



The following analytical results were produced using the strictest quality control and most current methods:

COC #: N/A

Lab #: 43666-43683

Quality Control #: 4167

Report Contents:

Pages 2-19: analytical results

Pages 20-22: QA/QC analysis

Approved by:

Neil Ray

Neil Ray

Date: 05/25/16



Sample Matrix: Gas
 Sample Type: N/A
 Preservative: N/A
 Sample Container: 500 ml Cylinder
 # M51537

Client: Air Products
 Project Location: N.A
 Sample Id.: 253254BLM-R1-YJP

Method(s): ASTM D 1945
 Gas Analysis by Gas
 Chromatography
 GPA 2145-09 - Calculations/
 Physical Constants
 GPA 2172 – Calculation of
 Gross Heating Value
 H2S by GC-FPD

Sample Temp.: 64°F
 Atmospheric Temp.: N/A
 Pressure: 575 psig
 Field Data: N/A
 Sample Date: 04/28/16 Time: 1:25 pm
 Sampled by: N/A
 Analysis Date: 05/23/16 – 05/24/16
 Analysis By: Trey Rogers

Lab #: 43681

Quality Control Report: 4167

Analytical Results

<u>Gas Composition</u>	<u>Mol %</u>	<u>GPM</u>
Nitrogen (N2):	2.4950	0.2736
Carbon Dioxide (CO2):	97.3153	16.4968
Helium (He):	0.0762	0.0077
Hydrogen (H2):	0.0000	0.0000
Oxygen (O2):	0.0077	0.0007
Argon (Ar):	0.0225	0.0020
Carbon Monoxide (CO):	0.0000	0.0000
Water Vapor (H2O):	<3 ppmv	
Hydrogen Sulfide (H2S):	<0.08 ppmv	
<u>Hydrocarbon Composition</u>	<u>Mol %</u>	<u>GPM</u>
Methane (CH4):	0.0789	0.0135
Ethane (C2H6):	0.0024	0.0006
Propane (C3H8):	0.0015	0.0004
Iso-Butane (C4H10):	0.0000	0.0000
N-Butane (C4H10):	0.0002	0.0001
Iso-Pentane (C5H12):	0.0000	0.0000
N-Pentane (C5H12):	0.0001	0.0000
Hexane+ (C6H14):	0.0002	0.0001
Totals	100.0000	16.7955

Comments - Additional Data

BTU -dry (BTU/ft3):	0.9	Z-Comp. Factor-dry:	0.99465
BTU -water vapor sat.(BTU/ft3):	0.9	Z-Comp. Factor-water vapor sat.:	0.99420
Specific Gravity -dry:	1.5113	14.65 psi Pressure Base	
Specific Gravity-water vapor sat.:	1.4965		
Gasoline Content (GPM)			
Ethane & Heavier	0.0012	Butane & Heavier	0.0002
Propane & Heavier	0.0006	Pentane & Heavier	0.0001



Sample Matrix: Gas
 Sample Type: N/A
 Preservative: N/A
 Sample Container: 500 ml Cylinder
 # M51538
 Method(s): ASTM D 1945
 Gas Analysis by Gas
 Chromatography
 GPA 2145-09 - Calculations/
 Physical Constants
 GPA 2172 – Calculation of
 Gross Heating Value
 H2S by GC-FPD

Client: Air Products
 Project Location: N.A
 Sample Id.: 253254BLM-R2-YJP

 Sample Temp.: 64°F
 Atmospheric Temp.: N/A
 Pressure: 571 psig
 Field Data: N/A
 Sample Date: 04/28/16 Time: 3:45 pm
 Sampled by: N/A
 Analysis Date: 05/23/16 – 05/24/16
 Analysis By: Trey Rogers

