Stephenson

Environmental Management Australia

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EMISSION TEST REPORT (ETR) NO. 6067/S25299/19

STYRENE SCRUBBER EFFICIENCY MONITORING

ROCBOLT RESINS PTY LIMITED

SMEATON GRANGE, NSW 2567

PROJECT NO.: **6067/S25299/19**

DATE OF SURVEY: **10 APRIL 2019**

DATE OF ISSUE: **03 MAY 2019**

NATA accredited laboratory number 15043.
Accredited for Compliance with ISO/IEC 17025 - Testing

EMISSION TEST REPORT NO. 6067/S25299/19

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:	6067/S25299/19
	Test Date:	10 April 2019
	Production Conditions:	Normal operating conditions during testing
	Analysis Requested:	Dry gas density, volumetric flowrate, velocity, temperature, moisture, molecular weight of stack gases, Nitrogen Oxides, Volatile Organic Compounds and 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*	*NATA Laboratory Analysis By: NATA Accreditation No. & Report No.*
Dry Gas Density	NSW TM-23, USEPA M3	SEMA, Accreditation No. 15043, ETR No. 6067
Moisture	NSW TM-22, USEPA M4	SEMA, Accreditation No. 15043, ETR No. 6067
Molecular Weight of Stack Gases	NSW TM-23, USEPA M3	SEMA, Accreditation No. 15043, ETR No. 6067
Oxides of Nitrogen	NSW TM-11, USEPA M7E	SEMA, Accreditation No. 15043, ETR No. 6067
Stack Pressure	NSW TM-2, USEPA M2	SEMA, Accreditation No. 15043, ETR No. 6067
Stack Temperature	NSW TM-2, USEPA M2	SEMA, Accreditation No. 15043, ETR No. 6067
Velocity	NSW TM-2, USEPA M2	SEMA, Accreditation No. 15043, ETR No. 6067
Volatile Organic Compounds (styrene, benzene, total as n-Propane)	NSW TM-34, USEPA M18	TestSafe Australia, Accreditation No. 3726, Report No. 2019-1808
Volumetric Flowrate	NSW TM-2, USEPA M2	SEMA, Accreditation No. 15043, ETR No. 6067

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: 3 May 2019

P W Stephenson
Managing Director

1.1 SCOPE OF WORK

The scope of work undertaken at Rocbolt Resins, Smeaton Grange, on April 10, 2019 is tabled below and was requested by Rocbolt Resins to address a requirement of their Environment Protection Licence (EPL) 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
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 information was sent to SEMA from 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 – 10 APRIL 2019

Parameter	Unit of measure	Average Measured Concentrations 10 April 2019 Exhaust Stack		EPL Licence 20944 Limit
Stack temperature	^oC	18		*ns*
Velocity	m/s	6		*ns*
Volumetric flow	m^3/s	0.36		*ns*
Moisture	%	1.4		*ns*
Molecular weight dry stack gas	g/g mole	28.8		*ns*
Gas Density	kg/m^3	1.29		*ns*
Stack pressure	kPa	102.4		*ns*
Oxides of nitrogen	mg/m^3	1		
Oxides of nitrogen	g/s	0.0005		
		Run 1	Run 2	
Styrene (as Styrene)	mg/m^3	**<0.18**	**<0.18**	**220**
Styrene (as n-propane)	mg/m^3	<0.075	<0.074	
Styrene MER (as Styrene)	g/s	<6.4E-5	<6.4E-5	
Benzene (as Benzene)	mg/m^3	<0.18	<0.18	
Benzene MER (as Benzene)	g/s	<6.4E-5	<6.4E-5	
Volatile Organic Compounds (as n- propane)	g/s	<6.3E-5	<6.3E-5	

Key:

