Stephenson

Environmental Management Australia

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EMISSION TEST REPORT (ETR) NO. 7362A/S26193/23

STYRENE SCRUBBER EMISSION MONITORING

ROCBOLT RESINS PTY LIMITED

SMEATON GRANGE, NSW 2567

PROJECT NO.: **7362A/S26193/23**

DATE OF SURVEY: **23 NOVEMBER 2023**

DATE OF ISSUE: **12 DECEMBER 2023**

EMISSION TEST REPORT NO. 7362A/S26193/23

	The sampling and analysis was commissioned by:	
Client	Organisation:	Rocbolt Resins Pty Limited
	Contact:	Andrew Sykes
	Address:	40-44 Anzac Avenue, Smeaton Grange NSW 2567
	Telephone:	02 4647 8388
	Email:	asykes@rocboltresins.com.au
	Project Number:	7362A/S26193/23
	Test Date:	23 November 2023
	Production Conditions:	Normal operating conditions during testing
	Analysis Requested:	Dry gas density, volumetric flowrate, velocity, temperature, moisture, molecular weight of stack gases, nitrogen oxides, particulate matter less than 10 microns, volatile organic compounds including styrene and benzene
	Sample Locations:	Styrene dry scrubber exhaust stack
	Sample ID Nos.:	See attachment A
	Identification	The samples are labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time and whether further analysis is required.

Test	*Test Method Number for Sampling & Analysis*	*Laboratory Analysis & Report No.*
Dry Gas Density	NSW TM-23, USEPA M3	Trinity Consultants Australia; NATA Accreditation No. 15841; Report No. 237401.0192
Moisture	NSW TM-22, USEPA M4	
Molecular Weight of Stack Gases	NSW TM-23, USEPA M3	
Oxides of Nitrogen	NSW TM-11, USEPA M7E	
Particulate Matter less than 10 microns	NSW OM-5, USEPA M201A	
Stack Pressure & Volumetric Flow	NSW TM-2, USEPA M2	
Stack Temperature	NSW TM-2, USEPA M2	
Velocity	NSW TM-2, USEPA M2	
Volatile Organic Compounds (styrene, benzene, total as n-Propane)	NSW TM-34, USEPA M18	TestSafe Australia, NATA Accreditation No. 3726, Report No. 2023-5908

Deviations from Test Methods Nil

Sampling Times NSW - As per Test Method requirements or if not specified in the Test Method then as per Protection of the Environment Operations (Clean Air) Regulations Part 2.

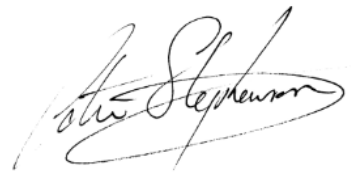
Reference Conditions NSW – As per

(1) Environment Protection Licence conditions, or

(2) Part 3 of the Protection of the Environment Operations (Clean Air) Regulations

All associated NATA endorsed Test Reports/Certificates of Analysis are provided in Attachment A.

Issue date: 12 December 2023



P W Stephenson
Managing Director

1.1 SCOPE OF WORK

The scope of work undertaken at Rocbolt Resins, Smeaton Grange, on October 13, 2022 is tabled below. Rocbolt Resins holds Environment Protection Licence (EPL) No. 20944.

Parameter	Styrene Scrubber Exhaust Stack	Units of Measure	NSW Approved Test Method
VOCs including Styrene and Benzene	2 samples	mg/m^3 or g/s	OM-2, TM-34
Particulate matter less than 10 microns	1 sample	mg/m^3	OM-5, USEPA 201A
Nitrogen Oxides	Continuous	mg/m^3	TM-11
Dry Gas Density	✓	kg/m^2	TM-23
Moisture	✓	%	TM-22
Molecular weight of stack gases	✓	g.g-mole	TM-23
Temperature	✓	K	TM-2
Velocity	✓	m/s	TM-2
Volumetric flowrate	✓	m^3/s	TM-2

Key:

kg/m^3	=	kilograms per cubic metre
mg/m^3	=	milligrams per cubic metre at 0^oC and 101.3 kilopascals (kPa)
g/s	=	grams per second
%	=	percentage
g.g-mole	=	grams per gram mole
g/s	=	grams per second
^oC	=	degrees Celsius
TM	=	test method
m/s	=	metres per second
m^3/s	=	dry cubic metre per second 0^oC and 101.3 kilopascals (kPa)
AS	=	Australian Standard
hr	=	hour
*	=	method agreed to by Chris Kelly, NSW EPA. Refer Benbow Environmental.

1.2 PRODUCTION AND SAMPLING CONDITIONS

Rocbolt Resins personnel considered the manufacturing facility was operating under typical conditions on the day of testing. Details of production conditions are available on request.

The following description of the process was supplied by Rocbolt Resins,

> *Rocbolt Resins manufactures resin capsules used as reinforcement for rocks/strata in the mining industry in conjunction with steel bolts and cables.*
>
> *The capsules are a 2 part capsule, an outer plastic skin, sealed at both ends with clips and a separate inner compartment. The larger compartment consists of a highly viscous polyester resin mastic paste comprising approximately 20% polyester resin (contains Styrene monomer) & 80% inert limestone fillers. The smaller compartment consists of catalyst containing inert limestone fillers, benzoyl peroxide paste and oil or water as the carrier. The ratio of the two compartment ranges from 80:20 to 93:7 by weight.*

