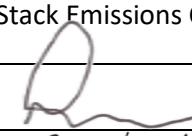




Report for the Periodic Monitoring of Emissions to Air	
Part 1: Executive Summary	
Permit Number:	VP 3635SY & Viscose V 201/16
Operator:	Viscose Closures Ltd
Installation:	A1 Scrubber, A2 Rocket & Thermal Oxidiser

Test Report:	ALL105634/23/PR-1
Monitoring Dates:	04 – 05/10/2023
Client / Organisation:	Mr Robbert Rodenburg
Address:	Viscose Closures Ltd
	Ferryboat Close
	Enterprise Park
	Swansea
Date of Report:	26/10/2023
Report Approved By:	Phillip Ruck BSc
MCERTS Number/Level/Technical Endorsement	MM 11 1117 Level 2, TE1, TE2, TE3, TE4
Designation:	Stack Emissions Co-ordinator
Signed:	 Phillip Ruck
Reviewed:	 Robert Lethbridge

Contents

Part 1 Executive summary

Page number	Description
1	Executive Summary
2 - 3	Contents
4	Monitoring objectives
5 – 9	Monitoring results
10	Process status
11	Operating information
12	Monitoring deviations

Part 2 – Supporting information

Page number	Description
N/A	Appendix 1
N/A	Sampling personnel
N/A	Method specification
N/A	Equipment Checklist
N/A	Appendix 2
N/A	A1 Scrubber stack details including gas measurements (10 pages)
N/A	Appendix 3
N/A	A2 Rocket stack details including gas measurements (10 pages)
N/A	Appendix 4
N/A	Thermal Oxidiser stack details including gas measurements (20 pages)
N/A	Appendix 5 (Uncertainty)
N/A	Appendix 6 (Subcontracted analysis results)
N/A	Appendix 7 (Instrumental analyser details)
N/A	Appendix 8 (Annual calibration details & analysis data retained at permanent laboratory)

Monitoring objectives

At the request of Mr Robbert Rodenburg of Viscose Closures Ltd, Anchem Laboratories Limited has carried out an “emissions to atmosphere” monitoring regime in the exhaust ductwork of the A1, A2 and Thermal Oxidiser process stacks at their Llansamlet plant. This is the annual emissions monitoring regime to be carried out for 2023 and has been undertaken to meet the requirements of their Local Authority & Environment Agency Permits.

Emission point	Reference number	Substance to be monitored	Specific requirements
A1 Scrubber	105634/1	Ammonia (NH ₃)	None
	105634/2	Carbon disulphide (CS ₂)	None
	105634/3	Hydrogen sulphide (H ₂ S)	None
A2 Rocket	105634/4	Ammonia (NH ₃)	None
	105634/5	Carbon disulphide (CS ₂)	None
	105634/6	Hydrogen sulphide (H ₂ S)	None
Thermal Oxidiser	105634/7	Particulates	2-hour sampling
	105634/8	Pre - RTO TOC*	2-hour sampling with 15-minute mean values
	105634/9	Post – RTO TOC*	2-hour sampling with 15-minute mean values
	105634/10	Carbon Monoxide	2-hour sampling with 15-minute mean values
		Nitrogen Oxides (as NO ₂)	2-hour sampling with 15-minute mean values

*note that where TOC has been referred within this report, it refers to total gaseous organic compounds (propane equivalent) as defined by the methodology.

Monitoring results

Emission Point	A1 Scrubber		
Reference Number	105634/1	105634/2	105634/3
Substance to be Monitored	Ammonia	Carbon disulphide	Hydrogen sulphide
Emission Limit Value	190	105	2
Periodic Monitoring Result	47.50	43.97	0.77
Uncertainty	±6.14	±9.00	±0.07
Units	mg/Nm ³		
Reference Conditions	273K, 101.3kPa without correction for moisture content or oxygen.		
Date of Sampling	04/10/2023		
Start/End Time	09:35 – 10:20	09:40 – 11:08	10:46 – 11:46
Average Volumetric flow @ reference conditions / m ³ /hr	36937.1		
Standard Reference Method	BS EN 21877	BS EN 13649	US EPA M11
Technical Procedure Reference	ANC/S/40	ANC/S/23	ANC/S/22
Accreditation Status	MCERTS		
Process Status (Load/Feedstock)	See Process Status (page 10)		

Monitoring results continued

Emission Point	A2 Rocket		
Reference Number	105634/4	105634/5	105634/6
Substance to be Monitored	Ammonia	Carbon disulphide	Hydrogen sulphide
Emission Limit Value	10	17	1
Periodic Monitoring Result	1.51	1.70	<0.08
Uncertainty	±0.19	±0.34	<0.02
Units	mg/Nm ³		
Reference Conditions	273K, 101.3kPa without correction for moisture content or oxygen.		
Date of Sampling	04/10/2023		
Start/End Time	12:57 – 13:39	09:51 – 11:29	13:55 – 14:55
Average Volumetric flow @ reference conditions / m³/hr	26719.2		
Standard Reference Method	BS EN 21877	BS EN 13649	US EPA M11
Technical Procedure Reference	ANC/S/40	ANC/S/23	ANC/S/22
Accreditation Status	MCERTS		
Process Status (Load/Feedstock)	See Process Status (page 10)		

Monitoring results continued

Emission Point	Post - Thermal Oxidiser
Reference Number	105634/7
Substance to be Monitored	Particulates
Emission Limit Value	50
Periodic Monitoring Result	0.20
Uncertainty	±0.02
Units	mg/Nm ³
Reference Conditions	273K, 101.3kPa without correction for moisture content or oxygen.
Date of Sampling	05/10/2023
Start/End Time	10:18 – 12:18
Average Volumetric flow @ reference conditions / m³/hr	5841.6
Standard Reference Method	BS EN 13284-1
Technical Procedure Reference	ANC/S/6
Accreditation Status	MCERTS
Process Status (Load/Feedstock)	See Process Status (page 10)

Monitoring results continued

Emission Point	Pre - Thermal Oxidiser	Post - Thermal Oxidiser
Reference Number	105634/8	105634/9
Substance to be Monitored	TOC	TOC
Emission Limit Value	N/A	150
Periodic Monitoring Result	498.4	139.9
Uncertainty	±6.1	±0.9
Units	mg/Nm ³	
Reference Conditions	273K, 101.3kPa without correction for moisture content or oxygen.	
Date of Sampling	05/10/2023	
Start/End Time	10:20 – 12:20	10:15 – 12:15
Average Volumetric flow @ reference conditions / m³/hr	4872.3	5841.6
Standard Reference Method	BS EN 12619	
Technical Procedure Reference	ANC/S/2	
Accreditation Status	MCERTS	
Process Status (Load/Feedstock)	See Process Status (page 10)	

Monitoring results continued

Emission Point	Post Thermal Oxidiser	
Reference Number	105634/10	
Substance to be Monitored	Carbon Monoxide	Oxides of Nitrogen
Emission Limit Value	100	100
Periodic Monitoring Result	2.6	13.9
Uncertainty	±0.3	±0.3
Units	mg/Nm ³	
Reference Conditions	273K, 101.3kPa without correction for moisture content or oxygen.	
Date of Sampling	05/10/2023	
Start/End Time	10:20 – 12:20	
Average Volumetric flow @ reference conditions / m³/hr	5841.6	
Standard Reference Method	BS EN 15058	BS EN 14792
Technical Procedure Reference	ANC/S/29	
Accreditation Status	MCERTS	
Process Status (Load/Feedstock)	See Process Status (page 10)	

Process status

During the sampling period the processes were considered to run continuously, this included some stoppages for product changes and routine maintenance.

Process Information:

04/10/2023 - 217mm

Operating information

Nature of process (continuous or batch)	A1, A2 and Thermal Oxidiser ran continuously
What part of the batch was sampled or whole batch (if applicable)	Not applicable
What fuel was used (if applicable)	Not applicable
What feedstock was used during the monitoring (if applicable)	Raw viscose is utilised for A1 & A2. Sheet product and solvent based printing ink (RTO).
“Normal” load, throughput or continuous rating of plant	Normal loading during monitoring regime
What type of abatement system and whether operating	The A1 process stack utilises a caustic scrubber abatement system. There is no means of abatement present on the A2 Rocket process stack. The Thermal Oxidiser was in operation during the monitoring regime.
The periodic monitoring result and the results from the operators CEMS	There is no CEM fitted with the purpose of monitoring emissions to air on A1 & A2. There is a CO monitor fitted on the RTO, although no data was available during the time of test.

Monitoring Deviations:

Why any substance(s) in the monitoring objectives were not monitored.

N/A

Why any substance(s) were not monitored in accordance with the monitoring method and any other issues relevant to the monitoring results.

Regarding the monitoring on the A1 scrubber stack, there was only a single traverse to sample from due to platform constraints. No sample points on the traverse were in compliance with the methodology, with all points exhibiting swirl $>15^\circ$. As there are no additional suitable sampling planes present on the system, monitoring for ammonia was conducted isokinetically at a single sampling point, while Hydrogen Sulphide was carried out at the centre point. Consequently, the sample location is not compliant for flow measurements, particulates and particulate phase-based measurements.

There were no other deviations from documented in-house methods ANC/S/22, ANC/S/23 & ANC/S/40.

There was only a single traverse present on the Pre and Post RTO exhaust duct with which to sample from and take velocity measurements. The number of sample points used on the available line was increased to meet the requirements of the Standard.

Part 2: Supporting information

APPENDIX 1

Sampling personnel

Name	Function	MCERTS number	MCERTS level	Technical endorsements
P Ruck	Team Leader	MM 11 1117	Level 2	TE1, TE2, TE3, TE4
R Lethbridge	Team Leader	MM 05 575	Level 2	TE1, TE2, TE3, TE4
D Hapgood	Emissions Analyst	MM 21 1664	Level 1	TE1

Method specifications

Substance	Standard reference method	Anchem technical procedure
Ammonia	BS EN 21877	ANC/S/40
Carbon disulphide	CEN/TS 13649	ANC/S/23
Hydrogen sulphide	USEPA Method M11	ANC/S/22
Particulate	BS EN 13284-1 & MID	ANC/S/6
TOC	BS EN 12619	ANC/S/2
Carbon monoxide	BS EN 15058	ANC/S/29
Oxides of nitrogen	BS EN 14792	ANC/S/29

Equipment checklist

Please see relevant appendices and site-specific protocol associated with monitoring campaign for equipment utilised during monitoring & checklist.