Lab #: 43682
 Quality Control Report: 4167

Analytical Results

<u>Gas Composition</u>	<u>Mol %</u>	<u>GPM</u>
Nitrogen (N2):	5.1351	0.5629
Carbon Dioxide (CO2):	94.6509	16.0415
Helium (He):	0.0896	0.0091
Hydrogen (H2):	0.0022	0.0002
Oxygen (O2):	0.0060	0.0005
Argon (Ar):	0.0308	0.0028
Carbon Monoxide (CO):	0.0000	0.0000
Water Vapor (H2O):	<3 ppmv	
Hydrogen Sulfide (H2S):	0.12 ppmv	
<u>Hydrocarbon Composition</u>	<u>Mol %</u>	<u>GPM</u>
Methane (CH4):	0.0786	0.0134
Ethane (C2H6):	0.0038	0.0010
Propane (C3H8):	0.0025	0.0007
Iso-Butane (C4H10):	0.0000	0.0000
N-Butane (C4H10):	0.0003	0.0001
Iso-Pentane (C5H12):	0.0002	0.0001
N-Pentane (C5H12):	0.0000	0.0000
Hexane+ (C6H14):	0.0000	0.0000
Totals	100.0000	16.6323

Comments - Additional Data

BTU -dry (BTU/ft3):	0.9	Z-Comp. Factor-dry:	0.99488
BTU -water vapor sat.(BTU/ft3):	0.9	Z-Comp. Factor-water vapor sat.:	0.99443
Specific Gravity -dry:	1.4961	14.65 psi Pressure Base	
Specific Gravity-water vapor sat.:	1.4816		
Gasoline Content (GPM)			
Ethane & Heavier	0.0019	Butane & Heavier	0.0002
Propane & Heavier	0.0009	Pentane & Heavier	0.0001



Sample Matrix: Gas
 Sample Type: N/A
 Preservative: N/A
 Sample Container: 500 ml Cylinder
 # M51539

Client: Air Products
 Project Location: N.A
 Sample Id.: 253254BLM-R3-YJP

Method(s): ASTM D 1945
 Gas Analysis by Gas
 Chromatography
 GPA 2145-09 - Calculations/
 Physical Constants
 GPA 2172 – Calculation of
 Gross Heating Value
 H2S by GC-FPD

Sample Temp.: 64°F
 Atmospheric Temp.: N/A
 Pressure: 623 psig
 Field Data: N/A
 Sample Date: 04/28/16 Time: 4:38 pm
 Sampled by: N/A
 Analysis Date: 05/23/16 – 05/24/16
 Analysis By: Trey Rogers

Lab #: 43683

Quality Control Report: 4167

Analytical Results

<u>Gas Composition</u>	<u>Mol %</u>	<u>GPM</u>
Nitrogen (N2):	4.9886	0.5469
Carbon Dioxide (CO2):	94.7608	16.0603
Helium (He):	0.0896	0.0091
Hydrogen (H2):	0.0029	0.0003
Oxygen (O2):	0.0059	0.0005
Argon (Ar):	0.0260	0.0023
Carbon Monoxide (CO):	0.0000	0.0000
Water Vapor (H2O):	<3 ppmv	
Hydrogen Sulfide (H2S):	0.39 ppmv	
<u>Hydrocarbon Composition</u>	<u>Mol %</u>	<u>GPM</u>
Methane (CH4):	0.1219	0.0208
Ethane (C2H6):	0.0026	0.0007
Propane (C3H8):	0.0015	0.0004
Iso-Butane (C4H10):	0.0000	0.0000
N-Butane (C4H10):	0.0000	0.0000
Iso-Pentane (C5H12):	0.0001	0.0000
N-Pentane (C5H12):	0.0000	0.0000
Hexane+ (C6H14):	0.0001	0.0000
Totals	100.0000	16.6413

Comments - Additional Data

BTU -dry (BTU/ft3):	1.3	Z-Comp. Factor-dry:	0.99487
BTU -water vapor sat.(BTU/ft3):	1.3	Z-Comp. Factor-water vapor sat.:	0.99442
Specific Gravity -dry:	1.4965	14.65 psi Pressure Base	
Specific Gravity-water vapor sat.:	1.4820		
Gasoline Content (GPM)			
Ethane & Heavier	0.0012	Butane & Heavier	0.0001
Propane & Heavier	0.0005	Pentane & Heavier	0.0001



QUALITY CONTROL ANALYSIS

Sample Matrix: Gas
 Sample Type: Standard
 Preservative: N/A
 Sample Container: Industrial
 Cylinder

Sample Id.: DCG
 Reference Std. 53619AW
 Sample Temp.: 120° F
 Analysis Date: 05/23/16
 Analysis By: Trey Rogers