^oC	=	degrees Celsius
%	=	percentage
<	=	less than
EPL	=	Environment Protection Licence
kg/m^3	=	Kilograms per cubic metre
kPa	=	Kilo Pascals
g/g mole	=	grams per gram mole
m/s	=	metres per second
m^3/s	=	dry cubic metre per second 0^oC and 101.3 kilopascals (kPa)
MER	=	Mass Emission Rate
mg/m^3	=	milligrams per cubic metre at 0^oC and 101.3 kilopascals (kPa)

1.4 ESTIMATED UNCERTAINTY OF MEASUREMENT

Pollutant	Methods	Uncertainty
Moisture	AS4323.2, NSW TM-22, USEPA 4	25%
Nitrogen Oxides	NSW TM-11, USEPA M7E	15%
Oxygen and Carbon Dioxide	NSW TM-24, TM-25, USEPA M3A	1% actual
Velocity	AS4323.1, NSW TM-2, USEPA 2	5%
Volatile Organic Compounds (adsorption tube)	NSW TM-34, USEPA M18	25%
Styrene as Volatile Organic Compound (adsorption tube)	NSW TM-34, USEPA 18	25%

Key:

Unless otherwise indicated the uncertainties quoted have been determined @ 95% level of Confidence level (i.e. by multiplying the repeatability standard deviation by a co-efficient equal to 1.96) (Source – Measurement Uncertainty)

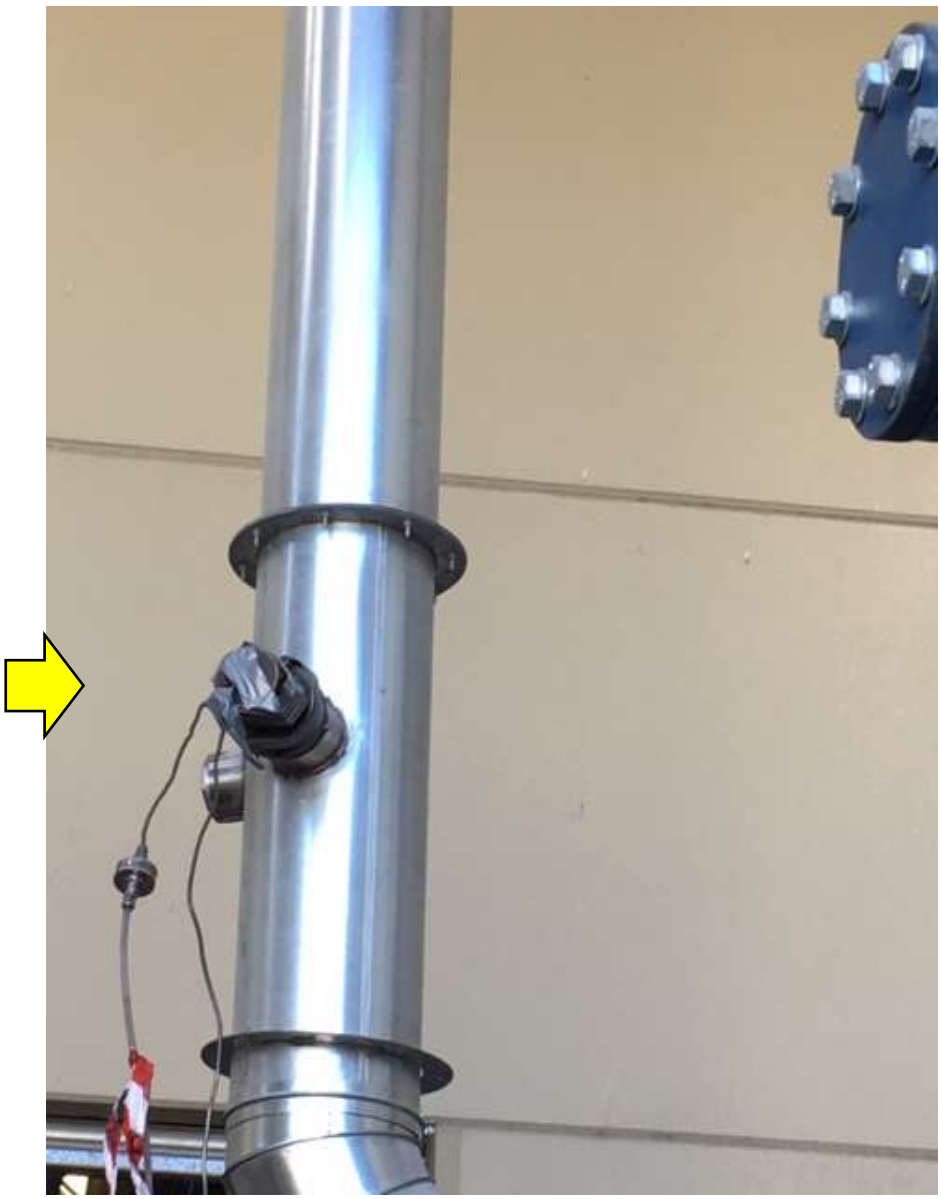
Sources: *Measurement Uncertainty – implications for the enforcement of emission limits by Maciek Lewandowski (Environment Agency) & Michael Woodfield (AEAT) UK*

