ATTACHEMENT 1.0

- ANALYSIS REPORT EXSTING EMISSION TO AIR – RUBBER FUME
- TABLES E(II)(III) A2-01 – A2-04 RUBBER FUME, PROPOSED A2-05

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ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 150T

CONFIDENTIAL REPORT

ANNUAL AIR EMISSIONS SURVEY 2017

AT
G BRUSS GMBH
Finisklin Road,
Sligo

Licence Reg. P0465-01
TMS Environment Ref: 23888 Rev 1.0

Commencement Date: 11 January 2017 **Completion Date:** 13 April 2017
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EXECUTIVE SUMMARY

This Air Emissions report presents results of emissions monitoring from emission point A2-01, A2-02, A2-03 &, A2-04 at G Bruss GmbH, Finisklin Road, Sligo, County Sligo. Monitoring has been conducted to satisfy the customer's requirements in respect of the following parameters, having regard to relevant substances listed in Table 6.1 of the Agency's "BAT Guidance Note for Manufacturing of Organic Chemicals"

Monitoring Scope	***Annual Rubber Fume Emissions Monitoring 2017***
Emission Point	***Parameter***
A2-1, A2-2, A2-3 & A2-4	• Carcinogenic substances listed as Class I, II or III • Organic substances listed as Class I or Class II • Total Organic Carbon as Carbon (TOC as C) • Mercaptans • Amines (Total) • Trimethylamine • Phenols, Cresols and xylols • Toluene di-idocyante • Organic Substances with Photochemical Ozone Potential (R59) • Vaporous or Gaseous Inorganic Substances listed as Class I, II III or IV • Inorganic Dust Particles Class I, II or III • Total Particulates • Rubber Fume • Velocity and Temperature • Moisture

Measurements were completed during a two day site visit on 11 & 12 January 2017. Details of the monitoring methods employed, Standard Reference Methods used and Guidance Notes consulted are presented in Section 4.0 of this report together with information on the equipment used and the monitoring personnel.

Prior to the site visit a review of all products used in the drying ovens was under taken to identify which substances would be present in the emission streams, and the monitoring and analysis techniques to be used to report the concentration of these substances.

Monitoring for Total Particulate was carried out at each emission point, with subsequent analysis to determine the Rubber Fume composition of the total particulate. Additionally, at each emission point, monitoring of speciated Volatile Organic Compounds (VOC's) and Total Organic Carbon as Carbon (TOC as C) was also completed.

Monitoring at each location occurred at a location post the Electro Static Precipitators (ESP) abetment unit in each of the vents. To monitor "pre abatement" conditions, monitoring were carried out at the same locations, however the ESP systems were turned off, details of the ESP units are included in Table 2-1.

The results for all of the measurement parameters reported are compared with the Licence Limit Values specified in the customer's IPPC Licence. With respect to this it can be seen that results for Rubber fume are below the Licence Limit Values specified for all Stack's monitored.

All compounds identified, where applicable have been classified in to a category based on the BAT Guidance Note for the Manufacture of Organic Chemical, and have been compared to the emission limits as specified in Table 6.1 BAT Associated Levels of Emissions to Air, in addition to this, all Volatile Organic Compounds, identified have also been compared to TA Luft (Technical Instructions on the Air Quality Control), in accordance with BAT guidelines, as monitoring has been conducted at an existing facility.

1.0 Scope

This Air Emissions report presents results of emissions monitoring from emission point A2-01 to A2-04 at G Bruss GmbH, Finisklin Road, Sligo, County Sligo.

A review of the Material Safety Data Sheets for the products used in the drying oven was completed prior to monitoring; this review identified a number products classified as Organic Substances of Class I (*Carbon Black* & *1,-1'-)1,-3-Phenylene)bis-1H-pyrrole-2,5-dione*) & Class II (*Octamethylcyclotetrasiloxane*) in use and one product containing Inorganic Dust Particle Class II (*Lead*). (Full details of the products reviewed are included in Appendix III of this report). Based on the review of the MSDS's monitoring has been conducted to satisfy the customer's requirements in respect of the following parameters:

Table 1-1Scope of Monitoring Survey

Reporting period		***Annual 2017***	
EMISSION POINT	***PARAMETER***	***SAMPLING METHOD AND MEDIUM & ANALYSIS METHODOLOGY***	***STANDARD REFERENCE METHOD***
A2-1 to A2-4	Total Particulate (*Organic Substance Class I*) Rubber Fume/ Lead (*Inorganic Dust Particle Class II*)	Isokinetic, Filter & rinse / Gravimetric analysis with cyclohexane extraction	EN 13284-1:2002
	Speciated VOC's (*organic substances Class I & Class II*)	Non-isokinetic / Charcoal tube absorption / Analysis by solvent desorption followed by GC-MS or GC-FID	CEN/TS 13649:2014
	Organics TOC	*In situ* FID analyser	EN 12619:2013
	Temperature, Pressure, Velocity, Flow	Pitot tube coupled with pressure measurement device or anemometer, and temperature measurement device	EN/ISO 16911-1:2013

2.0 Survey protocol

2.1 Protocol

TMS Environment Ltd personnel conducted the monitoring survey on 11 & 12 January 2017. Emissions to atmosphere from the Emission Points A2-01, A2-02, A2-03 and A2-04 were monitored during the visit.

Particulate monitoring was conducted isokinetically with filters gravimetrically analysed to determine the concentration of total particulate matter found at each emission point, with the rubber fume concentration of the total particulate subsequently analysed via extraction with cyclohexane.

Lead particulate monitoring was conducted isokinetically with filters analysed by ICP to determine the concentration of total lead particulate matter found on filters at specific emission points.

Speciated VOC's were monitored by absorption via charcoal sorbent tubes, flow rates through these tube was approximately 500ml/min. Tubes were subsequently sent for sub-contract analysis. Results for VOC's are reported relevant to TA Luft Classes I, II or III with individual parameter identified in each Class reported in Appendix I.

TOC as C analysis was completed *in-situ* via FID analysis, with results logged on site.

The survey was completed in order to meet the requirements of the company's IPPC Licence (Reg. No. P0465-01) for particulate matter and rubber fume concentrations, while VOC's, TOC as C mad Lead particulate matter were monitored to collect information on the process on site with respect to the Client's application under Regulation 9 of the IPC Regulations 2013.

A Site Specific Protocol was prepared in accordance with EPA Air Guidance Note AG1 and CEN/TS 15675:2007 after a site review has been conducted with site personnel. A site risk assessment was completed prior to commencement of any monitoring to confirm that the monitoring could be carried out in a safe manner. All necessary PPE was worn at all times on site.

Relevant Process conditions during the survey are summarized below.

Table 2-1: Operational information during testing

Emission monitoring point	Date and time	Details	Products in Use in Drying Ovens	Abatement system
A2-01 Pre Abatement	12 January 2017 13:06 – 13:36	Normal operation	141617 HNBR, 14615 HNBR, 05640 ACM 05532 ACM	ESP 08
A2-01 Post Abatement	12 January 2017 12:27 – 12:57	Normal operation – ESP off		ESP 08
A2-02 Pre Abatement	12 January 2017 15:34 – 16:04	Normal operation	05730 ACM 11721 AEM 05532 ACM 11827 AEM	ESP 02
A2-02 Post Abatement	12 January 2017 14:52 – 15:22	Normal operation – ESP off		ESP 02
A2-03 Pre Abatement	12 January 2017 10:40 – 11:10	Normal operation	W1150 AEM 11888 AEM 11825 AEM	ESP04
A2-03 Post Abatement	12 January 2017 09:59 – 10:29	Normal operation – ESP off		ESP04
A2-04 Pre Abatement	11 January 2017 15:16 – 15:46	Normal operation	07781 FKM 05730 ACM 07770 FKM 11827 AEM	ESP 03
A2-04 Post Abatement	11 January 2017 16:00 – 16:30	Normal operation – ESP off		ESP 03

3.0 Monitoring Results

The results of the air emission monitoring reported in this document are presented in tables below. Where parameters have been classified according to Table 6.1 of The Agency's *'BAT Guidance Note for the Manufacture of Organic Chemicals'*, the sum of the total class is provided in Section 3, with individual compounds detailed Appendix I. Methods used are defined by Standard Operating Procedures (SOP), each SOP has a unique number, details regarding each SOP are given in Part 2 of this report.

3.1 Results for A2-01- Pre Abatement, 12 Jan 2017, 13:06-13:36

Parameter	Emission limit value	Emission results	Uncertainty	Units	Mass Emission kg/hr	Compliance
Total Particulate	20	< 1.5	±0.19	mg/m^3	2.13×10^{-03}	Yes
Rubber Fume	150 (At mass flows < 0.5 kg/hr) 50 (At mass flows > 0.5 kg/hr)	0.8	±0.10	mg/m^3	1.10×10^{-03}	Yes
Total Organic Substances Class I	20	1.1	±0.13	mg/m^3	1.88×10^{-03}	Yes
Total Organic Substances Class II	100	13.8	1.17	mg/m^3	1.92×10^{-02}	Yes
TA Luft Class I	N/S	13.8	±1.17	mg/m^3	0.02	N/A
TA Luft Class II	N/S	2.52	±0.06	mg/m^3	$<1.06 \times 10^{-03}$	N/A
TA Luft Class III	N/S	< 0.76	±0.06	mg/m^3	$<1.06 \times 10^{-03}$	N/A
TOC as C	N/S	20.3	±3.98	mg/m^3	0.03	N/A
Volume Flow	N/S	1,393	±81	Nm^3/hr	-	N/A

3.2 Results for A2-01- Post Abatement, 12 Jan 2017, 12:27 – 12:57

Parameter	Emission limit value	Emission results	Uncertainty	Units	Mass Emission kg/hr	Compliance
Total Particulate	20	< 1.5	±0.19	mg/m^3	$<2.09 \times 10^{-3}$	Yes
Rubber Fume	150 (At mass flows < 0.5 kg/hr) 50 (At mass flows > 0.5 kg/hr)	0.7	±0.09	mg/m^3	1.01×10^{-03}	Yes
Total Organic Substances Class I	20	1.15	±0.13	mg/m^3	1.59×10^{-03}	Yes
Total Organic Substances Class II	100	27.6	±2.34	mg/m^3	0.04	Yes
TA Luft Class I	N/S	27.6	±2.34	mg/m^3	0.04	N/A
TA Luft Class II	N/S	< 0.77	±0.06	mg/m^3	$<1.09 \times 10^{-03}$	N/A
TA Luft Class III	N/S	7.51	±0.64	mg/m^3	0.01	N/A
TOC as C	N/S	11.8	±2.24	mg/m^3	0.02	N/A
Volume Flow	N/S	1,426	±83	Nm^3/hr	-	N/A

3.3 Results for A2-02- Pre Abatement, 12 Jan 2017, 15:34 – 16:04

Parameter	Emission limit value	Emission results	Uncertainty	Units	Mass Emission kg/hr	Compliance
Total Particulate	20	< 0.4	±0.05	mg/m^3	$< 4.79 \times 10^{-03}$	Yes
Rubber Fume	150 (At mass flows < 0.5 kg/hr) 50 (At mass flows > 0.5 kg/hr)	3.4	±0.44	mg/m^3	4.48×10^{-03}	Yes
Total Organic Substances Class I	20	0.54	±0.13	mg/m^3	2.13×10^{-01}	Yes
Total Organic Substances Class II	100	6.44	±0.55	mg/m^3	8.38×10^{-03}	Yes
TA Luft Class I	N/S	6.44	±0.55	mg/m^3	8.38×10^{-03}	N/A
TA Luft Class II	N/S	< 0.72	±0.06	mg/m^3	$<9.31 \times 10^{-04}$	N/A
TA Luft Class III	N/S	6.73	±0.57	mg/m^3	8.76×10^{-03}	N/A
TOC as C	N/S	34.6	±6.77	mg/m^3	0.05	N/A
Volume Flow	N/S	1,309	±76	Nm^3/hr	-	N/A

3.4 Results for A2-02- Post Abatement, 12 Jan 2017, 14:52-15:22

Parameter	Emission limit value	Emission results	Uncertainty	Units	Mass Emission kg/hr	Compliance
Total Particulate	20	2.1	±0.27	mg/m^3	2.66×10^{-03}	Yes
Rubber Fume	150 (At mass flows < 0.5 kg/hr) 50 (At mass flows > 0.5 kg/hr)	1.3	±0.16	mg/m^3	1.62×10^{-04}	Yes
Total Organic Substances Class I	20	1.0	±0.11	mg/m^3	1.50×10^{-03}	Yes
Total Organic Substances Class II	100	1.65	±0.14	mg/m^3	2.07×10^{-03}	Yes
TA Luft Class I	N/S	1.65	±0.14	mg/m^3	2.07×10^{-03}	N/A
TA Luft Class II	N/S	< 0.72	±0.06	mg/m^3	$<9.01 \times 10^{-04}$	N/A
TA Luft Class III	N/S	1.22	±0.10	mg/m^3	1.53×10^{-02}	N/A
TOC as C	N/S	28.7	±5.63	mg/m^3	0.04	N/A
Volume Flow	N/S	1,259	±73	Nm^3/hr	-	N/A

3.5 Results for A2-03- Pre Abatement, 12 Jan 2017, 10:40-11:10

Parameter	Emission limit value	Emission results	Uncertainty	Units	Mass Emission kg/hr	Compliance
Total Particulate	20	< 1.3	±0.17	mg/m^3	$< 3.56 \times 10^{-03}$	Yes
Rubber Fume	150 (At mass flows < 0.5 kg/hr) 50 (At mass flows > 0.5 kg/hr)	4.4	±0.56	mg/m^3	0.01	Yes
Total Organic Substances Class I	20	1.0	±0.12	mg/m^3	2.73×10^{-03}	Yes
Total Organic Substances Class II	100	22.2	±1.89	mg/m^3	0.06	Yes
TA Luft Class I	N/S	22.2	±1.89	mg/m^3	0.06	N/A
TA Luft Class II	N/S	<0.72	±0.06	mg/m^3	$<1.90 \times 10^{-03}$	N/A
TA Luft Class III	N/S	5.88	±0.50	mg/m^3	0.02	N/A
TOC as C	N/S	7.0	±1.36	mg/m^3	0.02	N/A
Volume Flow	N/S	2,656	±154	Nm^3/hr	-	N/A

3.6 Results for A2-03- Post Abatement, 12 Jan 2017, 09:59-10:29

Parameter	Emission limit value	Emission results	Uncertainty	Units	Mass Emission kg/hr	Compliance
Total Particulate	20	< 1.5	±0.19	mg/m^3	$< 3.50 \times 10^{-03}$	Yes
Rubber Fume	150 (At mass flows < 0.5 kg/hr) 50 (At mass flows > 0.5 kg/hr)	0.7	±0.08	mg/m^3	1.58×10^{-03}	Yes
Total Organic Substances Class I	20	1.1	±0.12	mg/m^3	2.16×10^{-03}	Yes
Total Organic Substances Class II	100	44.3	±3.76	mg/m^3	0.05	Yes
TA Luft Class I	N/S	44.3	±3.76	mg/m^3	0.05	N/A
TA Luft Class II	N/S	< 0.72	±0.06	mg/m^3	$< 8.29 \times 10^{-04}$	N/A
TA Luft Class III	N/S	17.2	±1.46	mg/m^3	0.02	N/A
TOC as C	N/S	10.2	±1.99	mg/m^3	0.02	N/A
Volume Flow	N/S	2,400	±139	Nm^3/hr	-	N/A

3.7 Results for A2-04- Pre Abatement, 11 Jan 2017, 15:16 – 15:46

Parameter	Emission limit value	Emission results	Uncertainty	Units	Mass Emission kg/hr	Compliance
Total Particulate	N/S	3.1	±0.39	mg/m^3	7.17×10^{-03}	Yes
Rubber Fume	150 (At mass flows < 0.5 kg/hr) 50 (At mass flows > 0.5 kg/hr)	1.5	±0.20	mg/m^3	3.53×10^{-03}	Yes
Total Organic Substances Class I	20	1.1	±0.13	mg/m^3	2.62×10^{-03}	Yes
Total Organic Substances Class II	100	< 0.71	±0.06	mg/m^3	$<1.63 \times 10^{-03}$	Yes
Inorganic Dust Particle Class II	0.5	7.68×10^{-03}	$\pm 9.80 \times 10^{-04}$	mg/m^3	1.78×10^{-05}	Yes
TA Luft Class I	N/S	< 0.71	±0.06	mg/m^3	$<1.63 \times 10^{-03}$	N/A
TA Luft Class II	N/S	< 0.71	±0.06	mg/m^3	$<1.63 \times 10^{-03}$	N/A
TA Luft Class III	N/S	1.21	±0.10	mg/m^3	2.77×10^{-03}	N/A
TOC as C	N/S	3.09	±0.60	mg/m^3	7.14×10^{-03}	N/A
Volume Flow	N/S	2,313	±134	Nm^3/hr	-	N/A