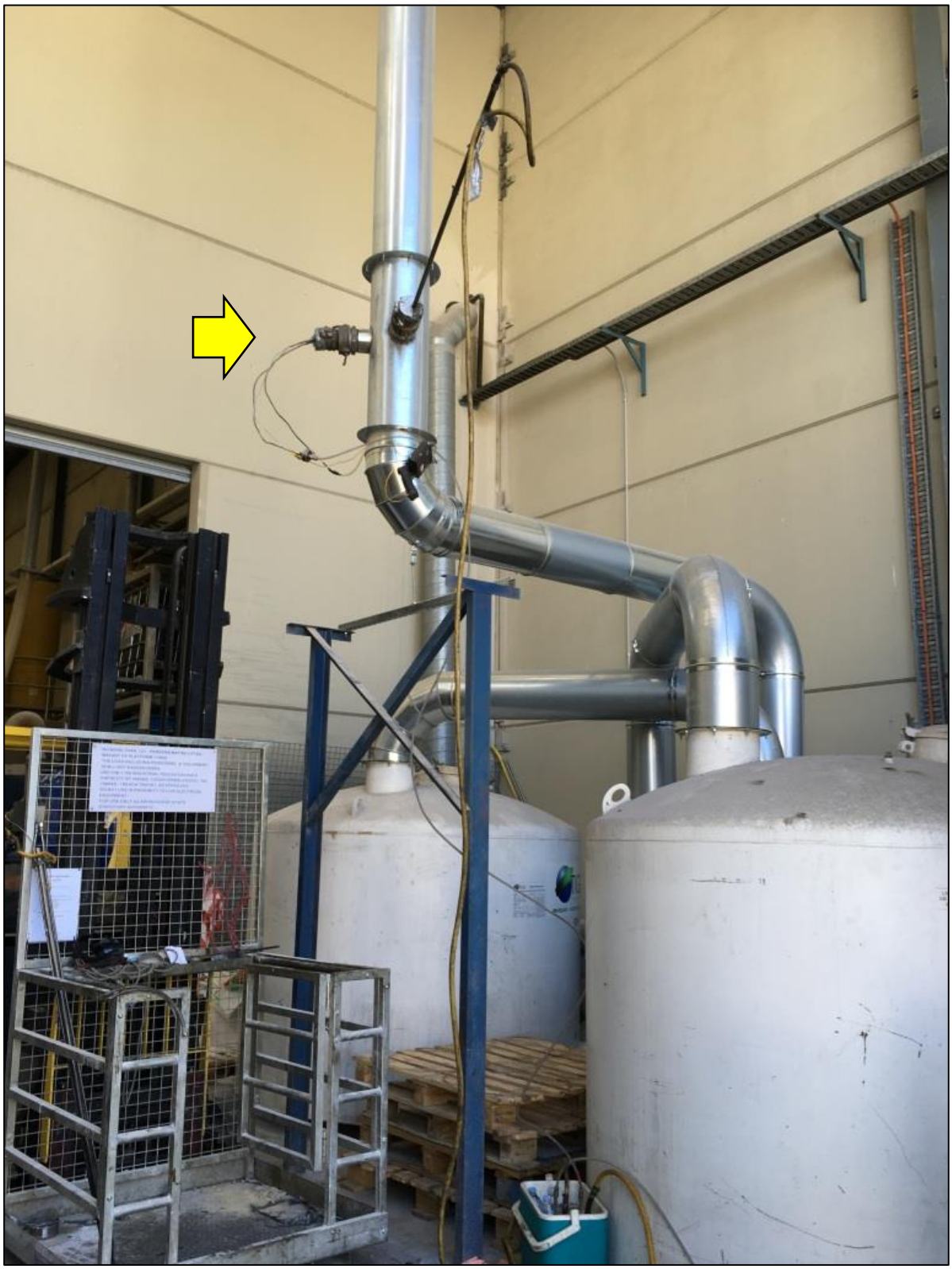
1.3 SUMMARY OF EMISSION TEST RESULTS – 23 NOVEMBER 2023

Parameter		Unit of measure	Average Measured Concentrations 23 November 2023 Exhaust Stack	EPL Licence 20944 Limit
Styrene	(as Styrene)	mg/m^3	7.7	**220**
	MER (as Styrene)	g/s	0.0023	--
Benzene	(as Benzene)	mg/m^3	<0.017	--
	MER (as Benzene)	g/s	<0.0000053	--
VOC (total)	(as n- propane)	mg/m^3	10.15	--
PM_{10}	concentration	mg/m^3	<0.15	--
	MER	g/s	0.000044	--
Oxides of nitrogen	concentration	mg/m^3	<0.21	--
	MER	g/s	<0.00006	--
Stack temperature		^oC	26	--
Velocity		m/s	4.7	--
Volumetric flow		m^3/s	0.295	--
Moisture		%	2.5	--
Molecular weight dry stack gas		g/g mole	28.85	--

Key:
- EPL = Environment Protection Licence
- MER = Mass Emission Rate
- VOC = Volatile organic compounds
- mg/m^3 = milligrams per cubic metre at 0^oC and 101.3 kilopascals (kPa)
- g/s = grams per second
- ^oC = degrees Celsius
- m/s = metres per second
- m^3/s = dry cubic metre per second 0^oC and 101.3 kilopascals (kPa)
- % = percentage
- < = less than
- g/g mole = grams per gram mole
- kg/m^3 = Kilograms per cubic metre
- kPa = Kilo Pascals
- -- = not specified in EPL 20944

