

# HALLIBURTON

iCem<sup>®</sup> Service

## **PDC ENERGY-EBUS**

**For: PDC Energy**

Date: Monday, July 02, 2018

## **J Clark 15N Foam Production**

Job Date: Sunday, June 24, 2018

Sincerely,

**Ryan Keeran**

## 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	Job Charts.....	13
3.1	Job Chart - Simplified .....	13
3.2	Job Chart - Expanded .....	14

## 1.0 Cementing Job Summary

---

### 1.1 Executive Summary

---

Halliburton appreciates the opportunity to perform the cementing services on the **J Clark 15N cement Foam 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.

30 bbls of Mudflush III was circulated 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 #: 3870544	Quote #: 0022458744	Sales Order #: 0904948197
Customer: PDC ENERGY-EBUS		Customer Rep: Tony	
Well Name: J CLARK		Well #: 15N	API/UWI #: 05-123-46683-00
Field: WATTENBERG	City (SAP): KERSEY	County/Parish: WELD	State: COLORADO
Legal Description: NW NE-14-5N-65W-550FNL-1964FEL			
Contractor:		Rig/Platform Name/Num:	
Job BOM: 14143 14143			
Well Type: HORIZONTAL OIL			
Sales Person: HALAMERICA\HX38199		Srvc Supervisor: Nicholas Peterson	

**Job**

Formation Name			
Formation Depth (MD)	Top		Bottom
Form Type	BHST		
Job depth MD	12,084'		Job Depth TVD 6.869
Water Depth			Wk Ht Above Floor 5'
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	LTC	J-55	0	1675		1671
Casing	0	5.5	4.778	20		P-110	0	12084		6843
Open Hole Section			8.5				1675	6869	1671	6588
Open Hole Section			8.5				6869	12089	6588	6869

**Tools and Accessories**

Type	Size in	Qty	Make	Depth ft	Type	Size in	Qty	Make
Float Shoe	5.5	1	Weath	12,082.3	Top Plug	5.5	1	Weath
Float Collar	5.5	1	Weath	12,070.3	Bottom Plug	5.5	1	Weath
Float Collar	5.5	1	Weath	12,068.7				
Wet Shoe Sub	5.5	1	Weath	12,054.8	Plug Container	5.5	1	HES
					Centralizers	5.5	175	Weath

**Fluid Data**

Stage/Plug #: 1										
Fluid #	Stage Type	Fluid Name	Qty	Qty UoM	Mixing Density lbm/gal	Yield ft <sup>3</sup> /sack	Mix Fluid Gal	Rate bbl/min	Total Mix Fluid Gal	
1	Spacer	Mud Flush III	50	bbl	8.4			5		

Fluid #	Stage Type	Fluid Name	Qty	Qty UoM	Mixing Density lbm/gal	Yield ft <sup>3</sup> /sack	Mix Fluid Gal	Rate bbl/min	Total Mix Fluid Gal
2	Spacer	Tuned Spacer III	100	bbl	12.5	2.74	16.9	5	3,464
3	Cap	HALCEM (TM) SYSTEM	100	sack	15.6	1.18	5.18	5	518
4	Lead	HALSEAL (TM) SYSTEM	620	sack	15.6	1.18	5,18	5	3,211
5	Tail	ELASTICEM (TM) SYSTEM	765	sack	14.4	1.7	7.3	5	5,584
6	Displacement	MMCR Displacement	30	bbl	8.34			8	
7	Displacement	Biocide Water	200	bbl	8.33			8	

<b>Cement Left In Pipe</b>	<b>Amount</b>	0 ft	<b>Reason</b>	<b>Wet Shoe</b>	
Mix Water:	pH 7.0	Mix Water Chloride:	0 ppm	Mix Water Temperature:	65 °F
Cement Temperature:	## °F	Plug Displaced by:	8.33 lb/gal	Disp. Temperature:	65 °F
Plug Bumped?	Yes	Bump Pressure:	2,300 psi	Floats Held?	Yes
Cement Returns:	0 bbl	Returns Density:	8.4 lb/gal	Returns Temperature:	## °F

**Comment:** Pumped 50 bbls Mud Flush, 100 bbls Tuned Spacer, 21 bbls cap cement, 149 bbls Foamed Lead, 232 bbls Tail. Pumped 268 bbls fresh water for displacement. 30 bbls Mud Flush to surface.