Technical Guidance Note (Monitoring) M2 Monitoring of stack emissions to air Environment Agency Version 3.1 June 2005.

Note: ISO 9096 is for 20-1000 mg/m^{3-} which AS4323.2 is based on. Note DSEN 13284-1 testing for < 5 mg/m^3 correlates to 5 mg/m^3 with most quoted uncertainties of $\pm$ 5.3 mg/m^3 @ 6.4 mg/m^3. From Clean Air Engineering in the United States the lowest practical limit of USEPA M5 is 5 mg/m^3 under lab conditions.

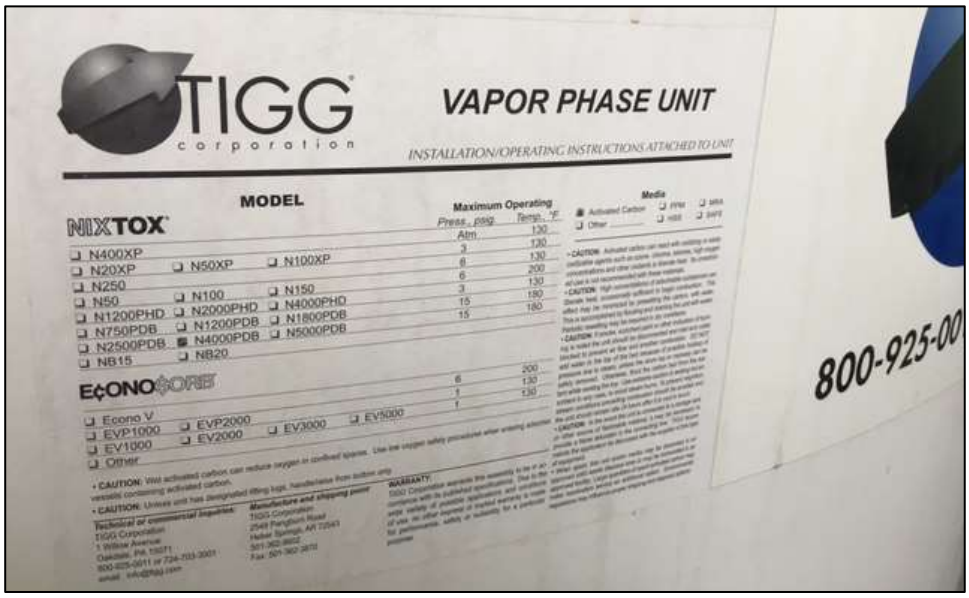
1.5 DRY SCRUBBER SAMPLING LOCATIONS

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



1.6 INSTRUMENT CALIBRATION DETAILS

SEMA Asset No.	Equipment Description	Date Last Calibrated	Calibration Due Date
647	Stopwatch	17-Jan-19	17-Jul-19
857	Digital Temperature Reader	15-Jan-19	15-Jul-19
920	Thermocouple	15-Jan-19	15-Jul-19
893	Thermocouple	15-Jan-19	15-Jul-19
815	Digital Manometer	21-Jan-19	21-Jan-20
613	Barometer	21-Jan-19	21-Jan-20
183	Pitot	24-May-18	24-May-2019 Visually inspected On-Site before use
928	Balance		Response Check with SEMA Site Mass
834	Personal Sampler	14-Mar-19	14-Mar-20
764	TSI Thermal Mass Flowmeter	09-Apr-19	09-Sep-19
946	combustion analyzer	22-Jan-19	22-Jul-19
929	Calibrated Site Mass	14-Mar-19	14-Mar-20

Gas Mixtures used for Analyser Span Response

Conc.	Mixture	Cylinder No.	Expiry Date
400 ppm 400 ppm 401 ppm	Nitric Oxide Total Oxide Of Nitrogen In Nitrogen Sulphur Dioxide In Nitrogen	ALWB6150	05-May-20
262 ppm 263 ppm 249 ppm	Nitric Oxide Total Oxide Of Nitrogen In Nitrogen Sulphur Dioxide In Nitrogen	ALWB 4441	23-Jun-21
0.099% 9.8% 10.1%	Carbon Monoxide Carbon Dioxide Oxygen In Nitrogen	ALWB 5361	17-Jul-21

1.7 CONCLUSIONS

Emissions were monitored on discharge sides of the dry carbon scrubbing units at the Rocbolt Resins manufacturing facility with the following result:

- The average Styrene emission concentration reported as Styrene less than 0.18 mg/m^3 which was compliant with the EPL limit of 220 mg/m^3;
- The average Styrene mass emission rate reported as styrene was less than 6.4 x10^{-5} g/s;
- The average Benzene mass emission rate reported as benzene was less than 6.4 x10^{-5} g/s;
- The average total VOC mass emission rate reported as n-propane was 6.3 x 10^{-5} g/s;
- The average emission concentration of Oxides of Nitrogen (NO_x) (expressed as nitrogen dioxide (NO_2)) was 1 mg/m^3.
- 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.

ATTACHMENT A – NATA CERTIFICATES OF ANALYSIS

NSW SafeWork NSW

Test Safe AUSTRALIA

Jay Weber
Stephenson Environmental Management Australia
PO Box 6398
SILVERWATER NSW 1811