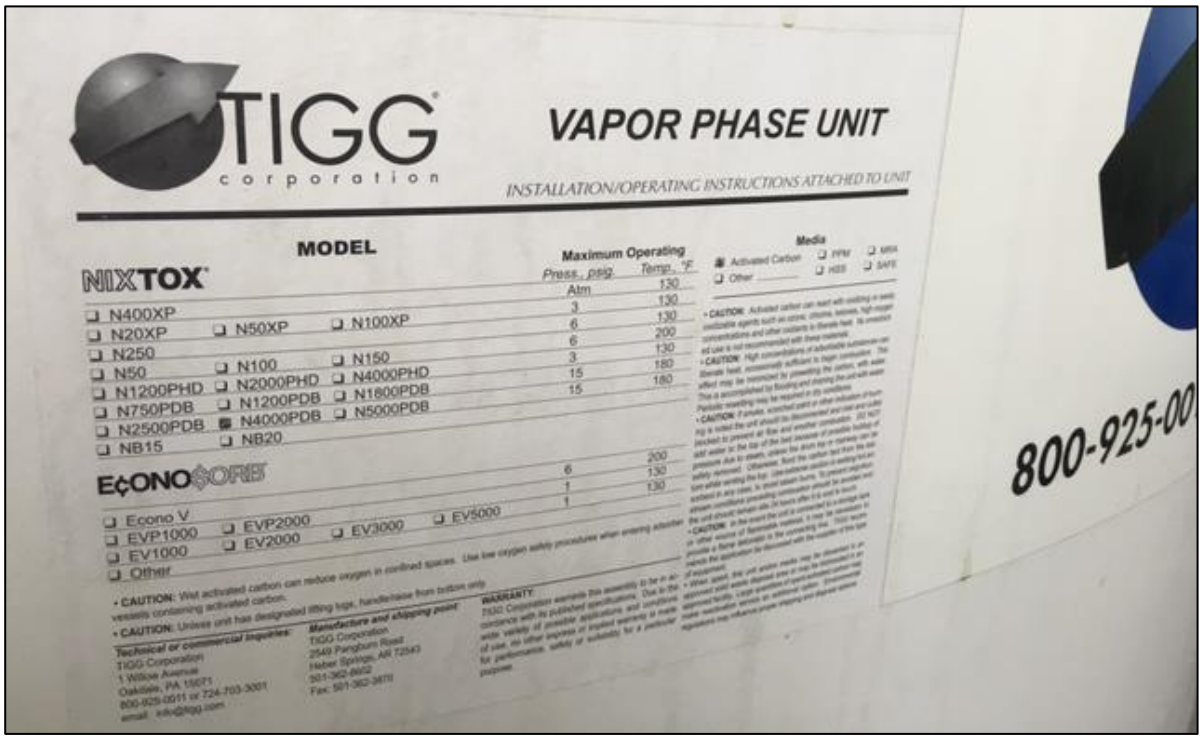
1.4 DRY SCRUBBER SAMPLING LOCATIONS

PHOTOGRAPH 1 DRY CARBON SCRUBBERS AND OUTLET SAMPLE PORTS



PHOTOGRAPH 2 VARIABLE SPEED FAN EXTRACTING AIR FROM WITHIN PLANT TO SCRUBBER TOWERS IN SERIES

PHOTOGRAPH 3 DRY SCRUBBER MANUFACTURER'S DETAILS



1.5 CONCLUSIONS

Emissions were monitored on the discharge side of the two dry carbon scrubbing units connected in series, at the Rocbolt Resins manufacturing facility with the following results:

- The average Styrene emission concentration (reported as Styrene) was 7.7 mg/m^3 which was compliant with the EPL limit of 220 mg/m^3. The styrene mass emission rate (MER) was less than 0.0023 grams per second (g/s).
- The average benzene MER (reported as benzene) was less than 5.3 X 10^{-6} g/s;
- The average total VOC MER (reported as n-propane) was 0.003 g/s;
- The average emission concentration of Oxides of Nitrogen (NO_x) (expressed as nitrogen dioxide (NO_2)) was <0.21 mg/m^3. The NO_x MER was <0.00006 g/s.
- The average PM_{10} emission concentration was <0.15 mg/m^3. The PM_{10} MER was 0.00004 g/s.
- Rocbolt Resins advised that the variable speed extraction fan serving the scrubber system was running at its normal set point (20 Hertz) during the system efficiency testing. This is of the order of 50% of total flow;
- However, the fan speed is variable depending on demand for extraction within the plant. Rocbolt Resins advise that this is both an energy conservation and scrubber efficiency optimisation policy.
- Sampling plane location is satisfactory for sampling of gases and low concentrations of very fine particles which have been filtered through two beds of activated carbon. However, the sampling plane could be relocated further downstream but would have no impact on this emission test work for these parameters.

ATTACHMENT A – NATA CERTIFICATES OF ANALYSIS

TESTSAFE NSW – REPORT NO. 2023-5908

TCA- REPORT NO. 237401.0192

SEMA - CHAIN OF CUSTODY S26251-7362

NSW GOVERNMENT | SafeWork NSW

Test Safe AUSTRALIA

Peter Stephenson
Stephenson Environmental Management Australia
PO Box 6398
SILVERWATER NSW 1811

Lab. Reference: 2023-5908

Samples analysed as received

SAMPLE ORIGIN: 7362

DATE OF INVESTIGATION: 23/11/2023 **DATE RECEIVED:** 24/11/23

ANALYSIS REQUIRED: Volatile Organic Compound

REPORT OF ANALYSIS OFFICIAL: Sensitive – Personal

See attached sheet(s) for sample description and test results.

The results of this report have been approved by the signatory whose signature appears below.

For all administrative or account details please contact the Laboratory.

Increment and total pagination can be seen on the following pages.

