



REPORT NUMBER R010889

**Emission Testing Report
Clingcast Metals, Kirrawee**

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Document Information

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Client Name: Clingcast Metals
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Report Authorisation



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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.

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1 EXECUTIVE SUMMARY

1.1 Background

Ektimo was engaged by Clingcast Metals to perform emission testing at their Kirrawee plant.

1.2 Project Objectives

The objectives of the project were to conduct a monitoring programme to quantify emissions from one discharge point.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
Baghouse Stack	11 May 2021	Particulate matter Particulate matter <10µm (PM ₁₀) Particulate matter <2.5µm (PM _{2.5}) Nitrogen oxides (as NO ₂) Carbon monoxide Carbon dioxide Metals (type 1 & 2 substances + iron) Smoke Speciated volatile organic compounds (VOCs) Formaldehyde Phenols Odour and character

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

All results are reported on a dry basis at STP (except odour wet – STP).

Plant operating conditions have been noted in the report.

1.3 Results Summary Table

The table below outlines the proposed licence limits and the detected results for testing on the 11 May 2021.

Results from this stack emission monitoring program indicate that Clingcast Metals Pty Ltd are compliant with the proposed baghouse stack emission limits during the sampling period.

Location Description	Pollutant	Units	POEO Reg Group C Limits ¹	POEO Reg Group 6 Limits ²	Detected values 11/05/21
Baghouse Stack	Total solid particles	mg/m ³	100	50	<2
	Smoke	Ringelmann	1	1	0
	Type 1 & 2 substances in aggregate	mg/m ³	-	1	≤0.038
	Cadmium	mg/m ³	-	0.2	0.00064
	Mercury	mg/m ³	-	0.2	<0.0003
	Nitrogen oxides	mg/m ³	-	350	<4
	Volatile organic compounds	mg/m ³	-	40	0.21

1. The standards shown are derived from the *Protection of the Environment Operations (Clean Air) Regulation NSW 2010* Schedule 6 "Standards of concentration for non-scheduled premises". It is considered that these standards apply to Clingcast Metals Baghouse Stack.

2. The standards shown are derived from the *Protection of the Environment Operations (Clean Air) Regulation NSW 2010* Schedule 4 "Standards of concentration for scheduled premises: general activities and plant", Group 6. These represent the most stringent standards that are routinely applied in NSW for new plant. It is considered that these standards do not apply to the Clingcast Baghouse and have been displayed in this table for comparison purposes only.

2 RESULTS

2.1 Baghouse Stack

Date	11/05/2021	Client	Cling Cast Metals
Report	R010889	Stack ID	Baghouse Stack
Licence No.	-	Location	Kirra wee
Ektimo Staff	Hamish Proust, Ish Alam, Ahmad Ramiz	State	NSW
Process Conditions	Process conditions were normal and testing was completed over iron and copper alloy pours		2 10506

Sampling Plane Details	
Sampling plane dimensions	1355 mm
Sampling plane area	1.44 m ²
Sampling port size, number	4" Flange (x2)
Access & height of ports	Fixed ladder 12 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 1.5 D
Upstream disturbance	Centrifugal fan 8 D
No. traverses & points sampled	2 16
Sample plane compliance to AS4323.1	Compliant but non-ideal
Comments	
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	

Stack Parameters		
Moisture content, %v/v	0.41	
Gas molecular weight, g/g mole	29.0 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.29 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m ³	1.17	
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	0925 & 1110	
Temperature, °C	28	
Velocity at sampling plane, m/s	9.9	
Volumetric flow rate, actual, m ³ /s	14	
Volumetric flow rate (wet STP), m ³ /s	13	
Volumetric flow rate (dry STP), m ³ /s	13	
Mass flow rate (wet basis), kg/hour	60000	

Gas Analyser Results	Sampling time	Average		Minimum		Maximum	
		0934 - 1038		0934 - 1038		0934 - 1038	
Combustion Gases		Concentration	Mass Rate	Concentration	Mass Rate	Concentration	Mass Rate
Nitrogen oxides (as NO ₂)		mg/m ³	g/min	mg/m ³	g/min	mg/m ³	g/min
		<4	<3	<4	<3	<4	<3
Carbon monoxide		2.7	2.1	<2	<2	17	13
		Concentration		Concentration		Concentration	
		%v/v		%v/v		%v/v	
Carbon dioxide		<0.4		<0.4		<0.4	
Oxygen		20.9		20.9		20.9	

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Phenols	Sampling time	Results	
		0953-1053	
		Concentration mg/m ³	Mass Rate g/min
Phenol		<0.01	<0.01

Formaldehyde	Sampling time	Results	
		0945-1045	
		Concentration mg/m ³	Mass Rate g/min
Formaldehyde		0.11	0.083

Odour	Sampling time	Results	
		0955 - 1015	
		Concentration ou	Mass Rate oum ³ /min
Results		<30	<20000
Lower uncertainty limit		18	
Upper uncertainty limit		36	
Hedonic tone			Neutral
Odour character			Burnt
Analysis date & time		12/05/21, 1030	
Holding time		24 hours	
Dilution factor		1	
Bag material		Nalophan	
Butanol threshold (ppb)		67.8	
Laboratory temp (°C)		23.5	
Last calibration date		October 2020	