Lab. Reference: 2019-1808

Samples analysed as received

SAMPLE ORIGIN: 6067

DATE OF INVESTIGATION: 10/04/2019 **DATE RECEIVED:** 12/04/19

ANALYSIS REQUIRED: VOCs

REPORT OF ANALYSIS

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: 2/05/19

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Accreditation No. 3726

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Test Safe AUSTRALIA

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

Client : Jay Weber **Date Sampled : 16-Apr-2019**

Sample ID : 727480 **Reference Number'e : 2019-1808-1**

No	Compounds	CAS No	Front µg/section	Back µg/section	No	Compounds	CAS No	Front µg/section	Back µg/section
	Aliphatic hydrocarbons (LOQ = 5µg/compound/section)					**Aromatic hydrocarbons** (LOQ = 1µg/compound/section)			
1	2-Methylbutane	78-78-4	ND	ND	39	Benzene	71-43-2	ND	ND
2	n-Pentane	109-66-0	ND	ND	40	Ethylbenzene	100-41-4	ND	ND
3	2-Methylpentane	107-83-5	ND	ND	41	Isopropylbenzene	98-82-8	ND	ND
4	3-Methylpentane	96-14-0	ND	ND	42	1,2,3-Trimethylbenzene	526-73-8	ND	ND
5	Cyclopentane	287-92-3	ND	ND	43	1,2,4-Trimethylbenzene	95-63-6	ND	ND
6	Methylcyclopentane	96-37-7	ND	ND	44	1,3,5-Trimethylbenzene	108-67-8	ND	ND
7	2,3-Dimethylpentane	565-59-3	ND	ND	45	Styrene	100-42-5	ND	ND
8	n-Hexane	110-54-3	ND	ND	46	Toluene	108-88-3	ND	ND
9	3-Methylhexane	589-34-4	ND	ND	47	p-Xylene &/or m-Xylene	106-42-3 (108-38-3)	ND	ND
10	Cyclohexane	110-82-7	ND	ND	48	o-Xylene	95-47-6	ND	ND
11	Methylcyclohexane	108-87-2	ND	ND		**Ketones** (LOQ 649, 654 & 655 =5µg/c/s; 650, 651, 652 & 653 =25µg/c/s)			
12	2,2,4-Trimethylpentane	540-84-1	ND	ND	49	Acetone	67-64-1	ND	ND
13	n-Heptane	142-82-5	ND	ND	50	Acetoin	513-86-0	ND	ND
14	n-Octane	111-65-9	ND	ND	51	Diacetone alcohol	123-42-2	ND	ND
15	n-Nonane	111-84-2	ND	ND	52	Cyclohexanone	108-94-1	ND	ND
16	n-Decane	124-18-5	ND	ND	53	Isophorone	78-59-1	ND	ND