APPENDIX 2

A1 Scrubber

(10 Pages)

Stack diagram



Stack Dimension (m)	1.38m
Homogeneity test previously carried out (yes/no)	No
Is the gas stream homogeneous? (yes/no/unknown)	Unknown

Ref No	105634/1
Date	04/10/2023
Client	Viscose Closures Ltd
Site	Llansamlet
Emission Point	A1 Scrubber
Determinand	Ammonia
Methodology Used	BS EN ISO 21877
Hot Box Setting °C	160
Probe Length (m)	1.5
Pitot no	A/S149
Probe Material	Titanium
Probe Setting (°C)	160
Nozzle diam (mm) & no	7.5

Blank Filter	n/a	K Factor
Filter Code	n/a	7.82

Run No	1
--------	---

Test Start	09:35:00
Test End	10:20:00

	Field Blank Leak Check			Max Vacuum
	Open	Sealed	% Leak over 30 secs	
Pre-Test	33.3	0.05	0.3	55.0

Field Blank Pitot Leak Check	
Pre Test	Post Test
Yes	Yes

	Sample Leak Check			Max Vacuum
	Open	Sealed	% Leak over 30 secs	
Pre-Test	33.3	0.04	0.2	55.0

Sample Pitot Leak Check	
Pre Test	Post Test
Yes	Yes

Traverse Point	Minute per Point - (Min) Clock Time	Pump Vacuum	Velocity Head DP (mmH ₂ O)	$\sqrt{\Delta P}$	ΔH (mmH ₂ O)	Initial DGM Reading	Stack Temp (°C)	Probe Temp (°C)	Filter Temp (°C)	Impinger Temp (°C)	Gas Sample Temperature at Dry Gas Meter		Gas Readings		
						5074.5					Inlet (°C)	Outlet (°C)			
						DGM Readings							% O ₂	% CO ₂	%CO
3	5.0	25	13.6	3.69	106	5232.2	24	160	160	18	15	15	20.9	0.0	0.0
3	10.0	25	13.8	3.71	108	5394	24	160	160	17	16	16	20.9	0.0	0.0
3	15.0	25	13.5	3.67	106	5552	24	160	160	16	17	16	20.9	0.0	0.0
3	20.0	25	13.4	3.66	105	5707.8	24	160	160	16	17	17	20.9	0.0	0.0
3	25.0	25	13.8	3.71	108	5866	24	160	160	16	17	17	20.9	0.0	0.0
3	30.0	25	13.6	3.69	106	6025.4	24	160	160	17	18	17	20.9	0.0	0.0
3	35.0	25	13.5	3.67	106	6184.6	24	160	160	18	18	17	20.9	0.0	0.0
3	40.0	25	13.5	3.67	106	6342.5	24	160	160	19	19	17	20.9	0.0	0.0
3	45.0	25	13.5	3.67	106	6502.2	24	160	160	19	19	18	20.9	0.0	0.0

Additional Notes
Sampled at single point due to non-compliant velocity traverse

Wet chemistry monitoring sampling data (Isokinetic)

Client	Viscose Closures Ltd
Site	Llansamlet
Emission Point	A1 Scrubber
Date	04/10/2023
Reference Number	105634/1
Determinand	Ammonia
Run	1
Team Leader	RJL
Analyst(s)	DH, PR
X-Sectional Area	1.4957
$\Delta H@$	47.22
Y_d	1.002
C_p	0.83
k Factor	7.82
Duct static pressure (mmH ₂ O)	11
Absolute stack gas pressure (mm Hg)	769.6
Total gas volume sampled at STP (Litres)	1376.1
Total sampling time (minutes)	45
Moisture (%)	3.09
Dessicant discolouration less than 50%	Yes
Velocity at stack conditions (m/s)	7.40
Measured during preliminary traverse	
Volumetric flow at stack conditions (m ³ /s)	11.0
Measured during preliminary traverse	
Volumetric Flow at STP Wet Gas (m ³ /hr)	36937.1
Measured during preliminary traverse	
% Isokinetic	102.9
Absorption efficiency check (%)	99.98
Oxygen calibration gas concentration/reference	n/a
% Uncertainty of Measurement	12.93

Additional Notes

Results summary at STP wet gas with no correction for oxygen

Ammonia	
Concentration (mg/Nm ³) Wet Gas	47.50
Emission Rate (g/h) @ STP wet gas	2962.87

Blank	
Concentration (mg/Nm ³) Wet Gas	0.00

CEN/TS 13649:2014 Analysis Checksheet

Determinand:	Carbon Disulphide
---------------------	--------------------------

Site Information	
Customer	Viscose Closures
Site	Llansamlet
Date	04/10/23
Stack I.D.	A1 Scrubber
Sample No	105634/2

Equipment Details	
Pump number	A/S602
Dry gas meter number	A/S234
Dry gas meter correction factor	1.0060
Probe length (m)	0.75m
Probe material	Stainless Steel
Barometer number	A/S543
Timer number	A/S694

Stack Details	
Diameter (m)	1.38
Port nipple (cm)	16
Gas flow (Out / In)	Out

Sampling Data	
Run	1
Barometric pressure (mb)	1025
Average dry gas meter temperature (°C)	17
Average stack gas temperature entering sorbent media (°C)	18
Stack gas temperature (°C)	24
Sorbent media	226-09
Total gas volume sampled (Litres)	20.2
Test start time	09:40
Test end time	11:08
Total sampling time (minutes)	88
Pre test leak rate (%)	0.00
Post test leak rate (%)	0.40
Volumetric flow at STP & wet conditions (m ³ /min)	36937
% Uncertainty of measurement	20.5

Condensation visible in sorbent tube (post test)	No
Temperature of tubes transferred to Lab <25°C	Yes

Analysis Results	
Concentration (mg/Nm ³), STP @ wet gas	43.97
Blank concentration (mg/Nm ³), STP @ wet gas	0.51
Emission rate (g/h) @ STP wet gas	1624.3



Ref No	105634/3
Date	04/10/2023
Client	Viscose Closures Ltd
Site	Llansamlet
Emission Point	A1 Scrubber
Determinand	Hydrogen Sulphide
Methodology Used	US EPA M11
Hot Box Setting °C	160
Probe Length (m)	1.5
Pitot no	A/S149
Probe Material	Titanium
Probe Setting (°C)	160
Nozzle diam (mm) & no	n/a

Blank Filter	n/a	K Factor
Filter Code	n/a	n/a

Test Start	10:46:00
Test End	11:46:00

	Field Blank Leak Check			Max Vacuum
	Open	Sealed	% Leak over 30 secs	
Pre-Test	33.3	0.02	0.1	55.0

Field Blank Pitot Leak Check	
Pre Test	Post Test
Yes	Yes

	Sample Leak Check			Max Vacuum
	Open	Sealed	% Leak over 30 secs	
Pre-Test	33.3	0.02	0.1	55.0

Sample Pitot Leak Check	
Pre Test	Post Test
Yes	Yes

Traverse Point	Minute per Point - (Min) Clock Time	Pump Vacuum	Velocity Head DP (mmH ₂ O)	$\sqrt{\Delta P}$	ΔH (mmH ₂ O)	Initial DGM Reading	Stack Temp (°C)	Probe Temp (°C)	Filter Temp (°C)	Impinger Temp (°C)	Gas Sample Temperature at Dry Gas Meter		Gas Readings		
						6561.7					Inlet (°C)	Outlet (°C)			
						DGM Readings									
						% O ₂					% CO ₂	%CO			
3	5.0	10	14.0	3.74	2	6590.2	24	160	N/A	16	20	18	20.9	0.0	0.0
3	10.0	10	14.2	3.77	2	6618.5	24	160	N/A	17	20	18	20.9	0.0	0.0
3	15.0	10	14.0	3.74	2	6646.8	24	160	N/A	17	20	18	20.9	0.0	0.0
3	20.0	10	13.8	3.71	2	6675.0	24	160	N/A	17	20	18	20.9	0.0	0.0
3	25.0	10	14.6	3.82	2	6703.0	24	160	N/A	17	21	19	20.9	0.0	0.0
3	30.0	10	14.2	3.77	2	6732.0	24	160	N/A	18	21	19	20.9	0.0	0.0
3	35.0	10	13.9	3.73	2	6760.1	24	160	N/A	18	21	19	20.9	0.0	0.0
3	40.0	10	14.0	3.74	2	6788.2	24	160	N/A	17	21	19	20.9	0.0	0.0
3	45.0	10	14.0	3.74	2	6817.2	24	160	N/A	17	21	19	20.9	0.0	0.0
3	50.0	10	14.2	3.77	2	6846.0	24	160	N/A	17	21	19	20.9	0.0	0.0
3	55.0	10	13.8	3.71	2	6874.0	24	160	N/A	18	22	20	20.9	0.0	0.0
3	60.0	10	13.6	3.69	2	6902.8	24	160	N/A	18	22	20	20.9	0.0	0.0

Additional Notes

Sampled at single point due to non-compliant velocity traverse

Hydrogen sulphide monitoring sampling data

Client	Viscose Closures Ltd
Site	Llansamlet
Emission Point	A1 Scrubber
Date	04/10/2023
Reference Number	105634/3
Determinand	Hydrogen Sulphide
Run	1
Team Leader	RJL
Analyst(s)	DH, PR
X-Sectional Area	1.4957
$\Delta H@$	47.22
Y_d	1.002
C_p	0.83
Duct static pressure (mmH ₂ O)	11
Absolute stack gas pressure (mm Hg)	769.6
Total gas volume sampled at STP (Litres)	322.4
Total sampling time (minutes)	45
Moisture (%)	3.09
Dessicant discolouration less than 50%	Yes
Velocity at stack conditions (m/s) Measured during preliminary traverse	7.40
Volumetric flow at stack conditions (m ³ /s) Measured during preliminary traverse	11.0
Volumetric Flow at STP Wet Gas (m ³ /hr) Measured during preliminary traverse	36937.1
Oxygen calibration gas concentration/reference	n/a
% Uncertainty of Measurement	8.57

Hydrogen Sulphide results summary at STP wet gas with no correction for oxygen

Hydrogen Sulphide	
Concentration (mg/Nm ³) Wet Gas	0.77
Emission Rate (Kg/h) @ STP wet gas	0.03

Blank	
Concentration (mg/Nm ³) Wet Gas	0.07

Client	Viscose Closures Ltd
Site	Llansamlet
Emission Point	A1 Scrubber
Date	04/10/2023
Sample Number	105634/1-3
Probe Operator	DH
Console Operator	RJL

DGM Inlet (°C)	14
DGM Outlet (°C)	14
Mean Temp (°C)	14
Bar Pressure (mb)	1025
Moisture (%)	3.09
Dimension (m)	1.38
Stack C.S.A (m²)	1.4957

Gas Flow	Out
Port Nipple (cm)	16
Console No.	A/S136
Pitot No.	A/S149
Tape Measure	A/S223
Timer	A/S720
Barometer No.	A/S543

Traverse Line 1

Traverse Number	Distance (cm)	Av Velocity Head DP (mmH ₂ O)	$\sqrt{\Delta P}$	Av Stack Temp (°C)	Degree of Swirl	Degree of Pitch
1	9.2	2.5	1.579	25	27	N/A
2	34.5	1.7	1.295	24	26	N/A
3	103.5	13.3	3.645	24	22	N/A
4	128.8	7.5	2.737	24	24	N/A

Traverse Line 2

Traverse Number	Distance (cm)	Av Velocity Head DP (mmH ₂ O)	$\sqrt{\Delta P}$	Av Stack Temp (°C)	Degree of Swirl	Degree of Pitch
1	9.2	2.9	1.690	24	28	N/A
2	34.5	0.2	0.420	24	28	N/A
3	103.5	11.6	3.405	24	26	N/A
4	128.8	7.2	2.681	24	24	N/A