Method(s): ASTM D 1945
 Gas Analysis by Gas
 Chromatography

GPA 2145-09 - Calculations/
 Physical Constants
 GPA 2172-09 – Calculation of
 Gross Heating Value

Quality Control Report#: 4167

Analytical Results

RESULTS	ACTUAL	ANALYSIS			
<u>Gas Composition</u>			MDL	RL	% Deviation
	Mol %	Mol %	Mol %	ppm mol	(90-100%)
Nitrogen (N2):	4.918	4.9696	0.0010	10	99.0
Carbon Dioxide (CO2):	1.499	1.4832	0.0010	10	98.9
			MDL	RL	% Deviation
<u>Hydrocarbon Composition</u>	Mol %	Mol %	Mol %	ppm mol	(90-100%)
Methane (CH4):	69.891	70.5375	0.0001	1	99.1
Ethane (C2H6):	9.111	8.8703	0.0001	1	97.4
Propane (C3H8):	5.984	5.9321	0.0001	1	99.1
Iso-Butane (C4H10):	3.024	2.9424	0.0001	1	97.3
N-Butane (C4H10):	3.040	2.9127	0.0001	1	95.8
Iso-Pentane (C5H12):	1.012	0.9622	0.0001	1	95.1
N-Pentane (C5H12):	1.018	0.9191	0.0001	1	90.3
Hexane+ (C6H14):	0.503	0.4708	0.0001	1	93.6
Totals	100.000	100.000			

Comments - Additional Data

ACTUAL		ANALYSIS	
BTU -dry (BTU/ft3):	1324.0	BTU -dry (BTU/ft3):	1317.5
BTU -water vapor sat. (BTU/ft3):	1318.4	BTU -water vapor sat. (BTU/ft3):	1295.2
Specific Gravity -dry:	0.8349	Specific Gravity -dry:	0.8264
Specific Gravity -water vapor sat.:	0.8419	Specific Gravity -water vapor sat.:	0.8232
Z-Comp. Factor -dry:	0.99564	Z-Comp. Factor -dry:	0.99572
Z-Comp. Factor -water vapor sat.:	0.98306	Z-Comp. Factor -water vapor sat.:	0.99530



QUALITY CONTROL ANALYSIS

Sample Matrix: Gas
 Sample Type: Standard
 Preservative: N/A
 Sample Container: Industrial
 Cylinder

Sample Id.: Matheson Tri Gas
 Reference Std. SX42424
 Sample Temp.: 120° F
 Analysis Date: 05/23/16
 Analysis By: Trey Rogers

Method(s): ASTM D 1945
 Gas Analysis by Gas
 Chromatography

GPA 2145-09 - Calculations/
 Physical Constants
 GPA 2172-09 – Calculation of
 Gross Heating Value

Quality Control Report#: 4167

Analytical Results

RESULTS	ACTUAL	ANALYSIS			
<u>Gas Composition</u>			MDL	RL	% Deviation
	<u>Mol %</u>	<u>Mol %</u>	<u>Mol %</u>	<u>ppm mol</u>	<u>(90-100%)</u>
Helium (He):	0.510	0.4896	0.0010	10	96.0
Hydrogen (H2):	0.990	0.9548	0.0010	10	96.4
Oxygen (O2):	0.980	0.9156	0.0010	10	93.4
Nitrogen (N2):	3.050	2.9150	0.0010	10	95.6
Carbon Monoxide (CO):	1.020	1.0190	0.0010	10	99.9
Totals	6.550	6.294			



Sample Matrix: Gas
 Sample Type: Standard
 Preservative: Aluminum Inert Cylinder
 Sample Container: Industrial Cylinder

Sample Id.: Matheson Tri Gas
 Reference Std.SX048765
 Sample Temp.: 74° F
 Analysis Date: 05/24/16
 Analysis By: Neil Ray

Method(s): ASTM D 6228
 Sulfur Compounds by Gas
 Chromatography /Flame
 Photometric Detector

Quality Control Report#: 4167

Analytical Results

RESULTS	ACTUAL	ANALYSIS			
<u>Gas Composition</u>			MDL	RL	
	ppm vol.	ppm vol.	ppm vol.	ppb vol.	% Deviation
Hydrogen Sulfide	1.03	1.19	0.01	10	84.5