17	n-Undecane	1120-21-4	ND	ND	54	Methyl ethyl ketone (MEK)	78-93-3	ND	ND
18	n-Dodecane	112-40-3	ND	ND	55	Methyl isobutyl ketone (MIBK)	108-10-1	ND	ND
19	n-Tridecane	629-50-5	ND	ND		**Alcohols** (LOQ = 25µg/compound/section)			
20	n-Tetradecane	629-59-4	ND	ND	56	Ethyl alcohol	64-17-5	ND	ND
21	α-Pinene	80-56-8	ND	ND	57	n-Butyl alcohol	71-36-3	ND	ND
22	β-Pinene	127-91-3	ND	ND	58	Isobutyl alcohol	78-83-1	ND	ND
23	D-Limonene	138-86-3	ND	ND	59	Isopropyl alcohol	67-63-0	ND	ND
	Chlorinated hydrocarbons (LOQ = 5µg/compound/section)				60	2-Ethyl hexanol	104-76-7	ND	ND
24	Dichloromethane	75-09-2	ND	ND	61	Cyclohexanol	108-93-0	ND	ND
25	1,1-Dichloroethane	75-34-3	ND	ND		**Acetates** (LOQ = 25µg/compound/section)			
26	1,2-Dichloroethane	107-06-2	ND	ND	62	Ethyl acetate	141-78-6	ND	ND
27	Chloroform	67-66-3	ND	ND	63	n-Propyl acetate	109-60-4	ND	ND
28	1,1,1-Trichloroethane	71-55-6	ND	ND	64	n-Butyl acetate	123-86-4	ND	ND
29	1,1,2-Trichloroethane	79-00-5	ND	ND	65	Isobutyl acetate	110-19-0	ND	ND
30	Trichloroethylene	79-01-6	ND	ND		**Ethers** (LOQ = 25µg/compound/section)			
31	Carbon tetrachloride	56-23-5	ND	ND	66	Ethyl ether	60-29-7	ND	ND
32	Perchloroethylene	127-18-4	ND	ND	67	MTBE (MTBE)	1634-04-4	ND	ND
33	1,1,2,2-Tetrachloroethane	79-34-5	ND	ND	68	Tetrahydrofuran (THF)	109-99-9	ND	ND
34	Chlorobenzene	108-90-7	ND	ND		**Glycols** (LOQ = 25µg/compound/section)			
35	1,2-Dichlorobenzene	95-50-1	ND	ND	69	PGME	107-98-2	ND	ND
36	1,4-Dichlorobenzene	106-46-7	ND	ND	70	Ethylene glycol diethyl ether	629-14-1	ND	ND
	Miscellaneous (LOQ 637= 5ug & 638=25µg/compound/section)				71	PGMEA	108-65-6	ND	ND
37	Acetonitrile	75-05-8	ND	ND	72	Cellosolve acetate	111-15-9	ND	ND
38	n-Vinyl-2-pyrrolidinone	88-12-0	ND	ND	73	DGMEA	112-15-2	ND	ND
	Total VOCs (LOQ =50µg/compound/section)		ND	ND		Worksheet check		yes	yes

