



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
 # M51525
 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-R1-SCP

 Sample Temp.: 60.9°F
 Atmospheric Temp.: N/A
 Pressure: 750 psig
 Field Data: N/A
 Sample Date: 04/27/16 Time: 8:45 am
 Sampled by: N/A
 Analysis Date: 05/23/16 – 05/24/16
 Analysis By: Trey Rogers

Lab #: 43669

Quality Control Report: 4167

Analytical Results

<u>Gas Composition</u>	<u>Mol %</u>	<u>GPM</u>
Nitrogen (N2):	2.0685	0.2268
Carbon Dioxide (CO2):	97.7252	16.5670
Helium (He):	0.0918	0.0093
Hydrogen (H2):	0.0019	0.0002
Oxygen (O2):	0.0084	0.0007
Argon (Ar):	0.0095	0.0009
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):	0.0745	0.0127
Ethane (C2H6):	0.0030	0.0008
Propane (C3H8):	0.0043	0.0012
Iso-Butane (C4H10):	0.0011	0.0004
N-Butane (C4H10):	0.0032	0.0010
Iso-Pentane (C5H12):	0.0014	0.0005
N-Pentane (C5H12):	0.0023	0.0008
Hexane+ (C6H14):	0.0048	0.0021
Totals	100.0000	16.8244

Comments – Additional Data

BTU –dry (BTU/ft3):	1.5	Z-Comp. Factor-dry:	0.99462
BTU –water vapor sat.(BTU/ft3):	1.4	Z-Comp. Factor-water vapor sat.:	0.99416
Specific Gravity –dry:	1.5137	14.65 psi Pressure Base	
Specific Gravity-water vapor sat.:	1.4988		
Gasoline Content (GPM)			
Ethane & Heavier	0.0068	Butane & Heavier	0.0048
Propane & Heavier	0.0060	Pentane & Heavier	0.0034



Sample Matrix: Gas
 Sample Type: N/A
 Preservative: N/A
 Sample Container: 500 ml Cylinder
 # M51526

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

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.: 60.9°F
 Atmospheric Temp.: N/A
 Pressure: 700 psig
 Field Data: N/A
 Sample Date: 04/27/16 Time: 10:29 am
 Sampled by: N/A
 Analysis Date: 05/23/16 – 05/24/16
 Analysis By: Trey Rogers

Lab #: 43670

Quality Control Report: 4167

Analytical Results

<u>Gas Composition</u>	<u>Mol %</u>	<u>GPM</u>
Nitrogen (N2):	2.7856	0.3054
Carbon Dioxide (CO2):	96.9774	16.4393
Helium (He):	0.0889	0.0090
Hydrogen (H2):	0.0010	0.0001
Oxygen (O2):	0.0000	0.0000
Argon (Ar):	0.0180	0.0016
Carbon Monoxide (CO):	0.0000	0.0000
Water Vapor (H2O):	<3 ppmv	
Hydrogen Sulfide (H2S):	0.25 ppmv	
<u>Hydrocarbon Composition</u>	<u>Mol %</u>	<u>GPM</u>
Methane (CH4):	0.0797	0.0136
Ethane (C2H6):	0.0059	0.0016
Propane (C3H8):	0.0112	0.0031
Iso-Butane (C4H10):	0.0034	0.0011
N-Butane (C4H10):	0.0088	0.0028
Iso-Pentane (C5H12):	0.0043	0.0016
N-Pentane (C5H12):	0.0056	0.0020
Hexane+ (C6H14):	0.0104	0.0045
Totals	100.0000	16.7856

Comments – Additional Data

BTU –dry (BTU/ft3):	2.5	Z-Comp. Factor-dry:	0.99467
BTU –water vapor sat.(BTU/ft3):	2.5	Z-Comp. Factor-water vapor sat.:	0.99422
Specific Gravity –dry:	1.5098	14.65 psi Pressure Base	
Specific Gravity-water vapor sat.:	1.4950		
Gasoline Content (GPM)			
Ethane & Heavier	0.0166	Butane & Heavier	0.0120
Propane & Heavier	0.0151	Pentane & Heavier	0.0081



Sample Matrix: Gas
 Sample Type: N/A
 Preservative: N/A
 Sample Container: 500 ml Cylinder
 # M51527

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

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.: 61°F
 Atmospheric Temp.: N/A
 Pressure: 600 psig
 Field Data: N/A
 Sample Date: 04/27/16 Time: 12:00 pm
 Sampled by: N/A
 Analysis Date: 05/23/16 – 05/24/16
 Analysis By: Trey Rogers

Lab #: 43671

Quality Control Report: 4167

Analytical Results

<u>Gas Composition</u>	<u>Mol %</u>	<u>GPM</u>
Nitrogen (N2):	2.3883	0.2619
Carbon Dioxide (CO2):	97.4246	16.5157
Helium (He):	0.0782	0.0079
Hydrogen (H2):	0.0000	0.0000
Oxygen (O2):	0.0000	0.0000
Argon (Ar):	0.0168	0.0015
Carbon Monoxide (CO):	0.0000	0.0000
Water Vapor (H2O):	<3 ppmv	
Hydrogen Sulfide (H2S):	0.17 ppmv	
<u>Hydrocarbon Composition</u>	<u>Mol %</u>	<u>GPM</u>
Methane (CH4):	0.0605	0.0103
Ethane (C2H6):	0.0030	0.0008
Propane (C3H8):	0.0067	0.0018
Iso-Butane (C4H10):	0.0021	0.0007
N-Butane (C4H10):	0.0056	0.0018
Iso-Pentane (C5H12):	0.0030	0.0011
N-Pentane (C5H12):	0.0038	0.0014
Hexane+ (C6H14):	0.0074	0.0032
Totals	100.0000	16.8080

Comments – Additional Data

BTU –dry (BTU/ft3):	1.7	Z-Comp. Factor-dry:	0.99464
BTU –water vapor sat.(BTU/ft3):	1.7	Z-Comp. Factor-water vapor sat.:	0.99419
Specific Gravity –dry:	1.5123	14.65 psi Pressure Base	
Specific Gravity-water vapor sat.:	1.4975		
Gasoline Content (GPM)			
Ethane & Heavier	0.0108	Butane & Heavier	0.0081
Propane & Heavier	0.0100	Pentane & Heavier	0.0057



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