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# Rocky Mountain Natural Gas, LLC Lab Report

Test/Iteration 13287-4  
Prod Lead

8/5/2019



**Lab Report**

Rocky Mountain Natural Gas, LLC  
1515 Wynkoop Street #500 | Denver, CO 80202  
8/5/2019

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Dear Rocky Mountain Natural Gas, LLC,

Thank you for the opportunity to submit a lab report for cementing services on the attached wellbore. BJ Services' priority is providing premium customer service while operating in a safe, efficient manner. If you have any questions regarding the proposal or services offered, please contact BJ Services at any time.

Sincerely,

**Zen Keith**

Technical Specialist-II | (307) 757-7178 | Zen.Keith@bjservices.com

**Field Office**      28730 US-6, Rifle, CO 81650  
Phone: (307) 360-3062

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## 1 General Lab Test Information

Date:	8/5/2019
Well Name:	WOLF CREEK 9-D3
Well API #:	05-097-06017
Fluid Type:	Lead
Job Type:	Production
Test Type	Pilot
TMD:	5185 ft
TVD:	5608 ft
BHCT:	109 °F
BHST:	140 °F
Temperature Gradient:	1.20 °F/100ft
Surface Temperature:	80 °F
Density:	12.50 lb/gal
Yield:	2.14 ft <sup>3</sup> /sk
Water Requirement:	11.95 gal/sk
Sack Weight:	94.00 lbs
Fluid SG:	1.50
Service District:	Rifle

## 2 Material Weigh-up Information

No	Material	Function	Type	Form	Concen.	Uom	SG	Weight (g)	Volume (mL)	Lot
1	Type III	Cement	Base	Dry	100.00	%	3.14	423.78	134.96	
2	Gypsum	Extender	Additive	Dry	2.00	%BWOB	2.70	8.48	3.14	
3	IntegraSeal PHENO	LostCirculation	Additive	Dry	3.00	lb/sk	1.40	13.53	9.66	
4	Sodium Metasilicate	Extender	Additive	Dry	0.30	%BWOB	2.18	1.27	0.58	
5	FP-25	Defoamer	Additive	Dry	0.30	%BWOB	1.94	1.27	0.65	
6	FL-66	FluidLoss	Additive	Dry	0.70	%BWOB	1.47	2.97	2.02	
	Water	-	-	-	-	-	1.00	448.98	448.98	
								900.27	600.00	

Density: 12.50 lb/gal Yield: 2.14 ft<sup>3</sup>/sk SG: 1.50 Water Req.: 11.95 gal/sk Water Src: Tap Water SG: 1.00

### 3 Test Analysis/Results

#### Mixability Analysis

	#1
Vortex:	Half Dollar Size @ 12,000 RPM

#### Free Fluid Analysis

	#1
Sample size:	250 mL
Measured Free Fluid:	1.4 mL
% Free Fluid:	0.6
Channeling:	None

#### Fluid Loss Analysis

	#1
Measured Fluid Loss:	85 ml
Test Time:	0:10:49 min
ISO Fluid Loss:	283.12 ml

#### Rheology Analysis

	#1	#2
Test Temperature:	70 °F	109 °F
Conditioning Time:	0	30
YP:	1.5 lb/100ft <sup>2</sup>	3.1 lb/100ft <sup>2</sup>
PV:	14.5 cP	12.9 cP
600 rpm:	30.5	28.9
300 rpm:	16	16
200 rpm:	11	12
100 rpm:	7	8
60 rpm:	5	6
30 rpm:	3	4
6 rpm:	0.6	1.6
3 rpm:	0.5	1.3

