

HALLIBURTON

iCem[®] Service

NOBLE ENERGY INC-EBUS

Date: Friday, June 01, 2018

Larson A23-662 Production

Job Date: Thursday, May 31, 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 Summary	4
2.0	Real-Time Job Summary	7
2.1	Job Event Log	7
3.0	Attachments.....	9
3.1	Larson A23-662-Custom Results.png	9

1.0 Cementing Job Summary

1.1 Executive Summary

Halliburton appreciates the opportunity to perform the cementing services on the **Larson A23-662** 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 #: 3827259		Quote #:		Sales Order #: 0904878622	
Customer: NOBLE ENERGY INC - EBUS				Customer Rep: Jim Turner			
Well Name: LARSON			Well #: A23-662			API/UWI #: 05-123-45513-00	
Field: WATTENBERG		City (SAP): GILL		County/Parish: WELD		State: COLORADO	
Legal Description: SW NW-19-6N-63W-2329FNL-535FWL							
Contractor: H & P DRLG				Rig/Platform Name/Num: H & P 321			
Job BOM: 7523 7523							
Well Type: HORIZONTAL OIL							
Sales Person: HALAMERICA\HB70026				Srvc Supervisor: Nicholas Roles			
Job							

Formation Name			
Formation Depth (MD)	Top		Bottom
Form Type		BHST	230 degF
Job depth MD	18083ft	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		J-55	0	1963	0	1963
Casing	0	5.5	4.778	20	BUTTRESS	P-110	0	18083	0	6759
Open Hole Section			8.5				2446	6882	2446	6759
Open Hole Section			8.5				6882	18100	0	0

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		
	34.70 gal/bbl	FRESH WATER								
	0.60 gal/bbl	DUAL SPACER SURFACTANT B, 5 GAL PAIL (100003665)								
	149.34 lbm/bbl	BARITE, BULK (100003681)								
	0.60 gal/bbl	MUSOL A, 330 GAL TOTE - (790828)								

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 Cap	ELASTICEM (TM) SYSTEM	140	sack	13.2	1.68		8	8.04		
8.06 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	464	sack	13.2	1.68		8	8.06		
8.08 Gal		FRESH WATER									
0.45 %		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		
4	NeoCem NT1	NeoCem TM	1260	sack	13.2	2.04		8	9.75		
9.75 Gal		FRESH WATER									
0.07 %		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	400	bbl	8.33			10			
Cement Left In Pipe		Amount	42ft		Reason			Shoe Joint			
Mix Water:		pH 06	Mix Water Chloride:		0ppm		Mix Water Temperature:			67 °F	
Cement Temperature:		70 °F °C		Plug Displaced by:		8.33 lb/gal		Disp. Temperature:			67 °F
Plug Bumped?		Yes		Bump Pressure:		psi MPa		Floats Held?			Yes
Cement Returns:		0 bbl		Returns Density:		## lb/gal kg/m3		Returns Temperature:			## °F °C
Comment Got 0bbls spacer to surface. Estimated TOL#1-2446', TOL#2-3475',TOT-6882'											