3.8 Results for A2-04- Post Abatement, 11 Jan 2017, 16:00 – 16:30

Parameter	Emission limit value	Emission results	Uncertainty	Units	Mass Emission kg/hr	Compliance
Total Particulate	N/S	< 7.5	±0.95	mg/m^3	$< 2.24 \times 10^{-03}$	Yes
Rubber Fume	150 (At mass flows < 0.5 kg/hr) 50 (At mass flows > 0.5 kg/hr)	22.4	±2.85	mg/m^3	6.73×10^{-04}	Yes
Total Organic Substances Class I	20	1.1	±0.13	mg/m^3	1.91×10^{-03}	Yes
Total Organic Substances Class II	100	< 0.72	±0.06	mg/m^3	$<2.12 \times 10^{-04}$	Yes
Inorganic Dust Particle Class II	0.5	0.07	±0.01	mg/m^3	2.03×10^{-05}	Yes
TA Luft Class I	N/S	< 0.72	±0.06	mg/m^3	$<2.12 \times 10^{-04}$	N/A
TA Luft Class II	N/S	< 0.72	±0.06	mg/m^3	$<2.12 \times 10^{-04}$	N/A
TA Luft Class III	N/S	1.29	±0.11	mg/m^3	3.82×10^{-04}	N/A
TOC as C	N/S	2.60	±0.50	mg/m^3	7.59×10^{-04}	N/A
Volume Flow	N/S	301	±17	Nm^3/hr	-	N/A

3.9 Reference Conditions for emission point A2-01 – A2-04

Reference Conditions for concentrations and volume flow as expressed as:

Temperature, K	Pressure, kPa	Oxygen %	Moisture %
273	101.3	N/A	Dry

4.0 Supporting Information

4.1 Monitoring team information

Name	Function	Qualification
Enda Flood	Environmental Scientist	• PgC Green Tech (2010) UCD Dublin • BAgSc (2008) UCD Dublin
Tim Hurley	Environmental Scientist	• Bsc (Hons) Chem, (2008) UCC • MSc (Merit) GeoChem, (2009) University of Leeds

4.2 Substance(s) monitored, SOP's and Standard Methods

Substance Monitored	SOP	Standard Method	Analysis by	Accreditation Range mg/m^3	ISO 17025 Accreditation Status	Analysis Date
Total Particulate	QP-SITE-2010	EN 13248-1 ISO 9096:2003	TMS	0.1-50 20-1,000	A	16 Jan 2017
Total Particulate (Rinse)	QP-SITE-2010	EN 13248-1 ISO 9096:2003	SAL	0.1-50 20-1,000	A	24 Jan – 02 Feb 2017
Rubber Fume	QP-SITE-2010	EN 13248-1	TMS	0.1-50 20-1,000	C	02 Feb 2017
Lead	QP-SITE-2017	EN 14358: 2004	SAL	0.005-50	B	24 Jan – 02 Feb 2017
Speciated VOC's	QP-SITE-2016	EN 13649: 2002	SAL	0.5-2,000	D	24 Jan – 02 Feb 2017
TOC as C	QP-SITE-2025	EN 12619	TMS	0.6-6,200	A	11 & 12 Jan 2017
Moisture	QP-SITE-2020	EN 14790:2005	TMS	2-40%	A	11 & 12 Jan 2017
Velocity & Temp	QP-SITE-2006 QP-SITE2027	EN 13284-1:2002/ EN/ISO 16911-1:2013	TMS	2.8-25m/s 0.13-40m/s 0-1,200°C	A	11 & 12 Jan 2017

Note 1: ISO 17025 Accreditation Status: **A** – TMS accredited for Monitoring and Analysis, , **B** – TMS accredited for Monitoring, Subcontract Lab accredited for Analysis, **C** - TMS accredited for Monitoring, non-accredited analysis by TMS, **D** - TMS not accredited for Monitoring, as non-accredited analysis preformed by subcontract lab.

4.3 *Equipment used and Quality checks*

Equipment	Equipment ID	Quality Check
Tecora G4 Isokinetic sampler	M-S-E-1-1	Annual Calibration
Ratfisch FID	M-S-E-4-1	On-site per and post calibration check
Balance Scales	M-S-E-13-1	On Site Eccentricity check

4.4 *Reporting results*

4.4.1 *Expression of test results*

All test results are expressed to one decimal place lower than the Emission Limit Value (ELV), while uncertainty of measurement results are expressed to two decimal places lower than the ELV, e.g. where an ELV of 50mg/m^3 applies, the reported result shall be reported to the first decimal place e.g. 6.6mg/m^3 with the uncertainty of measurement reported to two decimal places, e.g. ±0.12mg/m^3.

4.4.2 *Reporting results less than the detection limit*

If a single result is reported as being less than the limit of detection, the measurement result is expressed using a less than "<" sign, e.g. <0.005 mg/Nm^3. Where a number of parameter results, found to be less than the limit of detection, are expressed as an overall parameter, these results are calculated as per Section 3.3, Method 3 (Half the Limit of Detection) of the EPA *BREF Guidance on the General Principles of Monitoring*. This percentage method provides an estimation of the value of the measurement. It is reported without the less than "<" sign, e.g. 0.05 mg/Nm^3.

4.4.3 *Uncertainty calculation*

An estimation of the uncertainty of measurement is attached to all measurements. Measurement uncertainties are based on calibration data and laboratory repeatability experiments. All uncertainties are given at a 95% confidence, based on applying a coverage factor of k=2 to the combined uncertainties for each measurement. The uncertainty of measurement associated with emissions monitoring are provided in the Table below.

Table 4-1: Uncertainty of Measurement

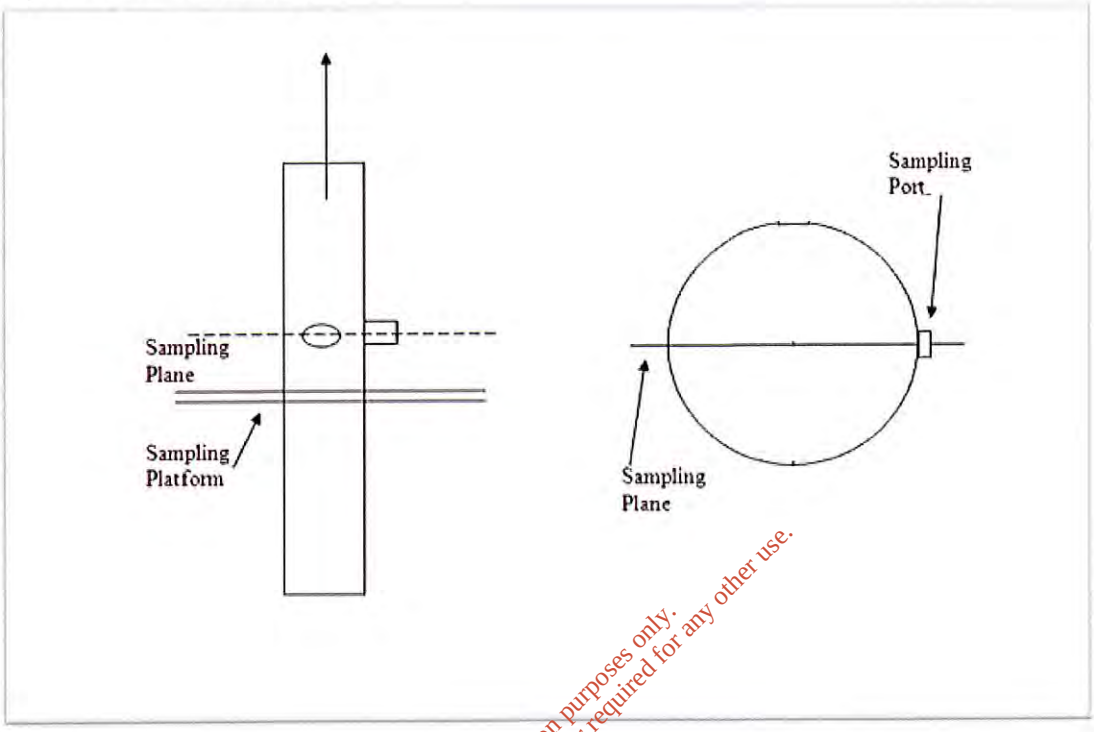
PARAMETER	SOURCE OF UNCERTAINTY	ESTIMATE OF UNCERTAINTY %	COMBINED UNCERTAINTY %	EXPANDED UNCERTAINTY % (95% Confidence Limit)
Rubber Fume	Flow/ADM Manometer	1.73	6.38	12.75%
	Lancom Analyser	3.46		
	Temperature/Lancom Analyser	0.29		
	Leak check**	0.00		
	Moisture	0.58		
	Isokinetic uncertainty	0.50		
	Analytical/Lab	5.00		
Speciated VOC's	Velocity	1.15	4.24	8.48%
	CSA	1.00		
	Pressure	0.58		
	Temperature	0.29		
	Analysis	5.00		
TOC as C	Lancom Analyser	3.46	4.28	8.56%
	Temperature/Lancom Analyser	0.29		
	FID	2.50		
Metals (Lead)	Lancom Analyser	6	7.24	14.48%
	Temperature/Lancom Analyser	0.5		
	Leak check**	0		
	Moisture	4		
	Isokinetic uncertainty	0.2		
	Analytical/Lab	12		
Volume Flow	Velocity	1.15	2.90	5.81%
	Stack Temperature	0.29		
	Stack Pressure	0.58		
	O_2	0.58		
	CSA	1.00		

ANNUAL AIR EMISSIONS
SURVEY 2017
G BRUSS GmBH
APPENDIX I
EMISSION POINT DETAILS

Licence Reg. P0465-01
TMS Environment Ref. 23888 Rev 1.0

Appendix 1: Emission Point A2-01, A2-02, A2-03, A2-04

Appendix1:1 – Stack Diagram



Stack Reference	A2-01	A2-02	A2-03	A2-04
Stack Diameter [m^2]	0.35	0.35	0.50	0.35
Stack Cross Sectional Area [m^3]	0.10	0.10	0.20	0.10
Number of Ports	2	2	2	1
Number of sampling planes	2	2	2	1
Number of Sampling points per line	1	1	1	1
Power supply available	110 supply	110 supply	110 supply	110 supply
Shelter at platform	Yes	Yes	Yes	Yes

Appendix1:2 - Stack Measurements: VOC monitoring – A2-1 Pre Abatement

Reference method		EN 13649	
Sampling date		12 January 2017	
Sampling time		13:06-13:36	
Sampling technique			
Flue gas sampling system		SKC pump with Tygon tubing and low flow tube holder	
Oxygen measurement technique		FGA	
Material			
Sampling material		Charcoal tubes	
Sampling conditions			
Average sampling flow rate [l/min]		0.5 per tube	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.013	
Average flue gas temp temperature [^oC]		39.7	
Reference conditions		**Actual conditions**	
Moisture [%]	Dry	Moisture [%]	0.9
Temperature [K]	273	Temperature [K]	313
Pressure [kPa]	101.3	Pressure [kPa]	100.2
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		N/A	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:3 - Stack Measurements: Particulate & Rubber Fume Monitoring - A2-1 Pre Abatement

Reference method		EN 13284	
Sampling date		12 January 2017	
Sampling time		13:06-13:36	
Sampling technique			
Flue gas sampling system		Isokinetic in stack filtration system	
Oxygen measurement technique		Flue Gas Analyser	
Material			
Sampling probe material		Titanium	
Filter material		Titanium	
Sampling conditions			
Probe temperature [°C]		120	
Filtration temperature [°C]		120	
Average sampling flow rate [l/min]		7.83	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.20	
Average flue gas velocity [m/s]		4.70	
Nozzle diameter [mm]		7	
Ratio of highest to lowest velocity		<1:3	
Swirl test result		Pass	
Initial leak test result [% of expected sampling flow rate]		0	
Final leak test result [% of average sampling flow rate]		0	
Average flue gas temp temperature [°C]		39.7	
Reference conditions		**Actual conditions**	
Moisture [%]	N/A	Moisture [%]	0.9
Temperature [K]	273	Temperature [K]	313
Pressure [kPa]	101.3	Pressure [kPa]	100.2
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		0.2	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:4 - Stack Measurements: TOC Monitoring - A2-1 Pre Abatement

Reference method	EN 12619
Sampling date	12 January 2017
Sampling time	13:06-13:36
Sampling technique	
TOC	Flame ionisation detection
Material	
Sampling probe material	SS, PTFE
Fuel	Hydrogen
Span calibration gas	Propane 90.0 ppm
Zero calibration gas	Ambient air after passing charcoal filter
Span gas drift [% of the range]	<2
Zero gas drift [% of the range]	<2
Sampling conditions	
Duct diameter [m]	0.35
Number of sampling ports	2
Number of sampling lines	Single point sampling
Heated line temperature [°C]	180
Number of sampling points per line	1
Average flue gas velocity [m/s]	4.70
Average flue gas temp temperature [°C]	39.7

Sampling conditions

Conditions	Reference	Sampling plane
Moisture	Dry	0.9
Temperature [K]	273	313
Pressure [kPa]	101.3	100.2
Oxygen [%]	N/A	N/A

Deviation from reference method

There was no deviation from reference method

Appendix1:5 - Stack Measurements: VOC monitoring - A2-1 Post Abatement

Reference method		EN 13649	
Sampling date		12 January 2017	
Sampling time		12:27-12:57	
Sampling technique			
Flue gas sampling system		SKC pump with Tygon tubing and low flow tube holder	
Oxygen measurement technique		FGA	
Material			
Sampling material		Charcoal tubes	
Sampling conditions			
Average sampling flow rate [l/min]		0.5 per tube	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.013	
Average flue gas temp temperature [^oC]		37.8	
Reference conditions		**Actual conditions**	
Moisture [%]	Dry	Moisture [%]	0.64
Temperature [K]	273	Temperature [K]	311
Pressure [kPa]	101.3	Pressure [kPa]	100.8
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		N/A	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:6 - Stack Measurements: Particulate & Rubber Fume Monitoring - A2-1 Post Abatement

Reference method		EN 13284	
Sampling date		12 January 2017	
Sampling time		12:27-12:57	
Sampling technique			
Flue gas sampling system		Isokinetic in stack filtration system	
Oxygen measurement technique		Flue Gas Analyser	
Material			
Sampling probe material		Titanium	
Filter material		Titanium	
Sampling conditions			
Probe temperature [°C]		120	
Filtration temperature [°C]		120	
Average sampling flow rate [l/min]		8.10	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.21	
Average flue gas velocity [m/s]		4.74	
Nozzle diameter [mm]		7	
Ratio of highest to lowest velocity		< 1:3	
Swirl test result		Pass	
Initial leak test result [% of expected sampling flow rate]		0	
Final leak test result [% of average sampling flow rate]		0	
Average flue gas temp temperature [°C]		37.8	
Reference conditions		**Actual conditions**	
Moisture [%]	N/A	Moisture [%]	0.64
Temperature [K]	273	Temperature [K]	311
Pressure [kPa]	101.3	Pressure [kPa]	100.8
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		0.2	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:7 - Stack Measurements: TOC Monitoring - A2-1 Post Abatement

Reference method	EN 12619
Sampling date	12 January 2017
Sampling time	12:27-12:57
Sampling technique	
TOC	Flame ionisation detection
Material	
Sampling probe material	SS, PTFE
Fuel	Hydrogen
Span calibration gas	Propane 90.0 ppm
Zero calibration gas	Ambient air after passing charcoal filter
Span gas drift [% of the range]	<2
Zero gas drift [% of the range]	<2
Sampling conditions	
Duct diameter [m]	0.35
Number of sampling ports	2
Number of sampling lines	Single point sampling
Heated line temperature [°C]	180
Number of sampling points per line	1
Average flue gas velocity [m/s]	4.74
Average flue gas temp temperature [°C]	37.8

Sampling conditions

Conditions	Reference	Sampling plane
Moisture	Dry	0.64
Temperature [K]	273	311
Pressure [kPa]	101.3	100.8
Oxygen [%]	N/A	N/A