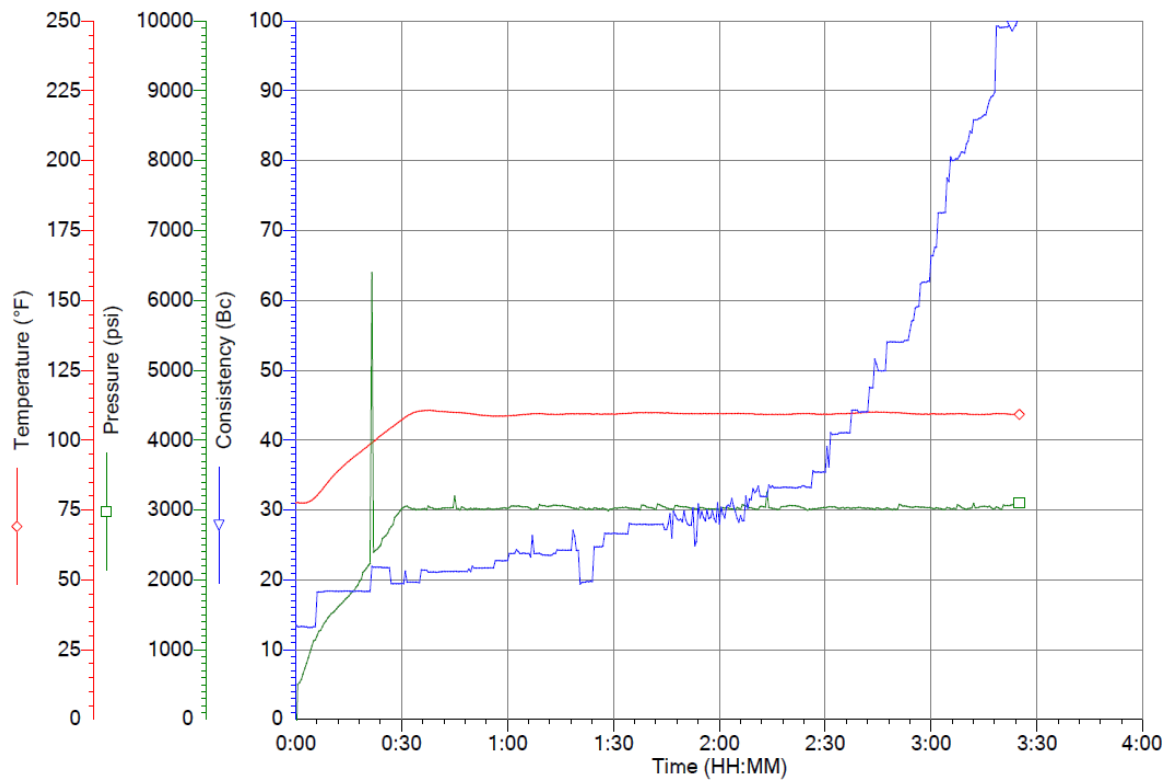
### Thickening Time Analysis

	#1
Initial Consistency:	14 bc
30 bc:	2:00 (HH:MM)
50 bc:	2:44 (HH:MM)
70 bc:	3:02 (HH:MM)
100 bc:	3:24 (HH:MM)
Termination Time:	3:25 (HH:MM)
Termination Consistency:	100 bc

