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31 May 2024

Roxley Penny
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Smartstream Technology
17 Cardup Siding Road
Cardup, Western Australia 6122

By email: [redacted]@wormallcivil.com.au

[EAQ Project Reference: 24016]

Technical Report – Air Quality Impact Assessment of Rotomould Facility (Cardup)

Dear Roxley,

Environmental and Air Quality Consulting Pty Ltd (EAQ) provides this technical report that presents the measured concentrations of airborne pollutants for the Cardup Smartstream Technology Rotomould Facility (the Site) and addresses the risk of adverse impacts of those individual pollutant species on nearby sensitive receptors within the Cardup locale.

The key pollutant sampling and testing was undertaken by Ektimo. The laboratory results are presented in Appendix A.

Table of Contents

Tables

1 Background to Assessment

The Shire of Serpentine-Jarrahdale (SSJ) has requested an updated air emissions report for the Site *"in accordance with the draft guideline on air emissions from the Department of Water and Environmental Regulation* (DWER). *The Air Emission assessment should consider concentrations of air pollutants at source (stack) and/or ground concentrations to compare with the relevant air quality criteria – for example criteria pollutants, principle toxic substances and individual toxic substances".*

The Assessment aims to demonstrate to the SSJ that the Site's operations do not impact upon the ambient air quality afforded to the Cardup locality.

The pollutants targeted are those that are most likely to be emitted from the Rotomoulding activities (plastic products) and include those key toxic pollutants prescribed within the current DWER draft guideline on air emissions.

The pollutant sampling and testing was undertaken by Ektimo. The laboratory results are presented in Appendix A.

2 Targeted Airborne Pollutants

Table 2-1 lists the airborne pollutants targeted in the Assessment and their ground level exposure limits at the nearest sensitive receptor (urban).

Table 2-1: Targeted Airborne Pollutants

Pollutant	DWER Exposure Criteria µg/m^3 @ 25^{0}C
Nitrogen oxides (NOx) as NO_2	226 (1-hr), 56 (Annual)
Sulphur dioxide (SO_2)	524 (1-hr), 210 (24-hrs), 52 (Annual)
Carbon monoxide (CO)	30,000 (1-hr), 10,000 (8-hrs)
Total Volatile Organic Compounds (VOCs)	n/a
Formaldehyde	20 (1-hr)
Acetaldehyde	1,830 (24-hrs), 46 (Annual)
Acetone	22,000 (1-hr)
Acrolein	0.42 (1-hr), 0.074 (24-hrs)
Propionaldehyde	1,830 (24-hrs), 46 (Annual)
Valeraldehyde	1,830 (24-hrs), 46 (Annual)
Methyl ethyl ketone (MEK - 2-butanone)	445,000 (8-hr) – Safe Work Australia
n-Butyraldehyde	1,830 (24-hrs), 46 (Annual)
Hexaldehyde	1,830 (24-hrs), 46 (Annual)

* Where individual aldehyde species have no exposure criteria, the criteria for Acetaldehyde has been adopted.

3 Results of Airborne Emissions Sampling and Testing

Table 3-1: Rotomould Ovens' Sampling Plane Details

Parameter	Unit	Stack West	Stack East
Stack diameter	Metres (m)	0.358	0.300
Stack area	Square metres (m^2)	0.101	0.071
Moisture content	% volume/volume	4.1	3.5
Temperature	Degrees Celsius (^0C)	194	179
Velocity	Metres per second (m/s)	4.5	15
Volumetric flow rate, actual	Cubic metres per minute (m^3/min)	27	63
Volumetric flow rate, wet		17	38

Table 3-2: Concentration Results of Measured Pollutants & Mass Emission Rates

Analyte (Chemical Species)	Stack West		Stack East	
	Conc'n (ou.m^3)	Emission Rate	Conc'n (ou.m^3)	Emission Rate
Odour	1,400	-	570	
Analyte (Chemical Species)	**Conc'n (mg/m^3)**	**g/s**	**Conc'n (mg/m^3)**	**g/s**
Nitrogen oxides (NOx)	49	0.0139	15	0.0095
Sulphur dioxide (SO_2)	A < 6	< 0.0017	A < 6	< 0.0038
Carbon monoxide (CO)	28	0.0079	6.6	0.0042
Total VOCs	1.3	0.0004	6.3	0.0040
Formaldehyde	0.2	0.0001	0.42	0.0003
Acetaldehyde	0.23	0.0001	0.17	0.0001
Acetone	2.5	0.000708	4.4	0.0028
Acrolein	< 0.03	< 0.000009	< 0.04	< 0.000025
Propionaldehyde	< 0.03	< 0.000009	< 0.04	< 0.000025
Valeraldehyde	< 0.03	< 0.000009	< 0.04	< 0.000025
MEK (2-butanone)	< 0.03	< 0.000009	< 0.04	< 0.000025
n-Butyraldehyde	< 0.03	< 0.000009	< 0.04	< 0.000025
Hexaldehyde	< 0.03	< 0.000009	< 0.04	< 0.000025