## 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>	N2 Pump Std Rt <i>(scfm)</i>	Comments
Event	1	Call Out	Call Out	6/24/2018	15:30:00	USER						CREW CALLED OUT AT 15:30, REQUESTED ON LOCATION 21:30. CREW PICKED UP CEMENT, CHEMICALS, AND PLUG CONTAINER FROM FT. LUPTON, CO. BULK 660 11527037, IT 12100990, N2 11291534, FOAM UNIT 10724585 AND PUMP 11189145.
Event	2	Depart Yard Safety Meeting	Depart Yard Safety Meeting	6/24/2018	19:30:00	USER						CREW DISCUSSED ROUTES, HAZARDS, AND COMMUNICATION WITH CREW.
Event	3	Crew Leave Yard	Crew Leave Yard	6/24/2018	19:45:00	USER						STARTED JOURNEY MANAGEMENT.
Event	4	Arrive At Loc	Arrive At Loc	6/24/2018	20:45:00	USER						END JOURNEY MANAGEMENT. MEET WITH CO. MAN TO DISCUSS JOB; SURFACE CASING- 9.625" 36 LB/FT @ 1,675', 5.5" CASING: 20 LB/FT TOTAL 12,084', 8.5" HOLE, TD 12,089', 30" SHOE TRAC, TVD- 6,869'. CASING LANDED @ MIDNIGHT 06/25/2018. RIG CIRCULATED 4 BOTTOMS UP.

Event	5	Pre-Rig Up Safety Meeting	Pre-Rig Up Safety Meeting	6/24/2018	21:30:00	USER						HAZARD HUNT. DISCUSSED POSSIBLE HAZARDS ASSOCIATED WITH LOCATION, RIG UP, AND WEATHER.
Event	6	Rig-Up Equipment	Rig-Up Equipment	6/24/2018	21:45:00	USER						CREW STAGED EQUIPMENT AND RIGGED UP BULK, IRON AND WATER HOSES TO PERFORM JOB.
Event	7	Pre-Job Safety Meeting	Pre-Job Safety Meeting	6/25/2018	02:30:00	USER	5.00	8.33	0.00	8.70	0	SAFETY MEETING WITH HALLIBURTON, AND RIG PERSONNEL. CREW COMMUNICATED POTENTIAL SAFETY HAZARDS, AND JOB DETAILS.
Event	8	Start Job	Start Job	6/25/2018	03:36:32	COM6	6.00	8.32	0.00	8.70	0	BEGIN RECORDING JOB DATA.
Event	9	Test Lines	Test Lines	6/25/2018	03:45:06	COM6	112.00	8.40	0.00	3.10	0	PRESSURE TESTED IRON TO 7,190 PSI. KICKOUTS SET @ 500 PSI, KICKED OUT @ 940 PSI, 5TH GEAR STALL OUT @ 1,910 PSI. N2 LINES TESTED TO 9,247 PSI
Event	10	Drop Bottom Plug	Drop Bottom Plug	6/25/2018	04:03:00	COM6	12.00	8.32	0.00	3.20	0	PLUG LEFT CONTAINER, VERIFIED BY CO. MAN.
Event	11	Pump Spacer 1	Pump Spacer 1	6/25/2018	04:03:37	COM6	129.00	8.32	0.00	3.20	0	PUMP 50 BBLS OF MUD FLUSH @ 8.4 LBS/GAL. PUMP RATE 5 BBLS/MIN @ 660 PSI.
Event	12	Pump Spacer 2	Pump Spacer 2	6/25/2018	04:19:49	COM6	493.00	8.42	0.00	0.00	0	PUMP 100 BBLS OF TUNED SPACER @ 12.5 LB/GAL, 15 GALLONS D-AIR. DENSITY VERIFIED BY PRESSURIZED MUD SCALES. PUMP RATE 5 BBLS/MIN @ 740 PSI.