Deviation from reference method

There was no deviation from reference method

Appendix1:8 - Stack Measurements: VOC monitoring - A2-2 Pre Abatement

Reference method		EN 13649	
Sampling date		12 January 2017	
Sampling time		15:34-16:04	
Sampling technique			
Flue gas sampling system		SKC pump with Tygon tubing and low flow tube holder	
Oxygen measurement technique		FGA	
Material			
Sampling material		Charcoal tubes	
Sampling conditions			
Average sampling flow rate [l/min]		0.5 per tube	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.014	
Average flue gas temp temperature [^oC]		39.6	
Reference conditions		**Actual conditions**	
Moisture [%]	Dry	Moisture [%]	0.72
Temperature [K]	273	Temperature [K]	313
Pressure [kPa]	101.3	Pressure [kPa]	100.6
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		N/A	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:9 - Stack Measurements: Particulate & Rubber Fume Monitoring - A2-2 Pre Abatement

Reference method		EN 13284	
Sampling date		12 January 2017	
Sampling time		15:34-16:04	
Sampling technique			
Flue gas sampling system		Isokinetic in stack filtration system	
Oxygen measurement technique		Flue Gas Analyser	
Material			
Sampling probe material		Titanium	
Filter material		Titanium	
Sampling conditions			
Probe temperature [°C]		120	
Filtration temperature [°C]		120	
Average sampling flow rate [l/min]		30.37	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.85	
Average flue gas velocity [m/s]		4.39	
Nozzle diameter [mm]		7	
Ratio of highest to lowest velocity		< 1:3	
Swirl test result		Pass	
Initial leak test result [% of expected sampling flow rate]		0	
Final leak test result [% of average sampling flow rate]		0	
Average flue gas temp temperature [°C]		39.6	
Reference conditions		**Actual conditions**	
Moisture [%]	N/A	Moisture [%]	0.72
Temperature [K]	273	Temperature [K]	313
Pressure [kPa]	101.3	Pressure [kPa]	100.6
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		0.2	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:10 - Stack Measurements: TOC Monitoring - A2-2 Pre Abatement

Reference method	EN 12619
Sampling date	12 January 2017
Sampling time	15:34-16:04
Sampling technique	
TOC	Flame ionisation detection
Material	
Sampling probe material	SS, PTFE
Fuel	Hydrogen
Span calibration gas	Propane 90.0 ppm
Zero calibration gas	Ambient air after passing charcoal filter
Span gas drift [% of the range]	<2
Zero gas drift [% of the range]	<2
Sampling conditions	
Duct diameter [m]	0.35
Number of sampling ports	2
Number of sampling lines	Single point sampling
Heated line temperature [°C]	180
Number of sampling points per line	1
Average flue gas velocity [m/s]	4.39
Average flue gas temp temperature [°C]	39.6

Sampling conditions

Conditions	Reference	Sampling plane
Moisture	Dry	0.72
Temperature [K]	273	313
Pressure [kPa]	101.3	100.6
Oxygen [%]	N/A	N/A

Deviation from reference method

There was no deviation from reference method

Appendix1:11 - Stack Measurements: VOC monitoring - A2-2 Post Abatement

Reference method		EN 13649	
Sampling date		12 January 2017	
Sampling time		14:52-15:22	
Sampling technique			
Flue gas sampling system		SKC pump with Tygon tubing and low flow tube holder	
Oxygen measurement technique		FGA	
Material			
Sampling material		Charcoal tubes	
Sampling conditions			
Average sampling flow rate [l/min]		0.5 per tube	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.014	
Average flue gas temp temperature [°C]		39.8	
Reference conditions		**Actual conditions**	
Moisture [%]	Dry	Moisture [%]	1.88
Temperature [K]	273	Temperature [K]	313
Pressure [kPa]	101.3	Pressure [kPa]	100.0
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		N/A	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:12 - Stack Measurements: Particulate & Rubber Fume Monitoring - A2-2 Post Abatement

Reference method		EN 13284	
Sampling date		12 January 2017	
Sampling time		14:52-15:22	
Sampling technique			
Flue gas sampling system		Isokinetic in stack filtration system	
Oxygen measurement technique		Flue Gas Analyser	
Material			
Sampling probe material		Titanium	
Filter material		Titanium	
Sampling conditions			
Probe temperature [°C]		120	
Filtration temperature [°C]		120	
Average sampling flow rate [l/min]		8.80	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.25	
Average flue gas velocity [m/s]		4.30	
Nozzle diameter [mm]		7	
Ratio of highest to lowest velocity		< 1:3	
Swirl test result		Pass	
Initial leak test result [% of expected sampling flow rate]		0	
Final leak test result [% of average sampling flow rate]		0	
Average flue gas temp temperature [°C]		39.8	
Reference conditions		**Actual conditions**	
Moisture [%]	N/A	Moisture [%]	1.88
Temperature [K]	273	Temperature [K]	313
Pressure [kPa]	101.3	Pressure [kPa]	100.0
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		0.2	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:13 - Stack Measurements: TOC Monitoring - A2-2 Post Abatement

Reference method	EN 12619
Sampling date	12 January 2017
Sampling time	14:52-15:22
Sampling technique	
TOC	Flame ionisation detection
Material	
Sampling probe material	SS, PTFE
Fuel	Hydrogen
Span calibration gas	Propane 90.0 ppm
Zero calibration gas	Ambient air after passing charcoal filter
Span gas drift [% of the range]	<2
Zero gas drift [% of the range]	<2
Sampling conditions	
Duct diameter [m]	0.35
Number of sampling ports	2
Number of sampling lines	Single point sampling
Heated line temperature [°C]	180
Number of sampling points per line	1
Average flue gas velocity [m/s]	4.30
Average flue gas temp temperature [°C]	39.8

Sampling conditions

Conditions	Reference	Sampling plane
Moisture	Dry	1.88
Temperature [K]	273	313
Pressure [kPa]	101.3	100.0
Oxygen [%]	N/A	N/A

Deviation from reference method

There was no deviation from reference method

Appendix1:14 - Stack Measurements: VOC monitoring - A2-3 Pre Abatement

Reference method		EN 13649	
Sampling date		12 January 2017	
Sampling time		14:52-15:22	
Sampling technique			
Flue gas sampling system		SKC pump with Tygon tubing and low flow tube holder	
Oxygen measurement technique		FGA	
Material			
Sampling material		Charcoal tubes	
Sampling conditions			
Average sampling flow rate [l/min]		0.5 per tube	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.014	
Average flue gas temp temperature [^oC]		34.6	
Reference conditions		**Actual conditions**	
Moisture [%]	Dry	Moisture [%]	1.10
Temperature [K]	273	Temperature [K]	308
Pressure [kPa]	101.3	Pressure [kPa]	100.4
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		N/A	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:15 - Stack Measurements: Particulate & Rubber Fume Monitoring - A2-3 Pre Abatement

Reference method		EN 13284	
Sampling date		12 January 2017	
Sampling time		14:52-15:22	
Sampling technique			
Flue gas sampling system		Isokinetic in stack filtration system	
Oxygen measurement technique		Flue Gas Analyser	
Material			
Sampling probe material		Titanium	
Filter material		Titanium	
Sampling conditions			
Probe temperature [°C]		120	
Filtration temperature [°C]		120	
Average sampling flow rate [l/min]		8.37	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.23	
Average flue gas velocity [m/s]		4.32	
Nozzle diameter [mm]		7	
Ratio of highest to lowest velocity		< 1:3	
Swirl test result		Pass	
Initial leak test result [% of expected sampling flow rate]		0	
Final leak test result [% of average sampling flow rate]		0	
Average flue gas temp temperature [°C]		34.6	
Reference conditions		**Actual conditions**	
Moisture [%]	N/A	Moisture [%]	1.10
Temperature [K]	273	Temperature [K]	308
Pressure [kPa]	101.3	Pressure [kPa]	100.4
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		0.2	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:16 - Stack Measurements: TOC Monitoring - A2-3 Pre Abatement

Reference method	EN 12619
Sampling date	12 January 2017
Sampling time	14:52-15:22
Sampling technique	
TOC	Flame ionisation detection
Material	
Sampling probe material	SS, PTFE
Fuel	Hydrogen
Span calibration gas	Propane 90.0 ppm
Zero calibration gas	Ambient air after passing charcoal filter
Span gas drift [% of the range]	<2
Zero gas drift [% of the range]	<2
Sampling conditions	
Duct diameter [m]	0.5
Number of sampling ports	2
Number of sampling lines	Single point sampling
Heated line temperature [°C]	180
Number of sampling points per line	1
Average flue gas velocity [m/s]	4.32
Average flue gas temp temperature [°C]	34.6

Sampling conditions

Conditions	Reference	Sampling plane
Moisture	Dry	1.10
Temperature [K]	273	308
Pressure [kPa]	101.3	100.4
Oxygen [%]	N/A	N/A

Deviation from reference method

There was no deviation from reference method

Appendix1:17 - Stack Measurements: VOC monitoring - A2-3 Post Abatement

Reference method		EN 13649	
Sampling date		12 January 2017	
Sampling time		09:59-10:29	
Sampling technique			
Flue gas sampling system		SKC pump with Tygon tubing and low flow tube holder	
Oxygen measurement technique		FGA	
Material			
Sampling material		Charcoal tubes	
Sampling conditions			
Average sampling flow rate [l/min]		0.5 per tube	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.014	
Average flue gas temp temperature [^oC]		16.7	
Reference conditions		**Actual conditions**	
Moisture [%]	Dry	Moisture [%]	0.80
Temperature [K]	273	Temperature [K]	290
Pressure [kPa]	101.3	Pressure [kPa]	101.4
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		N/A	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:18 - Stack Measurements: Particulate & Rubber Fume Monitoring - A2-3 Post Abatement

Reference method		EN 13284	
Sampling date		12 January 2017	
Sampling time		09:59-10:29	
Sampling technique			
Flue gas sampling system		Isokinetic in stack filtration system	
Oxygen measurement technique		Flue Gas Analyser	
Material			
Sampling probe material		Titanium	
Filter material		Titanium	
Sampling conditions			
Probe temperature [°C]		120	
Filtration temperature [°C]		120	
Average sampling flow rate [l/min]		7.57	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.21	
Average flue gas velocity [m/s]		3.63	
Nozzle diameter [mm]		7	
Ratio of highest to lowest velocity		< 1:3	
Swirl test result		Pass	
Initial leak test result [% of expected sampling flow rate]		0	
Final leak test result [% of average sampling flow rate]		0	
Average flue gas temp temperature [°C]		16.7	
Reference conditions		**Actual conditions**	
Moisture [%]	N/A	Moisture [%]	0.80
Temperature [K]	273	Temperature [K]	290
Pressure [kPa]	101.3	Pressure [kPa]	101.4
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		0.2	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:19 - Stack Measurements: TOC Monitoring - A2-3 Post Abatement

Reference method	EN 12619
Sampling date	12 January 2017
Sampling time	09:59-10:29
Sampling technique	
TOC	Flame ionisation detection
Material	
Sampling probe material	SS, PTFE
Fuel	Hydrogen
Span calibration gas	Propane 90.0 ppm
Zero calibration gas	Ambient air after passing charcoal filter
Span gas drift [% of the range]	<2
Zero gas drift [% of the range]	<2
Sampling conditions	
Duct diameter [m]	0.5
Number of sampling ports	2
Number of sampling lines	Single point sampling
Heated line temperature [°C]	180
Number of sampling points per line	1
Average flue gas velocity [m/s]	3.63
Average flue gas temp temperature [°C]	16.7

Sampling conditions

Conditions	Reference	Sampling plane
Moisture	Dry	0.80
Temperature [K]	273	290
Pressure [kPa]	101.3	101.4
Oxygen [%]	N/A	N/A

Deviation from reference method

There was no deviation from reference method

Appendix1:20 - Stack Measurements: VOC monitoring - A2-4 Pre Abatement

Reference method		EN 13649	
Sampling date		12 January 2017	
Sampling time		15:16-15:46	
Sampling technique			
Flue gas sampling system		SKC pump with Tygon tubing and low flow tube holder	
Oxygen measurement technique		FGA	
Material			
Sampling material		Charcoal tubes	
Sampling conditions			
Average sampling flow rate [l/min]		0.5 per tube	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.014	
Average flue gas temp temperature [^oC]		33.1	
Reference conditions		**Actual conditions**	
Moisture [%]	Dry	Moisture [%]	1.09
Temperature [K]	273	Temperature [K]	306
Pressure [kPa]	101.3	Pressure [kPa]	101.2
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		N/A	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:21 - Stack Measurements: Particulate & Rubber Fume Monitoring - A2-4 Pre Abatement

Reference method		EN 13284	
Sampling date		12 January 2017	
Sampling time		15:16-15:46	
Sampling technique			
Flue gas sampling system		Isokinetic in stack filtration system	
Oxygen measurement technique		Flue Gas Analyser	
Material			
Sampling probe material		Titanium	
Filter material		Titanium	
Sampling conditions			
Probe temperature [°C]		120	
Filtration temperature [°C]		120	
Average sampling flow rate [l/min]		13.9	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.39	
Average flue gas velocity [m/s]		7.58	
Nozzle diameter [mm]		7	
Ratio of highest to lowest velocity		< 1:3	
Swirl test result		Pass	
Initial leak test result [% of expected sampling flow rate]		0	
Final leak test result [% of average sampling flow rate]		0	
Average flue gas temp temperature [°C]		33.1	
Reference conditions		**Actual conditions**	
Moisture [%]	N/A	Moisture [%]	1.09
Temperature [K]	273	Temperature [K]	306
Pressure [kPa]	101.3	Pressure [kPa]	101.2
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		0.2	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:22 - Stack Measurements: TOC Monitoring - A2-4 Pre Abatement

Reference method	EN 12619
Sampling date	12 January 2017
Sampling time	15:16-15:46
Sampling technique	
TOC	Flame ionisation detection
Material	
Sampling probe material	SS, PTFE
Fuel	Hydrogen
Span calibration gas	Propane 90.0 ppm
Zero calibration gas	Ambient air after passing charcoal filter
Span gas drift [% of the range]	<2
Zero gas drift [% of the range]	<2
Sampling conditions	
Duct diameter [m]	0.35
Number of sampling ports	2
Number of sampling lines	Single point sampling
Heated line temperature [°C]	180
Number of sampling points per line	1
Average flue gas velocity [m/s]	7.58
Average flue gas temp temperature [°C]	33.1

Sampling conditions

Conditions	Reference	Sampling plane
Moisture	Dry	1.09
Temperature [K]	273	306
Pressure [kPa]	101.3	101.2
Oxygen [%]	N/A	N/A

Deviation from reference method

There was no deviation from reference method

Appendix1:23 - Stack Measurements: VOC monitoring - A2-4 Post Abatement

Reference method		EN 13649	
Sampling date		11 January 2017	
Sampling time		16:00-16:30	
Sampling technique			
Flue gas sampling system		SKC pump with Tygon tubing and low flow tube holder	
Oxygen measurement technique		FGA	
Material			
Sampling material		Charcoal tubes	
Sampling conditions			
Average sampling flow rate [l/min]		0.5 per tube	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.014	
Average flue gas temp temperature [^oC]		35.3	
Reference conditions		**Actual conditions**	
Moisture [%]	Dry	Moisture [%]	0.0
Temperature [K]	273	Temperature [K]	308
Pressure [kPa]	101.3	Pressure [kPa]	101.4
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		N/A	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:24 - Stack Measurements: Particulate & Rubber Fume Monitoring - A2-4 Post Abatement

Reference method		EN 13284	
Sampling date		11 January 2017	
Sampling time		16:00-16:30	
Sampling technique			
Flue gas sampling system		Isokinetic in stack filtration system	
Oxygen measurement technique		Flue Gas Analyser	
Material			
Sampling probe material		Titanium	
Filter material		Titanium	
Sampling conditions			
Probe temperature [°C]		120	
Filtration temperature [°C]		120	
Average sampling flow rate [l/min]		1.47	
Total sampling time [min]		30	
Sampled volume of the dry gas at STP [m^3]		0.04	
Average flue gas velocity [m/s]		0.98	
Nozzle diameter [mm]		7	
Ratio of highest to lowest velocity		<1.3	
Swirl test result		Pass	
Initial leak test result [% of expected sampling flow rate]		0	
Final leak test result [% of average sampling flow rate]		0	
Average flue gas temp temperature [°C]		35.3	
Reference conditions		**Actual conditions**	
Moisture [%]	N/A	Moisture [%]	0.0
Temperature [K]	273	Temperature [K]	308
Pressure [kPa]	101.3	Pressure [kPa]	101.4
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		0.2	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:25 - Stack Measurements: TOC Monitoring - A2-4 Post Abatement