% O ₂
20.9

% CO ₂
0

% CO
0

Traverse Line 3

Traverse Number	Distance (cm)	Av Velocity Head DP (mmH ₂ O)	$\sqrt{\Delta P}$	Av Stack Temp (°C)	Degree of Swirl	Degree of Pitch

Traverse Line 4

Traverse Number	Distance (cm)	Av Velocity Head DP (mmH ₂ O)	$\sqrt{\Delta P}$	Av Stack Temp (°C)	Degree of Swirl	Degree of Pitch

Average DP (mmH ₂ O)
5.8

Average sqrt DP
2.182

Average Stack Temp (°C)
24

Field Performance Criteria	OK?		
Pitch <±10°	N/A	Is Negative Flow Present?	No
Swirl <±15°	No	Minimum Velocity >5pa	Yes
Stack internal Area	Yes	Ratio of gas Velocities <3:1	No
Field Repeatability	N/A		
Static Pressure Check	Yes		

Flow Characteristics Meet Requirements of EN ISO 16911?
No

Number of Sample Points
8

EN ISO 16911 S-Type Pitot Summary Page

Customer	Viscose Closures Ltd
Site	Llansamlet
Emission Point	A1 Scrubber
Date Measured	4-Oct-23
Sample Number	105634/1-3
X-Sectional Area	1.496
DH@	47.22
DY _d	N/A
Average sqrt DP (mmH ₂ O)	2.182
Average % Oxygen	20.9
Average % Carbon Dioxide	0.0
Average % Carbon Monoxide	0.0
Average % Nitrogen	79.1
Barometric Pressure (mb)	1025
Duct Static Pressure (mmH ₂ O)	11.00
Absolute Stack Gas Pressure (KPa)	102.6
Average Stack Gas Temperature (K)	297
Actual moisture determined pre-test (%)	3.09
Velocity in Stack (m/s)	7.4
Volumetric Flow at Stack Conditions (m ³ /sec)	11.03
Volumetric flow rate at Stack Conditions (m ³ /hour)	39704.13
Volumetric flow rate STP - 273K, 101.3KPa (m ³ /sec)	10.26
Volumetric flow rate at STP - 273K, 101.3KPa (m ³ /hour)	36937.06
% Uncertainty of Measurement	5.3

APPENDIX 3

A2 Rocket

(10 Pages)

Stack diagram



Stack Dimension (m)	0.45m x 0.96m
Homogeneity test previously carried out (yes/no)	No
Is the gas stream homogeneous? (yes/no/unknown)	Unknown



Client	Viscose Ltd
Site	Llansamlet
Emission Point	A2 Rocket
Date	04/10/2023
Reference Number	105634/4
Team Leader	RJL
Analyst(s)	PR, DH

DGM Inlet (°C)	26
DGM Outlet (°C)	26
Mean Temp (°C)	26
Bar Pressure (mb)	1028
Moisture (%)	1.61
Duct Shape	Rectangular
Stack C.S.A (m ²)	0.4320

Gas Flow	Out
Port Nipple (cm)	16
Console No.	A/S136
Filter Box No.	A/S136
Tape Measure	A/S223
Timer	A/S720
Barometer No.	A/S543

Stack Equipment Area Check
2.47%

Field Repeatability
N/A

Static Pressure Check
Yes

Traverse Line 1

[illegible]

Traverse Line 2

[illegible]

Average ΔP (mmH ₂ O)
29.03

Average sqrt DP
5.39

Average Stack Temp (°C)
23

Gas Composition	
% O ₂	20.90
% CO ₂	0.00
% CO	0.00

Traverse Line 3

[illegible]

Traverse Line 4

[illegible]

Is negative flow present?
No

Minimum velocity >5Pa
Yes

Ratio of gas velocities <3:1
Yes

Swirl <15°
Yes



Ref No	105634/4
Date	04/10/2023
Client	Viscose Ltd
Site	Llansamlet
Emission Point	A2 Rocket
Determinand	Ammonia
Methodology Used	BS EN ISO 21877
Hot Box Setting °C	160
Probe Length (m)	1.0
Pitot no	A/S159
Probe Material	Titanium
Probe Setting (°C)	160
Nozzle diam (mm) & no	5.8

Blank Filter	n/a	K Factor
Filter Code	n/a	3.28

Run No	1
--------	---

Test Start	12:57:00
Test End	13:39:00

	Field Blank Leak Check			Max Vacuum
	Open	Sealed	% Leak over 30 secs	
Pre-Test	32	0.06	0.4	55.0

Field Blank Pitot Leak Check	
Pre Test	Post Test
Yes	Yes

	Sample Leak Check			Max Vacuum
	Open	Sealed	% Leak over 30 secs	
Pre-Test	32	0.04	0.3	55.0

Sample Pitot Leak Check	
Pre Test	Post Test
Yes	Yes

Traverse Point	Minute per Point - (Min) Clock Time	Pump Vacuum	Velocity Head DP (mmH₂O)	$\sqrt{\Delta P}$	ΔH (mmH₂O)	Initial DGM Reading	Stack Temp (°C)	Probe Temp (°C)	Filter Temp (°C)	Impinger Temp (°C)	Gas Sample Temperature at Dry Gas Meter		Gas Readings		
						6930.2					Inlet °C	Outlet (°C)			
						DGM Readings							% O₂	% CO₂	%CO
1	5.0	35	32.0	5.66	105	7088	23	160	160	18	26	26	20.9	0.0	0.0
1	10.0	35	32.2	5.67	105	7246	23	160	160	17	26	26	20.9	0.0	0.0
2	15.0	32	36.0	6.00	118	7412	23	160	160	17	27	26	20.9	0.0	0.0
2	20.0	32	25.8	5.08	85	7554	23	160	160	16	27	26	20.9	0.0	0.0
3	25.0	30	23.0	4.80	75	7688	23	160	160	17	27	26	20.9	0.0	0.0
3	30.0	30	23.0	4.80	75	7822	23	160	160	17	27	26	20.9	0.0	0.0
4	35.0	35	25.2	5.02	83	7962	23	160	160	17	28	27	20.9	0.0	0.0
4	40.0	40	25.4	5.04	83	8104	23	160	160	18	28	27	20.9	0.0	0.0
Total						1173.8									
Average			27.8	5.26	91.2		23	160	160	17	27	26	20.9	0.0	0.0

Additional Notes

Wet chemistry monitoring sampling data (Isokinetic)

Client	Viscose Ltd
Site	Llansamlet
Emission Point	A2 Rocket
Date	04/10/2023
Reference Number	105634/4
Determinand	Ammonia
Run	1
Team Leader	RJL
Analyst(s)	PR, DH
X-Sectional Area	0.4320
$\Delta H@$	47.22
Y_d	1.002
C_p	0.87
k Factor	3.28
Duct static pressure (mmH ₂ O)	5
Absolute stack gas pressure (mm Hg)	771.4
Total gas volume sampled at STP (Litres)	1096.7
Total sampling time (minutes)	40
Moisture (%)	1.61
Dessicant discolouration less than 50%	Yes
Velocity at stack conditions (m/s)	18.51
Volumetric flow at stack conditions (m ³ /s)	8
Volumetric Flow at STP Wet Gas (m ³ /hr)	26946
% Isokinetic	101.1
Absorption efficiency check (%)	98.35
Oxygen calibration gas concentration/reference	n/a
% Uncertainty of Measurement	12.90

Additional Notes

Results summary at STP wet gas with no correction for oxygen

Ammonia	
Concentration (mg/Nm ³) Wet Gas	1.51
Emission Rate (g/h) @ STP wet gas	40.55

Blank	
Concentration (mg/Nm ³) Wet Gas	0.00

CEN/TS 13649:2014 Analysis Checksheet

Determinand:	Carbon Disulphide
---------------------	--------------------------

Site Information	
Customer	Viscose Closures
Site	Llansamlet
Date	04/10/23
Stack I.D.	A2 Rocket
Sample No	105634/5

Equipment Details	
Pump number	A/S605
Dry gas meter number	A/S725
Dry gas meter correction factor	1.0569
Probe length (m)	0.25m
Probe material	Stainless Steel
Barometer number	A/S543
Timer number	A/S694

Stack Details	
Diameter (m)	0.45 x 0.96
Port nipple (cm)	16
Gas flow (Out / In)	Out

Sampling Data	
Run	1
Barometric pressure (mb)	1025
Average dry gas meter temperature (°C)	17
Average stack gas temperature entering sorbent media (°C)	18
Stack gas temperature (°C)	23
Sorbent media	226-09
Total gas volume sampled (Litres)	21.2
Test start time	09:51
Test end time	11:29
Total sampling time (minutes)	98
Pre test leak rate (%)	0.00
Post test leak rate (%)	0.48
Volumetric flow at STP & wet conditions (m ³ /min)	26719
% Uncertainty of measurement	20.2

Condensation visible in sorbent tube (post test)	No
Temperature of tubes transferred to Lab <25°C	Yes

Analysis Results	
Concentration (mg/Nm ³), STP @ wet gas	1.70
Blank concentration (mg/Nm ³), STP @ wet gas	0.49
Emission rate (g/h) @ STP wet gas	45.4



Client	Viscose Ltd
Site	Llansamlet
Emission Point	A2 Rocket
Date	04/10/2023
Reference Number	105634/6
Team Leader	RJL
Analyst(s)	PR, DH

DGM Inlet (°C)	26
DGM Outlet (°C)	26
Mean Temp (°C)	26
Bar Pressure (mb)	1028
Moisture (%)	1.61
Duct Shape	Rectangular
Stack C.S.A (m ²)	0.4320

Gas Flow	Out
Port Nipple (cm)	16
Console No.	A/S136
Filter Box No.	A/S136
Tape Measure	A/S223
Timer	A/S720
Barometer No.	A/S543

Stack Equipment Area Check
2.47%

Field Repeatability
N/A

Static Pressure Check
Yes

Traverse Line 1

[illegible]

Traverse Line 2

[illegible]

Average ΔP (mmH ₂ O)
29.03

Average sqrt DP
5.39

Average Stack Temp (°C)
23

Gas Composition	
% O2	20.90
% CO2	0.00
% CO	0.00

Traverse Line 3

[illegible]

Traverse Line 4

[illegible]

Is negative flow present?
No

Minimum velocity > 5Pa
Yes

Ratio of gas velocities <3:1
Yes

Swirl <15°
Yes



Ref No	105634/6
Date	04/10/2023
Client	Viscose Ltd
Site	Llansamlet
Emission Point	A2 Rocket
Determinand	Hydrogen Sulphide
Methodology Used	US EPA M11
Hot Box Setting °C	160
Probe Length (m)	1.0
Pitot no	A/S159
Probe Material	Titanium
Probe Setting (°C)	160
Nozzle diam (mm) & no	n/a

Blank Filter	n/a	K Factor
Filter Code	n/a	n/a

Test Start	13:55:00
Test End	14:55:00

	Field Blank Leak Check			Max Vacuum
	Open	Sealed	% Leak over 30 secs	
Pre-Test	32	0.06	0.4	55.0

Field Blank Pitot Leak Check	
Pre Test	Post Test
Yes	Yes

	Sample Leak Check			Max Vacuum
	Open	Sealed	% Leak over 30 secs	
Pre-Test	32	0.04	0.3	55.0