A " < " refers to a concentration less than the analytical detection limit.

Combining the two stacks, the cumulative results are listed in **Table 3-3.**

Table 3-3: Concentration & Mass Emissions of Cumulative Measured Pollutants

Analyte (Chemical Species)	Conc'n (ou.m^3)	Emission Rate
Odour	1,970	-
Analyte (Chemical Species)	**Conc'n (mg/m^3)**	**g/s**
Nitrogen oxides (NOx)	64	**0.0234**
Sulphur dioxide (SO_2)	< 12	**0.0055**
Carbon monoxide (CO)	34.6	**0.0121**
Total VOCs	7.6	**0.0044**
Formaldehyde	0.62	**0.0003**
Acetaldehyde	0.4	**0.0002**
Acetone	6.9	**0.0035**
Acrolein	< 0.07	**0.000034**
Propionaldehyde	< 0.07	**0.000034**
Valeraldehyde	< 0.07	**0.000034**
MEK (2-butanone)	< 0.07	**0.000034**
n-Butyraldehyde	< 0.07	**0.000034**
Hexaldehyde	< 0.07	**0.000034**

Table 3-4 compares the previous (2022) pollutant mass emission rate results to these 2024 results.

Table 3-4: Concentration & Mass Emissions of Cumulative Measured Pollutants

Analyte (Chemical Species)	2022 Measured Value (ou.m^3)	Modelled Ground Level Conc'n (GLC)	% of Criteria	2024 Measured Value (ou.m^3)	% ↑ ↓ on 2022 Results	Adjusted for % of Criteria
Odour	1,100	0.1911	19%	1,970	79%	34%
Analyte (Chemical Species)	**2022 Measured Value (mg/m^3)**	**Model GLC**	**% of Criteria**	**2024 Measured Value (mg/m^3)**	**% ↑ ↓ on 2022 Results**	**Adjusted for % of Criteria**
Nitrogen oxides (NOx)	13	1.2376	0.548%	64	392%	2.698%
Sulphur dioxide (SO_2)	< 6 (modelled as 6)	0.5681	0.108%	(2 x < 6) 12	100%	0.216%
Carbon monoxide (CO)	41	3.8752	0.013%	34.6	-16%	0.011%
Total VOCs	< 0.3	n/a	n/a	7.6	n/a	n/a
Formaldehyde	2.9	0.2840	1.420%	0.62	-79%	0.304%
Acetaldehyde	0.22	0.0203	0.001%	0.4	82%	0.002%
Acetone	2.5	[B] 0.2840	0.001%	6.9	176%	0.003%
Acrolein	< 0.007	<	n/a	< 0.07	< n/a	n/a
Propionaldehyde	≤ 0.025	<	n/a	< 0.07	< n/a	n/a
Valeraldehyde	< 0.007	<	n/a	< 0.07	< n/a	n/a
MEK (2-butanone)	< 0.007	<	n/a	< 0.07	< n/a	n/a
n-Butyraldehyde	0.065	[B] 0.2840	0.016%	< 0.07	< n/a	n/a
Hexaldehyde	0.021	[B] 0.2840	n/a	< 0.07	< n/a	n/a

[B] Analyte Modelled against Formaldehyde Concentration.

- The concentrations (g/s) listed in **Table 3-4** show that the 2024 mass emission rates for all chemical species are very low; and
- The emission rates listed in **Table 3-4**, when compared and subsequently adjusted against the most recent 2022 modelled ground level concentrations (**column 7**) shows that ground level concentrations of these key pollutants do not exceed regulatory guidelines.

Some pollutant emission rates have increased in 2024 compared to the 2022 results, however; these increases are not material. Equally, some emission rates have decreased (**Table 3-4, column 6**).

