

HALLIBURTON

iCem[®] Service

TERRA ENERGY PARTNERS-EBUS

Rock Springs District, COLORADO

For: DARRELL LEATHERMAN

Date: Monday, January 06, 2020

FEDERAL RWF 22-12

4 ½" Production Casing

Post Job Report

Job Date: Monday, January 06, 2020

Sincerely,

DUANE PUGMIRE

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
1.2	Job Overview	5
1.3	Planned Pumping Schedule	5
1.4	Water Analysis Report	6
2.0	Real-Time Job Summary	7
2.1	Job Event Log	7
3.0	Attachments.....	9
3.1	CHART WITHOUT EVENTS.png	9
3.2	CHART WITH EVENTS.png	10

1.0 Cementing Job Summary

1.1 Executive Summary

Halliburton appreciates the opportunity to perform the cementing services for this cementing services 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, Rock Springs

Job Times

	Date	Time	Time Zone
Called Out	01/05/2020	09:00	MST
On Location	01/05/2020	19:00	MST
Job Started	01/05/2020	22:48	MST
Job Complete	01/06/2020	01:00	MST
Depart Location	01/06/2020	02:00	MST

1.2 Job Overview

		Units	Description
1	Surface temperature at time of job	°F	35
2	Mud type (OBM, WBM, SBM, Water, Brine)	lb/gal	WBM
3	Actual mud density	lb/gal	12.6
4	Time circulated before job	HH:MM	1:00
5	Mud volume circulated	Bbls	10.7
6	Rate at which well was circulated	Bpm	600
7	Pipe movement during hole circulation	Y/N	N
8	Rig pressure while circulating	Psi	1300
9	Time from end mud circulation to start of job	HH:MM	00:10
10	Pipe movement during cementing	Y/N	N
11	Calculated displacement	Bbls	137.1
12	Job displaced by	Rig/HES	HES
13	Annular flow before job	Y/N	N
14	Annular flow after job	Y/N	N
15	Length of rat hole	Ft	7
16	Units of gas detected while circulating	Units	1000
17	Was lost circulation experienced at any time ?	Y/N	N

1.3 Planned Pumping Schedule

Description	Stage No.	Density (ppg)	Rate (bbl/min)	Yield (ft ³ /sack)	Water Req. (gal/sack)	Volume (bbl)	Bulk Cement (sacks)	Duration (min)
10 lb/gal Base Production Mud	1	10.00	8.00			0.00		0.00
Water	2	8.33	6.00			10.00		1.67
Mud Flush	3	8.40	6.00			20.00		3.33
ThermaCem TEP Deep Tail (2591582/1)	4	13.30	8.00	1.7943	8.498	389.89	1220.00	48.74
Top Plug/Start Displacement								
Water	5-1	8.33	10.00			108.53		10.85
Water	5-2	8.33	4.00			30.00		7.50
Total:						558.42		72.09

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

1.4 Water Analysis Report

CEMENT MIX WATER REQUIREMENTS

Item	Recorded Test Value	Units	Max. Acceptable Limit	Potential Problems in Exceeding Limit
pH	8	----	6.0 - 8.0	Chemicals in the water can cause severe retardation
Chlorides	0	ppm	3000 ppm	Can shorten thickening time of cement
Temperature	75	°F	50-80 °F	High temps will accelerate; Low temps may risk freezing in cold weather

