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17025

Accreditation No 2013

Amended Certificate of Analysis



**BUREAU
VERITAS**

Origin Energy Resources Ltd
GPO Box 148
Brisbane QLD 4001

Attention: Matt Kerke

Project 14PEBR0003569
Collected by P.Marty
Client Ref: PO 16174462

Customer Sample ID		Talinga-23	Talinga-71
Sample Type		Wellhead Gas	Wellhead Gas
Date Sampled		16/04/2014	16/04/2014
Time Sampled		1132 h	1310 h
Pressure		238 kPag	616 kPag
Temperature		28°C	31°C
Cylinder ID		#459	#049
Test/Reference	Unit		
Dräger Tube Test			
Mercaptans (ppm v/v)*	mL/m ³	< 0.10	< 0.10
Name Of Component*		Carbon Disulphide	Carbon Disulphide
Component (ppm v/v)*	mL/m ³	<0.30	<0.30
Name Of Component*		Carbonyl Sulphide	Carbonyl Sulphide
Component (ppm v/v)*	mL/m ³	<0.40	<0.80
Name Of Component*		Arsine	Arsine
Component (ppm v/v)*	mL/m ³	< 0.10	< 0.10
H2S by Wet Chemistry ASTM D2385			
Total H2S @ 15°C*	mg/m ³	0.23	0.20
Total H2S (ml/ cu m (ppm)) @ 20°C*	mL / cu m	0.16	0.14
Total Mercury ISO 6978:1992A (OS-02-01)			
Total Mercury*	µg/m ³	0.05	0.02
Oxygen In-house Method GC-09			
Oxygen	Mol %	0.01	< 0.01
Radioactive Material OS-03-01			
Radioactivity*	Bq/m ³	177 +/- 84	< 130
Trace Elements			
Trace Elements*		See attached table	See attached table
GAS ANALYSIS			
Test/Reference	Unit		
Gas Analysis In-house Method GC-01			
Nitrogen	Mol %	1.50	1.34
Carbon Dioxide	Mol %	0.12	0.13
Methane	Mol %	98.37	98.52
Ethane	Mol %	0.012	0.011
Propane	Mol %	0.0016	0.0010
I-Butane	Mol %	0.0004	0.0003
N-Butane	Mol %	0.0007	0.0006
I-Pentane	Mol %	0.0004	0.0005
N-Pentane	Mol %	0.0004	0.0006
Hexanes	Mol %	< 0.01	< 0.01
Heptanes	Mol %	< 0.01	< 0.01
Octanes and higher hydrocarbons	Mol %	< 0.01	< 0.01
Total	Mol %	100.00	100.00



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Pressure	238 kPag	616 kPag
Temperature	28°C	31°C
Cylinder ID	#459	#049
GAS ANALYSIS		
Test/Reference	Unit	
Gas Parameters		
Average Molecular Weight	16.26	16.24
Lower Flammability Limit	5.08	5.07
Upper Flammability Limit	15.25	15.22
Ratio Of Upper To Lower	3.00	3.00
Wobbe Index	49.53	49.62
Compressibility Factor (Z)	0.9980	0.9980
Ideal Gas Density (Rel to Air = 1)	0.561	0.561
Real Gas Density (Rel to Air = 1)	0.562	0.562
Ideal Nett Calorific Value	MJ/m ³ 33.41	33.46
Ideal Gross Calorific Value	MJ/m ³ 37.11	37.16
Real Nett Calorific Value	MJ/m ³ 33.47	33.52
Real Gross Calorific Value	MJ/m ³ 37.18	37.23
Gross Calorific Val Water-Sat Gas	MJ/m ³ 36.45	36.51
Extended Gas In-house Method GC-04		
Nitrogen	Mol % 1.50	1.34
Carbon Dioxide	Mol % 0.12	0.13
Methane	Mol % 98.37	98.52
Ethane	Mol % 0.012	0.011
Propane	Mol % 0.0016	0.0010
I-Butane	Mol % 0.0004	0.0003
N-Butane	Mol % 0.0007	0.0006
I-Pentane	Mol % 0.0004	0.0005
N-Pentane	Mol % 0.0004	0.0006
Hexanes; C-6	Mol % < 0.0001	< 0.0001
Benzene	Mol % < 0.0001	< 0.0001
Cyclohexane	Mol % < 0.0001	< 0.0001
Heptanes; C-7	Mol % < 0.0001	< 0.0001
Methylcyclohexane	Mol % < 0.0001	< 0.0001
Toluene	Mol % < 0.0001	< 0.0001
Octanes; C-8	Mol % < 0.0001	< 0.0001
Ethylbenzene + Xylenes	Mol % < 0.0001	< 0.0001
Nonanes; C-9	Mol % < 0.0001	< 0.0001
Decanes; C-10	Mol % < 0.0001	< 0.0001
Undecanes; C-11	Mol % < 0.0001	< 0.0001
Dodecanes; C-12	Mol % < 0.0001	< 0.0001
Tridecanes; C-13	Mol % < 0.0001	< 0.0001
Tetradecanes; C14+	Mol % < 0.0001	< 0.0001
Isotopic Analysis		
Test/Reference	Unit	
Isotope Analysis*	Shipped to Intertek	Shipped to Intertek