Martin Mazereeuw
Manager

Date: 30/11/23

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ABN 81 913 830 179

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Accreditation No. 3726

Accredited for compliance with ISO/IEC 17025 - Testing

NSW GOVERNMENT SafeWork NSW

Test Safe AUSTRALIA

Analysis of Volatile Organic Compounds in Workplace Air by GC/MS

Client: Stephenson
Sample ID: 728862

Date Sampled : 23/11/2023
Date Analysed : 29/11/2023
Reference Number : 2023-5908-1

No	Compounds	CAS No	Front µg/section	Back µg/section	No	Compounds	CAS No	Front µg/section	Back µg/section
	Aliphatic hydrocarbons (LOQ =1µg/c/s; #10, #18 - #23 =5µg/c/s)					**Aromatic hydrocarbons** (LOQ = 1µg/compound/section)			
1	2-Methylbutane	*78-78-4*	<LOQ	<LOQ	39	Benzene	*71-43-2*	<LOQ	<LOQ
2	n-Pentane	*109-66-0*	<LOQ	<LOQ	40	Ethylbenzene	*100-41-4*	<LOQ	<LOQ
3	2-Methylpentane	*107-83-5*	<LOQ	<LOQ	41	Isopropylbenzene	*98-82-8*	<LOQ	<LOQ
4	3-Methylpentane	*96-14-0*	<LOQ	<LOQ	42	1,2,3-Trimethylbenzene	*526-73-8*	<LOQ	<LOQ
5	Cyclopentane	*287-92-3*	<LOQ	<LOQ	43	1,2,4-Trimethylbenzene	*95-63-6*	<LOQ	<LOQ
6	Methylcyclopentane	*96-37-7*	<LOQ	<LOQ	44	1,3,5-Trimethylbenzene	*108-67-8*	<LOQ	<LOQ
7	2,3-Dimethylpentane	*565-59-3*	<LOQ	<LOQ	45	Styrene	*100-42-5*	44	<LOQ
8	n-Hexane	*110-54-3*	<LOQ	<LOQ	46	Toluene	*108-88-3*	<LOQ	<LOQ
9	3-Methylhexane	*589-34-4*	<LOQ	<LOQ	47	p-Xylene &/or m-Xylene	*106-42-3 & 108-38-3*	<LOQ	<LOQ
10	Cyclohexane	*110-82-7*	<LOQ	<LOQ	48	o-Xylene	*95-47-6*	<LOQ	<LOQ
11	Methylcyclohexane	*108-87-2*	<LOQ	<LOQ		**Ketones** (LOQ =1µg/c/s; LOQ #49, #53 =10µg/c/s; #58, #51 =50µg/c/s)			
12	2,2,4-Trimethylpentane	*540-84-1*	<LOQ	<LOQ	49	Acetone	*67-64-1*	48	<LOQ
13	n-Heptane	*142-82-5*	<LOQ	<LOQ	50	Acetoin	*513-86-0*	<LOQ	<LOQ
14	n-Octane	*111-65-9*	<LOQ	<LOQ	51	Diacetone alcohol	*123-42-2*	<LOQ	<LOQ
15	n-Nonane	*111-84-2*	<LOQ	<LOQ	52	Cyclohexanone	*108-94-1*	<LOQ	<LOQ
16	n-Decane	*124-18-5*	<LOQ	<LOQ	53	Isophorone	*78-59-1*	<LOQ	<LOQ
17	n-Undecane	*1120-21-4*	<LOQ	<LOQ	54	Methyl ethyl ketone (MEK)	*78-93-3*	<LOQ	<LOQ
18	n-Dodecane	*112-40-3*	<LOQ	<LOQ	55	Methyl isobutyl ketone (MIBK)	*108-10-1*	<LOQ	<LOQ
19	n-Tridecane	*629-50-5*	<LOQ	<LOQ		**Alcohols** (LOQ =1µg/c/s; #56, #57, #58, #60 =10µg/c/s)			
20	n-Tetradecane	*629-59-4*	<LOQ	<LOQ	56	Ethyl alcohol	*64-17-5*	<LOQ	<LOQ
21	α-Pinene	*80-56-8*	<LOQ	<LOQ	57	n-Butyl alcohol	*71-36-3*	<LOQ	<LOQ
22	β-Pinene	*127-91-3*	<LOQ	<LOQ	58	Isobutyl alcohol	*78-83-1*	<LOQ	<LOQ
23	D-Limonene	*138-86-3*	<LOQ	<LOQ	59	Isopropyl alcohol	*67-63-0*	<LOQ	<LOQ
	Chlorinated hydrocarbons (LOQ = 1µg/c/s; #30 =5µg/c/s)				60	2-Ethyl hexanol	*104-76-7*	<LOQ	<LOQ
24	Dichloromethane	*75-09-2*	<LOQ	<LOQ	61	Cyclohexanol	*108-93-0*	<LOQ	<LOQ
25	1,1-Dichloroethane	*75-34-3*	<LOQ	<LOQ		**Acetates** (LOQ =1µg/c/s; #62 =10µg/c/s)			
26	1,2-Dichloroethane	*107-06-2*	<LOQ	<LOQ	62	Ethyl acetate	*141-78-6*	<LOQ	<LOQ
27	Chloroform	*67-66-3*	<LOQ	<LOQ	63	n-Propyl acetate	*109-60-4*	<LOQ	<LOQ
28	1,1,1-Trichloroethane	*71-55-6*	<LOQ	<LOQ	64	n-Butyl acetate	*123-86-4*	<LOQ	<LOQ
29	1,1,2-Trichloroethane	*79-00-5*	<LOQ	<LOQ	65	Isobutyl acetate	*110-19-0*	<LOQ	<LOQ
30	Trichloroethylene	*79-01-6*	<LOQ	<LOQ		**Ethers** (LOQ =1µg/c/s; #66 =10µg/c/s)			
31	Carbon tetrachloride	*56-23-5*	<LOQ	<LOQ	66	Ethyl ether	*60-29-7*	<LOQ	<LOQ
32	Perchloroethylene	*127-18-4*	<LOQ	<LOQ	67	*tert*-Butyl methyl ether (MTBE)	*1634-04-4*	<LOQ	<LOQ
33	1,1,2,2-Tetrachloroethane	*79-34-5*	<LOQ	<LOQ	68	Tetrahydrofuran (THF)	*109-99-9*	<LOQ	<LOQ
34	Chlorobenzene	*108-90-7*	<LOQ	<LOQ		**Glycols** (LOQ =1µg/c/s; #69, #73 =50µg/c/s)			
35	1,2-Dichlorobenzene	*95-50-1*	<LOQ	<LOQ	69	PGME	*107-98-2*	<LOQ	<LOQ
36	1,4-Dichlorobenzene	*106-46-7*	<LOQ	<LOQ	70	Ethylene glycol diethyl ether	*629-14-1*	<LOQ	<LOQ
	Miscellaneous (LOQ #37= 10µg & #38=50µg/compound/sample)				71	PGMEA	*108-65-6*	<LOQ	<LOQ
37	Acetonitrile	*75-05-8*	<LOQ	<LOQ	72	Cellosolve acetate	*111-15-9*	<LOQ	<LOQ
38	n-Vinyl-2-pyrrolidinone	*88-12-0*	<LOQ	<LOQ	73	DGMEA	*112-15-2*	<LOQ	<LOQ
	Extra compound (LOQ = 10µg/compound/sample)					**Extra compound** (LOQ = 50µg/compound/sample)			
74	Bromopropane *	*106-94-5*	<LOQ	<LOQ	75	Naphthalene *	*91-20-3*	<LOQ	<LOQ
	Total VOCs (LOQ =50µg/compound/section)		92	<LOQ		Worksheet check		2023-5908-1	

