

HALLIBURTON

iCem[®] Service

NOBLE ENERGY INC-EBUS

Date: Friday, June 15, 2018

Larson A23-683 Production

Job Date: Monday, June 11, 2018

Sincerely,

Adam McKay

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 Summary4

2.0 Real-Time Job Summary 7

 2.1 Job Event Log7

3.0 Attachments..... 9

 3.1 Larson A23-683-Custom Results.png9

1.0 Cementing Job Summary

1.1 Executive Summary

Halliburton appreciates the opportunity to perform the cementing services on the **Larson A23-683** 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

Sold To #: 345242		Ship To #: 3813428		Quote #: 0022441321		Sales Order #: 0904901508					
Customer: NOBLE ENERGY INC-EBUS				Customer Rep: Rick Oaks							
Well Name: LARSON			Well #: A23-683		API/UWI #: 05-123-45095-00						
Field: WATTENBERG		City (SAP): GILL		County/Parish: WELD		State: COLORADO					
Legal Description: NE NE-24-6N-64W-630FNL-275FEL											
Contractor: H & P DRLG				Rig/Platform Name/Num: H & P 321							
Job BOM: 7523 7523											
Well Type: HORIZONTAL OIL											
Sales Person: HALAMERICA\HB70026				Srv Supervisor: Nicholas Roles							
Job											
Formation Name											
Formation Depth (MD)		Top		Bottom							
Form Type				BHST		230 degF					
Job depth MD		17352ft		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	1908	0	1908	
Casing		5.5	4.778	20			0	17352	0	6760	
Open Hole Section			8.5				2477	6886	2477	6760	
Open Hole Section			8.5				6886	17368	0	0	
Tools and Accessories											
Type	Size in	Qty	Make	Depth ft		Type	Size in	Qty	Make		
Guide Shoe	5.5			17352		Top Plug	5.5	1	HES		
Float Shoe	5.5					Bottom Plug	5.5	2	HES		
Float Collar	5.5			17310.6		SSR plug set	5.5				
Insert Float	5.5					Plug Container	5.5				
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	11.5 lb/gal Tuned Spacer III w/ Chems	Tuned Spacer III			120	bbl	11.5	3.73		8	
0.60 gal/bbl		MUSOL(R) A, 5 GAL PAIL (100064220)									

35.10 gal/bbl		FRESH WATER							
0.60 gal/bbl		DUAL SPACER SURFACTANT B, 5 GAL PAIL (100003665)							
149.34 lbm/bbl		BARITE, BULK (100003681)							
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	ElastiCem	ELASTICEM (TM) SYSTEM	150	sack	13.2	1.57		8	7.53
7.52 Gal		FRESH WATER							
0.90 %		SCR-100 (100003749)							
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 w/ SCBL	ELASTICEM (TM) SYSTEM	484	sack	13.2	1.6		8	7.69
0.40 %		SCR-100 (100003749)							
7.69 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	NeoCem NT1	NeoCem TM	1178	sack	13.2	2.04		8	9.75
9.71 Gal		FRESH WATER							
0.08 %		SCR-100 (100003749)							
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	Displacement	384	bbl	8.33			10	
Cement Left In Pipe		Amount	41 ft		Reason			Shoe Joint	
Mix Water:	pH 06	Mix Water Chloride:	500 ppm			Mix Water Temperature:	68 °F		
Cement Temperature:	71°F	Plug Displaced by:	8.33 lb/gal			Disp. Temperature:	68 °F °C		
Plug Bumped?	Yes	Bump Pressure:	2100psi			Floats Held?	Yes		
Spacer Returns:	0bbl	Returns Density:	## lb/gal			Returns Temperature:	## °F °C		
Comment Got 0bbls spacer to surface. Estimated TOL#1-2477', TOL#2-3504',TOT-6886'									