Customer Sample ID		Talinga-110, Test 1	Talinga-110, Test 2
Sample Type		Wellhead Gas	Wellhead Gas
Date Sampled		15/04/2014	15/04/2014
Time Sampled		1337 h	1356 h
Pressure		385 kPag	385 kPag
Temperature		38°C	38°C
Cylinder ID		#367	#434
Test/Reference	Unit		
Dräger Tube Test			
Mercaptans (ppm v/v)*	mL/m ³	< 0.10	< 0.10
Name Of Component*		Carbon Disulphide	Carbon Disulphide
Component (ppm v/v)*	mL/m ³	<0.30	<0.30
Name Of Component*		Carbonyl Sulphide	Carbonyl Sulphide
Component (ppm v/v)*	mL/m ³	<0.40	<0.40
Name Of Component*		Arsine	Arsine
Component (ppm v/v)*	mL/m ³	< 0.10	< 0.10
H2S by Wet Chemistry ASTM D2385			
Total H2S @ 15°C*	mg/m ³	0.10	0.09
Total H2S (ml/ cu m (ppm)) @ 20°C*	mL / Cu m	0.07	0.06
Total Mercury ISO 6978:1992A (OS-02-01)			
Total Mercury*	µg/m ³	0.02	0.02
Oxygen In-house Method GC-09			
Oxygen	Mol %	< 0.01	< 0.01
Radioactive Material OS-03-01			
Radioactivity*	Bq/m ³	96 +/- 83	112 +/- 86
Trace Elements			
Trace Elements*		See attached table	See attached table
GAS ANALYSIS			
Test/Reference	Unit		
Gas Analysis In-house Method GC-01			
Nitrogen	Mol %	2.14	2.16
Carbon Dioxide	Mol %	0.12	0.09
Methane	Mol %	97.73	97.74
Ethane	Mol %	0.0063	0.0058
Propane	Mol %	0.0006	0.0007
I-Butane	Mol %	0.0003	0.0002
N-Butane	Mol %	0.0006	0.0005
I-Pentane	Mol %	0.0005	0.0006
N-Pentane	Mol %	0.0007	0.0007
Hexanes	Mol %	< 0.01	< 0.01
Heptanes	Mol %	< 0.01	< 0.01
Octanes and higher hydrocarbons	Mol %	< 0.01	< 0.01
Total	Mol %	100.00	100.00
Gas Parameters			
Average Molecular Weight		16.34	16.33
Lower Flammability Limit		5.11	5.11
Upper Flammability Limit		15.35	15.34
Ratio Of Upper To Lower		3.00	3.00
Wobbe Index		49.09	49.10
Compressibility Factor (Z)		0.9980	0.9981
Ideal Gas Density (Rel to Air = 1)		0.564	0.564
Real Gas Density (Rel to Air = 1)		0.565	0.565
Ideal Nett Calorific Value	MJ/m ³	33.19	33.19
Ideal Gross Calorific Value	MJ/m ³	36.87	36.87