Sample Pitot Leak Check	
Pre Test	Post Test
Yes	Yes

Traverse Point	Minute per Point - (Min) Clock Time	Pump Vacuum	Velocity Head DP (mmH ₂ O)	$\sqrt{\Delta P}$	ΔH (mmH ₂ O)	Initial DGM Reading	Stack Temp (°C)	Probe Temp (°C)	Filter Temp (°C)	Impinger Temp (°C)	Gas Sample Temperature at Dry Gas Meter		Gas Readings		
						8163.6					Inlet (°C)	Outlet (°C)			
						DGM Readings									
						% O ₂					% CO ₂	%CO			
1	5.0	10	31.0	5.57	2	8190	23	160	n/a	17	25	25	20.9	0.0	0.0
1	10.0	10	32.0	5.66	2	8215	23	160	n/a	16	25	25	20.9	0.0	0.0
1	15.0	10	32.0	5.66	2	8241	23	160	n/a	16	25	25	20.9	0.0	0.0
2	20.0	10	26.0	5.10	2	8268	23	160	n/a	15	25	25	20.9	0.0	0.0
2	25.0	10	25.8	5.08	2	8293	23	160	n/a	15	26	25	20.9	0.0	0.0
2	30.0	10	26.0	5.10	2	8319	23	160	n/a	16	26	25	20.9	0.0	0.0
3	35.0	10	25.2	5.02	2	8344.2	23	160	n/a	16	26	25	20.9	0.0	0.0
3	40.0	10	23.2	4.82	2	8371	23	160	n/a	16	26	25	20.9	0.0	0.0
3	45.0	10	23.5	4.85	2	8396	23	160	n/a	16	26	25	20.9	0.0	0.0
4	50.0	10	25.6	5.06	2	8422	23	160	n/a	17	26	26	20.9	0.0	0.0
4	55.0	10	25.8	5.08	2	8447	23	160	n/a	17	26	26	20.9	0.0	0.0
4	60.0	10	25.5	5.05	2	8473.6	23	160	n/a	17	26	26	20.9	0.0	0.0

Hydrogen sulphide monitoring sampling data

Client	Viscose Ltd
Site	Llansamlet
Emission Point	A2 Rocket
Date	04/10/2023
Reference Number	105634/6
Determinand	Hydrogen Sulphide
Run	1
Team Leader	RJL
Analyst(s)	PR, DH
X-Sectional Area	0.4320
$\Delta H@$	47.22
Y_d	1.002
C_p	0.87
Duct static pressure (mmH ₂ O)	5
Absolute stack gas pressure (mm Hg)	771.4
Total gas volume sampled at STP (Litres)	288.3
Total sampling time (minutes)	40
Moisture (%)	1.61
Dessicant discolouration less than 50%	Yes
Velocity at stack conditions (m/s)	18.20
Volumetric flow at stack conditions (m ³ /s)	7.86
Volumetric Flow at STP Wet Gas (m ³ /hr)	26493
Oxygen calibration gas concentration/reference	n/a
% Uncertainty of Measurement	21.74

Hydrogen Sulphide results summary at STP wet gas with no correction for oxygen

Hydrogen Sulphide	
Concentration (mg/Nm ³) Wet Gas	0.08
Emission Rate (Kg/h) @ STP wet gas	0.00

Blank	
Concentration (mg/Nm ³) Wet Gas	0.08

APPENDIX 4

RTO

(20 Pages)

Stack diagram



Stack Dimension (m)	0.64m
Homogeneity test previously carried out (yes/no)	No
Is the gas stream homogeneous? (yes/no/unknown)	Unknown



Client	Viscose Closures
Site	Llansamlet
Emission Point	Thermal Oxidiser
Date	05/10/2023
Reference Number	105634/7
Team Leader	RJL
Analyst(s)	PR, DH

DGM Inlet (°C)	17
DGM Outlet (°C)	16
Mean Temp (°C)	16.5
Bar Pressure (mb)	1024
Moisture (%)	2.21
Duct Shape	Circular
Stack C.S.A (m ²)	0.3217

Gas Flow	Out
Port Nipple (cm)	9
Console No.	A/S136
Filter Box No.	A/S136
Tape Measure	A/S223
Timer	A/S720
Barometer No.	A/S543

Stack Equipment Area Check	6.92%
----------------------------	-------

Field Repeatability
N/A

Static Pressure Check
Yes

Traverse Line 1

[illegible]

Traverse Line 2

[illegible]

Average ΔP (mmH ₂ O)
3.83

Average sqrt DP
1.96

Average Stack Temp (°C)
139

Gas Composition	
% O2	19.90
% CO2	0.50
% CO	0.00

Traverse Line 3

[illegible]

Traverse Line 4

[illegible]

Is negative flow present?
No

Minimum velocity >5Pa
Yes

Ratio of gas velocities <3:1
Yes

Swirl <15°
Yes

Ref No	105634/7
Date	05/10/2023
Client	Viscose Closures
Site	Llansamlet
Emission Point	Thermal Oxidiser
Determinand	Particulate
Methodology Used	BS EN 13284-1
Hot Box Setting °C	160
Probe Length (m)	1.0
Pitot no	A/5159
Probe Material	Titanium
Probe Setting (°C)	160
Nozzle diam (mm) & no	9.1

Blank Filter	3463blk	K Factor
Filter Code	3463	13.94

Run No	1
--------	---

Test Start	10:18:00
Test End	12:18:00

	Field Blank Leak Check			Max Vacuum
	Open	Sealed	% Leak over 30 secs	
Pre-Test	21.5	0.04	0.4	260.0
	0.02			

Field Blank Pitot Leak Check	
Pre Test	Post Test
Yes	Yes

	Sample Leak Check			Max Vacuum
	Open	Sealed	% Leak over 30 secs	
Pre-Test	21.5	0.02	0.2	270.0

Sample Pitot Leak Check	
Pre Test	Post Test
Yes	Yes

Traverse Point	Minute per Point - (Min) Clock Time	Pump Vacuum	Velocity Head DP (mmH ₂ O)	$\sqrt{\Delta P}$	ΔH (mmH ₂ O)	Initial DGM Reading	Stack Temp (°C)	Probe Temp (°C)	Filter Temp (°C)	Impinger Temp (°C)	Gas Sample Temperature at Dry Gas Meter		Gas Readings		
						8476									
						DGM Readings					Inlet (°C)	Outlet (°C)	% O ₂	% CO ₂	% CO
1	5.0	25	3.7	1.92	52	8584	144	160	160	17	17	16	20.1	0.5	0.0
1	10.0	25	3.5	1.87	49	8689	145	160	160	17	17	16	20.1	0.5	0.0
1	15.0	25	3.4	1.84	47	8793	146	160	160	18	17	16	20.1	0.5	0.0
1	20.0	25	3.2	1.79	45	8894	146	160	160	19	17	16	20.1	0.5	0.0
1	25.0	25	3.2	1.79	45	8999	146	160	160	19	18	17	20.1	0.5	0.0
1	30.0	25	3.2	1.79	45	9101	144	160	160	20	19	17	20.1	0.5	0.0
2	35.0	25	3.4	1.84	47	9205	145	160	160	21	19	17	20.1	0.5	0.0
2	40.0	25	3.0	1.73	42	9304	146	160	160	21	20	17	20.1	0.5	0.0
2	45.0	25	3.0	1.73	42	9403	146	160	160	22	20	17	20.1	0.5	0.0
2	50.0	25	3.4	1.84	47	9508	143	160	160	22	21	17	20.1	0.5	0.0
2	55.0	25	3.5	1.87	49	9617	140	160	160	23	21	17	20.1	0.5	0.0
2	60.0	25	3.3	1.82	46	9722	139	160	160	23	21	17	20.1	0.5	0.0
3	65.0	25	3.2	1.79	45	9826	140	160	160	24	22	17	20.1	0.5	0.0
3	70.0	25	3.3	1.82	46	9933	139	160	160	24	22	17	20.1	0.5	0.0
3	75.0	25	3.2	1.79	45	10037	138	160	160	25	23	17	20.1	0.5	0.0
3	80.0	25	3.4	1.84	47	10144	139	160	160	25	23	17	20.1	0.5	0.0
3	85.0	25	3.2	1.79	45	10248	140	160	160	25	23	17	20.1	0.5	0.0
3	90.0	25	3.4	1.84	47	10355	141	160	160	26	23	18	20.1	0.5	0.0
4	95.0	25	3.2	1.79	45	10459	141	160	160	26	23	18	20.1	0.5	0.0
4	100.0	25	3.2	1.79	45	10563	144	160	160	26	24	18	20.1	0.5	0.0
4	105.0	25	3.3	1.82	46	10667	146	160	160	27	24	18	20.1	0.5	0.0
4	110.0	25	3.2	1.79	45	10772	146	160	160	27	24	18	20.1	0.5	0.0
4	115.0	25	3.4	1.84	47	10879	145	160	160	28	24	18	20.1	0.5	0.0
4	120.0	25	3.4	1.84	47	10986	145	160	160	28	24	18	20.1	0.5	0.0
Total						2510									
Average			3.3	1.82	46.0		143	160	160	23	21	17	20.1	0.5	0.0

Additional Notes



Reference Number	105634/7	Customer	Viscose Closures	Emission Point	Thermal Oxidiser		
------------------	----------	----------	------------------	----------------	------------------	--	--

Filter Number (ST)	3463	Date of Initial Weighing	12/09/2023	Temp (°C)	23	Pressure (mb)	1012
--------------------	------	--------------------------	------------	-----------	----	---------------	------

Initial Weighing

Weight After 1 Minute (mg)	1	543.50
Weight after 2 Minutes (mg)	2	543.55
Weight After 3 Minutes (mg)	3	543.55

Person Carrying Out Initial Weighings	CW	543.48
---------------------------------------	----	--------

Post Test Weighing

Date of Final Weighing	24/10/2023
------------------------	------------

Weight After 1 Minute (mg)	1	543.78
Weight after 2 Minutes (mg)	2	543.85
Weight After 3 Minutes (mg)	3	543.87

Person Carrying Out Final Weighings	CW	543.74
-------------------------------------	----	--------

Probe Rinse

Acetone Batch Number	JX735431
Reagent Blank (mg)	0.13

Weight After 1 Minute (g)	1	35.34316
Weight after 2 Minutes (g)	2	35.34316
Weight After 3 Minutes (g)	3	35.34318

Person Carrying Out Initial Rinse Weighings	CW
---	----

Extrapolated Weight to Zero (g)	35.34315
---------------------------------	----------

Crucible Cleaned & Re-Conditioned

Weight After 1 Minute (g)	1	35.34291
Weight after 2 Minutes (g)	2	35.34291
Weight After 3 Minutes (g)	3	35.34292

Person Carrying Out Final Rinse Weighings	CW
---	----

Extrapolated Weight to Zero (g)	35.34290
---------------------------------	----------

Blank Probe Rinse

Weight After 1 Minute (g)	1	34.02583
Weight after 2 Minutes (g)	2	34.02584
Weight After 3 Minutes (g)	3	34.02584