Analytes measured and found to be below the detection limits of the laboratory (<) shows that these pollutants are of a very low risk and/or negligible risk in terms of ground level pollutant impacts.

Odour impacts are evaluated based on odour field assessment (OFA) techniques, not dispersion modelling; where the OFAs have been undertaken and reported by Ektimo and therefore not represented or discussed herein.

4 Discussion

The site-specific sampling and testing of airborne pollutants by Ektimo have provided emission parameters and analtye concentrations for criteria, principal and individual toxic substances, and for measured odour concentration, from the Rotomould emission stacks. Importantly, the measured emission temperatures are high which will provide large thermal buoyancy of the plume and thus aid in dispersion of the plume before the plume touches back to ground level.

The measured chemical species all had low concentrations with some analytes having negligible concentrations which were not detectable at, or above the laboratory lower detection limit.

4.1 Conclusion and Closing

The Assessment of Smartstream's Rotomoulding process at their Cardup Site, by site-specific odour and chemical sampling and testing of the stacks' emission streams, has shown that the measured concentrations of airborne pollutants from the Rotomoulding process are very low and hence the risk of an adverse impact at the nearest sensitive receptor is also low.

Based on the Assessment findings, the emission plume from Smartstream's Rotomoulding process poses a negligible risk for causing adverse impacts at the nearest sensitive receptor.

Closing

Should you have any queries on the detail and technical points herein please don't hesitate to contact EAQ as required.

Yours sincerely,

John Hurley
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Director | Principal Air Quality Consultant
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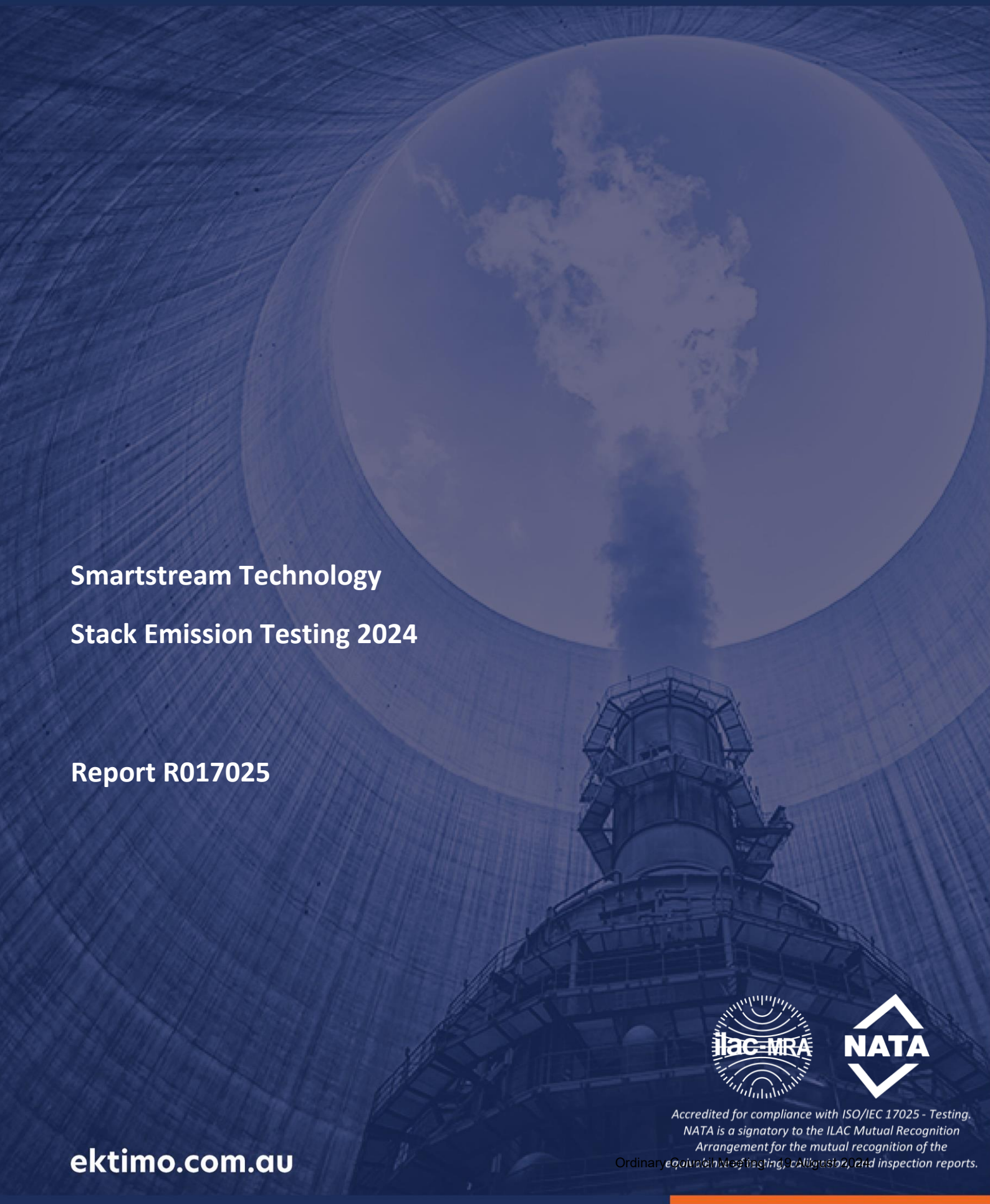
APPENDIX A – EKTIMO LABORATORY RESULTS

