



Certificate of Analysis
Number: 2500-18070053-001A

Windsor Laboratory
208 Main Street – Unit A
Windsor, CO 80550

Kristy Johnson
Sandridge
123 Robert Skerr Ave.
Oklahoma City, OK 73102

July 20, 2018

Station Name: Peters 0781 16-12 H13
Sample Point: Separator
Meter Number: CO04R0046
Cylinder No: 1030-09050
Analyzed: 07/19/2018 11:09:25 by James Lowe

Sampled By: MK
Sample Of: Liquid Spot
Sample Date: 07/13/2018 11:23
Sample Conditions: 132 psig, @ 145 °F
Method: GPA 2186

Analytical Data

Table with 4 columns: Components, Mol. %, Wt. %, L.V. %. Rows include Nitrogen, Carbon Dioxide, Methane, Ethane, Propane, Iso-Butane, n-Butane, Iso-Pentane, n-Pentane, Hexanes Plus, and totals.

Table with 3 columns: Calculated Physical Properties, Total, C6+. Rows include Specific Gravity at 60°F, API Gravity at 60°F, Molecular Weight, Pounds per Gallon (in Vacuum), Pounds per Gallon (in Air), Cu. Ft. Vapor per Gallon @ 14.73 psia, Specific Gravity as a vapor, Calculated Vapor Pressure @ 100°F, BTU / GAL., and BTU / LB.

Handwritten signature of Andy Hartman

Hydrocarbon Laboratory Manager

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.



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Analytical Data

Components	Mol. %	Wt. %	L.V. %
Nitrogen	0.106	0.034	0.029
Carbon Dioxide	0.313	0.158	0.133
Methane	4.336	0.798	1.826
Ethane	2.508	0.866	1.668
Propane	8.346	4.224	5.716
Iso-Butane	2.156	1.438	1.753
n-Butane	9.747	6.503	7.640
Iso-Pentane	4.649	3.850	4.227
n-Pentane	6.308	5.224	5.685
Hexanes	9.299	9.073	9.320
Heptanes Plus	52.232	67.832	62.003
	100.000	100.000	100.000

Calculated Physical Properties	Total	C7+
Specific Gravity at 60°F	0.6865	0.7511
API Gravity at 60°F	74.6181	56.8858
Molecular Weight	87.118	113.138
Pounds per Gallon (in Vacuum)	5.723	6.262
Pounds per Gallon (in Air)	5.717	6.255
Cu. Ft. Vapor per Gallon @ 14.73 psia	24.873	20.956
BTU / GAL.	117528	126833
BTU / LB.	20537	20254

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Ethane	2.508	0.866	1.668
Propane	8.346	4.224	5.716
Iso-Butane	2.156	1.438	1.753
n-Butane	9.747	6.503	7.640
Iso-Pentane	4.649	3.850	4.227
n-Pentane	6.308	5.224	5.685
i-Hexanes	5.271	5.089	5.201
n-Hexane	4.028	3.984	4.119
Benzene	0.372	0.333	0.260
Cyclohexane	1.699	1.641	1.439
2,2,4-Trimethylpentane	0.172	0.226	0.225
i-Heptanes	10.993	11.782	11.035
n-Heptane	3.033	3.489	3.481
Toluene	1.018	1.077	0.849
i-Octanes	11.299	14.039	13.103
n-Octane	1.805	2.367	2.302
Ethylbenzene	0.657	0.801	0.629
Xylenes	1.989	2.425	1.914
i-Nonanes	8.090	11.441	10.352
n-Nonane	1.909	2.811	2.671
i-Decanes	5.375	8.494	7.388
Decanes Plus	3.821	6.906	6.355
	100.000	100.000	100.000

Calculated Physical Properties	Total	C10+
API Gravity at 60°F	74.6181	52.4647
Pounds per Gallon (in Air)	5.717	6.406
Pounds per Gallon (in Vacuum)	5.723	6.413
Cu. Ft. Vapor per Gallon @ 14.73 psia	24.873	16.641
Specific Gravity at 60°F	0.6865	0.7692
Molecular Weight	87.118	145.895
BTU / GAL.	117528	129959
BTU / LB.	20537	20267

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Meter Number: CO04R0046
Cylinder No: 1030-09050

Sampled By: MK
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Sample Date: 07/13/2018 11:23
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Analytical Data

Table with 7 columns: Test, Method, Result, Units, Detection Limit, Lab Tech., Analysis Date. Rows include API Gravity @ 60° F, Specific Gravity @ 60/60° F, Density @ 60° F, VP of Crude Oil: V/L = 4:1 @ 100 °F, and RVPE (D323 Equivalent) @ 100 °F.