Person Carrying Out Initial Blank Rinse Weighings	CW
---	----

Extrapolated Weight to Zero (g)	34.02583
---------------------------------	----------

Crucible Cleaned & Re-Conditioned

Weight After 1 Minute (g)	1	34.02576
Weight after 2 Minutes (g)	2	34.02576
Weight After 3 Minutes (g)	3	34.02576

Person Carrying Out Final Blank Rinse Weighings	CW
---	----

Extrapolated Weight to Zero (g)	34.02576
---------------------------------	----------

Control Weight Processing

	Pre	Post		Pre	Post		Pre	Post	St filter control
C1 1 minute	21.56866	21.56873	C2 1 Minute	21.11731	21.11739	C3 1 Minute	21.83754	21.83760	470.60
C1 2 Minutes	21.56866	21.56875	C2 2 Minutes	21.11732	21.11739	C3 2 Minutes	21.83756	21.83762	Fn Filter control
C1 3 Minutes	21.56867	21.56875	C2 3 Minutes	21.11733	21.11740	C3 3 Minutes	21.83756	21.83762	470.55
Extrapolated	21.56865	21.56872		21.11730	21.11738		21.83753	21.83759	Correction
Wt Change C1	-0.00007		Wt Change C2	-0.00008		Wt Change C3	-0.00006		-0.05

Correction Value to be applied to weight gain	-0.00007
---	----------

Blank Filter

1	523.76	1	470.60
2	523.76	2	470.60
3	523.76	3	470.60

Zero Wt	523.76	Zero Wt	470.60
---------	--------	---------	--------

Temp (°C)	996	Pressure (mb)	20
-----------	-----	---------------	----

Blank Filter

1	523.76	1	470.57
2	523.77	2	470.61
3	523.76	3	470.62

Zero Wt	523.76	Zero Wt	470.55
---------	--------	---------	--------

Temp (°C)	20	Pressure (mb)	998
-----------	----	---------------	-----

Temp (°C)	20	Pressure (mb)	998
-----------	----	---------------	-----

Temp (°C)	20	Pressure (mb)	998
-----------	----	---------------	-----

Temp (°C)	20	Pressure (mb)	998
-----------	----	---------------	-----

Particulate summary results page at STP no correction for oxygen or moisture

Customer	Viscose Closures
Site	Llansamlet
Emission Point	Thermal Oxidiser
Date Sampled	5-Oct-23
Reference Number	105634/7
Determinand	Particulate
Run	1
Team Leader	RJL
Analyst(s)	PR, DH
X-Sectional Area (m ²)	0.3217
$\Delta H@$	47.22
Y_d	1.002
C_p	0.87
k Factor	13.94
Duct Static Pressure (mmH ₂ O)	24.0
Absolute Stack Gas Pressure (mm Hg)	769.8
Total Particulate Gain (mg)	0.50
Filter Conditioning temperature (°C)	350
Filter Material	Quartz
Filter Size (mm)	90
Filtration Device	Out Stack
Probe Rinse (mg)	0.19
Blank Weight Gain (mg)	0.01
Reagent Blank (mg)	0.13
Total Gas Volume Sampled at STP (Litres)	2385.9
% Isokinetic	102.3
Stack moisture (%)	2.21
Dessicant discolouration less than 50%	Yes
Velocity at Stack conditions (m/s)	7.59
Volumetric Flow wet gas (m ³ /hr)	8790
Volumetric Flow @ STP Wet Gas (m ³ /hr)	5842
Particulate Concentration, wet Gas (mg/Nm ³)	0.20
Particulate Emission Rate (g/h) wet gas @ STP	1
Blank concentration ,wet gas (mg/Nm ³)	0.01
% Uncertainty of Measurement	10.39

TOC site worksheet

Customer name	Viscose Closures
Site location	Llansamlet
Emission point	Post RTO
Substance to be monitored	TOC (propane equivalent)
Date	05/10/2023
Sample Number	105634/8
Homogeneity test previously conducted? (Yes/No)	No
Is the gas stream homogeneous? (Yes/No/Unknown)	Unknown

Preliminary gas test

Sample point number	1	2	3	4	5	6	7	8	9
TOC concentration ppm	400								

Range of analyser	1000
-------------------	------

Start of test **10:20**

Instrument adjustment through analyser

Initial instrument zero gas reading (ppm)	-0.6
Instrument span gas reading (ppm)	895.6
Post instrument zero gas reading (ppm)	-0.6

System leak test through line

Initial system leak zero gas reading (ppm)	-0.6
System leak span gas reading (ppm)	888.7
Post system leak zero gas reading (ppm)	0.0

% Leak	0.8
--------	-----

End of test **12:20**

System leak test through line

Initial drift zero gas reading (ppm)	-0.6
System drift span gas reading (ppm)	889.7
Post drift zero gas reading (ppm)	-0.6

Test Span Drift (%)	0.7
Test Zero Drift (%)	0.0

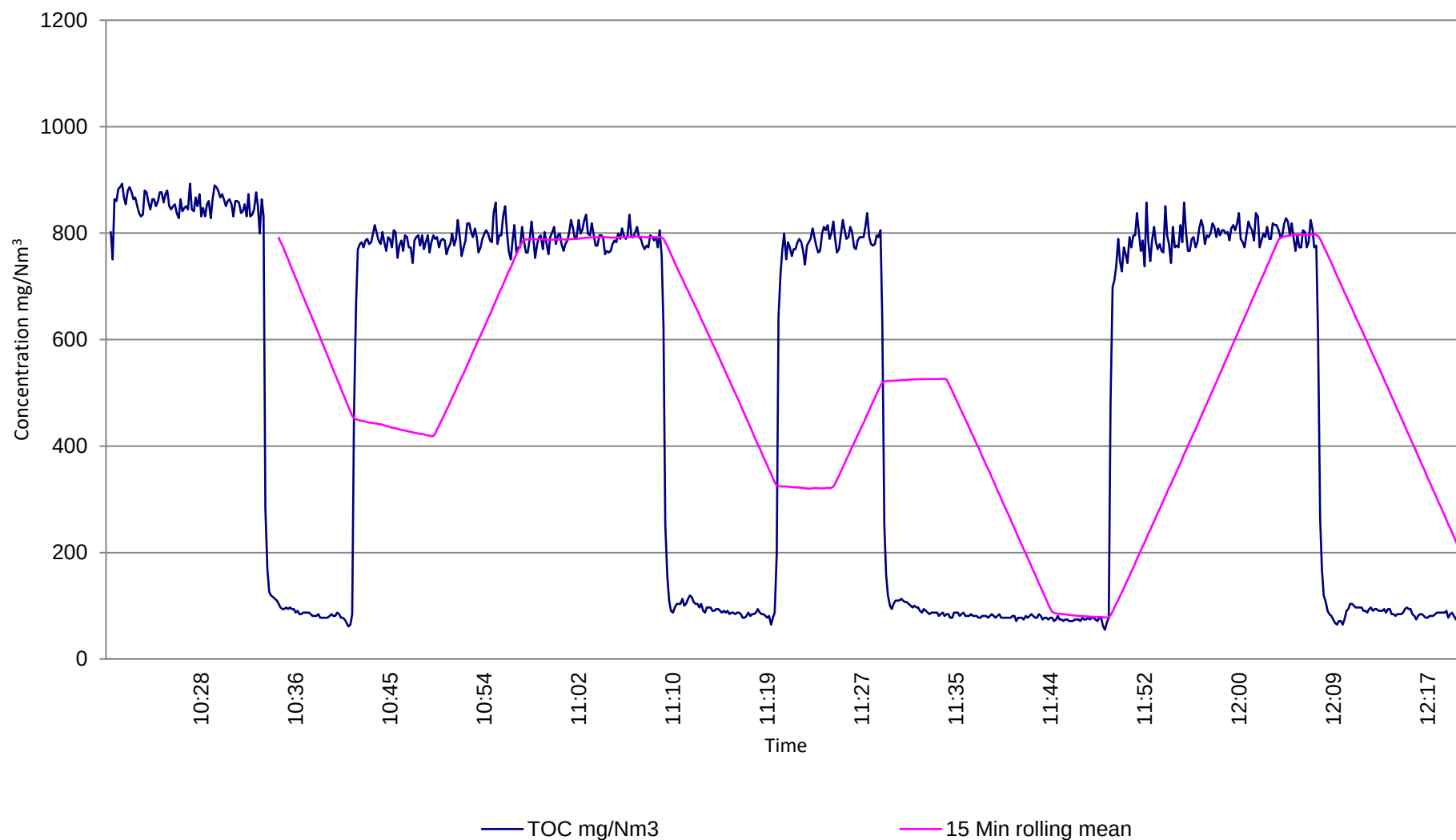
Anchem Laboratories Ltd TOC Summary

Customer name	Viscose Closures
Site location	Llansamlet
Emission point	Post RTO
Substance to be monitored	TOC (propane equivalent)
Sample Number	105634/8
Date	05/10/2023
Team leader	Phil Ruck
Analyst(s)	Robert Lethbridge / Dan Hapgood
Barometric pressure (mb)	1024
Span Gas Concentration (ppm)	901.4
Span Gas Cylinder Reference	108884
Volume flow at STP (m ³ /hour)	4872.3
Start Time	10:20:00
End Time	12:20:00
% Drift	0.11
% Uncertainty	1.23
Average concentration @ STP (mg/Nm ³)	498.44
15 minute rolling mean @ STP (mg/Nm ³)	501.80
Highest 15 minute rolling mean @ STP (mg/Nm ³)	797.60
Emission rate @ STP wet gas (g/hour)	2429
Emission uncertainty concentration	6.1

TOC concentrations measured on the Post RTO, at Viscose Closures, Llansamlet

Date: 5/10/2023

Sample No: 105634/8



TOC concentrations measured on the Post RTO, at Viscose Closures,
Llansamlet

Date: 5/10/2023

Sample No: 105634/8

Concentration	TOC mg/Nm ³	15 Min rolling mean
Minimum	55.0	77.9
Maximum	892.9	797.6
Average	498.4	501.8

Client	Viscose Closures
Site	Llansamlet
Emission Point	Pre RTO
Date	07/10/2023
Sample Number	105634/8
Bar Pressure (mb)	1024
Moisture (%)	2.00

Gas Flow	In
Port Nipple (cm)	0
Dimension (m)	0.56
Stack C.S.A (m ²)	0.246
Tape Measure	A/S544
Timer	A/S720
Barometer No.	A/S543

Field Performance Criteria	Acceptable
Pitch <±10°	N/A
Swirl <±15°	Yes
Stack Internal Area	Yes
Field Repeatability	N/A
Blockage Check	Yes
Average Stack Temp °C	27

% O ₂	% CO ₂	% CO
20.9	0.0	0.0

Traverse Line 1

Traverse Number	Distance (cm)	Average Velocity m/s	Pressure hPa	Average Stack Temp (°C)	Degree Angle of Swirl	Degree Angle of Pitch
1	5.0	5.5	0.18	27	7	N/A
2	14.0	6.2	0.23	27	4	N/A
3	42.0	6.1	0.23	27	5	N/A
4	51.0	6.1	0.22	27	4	N/A