Reference method	EN 12619
Sampling date	11 January 2017
Sampling time	16:00-16:30
Sampling technique	
TOC	Flame ionisation detection
Material	
Sampling probe material	SS, PTFE
Fuel	Hydrogen
Span calibration gas	Propane 90.0 ppm
Zero calibration gas	Ambient air after passing charcoal filter
Span gas drift [% of the range]	<2
Zero gas drift [% of the range]	<2
Sampling conditions	
Duct diameter [m]	0.35
Number of sampling ports	2
Number of sampling lines	Single point sampling
Heated line temperature [°C]	180
Number of sampling points per line	1
Average flue gas velocity [m/s]	0.98
Average flue gas temp temperature [°C]	35.3

Sampling conditions

Conditions	Reference	Sampling plane
Moisture	Dry	0.0
Temperature [K]	273	308
Pressure [kPa]	101.3	101.4
Oxygen [%]	N/A	N/A

Deviation from reference method

There was no deviation from reference method

Emission Point	Compound	ug	mg/m3	Risk Phase	Hazard Code	BAT	Classification	TA Luft Classification
A2-1 Pre Abatement	Carbon Black	<30	<1.53	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I	N/A
	1,-1'-)1,-3-Phenylene)bis-1H-pyrrole-2,5-dione	<10	<0.71	R22, R26, R36/R37/R38	T, Xi, T+	R26	Organic Substance Class I	N/A
	Pent methyl Heptene	10	0.765	R10, R65	Xn, F	N/A	N/A	Class III
	Octamethylcyclotetrasiloxane	180	13.762	R53, R62, R10	Xn	R62	Organic Substance Class II	Class I
	Hexamethylcyclotrisiloxane	33	2.523	R11-36/37/38	F, Xi	N/A	N/A	Class III
A2-1 Post Abatement	Carbon Black	<30	<1.47	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I	N/A
	1,-1'-)1,-3-Phenylene)bis-1H-pyrrole-2,5-dione	<10	<0.77	R22, R26, R36/R37/R38	T, Xi, T+	R26	Organic Substance Class I	N/A
	Ethanol	16	1.23	11-10-36/37/38-39/23/24/25-23/24/25-68/20/21/22-20/21/22-52/53-51/53	F, T, Xn, N	N/A	N/A	Class III
	n-Butan-1-ol	13	1.00	10-22-37/38-41-67-39/23/24/25-23/24/25-11	F, T, Xn	N/A	N/A	Class III
	Hexamethylcyclotrisiloxane	34	2.61	R11-36/37/38	F, Xi	N/A	N/A	Class III

Emission Point	Compound	ug	mg/m3	Risk Phase	Hazard Code	BAT	Classification	TA Luft Classification
	Octamethylcyclotetrasiloxane	360	27.60	R53, R62, R10	Xn	R62	Organic Substance Class II	Class I
	Pent methyl Heptene	35	2.68	R10, R65	Xn, F	N/A	N/A	Class III
A2-2 Pre Abatement	Carbon Black	<30	<0.37	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I	N/A
	1,-1'-)1,-3-Phenylene)bis-1H-pyrrole-2,5-dione	<10	<0.72	R22, R26, R36/R37/R38	T, Xi, T+	R26	Organic Substance Class I	N/A
	Hexamethylcyclotrisiloxane	94	6.73	R11-36/37/38	F, Xi	N/A	N/A	Class III
	Octamethylcyclotetrasiloxane	90	6.44	R53, R62, R10	Xn	R62	Organic Substance Class II	Class I
A2-2 Post Abatement	Carbon Black	<30	<1.28	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I	N/A
	1,-1'-)1,-3-Phenylene)bis-1H-pyrrole-2,5-dione	<10	<0.72	R22, R26, R36/R37/R38	T, Xi, T+	- R26	Organic Substance Class I	N/A
	Hexamethylcyclotrisiloxane	17	1.22	R11-36/37/38	F, Xi	N/A	N/A	Class III
	Octamethylcyclotetrasiloxane	23	1.65	R53, R62, R10	Xn	R62	Organic Substance Class II	Class I
A2-3 Pre Abatement	Carbon Black	<30	<1.34	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I	N/A
	1,-1'-)1,-3-Phenylene)bis-1H-pyrrole-2,5-dione	<10	<0.72	R22, R26, R36/R37/R38	T, Xi, T+	R26	Organic Substance Class I	N/A

Emission Point	Compound	ug	mg/m3	Risk Phase	Hazard Code	BAT	Classification	TA Luft Classification
	Hexamethylcyclotrisiloxane	82	5.88	R11-36/37/38	F, Xi	N/A	N/A	Class III
	Octamethylcyclotetrasiloxane	310	22.24	R53, R62, R10	Xn	R62	Organic Substance Class II	Class I
A2-3 Post Abatement	Carbon Black	<30	<1.46	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I	N/A
	1,-1'-)1,-3-Phenylene)bis-1H-pyrrole-2,5-dione	<10	<0.72	R22, R26, R36/R37/R38	T, Xi, T+	R26	Organic Substance Class I	N/A
	Ethanol	17	1.22	11-10-36/37/38-39/23/24/25-23/24/25-68/20/21/22-20/21/22-52/53-53/53	F, T, Xn, N	N/A	N/A	Class III
	Hexamethylcyclotrisiloxane	240	17.16	R11-36/37/38	F, Xi	N/A	N/A	Class III
	Octamethylcyclotetrasiloxane	620	44.34	R53, R62, R10	Xn	R62	Organic Substance Class II	Class I
A2-4 Pre Abatement	Carbon Black	<30	<1.56	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I	N/A
	1,-1'-)1,-3-Phenylene)bis-1H-pyrrole-2,5-dione	<10	<0.71	R22, R26, R36/R37/R38	T, Xi, T+	R26	Organic Substance Class I	N/A
	Lead	3	0.01	R61, R20/21, R33, R50/53. R62	T, N	R33	Inorganic Dust Particle class II	Class II
	Hexamethylcyclotrisiloxane	17	1.21	R11-36/37/38	F, Xi	N/A	N/A	Class III

Emission Point	Compound	ug	mg/m3	Risk Phase	Hazard Code	BAT	Classification	TA Luft Classification
A2-4 Post Abatement	Carbon Black	<30	<1.46	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I	N/A
	1,-1'-)1,-3-Phenylene)bis-1H-pyrrole-2,5-dione	<10	<0.72	R22, R26, R36/R37/R38	T, Xi, T+	R26	Organic Substance Class I	N/A
	Lead	2.8	0.07	R61, R20/21, R33, R50/53. R62	T, N	R33	Inorganic Dust Particle class II	Class II
	Hexamethylcyclotrisiloxane	18	1.29	R11-36/37/38	F, Xi	N/A	N/A	Class III

Symbol	Hazard Code
N	Dangerous for the Environment
F	Highly Flammable
Xi	Irritant
Xn	Harmful
T	Toxic

ANNUAL AIR EMISSIONS
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APPENDIX II

MONITORING EQUIPMENT CALIBRATION CERTIFICATES

Licence Reg. P0465-01
TMS Environment Ref. 23888 Rev 1.0

MS-E-1-1 29 MAR 2016

Temperature - *Temperature (°C)*

Campo di misura ingresso Termocoppie - Thermocouple input *Range* : 0 + 1200 °C
Campo di misura sonda Pt100 - Pt100 sensor *Range* : - 20 +80 °C

	Riferimento *Reference*	DUT	Dmax (°C)	Accett. *Accept.*	Emax (%)
TC Fumes	100	99.3	0.7	1%fs ±0.2 °C	0.06
	600	600.4	-0.4	1%fs ±0.2 °C	0.03
TC Aux1	100	99	1	1%fs ±0.2 °C	0.08
	600	599.9	0.1	1%fs ±0.2 °C	0.01
TC Aux2	100	99.1	0.9	1%fs ±0.2 °C	0.08
	600	600.1	-0.1	1%fs ±0.2 °C	0.01
TC Probe	100	99.3	0.7	1%fs ±0.2 °C	0.06
	600	600.4	-0.4	1%fs ±0.2 °C	0.03
TC Box	100	99.4	0.6	1%fs ±0.2 °C	0.05
	600	600.4	-0.4	1%fs ±0.2 °C	0.03
DGM Pt100	23.71	23.62	0.09	1%fs ±0.2 °C	0.09

Verifica misura del Volume - *Volume Measure Verifying*

Flusso di Taratura - *Reference Flow rate : 15 l/min [4 mc/h pump] - 30 l/min [8mc/h pump]*
Ref DGM Volume riferimento alle condizioni attuali - *Reference volume @ actual condition*
G4 Volume Volume attuale indicato dallo strumento - *Instrument volume reading @ actual condition*

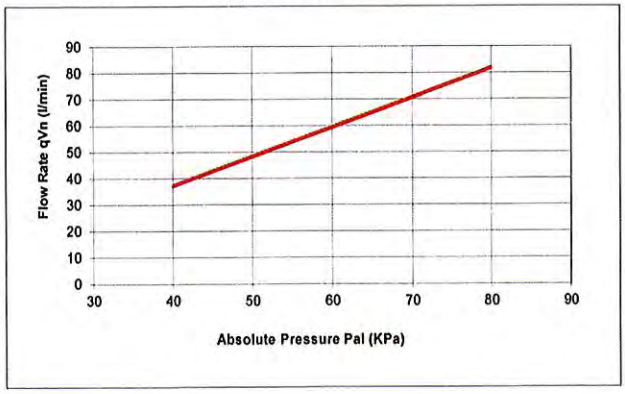
Ref DGM ini	Ref DGM fin	Ref DGM corr.	Ref Volume (@actual)	DUT (@actual)	Dmax (l)	Emax (%)	Accett. *Accept.*
172309.8	172789.4	1.005	482.00	484.241	2.2	0.47	± 2 %

Misura Portata - Flow rate measure

Flusso di Taratura - Reference Flow rate : 15 - 30 l/min [4 mc/h pump] ; 30 - 40 l/min [8 mc/h pump]

Point	Riferimento *Reference*	DUT	Dmax (l/min)	Accett. *Accept.*	Emax (%)
1	21.06	21.89	-0.83	±2 %	1.38
2	41.27	41.77	-0.5	±2 %	0.83

Curva caratteristica Pompa - *Pump performance curve*



Pal (KPa)	qVn (l/min)
79.9	81.82
40.05	37.35

M-S-E-1-1 29 MAR 2016

tecora
A DIVISION OF OMNISENSE TECHNOLOGIES

Rapporto di taratura
Calibration report N° R-11420244P

Strumento - *Instrument:* **Isostack G4**
Firmware version : **1.9.2000**
Destinatario - *Customer* :

Costruttore - Constructor : **TCR Tecora**
S.N.: **11420244P**

Il presente verbale di taratura non è utilizzabile per misure fiscali. Rappresenta la registrazione delle prove eseguite durante il collaudo dello strumento, in accordo ai requisiti qualitativi previsti dal nostro sistema di qualità.

Condizioni ambientali della prova - *Ambient condition*
Temp. - *Temperature* (°C) : **21.6**
Pressione - *Pressure* (KPa) : **99.8**

Riferimenti utilizzati - *Reference used*

Temperatura - *Temperature* :	Eurotron Mod. Microcal 10	S.N. 29454	TCR std 28S
Pressione - *Pressure* :	Eurotron Mod. Microcal P2	S.N. 59S	TCR std 59S
Pressione - *Pressure* :	Tecora Flowcal Air	S.N. 1043008FC	TCR std 56S
Flusso - *Flowrate* :	BGI Deltacal	S.N. 237	TCR std 43S
Volume - *Volume* :	Itron G4 Gallus	S.N. 0314A111213738	TCR std 67S
Rischi elettrici - *Electr. Risk* :	Fulltest HT 4050	S.N. 01021626	TCR std 39S

Pressione assoluta Pitot - Pitot *Absolute pressure*
Campo di misura - *Range* : 0 - 105 KPa
Dmax = Deviazione massima della misura - *Max reading deviation*
E max = Max errore di indicazione percentuale sul campo di misura - *Max full range percent indication error (%)*
DUT = Strumento in prova = Device under test

Point	Riferimento *Reference*	DUT	Dmax (kPa)	Accett. *Accept.*	Emax (%)
1	89.95	90	-0.05	1% ±0.1kPa	0.05
2	50.03	50	0.03	1% ±0.1kPa	0.03

Pressione assoluta CV - DGM *Absolute pressure*
Campo di misura - *Range* : 0 - 105 KPa

Point	Riferimento *Reference*	DUT	Dmax (kPa)	Accett. *Accept.*	Emax (%)
1	89.97	90	-0.03	1% ±0.1kPa	0.03
2	49.98	50	-0.02	1% ±0.1kPa	0.02

Pressione differenziale Pitot - Pitot *Differential pressure*
Campo di misura - *Range* : 0 - 2500 Pa

Point	Riferimento *Reference*	DUT	Dmax (Pa)	Accett. *Accept.*	Emax (%)
1	50.8	51	-0.2	1%fs ±2Pa	0.01
2	500.3	500	0.3	1%fs ±2Pa	0.01

Pressione differenziale OM - OM *Differential pressure*
Campo di misura - *Range* : 0 - 10000 Pa

Point	Riferimento *Reference*	DUT	Dmax (Pa)	Accett. *Accept.*	Emax (%)
1	1000.6	1000	0.6	1%fs ±10Pa	0.01

M-S-E-1-1 29 MAR 2016

Rischi. Elett. - Electr. Risk : Fulltest HT 4050 S.N. 01021626 TCR std 39S

Verifica rischi elettrici - ***Electrical risk verifying***

In accordo alle norme CEI EN 61010-1 e CEI EN 60601-1 - In accordance to norms CEI EN 61010-1 and CEI EN 60601-1

Test	Valore-*Value*	Accett. - *Accept.*
Corrente di dispersione - *leakage current*	4.3	< 15 mA
Resistenza di isolamento - *Insulation resistance*	O.R.	> 0.2 MΩ
Resistenza equipotenziale - *Continuity resistance*	0.101	< 0.2 Ω

Data - *Date :* 25/03/2016 Eseguito da - *Tested by:* Pasquini C.

ANNUAL AIR EMISSIONS
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APPENDIX III
MATERIAL SAFETY DATA SHEET INFOMRATION

Licence Reg. P0465-01
TMS Environment Ref. 23888 Rev 1.0

FKM 07709
SEAL TURB SHF (O-ring)

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Magnesium-Oxide	1309-48-4	24/25	-	N/A	N/A
Wollastonite	13983-17-0	36/37	Xi	N/A	N/A
Diiron-trioxide	1306-37-1	24/25	-	N/A	N/A
Octedecylamide	124-30-1	38, 41	Xi	N/A	N/A
Oprefluoropolyehter	60164-51-4	36/37, S26, S36	Xi	N/A	N/A

FKM 07795
Dichtring

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
Octedecylamide	124-30-1	38, 41	Xi	N/A	N/A
Carnauba-wax	8015-86-9	R24/R25	-	N/A	N/A

FKM 07730
DR 317x4,5

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Calcium-dihydroxide	1305-62-0	R26, R39, R45, R36/37/39, R27	Xi, C	N/A	N/A
Magnesium-Oxide	1309-48-4	R24/25	-	N/A	N/A
Chromium(III) Oxide	1308-38-9	R24/25	-	N/A	N/A
Barium sulphate	7727-43-7	R20/21/22, R36/37/38	Xn	N/A	N/A
Carnauba-wax	8015-86-9	R24/R25	-	N/A	N/A
Siloxanes and silicones, Di-Me, hydroxly-terminated	70131-67-8	R36/37/38	Xi	N/A	N/A

FKM 07781

DR 149, 4x,95

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	**R40**	Organic Substance Class I
Calcium-carbonate	471-34-1	R36/37, R41, R36/38, R36	Xi	N/A	N/A
Octedecylamide	124-30-1	38, 41	Xi	N/A	N/A
Lead-monoxide	1317-36-8	R61, R20/21, R33, R50/53. R62	T, N	**R33, Lead and its compou nds as Pb,**	Inorganic Dust Particle lass II
Carnauba-wax	8015-86-9	R24/R25	-	N/A	N/A

FKM 07712

Dichtring

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Calcium-dihydroxide	1305-62-0	R26, R39, R45, R36/37/39, R22	Xi, C	N/A	N/A
Magnesium-Oxide	1309-48-4	R24/25	-	N/A	N/A
Chromium(III) Oxide	1308-38-9	R24/25	-	N/A	N/A
Barium sulphate	7727-43-7	R20/21/22, R36/37/38	Xn	N/A	N/A
Carnauba-wax	8015-86-9	R24/R25	-	N/A	N/A
Siloxanes and silicones, Di-Me, hydroxly-terminated	70131-67-8	R36/37/38	Xi	N/A	N/A

