

**Emission Testing Report
EPA 7 - Bitumen Combustor
Quantem, Port Botany
Report Number R013727**

Document Information

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Report Authorisation



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NATA Accredited Laboratory
No. 14601



Steven Cooper
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1 Executive Summary

1.1 Background

Ektimo was engaged by Quantem to perform annual emission testing as required by NSW EPA Environmental Protection Licence 1048.

1.2 Project Objective

The objective of the project was to conduct a monitoring programme to quantify emissions from one (1) discharge point to determine compliance with Quantem's Environment Protection Licence.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 7 - Bitumen Combustor	25 September 2022	Hydrogen sulfide Nitrogen oxides (as NO ₂), oxygen (O ₂), carbon dioxide (CO ₂) Total organic compounds (TOC)

* Flow rate, velocity, temperature, and moisture were also determined.

All results are reported on a dry basis at STP.

Plant operating conditions have been noted in the report.

1.3 Licence Comparison

The following licence comparison table shows that all analytes highlighted in green are within the licence limit set by the NSW EPA as per licence 1048 (last amended on 30 October 2020).

EPA No.	Location Description	Parameter	Units	Licence limit	Detected values 25-Sep-22	Detected values (corrected to 3% O ₂) 25-Sep-22
7	Bitumen Combustor	Nitrogen oxide (as NO ₂)	mg/m ³	350	130	220
		Volatile organic compounds (VOCs)	mg/m ³	40	3.8	6.3

Please note that the measurement uncertainty associated with the test results was not considered when determining whether the results were compliant or non-compliant.

Refer to the Test Methods table for the measurement uncertainties.

2 Results

2.1 EPA 7 - Bitumen Combustor

Date	25/09/2022	Client	Quantem
Report	R013727	Stack ID	EPA 7 - Bitumen Combustor
Licence No.	1048	Location	Port Botany
Ektimo Staff	Steven Cooper	State	NSW
Process Conditions	Displaced gas from a vessel named 'Palanca Miami'		

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Sampling Plane Details	
Sampling plane dimensions	980 mm
Sampling plane area	0.754 m ²
Sampling port size, number	4" Flange (x2)
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 2 D
Upstream disturbance	Change in diameter 6 D
No. traverses & points sampled	2 12
Sample plane conformance to AS 4323.1	Conforming but non-ideal

The sampling plane is deemed to be non-ideal due to the following reasons:
 The sampling plane is too near to the downstream disturbance but is greater than or equal to 1D
 The sampling plane is too near to the upstream disturbance but is greater than or equal to 2D

Stack Parameters	
Moisture content, %v/v	6.3
Gas molecular weight, g/g mole	28.8 (wet) 29.5 (dry)
Gas density at STP, kg/m ³	1.28 (wet) 1.32 (dry)
Gas density at discharge conditions, kg/m ³	0.27
% Oxygen correction & Factor	3 % 1.65

Gas Flow Parameters	
Flow measurement time(s) (hhmm)	1350 & 1520
Temperature, °C	1008
Temperature, K	1281
Velocity at sampling plane, m/s	7.5
Volumetric flow rate, actual, m ³ /s	5.6
Volumetric flow rate (wet STP), m ³ /s	1.2
Volumetric flow rate (dry STP), m ³ /s	1.1
Mass flow rate (wet basis), kg/hour	5600

Gas Analyser Results	Sampling time	Average			Minimum			Maximum		
		1406 - 1506			1406 - 1506			1406 - 1506		
Combustion Gases		Corrected to			Corrected to			Corrected to		
		Concentration mg/m ³	3% O ₂ mg/m ³	Mass Rate g/min	Concentration mg/m ³	3% O ₂ mg/m ³	Mass Rate g/min	Concentration mg/m ³	3% O ₂ mg/m ³	Mass Rate g/min
Nitrogen oxides (as NO ₂)		130	220	9.1	130	220	8.9	140	230	9.3
		Concentration % v/v			Concentration % v/v			Concentration % v/v		
Carbon dioxide		5.9			5.8			6		
Oxygen		10.1			9.5			10.4		

Total Organic Compounds (TOC)	Sampling time	Average			Minimum			Maximum		
		1406-1506			1406 - 1506			1406-1506		
		Corrected to			Corrected to			Corrected to		
		Concentration mg/m ³	3% O ₂ mg/m ³	Mass Rate g/min	Concentration mg/m ³	3% O ₂ mg/m ³	Mass Rate g/min	Concentration mg/m ³	3% O ₂ mg/m ³	Mass Rate g/min
TOC (as Propane)		3.8	6.3	0.26	2.1	3.5	0.14	17	28	1.1

Hydrogen Sulfide	Sampling time	Results		
		1401-1501		
		Corrected to		
		Concentration mg/m ³	3% O ₂ mg/m ³	Mass Rate g/min
Hydrogen sulfide		<0.5	<0.9	<0.04

3 Plant Operating Conditions

The Bitumen Combustor was treating gas displaced by the filling of storage tanks on-site from a ship called “Palanca Miami” when this testing was conducted. See Quantum records for complete process conditions.