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)	DS Pump Press (psi)	Comments
Event	1	Call Out	Call Out	6/10/2018	08:00:00	USER				Called out by Service Coordinator for O/L at 1530
Event	2	Depart Yard Safety Meeting	Depart Yard Safety Meeting	6/10/2018	13:45:00	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	6/10/2018	14:00:00	USER				Journey Management prior to departure
Event	4	Arrive at Location from Service Center	Arrive at Location from Service Center	6/10/2018	15:00:00	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	6/10/2018	15:45:00	USER				Discussed rigging up hazards and procedure according to HMS.
Event	6	Other	Other	6/10/2018	16:00:00	USER				Water test- PH-6, Chlor-0, Temp-85.
Event	7	Safety Meeting - Pre Job	Safety Meeting - Pre Job	6/10/2018	18:30:00	USER				Held safety meeting with all job associated personnel to discuss job procedure, hazards and stop work authority.
Event	8	Start Job	Start Job	6/10/2018	19:14:01	COM4				TD-17368', TP-17351.8' 5.5" 20#, FC-17310.6', TVD-6760', SURF-1908' 9.625" 36#, OH-8.5" MUD-9.6#
Event	9	Test Lines	Test Lines	6/10/2018	19:16:13	COM4	8.30		4604.00	Pumped 5bbls fresh water to fill lines, closed 2" lo torc, performed 500psi k/o function test, followed with 5th gear stall at 1380psi, Performed 3000psi test on Rig Kelly Line. Held pressure, no leaks. proceeded to bring pressure to 4500psi, pressure stabilized and held with no leaks.
Event	10	Drop Bottom Plug	Drop Bottom Plug	6/10/2018	19:24:31	COM4				Dropped by HES supervisor, witnessed by company man.
Event	11	Pump Spacer 1	Pump Spacer 1	6/10/2018	19:25:18	COM4	11.50	4.00	389.00	Pumped 120bbls Tuned Spacer III 11.5# 3.78y 23.5g/s with 70g Musol A, 70g Dual Spacer B and 20g D-Air at 8bpm 676psi.
Event	12	Check Weight	Check Weight	6/10/2018	19:27:18	COM4	11.47	4.00	365.00	Weight verified with pressurized mud scales.
Event	13	Shutdown	Shutdown	6/10/2018	19:44:52	COM4				
Event	14	Drop Bottom Plug	Drop Bottom Plug	6/10/2018	19:47:09	COM4				Dropped by HES supervisor, witnessed by company man.

Event	15	Pump Lead Cement	Pump Lead Cement	6/10/2018	19:47:11	COM4	13.41	5.50	281.00	Pumped 150sks or 41.9bbbls Elasticem w/o CBL 13.2# 1.57y 7.53g/s at 8bpm 520psi.
Event	16	Check Weight	Check Weight	6/10/2018	19:49:08	COM4	13.43	5.50	286.00	Weight verified with pressurized mud scales.
Event	17	Pump Lead Cement	Pump Lead Cement	6/10/2018	19:53:32	COM4	13.16	4.90	267.00	Pumped 484sks or 138bbbls Elasticem w/CBL 13.2# 1.6y 7.69g/s at 8bpm 560psi.
Event	18	Check Weight	Check Weight	6/10/2018	19:56:15	COM4	13.06	4.90	268.00	Weight verified with pressurized mud scales.
Event	19	Pump Tail Cement	Pump Tail Cement	6/10/2018	20:15:52	COM4	13.23	5.50	404.00	Pumped 1178sks or 428bbbls 13.2# 2.04y 9.75g/s Neocem at 8bpm 600psi.
Event	20	Check Weight	Check Weight	6/10/2018	20:17:24	COM4	13.14	5.50	405.00	Weight verified with pressurized mud scales.
Event	21	Check Weight	Check Weight	6/10/2018	20:53:55	COM4	13.18	8.00	891.00	Weight verified with pressurized mud scales.
Event	22	Shutdown	Shutdown	6/10/2018	21:15:38	COM4				Shutdown, rig blew air through lines to pits, followed with 5bbbls fresh water through pumps and lines.
Event	23	Drop Top Plug	Drop Top Plug	6/10/2018	21:26:25	COM4				Dropped by HES supervisor, witnessed by company man.
Event	24	Pump Displacement	Pump Displacement	6/10/2018	21:26:27	COM4	7.99	10.10	480.00	Pumped 384bbbls fresh water with 10g MMCR in first 20bbbls, 15g Algicide throughout.
Event	25	Bump Plug	Bump Plug	6/10/2018	22:11:10	COM4	8.39	3.10	1661.00	Slowed down to 3bpm at 360bbbls away, final circulating pressure-1600psi, Bump pressure-2100psi.
Event	26	End Job	End Job	6/10/2018	22:18:22	COM4				Got 0bbbls spacer to surface. Estimated TOL#1-2477', TOL#2-3504',TOT-6886'
Event	27	Safety Meeting - Pre Rig-Down	Safety Meeting - Pre Rig-Down	6/10/2018	22:20:00	USER				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	28	Pre-Convoy Safety Meeting	Pre-Convoy Safety Meeting	6/11/2018	00:45:00	USER				All HSE present and fit to drive. Aware of directions and hazards.
Event	29	Depart Location for Service Center or Other Site	Depart Location for Service Center or Other Site	6/11/2018	01:00:00	USER				Pre journey managment prior to departure.

3.0 Attachments

3.1 Larson A23-683-Custom Results.png