FKM 07770

Seal Ring

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	**R40**	Organic Substance Class I
Octedecylamide	124-30-1	38, 41	Xi	N/A	N/A
Carnauba-wax	8015-86-9	R24/R25	-	N/A	N/A

FKM 07694
Gasket

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	**R40**	Organic Substance Class I
Barium sulphate	7727-43-7	R20/21/22, R36/37/38	Xn	N/A	N/A
Kieselguhr, soda ash flux-calcined	68855-54-9	R48/20, R49, R36/37, R37/38, R45, R36/37/38	T, N	N/A	N/A
Zinc oxide	1314-13-2	50/53-20-43-36/38-20/21/22-67-66-10-11	N,Xn,F	N/A	N/A
Calcium-carbonate	471-34-1	R36/37, R41, R36/38, R36	Xi	N/A	N/A
Octedecylamide	124-30-1	38, 41	Xi	N/A	N/A
Carnauba-wax	8015-86-9	R24/R25	-	N/A	N/A

ACM 05740
Dichtring

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	11, 40, 36/37/38	F,Xi,Xn	R40	Organic Substance Class I
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
Sodium stearate	822-16-2	-	-	N/A	N/A
4-(1-Methyl-1-phenylethyl)-N-[4-(1-methyl-1-phehylethyl)phenyl] aniline	10081-67-1	-	-	N/A	N/A
Pentatearythritol-tetrastearsteartate	115-83-3	-	-	N/A	N/A
N,N'-Ethylenedi(stearamide)	110-30-5	R36/37/38	Xi	N/A	N/A

ACM 05532
Dichtring

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	11, 40, 36/37/38	F,Xi,Xn	R40	Organic Substance Class I
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
Sodium stearate	822-16-2	-	-	N/A	N/A
4-(1-Methyl-1-phenylethyl)-N-[4-(1-methyl-1-phehylethyl)phenyl] aniline	10081-67-1	-	-	N/A	N/A
Pentatearythritol-tetrastearsteartate	115-83-3	-	-	N/A	N/A
N,N'-Ethylenedi(stearamide)	110-30-5	R36/37/38	Xi	N/A	N/A

ACM 05730

OR 95x3

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	11, 40, 36/37/38	F,Xi,Xn	R40	Organic Substance Class I
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
Sodium stearate	822-16-2	-	-	N/A	N/A
4-(1-Methyl-1-phenylethyl)-N-[4-(1-methyl-1-phehylethyl)phenyl]aniline	10081-67-1	-	-	N/A	N/A
Pentatearythritol-tetrastearsteartate	115-83-3	-	-	N/A	N/A
N,N'-Ethylenedi(stearamide)	110-30-5	R36/37/38	Xi	N/A	N/A

ACM 05640

DR 27,8

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	11, 40, 36/37/38	F,Xi,Xn	R40	Organic Substance Class I
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
Sodium stearate	822-16-2	-	-	N/A	N/A
4-(1-Methyl-1-phenylethyl)-N-[4-(1-methyl-1-phehylethyl)phenyl]aniline	10081-67-1	-	-	N/A	N/A
Pentatearythritol-tetrastearsteartate	115-83-3	-	-	N/A	N/A
N,N'-Ethylenedi(stearamide)	110-30-5	R36/37/38	Xi	N/A	N/A

AEM 11827

Entkopplungselement Rail N47C

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
BIS[2-[2-(2-butoxyethoxy)ethoxy]ethyl] adipate	65520-46-9	-	-	N/A	N/A
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
Octadecylamine	124-30-1	-	-	N/A	N/A
4-(1-Methyl-1-phenylethyl)-N-[4-(1-methyl-1-phehylethyl)phenyl]aniline	10081-67-1	-	-	N/A	N/A
Octadecan-1-ol, ethoxyllated, phosphate	62362-49-6	-		N/A	N/A

AEM 11727

Profile Gasket

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
Octadecylamine	124-30-1	-	-	N/A	N/A
Octadecan-1-ol, ethoxyllated, phosphate	62362-49-6	-	-	N/A	N/A
4-(1-Methyl-1-phenylethyl)-N-[4-(1-methyl-1-phehylethyl)phenyl]aniline	10081-67-1	-	-	N/A	N/A
Siloxanes & Silicones, di-me, hydroxy-terminated	70131-67-8	-	-	N/A	N/A
BIS[2-[2-(2-butoxyethoxy)ethoxy]ethyl] adipate	65520-46-9	-	-	N/A	N/A

AEM 11621

Dichtring

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
Octadecylamine	124-30-1	-	-	N/A	N/A
Octadecan-1-ol, ethoxyllated, phosphate	62362-49-6	-	-	N/A	N/A
Siloxanes & Silicones, di-me, hydroxy-terminated	70131-67-8	-	-	N/A	N/A
BIS[2-[2-(2-butoxyethoxy)ethoxy]ethyl] adipate	65520-46-9	-	-	N/A	N/A

AEM 11825
Dichtring

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
BIS[2-[2-(2-butoxyethoxy)ethoxy]ethyl] adipate	65520-46-9	-	-	N/A	N/A
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
4-(1-Methyl-1-phenylethyl)-N-[4-(1-methyl-1-phehylethyl)phenyl]aniline	10081-67-1	-	-	N/A	N/A
Octadecan-1-ol, ethoxyllated, phosphate	62362-49-6	-	-	N/A	N/A
Octadecylamine	124-30-1	-	-	N/A	N/A

AEM W1150

Gasket

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
Coke (petroleum), calcined	64743-05-1	-	-	N/A	N/A
Cellulose	9004-34-6	R37	Xi	N/A	N/A
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
BIS[2-[2-(2-butoxyethoxy)ethoxy]ethyl] adipate	65520-46-9	-	-	N/A	N/A
4-(1-Methyl-1-phenylethyl)-N-[4-(1-methyl-1-phehylethyl)phenyl]aniline	10081-67-1	-	-	N/A	N/A
Calcium-carbonate	471-34-1	R36/37, R41, R36/38, R36	Xi	N/A	N/A
Octadecylamine	124-30-1		-	N/A	N/A

AEM 11721

Dichtring 39,5x3,7 /sealing 38,5x3,7

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
Octadecylamine	124-30-1	-	-	N/A	N/A
Octadecan-1-ol, ethoxyllated, phosphate	62362-49-6	-	-	N/A	N/A
4-(1-Methyl-1-phenylethyl)-N-[4-(1-methyl-1-phehylethyl)phenyl]aniline	10081-67-1	-	-	N/A	N/A
Siloxanes & Silicones, di-me, hydroxy-terminated	70131-67-8	-	-	N/A	N/A
Polu(oxy-1,2-ethanediyl), alpha-(2-ethyl-1-oxohexyl)-omega-((2Ethyl-1-oxoxhexyl)oxy	9004-93-7	-	-	N/A	N/A

AEM 11888
DR 67,8 x 3,5/OS

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
Octadecan-1-ol, ethoxyllated, phosphate	62362-49-6	-	-	N/A	N/A
4-(1-Methyl-1-phenylethyl)-N-[4-(1-methyl-1-phehylethyl)phenyl]aniline	10081-67-1	-	-	N/A	N/A
Siloxanes & Silicones, di-me, hydroxy-terminated	70131-67-8	-	-	N/A	N/A

AEM 11622
Gasket

Composition	CAS no	Risk Phase	Hazard Code	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
Octadecan-1-ol, ethoxyllated, phosphate	62362-49-6	-	-	N/A	N/A
BIS[2-[2-(2-butoxyethoxy)ethoxy]ethyl] adipate	65520-46-9	-	-	N/A	N/A
4-(1-Methyl-1-phenylethyl)-N-[4-(1-methyl-1-phehylethyl)phenyl]aniline	10081-67-1	-	-	N/A	N/A
Siloxanes & Silicones, di-me, hydroxy-terminated	70131-67-8	-	-	N/A	N/A

09613 EPDM

Profilring

Composition	CAS no	Risk Phase	Safety Phase	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
Residual Oils (petroleum) solven-dewaxed	64742-62-7	-	-	N/A	N/A
Zinc oxide	1314-13-2	50/53-20-43-36/38-20/21/22-67-66-10-11	N,Xn,F	N/A	N/A
Calcium Carbonate	471-34-1	R37/338	Xi	N/A	N/A
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
2,2'-Oxydiethanol	111-46-6	R22	Xi	N/A	N/A
N-(2-Hydroxeyethyl)stearamide	111-57-9	-	-	N/A	N/A

09716 EPDM

DR 58,5

Composition	CAS no	Risk Phase	Safety Phase	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
Zinc oxide	1314-13-2	50/53-20-43-36/38-20/21/22-67-66-10-11	N,Xn,F	N/A	N/A
Calcium Carbonate	471-34-1	R37/338	Xi	N/A	N/A
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
Quartz (SiO2)	14808-60-7	36/37/38-48/20	Xn	N/A	N/A
N-(2-Hydroxeyethyl)stearamide	111-57-9	-	-	N/A	N/A
1,2-Benzenetriccarboxylic acid, p;olymer with 2,2'-(1,2-ethanediylbis)	68389-55-9	-	-	N/A	N/A

09617EPDM
OR 65x3

Composition	CAS no	Risk Phase	Safety Phase	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
Residual Oils (petroleum) solven-dewaxed	64742-62-7	-	-	N/A	N/A
Zinc oxide	1314-13-2	50/53-20-43-36/38-20/21/22-67-66-10-11	N,Xn,F	N/A	N/A
Calcium Carbonate	471-34-1	R37/338	Xi	N/A	N/A
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
N-(2-Hydroxeyethyl)stearamide	111-57-9	-	-	N/A	N/A
2,2'-Oxydiethanol	111-46-6	R22	Xi	N/A	N/A

09611 EPDM
OR 20x2

Composition	CAS no	Risk Phase	Safety Phase	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
Residual Oils (petroleum) solven-dewaxed	64742-62-7	-	-	N/A	N/A
Zinc oxide	1314-13-2	50/53-20-43-36/38-20/21/22-67-66-10-11	N,Xn,F	N/A	N/A
Calcium Carbonate	471-34-1	R37/338	Xi	N/A	N/A
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
N-(2-Hydroxeyethyl)stearamide	111-57-9	-	-	N/A	N/A
2,2'-Oxydiethanol	111-46-6	R22	Xi	N/A	N/A

HNBR 14617
Dictring

Composition	CAS no	Risk Phase	Safety Phase	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	**R40**	Organic Substance Class I
Zinc oxide	1314-13-2	50/53-20-43-36/38-20/21/22-67-66-10-11	N,Xn,F	N/A	N/A
1,-1'-)1,-3-Phenylene)bis-1H-pyrrole-2,5-dione	3006-93-7	R22, R26, R36/R37/R38	T, Xi, T+	**YES - R26**	Organic Substance Class I
calcium-carbonate	471-34-1	R36/R37/38/R41	Xi	N/A	N/A
4-(1-Methyl-1-phenylethyl)-N-[4-(1-methyl-1-phehylethyl)phenyl]aniline	10081-67-1	-	-	N/A	N/A
1,2,4-Benzenetriccarboxylic acid, decyl octyl ester	67989-23-5	-	-	N/A	N/A
Pentatearythritol-tetrastearsteartate	115-83-3	-	-	N/A	N/A
Parafin waxes(petrolum) hydrotreated	64742-51-4	-	-	N/A	N/A
Bis[2-[2-(2-butoxyethoxy)ethoxy]ethyl]adipate	65520-46-9	-	-	N/A	N/A

HNBR 14750
PD 86,1/1

Composition	CAS no	Risk Phase	Safety Phase	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	**R40**	Organic Substance Class I
Zinc oxide	1314-13-2	50/53-20-43-36/38-20/21/22-67-66-10-11	N,Xn,F	N/A	N/A
1,-1'-)1,-3-Phenylene)bis-1H-pyrrole-2,5-dione	3006-93-7	R22, R26, R36/R37/R38	T, Xi, T+	**YES - R26**	Organic Substance Class I
calcium-carbonate	471-34-1	R36/R37/38/R41	Xi	N/A	N/A
4-(1-Methyl-1-phenylethyl)-N-[4-(1-methyl-1-phehylethyl)phenyl]aniline	10081-67-1	-	-	N/A	N/A
1,2,4-Benzenetriccarboxylic acid, decyl octyl ester	67989-23-5	-	-	N/A	N/A
Pentatearythritol-tetrastearsteartate	115-83-3		-	N/A	N/A
Paraffin waxes(petroleum) hydro treated	64742-51-4	-	-	N/A	N/A

HNBR 14615
PD 118

Composition	CAS no	Risk Phase	Hazaed Code	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	**R40**	Organic Substance Class I
Zinc oxide	1314-13-2	50/53-20-43-36/38-20/21/22-67-66-10-11	N,Xn,F	N/A	N/A
1,-1'-)1,-3-Phenylene)bis-1H-pyrrole-2,5-dione	3006-93-7	R22, R26, R36/R37/R38	T, Xi, T+	**YES - R26**	Organic Substance Class I
calcium-carbonate	471-34-1	R36/R37/38/R41	Xi	N/A	N/A
4-(1-Methyl-1-phenylethyl)-N-[4-(1-methyl-1-phehylethyl)phenyl]anilin e	10081-67-1	-	-	N/A	N/A
1,2,4-Benzenetriccarboxylic acid, decyl octyl ester	67989-23-5	-	-	N/A	N/A
Pentatearythritol-tetrastearsteartate	115-83-3	-	-	N/A	N/A
Paraffin waxes(petroleum) hydro treated	64742-51-4	-	-	N/A	N/A

NRB - 01722
Dicthung

Composition	CAS No	Risk Phase	Hazard Phase	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
Zinc oxide	1314-13-2	50/53-20-43-36/38-20/21/22-67-66-10-11	N,Xn,F	N/A	N/A
Bis(2-ethylhexyl) adipate	103-23-1	36/38-40-39/23/24/25-23/24/25-11	Xi,Xn,T,F	R40	Organic Substance Class I
Quartz (SiO2)	14808-60-7	36/37/38-48/20	Xn	N/A	N/A
Kaolinite	1318-74-7	N/C	N/C	N/A	N/A
Stearic acid	57-11-4	38-36/37/38-11	Xi,F	N/A	N/A
Paraffin waxes (petroleum), hydrotreated	64742-51-4	N/C	N/C	N/A	N/A

NRB - 01736
o -Ring

Composition	CAS No	Risk Phase	Hazard Phase	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
Zinc oxide	1314-13-2	50/53-20-43-36/38-20/21/22-67-66-10-11	N,Xn,F	N/A	N/A
Stearic acid	57-11-4	38-36/37/38-11	Xi,F	N/A	N/A
Poly(oxy-1, 2-ethanediyl), alpha, alpha'-(thiodi-2, 1-ethanediyl)bis(omega-butoxy)	68958-65-6	N/C	N/C	N/A	N/A
Silicic Acid, aluminum sodium salt	1344-00-9	36/37/38	Xn,Xi		
Silica, amorphous	112929-00-8	N/C	N/C	N/A	N/A
Quartz (SiO2)	14808-60-7	36/37/38-48/20	Xn	N/A	N/A
Kaolinite	1318-74-7	N/C	N/C	N/A	N/A

NRB - 01723
o -Ring 12,5x1,8

Composition	CAS No	Risk Phase	Hazard Phase	BAT	Classification
Carbon Black	1333-86-4	36/37-18-11-40	F,Xi,Xn	R40	Organic Substance Class I
Zinc oxide	1314-13-2	50/53-20-43-36/38-20/21/22-67-66-10-11	N,Xn,F	N/A	N/A
Bis(2-ethylhexyl) adipate	103-23-1	36/38-40-39/23/24/25-23/24/25-11	Xi,Xn,T,F	R40	Organic Substance Class I
Quartz (SiO2)	14808-60-7	36/37/38-48/20	Xn	N/A	N/A
Kaolinite	1318-74-7	N/C	N/C	N/A	N/A
Stearic acid	57-11-4	11, 36/37/38	Xi,F	N/A	N/A
Paraffin waxes (petroleum), hydrotreated	64742-51-4	N/C	N/C	N/A	N/A

ANNEX 1: TABLES / ATTACHMENTS

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. Nº:	A2-1
Source of Emission:	Rubber Tempering Ovens – Rubber Fume Stack
Location:	BRUSS – within roof space
Grid Ref. (12 digit, 6E,6N):	168395, 336310
Vent Details Diameter: Height above Ground(m):	350 mm 9.5
Date of commencement:	2001 (2014 change roof location < 100m)