Traverse Line 2

Traverse Number	Distance (cm)	Average Velocity m/s	Pressure hPa	Average Stack Temp (°C)	Degree Angle of Swirl	Degree Angle of Pitch

Traverse Line 3

Traverse Number	Distance (cm)	Average Velocity m/s	Pressure hPa	Average Stack Temp (°C)	Degree Angle of Swirl	Degree Angle of Pitch

Traverse Line 4

Traverse Number	Distance (cm)	Average Velocity m/s	Pressure hPa	Average Stack Temp (°C)	Degree Angle of Swirl	Degree Angle of Pitch

Number of Sample Points
4

Flow Characteristics Meet Requirements of EN ISO 16911?
Yes

EN ISO 16911 L-Type Pitot Summary Page

Client	Viscose Closures
Site	Llansamlet
Emission Point	Pre RTO
Date	7-Oct-23
Sample Number	105634/8
X-Sectional Area	0.246
Pitot Tube Factor	0.99
Average DP (kPa)	0.022
% Water Vapour	2.0
Average % Oxygen	20.9
Average % Carbon Dioxide	0.0
Average % Carbon Monoxide	0.0
Average % Nitrogen	79.1
Barometric Pressure (mb)	1024
Arithmetic Average Duct Static Pressure (hPa)	-6.01
Absolute Stack Gas Pressure (KPa)	101.8
Average Stack Gas Temperature (K)	300
Velocity in Stack (m/s)	6.0
Volumetric Flow at Stack Conditions (m ³ /sec)	1.48
Volumetric flow rate at STP - 273K, 101.3KPa (m ³ /sec)	1.35
Volumetric flow rate at STP - 273K, 101.3KPa (m ³ /hour)	4872.27
% Uncertainty of Measurement	5.6

TOC site worksheet

Customer name	Viscose Closures
Site location	Llansamlet
Emission point	Post RTO
Substance to be monitored	TOC (propane equivalent)
Date	05/10/2023
Sample Number	105634/9
Homogeneity test previously conducted? (Yes/No)	No
Is the gas stream homogeneous? (Yes/No/Unknown)	Unknown

Preliminary gas test

Sample point number	1	2	3	4	5	6	7	8	9
TOC concentration ppm	100								

Range of analyser	1000
-------------------	------

Start of test **10:15**

Instrument adjustment through analyser

Initial instrument zero gas reading (ppm)	0.1
Instrument span gas reading (ppm)	901.4
Post instrument zero gas reading (ppm)	0.1

System leak test through line

Initial system leak zero gas reading (ppm)	0.1
System leak span gas reading (ppm)	900.8
Post system leak zero gas reading (ppm)	0.0

% Leak	0.1
--------	-----

End of test **12:15**

System leak test through line

Initial drift zero gas reading (ppm)	-0.1
System drift span gas reading (ppm)	898.9
Post drift zero gas reading (ppm)	0.0

Test Span Drift (%)	0.3
Test Zero Drift (%)	0.0

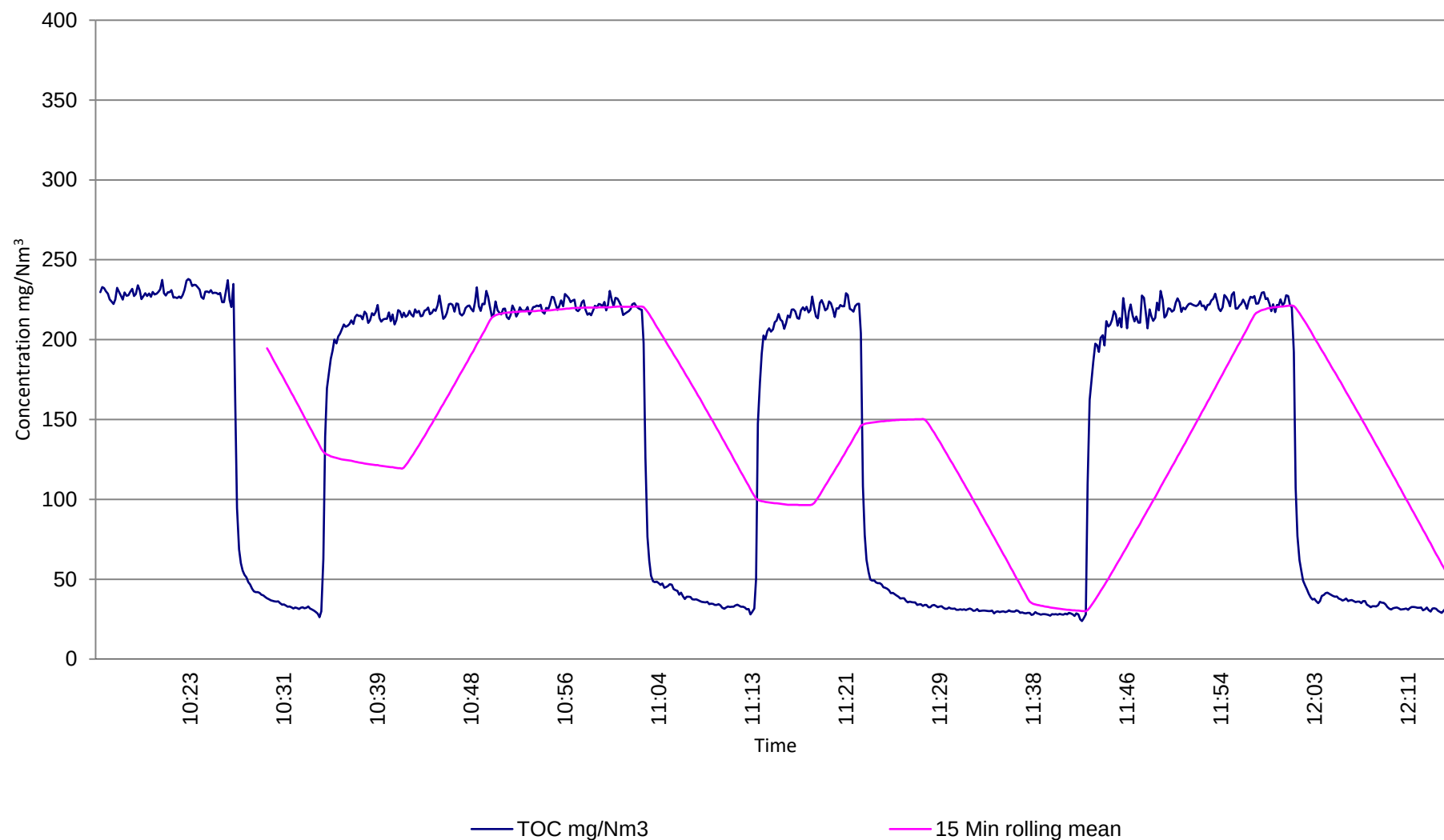
Anchem Laboratories Ltd TOC Summary

Customer name	Viscose Closures
Site location	Llansamlet
Emission point	Post RTO
Substance to be monitored	TOC (propane equivalent)
Sample Number	105634/9
Date	05/10/2023
Team leader	Phil Ruck
Analyst(s)	Robert Lethbridge / Dan Hapgood
Barometric pressure (mb)	1024
Span Gas Concentration (ppm)	901.4
Span Gas Cylinder Reference	108884
Volume flow at STP (m ³ /hour)	5841.6
Start Time	10:15:00
End Time	12:15:00
% Drift	0.21
% Uncertainty	0.63
Average concentration @ STP (mg/Nm ³)	139.91
15 minute rolling mean @ STP (mg/Nm ³)	141.54
Highest 15 minute rolling mean @ STP (mg/Nm ³)	221.35
Emission rate @ STP wet gas (g/hour)	817
Emission uncertainty concentration	0.9

TOC concentrations measured on the Post RTO, at Viscose Closures, Llansamlet

Date: 5/10/2023

Sample No: 105634/9



TOC concentrations measured on the Post RTO, at Viscose Closures,
Llansamlet

Date: 5/10/2023

Sample No: 105634/9

Concentration	TOC mg/Nm ³	15 Min rolling mean
Minimum	23.8	29.9
Maximum	238.0	221.3
Average	139.9	141.5

Combustion Gas Site Data



Document Reference ANC417 B	Issue No: 10	Page 1 of 1
-----------------------------	--------------	-------------

Customer	Viscose Closures
Emission Point	RTO
Date	05/10/2023
Sample No	105634/10

Pre test				
ANALYTE	CO	NO	SO ₂	O ₂
Zero through analyser (ppm)	0	0		
Span Through analyser (ppm)	99.7	156.0		
Zero through analyser (ppm)	0.3	0.1		
Zero Through line (ppm)	0.20	0.10		
Span Through line (ppm)	99.8	156.1		
Residence Time (seconds)	56.0	59.0		
System T90 (seconds)	82	87		
T90 Value (ppm)	89.7	140.4		
Initial leak test				
	0.1	0.1		
Post test				
ANALYTE	CO	NO	SO ₂	O ₂
Zero Through Analyser	0.30	0.10		
Span Through Analyser (ppm)	100.1	155.00		
Span Drift (%)				
	0.3	0.7		
Zero Drift (%)				
	0.1	0.0		

Oxygen cylinder grade/reference	N/A
Nitrogen Monoxide cylinder grade/reference	VCD116427 156ppm
Sulphur Dioxide cylinder grade/reference	N/A
Carbon Monoxide cylinder grade/reference	VCD116427 99.7ppm

Gas conditioning Temperature Validation

Temperature @ Start of Test (°C)	N/A
Temperature During Test (°C)	N/A
Temperature @ End of Test (°C)	N/A
Temperature of Heated Line (°C)	120
Temperature of PD-100 oven (°C)	100