Ektimo

Smartstream Technology

Stack Emission Testing 2024

Report R017025



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Document Information

Client Name:	Smartstream Technology
Report Number:	R017025
Date of Issue:	22 May 2024
Attention:	Roxley Penney
Address:	17 Cardup Siding Road Cardup WA 6123
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Report Authorisation

Brock Zimoch
Air Monitoring Consultant

NATA Accredited Laboratory
No. 14601

Tom Manton
Ektimo Signatory

Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo terms of NATA accreditation as described in the Test Methods table. This does not include calculations that use data supplied by third-parties, comments, conclusions, or recommendations based upon the results. Refer to Test Methods section for full details of testing covered by NATA accreditation.

Table of Contents

1 Executive Summary

1.1 Background

Ektimo was engaged by Smartstream Technology to perform emission testing at their Cardup plant.

Monitoring was performed during peak production.

1.2 Project Objective & Overview

The objective of the project was to quantify emissions from two discharge points.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
Roto Moulding Oven Exhaust Stack (West)	1 May 2024	Volatile organic compounds (VOCs) Aldehydes and ketones Odour Nitrogen oxides, sulfur dioxide, carbon monoxide, carbon dioxide & oxygen
Roto Moulding Oven Exhaust Stack (East)	2 May 2024	

* 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 this report.

2 Results

2.1 Roto Moulding Oven Exhaust Stack (West)

Date	1/05/2024	**Client**	Smartstream Technology
Report	R017025	**Stack ID**	Roto Moulding Oven Stack West
Licence No.	-	**Location**	Cardup
Ektimo Staff	Brock Zimoch, Tim Blankley	**State**	WA
Process Conditions	Please refer to client records.		*240424*

Stack Parameters		
Moisture content, %v/v	4.1	
Gas molecular weight, g/g mole	28.8 (wet)	29.3 (dry)
Gas density at STP, kg/m³	1.29 (wet)	1.31 (dry)
Gas density at discharge conditions, kg/m³	0.82	
Gas Flow Parameters		
Temperature, °C	194	
Velocity at sampling plane, m/s	4.5	
Volumetric flow rate, actual, m³/min	27	
Volumetric flow rate (wet STP), m³/min	17	
Volumetric flow rate (dry STP), m³/min	17	
Mass flow rate (wet basis), kg/h	1300	

Gas Analyser Results	Average	
Sampling time	1109 - 1142	
	Concentration mg/m³	Mass Rate g/min
Combustion Gases		
Nitrogen oxides (as NO_2)	49	0.81
Sulfur dioxide	<6	<0.09
Carbon monoxide	28	0.46
	Concentration %v/v	
Carbon dioxide	3.6	
Oxygen	14.5	

Aldehydes	Average		Test 1		Test 2	
Sampling time			1109-1124		1125-1140	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Formaldehyde	0.2	0.0033	0.079	0.0013	0.31	0.0052
Acetaldehyde	0.23	0.0038	0.13	0.0021	0.33	0.0056
Acetone	2.5	0.042	2	0.034	3	0.051
Acrolein	<0.03	<0.0005	<0.03	<0.0005	<0.03	<0.0005
Propionaldehyde	<0.03	<0.0005	<0.03	<0.0005	<0.03	<0.0005
2-Butanone (MEK)	<0.03	<0.0005	<0.03	<0.0005	<0.03	<0.0005
Butrylaldehyde	<0.03	<0.0005	<0.03	<0.0005	<0.03	<0.0005
Valeraldehyde	<0.03	<0.0005	<0.03	<0.0005	<0.03	<0.0005
Hexaldehyde	<0.03	<0.0005	<0.03	<0.0005	<0.03	<0.0005