Characteristics of Emission:

(i) Volume to be emitted:			
Average/day	Nm^3/d	Maximum/day	Nm^3/d
Maximum rate/hour	Nm^3/h	Min efflux velocity	$m.sec^{-1}$
(ii) Other factors			
Temperature	^oC(max)	^oC(min)	^oC(avg)
For Combustion Sources: Volume terms expressed as : ☐ wet. ☐ dry. _____ $\%O_2$			

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 250 day/yr

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. Nº:	A2-2
Source of Emission:	Rubber Tempering Ovens – Rubber Fume Stack
Location:	BRUSS – within roof space
Grid Ref. (12 digit, 6E,6N):	168473, 336328
Vent Details Diameter: Height above Ground(m):	350 mm
Date of commencement:	2001

Characteristics of Emission:

(i) Volume to be emitted:			
Average/day	Nm^3/d	Maximum/day	Nm^3/d
Maximum rate/hour	Nm^3/h	Min efflux velocity	$m.sec^{-1}$
(ii) Other factors			
Temperature	^oC(max)	^oC(min)	^oC(avg)
For Combustion Sources: Volume terms expressed as : ☐ wet. ☐ dry. _____ $\%O_2$			

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 250 day/yr

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. Nº:	A2-3
Source of Emission:	Rubber Tempering Ovens – Rubber Fume Stack
Location:	BRUSS – within roof space
Grid Ref. (12 digit, 6E,6N):	168463, 336311
Vent Details Diameter: Height above Ground(m):	500mm 9.5m
Date of commencement:	2001

Characteristics of Emission:

(i) Volume to be emitted:			
Average/day	Nm^3/d	Maximum/day	Nm^3/d
Maximum rate/hour	Nm^3/h	Min efflux velocity	$m.sec^{-1}$
(ii) Other factors			
Temperature	^oC(max)	^oC(min)	^oC(avg)
For Combustion Sources: Volume terms expressed as : ☐ wet. ☐ dry. _____ $\%O_2$			

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 250 day/yr

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. Nº:	A2-4
Source of Emission:	Rubber Tempering Ovens – Rubber Fume Stack
Location:	BRUSS – within roof space
Grid Ref. (12 digit, 6E,6N):	168395, 336310
Vent Details Diameter: Height above Ground(m):	350mm 9.5m
Date of commencement:	2001

Characteristics of Emission:

(i) Volume to be emitted:			
Average/day	Nm^3/d	Maximum/day	Nm^3/d
Maximum rate/hour	Nm^3/h	Min efflux velocity	$m.sec^{-1}$
(ii) Other factors			
Temperature	^oC(max)	^oC(min)	^oC(avg)
For Combustion Sources: Volume terms expressed as : ☐ wet. ☐ dry. _____ $\%O_2$			

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 250 day/yr

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. Nº:	Proposed A2-5
Source of Emission:	'Gleitmo' Coating Proess – Fume Stack
Location:	BRUSS – within Roof Space
Grid Ref. (12 digit, 6E,6N):	168433, 336321
Vent Details Diameter: Height above Ground(m):	500mm 9.0 m
Date of commencement:	2011 Pilot 2017 Final Process

Characteristics of Emission:

(i) Volume to be emitted:			
Average/day	Nm^3/d	Maximum/day	Nm^3/d
Maximum rate/hour	Nm^3/h	Min efflux velocity	$m.sec^{-1}$
(ii) Other factors			
Temperature	^oC(max)	^oC(min)	^oC(avg)
For Combustion Sources: Volume terms expressed as : ☐ wet. ☐ dry. _____ $\%O_2$			

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 6 hr/day 50 day/yr

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE - Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: ***A2-1***

Parameter	Prior to treatment[1]				Brief	As discharged[1]					
	mg/Nm^3		kg/h		description	mg/Nm^3		kg/h.		kg/year	
	Avg	Max	Avg	Max	of treatment	Avg	Max	Avg	Max	Avg	Max
Carbon Black		<1.53		0.002	Electrostatic Precipitation		<1.47		0.002		12.0
l ,-l'-)1,-3- Phenylene)bis-1H- pyrrole-2,5-dione		<0.71		0.0009	ESP Unit 08		<0.77		0.001		6.0
Pent methyl Heptene		0.765		0.001			2.68		0.0038		22.8
Octamethylcyclotetrasiloxane		13.762		0.019			27.6		0.0393		23.88
Hexamethylcyclotrisiloxane		2.523		0.0035			2.61		0.0037		22.2
TOC as C		20.30		0.03			11.4		0.020		120.0
TOC Class I		1.10		0.0018			1.15		0.00159		9.54
TOC Class II		13.80		0.0019			27.6		0.04		240.0
TA Luft Class I		13.80		0.02			27.6		0.04		240.0
TA Luft Class II		2.52		0.001			<0.77		0.001		6.0
TA Luft Class III		<0.76		0.001			7.51		0.01		60.0
Total Particulate		<1.5		0.0021			<1.50		0.002		12.0
Rubber Fume		0.80		0.0011			0.70		0.001		6.0
Ethanol		0		0			1.23		0.001		6.0
n-Butan-1-ol		0		0			1.00		0.001		6.0

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE - Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: ***A2-2***

Parameter	Prior to treatment[1]				Brief description of treatment	As discharged[1]					
	mg/Nm^3		kg/h			mg/Nm^3		kg/h.		kg/year	
	Avg	Max	Avg	Max		Avg	Max	Avg	Max	Avg	Max
Carbon Black		<0.37		0.00048	Electrostatic Precipitation		<1.28		0.0016		9.6
1,-1'-)l ,-3-					ESP Unit 02						
Phenylene)bis-1H- pyrrole-2,5-dione		<0.72		0.00094			<0.72		0.00091		5.46
Hexamethylcyclotris iloxane		6.73		0.0088			1.22		0.0015		9.0
Octamethylcyclotetr asiloxane		6.44		0.0084			1.65		0.0021		12.6
TOC as C		34.6		0.05			28.7		0.04		240.0
TOC Class I		0.54		0.0213			1.00		0.0015		9.0
TCO Class II		6.44		0.0083			1.65		0.0021		12.6
TA Luft Class I		6.44		0.0083			1.65		0.0021		12.6
TA Luft Class II		<0.72		0.00093			<0.72		0.0009		5.4
TA Luft Class III		6.73		0.00876			1.22		0.0153		91.8
Total Particulate		<0.40		0.00479			2.10		0.00266		15.96
Rubber Fume		3.40		0.00448			1.30		0.00016		0.96

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE - Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: ***A2-3***

Parameter	Prior to treatment[1]				Brief description of treatment	As discharged[1]					
	mg/Nm^3		kg/h			mg/Nm^3		kg/h.		kg/year	
	Avg	Max	Avg	Max		Avg	Max	Avg	Max	Avg	Max
Carbon Black		<1.34		0.0035	Electrostatic Precipitation		<1.46		0.0035		21.0
1,-l'-)1,-3-		<0.72		0.0019	ESP 04		<0.71		0.0017		10.2
Phenylene)bis-1H- pyrrole-2,5-dione											
Hexamethylcyclotris iloxane		5.88		0.0156			17.16		0.0411		246.6
Octamethylcyclotetr asiloxane		22.24		0.059			44.34		0.106		636.0
Ethanol		0		0			1.22		0.0029		17.4
TOC as C		7.0		0.02			10.2		0.02		120.0
TOC Class I		1.00		0.00273			1.10		0.00273		16.38
TOC Class II		22.20		0.06			44.30		0.06		360.0
TA Luft Class I		22.20		0.06			44.30		0.06		360.0
TA Luft Class II		<0.72		0.0019			<0.72		0.0019		11.4
TA Luft Class III		5.88		0.02			17.20		0.02		120.0
Total Particulate		<1.30		0.00356			<1.50		0.0035		21.0
Rubber Fume		4.40		0.01			0.70		0.01		60.0

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE - Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: ***A2-4***

Parameter	Prior to treatment[1]				Brief description of treatment	As discharged[1]					
	mg/Nm^3		kg/h			mg/Nm^3		kg/h.		kg/year	
	Avg	Max	Avg	Max		Avg	Max	Avg	Max	Avg	Max
Carbon Black		<1.56		0.0036	Electrostatic Precipitation		<1.46		0.00043		2.58
1,-1'-)l ,-3-					ESP Unit 03						
Phenylene)bis-1H-pyrrole-2,5-dione		<0.71		0.164			<0.72		0.00021		1,26
Lead		0.01		0.000023			0.07		0.000021		0.126
Hexamethylcyclotris iloxane		1.21		0.0027			1.29		0.00038		2.28
TOC as C		3.09		0.0071			2.60		0.000759		4.5
TOC Class I		1.10		0.00262			1.10		0.0019		11.4
TOC Class II		<0.71		0.00163			<0.72		0.00021		1.26
Inorganic Dust Particle Class II		0.00768		0.000017			0.07		0.00002		0.12
TA Luft Class I		<0.71		0.00163			<0.72		0.00021		1.26
TA Luft Class II		<0.71		0.00163			<0.72		0.00021		1.26
TA Luft Class III		1.21		0.00277			1.29		0.00038		2.28
Total Particulate		3.1		0.0071			<7.5		0.0022		13.2
Rubber Fume		1.5		0.0034			22.4		0.00067		4.02

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE - Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: ***Proposed A2-5***

Parameter	Prior to treatment[1]				Brief description of treatment	As discharged[1]					
	mg/Nm^3		kg/h			mg/Nm^3		kg/h.		kg/year	
	Avg	Max	Avg	Max		Avg	Max	Avg	Max	Avg	Max
					Activated Carbon Filter						
Di-Butyltin		<0.01		<0.01			<0.05		<0.01		3.00
Propan-2-ol		2.80		0.09			32.00		0.10		30.0
TOC as C		267.0		0.82			219.0		0.68		204.0
TA Luft Class 1 VOC's		14.7		0.05			18.30		0.06		18.0
TA Luft Class II VOC's		8.69		0.03			62.90		0.19		57.0
TA Luft Class III VOC's		1.50		0.02			11.10		0.03		9.0

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

ATTACHMENT 4.0

- WALTHER TROWEL ROTAMAT R 90 SYSTEM
- AIR EMISSIONS SURVEY GLEITMO COATING 2016 TMS

WALTHER TROWAL !

ROTAMAT

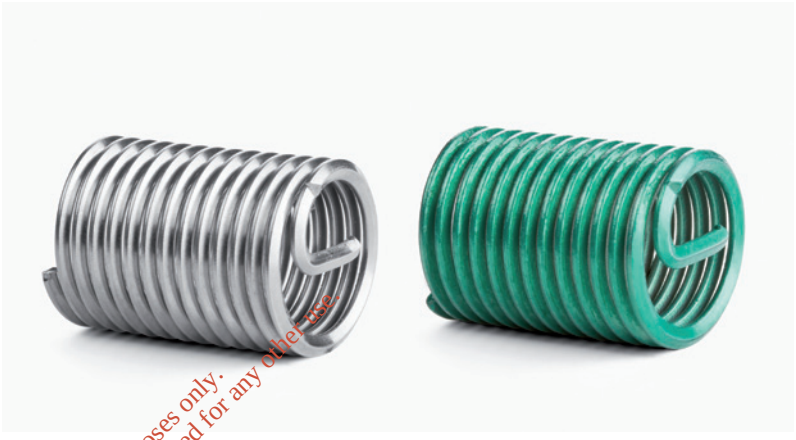
ROTAMAT COATERS

The ideal solution for coating the surface of mass produced small parts

WE IMPROVE SURFACES

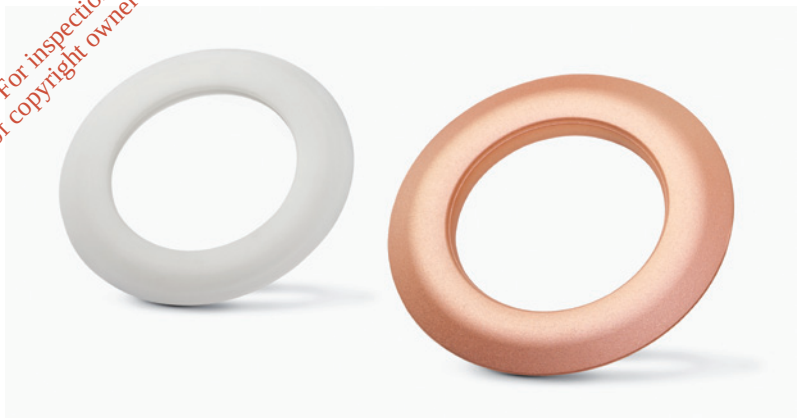
The Rotamat coaters offer a wide range of surface coating possibilities

Coating of radial shaft seal rings with a bonding agent



Decorative coating of metal components

Decorative coating of wood



Decorative coating of plastic components

Anti-friction coating of O-rings

Anticorrosion coating of metal components

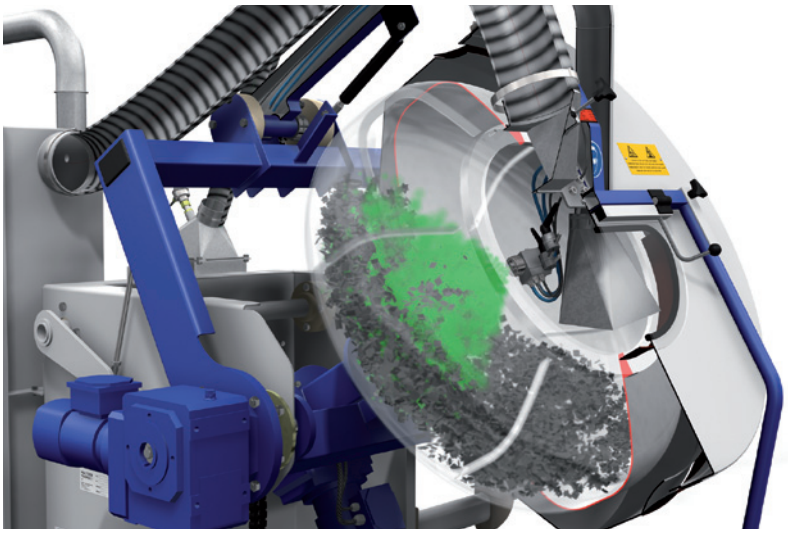
Efficient and cost effective surface coating of mass produced small parts

Key features of the Rotamat technology for coating of small parts are (1) the sealed rotary drum, (2) the sophisticated paint spray system and (3) the precisely controlled injection of hot air.

A batch of raw (uncoated) parts is loaded manually into the rotary drum where the parts are continuously tumbling over each other. For insulation purposes and work place protection the rotary drum is completely encapsulated.
One or, sometimes, two sophisticated, fully automatic paint spray systems are evenly applying the respective coating material onto the tumbling parts which can consist of various plastic materials (e.g. elastomers), metal and wood. The system is able to process water based as well as solvent based coating materials.

The part temperature, precisely adjusted to the respective coating process, is generated by an inlet air heating unit and measured & controlled by an infrared (IR) sensor. The fine mist of coating material sprayed onto the tumbling parts during the process dries quickly, not only producing a highly homogeneous surface but also minimizing paint losses due to overspray. Once the coating process is completed, the rotary drum mechanically tilts downward for easy unloading of the parts which are immediately available for their further use: An additional drying operation, for example in a separate dryer, is not required!

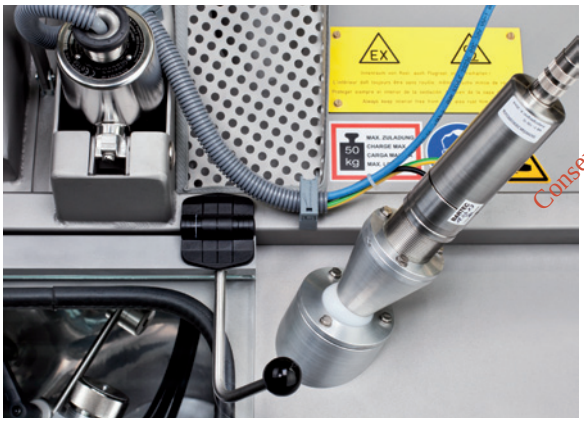
Model R 90 with closed rotary drum hood



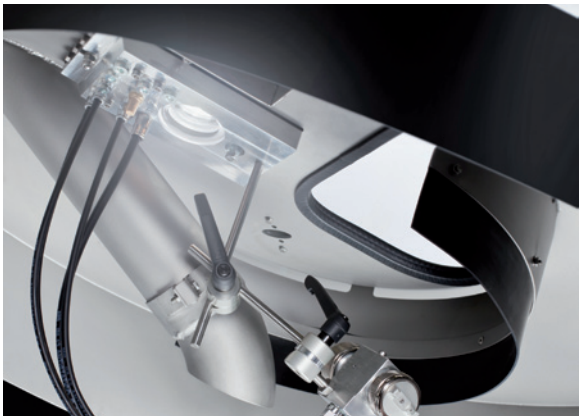
3D schematic of the Rotamat coating process

Model R 90 with open rotary drum hood

View of the inside of the drum with coated O-rings



Infrared (IR) sensor



Interior drum lighting

THE ROTARY DRUM

In order to achieve perfect coating results, the parts must be thoroughly mixed. This is achieved by the parts continuously tumbling over each other. Of course, different parts generally have completely different tumbling characteristics. For this reason, the rotary drum has not only a unique shape, but the drum speed and drum angle of inclination are variable, thus allowing drum settings which produce an optimum tumbling and mixing action. The coating process is fully automatic, eliminating the need for time consuming positioning of the parts on racks as required with conventional coating systems.

