Ektimo

REPORT NUMBER R011915

Emission Testing Report

EPA 7 – Bitumen Combustor
Quantem, Port Botany

Document Information

Template Version; 230621

Client Name:	Quantem
Report Number:	R011915
Date of Issue:	17 December 2021
Attention:	Richard McGrath
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Report Authorisation

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NATA Accredited Laboratory
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Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo's terms of NATA accreditation. This does not include comments, conclusions or recommendations based upon the results. Refer to 'Test Methods' for full details of testing covered by NATA accreditation.

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1 EXECUTIVE SUMMARY

1.1 Background

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

1.2 Project Objective

The objectives of the project were to conduct a monitoring programme to quantify emissions from one 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	26 November 2021	Hydrogen sulfide Volatile organic compounds (VOCs as n-propane) Oxygen, carbon dioxide, nitrogen oxides (as NO_2)

* 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).

Results have also been corrected to 3% Oxygen as stipulated in Schedule 5 of the *Protection of the Environment Operations (Clean Air) Regulation, (NSW)* 2021.

EPA No.	Location Description	Parameter	Units	Licence limit	Detected values 26/11/2021	Detected values (corrected to 3% O2) 26/11/2021
7	Bitumen Combustor	Nitrogen oxide (as NO_2)	mg/m^3	350	98	210
		Volatile organic compounds (VOCs)	mg/m^3	40	<0.1	<0.3

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	26/11/2021	**Client**	Quantem
Report	R011915	**Stack ID**	EPA 7 - Bitumen Combustor
Licence No.	1048	**Location**	Port Botany
Ektimo Staff	Steven Cooper & Harrison Handicott	**State**	NSW
Process Conditions	Displaced gas from a vessel named 'Palanca Miami'		211115

Sampling Plane Details	
Sampling plane dimensions	980 mm
Sampling plane area	0.754 m²
Sampling port size, number	4" Flange (x2)
Access & height of ports	Fixed ladder 12 m
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 compliance to AS4323.1 (1995)	Ideal

Stack Parameters		
Moisture content, %v/v	12	
Gas molecular weight, g/g mole	28.1 (wet)	29.4 (dry)
Gas density at STP, kg/m³	1.25 (wet)	1.31 (dry)
Gas density at discharge conditions, kg/m³	0.31	
% Oxygen correction & Factor	3 %	2.13
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1035 & 1150	
Temperature, °C	844	
Temperature, K	1117	
Velocity at sampling plane, m/s	7.3	
Volumetric flow rate, actual, m³/s	5.5	
Volumetric flow rate (wet STP), m³/s	1.3	
Volumetric flow rate (dry STP), m³/s	1.2	
Mass flow rate (wet basis), kg/hour	6100	
Velocity difference, %	7	

Gas Analyser Results	Average			Minimum			Maximum		
Sampling time	1043 - 1142			1043 - 1142			1043 - 1142		
	Concentration mg/m³	Corrected to 3% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 3% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 3% O2 mg/m³	Mass Rate g/min
Combustion Gases									
Nitrogen oxides (as NO_2)	98	210	7	92	200	6.5	110	240	8
	Concentration %v/v			Concentration %v/v			Concentration %v/v		
Carbon dioxide	5.1			4.7			5.8		
Oxygen	12.5			11.1			13		

Hydrogen Sulfide	Results		
Sampling time	1043-1143		
	Concentration mg/m³	Corrected to 3% O2 mg/m³	Mass Rate g/min
Hydrogen sulfide	<2	<5	<0.2

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Total VOCs (as n-Propane)	Results		
Sampling time	1143-1243		
	Concentration mg/m³	Corrected to 3% O2 mg/m³	Mass Rate g/min
Total	<0.1	<0.3	<0.01

VOC (speciated)	Results		
Sampling time	1143-1243		
	Concentration mg/m³	Corrected to 3% O2 mg/m³	Mass Rate g/min
Detection limit[1]	<0.1	<0.3	<0.01

(1) Unless otherwise reported, the following target compounds were found to be below detection:
Dichloromethane, Ethanol, Isopropanol, 1,1-Dichloroethene, trans-1,2-Dichloroethene, cis-1,2-Dichloroethene, Chloroform, 1,1,1-Trichloroethane, 1,2-Dichloroethane, Benzene, Carbon tetrachloride, Butanol, 1-Methoxy-2-propanol, Trichloroethylene, Toluene, 1,1,2-Trichloroethane, Tetrachloroethene, Chlorobenzene, Ethylbenzene, m + p-Xylene, Styrene, o-Xylene, 2-Butoxyethanol, 1,1,2,2-Tetrachloroethane, Isopropylbenzene, Propylbenzene, 1,3,5-Trimethylbenzene, tert-Butylbenzene, 1,2,4-Trimethylbenzene, 1,2,3-Trimethylbenzene, Acetone, Pentane, Acrylonitrile, Methyl ethyl ketone, n-Hexane, Ethyl acetate, Cyclohexane, Isopropyl acetate, 2-Methylhexane, 2,3-Dimethylpentane, 3-Methylhexane, Heptane, Ethyl acrylate, Methyl methacrylate, Propyl acetate, Methylcyclohexane, Methyl Isobutyl Ketone, 2-Hexanone, Octane, Butyl acetate, 1-Methoxy-2-propyl acetate, Butyl acrylate, Nonane, Cellosolve acetate, alpha-Pinene, beta-Pinene, Decane, 3-Carene, D-Limonene, Undecane, Dodecane, Tridecane, Tetradecane

3 PLANT OPERATING CONDITIONS

The bitumen combustor was treating gas displaced gas from a ship called *Palanca Miami* when this testing was conducted. See Quantem 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	NA	NA	✓	NA
Flow rate, temperature and velocity	NSW EPA TM-2	NSW EPA TM-2	8%, 2%, 7%	NA	✓
Moisture content	NSW EPA TM-22	NSW EPA TM-22	19%	✓	✓
Carbon dioxide	NSW EPA TM-24	NSW EPA TM-24	13%	✓	✓
Nitrogen oxides	NSW EPA TM-11	NSW EPA TM-11	12%	✓	✓
Oxygen	NSW EPA TM-25	NSW EPA TM-25	13%	✓	✓
Hydrogen sulfide	NSW EPA TM-5	NSW EPA TM-5	not specified	✓	✓†
Speciated volatile organic compounds (VOCs)	NSW EPA TM-34[d]	Ektimo 344	19%	✓	✓†

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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. Results were reported on:
7 December 2021 in report LV-002257.
14 December 2021 in report R011915 – H2S (Method 11).

d Excludes recovery study as specified in section 8.4.3 of USEPA Test Method 18.

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 (National Association of Testing Authorities) 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}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
$PM_{2.5}$	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PSA	Particle size analysis
RATA	Relative accuracy test audit
Semi-quantified VOCs	Unknown VOCs (those not matching a standard compound), 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, unless otherwise specified.
TM	Test method
TOC	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.

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