Prepared for: Smartstream Technology
Report No.: R017025
Date: 22/05/2024

Ektimo

Date	1/05/2024	**Client**	Smartstream Technology
Report	R017025	**Stack ID**	Roto Moulding Oven Stack West
Licence No.	-	**Location**	Cardup
Ektimo Staff	Brock Zimoch, Tim Blankley	**State**	WA
Process Conditions	Please refer to client records.		*240424*

Odour	Average		Test 1		Test 2	
Sampling time			1111 - 1116		1125 - 1130	
	Concentration ou	Odourant Flow Rate ou.m³/min	Concentration ou	Odourant Flow Rate ou.m³/min	Concentration ou	Odourant Flow Rate ou.m³/min
Results	1400	25000	1400	25000	1400	25000
Lower uncertainty limit	1100		1100		1000	
Upper uncertainty limit	1800		1900		1900	
Analysis date & time			02/05/24, 0900-0930		02/05/24, 0900-0930	
Holding time			22 hours		22 hours	
Dilution factor			1		1	
Bag material			Nalophan		Nalophan	
Butanol threshold (ppb)	44					
Laboratory temp (°C)	23					
Last calibration date	March 2024					

Total Speciated VOCs	Average		Test 1		Test 2	
Sampling time			1109-1124		1125-1140	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
C5-C20	1.3	0.021	1.7	0.028	0.84	0.014

VOC's C5-C20	Average		Test 1		Test 2	
Sampling time			1109-1124		1125-1140	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Detection limit[1]	<0.1	<0.002	<0.1	<0.002	<0.1	<0.002
Dichloromethane	0.28	0.0046	0.32	0.0052	0.24	0.004
Residuals as Toluene	0.99	0.016	1.4	0.023	0.6	0.01

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

2.2 Roto Moulding Oven Exhaust Stack (East)

Date	2/05/2024	**Client**	Smartstream Technology
Report	R017025	**Stack ID**	Roto Moulding Oven Stack East
Licence No.	-	**Location**	Cardup
Ektimo Staff	Brock Zimoch, Tim Blankley	**State**	WA
Process Conditions	Please refer to client records.		*240424*

Stack Parameters		
Moisture content, %v/v	3.5	
Gas molecular weight, g/g mole	28.7 (wet)	29.1 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.30 (dry)
Gas density at discharge conditions, kg/m³	0.77	
Gas Flow Parameters		
Temperature, °C	179	
Velocity at sampling plane, m/s	15	
Volumetric flow rate, actual, m³/min	63	
Volumetric flow rate (wet STP), m³/min	38	
Volumetric flow rate (dry STP), m³/min	37	
Mass flow rate (wet basis), kg/h	2900	

Gas Analyser Results	Average	
Sampling time	0949 - 1023	
	Concentration mg/m³	Mass Rate g/min
Combustion Gases		
Nitrogen oxides (as NO_2)	15	0.55
Sulfur dioxide	<6	<0.2
Carbon monoxide	6.6	0.24
	Concentration %v/v	
Carbon dioxide	1.3	
Oxygen	18.7	

Aldehydes	Average		Test 1		Test 2	
Sampling time			0955-1004		1004-1023	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Formaldehyde	0.42	0.015	0.57	0.021	0.28	0.01
Acetaldehyde	0.17	0.006	0.19	0.0068	0.14	0.0053
Acetone	4.4	0.16	7.2	0.26	1.6	0.057
Acrolein	<0.04	<0.001	<0.05	<0.002	<0.02	<0.0009
Propionaldehyde	<0.04	<0.001	<0.05	<0.002	<0.02	<0.0009
2-Butanone (MEK)	<0.04	<0.001	<0.05	<0.002	<0.02	<0.0009
Butrylaldehyde	<0.04	<0.001	<0.05	<0.002	<0.02	<0.0009
Valeraldehyde	<0.04	<0.001	<0.05	<0.002	<0.02	<0.0009
Hexaldehyde	<0.04	<0.001	<0.05	<0.002	<0.02	<0.0009