For the treatment of larger parts with complex shapes the rotary drum can be equipped with an elastic lining that helps maintain the integrity of sharp edges.

The easy-to-exchange rotary drums are available in five sizes / diameters:

Ø 400 mm (about 16")	Batch size = 1 – 3 liters (0.26 – 0.79 gallons) *)
Ø 550 mm (about 22")	Batch size = 2 – 8 liters (0.52 – 2.1 gallons)
Ø 700 mm (about 28")	Batch size = 10 – 30 liters (2.6 – 7.9 gallons)
Ø 800 mm (about 32")	Batch size = 30 – 50 liters (7.9 – 13.2 gallons)
Ø 850 mm (about 34")	Batch size = 40 – 75 liters (10.5 – 19.7 gallons)

*) US gallons

THE SPRAYING SYSTEM

The Rotamat small part coating process takes place in a sealed paint spray chamber at a slight, precisely controlled negative pressure that prevents leakage of hazardous fumes into the environment.

The various Rotamat process parameters like spraying quantity and spraying pattern (wide or round spray pattern) are controlled by a process computer. This guarantees total repeatability of the coating results.

The utilization of special HVLP automatic spraying systems ensures a minimum of spray mist and, thus, very little overspray.

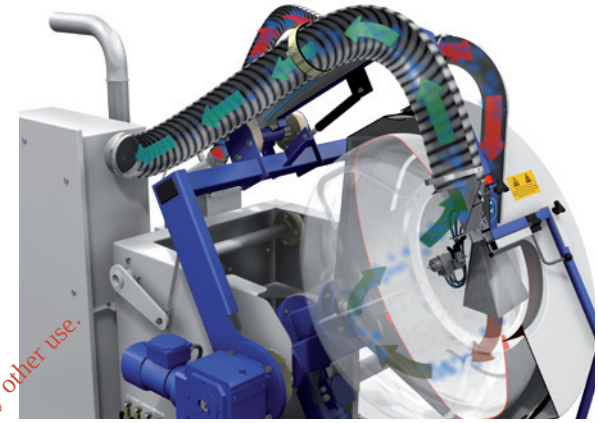
INTERIOR LIGHTING OF THE DRUM

The interior drum lighting serves for illumination of the drum chamber allowing the operator to observe all details of the coating process.

FRESH AIR INLET AND EXHAUST AIR SYSTEM

During the coating process hot air, free of any turbulence, is injected into the spray chamber to heat the part batch to its pre-set coating temperature. The part temperature is constantly monitored by an IR sensor and adjusted within a very narrow temperature range. The air temperature and volume are determined by the part material, geometry, part type and the specific coating material to be applied. The air flow guarantees a controlled evacuation of the volatile gases generated during the combined coating/drying process.

The pre-set negative pressure in the rotary drum is maintained at a constant value irrespective of the dust load in the integrated dust collector.



Fresh air inlet and exhaust air system: Red arrow ➡ heated inlet air; green arrow ➡ exhaust air

THE SYSTEM CONTROLS

In order to achieve absolutely repeatable coating results for every single part batch an industrial PC with touch and display screen are integrated into the electrical control panel monitors and controls all process parameters like air volume, air temperature, drum RPM and sprayed quantity of coating material. It also allows the operator to keep an eye on all coating parameters.

The recipe administration software in the computer stores all recipes created for the various coating applications and allows quick search for and retrieval of specific recipes. With this unique feature you can easily recreate all coating applications that were run in the past and review the individual process parameters of the various part batches.

Rotamat control system with screen

R 90 C with open and closed rotary drum hood

ACCESSORIES

MATERIAL PRESSURE VESSELS

Precondition for an even, homogeneous spray pattern is the pulse-free transfer of the coating material to the spray nozzles. For this reason, the Rotamat technology utilizes different sizes of material pressure vessels with a usable volume of up to 45 liters (about 12 gallons). Auxiliary accessories like lid lifting devices and rinsing systems are also available.

COLD AIR GENERATOR

For certain coating applications requiring a very high temperature in the coating drum, the conduits for transporting the coating material may have to be cooled to prevent coagulation and plugging up of these conduits.

ROTARY DRUM RINSING AND CLEANING SYSTEM

Within certain time intervals (depending on the respective coating process) the rotary drum must be cleaned by removing residues of the coating material from the inner drum surface. For this purpose the easily dismountable drum is placed on a so-called "cleaning frame" equipped with electric drive. The drum is then filled with Trowal cleaning media and rotated. This cleaning process is strictly mechanical without requiring the use of any organic solvents or chemical paint removers.

AUTOMATIC PAINT SPRAY SYSTEMS

Main features of the HVLP spraying systems used in the Trowal Rotamat coaters are the special paint atomization that generates only very little spray mist and the large spraying angle. This ensures the optimum and quick coating of the parts with a minimum of overspray.
The integrated adapter plate allows the quick removal of the spray guns for maintenance and cleaning purposes without having to manually open any hose connections. The Rotamat coaters can be equipped with one or two spraying systems. For example, this allows a two stage coating process with two different coating materials without any interruption of the overall process. Alternatively, both coating materials can be applied simultaneously.

CONDITIONING OF THE INLET AIR

Certain coating applications may require maintaining a specific humidity level in the rotary drum. Whenever this becomes necessary humidifiers or de-humidifiers can be integrated into the overall coating system.

Material pressure vessel with pneumatic stirrer

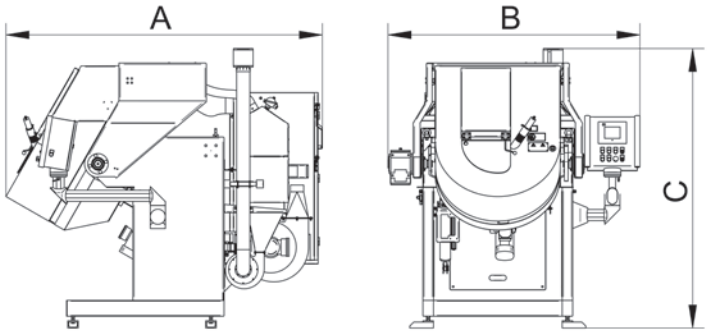
Material pressure vessel with electric stirrer

TECHNICAL DATA

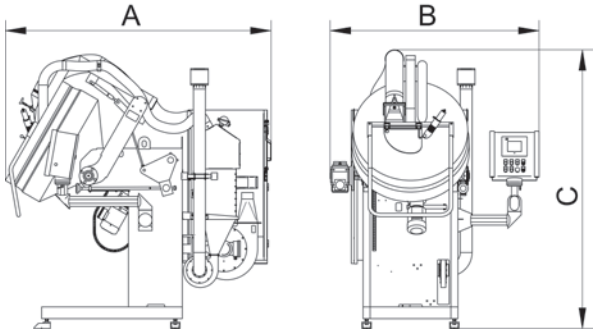
	R 55	R 70	R 90	R 90 C
Power input in kVA	14	24	24	24
Voltage*	400 V, 50 HZ	400 V, 50 HZ	400 V, 50 HZ	400 V, 50 HZ
Compressed air, dry and free of oil in bar (psi)	6±1 (87±14)	6±1 (87±14)	6±1 (87±14)	6±1 (87±14)
Rotary drums				
Drum Ø in mm	400 / 550	400 / 550 / 700	400 / 550 / 700 / 800	400 / 550 / 700 / 800 / 850
Drum Ø in inches	16 / 22	16 / 22 / 28	16 / 22 / 28 /32	16 / 22 / 28 /32 / 34
Batch volume max. in ltr. (gallons)**	6 (1.6)	30 (7.9)	50 (13.2)	75 (19.7)
Batch volume max. in kg (lbs)	25 (55)	50 (110)	50 (110)	100 (220)
Rotary drum RPM	2 … 30	2 … 30	2 … 30	2 … 30
Inlet air system				
Volume max. in m³/h (cfm)	160 (94.2)	160 (94.2)	160 (94.2)	160 (94.2)
Filter class per EN 779	G3	G3	G3	G3
Heating output in kW	9	16	16	16
Temperature increase max. in K	130	130	130	130
Exhaust air system				
Volume max in m³/h (cfm)	200 (117.8)	200 (117.8)	200 (117.8)	200 (117.8)
Filter class per EN 779	G4	G4	G4	G4

* Voltage & frequency will differ in North-America ** US gallons

R 90 C



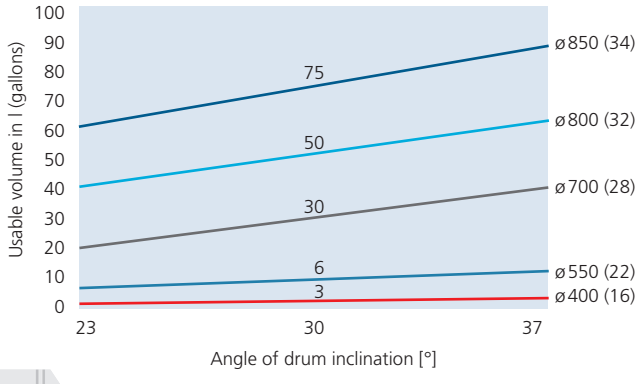
R 70 / R 90



	R 55	R 70	R 90	R 90 C
A (depth)	1,200 (47.2)	2,160 (85.0)	2,270 (89.4)	2,410 (94.9)
B (width)	810 (31.9)*	1,780 (70.1)	1,780 (70.1)	1,920 (75.6)
C (height)	1,900 (74.8)	2,340 (92.1)	2,370 (93.3)	2,130 (83.6)

Dimensions in mm (inches)
* without operating panel; model R 55 only available with separate operator console

USABLE DRUM VOLUMES



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ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 150T

CONFIDENTIAL REPORT

AIR EMISSIONS SURVEY
May 2016

AT
G BRUSS GMBH
Finisklin Road,
Sligo

Licence Reg. P0465-01
TMS Environment Ref. 23246

Commencement Date: 26 May 2016 **Completion Date: 29 July 2016**

Reporting	**Site Personnel**	**Analysts**
Enda Flood	Enda Flood	Amy O'Neill

Approved by: **Date:**

Imelda Shanahan

29 July 2016

Dr Imelda Shanahan
Technical Manager

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2. This report relates only to the items tested
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EXECUTIVE SUMMARY

This Air Emissions report presents results of emissions monitoring from emission point A2-05 at G Bruss GmbH, Finisklin Road, Sligo, County Sligo. Monitoring has been conducted to satisfy the customer's requirements in respect of the following parameters:

Emission Point	Monitoring Parameters
A2-05	• T.A. Luft Classes I, II & III • TOC as C • Propan-2-ol • Di-butyl Tin • Velocity and Temperature

Measurements were completed on 26 May 2016. Details of the monitoring methods employed, Standard Reference Methods used and Guidance Notes consulted are presented in Section 4.0 of this report together with information on the equipment used and the monitoring personnel.

Monitoring for VOCs was carried out at an emission point located at a position pre-abatement while simultaneously at an emission point post abatement system. The results received for VOC monitoring at both points are to be used to assess the effectiveness of the abatement system.

Monitoring for TOC as C was also conducted at points pre and post abatement, however monitoring did not occur simultaneously.

A number of VOC parameters were found on pre and post abatement samples, comparison of the pre and post abetment samples show an issue with the effectiveness of the abatement system, as a general increase in VOC concentrations was identified in post abatement samples.

Concentrations of TOC as C were measured over a number of batch spray processes with results reported as the average over the whole monitoring period, the maximum concentration detected over the whole monitoring periods and the minimum concentration detected over the whole monitoring periods. Each batch spray process lasted approximately 4-6 mins each. Post abatement TOC samples were identified as having an average reduction of approximately 19%.

1.0 Scope

This Air Emissions report presents results of emissions monitoring from emission point A2-05 at G Bruss GmbH, Finisklin Road, Sligo, County Sligo. Monitoring has been conducted to satisfy the customer's requirements in respect of the following parameters:

Table 1-1Scope of Monitoring Survey

Reporting period		***May 2016***	
EMISSION Point	***PARAMETER***	***SAMPLING METHOD AND MEDIUM & ANALYSIS METHODOLOGY***	***STANDARD REFERENCE METHOD***
A2-1(a)	Speciated VOC's	Non-isokinetic / Absorbent tube absorption / Analysis by solvent desorption followed by GC-MS or GC-FID	CEN/TS 13649:2014
	Organics TOC	*In situ* FID analyser	EN 12619:2013
	TEMPERATURE PRESSURE VELOCITY, FLOW	Pitot tube coupled with pressure measurement device or anemometer, and temperature measurement device	EN/ISO 16911-1:2013

2.0 Survey protocol

2.1 Protocol

TMS Environment Ltd personnel conducted the monitoring survey on 26 May 2016. Emissions to atmosphere from the Emission Point, A2-05 were monitored during the visit.

The survey was completed in order to meet the requirements of the company's IPPC Licence (Reg. No. P0643-02)

Relevant Process conditions during the survey are summarized below.

Table 2-1: Operational information during testing

Emission monitoring point	Date and time	Details
A2-05	26 May 2016 12:01- 13:04	Normal operation, Batch process, process lasts for periods of 4-6 mins. VOC monitoring included monitoring of 6 batch sprayings over a 60 minute period, while TOC as C monitoring included monitoring of 3 batch sprayings over a 30 minute period each.

A Site Specific Protocol was prepared in accordance with EPA Air Guidance Note AG1 and CEN/TS 15675:2007 after a site review has been conducted with site personnel. A site risk assessment was completed prior to commencement of any monitoring to confirm that the monitoring could be carried out in a safe manner. All necessary PPE was worn at all times on site.

3.0 Monitoring Results

The results of the air emission monitoring reported in this document are presented in tables below. The methods used are defined by Standard Operating Procedures (SOP), each SOP has a unique number, details regarding each SOP are given in Part 2 of this report. Specific parameters monitored in each TA Luft Class are detailed in

3.1 Results for A2-05, Pre Abatement, 26 May 2016, 12:01-13:01

Parameter	Emission limit value	Emission results	Uncertainty	Units	Mass Emission kg/hr	Compliance
TA Luft Class I VOC's	N/S	14.7	±1.24	mg/m^3	0.05	N/A
TA Luft Class II VOC's	N/S	8.69	±0.74	mg/m^3	0.03	N/A
TA Luft Class III * VOC's	N/S	1.5	±0.13	mg/m^3	0.02	N/A
Di-Butyl Tin	N/S	<0.01	±0.001	mg/m^3	<0.01	N/A
Isopropyl Alcohol	N/S	2.8	±0.23	mg/m^3	0.09	N/A
Volume Flow	N/S	3,314	±193	m^3/hr	-	N/A

* excluded Isopropyl Alcohol

3.2 Results for A2-05, TOC Pre Abatement, 26 May 2016, 12:37-13:04

Parameter	Emission limit value	Emission results	Uncertainty	Units	Mass Emission kg/hr	Compliance
TOC as C	N/S	267.0	±52.31	mg/m^3	0.82	N/A

3.3 Results for A2-05, Post Abatement, 26 May 2016, 12:01-13:01

Parameter	Emission limit value	Emission results	Uncertainty	Units	Mass Emission kg/hr	Compliance
TA Luft Class I VOC's	N/S	18.3	±1.55	mg/m^3	0.06	N/A
TA Luft Class II VOC's	N/S	62.9	±5.33	mg/m^3	0.19	N/A
TA Luft Class III* VOC's	N/S	11.1	±0.94	mg/m^3	0.03	N/A
Di-Butyl Tin	N/S	<0.05	±0.004	mg/m^3	<0.01	N/A
Isopropyl Alcohol	N/S	32.0	±2.71	mg/m^3	0.10	N/A
Volume Flow	N/S	3,090	±180	m^3/hr	-	N/A

* excluded Isopropyl Alcohol

3.4 Results for A2-05, TOC Post Abatement, 26 May 2016, 11:29 -11:32

Parameter	Emission limit value	Emission results	Uncertainty	Units	Mass Emission kg/hr	Compliance
TOC as C	N/S	219.1	±42.93	mg/m^3	0.68	N/A

3.5 Reference Conditions for emission point A2-05

Reference Conditions for concentrations and volume flow as expressed as:

Temperature, K	Pressure, kPa	Oxygen %	Moisture %
273	101.3	N/A	Dry

3.6 Comparison of Pre and Post abatement results

Parameter	*Pre Abatement Run mg/m3*	*Post Abatement mg/m3*	*% Difference*
TA Luft Class I Total	14.67	18.34	*-25%*
TA Luft Class II Total	88.56	62.88	*29%*
TA Luft Class III Total	7.34	11.06	*-51%*
Isopropyl Alcohol	30.39	31.97	*-5%*
Dibutly Tin	0.05	0.05	*0%*

3.7 Discussion of Results

Based on a review of MSDS's supplied by the Client a VOC screen was run on the tubes used during monitoring of both pre and post abatement monitoring locations. This VOC screen specifically looked for concentrations of Di-butyl Tin, Xylene in TA Luft Class II and Isopropyl Alcohol (IPA) in TA Luft Class III as well as al additional VOC's present as no target compounds. As IPA was specifically targeted, this compound has been reported individually and has not been included in the total TA Luft Class III compounds identified.