Handwritten signature of Andy Hartman

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Certificate of Analysis
 Number: 2500-18070053-001B

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July 20, 2018

Station Name: Peters 0781 16-12 H13
 Sample Point: Separator
 Meter Number: CO04R0046
 Cylinder No: 1030-06403
 Analyzed: 07/19/2018 09:06:04 by James Lowe

Sampled By: MK
 Sample Of: Gas Spot
 Sample Date: 07/13/2018 10:47
 Sample Conditions: 140 psig, @ 145 °F
 Method: GPA 2286

Analytical Data

Components	Mol. %	Wt. %	GPM at 14.73 psia		
Nitrogen	4.270	4.387		GPM TOTAL C2+	9.277
Carbon Dioxide	2.476	3.996		GPM TOTAL C3+	6.837
Methane	62.339	36.678		GPM TOTAL iC5+	1.775
Ethane	9.072	10.004	2.440		
Propane	11.024	17.828	3.054		
Iso-butane	1.448	3.087	0.476		
n-Butane	4.832	10.300	1.532		
Iso-pentane	1.143	3.024	0.420		
n-Pentane	1.253	3.316	0.457		
Hexanes Plus	2.143	7.380	0.898		
	100.000	100.000	9.277		

Calculated Physical Properties	Total	C6+
Relative Density Real Gas	0.9466	3.2423
Calculated Molecular Weight	27.27	93.91
Compressibility Factor	0.9942	
GPA 2172-09 Calculation:		
Calculated Gross BTU per ft³ @ 14.73 psia & 60°F		
Real Gas Dry BTU	1489	5087
Water Sat. Gas Base BTU	1463	4999
VOC Weight Fraction	0.4494	

Comments: H2S 28 ppm

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Analytical Data

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Nitrogen	4.270	4.387		GPM TOTAL C2+	9.277
Carbon Dioxide	2.476	3.996		GPM TOTAL C3+	6.837
Methane	62.339	36.678		GPM TOTAL iC5+	1.775
Ethane	9.072	10.004	2.440		
Propane	11.024	17.828	3.054		
Iso-Butane	1.448	3.087	0.476		
n-Butane	4.832	10.300	1.532		
Iso-Pentane	1.143	3.024	0.420		
n-Pentane	1.253	3.316	0.457		
Hexanes	0.852	2.640	0.343		
Heptanes Plus	1.291	4.740	0.555		
	100.000	100.000	9.277		

Calculated Physical Properties	Total	C7+
Relative Density Real Gas	0.9466	3.4519
Calculated Molecular Weight	27.27	99.98
Compressibility Factor	0.9942	
GPA 2172-09 Calculation:		
Calculated Gross BTU per ft³ @ 14.73 psia & 60°F		
Real Gas Dry BTU	1489	5361
Water Sat. Gas Base BTU	1463	5268
VOC Weight Fraction	0.4494	
Comments: H2S 28 ppm		

Andy Hartman

Hydrocarbon Laboratory Manager

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 Method: GPA 2286

Analytical Data

Components	Mol. %	Wt. %	GPM at 14.73 psia	
Nitrogen	4.270	4.387		
Methane	62.339	36.678		
Carbon Dioxide	2.476	3.996		
Hydrogen Sulfide	NIL	NIL		
Ethane	9.072	10.004	2.440	
Propane	11.024	17.828	3.054	
Iso-Butane	1.448	3.087	0.476	
n-Butane	4.832	10.300	1.532	
Iso-Pentane	1.143	3.024	0.420	
n-Pentane	1.253	3.316	0.457	
i-Hexanes	0.532	1.630	0.211	
n-Hexane	0.320	1.010	0.132	
Benzene	0.020	0.059	0.006	
Cyclohexane	0.089	0.271	0.030	
2,2,4-Trimethylpentane	0.006	0.026	0.003	
i-Heptanes	0.562	1.886	0.226	
n-Heptane	0.109	0.397	0.050	
Toluene	0.026	0.092	0.009	
i-Octanes	0.287	1.127	0.132	
n-Octane	0.034	0.143	0.018	
Ethylbenzene	0.008	0.028	0.003	
Xylenes	0.020	0.080	0.008	
i-Nonanes	0.088	0.396	0.046	
n-Nonane	0.010	0.052	0.006	
i-Decanes	0.028	0.149	0.016	
n-Decane	0.002	0.013	0.001	
Undecanes	0.002	0.019	0.001	
Dodecanes	NIL	0.002	NIL	
Tridecanes	NIL	NIL	NIL	
Tetradecanes Plus	NIL	NIL	NIL	
	<u>100.000</u>	<u>100.000</u>	<u>9.277</u>	

GPM TOTAL C2+ 9.277



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Calculated Physical Properties	Total
Calculated Molecular Weight	27.267
GPA 2172-09 Calculation:	
Calculated Gross BTU per ft³ @ 14.73 psia & 60°F	
Real Gas Dry BTU	1489.1
Water Sat. Gas Base BTU	1463.2
Relative Density Real Gas	0.9466
Compressibility Factor	0.9942
Comments: H2S 28 ppm	

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