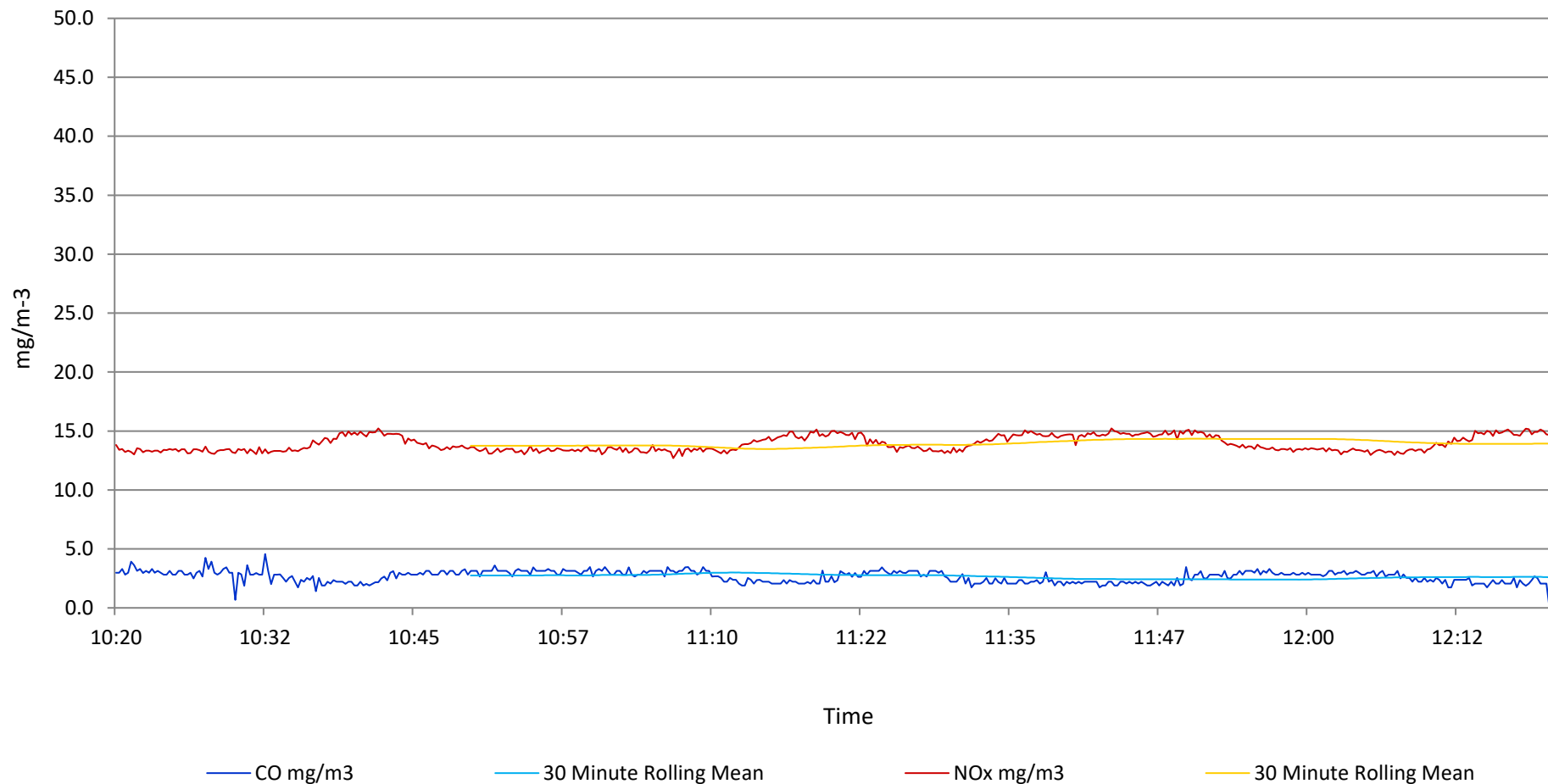
Stratification Data

Point	CO ppm	NO ppm	SO ₂ ppm	O ₂ % vol
1	2.39	6.73		
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Carbon monoxide / Oxides of nitrogen concentrations measured on the RTO, at Viscose Closures, Llansamlet

on the 5/10/2023

Sample No: 105634/10



Carbon monoxide / Oxides of nitrogen concentrations measured on the RTO, at Viscose
 Closures, Llangsamlet
 on the 5/10/2023
 Sample No: 105634/10

Concentration	CO mg/m ³	30 Minute Rolling Mean	NOx mg/m ³	30 Minute Rolling Mean	SO2 mg/m ³	30 Minute Rolling Mean	O ₂ %vol
Minimum	0.0	2.4	12.7	13.5			
Maximum	4.6	3.0	15.2	14.3			
Average	2.6	2.7	13.9	13.9			

Combustion Gas Monitoring Summary

Sample Number	105634/10
Date	05/10/2023
Customer name	Viscose Closures
Site location	Llansamlet
Emission point	RTO
Emission point dimension (m)	0.64m
Emission point C.S.A. (m ²)	0.3217
Team leader	Phil Ruck
Analyst(s)	Robert Lethbridge / Dan Hapgood
Average Ambient pressure (mb)	1024
Average Ambient temperature (°C)	23
Instrument number	A/S545 (PG-350)
Probe length (m)	0.5m
Timer	A/S637
Homogeneity test previously conducted? (Yes/No)	No
Is the gas stream homogeneous? (Yes/No/Unknown)	Unknown
Test start time	10:20:00
Test end time	12:20:00
Volumetric flow @ reference conditions (m ³ /hour)	5841.6

Reference conditions

Temperature (K)	273
Pressure (kPa)	101.3
Moisture	Dry
Oxygen (%)	21

Carbon Monoxide

Average concentration CO (mg/m ³)	2.6
Maximum concentration CO (mg/m ³)	4.6
Minimum concentration CO (mg/m ³)	0.0
Mass Emission CO (Kg/hour)	0.02
% Uncertainty of measurement	12.0
Uncertainty Concentration mg/m ³	0.3

Oxides of Nitrogen (as NO₂)

Average concentration NOx (mg/m ³)	13.9
Maximum concentration NOx (mg/m ³)	15.2
Minimum concentration NOx (mg/m ³)	12.7
Mass Emission NOx (Kg/hour)	0.08
% Uncertainty of measurement	2.0
Uncertainty Concentration mg/m ³	0.3

APPENDIX 5

(Uncertainty)

(13 Pages)

Uncertainty calculation for BS EN ISO 21877:2019 Determination of mass concentration of ammonia (NH₃), Reference method

Client	Viscose Closures Ltd	Reference Number	105634/1	Date	04/10/2023
Emission Point ID	A1 Scrubber	Run	1		

Limit value (ELV)	190	mg.m ⁻³	Reference oxygen		% by volume
Measured concentration	47.50	mg.m ⁻³ (at reference conditions)			

Measurement Equation

$$c = \frac{m}{V} f_c$$

Measured Quantities	Symbol	Value	Standard uncertainty	Units	Uncertainty as percentage	Uncertainty at lv	Requirement of std
Sampled Volume Gas	V _m	1.376101568	uV _m	0.001 m ³		0.07	<=2.5%
Sampled gas Temperature	T _m	297	uT _m	2 K		2.00	<=1.0%
Sampled gas Pressure	p _m	102.6076598	uP _m	0.5 kPa		0.49	<=1%
Sampled gas Humidity	H _m	0	uH _m	1 % by volume		1.00	<=1.0%
Oxygen content	O _{2,m}		uO _{2,m}	% by volume			<=5.0%
Concentration in impinger 1	C	151	uC	6.7195 mg/l		4.45	<5.0%
Impinger 1 solution volume	VS	0.447		0.001 l		0.22	<1.0%
Concentration in impinger 2	C	0.1		0.00445 mg/l		4.45	<5.0%
Impinger 2 solution volume	VS	0.155	uVS	0.001 l		0.65	<1.0%
Mass NH ₃	m	67.4523	um	4.27 mg		6.33	<5% of limit value
Note - Sampled gas humidity, temperature and pressure are values at the gas meter Leak	L	0.24024024		%		0.24	<=2.0%

Intermediate calculations

Factor for std conds	fs	0.93			
uncertainty components	symbol	sensitivity coeff	u (in units of fs)		
	p _m	0.009	0.005		
	H _m	0.009	0.009		
	T _m	0.003	0.006		
	ufs		0.012		1.30
Corrected volume	V	1.28	uV	0.017 m ³	1.30
				$V = V_m f_s$	
Factor for O2 correction	fc	1.00			
uncertainty components	symbol	sensitivity coeff	u		
	O _{2,m}	0.05	0.000		
				$f_c = \frac{21 - O_{2,ref}}{21 - O_{2,m}}$	
Factor for O2 Correction	ufc	1.00	0.000		0.00

Parameter	Value	Units	Sensitivity coeff	Uncertainty contribution	Uncertainty as %
Corrected Volume (standard conditor	V	1.28 m ³	37.08	0.62 mg.m ⁻³	1.30 %
Mass	m	67.45 mg	0.70	3.01 mg.m ⁻³	6.33 %
Factor for O2 Correction	fc	1.00	47.50	0.00 mg.m ⁻³	0.00 %
Leak	L	0.07 mg.m ⁻³	1.00	0.07 mg.m ⁻³	0.14 %
CSA Nozzle		0.03 mg.m ⁻³	1.00	0.03 mg.m ⁻³	0.06 %
Combined uncertainty				3.07 mg.m ⁻³	

Expanded uncertainty as percentage of measured value	12.93	% measured of value	expressed with a level of confidence of 95% (Using a coverage factor k=2)
Expanded uncertainty in units of measurement	6.14	mg.m ⁻³	
Expanded uncertainty as percentqge of limit value	3.23	% ELV	

Client	Viscose Closures	Date	04/10/2023
Emission Point ID	A1 Scrubber	Sample Number	105634/2

CEN/TS 13649 measured concentration (mg/m³)	43.974		
ELV	105		

Measured Quantities	Value	Standard Uncertainty	Uncertainty as %	Symbol
Sampled Volume (m ³)	0.0202	0.001 m ³	4.95	V _m
Sampled gas Temperature (K)	297	1 K	0.34	T _m
Sampled gas Pressure (kPa)	102.50	0.5 kPa	0.49	p _m
Sampled gas Humidity (%)	0	1 % Vol	1	H _m
Leak (%)	0.40		0.40	L
Sub Con Laboratory (%)	15.00			
		Factor for Standard Conditions	0.93	f _s
Uncertainty Components	Sensitivity Coeff	Uncertainty (in units of f_s)	$f_s = \frac{(100 - H_m) 273}{100 T_m} \frac{\rho_m}{101.3}$	
T _m	0.00	0.00		
p _m	0.01	0.00		
H _m	0.01	0.01		
ufs		0.01	1.16	
Corrected Volume (v)	0.02			V
	0.00	$V = V_m f_s$	5.44	uV
Parameter		Sensitivity Coeff		
Corrected Volume	0.02	2338.19	2.39	5.44
Leak	0.10	1	0.10	0.23
Sub Con Laboratory	3.81	1	3.81	8.66
Combined Measurement Uncertainty (mg/m³)	4.50			
Measurement Uncertainty				
Combined Uncertainty (mg/m ³)	4.50			
Coverage Factor k	2			
Expanded uncertainty (mg/m ³)	9.00			
Expanded Uncertainty (% ELV)	8.57			
Expanded uncertainty (mg/m³)	8.9981			
Expanded uncertainty (% Value)	20.46			

Client	Viscose Closures Ltd	Date	04/10/2023
Emission Point ID	A1 Scrubber	Reference Number	105634/3

Measured H₂S concentration (mg/m³)	0.77	Reference Oxygen (%)	
ELV	2		

Measured Quantities	Value	Standard Uncertainty	Uncertainty as %	Symbol
Sampled Volume (m ³)	0.3224	0.001 m ³	0.31	V _m
Sampled gas Temperature (K)	297	2 K	0.67	T _m
Sampled gas Pressure (kPa)	102.61	0.5 kPa	0.49	p _m
Sampled gas Humidity (%)	0	1 % Vol	1	H _m
Oxygen content (%)		0.1 % Vol		O _{2,m}
Leak (%)	0.12		0.12	L
Sub Con Laboratory (%)	7.0			
		Factor for Standard Conditions	0.93	f _s
Uncertainty Components	Sensitivity Coeff	Uncertainty (in units of f _s)	$f_s = \frac{(100 - H_m)}{100} \frac{273}{T_m} \frac{\rho_m}{101.3}$	
T _m	0.00	0.01		
p _m	0.01	0.00		
H _m	0.01	0.01		
ufs		0.01	1.30	
Corrected Volume (v)	0.30			V
	0.00	$V = V_m f_s$	1.34	uV
Factor for O₂ Correction	1.00			f _c
	0.05			O _{2,m}
	0.00	$f_c = \frac{21 - O_{2,ref}}{21 - O_{2,m}}$		u
	0.48			ufc
Parameter		Sensitivity Coeff		
Corrected Volume	0.30	2.57	0.01	1.34
Factor for O ₂ Correction	1.00	0.77	0.00	0.48
Leak	0.00	1	0.00	0.07
Sub Con Laboratory	0.03	1	0.03	4.04
CSA Nozzle		1	0.00	0.00
Combined Measurement Uncertainty (mg/m³)	0.03			
Measurement Uncertainty				
Combined Uncertainty (mg/m ³)	0.03			
Coverage Factor k	2			
Expanded uncertainty (mg/m ³)	0.07			
Expanded Uncertainty (% ELV)	3.30			
Expanded uncertainty (mg/m³)	0.07			
Expanded uncertainty (% Value)	8.57			