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Accreditation No. 3726
Accredited for compliance with ISO/IEC 17025 - Testing

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Test Safe AUSTRALIA

Analysis of Volatile Organic Compounds in Workplace Air by GC/MS

Client: Stephenson
Sample ID: 728863

Date Sampled : 23/11/2023
Date Analysed : 29/11/2023
Reference Number : 2023-5908-2

No	Compounds	CAS No	Front µg/section	Back µg/section	No	Compounds	CAS No	Front µg/section	Back µg/section
	Aliphatic hydrocarbons (LOQ =1µg/c/s; #10, #18 - #23 =5µg/c/s)					**Aromatic hydrocarbons** (LOQ = 1µg/compound/section)			
1	2-Methylbutane	78-78-4	<LOQ	<LOQ	39	Benzene	71-43-2	<LOQ	<LOQ
2	n-Pentane	109-66-0	<LOQ	<LOQ	40	Ethylbenzene	100-41-4	<LOQ	<LOQ
3	2-Methylpentane	107-83-5	<LOQ	<LOQ	41	Isopropylbenzene	98-82-8	<LOQ	<LOQ
4	3-Methylpentane	96-14-0	<LOQ	<LOQ	42	1,2,3-Trimethylbenzene	526-73-8	<LOQ	<LOQ
5	Cyclopentane	287-92-3	<LOQ	<LOQ	43	1,2,4-Trimethylbenzene	95-63-6	<LOQ	<LOQ
6	Methylcyclopentane	96-37-7	<LOQ	<LOQ	44	1,3,5-Trimethylbenzene	108-67-8	<LOQ	<LOQ
7	2,3-Dimethylpentane	565-59-3	<LOQ	<LOQ	45	Styrene	100-42-5	44	<LOQ
8	n-Hexane	110-54-3	<LOQ	<LOQ	46	Toluene	108-88-3	<LOQ	<LOQ
9	3-Methylhexane	589-34-4	<LOQ	<LOQ	47	p-Xylene &/or m-Xylene	106-42-3 & 108-38-3	<LOQ	<LOQ
10	Cyclohexane	110-82-7	<LOQ	<LOQ	48	o-Xylene	95-47-6	<LOQ	<LOQ
11	Methylcyclohexane	108-87-2	<LOQ	<LOQ		**Ketones** (LOQ =1µg/c/s; LOQ #49, #53 =10µg/c/s; #50, #51 =50µg/c/s)			
12	2,2,4-Trimethylpentane	540-84-1	<LOQ	<LOQ	49	Acetone	67-64-1	56	<LOQ
13	n-Heptane	142-82-5	<LOQ	<LOQ	50	Acetoin	513-86-0	<LOQ	<LOQ
14	n-Octane	111-65-9	<LOQ	<LOQ	51	Diacetone alcohol	123-42-2	<LOQ	<LOQ
15	n-Nonane	111-84-2	<LOQ	<LOQ	52	Cyclohexanone	108-94-1	<LOQ	<LOQ
16	n-Decane	124-18-5	<LOQ	<LOQ	53	Isophorone	78-59-1	<LOQ	<LOQ
17	n-Undecane	1120-21-4	<LOQ	<LOQ	54	Methyl ethyl ketone (MEK)	78-93-3	<LOQ	<LOQ
18	n-Dodecane	112-40-3	<LOQ	<LOQ	55	Methyl isobutyl ketone (MIBK)	108-10-1	<LOQ	<LOQ
19	n-Tridecane	629-50-5	<LOQ	<LOQ		**Alcohols** (LOQ =1µg/c/s; #56, #57, #58, #60 =10µg/c/s)			
20	n-Tetradecane	629-59-4	<LOQ	<LOQ	56	Ethyl alcohol	64-17-5	<LOQ	<LOQ
21	α-Pinene	80-56-8	<LOQ	<LOQ	57	n-Butyl alcohol	71-36-3	<LOQ	<LOQ
22	β-Pinene	127-91-3	<LOQ	<LOQ	58	Isobutyl alcohol	78-83-1	<LOQ	<LOQ
23	D-Limonene	138-86-3	<LOQ	<LOQ	59	Isopropyl alcohol	67-63-0	<LOQ	<LOQ
	Chlorinated hydrocarbons (LOQ = 1µg/c/s; #30 =5µg/c/s)				60	2-Ethyl hexanol	104-76-7	<LOQ	<LOQ
24	Dichloromethane	75-09-2	<LOQ	<LOQ	61	Cyclohexanol	108-93-0	<LOQ	<LOQ
25	1,1-Dichloroethane	75-34-3	<LOQ	<LOQ		**Acetates** (LOQ =1µg/c/s; #62 =10µg/c/s)			
26	1,2-Dichloroethane	107-06-2	<LOQ	<LOQ	62	Ethyl acetate	141-78-6	<LOQ	<LOQ
27	Chloroform	67-66-3	<LOQ	<LOQ	63	n-Propyl acetate	109-60-4	<LOQ	<LOQ
28	1,1,1-Trichloroethane	71-55-6	<LOQ	<LOQ	64	n-Butyl acetate	123-86-4	<LOQ	<LOQ
29	1,1,2-Trichloroethane	79-00-5	<LOQ	<LOQ	65	Isobutyl acetate	110-19-0	<LOQ	<LOQ
30	Trichloroethylene	79-01-6	<LOQ	<LOQ		**Ethers** (LOQ =1µg/c/s; #66 =10µg/c/s)			
31	Carbon tetrachloride	56-23-5	<LOQ	<LOQ	66	Ethyl ether	60-29-7	<LOQ	<LOQ