Event	13	Pump Cap Cement	Pump Cap Cement	6/25/2018	04:45:52	COM6	41.00	12.34	0.00	0.00	0	PUMPED CAP 100 SKS OF HALCEM @ 15.6 LB/GAL, 1.18 FT3/SK, 5.18 GAL/SK. 21.02 BBLS, HOCAP CALCULATED @ 515.19', TOL CALCULATED @ 2,223.67'. DENSITY VERIFIED BY PRESSURIZED MUD SCALES. PUMP RATE 5 BBLS/MIN @ 750 PSI.
Event	14	Pump Lead Cement	Pump Lead Cement	6/25/2018	04:50:42	COM6	594.00	15.64	5.00	21.10	0	PUMPED 620 SKS OF HALSEAL @ 13.7 LB/GAL, 1.57 FT3/SK, 7.54 GAL/SK. 149.85 BBLS, HOL CALCULATED @ 3,672.54', TOL CALCULATED @ 2,738.26'. DENSITY VERIFIED BY PRESSURIZED MUD SCALES. PUMP RATE 5 BBLS/MIN 1,100 PSI. 60 GALLONS OF FOAMER AND 70,760 SCF N2 USED.
Event	15	Pump Tail Cement	Pump Tail Cement	6/25/2018	05:19:06	COM6	790.00	14.52	5.00	141.20	0	PUMP 765 SKS OF ELASTICEM @ 14.4 LB/GAL, 1.7 FT3/SK, 7.3 GAL/SK, 231.62 BBLS. HOT CALCULATED @ 5,678.18', TOT CALCULATED @ 6,410.81'. DENSITY VERIFIED BY PRESSURIZED MUD SCALES. PUMP RATE 5 BBLS/MIN @ 500 PSI.
Event	16	Shutdown	Shutdown	6/25/2018	06:10:39	COM6	111.00	14.39	0.00	254.70		SHUTDOWN TO WASH LINES.
Event	17	Drop Top Plug	Drop Top Plug	6/25/2018	06:22:57	COM6	-1.00	7.78	0.00	265.40		PLUG LEFT CONTAINER, VERIFIED BY CO. MAN.
Event	18	Pump Displacement	Pump Displacement	6/25/2018	06:23:03	COM6	0.00	7.71	0.00	265.40		BEGIN CALCULATED DISPLACEMENT OF 268 BBLS WITH FRESH WATER.

											PUMPED THE FIRST 20 BBLS WITH MMCR, PUMPED 200 BBLS WITH BIOCIDES, AND STAFILL.
Event	19	Bump Plug	Bump Plug	6/25/2018	07:08:15	COM6					PLUG BUMPED AT CALCULATED DISPLACEMENT. 2,300 PSI PRESSURED UP TO 3,095 PSI TO ENSURE SEAT. HELD 5 MINUTES. 30 BBLS MUD FLUSH III TO SURFACE.
Event	20	Shift Tool - Lower	Shift Tool - Lower	6/25/2018	07:12:43	USER	3217.00	8.40	0.00	273.50	SHIFT WEATHERFORD WET SHOE SUB AT 5,038PSI. PUMP 5 BBLS FOR WET SHOE.
Event	21	Check Floats	Check Floats	6/25/2018	07:17:20	USER	5.00	8.30	0.00	280.20	FLOATS HELD, 2 BBLS BACK TO TRUCK.
Event	22	End Job	End Job	6/25/2018	07:31:44	COM6					STOP RECORDING JOB DATA.
Event	23	Pre-Rig Down Safety Meeting	Pre-Rig Down Safety Meeting	6/25/2018	07:40:00	USER					DISCUSSED POSSIBLE HAZARDS ASSOCIATED WITH WEATHER, LOCATION AND RIGGING DOWN IRON AND HOSES.
Event	24	Rig-Down Completed	Rig-Down Completed	6/25/2018	09:00:00	USER					ALL HALLIBURTON ITEMS WERE STOWED FOR TRAVEL, AND LOCATION WAS CLEAN.
Event	25	Pre-Convoy Safety Meeting	Pre-Convoy Safety Meeting	6/25/2018	09:30:00	USER					CREW DISCUSSED ROUTES HAZARDS AND COMMUNICATION WITH CREW.
Event	26	Crew Leave Location	Crew Leave Location	6/25/2018	10:00:00	USER					THANK YOU FOR USING HALLIBURTON – NICK PETERSON AND CREW.