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>	Comments
Event	1	Depart Yard Safety Meeting	Depart Yard Safety Meeting	5/30/2018	03:45:00	USER				Held meeting with all personnel in convoy to discuss directions and hazards associated with drive, all fit to drive.
Event	2	Depart from Service Center or Other Site	Depart from Service Center or Other Site	5/30/2018	04:00:00	USER				Journey Management prior to departure
Event	3	Call Out	Call Out	5/30/2018	13:00:00	USER				Called out by Service Coordinator for O/L at 1930
Event	4	Arrive at Location from Service Center	Arrive at Location from Service Center	5/30/2018	18:00:00	USER				Upon arrival met with company man to discuss job details and calculations, performed hazard hunt and site assessment. Rig had 2000' casing left to run.
Event	5	Pre-Rig Up Safety Meeting	Pre-Rig Up Safety Meeting	5/30/2018	18:15:00	USER				Discussed rigging up hazards and procedure according to HMS.
Event	6	Other	Other	5/30/2018	19:15:00	USER				Water test- PH-6, Chlor-0, Temp-65.
Event	7	Safety Meeting - Pre Job	Safety Meeting - Pre Job	5/30/2018	23:00:00	USER				Held safety meeting with all job associated personnel to discuss job procedure, hazards and stop work authority.
Event	8	Start Job	Start Job	5/31/2018	00:01:03	COM4				TD-18100', TP-18083' 5.5" 20#, FC-18041', TVD-6759', SURF-1963' 9.625" 36#, OH-8.5" MUD-9.7#
Event	9	Drop Bottom Plug	Drop Bottom Plug	5/31/2018	00:01:42	COM4				Dropped by HES supervisor, witnessed by company man.
Event	10	Test Lines	Test Lines	5/31/2018	00:04:32	COM4	8.51		2498.00	Pumped 5bbls fresh water to fill lines, closed 2" lo torc, performed 500psi k/o function test, followed with 5th gear stall at 1480psi, Performed 2500psi test on Rig Kelly Line. Held pressure, no leaks. proceeded to bring pressure to 4500psi, pressure stabilized and held with no leaks.
Event	11	Pump Spacer 1	Pump Spacer 1	5/31/2018	00:24:40	COM4	11.62	4.00	368.00	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 600psi.
Event	12	Drop Bottom Plug	Drop Bottom Plug	5/31/2018	00:45:24	COM4				Dropped by HES supervisor, witnessed by company man.
Event	13	Pump Lead Cement	Pump Lead Cement	5/31/2018	00:46:17	COM4	13.40	5.50	358.00	Pumped 140sks or 41.9bbls Elasticem w/o CBL 13.2# 1.68y 8.04g/s at

8bpm 650psi.

Event	14	Check Weight	Check Weight	5/31/2018	00:48:56	COM4	13.24	5.50	369.00	Weight verified with pressurized mud scales.
Event	15	Pump Lead Cement	Pump Lead Cement	5/31/2018	00:52:50	COM4	13.27	8.00	627.00	Pumped 464sks or 139bbbls Elasticem w/CBL 13.2# 1.68y 8.06g/s at 8bpm 680psi.
Event	16	Check Weight	Check Weight	5/31/2018	00:54:50	COM4	13.26	8.00	598.00	Weight verified with pressurized mud scales.
Event	17	Pump Tail Cement	Pump Tail Cement	5/31/2018	01:12:17	COM4	13.16	4.00	247.00	Pumped 1260sks or 458bbbls 13.2# 2.04y 9.75g/s Neocem at 8bpm 600psi.
Event	18	Check Weight	Check Weight	5/31/2018	01:13:56	COM4	13.22	8.00	739.00	Weight verified with pressurized mud scales.
Event	19	Check Weight	Check Weight	5/31/2018	01:55:53	COM4	13.21	8.00	834.00	Weight verified with pressurized mud scales.
Event	20	Shutdown	Shutdown	5/31/2018	02:23:21	COM4				Shutdown, rig blew air through lines to pits, followed with 5bbbls fresh water through pumps and lines.
Event	21	Drop Top Plug	Drop Top Plug	5/31/2018	02:26:54	COM4				Dropped by HES supervisor, witnessed by company man.
Event	22	Pump Displacement	Pump Displacement	5/31/2018	02:26:56	COM4	8.10	10.10	561.00	Pumped 400bbbls fresh water with 10g MMCR in first 20bbbls, 20g Algicide throughout.
Event	23	Bump Plug	Bump Plug	5/31/2018	03:11:01	COM4	8.38	3.20	1818.00	Slowed down to 3bpm at 375bbbls away, final circulating pressure-1780psi, Bump pressure-2158psi.
Event	24	Check Floats	Check Floats	5/31/2018	03:16:26	USER				Released pressure and got 4bbbls fresh water to truck, floats held.
Event	25	End Job	End Job	5/31/2018	03:19:14	COM4				Got 0bbbls spacer to surface. Estimated TOL#1-2446', TOL#2-3475',TOT-6882'
Event	26	Safety Meeting - Pre Rig-Down	Safety Meeting - Pre Rig-Down	5/31/2018	03:20:00	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	27	Pre-Convoy Safety Meeting	Pre-Convoy Safety Meeting	5/31/2018	04:45:00	USER				All HSE present and fit to drive. Aware of directions and hazards.
Event	28	Depart Location for Service Center or Other Site	Depart Location for Service Center or Other Site	5/31/2018	05:00:00	USER				Pre journey management prior to departure.

3.0 Attachments

3.1 Larson A23-662-Custom Results.png