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Isokinetic Results	Sampling time	Results	
		0934-1058	0934-1058 (PM10&2.5)
		Concentration mg/m ³	Mass Rate g/min
Solid Particles		<2	<1
Fine particulates (PM10)		<4	<3
Fine particulates (PM2.5)		<3	<2
D50 cut size, 10µm			10.8
D50 cut size, 2.5µm			2.32
Antimony		<0.004	0.003
Arsenic		<0.002	<0.001
Beryllium		<0.0005	<0.0004
Cadmium		0.00064	0.00049
Chromium		<0.0006	<0.0005
Cobalt		<0.0005	<0.0004
Iron		0.02	0.016
Lead		0.018	0.014
Manganese		0.0034	0.0027
Mercury		<0.0003	<0.0003
Nickel		<0.001	<0.001
Selenium		<0.004	<0.003
Tin		<0.002	<0.001
Vanadium		<0.0009	<0.0007
Type 1 & 2 Substances			
Upper Bound			
Total Type 1 Substances		≤0.024	≤0.019
Total Type 2 Substances		≤0.013	≤0.01
Total Type 1 & 2 Substances		≤0.038	≤0.029
Isokinetic Sampling Parameters			
Sampling time, min		Isokinetic 80	PM 10&2.5 80
Isokinetic rate, %		100	97
Velocity difference, %		2	2

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Smoke Obscuration	Time of assessment	Result
Smoke Obscuration		1015 - 1030 0

Total VOCs (as n-Propane)	Sampling time	Results	
		0945-1045	
		Concentration	Mass Rate
		mg/m ³	g/min
Total		0.21	0.16

VOC (speciated)	Sampling time	Results	
		0945-1045	
		Concentration	Mass Rate
		mg/m ³	g/min
Detection limit ⁽¹⁾		<0.06	<0.05
Benzene		0.17	0.13
Toluene		0.25	0.19

(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, Carbon tetrachloride, Butanol, 1-Methoxy-2-propanol, Trichloroethylene, 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, 2-Methylhexane, Isopropyl acetate, 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

See Clingcast Metals records for complete process conditions.

11 May 2021

Cast Iron Furnace operating normally (charging)

Copper Furnace operating normally (charging)

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
Sample plane criteria	NSW TM-1	NA	NA	✓	NA
Flow rate, temperature and velocity	NSW TM-2	NSW TM-2	8%, 2%, 7%	NA	✓
Moisture content	NSW TM-22	NSW TM-22	8%	✓	✓
Molecular weight	NA	NSW TM-23	not specified	NA	✓
Dry gas density	NA	NSW TM-23	not specified	NA	✓
Carbon dioxide	NSW TM-24	NSW TM-24	13%	✓	✓
Carbon monoxide	NSW TM-32	NSW TM-32	12%	✓	✓
Nitrogen oxides	NSW TM-11	NSW TM-11	12%	✓	✓
Oxygen	NSW TM-25	NSW TM-25	13%	✓	✓
Aldehydes and ketones	NSW TM-34	Ektimo 332	16%	✓	✓ [†]
Phenol and phenolic compounds	Ektimo 320	Ektimo 320	17%	✓	✓ [†]
Speciated volatile organic compounds (VOC's)	NSW TM-34 ^d	Ektimo 344	19%	✓	✓ [†]
Solid particles (total)	NSW TM-15	NSW TM-15 ^{††}	3%	✓	✓
Particulate matter (PM ₁₀)	NSW OM-5	NSW OM-5 ^{††}	6%	✓	✓
Particulate matter (PM _{2.5})	USEPA 201A	USEPA 201A ^{††}	9%	✓	✓
Total (gaseous and particulate) metals and metallic compounds	NSW TM-12, NSW TM-13, NSW TM-14	Envirolab inhouse Metals-006, Metals-022, Metals-021	15%	✓	✓ [‡]
Type 1 substances (Sb, As, Cd, Pb, Hg)	NSW TM-12	Envirolab inhouse Metals-006, Metals-022, Metals-021	15%	✓	✓ [‡]
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW TM-13	Envirolab inhouse Metals-006, Metals-022	15%	✓	✓ [‡]
Smoke	NSW TM-16	NA	not specified	NA	✓
Odour	NSW OM-7	NSW OM-7 [¥]	Refer to results	✓	✓
Odour Characterisation	NA	direct observation	NA	NA	✗

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* Uncertainty values cited in this table 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 1 June 2021 in report number LV-001446. 7 June 2021 in report number LV-001471. 17 June 2021 in report number LV-001567.

^{††} Gravimetric analysis conducted at the Ektimo Unanderra, NSW laboratory, NATA accreditation number 14601.

[¥] Odour analysis conducted at the Unanderra, NSW laboratory, by forced choice olfactometry, NATA accreditation number 14601. Results were reported on 12 May 2021 in report number ON-00077.

[‡] Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 20 May 2021 in report number 268913.

^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 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 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	Continuous Emission Monitoring
CEMS	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 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.
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
Lower Bound	Defines values reported below detection as equal to zero.
Medium Bound	Defines values reported below detection are equal to half 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	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 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 will be determined by matching the integrated 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 afterflows.
Vic EPA	Victorian Environment Protection Authority
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.
XRD	X-ray Diffractometry
Upper Bound	Defines values reported below detection are 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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