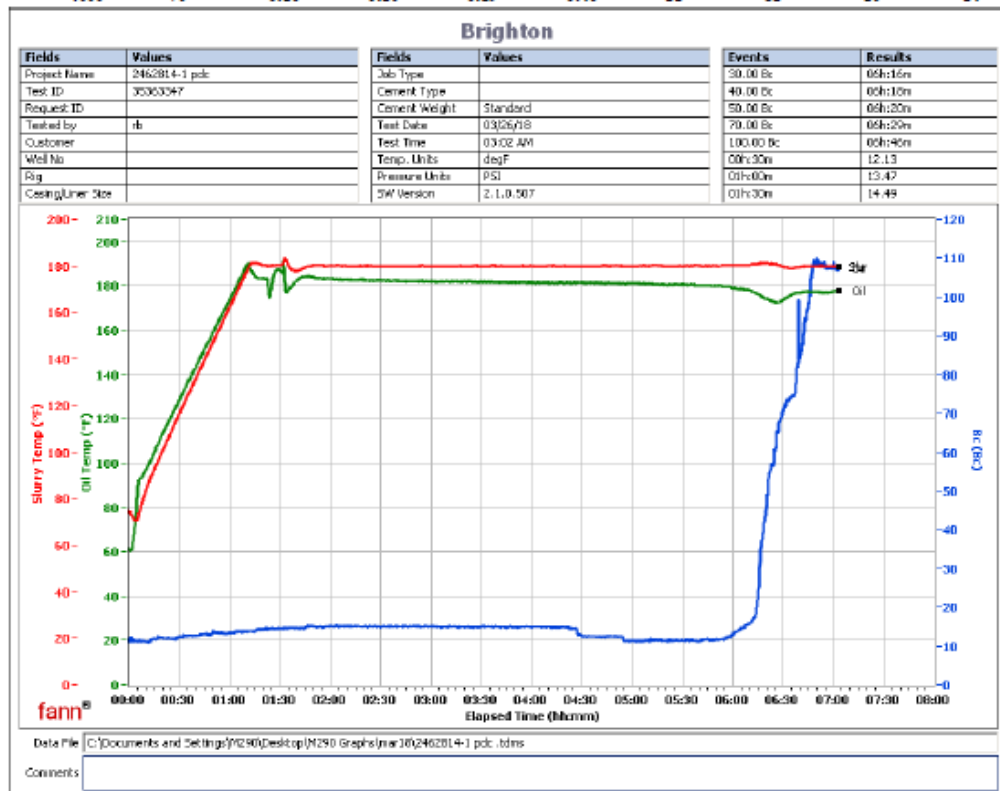
Slurry Density	13.2	lbm/gal
Slurry Yield	1.57	ft <sup>3</sup> /sack
Water Requirement	7.52	gal/sack

## Pilot Test Results Request ID 2462814/1

## Thickening Time - ON-OFF-ON

26/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	6:16	6:20	6:29	6:46	11	82	10	14



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iCem® Service

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Created: Monday, April 23, 2018

## 2.0 Real-Time Job Summary

## 2.1 Job Event Log

Type	Seq. No.	Activity	Graph Label	Date	Time	Source	DH Density (ppg)	DS Pump Press (psi)	Comb Pump Rate (bbl/min)	Pump Stg Tot (bbl)	Comments
Event	1	Call Out	Call Out	3/28/2018	04:30:00	USER					Job called out with an on location time of 10:00 ready to pump at noon.
Event	2	Pre-Convoy Safety Meeting	Pre-Convoy Safety Meeting	3/28/2018	08:40:00	USER					JSA with HES crew on driving safety and route to rig.
Event	3	Arrive at Location from Service Center	Arrive at Location from Service Center	3/28/2018	09:45:00	USER					Arrived on location, rig circulating until 12:30
Event	4	Assessment Of Location Safety Meeting	Assessment Of Location Safety Meeting	3/28/2018	09:50:00	USER					JSA and Hazard hunt with HES crew.
Event	5	Rig-Up Equipment	Rig-Up Equipment	3/28/2018	10:15:00	USER					Rigged up HES lines and equipment.
Event	6	Pre-Job Safety Meeting	Pre-Job Safety Meeting	3/28/2018	12:15:00	USER	8.51	-3.00	0.00	6.70	JSA with HES and rig crews on job safety and procedure.
Event	7	Start Job	Start Job	3/28/2018	12:45:32	COM4	8.56	-1.00	0.00	6.70	TD 15159' TP 15152' FC 15138' WSS 15124' 5 1/2" 20# Production casing, 8 1/2" open hole, 9 5/8" 36# Surface casing at 1634' TVD 6778'
Event	8	Test Lines	Test Lines	3/28/2018	12:50:34	COM4	8.37	153.00	0.00	4.00	Set kick outs to 500psi and check kick outs, then bring pressure up to 4500psi and hold.
Event	9	Pump Spacer 1	Pump Spacer 1	3/28/2018	12:58:55	COM4	8.34	2.00	0.00	0.00	Pump 50bbls of Mud Flush, pumped at 3bbl/min 400psi.
Event	10	Drop Bottom Plug	Drop Bottom Plug	3/28/2018	13:16:55	USER	8.33	11.00	0.00	55.00	Plug pre loaded into HES