Prepared for: Smartstream Technology
Report No.: R017025
Date: 22/05/2024

Ektimo

Date	2/05/2024	**Client**	Smartstream Technology
Report	R017025	**Stack ID**	Roto Moulding Oven Stack East
Licence No.	-	**Location**	Cardup
Ektimo Staff	Brock Zimoch, Tim Blankley	**State**	WA
Process Conditions	Please refer to client records.		*240424*

Odour	Average		Test 1		Test 2	
Sampling time			1012 - 1017		1017 - 1022	
	Concentration ou	Odourant Flow Rate ou.m³/min	Concentration ou	Odourant Flow Rate ou.m³/min	Concentration ou	Odourant Flow Rate ou.m³/min
Results	570	22000	570	22000	570	22000
Lower uncertainty limit	470		430		430	
Upper uncertainty limit	700		760		760	
Analysis date & time			03/05/24, 0900-0930		03/05/24, 0900-0930	
Holding time			23 hours		23 hours	
Dilution factor			1		1	
Bag material			Nalophan		Nalophan	
Butanol threshold (ppb)	56					
Laboratory temp (℃)	23					
Last calibration date	March 2024					

Total Speciated VOCs	Average		Test 1		Test 2	
Sampling time			0955-1004		1004-1012	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
C5-C20	6.3	0.23	8.2	0.3	4.3	0.16

VOC's C5-C20	Average		Test 1		Test 2	
Sampling time			0955-1004		1004-1012	
	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min	Concentration mg/m³	Mass Rate g/min
Detection limit[1]	<0.3	<0.009	<0.3	<0.009	<0.3	<0.009
Dichloromethane	1.3	0.046	1.5	0.055	1	0.036
Residuals as Toluene	5	0.18	6.7	0.24	3.3	0.12

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

3 Sample Plane Compliance

3.1 Roto Moulding Oven Exhaust Stack (West)

Sampling Plane Details	
Sampling plane dimensions	358 mm
Sampling plane area	0.101 m²
Sampling port size, number & depth	1" BSP (x2), 12 mm
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 5.4 D
Upstream disturbance	Centrifugal fan 3.5 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 upstream disturbance but is greater than or equal to 2D

3.2 Roto Moulding Oven Exhaust Stack (East)

Sampling Plane Details	
Sampling plane dimensions	300 mm
Sampling plane area	0.0707 m²
Sampling port size, number & depth	1" BSP (x1), 2 mm
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Centrifugal fan >6 D
No. traverses & points sampled	1 4
Sample plane conformance to AS 4323.1	Non-conforming

Comments
The number of traverses sampled is less than the requirement

The sampling plane is deemed to be non-conforming due to the following reasons:
The stack or duct does not have the required number of access holes (ports)

4 Plant Operating Conditions

See Smartstream Technology 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	Uncertainty*	NATA accredited Sampling	NATA accredited Analysis
Sampling points - Selection	AS 4323.1	NA	NA	✓	NA
Flow rate, temperature & velocity	USEPA Method 2	USEPA Method 2	8%, 2%, 7%	NA	✓
Carbon dioxide & oxygen	USEPA Method 3A	USEPA Method 3A	13%	✓	✓
Carbon monoxide	USEPA Method 10	USEPA Method 10	12%	✓	✓
Nitrogen oxides	USEPA Method 7E	USEPA Method 7E	12%	✓	✓
Sulfur dioxide	USEPA Method 6C	USEPA Method 6C	12%	✓	✓
Aldehydes & ketones	Ektimo 330	Ektimo 330	16%	✓	✓†
Speciated volatile organic compounds	Ektimo 344	Ektimo 344	19%	✓	✓†
Odour	AS 4323.3	AS 4323.3	refer to results	✓	✓¥

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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).

¥ Odour analysis conducted at the Ektimo WA laboratory by forced choice olfactometry. Results were reported to Ektimo on:
2 May 2024 in report WO-00357.
3 May 2024 in report WO-00359.

† Analysis performed by Ektimo. Results were reported to Ektimo on:
10 May 2024 in report LV-005737.
16 May 2024 in report LV-005773.

6 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.

Unless specifically noted, all samples were collected and handled in accordance with Ektimo's QA/QC standards.

7 Definitions

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

% v/v	Volume to volume ratio
~	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
BaP-TEQ	Benzo(a)pyrene toxic equivalents
BSP	British standard pipe
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
I-TEQ	International toxic equivalents
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.
WHO05-TEQ	World Health Organisation toxic equivalents
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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