2.0 Real-Time Job Summary

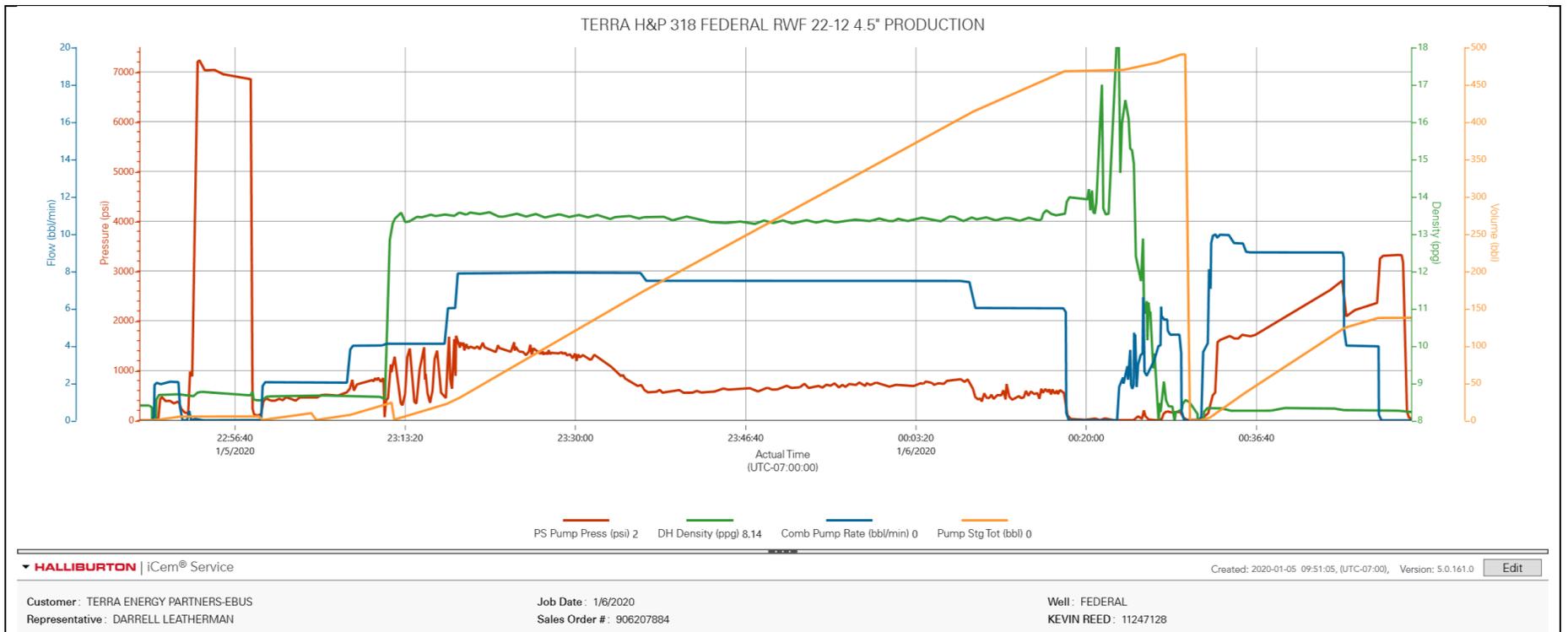
2.1 Job Event Log

Type	Seq. No.	Graph Label	Date	Time	Source	PS Pump Press <i>(psi)</i>	DH Density <i>(ppg)</i>	Comb Pump Rate <i>(bbl/min)</i>	Pump Stg Tot <i>(bbl)</i>	Comments
Event	1	Call Out	1/5/2020	09:00:00	USER					CALLED OUT FOR TERRA PRODUCTION ON LOCATION AT 19:00
Event	2	Pre-Convoy Safety Meeting	1/5/2020	11:30:00	USER					HALLIBURTON CEMENT CREW DISCUSSED THE HAZARDS OF DRIVING AND THE DIRECTIONS TO LOCATION
Event	3	Crew Leave Yard	1/5/2020	12:00:00	USER					
Event	4	Arrive At Loc	1/5/2020	19:00:00	USER					STILL RUNNING CASING. TD= 8879, TP 7", 8871.94' 11.6# P-110. HOLE= 8.75", CENT= 30, MUD= 12.6#, SHOE= 29.46'
Event	5	Assessment Of Location Safety Meeting	1/5/2020	19:10:00	USER					HALLIBURTON CEMENT CREW DISCUSSED THE HAZARDS OF THE LOCATION.
Event	6	Pre-Rig Up Safety Meeting	1/5/2020	19:20:00	USER					HALLIBURTON CEMENT CREW DISCUSSED THE HAZARDS OF RIGGING UP THE EQUIPMENT.
Event	7	Rig-Up Equipment	1/5/2020	19:30:00	USER					
Event	8	Pre-Job Safety Meeting	1/5/2020	22:00:00	USER	2.00	8.40	0.00	24.00	HALLIBURTON CEMENT CREW, RIG CREW AND COMPANY REP. DISCUSSED THE HAZARDS OF THE JOB AND THE JOB PROCEEDURE.
Event	9	Start Job	1/5/2020	22:48:00	COM4	2.00	8.40	0.00	0.00	
Event	10	Pump Water	1/5/2020	22:49:00	USER	11.00	8.65	2.00	0.50	PUMP 5 BBLS OF WATER TO FILL PUMPS AND LINES.
Event	11	Shutdown	1/5/2020	22:51:00	USER	373.00	8.70	2.00	4.60	
Event	12	Pressure Test	1/5/2020	22:53:00	USER	7190.00	8.74	0.00	5.20	PRESSURE TESTED HES LINES: 500 PSI LOW KICK OUT, 6500 PSI FOR HIGH PRESSURE.
Event	13	Pump Spacer	1/5/2020	22:59:00	USER	115.00	8.54	0.00	5.20	PUMP 10 BBLS OF H2O SPACER AT 8.33 PPG., AT 4 BPM. ESTIMATED TOP OF WATER SPACER AT 1169'.
Event	14	Pump MUDFLUSH Spacer 1	1/5/2020	23:04:00	USER	505.00	8.64	2.00	9.40	PUMPED 20 BBLS OF MUDFLUSH SPACER AT 4 BPM. ESTIMATED TOP OF MUDFLUSH AT 1351.8'