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SW08061 0817

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Test Safe AUSTRALIA

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

Client : Jay Weber **Date Sampled : 10-Apr-2019**

Sample ID : 727481 **Reference Number ie : 2019-1808-2**

No	Compounds	CAS No	Front µg/section	Back µg/section	No	Compounds	CAS No	Front µg/section	Back µg/section
	Aliphatic hydrocarbons (LOQ = 5µg/compound/section)					**Aromatic hydrocarbons** (LOQ = 1µg/compound/section)			
1	2-Methylbutane	78-78-4	ND	ND	39	Benzene	71-43-2	ND	ND
2	n-Pentane	109-66-0	ND	ND	40	Ethylbenzene	100-41-4	ND	ND
3	2-Methylpentane	107-83-5	ND	ND	41	Isopropylbenzene	98-82-8	ND	ND
4	3-Methylpentane	96-14-0	ND	ND	42	1,2,3-Trimethylbenzene	526-73-8	ND	ND
5	Cyclopentane	287-92-3	ND	ND	43	1,2,4-Trimethylbenzene	95-63-6	ND	ND
6	Methylcyclopentane	96-37-7	ND	ND	44	1,3,5-Trimethylbenzene	108-67-8	ND	ND
7	2,3-Dimethylpentane	565-59-3	ND	ND	45	Styrene	100-42-5	ND	ND
8	n-Hexane	110-54-3	ND	ND	46	Toluene	108-88-3	ND	ND
9	3-Methylhexane	589-34-4	ND	ND	47	p-Xylene &/or m-Xylene	106-42-3 / 108-38-3	ND	ND
10	Cyclohexane	110-82-7	ND	ND	48	o-Xylene	95-47-6	ND	ND
11	Methylcyclohexane	108-87-2	ND	ND		**Ketones** (LOQ 849, 854 & 855 =5µg/cm; 850, 851, 852 & 853 =25µg/cm)			
12	2,2,4-Trimethylpentane	540-84-1	ND	ND	49	Acetone	67-64-1	ND	ND
13	n-Heptane	142-82-5	ND	ND	50	Acetoin	513-86-0	ND	ND
14	n-Octane	111-65-9	ND	ND	51	Diacetone alcohol	123-42-2	ND	ND
15	n-Nonane	111-84-2	ND	ND	52	Cyclohexanone	108-94-1	ND	ND
16	n-Decane	124-18-5	ND	ND	53	Isophorone	78-59-1	ND	ND
17	n-Undecane	1120-21-4	ND	ND	54	Methyl ethyl ketone (MEK)	78-93-3	ND	ND
18	n-Dodecane	112-40-3	ND	ND	55	Methyl isobutyl ketone (MIBK)	108-10-1	ND	ND
19	n-Tridecane	629-50-5	ND	ND		**Alcohols** (LOQ = 25µg/compound/section)			
20	n-Tetradecane	629-59-4	ND	ND	56	Ethyl alcohol	64-17-5	ND	ND
21	α-Pinene	80-56-8	ND	ND	57	n-Butyl alcohol	71-36-3	ND	ND
22	β-Pinene	127-91-3	ND	ND	58	Isobutyl alcohol	78-83-1	ND	ND
23	D-Limonene	138-86-3	ND	ND	59	Isopropyl alcohol	67-63-0	ND	ND
	Chlorinated hydrocarbons (LOQ = 5µg/compound/section)				60	2-Ethyl hexanol	104-76-7	ND	ND
24	Dichloromethane	75-09-2	ND	ND	61	Cyclohexanol	108-93-0	ND	ND
25	1,1-Dichloroethane	75-34-3	ND	ND		**Acetates** (LOQ = 25µg/compound/section)			
26	1,2-Dichloroethane	107-06-2	ND	ND	62	Ethyl acetate	141-78-6	ND	ND
27	Chloroform	67-66-3	ND	ND	63	n-Propyl acetate	109-60-4	ND	ND
28	1,1,1-Trichloroethane	71-55-6	ND	ND	64	n-Butyl acetate	123-86-4	ND	ND
29	1,1,2-Trichloroethane	79-00-5	ND	ND	65	Isobutyl acetate	110-19-0	ND	ND
30	Trichloroethylene	79-01-6	ND	ND		**Ethers** (LOQ = 25µg/compound/section)			
31	Carbon tetrachloride	56-23-5	ND	ND	66	Ethyl ether	60-29-7	ND	ND
32	Perchloroethylene	127-18-4	ND	ND	67	tert-Butyl methyl ether (MTBE)	1634-04-4	ND	ND
33	1,1,2,2-Tetrachloroethane	79-34-5	ND	ND	68	Tetrahydrofuran (THF)	109-99-9	ND	ND
34	Chlorobenzene	108-90-7	ND	ND		**Glycols** (LOQ = 25µg/compound/section)			
35	1,2-Dichlorobenzene	95-50-1	ND	ND	69	PGME	107-98-2	ND	ND
36	1,4-Dichlorobenzene	106-46-7	ND	ND	70	Ethylene glycol diethyl ether	629-14-1	ND	ND
	Miscellaneous (LOQ 837= 5µg & 838=25µg/compound/section)				71	PGMEA	108-65-6	ND	ND
37	Acetonitrile	75-05-8	ND	ND	72	Cellosolve acetate	111-15-9	ND	ND
38	n-Vinyl-2-pyrrolidinone	88-12-0	ND	ND	73	DGMEA	112-15-2	ND	ND
	Total VOCs (LOQ =50µg/compound/section)		ND	ND		Worksheet check		yes	yes