4 Test Methods

All sampling and analysis performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling method	Analysis method	Uncertainty*	NATA accredited	
				Sampling	Analysis
Sampling points - Selection	NSW EPA TM-1 (AS 4323.1)	NA	NA	✓	NA
Flow rate, temperature & velocity	NSW EPA TM-2 (USEPA Method 2)	NSW EPA TM-2 (USEPA Method 2)	8%, 2%, 7%	NA	✓
Moisture content	NSW EPA TM-22 (USEPA Alt-Method 008)	NSW EPA TM-22 (USEPA Alt-Method 008)	19%	✓	✓
Dry gas density	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Carbon dioxide	NSW EPA TM-24 (USEPA Method 3A)	NSW EPA TM-24 (USEPA Method 3A)	13%	✓	✓
Nitrogen oxides	NSW EPA TM-11 (USEPA Method 7E)	NSW EPA TM-11 (USEPA Method 7E)	12%	✓	✓
Oxygen	NSW EPA TM-25 (USEPA Method 3A)	NSW EPA TM-25 (USEPA Method 3A)	13%	✓	✓
Total gaseous organic compounds	NSW EPA TM-34 (USEPA Method 25B)	NSW EPA TM-34 (USEPA Method 25B)	not specified	✓	✓
Hydrogen sulfide	NSW EPA TM-5 (USEPA Method 11)	NSW EPA TM-5	not specified	✓	✓ [†]

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* Uncertainties cited in this table are estimated using typical values and are calculated at the 95% confidence level (coverage factor = 2).

† Analysis conducted at the Ektimo Mitcham, VIC laboratory, NATA accreditation number 14601. Result was reported on 10 October 2022 in report R013727 – H2S (Method 11).

5 Quality Assurance/Quality Control Information

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA’s website www.nata.com.au.

Ektimo is accredited by NATA to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through mutual recognition arrangements with these organisations, NATA accreditation is recognised worldwide.

6 Definitions

The following symbols and abbreviations may be used in this test report:

% v/v	Volume to volume ratio, dry or wet basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
APHA	American Public Health Association, Standard Methods for the Examination of Water and Waste Water
AS	Australian Standard
BSP	British standard pipe
CARB	Californian Air Resources Board
CEM/CEMS	Continuous emission monitoring/Continuous emission monitoring system
CTM	Conditional test method
D	Duct diameter or equivalent duct diameter for rectangular ducts
D ₅₀	'Cut size' of a cyclone is defined as the particle diameter at which the cyclone achieves a 50% collection efficiency i.e. half of the particles are retained by the cyclone and half pass through it. The D ₅₀ method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the D ₅₀ of that cyclone and less than the D ₅₀ of the preceding cyclone.
DECC	Department of Environment & Climate Change (NSW)
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
DWER	Department of Water and Environmental Regulation (WA)
DEHP	Department of Environment and Heritage Protection (QLD)
EPA	Environment Protection Authority
FTIR	Fourier transform infra-red
ISC	Intersociety Committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
ITE	Individual threshold estimate
Lower bound	When an analyte is not present above the detection limit, the result is assumed to be equal to zero.
Medium bound	When an analyte is not present above the detection limit, the result is assumed to be equal to half of the detection limit.
NA	Not applicable
NATA	National Association of Testing Authorities
NIOSH	National Institute of Occupational Safety and Health
NT	Not tested or results not required
OM	Other approved method
OU	Odour unit. One OU is that concentration of odorant(s) at standard conditions that elicits a physiological response from a panel equivalent to that elicited by one Reference Odour Mass (ROM), evaporated in one cubic metre of neutral gas at standard conditions.
PM ₁₀	Particulate matter having an equivalent aerodynamic diameter less than or equal to 10 microns (µm).
PM _{2.5}	Particulate matter having an equivalent aerodynamic diameter less than or equal to 2.5 microns (µm).
PSA	Particle size analysis. PSA provides a distribution of geometric diameters, for a given sample, determined using laser diffraction.
RATA	Relative accuracy test audit
Semi-quantified VOCs	Unknown VOCs (those for which an analytical standard is not available), are identified by matching the mass spectrum of the chromatographic peak to the NIST Standard Reference Database (version 14.0), with a match quality exceeding 70%. An estimated concentration is determined by matching the area of the peak with the nearest suitable compound in the analytical calibration standard mixture.
STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0 °C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa.
TM	Test method
TOC	Total organic carbon. This is the sum of all compounds of carbon which contain at least one carbon-to-carbon bond, plus methane and its derivatives.
USEPA	United States Environmental Protection Agency
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
Velocity difference	The percentage difference between the average of initial flows and after flows.
Vic EPA	Victorian Environment Protection Authority
VOC	Volatile organic compound. A carbon-based chemical compound with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the given conditions of use. VOCs may contain oxygen, nitrogen and other elements. VOCs do not include carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts.
XRD	X-ray diffractometry
Upper bound	When an analyte is not present above the detection limit, the result is assumed to be equal to the detection limit.
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

7 Appendix 1: Site Photo



Figure 1 – EPA 7 - Bitumen Combustor

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