Event	15	Pump Cement	1/5/2020	23:12:14	USER	1238.00	13.37	4.10	0.90	PUMP 1220 SACKS OF THERMACEM CEMENT AT 13.3 PPG., 1.79 YLD., 8.5 GAL/ SACK 8 BPM. EST. TOP OF CEMENT AT 1717.4'.
Event	16	Check Weight	1/5/2020	23:13:10	COM4	314.00	13.33	4.10	4.70	
Event	17	Check Weight	1/5/2020	23:23:00	USER	1445.00	13.46	7.90	64.80	
Event	18	Check Weight	1/5/2020	23:38:17	USER	611.00	13.43	7.50	185.20	
Event	19	Check Weight	1/5/2020	23:52:09	USER	698.00	13.34	7.40	288.60	
Event	20	Check Weight	1/6/2020	00:03:40	USER	734.00	13.44	7.40	374.50	
Event	21	Shutdown	1/6/2020	00:18:01	USER	541.00	13.54	4.10	468.40	
Event	22	Clean Lines	1/6/2020	00:23:14	USER	2.00	15.74	1.90	468.60	
Event	23	Drop Top Plug	1/6/2020	00:30:22	USER	2.00	8.35	0.00	0.00	COMPANY REP. WITNESSED THE PLUG DROP
Event	24	Pump Displacement	1/6/2020	00:31:00	USER	2.00	1.05	0.00	0.00	PUMPED 137.1 BBLS OF KCL DISPLACEMENT, FIRST 10 BBLS WITH MMCR, 30 BBLS WITH BE-6 AT 9 BPM
Event	25	Slow Rate	1/6/2020	00:45:00	USER	2802.00	8.27	9.00	121.80	HALLIBURTON PUMPED 7.5 BBLS OF H2O AT 4 BPM. FOR A TOTAL OF 137.1 BBLS OF DISPLACEMENT.
Event	26	BUMP PLUG	1/6/2020	00:48:26	USER	2362.00	8.26	4.00	136.70	BUMP PLUG AT 2362 PSI WENT UP TO 3326 PRESSURE
Event	27	Check Floats	1/6/2020	00:50:32	USER	3326.00	8.26	0.00	137.50	FLOATS HELD WITH 2 BBLS BACK TO HES PUMP
Event	28	End Job	1/6/2020	00:55:00	USER	2.00	8.18	0.00	137.50	FULL RETURNS THROUGHOUT JOB
Event	29	Pre-Rig Down Safety Meeting	1/6/2020	01:00:00	USER	2.00	8.20	0.00	0.00	HALLIBURTON CEMENT CREW DISCUSSED THE HAZARDS OF RIGGING DOWN THE EQUIPMENT
Event	30	Rig-Down Equipment	1/6/2020	01:10:00	USER	2.00	8.16	0.00	0.00	
Event	31	Pre-Convoy Safety Meeting	1/6/2020	01:50:00	USER					HALLIBURTON CEMENT CREW DISCUSSES THE HAZARDS OF DRIVING.
Event	32	Crew Leave Location	1/6/2020	02:00:00	USER					
Event	33	Job Complete	1/6/2020	02:00:01	USER					NO ACCIDENTS, NO INCIDENTS. THANKS FROM THE ROCK SPRINGS HALLIBURTON CEMENT CREW.

3.0 Attachments

3.1 CHART WITHOUT EVENTS.png



3.2 CHART WITH EVENTS.png