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ilac-MRA NATA

Accreditation No. 3726

Accredited for compliance with ISO/IEC 17025 - Testing

SW88051 0917

NSW GOVERNMENT | SafeWork NSW

Test Safe AUSTRALIA

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

Client : Jay Weber

ND = Not Detected

Method : Analysis of Volatile Organic Compounds in Workplace Air by Gas Chromatography/Mass Spectrometry
Method Number : WCA 207
Limit of Quantitation : 5µg/section; 25µg/section for oxygenated hydrocarbons except acetone, MEK and MIBK at 5µg/section.
Brief Description : Volatile organic compounds are trapped from the workplace air onto charcoal tubes by the use of a personal air monitoring pump. The volatile organic compounds are then desorbed from the charcoal in the laboratory with CS_2. An aliquot of the desorbant is analysed by capillary 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.

Quality Assurance
In order to ensure the highest degree of accuracy and precision in our analytical results, we undertake extensive intra- and inter-laboratory quality assurance (QA) activities. Within our own laboratory, we analyse laboratory and field blanks and perform duplicate and repeat analysis of samples. Spiked QA samples are also included routinely in each run to ensure the accuracy of the analyses. WorkCover Laboratory Services has participated for many years in several national and international inter-laboratory comparison programs listed below:-
- Workplace Analysis Scheme for Proficiency (WASP) conducted by the Health & Safety Executive UK;
- Quality Management in Occupational and Environmental Medicine QA Program, conducted by the Institute for Occupational, Social and Environmental Medicine, University of Erlangen – Nuremberg, Germany;
- Quality Control Technologies QA Program, Australia;
- Royal College of Pathologists QA Program, Australia.

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