32	Perchloroethylene	127-18-4	<LOQ	<LOQ	67	tert-Butyl methyl ether (MTBE)	1634-04-4	<LOQ	<LOQ
33	1,1,2,2-Tetrachloroethane	79-34-5	<LOQ	<LOQ	68	Tetrahydrofuran (THF)	109-99-9	<LOQ	<LOQ
34	Chlorobenzene	108-90-7	<LOQ	<LOQ		**Glycols** (LOQ =1µg/c/s; #69, #73 =50µg/c/s)			
35	1,2-Dichlorobenzene	95-50-1	<LOQ	<LOQ	69	PGME	107-98-2	<LOQ	<LOQ
36	1,4-Dichlorobenzene	106-46-7	<LOQ	<LOQ	70	Ethylene glycol diethyl ether	629-14-1	<LOQ	<LOQ
	Miscellaneous (LOQ #37= 10µg & #38=50µg/compound/sample)				71	PGMEA	108-65-6	<LOQ	<LOQ
37	Acetonitrile	75-05-8	<LOQ	<LOQ	72	Cellosolve acetate	111-15-9	<LOQ	<LOQ
38	n-Vinyl-2-pyrrolidinone	88-12-0	<LOQ	<LOQ	73	DGMEA	112-15-2	<LOQ	<LOQ
	Extra compound (LOQ = 10µg/compound/sample)					**Extra compound** (LOQ = 50µg/compound/sample)			
74	Bromopropane *	106-94-5	<LOQ	<LOQ	75	Naphthalene *	91-20-3	<LOQ	<LOQ
	Total VOCs (LOQ =50µg/compound/section)		100	<LOQ		Worksheet check		2023-5908-2	

ilac-MRA NATA

Accreditation No. 3726

Accredited for compliance with ISO/IEC 17025 - Testing

NSW GOVERNMENT | SafeWork NSW

Test Safe AUSTRALIA

Analysis of Volatile Organic Compounds in Workplace Air by GC/MS

All compounds (numbered 1-73) that are reported in the analysis are covered within the scope of NATA accreditation. Any additional compounds denoted with * are not covered by NATA accreditation.

Method : WCA.207 Analysis of Volatile Organic Compounds in Workplace Air by Gas Chromatography/Mass Spectrometry

Limit of Quantitation (LOQ) : 1 µg/sample except Cyclohexane, n-Dodecane, n-Tridecane, n-Tetradecane, a-Pinene, b-Pinene, Limonene and Trichloroethylene at 5 µg/sample; 10 µg/sample for Acetonitrile, Acetone, Isophorone, Ethanol, n-Butyl alcohol, Isobutyl alcohol, 2-Ethyl hexanol, Ethyl acetate, Ethyl ether and Bromopropane; 50 µg/sample for n-Vinyl-2-pyrrolidione, Acetoin, Diacetone alcohol, PGME, DGMEA and Naphthalene.

Method Description : Volatile organic compounds were trapped from the workplace air onto charcoal tubes by the use of a personal air monitoring pump. The volatile organic compounds were desorbed from the charcoal in the laboratory with CS_2. An aliquot of the desorbant was analysed by gas chromatography with mass spectrometry detection.

PGME: Propylene Glycol Monomethyl Ether
PGMEA: Propylene Glycol Monomethyl Ether Acetate
DGMEA: Diethylene Glycol Monoethyl Ether Acetate

Measurement Uncertainty : The measurement uncertainty is an estimate that characterises the range of values within which the true value is asserted to lie. The uncertainty estimate is an expanded uncertainty using a coverage factor of 2, which gives a level of confidence of approximately 95%. The estimate is compliant with the "ISO Guide to the Expression of Uncertainty in Measurement" and is a full estimate based on in-house method validation and quality control data. The measurement uncertainty relates to the analysis of the analyte on the sampling device and does not take into consideration the sampling parameters such as pump flowrate, time, temperature and pressure. The measurement of uncertainty estimates are available upon request.

