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Report Number R002816

Emission Testing
Ingal Civil Products, Minto Plant

Document Information

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 Attention: Amit Gupta
 Address: 57 – 65 Airds Rd
 MINTO NSW 2566
 Testing Laboratory: Ektimo (ETC) ABN 74 474 273 172

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Report Authorisation



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

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1 EXECUTIVE SUMMARY

Ektimo was engaged by Ingal Civil Products to perform emission monitoring as part of the yearly requirement stipulated in their NSW EPA Environment Protection Licence (12593).

Monitoring was performed as follows;

Location	Test Date	Test Parameters*
EPA 1 - Baghouse Stack	23 June 2016	Solid particles, hydrogen chloride, metals (type 1 & 2 substances including cadmium) plus zinc, odour, ammonia and ammonium compounds
EPA 2 - Galvanising Area Boiler	23 June 2016	Solid particles, nitrogen oxides, oxygen
EPA 3 - Kettle Stack	23 June 2016	Nitrogen oxides, oxygen

* Flow rate, velocity, temperature and moisture were determined unless otherwise stated.

The sampling methodologies chosen by Ektimo are those recommended by the NSW Office of Environment and Heritage (as specified in the Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales, January 2007).

All results are reported on a dry basis at STP. Unless otherwise indicated, the methods cited in this report have been performed without deviation.

Plant operating conditions have been noted in the report.

2 RESULTS SUMMARY

The following licence comparison table shows that all analytes highlighted in green are below the licence limit set by the NSW EPA as per licence 12593 (last amended on 24 March 2015).

EPA	Parameter	Units	Licence limit	Detected values	Detected values (corrected to 3% O ₂)
EPA 1 - Baghouse Stack	Type 1 & 2 substances in aggregate	mg/m ³	0.08	<0.02	-
	Ammonia and ammonium compounds	mg/m ³	2	0.24	-
	Odour	odour units	520	310	-
	Zinc and zinc compounds	mg/m ³	5	0.0033	-
	Hydrogen chloride	mg/m ³	5	0.49	-
	Cadmium	mg/m ³	0.04	<0.0005	-
	Solid particles	mg/m ³	5	<2	-
EPA 2 - Galvanising Area Boiler	Solid particles	mg/m ³	11	<2	<9
	Nitrogen oxides	mg/m ³	170	37	150
EPA 3 - Kettle Stack	Nitrogen oxides	mg/m ³	150	41	120

3 RESULTS

3.1 EPA 1 - Baghouse Stack

Date	23/06/2016	Client	Ingal Civil Products
Report	R002816	Stack ID	EPA 1 - Baghouse Stack
Licence No.	12593	Location	Minto
Ektimo Staff	Aaron Davis / Scott Woods		State NSW
Process Conditions	Please refer to client records.		

Sampling Plane Details	
Sampling plane dimensions	1200 mm
Sampling plane area	1.13 m ²
Sampling port size, number	2" BSP (x2)
Access & height of ports	Fixed ladder 10 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 12
Compliance of sample plane to AS4323.1	Ideal
Comments	
The discharge is assumed to be composed of dry air and moisture	

Stack Parameters	
Moisture content, %v/v	2.5
Gas molecular weight, g/g mole	28.7 (wet) 29.0 (dry)
Gas density at STP, kg/m ³	1.28 (wet) 1.29 (dry)
Gas Flow Parameters	
Measurement time (hhmm)	1030
Temperature, °C	25
Velocity at sampling plane, m/s	9.5
Volumetric flow rate, discharge, m ³ /s	11
Volumetric flow rate (wet STP), m ³ /s	9.9
Volumetric flow rate (dry STP), m ³ /s	9.7
Mass flow rate (wet basis), kg/hour	46000
Isokinetic Sampling Parameters	
Sampling time, min	60
Isokinetic rate, %	98
Velocity difference, %	3

Isokinetic Results	Results	
	1030-1130	
Sampling time	Concentration mg/m ³	Mass Rate g/min
Hydrogen chloride	0.49	0.28
Ammonia	0.24	0.14

Date	23/06/2016	Client	Ingal Civil Products	
Report	R002816	Stack ID	EPA 1 - Baghouse Stack	
Licence No.	12593	Location	Minto	State NSW
Ektimo Staff	Aaron Davis / Scott Woods			
Process Conditions	Please refer to client records.			

Sampling Plane Details

Sampling plane dimensions	1200 mm
Sampling plane area	1.13 m ²
Sampling port size, number	2" BSP (x2)
Access & height of ports	Fixed ladder 10 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 12
Compliance of sample plane to AS4323.1	Ideal

Comments

The discharge is assumed to be composed of dry air and moisture

Stack Parameters

Moisture content, %v/v	2.9 (saturated)	
Gas molecular weight, g/g mole	28.6 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.28 (wet)	1.29 (dry)

Gas Flow Parameters

Measurement time (hhmm)	900
Temperature, °C	25
Velocity at sampling plane, m/s	9.3
Volumetric flow rate, discharge, m ³ /s	10
Volumetric flow rate (wet STP), m ³ /s	9.7
Volumetric flow rate (dry STP), m ³ /s	9.4
Mass flow rate (wet basis), kg/hour	45000