A number of compounds were identified in each of the TA Luft classes (Class I - Class III). In general an increase in concentrations was identified in post abatement monitoring, as expressed in Section 3.6, indicating that the abatement system is ineffective or possibly misfitted and allowing the vented gas to by-pass the abatement system. An Alternative reason for the increase in post abatement sample concentrations, may be due to the location of the pre-abatement sampling port, which is located at the bottom corner of the duct, as it exits the coating room, and diverts upwards, this area may experience high internal swirling flow and carry compounds present in the dust stream away from the sampling probes used.

The process was monitored over a series of three-four batch coatings, each of which lasted for periods of between four and six minutes each. Analysis of the raw data obtained during TOC as C concentrations show a peak concentration of organic carbon for approximately three minutes during the beginning of the batch process, with concentrations reducing to levels of approximately one sixth of the maximum concentration recorded and rising once again during the next batch, giving an trough and peak type trend. This is due to the nature of the process whereby solvent is sprayed on to the products for a short period, with no solvent emissions during periods when the product is being loaded and unloaded.

4.0 Supporting Information

4.1 Monitoring team information

Name	Function	Qualification
Enda Flood	Environmental Scientist	• PgC Green Tech (2010) UCD Dublin • BAgSc (2008) UCD Dublin

4.2 Substance(s) monitored, SOP's and Standard Methods

Substance Monitored	SOP	Standard Method	Analysis by	ISO 17025 Accreditation Status	Analysis Date
VOCs	QP-SITE-2016	EN 13649	SAL	C	10 June 2016
TOC as C	QP-SITE-2016	EN 13649	TMS	A	10 June 2016
Velocity & Temp	QP-SITE-2006	EN 13284-1:2002/ EN/ISO 16911-1:2013	TMS	A	26 May 2016

Note 1: ISO 17025 Accreditation Status: **A** – TMS accredited for Monitoring and Analysis, **C** - TMS accredited for Monitoring, non-accredited analysis by TMS

4.3 Equipment used and Quality checks

Equipment	Equipment ID	Quality Check
Deluxe SKC Sampling pump	M-S-E-20-3 M-S-E-20-6 M-S-E-20-2 M-S-E-20-4	On-site per and post calibration check

4.4 Reporting results

4.4.1 Expression of test results

All test results are expressed to one decimal place lower than the Emission Limit Value (ELV), while uncertainty of measurement results are expressed to two decimal places lower than the ELV, e.g. where an ELV of 50mg/m^3 applies, the reported result shall be reported to the first decimal place e.g. 6.6mg/m^3 with the uncertainty of measurement reported to two decimal places, e.g. ±0.12mg/m^3.

4.4.2 Reporting results less than the detection limit

If a single result is reported as being less than the limit of detection, the measurement result is expressed using a less than "<" sign, e.g. <0.005 mg/Nm^3. Where a number of parameter results, found to be less than the limit of detection, are expressed as an overall parameter, these results are calculated as per Section 3.3, Method 3 (Half the Limit of Detection) of the EPA *BREF Guidance on the General Principles of Monitoring*. This percentage method provides an estimation of the value of the measurement. It is reported without the less than "<" sign, e.g. 0.05 mg/Nm^3.

4.4.3 Uncertainty calculation

An estimation of the uncertainty of measurement is attached to all measurements. Measurement uncertainties are based on calibration data and laboratory repeatability experiments. All uncertainties are given at a 95% confidence, based on applying a coverage factor of k=2 to the combined

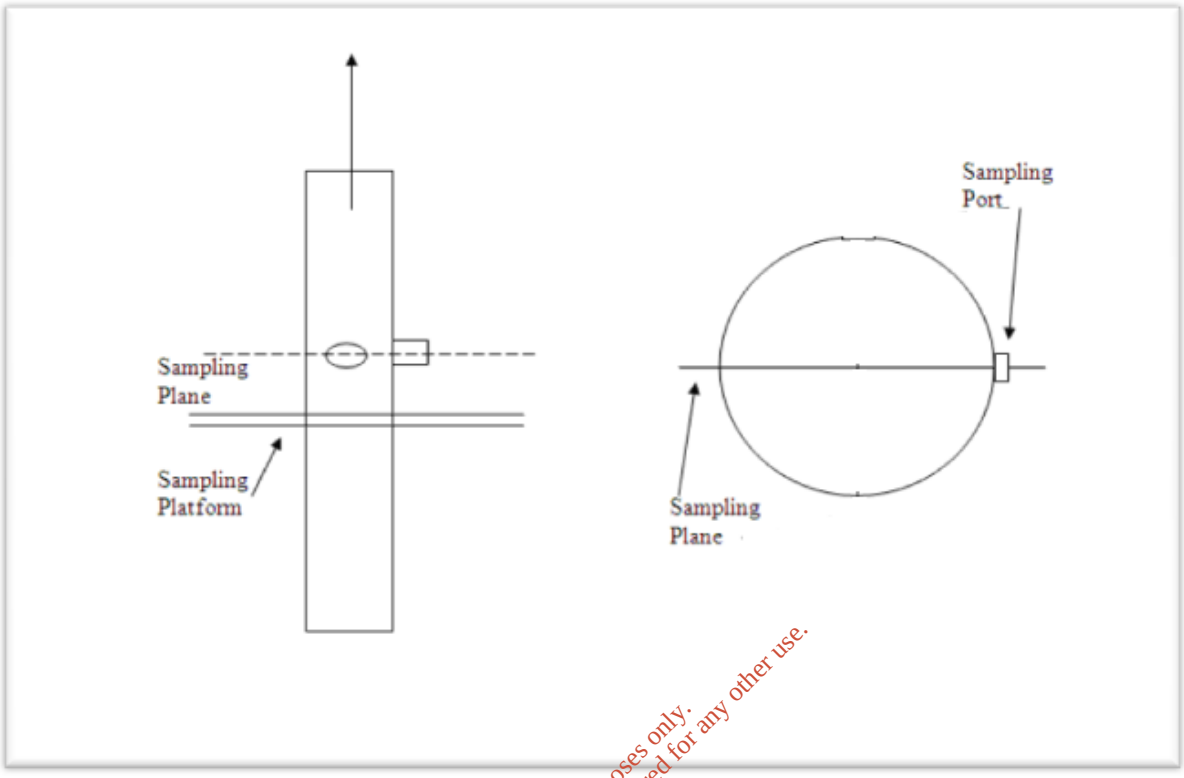
uncertainties for each measurement. The uncertainty of measurement associated with emissions monitoring are provided in the Table below.

Table 4-1: Uncertainty of Measurement

Parameter	Source of uncertainty	Estimated uncertainty %	Combined uncertainty %	Expanded uncertainty % (95% confidence level)
TOC/VOC	Oxygen Analyser	1	5.01	10%
	Temperature Analyser	0.5		
	Sampling pump	10		
Volume Flow	Velocity	2	2.8	6%
	Stack Temperature	0.5		
	Stack Pressure	0.5		
	O_2	1		
	CSA	2		

Appendix 1: Emission Point A2-05

Appendix1:1 – Stack Diagram



Stack Diameter	0.5
Stack Cross Sectional Area	0.2
Number of Ports	1
Number of sampling planes	1
Number of Sampling points per line	1
Power supply available	110 supply
Shelter at platform	Yes

Appendix1:2 - Stack Measurements

Reference method		EN 13649	
Sampling date		26 May 2016	
Sampling time		11:29-12:00	
Sampling technique			
Flue gas sampling system		SKC pump with Tygon tubing and dual low flow tube holder	
Oxygen measurement technique		N/A	
Material			
Sampling material		Charcoal tubes	
Sampling conditions			
Average sampling flow rate [l/min]		0.2 per tube	
Total sampling time [min]		31	
Sampled volume of the dry gas at STP [m^3]		0.006	
Average flue gas temp temperature [^oC]		5	
Reference conditions		**Actual conditions**	
Moisture [%]	Dry	Moisture [%]	Dry
Temperature [K]	273	Temperature [K]	278
Pressure [kPa]	101.3	Pressure [kPa]	101.32
Oxygen [%]	N/A	Oxygen [%]	N/A
Deviation from isokinetic conditions [%]		N/A	
Deviation from reference method		There was no deviation from reference method.	

Appendix1:3 – SKC Sampling Pump Calibration

Instrument	Equipment ID	Calibration Parameter	Reading before Calibration	Reading post Calibration	Reading post sampling
SKC Pump	M-S-E-20-2	Volume Flow	4000 ml/min	400 ml/min	400 ml/min
SKC Pump	M-S-E-20-3	Volume Flow	4000 ml/min	400 ml/min	400 ml/min
SKC Pump	M-S-E-20-4	Volume Flow	200 ml/min	400 ml/min	400 ml/min
SKC Pump	M-S-E-20-6	Volume Flow	200 ml/min	400 ml/min	400 ml/min

Appendix1:4 FID Calibration

Instrument	Equipment ID	Calibration Parameter	Reading before Calibration	Reading post Calibration	Reading post sampling
FID	M-S-E-4-1	Zero Gas	0.012	0.001	0.001
		Span Gas	89.45	90.00	90.05
		Zero Gas	-	0.002	0.001

Appendix1:5 –

Compound	***Pre Abatement Run µg/sample***	***Post Abatement Run µg/sample***	***Blank µg/sample***
Sample Ref	***23246-4***	***23246-7***	***23246-1***
TA Luft Class I - Nonane	280	350	*<10*
TA Luft Class II - ***cyclohexane, 1,1,2-trimethyl***	240	200	*<10*
TA Luft Class II - ***EthylBenzene***	340	300	*<10*
TA Luft Class II ***cis-1-Ethly-3-methly-cyclohexane***	200	140	*<10*
TA Luft Class II - ***Heptane, 3-ethly-2-methyl***	130	140	*<10*
TA Luft Class II - ***Decane***	120	0	*<10*
TA Luft Class II ***m/p-Xylene***	220	220	*<10*
TA Luft Class II - ***Cyclohexane, 1-ethyl-2-methyl***	200	200	*<10*
TA Luft Class II - ***Cyclohexanone***	240	0	*<10*
TA Luft Class III - ***Propylclochexane***	140	91	*<10*
TA Luft Class III - ***Octane***	0	120	*<10*

Compound	***Pre Abatement Run µg/sample***	***Post Abatement Run µg/sample***	***Blank µg/sample***
Sample Ref	***23246-5***	***23246-8***	***23246-2***
Propan-2-ol	580	610	*<5*

Compound	***Pre Abatement Run µg/sample***	***Post Abatement Run µg/sample***	***Blank µg/sample***
Sample Ref	***23246-6***	***23246-9***	***23246-3***
Dibutly Tin	**1**	**1**	*0.052*

Appendix II
Calibration Certificates

M-S-E-1P-1

30 Sept 15

CERTIFICATE OF CALIBRATION

Issued By Airflow Measurements Ltd **Certificate Number** 10864

Date of Issue 15 September 2015

UKAS CALIBRATION

0690

AFM

72-74 Manchester Rd
Kearsley, BOLTON
BL4 8NZ
Tel 01204 571499 Fax 01204 571734
www.airflowmeasurements.com

Approved Signatory

M. Slater.

☐ C Graham ☐ A Leonard ☑ M Slater

Customer : TMS Environment Ltd
53 Broomhill Drive, Tallaght,
Dublin 24

Date Received : 19 August 2015

Instrument -

System ID :	A21726096	Job Number : IR91610	
Description :	Electronic Manometer		
Manufacturer :	Shortridge	Site :	
Model Number :	870-C	Location :	
Serial Number :	M09227	Last Certificate Number : 09858	
Procedure Version :	Pa/ms/N	Last Calibration Date : 11/08/2014	

Environmental Conditions

Temperature :	20°C +/- 1°C	Mains Voltage :	240V +/- 10V
Relative Humidity :	50% +/- 10%	Mains Frequency :	50Hz +/- 1Hz

Comments

Instrument stablised in a controlled environment prior to calibration
Instrument cleaned and serviced prior to final calibration
Temperature measurements are outside our UKAS Scope but added for completeness

Calibration Information

The instrument was calibrated against laboratory standards whose values are traceable to recognised National Standards. The uncertainty limits quoted refer to the measured values only, with no account being taken of the instruments ability to maintain its calibration.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Calibrated By : M Slater **Date of Calibration :** 15 September 2015

CERTIFICATE OF CALIBRATION

UKAS Accredited Calibration Laboratory No. 0690
AS FOUND RESULTS

Certificate Number
10864

Test Title	Applied Value	Reading
Differential Pressure		
0 Pa	0.000Pa	0.00Pa
50 Pa	50.000Pa	49.90Pa
100 Pa	100.000Pa	99.94Pa
500 Pa	500.00Pa	499.7Pa
1000 Pa	1 000.0Pa	1 000Pa
2000 Pa	2 000.0Pa	2 010Pa
3000 Pa	3 000.0Pa	3 009Pa
4000 Pa	4 000.0Pa	4 022Pa
5000 Pa	5 000.0Pa	5 025Pa
7500 Pa	7 500.0Pa	7 544Pa
10000 Pa	10 000.0Pa	10 080Pa
13000 Pa	13 000.0Pa	13 095Pa
Velocity K factor = 1.000 (by pressure substitution)		
0 m/s	0.000m/s	0.00m/s
5 m/s	5.000m/s	5.01m/s
10 m/s	10.000m/s	9.98m/s
15 m/s	15.000m/s	15.02m/s
20 m/s	20.000m/s	20.02m/s
25 m/s	25.000m/s	25.02m/s
30 m/s	30.000m/s	30.01m/s

Uncertainties

Gas Pressure	0 Pa - 100 kPa +/- 0.050 % + 1 Pa
Air Vel 0.1 - 1mps	+/- 0.5% + 0.10mps + resolution
Air Vel 1 - 2mps	+/- 0.5% + 0.12mps + resolution
Air Vel 2 - 10mps	+/- 0.5% + 0.15mps + resolution
Air Vel 10 - 30mps	+/- 0.5% + 0.25mps + resolution
Temperature	+/-0.5°C

CERTIFICATE OF CALIBRATION

Certificate Number
10864

UKAS Accredited Calibration Laboratory No. 0690
AS FOUND RESULTS

Test Title	Applied Value	Reading
Absolute Pressure		
0.800Bar	0.800Bar	0.799Bar
0.900Bar	0.900Bar	0.899Bar
1.000Bar	1.000Bar	0.999Bar
1.100Bar	1.100Bar	1.099Bar
1.200Bar	1.200Bar	1.199Bar

End Of Data

Uncertainties

Gas Pressure	0 Pa - 100 kPa +/- 0.050 % + 1 Pa
Air Vel 0.1 - 1mps	+/- 0.5% + 0.10mps + resolution
Air Vel 1 - 2mps	+/- 0.5% + 0.12mps + resolution
Air Vel 2 - 10mps	+/- 0.5% + 0.15mps + resolution
Air Vel 10 - 30mps	+/- 0.5% + 0.25mps + resolution
Temperature	+/-0.5°C