

HALLIBURTON

iCem[®] Service

ANADARKO PETROLEUM CORP - EBUS

Date: Thursday, April 09, 2015

GRISWOLD 3N-11HZ

Intermediate

Job Date: Saturday, March 07, 2015

Sincerely,

Justin Lansdale

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1.0 Cementing Job Summary

1.1 Executive Summary

Halliburton appreciates the opportunity to perform the cementing services on the **GRISWOLD 3N-11HZ** cement **Intermediate** 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 [Fort Lupton]

	Date	Time (24hr)
Callout:	3/7/2015	4300
On Location:	3/7/2015	930
Job Started:	3/7/2015	1431
Job Completed:	3/7/2015	1700
Departed Location:	3/7/2015	1800
Verified Ticket With:	3/7/2015	RYAN WYCOFF

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Cementing Job Summary

The Road to Excellence Starts with Safety

Sold To #: 300466		Ship To #: 3642201		Quote #:		Sales Order #: 0902200626				
Customer: ANADARKO PETROLEUM CORP - EBUS				Customer Rep: ANADARKO						
Well Name: GRISWOLD		Well #: 3N-11HZ		API/UWI #: 05-123-40996-00						
Field: WATTENBERG		City (SAP): IONE		County/Parish: WELD		State: COLORADO				
Legal Description: SE SW-11-1N-66W-560FSL-1983FWL										
Contractor: ENSIGN DRLG		Rig/Platform Name/Num: ENSIGN 145								
Job BOM: 7522										
Well Type: HORIZONTAL GAS										
Sales Person: HALAMERICA\HB0191				Srv Supervisor: Vaughn Oteri						
Job										
Formation Name										
Formation Depth (MD)		Top		Bottom						
Form Type				BHST						
Job depth MD		7896ft		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	1770		0
Casing		7	6.276	26		HCP110	0	7883		0
Open Hole Section			8.75				1757	7896	0	0
Tools and Accessories										
Type	Size in	Qty	Make	Depth ft	Type	Size in	Qty	Make		
Guide Shoe	7				Top Plug	7		HES		
Float Shoe	7			7883	Bottom Plug	7		HES		
Float Collar	7			7804	SSR plug set	7		HES		
Insert Float	7				Plug Container	7		HES		
Stage Tool	7				Centralizers	7		HES		
Miscellaneous Materials										
Gelling Agt		Conc		Surfactant		Conc	Acid Type		Qty	Conc
Treatment Fld		Conc		Inhibitor		Conc	Sand Type		Size	Qty
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	Fresh Water Spacer	Fresh Water Spacer	20	bbl	8.33					
Fluid Data										
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	

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Cementing Job Summary

2	Mud Flush III (Powder)	Mud Flush III	40	bbl	8.35				
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
3	Fresh Water Spacer	Fresh Water Spacer	20	bbl	8.33				
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	Lead Cement	ECONOCEM (TM) SYSTEM	870	sack	13.8	1.6		4	7.09
7.09 Gal		FRESH WATER							
47 lbm		CMT - PREMIUM - CLASS G REG OR TYPE V, BULK (100003685)							
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		298	bbl	10.5				
Cement Left In Pipe		Amount 90 ft			Reason		Shoe Joint		
Comment 3BBL OF CEMENT BACK TO SURFACE									

1.2 Planned Pumping Schedule

1.3 Pump Schedule

Description	Stage No.	Density (ppg)	Rate (bbl/min)	Yield (ft ³ /sack)	Water Req. (gal/sack)	Volume (bbl)	Bulk Cement (sacks)	Duration (min)
Intermediate Mud	1	10.30	5.00			0.00		0.00
Fresh Water	2	8.33	5.00			10.00		2.00
Mud Flush	3	8.40	5.00			40.00		8.00
Fresh Water	4	8.33	5.00			10.00		2.00
Anadarko 13.8ppg 2213100	5-1	13.80	6.00	1.6042	7.085	248	870	24.76
Shutdown	5-2			1.6042	7.085		0.00	5.00
Top Plug/Start Displacement								
Intermediate Mud	6-1	10.30	6.00			170.00		28.33
Intermediate Mud	6-2	10.30	3.00			128.69		42.90
Total:						507.26		112.99

*Pump schedule may include additional rows for displacement if "Automatic Rate Adjustment" was enabled and ECDs approached the fracture gradient.

1.3 Job Overview

Job OverView

		Units	Description
1	Surface temperature at time of job	°F	55
2	Mud type (OBM, WBM, SBM, Water, Brine)	-	WBM
3	Actual mud density	lb/gal	10.2
4	Time circulated before job	HH:MM	N/A
5	Mud volume circulated	bbls	N/A
6	Rate at which well was circulated	bpm	N/A
7	Pipe movement during circulation	Y/N	N
8	Rig pressure while circulating	psi	N/A
9	Time from end mud circulation to start of job	HH:MM	N/A
10	Pipe movement during cementing	Y/N	N
11	Calculated displacement	bbls	298
12	Job displaced by	Rig/HES	HES
13	Annular before Job	Y/N	Y
14	Annular flow after job	Y/N	N
15	Length of rat hole	ft	13
16	Units of gas detected while circulating	Units	N/A
17	Was lost circulation experienced at any time?	Y/N	N