Isokinetic Sampling Parameters

Sampling time, min	60
Isokinetic rate, %	92
Velocity difference, %	1

Odour	Results	
	Concentration ou	Mass Rate oum ³ /s
Results	310	3000
Hedonic tone	neutral	
Odour character	combustion, foundry, stale	
Lower Uncertainty Limit	140	
Upper Uncertainty Limit	670	
Sampling date & Time	23/06/16	925 - 935
Analysis date & Time	24/06/16	1300
Holding time	28 hours	
Dilution factor	1	
Butanol threshold (ppb)	44.08	
Laboratory temp (°C)	21.3	
Last calibration date	Jul-16	

Date	23/06/2016	Client	Ingal Civil Products
Report	R002816	Stack ID	EPA 1 - Baghouse Stack
Licence No.	12593	Location	Minto
Ektimo Staff	Aaron Davis / Scott Woods		State NSW
Process Conditions	Please refer to client records.		

Isokinetic Results	Results	
	Concentration mg/m ³	Mass Rate g/min
Sampling time	910-1010	
Solid Particles	<2	<1
Antimony	<0.005	<0.003
Arsenic	<0.002	<0.001
Cadmium	<0.0005	<0.0003
Lead	<0.001	<0.0007
Mercury	<0.0002	<0.0001
Beryllium	<0.001	<0.0006
Chromium	<0.0007	<0.0004
Cobalt	<0.0006	<0.0004
Manganese	<0.001	<0.0008
Nickel	<0.001	<0.0006
Selenium	<0.005	<0.003
Vanadium	<0.001	<0.0006
Tin	<0.002	<0.001
Zinc	0.0033	0.0018
Type 1 & 2 Substances Upper Bound		
Total Type 1 Substances	<0.009	<0.005
Total Type 2 Substances	<0.01	<0.007
Total Type 1 & 2 Substances	<0.02	<0.01

3.2 EPA 2 - Galvanising Area Boiler

Date	23/06/2016	Client	Ingal Civil Products		
Report	R002816	Stack ID	EPA 2 - Galvanising Area Boiler		
Licence No.	12593	Location	Minto	State	NSW
Ektimo Staff	Aaron Davis / Scott Woods				
Process Conditions	Please refer to client records.				

Sampling Plane Details

Sampling plane dimensions	260 mm
Sampling plane area	0.0531 m ²
Sampling port size, number	4" BSP (x2)
Access & height of ports	Elevated work platform 4 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 4
Compliance of sample plane to AS4323.1	Ideal

Stack Parameters

Moisture content, %v/v	6.2	
Gas molecular weight, g/g mole	28.5 (wet)	29.2 (dry)
Gas density at STP, kg/m ³	1.27 (wet)	1.30 (dry)
% Oxygen correction & Factor	3 %	4.11

Gas Flow Parameters

Measurement time (hhmm)	1230
Temperature, °C	138
Velocity at sampling plane, m/s	3.8
Volumetric flow rate, discharge, m ³ /s	0.2
Volumetric flow rate (wet STP), m ³ /s	0.13
Volumetric flow rate (dry STP), m ³ /s	0.13
Mass flow rate (wet basis), kg/hour	620

Isokinetic Sampling Parameters

Sampling time, min	60
Isokinetic rate, %	97
Velocity difference, %	4

Isokinetic Results	Sampling time	Results		
		Concentration	O ₂	Mass Rate
			Corrected to 3%	
			O ₂	
		mg/m ³	mg/m ³	g/min
Solid Particles		<2	<9	<0.02

Gases	Sampling time	Average		
		Concentration	O ₂	Mass Rate
			Corrected to 3%	
			O ₂	
		mg/m ³	mg/m ³	g/min
Nitrogen oxides (as NO ₂)		37	150	0.28
			Concentration	
			%	
Oxygen			16.5	

3.3 EPA 3 - Kettle Stack

Date	23/06/2016	Client	Ingal Civil Products		
Report	R002816	Stack ID	EPA 3 - Kettle Stack		
Licence No.	12593	Location	Minto	State	NSW
Ektimo Staff	Aaron Davis / Scott Woods				
Process Conditions	Please refer to client records.				

Sampling Plane Details

Sampling plane dimensions	450 mm
Sampling plane area	0.159 m ²
Sampling port size, number	1" BSP (x2)
Access & height of ports	Elevated work platform 5 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 8
Compliance of sample plane to AS4323.1	Non-compliant ⁽¹⁾

Comments

Non-compliant sampling plane; the testing precision will be reduced

Stack Parameters

Moisture content, %v/v	6.2	
Gas molecular weight, g/g mole	28.6 (wet)	29.3 (dry)
Gas density at STP, kg/m ³	1.28 (wet)	1.31 (dry)
% Oxygen correction & Factor	3 %	3.01

Gas Flow Parameters

Measurement time (hhmm)	1100
Temperature, °C	171
Velocity at sampling plane, m/s	2
Volumetric flow rate, discharge, m ³ /s	0.32
Volumetric flow rate (wet STP), m ³ /s	0.2
Volumetric flow rate (dry STP), m ³ /s	0.18
Mass flow rate (wet basis), kg/hour	900
Velocity difference, %	<1