											head. Plug dropped in front of company rep.
Event	11	Pump Spacer 2	Pump Spacer 2	3/28/2018	13:17:55	COM4	11.91	515.00	1.40	56.40	Pump 50bbls of 12ppg 2.27yield Tuned Spacer, pumped at 6bbl/min 856psi.
Event	12	Check Weight	Check weight	3/28/2018	13:19:45	COM4	12.15	747.00	4.90	6.00	Weight verified by pressurized scales.
Event	13	Pump Cement	Pump Cement	3/28/2018	13:27:04	COM4	12.72	524.00	4.40	44.70	Pump 518bbls (1855sks) of 13.2ppg 1.57yield Cement. Pumped at 8bbl/min 1505psi.
Event	14	Check Weight	Check weight	3/28/2018	13:27:17	COM4	13.15	560.00	4.60	1.00	Weight verified by pressurized scales.
Event	15	Check Weight	Check weight	3/28/2018	13:30:08	COM4	13.10	599.00	4.20	14.20	Weight verified by pressurized scales.
Event	16	Check Weight	Check weight	3/28/2018	13:54:59	COM4	13.19	615.00	8.00	199.00	Weight verified by pressurized scales.
Event	17	Check Weight	Check weight	3/28/2018	14:05:59	COM4	13.20	124.00	3.00	281.20	Weight verified by pressurized scales.
Event	18	Check Weight	Check weight	3/28/2018	14:08:37	COM4	13.13	118.00	3.00	289.20	Weight verified by pressurized scales.
Event	19	Check Weight	Check weight	3/28/2018	14:14:26	COM4	13.29	432.00	8.10	323.90	Weight verified by pressurized scales.
Event	20	Shutdown	Shutdown	3/28/2018	14:41:39	COM4	13.21	127.00	0.80	522.20	Shutdown and clean pumps and lines.
Event	21	Drop Top Plug	Drop Top Plug	3/28/2018	15:01:24	COM4	7.69	-2.00	0.00	545.30	Plug loaded and dropped in front of company rep.
Event	22	Pump Displacement	Pump Displacement	3/28/2018	15:01:29	COM4	7.69	-2.00	0.00	545.30	Pump 328bbls of H2O. First 50bbls with MMCR then 278 with biocide. Pumped at 8bbl/min and slowed rate to 4bbls a min at 310bbls away to bump plug.

Event	23	Bump Plug	Bump Plug	3/28/2018	15:45:52	COM4	8.39	2169.00	4.00	327.40	Bumped plug at 328bbls away final lifting pressure was 2170psi brought pressure 500psi over and held.
Event	24	Other	Other	3/28/2018	15:49:38	USER	8.40	2846.00	0.00	328.00	Kicked in pumps to burst WSS, WSS burst at 3941psi. brought rate to 4bbl/min and pumped a 5bbl wet shoe. Opened release line to check floats and after 1.5bbls back floats held.
Event	25	End Job	End Job	3/28/2018	16:11:24	COM4	-0.11	-11.00	0.00	334.80	Thank you Steve Markovich and crew.

3.0 Attachments

3.1 Fern 11V-234 Production.png