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2023-5908

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Accreditation No. 3726
Accredited for compliance with ISO/IEC 17025 - Testing

Trinity Consultants Australia

ask VISION ENVIRONMENT Air Noise Environment

STYRENE SCRUBBER EXHAUST EMISSION MONITORING - 23 NOVEMBER 2023

40-44 Anzac Avenue, Smeaton Grange NSW 2567

Rocbolt Resins PTY LTD

NATA
WORLD RECOGNISED ACCREDITATION

Accredited for Compliance with ISO/IEC 17025 – Testing

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Document Approval	
Approver Signature	
Name	Gary Hall
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Accredited for compliance with ISO/IEC 17025 – Testing
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EXECUTIVE SUMMARY

Stack Emission testing for VOC's, NO_x and Particulate matter less than 10 microns (PM_{10}) was conducted at the Rocbolt Resins Pty Ltd site in Smeaton Grange, NSW. The emission testing from the Dry Scrubber Exhaust Stack was completed on 23 November 2023. A summary of the results are included in **Table E1.1.**

Table E1.1: Summary of Results for the Rocbolt Resins Dry Scrubber Exhaust Stack

Parameter	Results	Units	EPL 20944 Licence Limit
Particulate Matter (PM_{10})	<0.15	mg/Nm^3	-
Styrene	7.7	mg/Nm^3	220
TVOC (as n-propane)	10.1	mg/Nm^3	-
Nitrogen Oxides (expressed as NO_2)	<0.21	mg/Nm^3	-
Benzene	<0.017	mg/Nm^3	-
Velocity	4.7	m/s	-
Temperature	26	°C	-
Molecular weight (dry)	28.85	g/g-mole	-
Volumetric flow	0.295	Nm3/s	-
Moisture	2.5	%	-
Oxygen	21.03	%	-

1. INTRODUCTION

Stephenson Environmental Management Australia (SEMA) commissioned Trinity Consultants Australia to assist with conducting monitoring of air emissions from the Rocbolt Resins Pty Ltd site in Smeaton Grange NSW. The emission testing from the Dry Scrubber Exhaust stack was completed on 23 November 2023.

The objectives of the emission testing were to meet the annual monitoring requirements for the stack under the site's Environmental Protection Licence (EPL) 20944 to determine if the concentration limits specified in the EPL were met.

Table 1.1 details the monitoring location and the monitoring performed.

Table 1.1: Monitoring Locations and Parameters

Parameter	Styrene Scrubber Exhaust stack	Units of Measure	NSW Approved Test Method	EPL 20944 Licence Limit
VOC's including Styrene	2 Samples	mg/Nm^3	OM-2, TM-34	220 (Styrene)
Particulate matter less than 10 microns	1 sample	mg/Nm^3	OM-5 USEPA 201A	-
Nitrogen Oxides	Continuous	mg/Nm^3	TM-11	-
Oxygen	✓	%	TM-25	-
Moisture	✓	%	TM-22	-
Molecular weight of stack gases	✓	g/g-mole	TM-23	-
Temperature	✓	°C	TM-2	-
Velocity	✓	m/s	TM-2	-
Volumetric flow rate	✓	m^3/s	TM-2	-

The monitoring of air emissions at the Wetherill Park facility was completed during normal operating conditions. Any factors that may have affected the monitoring results were not observed by, or brought to the notice of Trinity Consultants Australia staff except where noted in this report.

2. METHODOLOGY

2.1 Emission Testing

Table 2.1 below lists the Methods used when undertaking emission monitoring at the Rocbolt Resins Pty Ltd site.

All air quality monitoring undertaken by the Trinity Consultants Australia staff has been undertaken in accordance with the methods identified in **Table 2.1** below unless as specified in section 2.2 below.

Table 2.1: Summary of Emission Monitoring Methods

Measurement Parameter	Method Equivalency
Temperature	**TM-2 (USEPA Method 2** Determination of Stack Gas Velocity and Flow Rate)
Dry Gas Density	**TM23 (USEPA Method 3** Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources)
Flow	**TM-2 (USEPA Method 2** Determination of Stack Gas Velocity and Flow Rate)
Moisture Content	**TM-22 (USEPA Method 4** Determination of Moisture Content in Stack Gases)
Molecular Weight	**TM23 (USEPA Method 3** Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources)
NO_x	**TM-11 (US EPA Method 7E** Determination of Nitrous Oxide emissions from stationary sources)
Oxygen	**TM23 (USEPA Method 3a** Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources)
Particulate Matter less than 10 microns (PM_{10})	**OM-5 (USEPA 201A** Determination of PM10 and PM2.5 Emissions from Stationary Sources)
VOC's (including Styrene, Benzene, Toluene, Acetone)	**TM-34 (USEPA Method 18** Measurement of Gaseous Organic Compounds by Gas Chromatography)

2.2 Deviation from Methods

Post sampling, VOC sample tubes were provided to SEMA who submitted the samples to Test Safe Laboratories for analysis.

2.3 Laboratory Analysis

Table 2.2 below presents a list of the NATA accredited laboratories that performed the applicable analysis and their NATA accreditation number and the report number.

Table 2.2: Table of NATA accredited Laboratories with Accreditation Number

Measurement Parameter	NATA Accreditation Number	Report Number
VOC's (including Styrene, Benzene, Toluene, Acetone)	SafeWork NSW TestSafe Australia 3726	2023-5908

3. RESULTS

3.1 Production Conditions

On the day of testing, the plant operating procedures and production rate was considered typical by Rocbolt Resins Pty Ltd personnel.