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Customer Sample ID		Talinga-110, Test 1	Talinga-110, Test 2
Sample Type		Wellhead Gas	Wellhead Gas
Date Sampled		15/04/2014	15/04/2014
Time Sampled		1337 h	1356 h
Pressure		385 kPag	385 kPag
Temperature		38°C	38°C
Cylinder ID		#367	#434
GAS ANALYSIS			
Test/Reference	Unit		
Real Nett Calorific Value	MJ/m ³	33.26	33.26
Real Gross Calorific Value	MJ/m ³	36.94	36.94
Gross Calorific Val Water-Sat Gas	MJ/m ³	36.22	36.22
Extended Gas In-house Method GC-04			
Nitrogen	Mol %	2.14	2.16
Carbon Dioxide	Mol %	0.12	0.09
Methane	Mol %	97.73	97.73
Ethane	Mol %	0.0063	0.0058
Propane	Mol %	0.0006	0.0007
I-Butane	Mol %	0.0003	0.0002
N-Butane	Mol %	0.0006	0.0005
I-Pentane	Mol %	0.0005	0.0006
N-Pentane	Mol %	0.0007	0.0007
Hexanes; C-6	Mol %	< 0.0001	< 0.0001
Benzene	Mol %	< 0.0001	< 0.0001
Cyclohexane	Mol %	< 0.0001	< 0.0001
Heptanes; C-7	Mol %	< 0.0001	< 0.0001
Methylcyclohexane	Mol %	< 0.0001	< 0.0001
Toluene	Mol %	< 0.0001	< 0.0001
Octanes; C-8	Mol %	< 0.0001	< 0.0001
Ethylbenzene + Xylenes	Mol %	< 0.0001	< 0.0001
Nonanes; C-9	Mol %	< 0.0001	< 0.0001
Decanes; C-10	Mol %	< 0.0001	< 0.0001
Undecanes; C-11	Mol %	< 0.0001	< 0.0001
Dodecanes; C-12	Mol %	< 0.0001	< 0.0001
Tridecanes; C-13	Mol %	< 0.0001	< 0.0001
Tetradecanes; C14+	Mol %	< 0.0001	< 0.0001
Isotopic Analysis			
Test/Reference	Unit		
Isotope Analysis*		Shipped to Intertek	Shipped to Intertek

Customer Sample ID		Talinga-12	Talinga-10
Sample Type		Wellhead Gas	Wellhead Gas
Date Sampled		16/04/2014	16/04/2014
Time Sampled		1517 h	1528 h
Isotopic Analysis			
Test/Reference	Unit		
Isotope Analysis*		Shipped to Intertek	Shipped to Intertek



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Test Description

Gas Parameters

The above results are calculated on an air and water free basis assuming only the measured constituents are present. The following parameters are calculated from the above composition at 15°C and 101.325 kPa (abs) using ISO 6976 and the physical constants from the GPSA SI Engineering Data Handbook 11th Ed.
Measured as Radon-222 in the gas phase at 101.3 kPa abs @ 15°C.

Radioactive Material

Sample Comments

Talinga-23

Sample time listed is for GC sample, other tests conducted from 0930h to 1700h 16/04/14

Talinga-71

Sample time listed is for GC sample, other tests conducted from 0750h to 1610h 16/04/14
Detection limit for COS is increased due to an unknown slight interference

Talinga-110, Test 1

Sample time listed is for GC sample, other tests conducted from 0910h to 1615h 15/04/14

Talinga-110, Test 2

Sample time listed is for GC sample, other tests conducted from 0910h to 1615h 15/04/14

Authorised By

Paul Marty

Technical Manager, Petroleum Services

Michelle Fordham

Chemist

Accreditation No 2013

Laboratory Manager

James Dennett

Operations Manager

Amended Report: Test for VOC by adsorption tube removed. H2S result reported in ppm v/v in addition to ppmw.

This report replaces report number 849073.

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Samples will be discarded after 30 days unless otherwise notified.

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The samples were collected by Laboratory staff.