Instrument: 05-271  
50 Bc: 2:44:00

Initial Consistency: 14 Bc  
70 Bc: 3:02:00

30Bc: 2:02:00  
100 Bc: 3:24:30



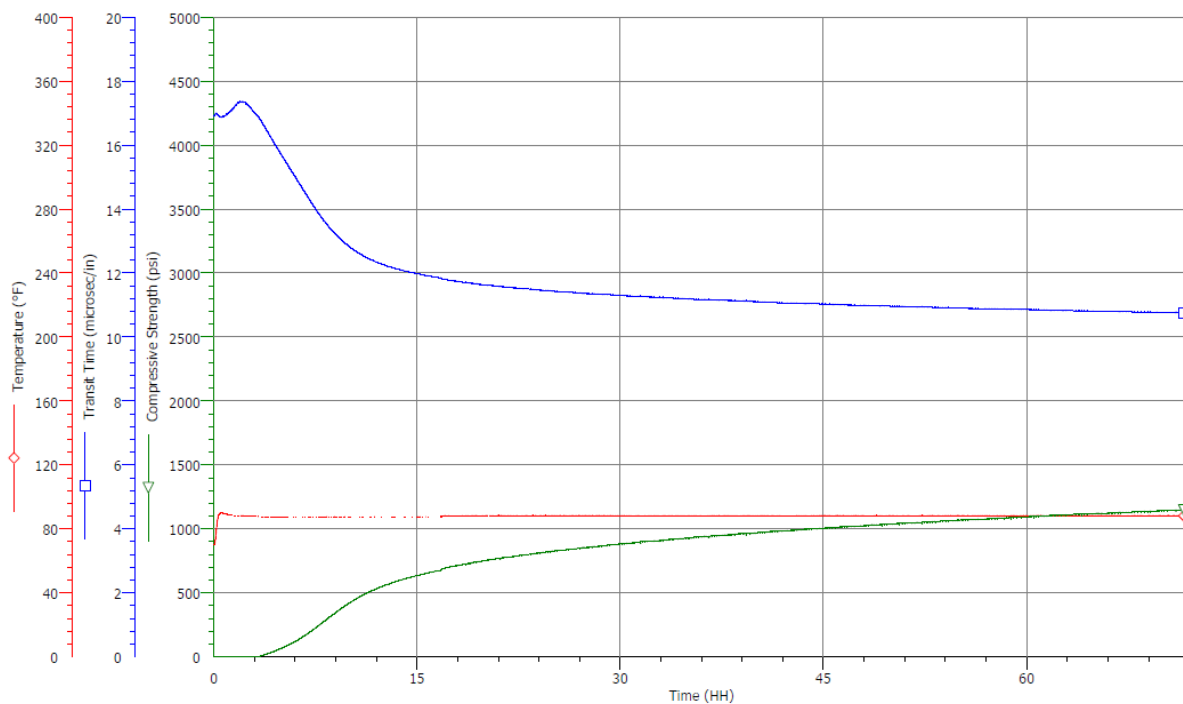
### UCA Compressive Strength Analysis

	#1
Test Temperature:	95 °F
Time to 50 psi:	4:36 (HH:MM)
Time to 500 psi:	11:19 (HH:MM)
6h Strength:	120 psi
12h Strength:	532 psi
24h Strength:	811 psi
48h Strength:	1024 psi
72h Strength:	1151 psi
Algorithm:	A

Well ID:  
Test Start: 8/1/2019 2:56:29 PM  
Test Stop: 8/5/2019 7:39:55 AM

Customer: Rocky Mountain  
Strength: 1216 psi  
Algorithm: Compressive strength type A (less than 14 lb/gal)

BHST:  
50 psi @ 4:36:30  
500 psi @ 11:19:00



## 4 Conditioning Schedules

### Fluid Loss #1

No	Time (min)	Temp (°F)	Pressure (psi)	Conditioning	Static
1	30	109	0	Yes	No

### Thickening Time #1

No	Time (min)	Temp (°F)	Pressure (psi)	Conditioning	Static
1	0	80	409	Yes	No
2	30	109	3011	Yes	No
3	999	109	3011	Yes	No

### Rheology #2

No	Time (min)	Temp (°F)	Pressure (psi)	Conditioning	Static
1	30	109	0	Yes	No

### UCA Compressive Strength #1

No	Time (min)	Temp (°F)	Pressure (psi)	Conditioning	Static
1	0	80	0	Yes	No
2	30	109	0	Yes	No
3	60	109	0	Yes	No
4	0	80	800	No	Yes
5	10	95	800	No	Yes
6	4310	95	800	No	Yes

### Free Fluid #1

No	Time (min)	Temp (°F)	Pressure (psi)	Conditioning	Static
1	30	109	0	Yes	No