3.2 Monitoring Results - Dry Scrubber Exhaust Stack

Results of emissions monitoring for the Dry Scrubber Exhaust Stack are provided in **Table 3.1** below for emissions monitoring completed on 23 November 2023.

Table 3.1: Flow and Sample Characteristics for the Dry Scrubber Exhaust Stack

Parameter	Units of Measure	Average Measured Concentration	EPL 20944 Licence Limit
Styrene	mg/Nm^3	7.70	220
Styrene	g/s	0.0023	-
TVOC (as n-propane)	mg/Nm^3	10.15	-
TVOC (as n-propane)	g/s	0.003	-
Benzene	mg/Nm^3	<0.017	
Benzene	g/s	<0.0000053	
NO_x (expressed as NO_2)	mg/Nm^3	<0.21	-
NO_x (expressed as NO_2)	g/s	<0.00006	-
Particulate Matter (PM_{10})	mg/Nm^3	<0.15	-
Particulate Matter (PM_{10})	g/s	<0.000044	-
Stack Temperature	°C	26	-
Velocity	m/s	4.7	-
Volumetric flow	Nm^3/s	0.295	-
Moisture	%	2.5	-
Molecular weight (dry)	g/g-mole	28.85	-
Average Oxygen	%	21.03	-

3.3 Accuracy of Monitoring Results

Table 3.2 presents a summary of the estimated method uncertainties for each of the monitoring parameters.

Table 3.2: Estimated Method Uncertainties for the Dry Scrubber Exhaust Stack

Measurement Parameter	Method	% Uncertainty	Uncertainty	Units
Oxygen	USEPA Method 3A	2	0.42	%
Particulates	M201A	10	-[a]	mg/Nm^3
NO_x	US EPA Method 7E	5	-[a]	mg/Nm^3
VOC	USEPA Method 18	12.26	1.03	mg/Nm^3

Uncertainty values cited are calculated at the 95% confidence level, with a coverage factor of 2.
* NO_x results less than detection limits.

APPENDIX A GLOSSARY

Parameter or Term	Description
<	The analytes tested for was not detected, the value stated is the reportable limit of detection
µg	Micrograms (10^{-6}grams)
AS	Australian Standard
dscm	dry standard cubic meters (at 0°C and 1 atmosphere)
g	grams
kg	kilograms
m	metres
m^3	Cubic Metres, actual gas volume in cubic metres as measured.
mg	Milligrams
min	Minute
mg/m^3	Milligrams (10^{-3}) per cubic metre.
mmH_2O	Millimetres of water
Mole	The mole, symbol mol, is the SI unit of amount of substance. One mole contains exactly 6.022 140 76 x 10^{23} elementary entities. This number is the fixed numerical value of the Avogadro constant, N_A, when expressed in the unit mol^{-1} and is called the Avogadro number. The amount of substance, symbol n, of a system is a measure of the number of specified elementary entities. An elementary entity may be an atom, a molecule, an ion, an electron, any other particle or specified group of particles. This definition implies the exact relation N_A = 6.022 140 76 x 10^{23} mol^{-1}. Inverting this relation gives an exact expression for the mole in terms of the defining constant N_A: $1\ \text{mol} = \left(\frac{6.022\,140\,76 \times 10^{23}}{N_A} \right)$ The effect of this definition is that the mole is the amount of substance of a system that contains 6.022 140 76 x 10^{23}specified elementary entities.
N/A	Not Applicable
ng	Nanograms (10^{-9} grams)
Nm^3	Normalised Cubic Metres - Gas volume in dry cubic metres at standard temperature and pressure (0°C and 101.3 kPa).
ou	Odour Units
°C	Degrees Celsius
$µg/m^3$	Micrograms (10^{-6}) per cubic metre. Conversions from $µg/m^3$ to parts per volume concentrations (ie, ppb) are calculated at 25 °c.
ppb / ppm	Parts per billion / million.
PM	Particulate Matter.
PM_{10}, $PM_{2.5}$, PM_1	Fine particulate matter with an equivalent aerodynamic diameter of less than 10, 2.5 or 1 micrometres respectively. Fine particulates are predominantly sourced from combustion processes. Vehicle emissions are a key source in urban environments.
sec	Second
Sm^3	Standardised Cubic Metres - Gas volume in dry cubic metres at standard temperature and pressure (0°C and 101.3 kPa) and corrected to a standardised value (e.g. 7% O_2).
STP	Standard Temperature and Pressure (0°C and 101.3 kPa).
TVOC	Total Volatile Organic Compounds. These compounds can be both toxic and odorous.
USEPA	United States Environmental Protection Agency


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Chain of Custody & Analysis Request

Document No: 526251

Project No: 7362

Purchase Order No.: 5297

Purchase Results Required By: Normal

Lab Name: Workcover Testsafe Australia

Lab Telephone: (02) 9473 4000 Lab Facsimile: (02) 9980 6849

Lab Contact Name: Martin

Location	Sampling Date	Sample ID		Lab Sample ID	Parameter	NSW Test Method	Workcover Method	Temperature Chilled/ Ambient
R1	23/11/2023	728862			VOC Screen including styrene & benzene	TM-34	WCA.207	
R2	23/11/2023	728863				TM-34	WCA.207	
Relinquished By: margot kimber		Date/Time: 24/11 /2023 @10:30			Received By:		Date/Time:	/ / @
Samples Sent Intact: YES / NO					Samples Received Intact: YES / NO			
Comments: **Please contact us immediately should you have any questions with regards to the samples or analysis or if there will be any delays with the reporting.**								

P: QUALITY SYSTEMS/FORMS/SITE WORK
ISSUE DATE: 27 MAY 2016

VERSION: 1.4
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