Gases	Sampling time	Average		
		1104-1213 Corrected to 3%		
		Concentration mg/m ³	O ₂ mg/m ³	Mass Rate g/min
Nitrogen oxides (as NO ₂)		41	120	0.46
Oxygen			Concentration %	14.9

(1) The sampling plane is deemed to be non-ideal or non-compliant due to the following reasons:

The gas velocity at some or all sampling points is less than 3 m/s

4 PLANT OPERATING CONDITIONS

Unless otherwise stated, the plant operating conditions were normal at the time of testing. See Ingal Civil Products' records for complete process conditions.

5 TEST METHODS

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

Parameter	Sampling Method	Analysis Method	Method Detection Limit	Uncertainty*	NATA Accredited	
					Sampling	Analysis
Sample plane criteria	NSW TM-1	NA	NA	-	✓	NA
Moisture content	NSW TM-22	NSW TM-22	0.4%	8%	✓	✓
Temperature	NSW TM-2	NA	0°C	2%	✓	NA
Flow rate	NSW TM-2	NA	Location specific	8%	✓	NA
Velocity	NSW TM-2	NA	2ms ⁻¹	7%	✓	NA
Solid particles	NSW TM-15	NSW TM-15	0.001g/m ³	5%	✓	✓
Total (gaseous and particulate) metals and metallic compounds, incl zinc	NSW TM-12, NSW TM-13, NSW TM-14	Envirolab inhouse	Analyte specific	15%	✓	✓ ¹
Type 1 substances (Sb, As, Cd, Pb, Hg)	NSW TM-12	Envirolab inhouse	Analyte specific	15%	✓	✓ ¹
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW TM-13	Envirolab inhouse	Analyte specific	15%	✓	✓ ¹
Hydrogen chloride	NSW TM-8	Ektimo (EML Air) 235	10mg/m ³	14%	✓	✓ ²
Nitrogen oxides (NO _x)	NSW TM-11	NSW TM-11	4mg/m ³	12%	✓	✓
Carbon dioxide	NSW TM-24	NSW TM-24	0.1%	13%	✓	✓
Oxygen	NSW TM-25	NSW TM-25	0.1%	13%	✓	✓
Ammonia	-	Inorg093	0.1mg/m ³	19%	✓	✓ ³
Odour	NSW OM-7	NSW OM-7	16ou	not specified	✓	✓

* Uncertainty values cited in this table are calculated at the 95% confidence level (coverage factor = 2)

- 1 Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 7 July 2016 in report number 149218
- 2 Analysis performed by Ektimo Laboratory, NATA accreditation number 2732. Results were reported to Ektimo on 12 July 2016 in report number R002816_Halides_Halogens.
- 3 Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 20 July 2016 in report number 150002.

6 QUALITY ASSURANCE/ QUALITY CONTROL INFORMATION

Ektimo (EML) and Ektimo (ETC) are 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 (EML) and Ektimo (ETC) are accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025. – General Requirements for the Competence of Testing and Calibration Laboratories. ISO/IEC 17025 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 Compliance Manager.

NATA is a member of APLAC (Asia Pacific Laboratory Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through the mutual recognition arrangements with both of these organisations, NATA accreditation is recognised world –wide.

A formal Quality Control program is in place at Ektimo to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.

7 DEFINITIONS

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

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.
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.
VOC	Any chemical compound based on carbon with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the particular conditions of use. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts.
TOC	The sum of all compounds of carbon which contain at least one carbon to carbon bond, plus methane and its derivatives.
OU	The number of odour units per unit of volume. The numerical value of the odour concentration is equal to the number of dilutions to arrive at the odour threshold (50% panel response).
PM _{2.5}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PM ₁₀	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
BSP	British standard pipe
NT	Not tested or results not required
NA	Not applicable
D ₅₀	'Cut size' of a cyclone defined as the particle diameter at which the cyclone achieves a 50% collection efficiency ie. half of the particles are retained by the cyclone and half are not and pass through it to the next stage. 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.
D	Duct diameter or equivalent duct diameter for rectangular ducts
<	Less than
>	Greater than
≥	Greater than or equal to
~	Approximately
CEM	Continuous Emission Monitoring
CEMS	Continuous Emission Monitoring System
DER	WA Department of Environment & Regulation
DECC	Department of Environment & Climate Change (NSW)
EPA	Environment Protection Authority
FTIR	Fourier Transform Infra Red
NATA	National Association of Testing Authorities
RATA	Relative Accuracy Test Audit
AS	Australian Standard
USEPA	United States Environmental Protection Agency
Vic EPA	Victorian Environment Protection Authority
ISC	Intersociety committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
APHA	American public health association, Standard Methods for the Examination of Water and Waste Water
CARB	Californian Air Resources Board
TM	Test Method
OM	Other approved method
CTM	Conditional test method
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
NIOSH	National Institute of Occupational Safety and Health
XRD	X-ray Diffractometry