1.4 Water Field Test

Cement Mix Water Requirements

Item	Recorded Test Value	Max Acceptable Limit	Potential Problems in Exceeding Limit
pH	6	5 to 8.5	Chemicals in water can cause severe retardation
Chlorides	0	3000 mg/L	Can accelerate the set time on cement 1% ~ 4800 mg/L
Sulfates	<200	1500 mg/L	Will greatly decrease its strength to the point where it may not set up at all
Total Hardness or Alkalinity	4	500 mg/L	Will retard cement and decrease its strength (only occurs @ pH ≥ 8.3)
Calcium	n/a	500 mg/L	High concentrations will accelerate the set of cement
Bicarbonates	n/a	1000 mg/L	Will greatly decrease its strength to the point where it may not set up at all
Iron	0	300 mg/L	High concentrations will accelerate the set of cement
Potassium	n/a	5000 ppm	High concentrations will accelerate the set of cement
Water Temp	39	50F to 80F	High temps will accelerate; Low temps may risk freezing in cold weather

2.0 Real-Time Job Summary

2.1 Job Event Log

Type	Seq. No.	Activity	Graph Label	Date	Time	Source	Comb Pump Rate (bbl/min)	DH Density (ppg)	PS Pump Press (psi)	Comments
Event	1	Call Out	Call Out	3/7/2015	04:30:00	USER				CALL OUT FROM ARS OFFICE
Event	2	Arrive At Loc	Arrive At Loc	3/7/2015	09:30:00	USER				ARRIVE ON LOCATION MET WITH COMPANY REP TO DISCUSS JOB PROCESS AND CONCERNS ADVISED THAT THEY HAD APPROXIMATELY 1000 FEET OF CASING LEFT TO RUN INTO THE HOLE
Event	3	Casing on Bottom	Casing on Bottom	3/7/2015	12:45:00	USER				ADVISED BY RIG CREW THAT CASING WAS ON BOTTOM AND WAS SAFE FOR HES TO RIG UP TO THE FLOOR
Event	4	Start Job	Start Job	3/7/2015	14:40:53	COM6				HELD PREJOB SAFTY MEETING IN DOG HOUSE WITH ALL HANDS ON LOCATION TO DISCUSS JOB PROCESS AND HAZARDS
Event	5	Test Lines	Test Lines	3/7/2015	14:43:46	COM6				PRESSURE TESTED PUMPS AND LINES FOUND NO LEAKS AND PRESSURE HELD GOOD
Event	6	Pump Spacer 1	Pump Spacer 1	3/7/2015	14:48:47	COM6	2.9	8.47	320	PUMPED 20BBL OF FRESH WATER AT 3.0BPM 315PSI
Event	7	Pump Spacer 2	Pump Spacer 2	3/7/2015	14:57:16	COM6	2.90	8.32	320.00	MIXED 40BBL OF MUD FLUSH AT 3.0BPM 365PSI
Event	8	Pump Spacer 1	Pump Spacer 1	3/7/2015	15:09:24	COM6	4.60	8.35	502.00	PUMPED 20BBL OF FRESH WATER WITH RED TRACER DYE AT 4.5BPM 524PSI

Event	9	Drop Bottom Plug	Drop Bottom Plug	3/7/2015	15:16:48	COM6	2.00	8.32	429.00	RELEASED BOTTOM PLUG WITNESSED BY COMPANY REP
Event	10	Pump Lead Cement	Pump Lead Cement	3/7/2015	15:17:16	COM6	2.00	8.32	436.00	MIXED 247BBL OF 13.8 ECONOCHEM AT 8.0BPM 877PSI
Event	11	Check Weight	Check weight	3/7/2015	15:26:14	COM6	6.20	14.22	874.00	CONFIRM WEIGHT WITH SCALES
Event	12	Check Weight	Check weight	3/7/2015	15:52:48	COM6	7.40	13.88	437.00	CONFIRM WEIGHT WITH SCALES
Event	13	Shutdown	Shutdown	3/7/2015	16:01:07	COM6				
Event	14	Drop Top Plug	Drop Top Plug	3/7/2015	16:05:49	COM6				RELEASED TOP PLUG WITNESSED BY COMPANY REP
Event	15	Pump Displacement	Pump Displacement	3/7/2015	16:06:01	COM6	9.00	10.50	350.00	PUMPED 298BBL OF DRILL MUD TO DISPLACE CEMENT
Event	16	Bump Plug	Bump Plug	3/7/2015	16:57:07	COM6				BUMP PLUG 500PSI OVER FINAL PUMP PRESSURE
Event	17	Other	Other	3/7/2015	17:02:13	COM6				RELEASED PRESSURE OFF TO PUMP TRUCK TO CHECK FLOATS , FLOATS HELD GOOD 2.5BBL BACK
Event	18	Pressure Up Well	Pressure Up Well	3/7/2015	17:05:34	COM6				PRESSURE UP CASING FOR TEST PER ANADARKO POLICY
Event	19	Other	Other	3/7/2015	17:36:05	COM6				RELEASE PRESSURE OFF CASING

2.2 Custom Graph