ISO 16911 S-Type Pitot Uncertainty

Client	Viscose Closures Ltd
Site	Llansamlet
Emission Point	A1 Scrubber
Date	04/10/2023
Sample Number	105634/1-3

<u>Uncertainty</u>	<u>Estimated Value %</u>	<u>Measured Value %</u>	<u>sqr est</u>	<u>sqr meas</u>
Equipment Sources				
Master System Velocity Measurements		1	0	1
Master System Air Density Measurement		0.15	0	0.0225
Tape Measure		2	0	4
Dual Incline Manometer		0.05	0	0.0025
Thermocouples		1	0	1
Sensitivity to Atmospheric Pressure	2		4	0
Sensitivity to Ambient Temperature	2		4	0
Site Sources				
Stack Internal Area		5.24834E-07	0	2.75451E-13
Uncertainty in Flow Measurement Device Calibration	1		1	0
Uncertainty in Differential Pressure Device Calibration	1		1	0
Time	0		0	0
S-Type Reference/Stagnation Check		0.00	0	0
Repeatability at single point			0	0
Swirl/Pitch Meter Position	2		4	0
Temperature on site			0	0
Pressure on Site			0	0
Humidity on Site	0		0	0
Laboratory Sources				
Uncertainty due to Caibration	2		4	0
Repeatability (hPa)		0.66	0	0.4356
Repeatability (m/s)		0.14		
Linearity		0.15	0	0.0225
Measurement of Duct Diameter		0.67	0	0.4489
Effect of Swirl Angle (Clockwise)		0.16	0	0.0256
Effect of Swirl Angle (Anti-clockwise)		1.82	0	3.3124
Sum of squares			28.27	
		Total Uncertainty	5.3	

Uncertainty calculation for BS EN ISO 21877:2019 Determination of mass concentration of ammonia (NH₃), Reference method

Client	Viscose Ltd	Reference Number	105634/4	Date	04/10/2023
Emission Point ID	A2 Rocket	Run	1		

Limit value (ELV)	10	mg.m ⁻³	Reference oxygen		% by volume
Measured concentration	1.51	mg.m ⁻³ (at reference conditions)			

Measurement Equation

$$c = \frac{m}{V} f_c$$

Measured Quantities	Symbol	Value	Standard uncertainty	Units	Uncertainty as percentage	Uncertainty at lv	Requirement of std
Sampled Volume Gas	V _m	1.096652775	uV _m	0.001 m ³		0.09	<=2.5%
Sampled gas Temperature	T _m	296	uT _m	2 K		2.00	<=1.0%
Sampled gas Pressure	p _m	102.8488193	up _m	0.5 kPa		0.49	<=1%
Sampled gas Humidity	H _m	0	uH _m	1 % by volume		1.00	<=1.0%
Oxygen content	O _{2,m}		uO _{2,m}	% by volume			<=5.0%
Concentration in impinger 1	C	6.2	uC	0.2759 mg/l		4.45	<5.0%
Impinger 1 solution volume	VS	0.275		0.001 l		0.36	<1.0%
Concentration in impinger 2	C	0.1		0.00445 mg/l		4.45	<5.0%
Impinger 2 solution volume	VS	0.282	uVS	0.001 l		0.35	<1.0%
Mass NH ₃	m	1.6775	um	0.11 mg		6.31	<5% of limit value
Note - Sampled gas humidity, temperature and pressure are values at the gas meter							
Leak	L	0.25		%		0.25	<=2.0%

Intermediate calculations

Factor for std conds	fs	0.94			
uncertainty components	symbol	sensitivity coeff	u (in units of fs)		
	p _m	0.009	0.005		
	H _m	0.009	0.009		
	T _m	0.003	0.006		
	ufs		0.012		1.30
Corrected volume	V	1.03	uV	0.013 m ³	1.30
				$V = V_m f_s$	
Factor for O2 correction	fc	1.00			
uncertainty components	symbol	sensitivity coeff	u		
	O _{2,m}	0.05	0.000		
				$f_c = \frac{21 - O_{2,ref}}{21 - O_{2,m}}$	
Factor for O2 Correction	ufc	1.00	0.000		0.00

Parameter	Value	Units	Sensitivity coeff	Uncertainty contribution	Uncertainty as %
Corrected Volume (standard conditor	V	1.03 m ³	1.47	0.02 mg.m ⁻³	1.30 %
Mass	m	1.68 mg	0.90	0.10 mg.m ⁻³	6.31 %
Factor for O2 Correction	fc	1.00	1.51	0.00 mg.m ⁻³	0.00 %
Leak	L	0.00 mg.m ⁻³	1.00	0.00 mg.m ⁻³	0.14 %
CSA Nozzle		0.00 mg.m ⁻³	1.00	0.00 mg.m ⁻³	0.03 %
Combined uncertainty				0.10 mg.m ⁻³	

Expanded uncertainty as percentage of measured value	12.90	% measured of value	expressed with a level of confidence of 95% (Using a coverage factor k=2)
Expanded uncertainty in units of measurement	0.19	mg.m ⁻³	
Expanded uncertainty as percentqge of limit value	1.94	% ELV	

Client	Viscose Closures	Date	04/10/2023
Emission Point ID	A2 Rocket	Sample Number	105634/5

CEN/TS 13649 measured concentration (mg/m³)	1.701		
ELV	17		

Measured Quantities	Value	Standard Uncertainty	Uncertainty as %	Symbol
Sampled Volume (m ³)	0.0212	0.001 m ³	4.71	V _m
Sampled gas Temperature (K)	296	1 K	0.34	T _m
Sampled gas Pressure (kPa)	102.50	0.5 kPa	0.49	p _m
Sampled gas Humidity (%)	0	1 % Vol	1	H _m
Leak (%)	0.48		0.48	L
Sub Con Laboratory (%)	15.00			
		Factor for Standard Conditions	0.93	f _s
Uncertainty Components	Sensitivity Coeff	Uncertainty (in units of f_s)	$f_s = \frac{(100 - H_m)}{100} \frac{273}{T_m} \frac{\rho_m}{101.3}$	
T _m	0.00	0.00		
p _m	0.01	0.00		
H _m	0.01	0.01		
ufs		0.01	1.16	
Corrected Volume (v)	0.02			V
	0.00	$V = V_m f_s$	5.18	uV
Parameter		Sensitivity Coeff		
Corrected Volume	0.02	85.79	0.09	5.18
Leak	0.00	1	0.00	0.27
Sub Con Laboratory	0.15	1	0.15	8.66
Combined Measurement Uncertainty (mg/m³)	0.17			
Measurement Uncertainty				
Combined Uncertainty (mg/m ³)	0.17			
Coverage Factor k	2			
Expanded uncertainty (mg/m ³)	0.34			
Expanded Uncertainty (% ELV)	2.02			
Expanded uncertainty (mg/m³)	0.3433			
Expanded uncertainty (% Value)	20.19			

Client	Viscose Ltd	Date	04/10/2023
Emission Point ID	A2 Rocket	Reference Number	105634/6

Measured H₂S concentration (mg/m³)	0.08	Reference Oxygen (%)	
ELV	1		

Measured Quantities	Value	Standard Uncertainty		Uncertainty as %	Symbol
Sampled Volume (m ³)	0.2883	0.001 m ³		0.35	V _m
Sampled gas Temperature (K)	296	2 K		0.68	T _m
Sampled gas Pressure (kPa)	102.85	0.5 kPa		0.49	ρ _m
Sampled gas Humidity (%)	0	1 % Vol		1	H _m
Oxygen content (%)	20.9	0.1 % Vol		0.48	O _{2,m}
Leak (%)	0.25			0.25	L
Sub Con Laboratory (%)	7.0				
		Factor for Standard Conditions		0.94	f _s
Uncertainty Components	Sensitivity Coeff	Uncertainty (in units of f _s)			
T _m	0.00	0.01		$f_s = \frac{(100 - H_m)}{100} \frac{273}{T_m} \frac{\rho_m}{101.3}$	
ρ _m	0.01	0.00			
H _m	0.01	0.01			
ufs		0.01			1.30
Corrected Volume (v)	0.27				V
	0.00	$V = V_m f_s$		1.35	uV
Factor for O ₂ Correction	1.00				f _c
	1.00				O _{2,m}
	0.10	$f_c = \frac{21 - O_{2,ref}}{21 - O_{2,m}}$			u
	10.00				ufc
Parameter		Sensitivity Coeff			
Corrected Volume	0.27	0.30	0.00	1.35	V
Factor for O ₂ Correction	1.00	0.08	0.01	10.00	f _c
Leak	0.00	1	0.00	0.14	L
Sub Con Laboratory	0.00	1	0.00	4.04	
CSA Nozzle		1	0.00	0.00	
Combined Measurement Uncertainty (mg/m ³)	0.01				
Measurement Uncertainty					
Combined Uncertainty (mg/m ³)	0.01				
Coverage Factor k	2				
Expanded uncertainty (mg/m ³)	0.02				
Expanded Uncertainty (% ELV)	1.74				
Expanded uncertainty (mg/m ³)	0.02				
Expanded uncertainty (% Value)	21.74				

Uncertainty calculation for EN 13284 Determination of low range mass concentration of dust, Manual Gravimetric Method

Client	Viscose Closures	Reference Number	105634/7	Date	05/10/2023
Emission Point ID	Thermal Oxidiser	Run	1		

Limit value (ELV)	50 mg.m ⁻³	Reference oxygen	% by volume
Measured concentration	0.20 mg.m ⁻³ (at reference conditions)		

Measurement Equation

$$c = \frac{m}{V} f_c$$

Measured Quantities	Symbol	Value	Standard uncertainty	Units	Uncertainty as percentage	Uncertainty at lv	Requirement of std
Sampled Volume	V _m	2.39	uV _m	0.001 m ³	0.04		<=2%
Sampled gas Temperature	T _m	416	uT _m	2 K	0.48		<=1%
Sampled gas Pressure	p _m	102.64	up _m	0.5 kPa	0.49		<=1%
Sampled gas Humidity	H _m	0	uH _m	1 % by volume	1.00		<=1%
Oxygen content	O _{2,m}		uO _{2,m}	% by volume			<=5%
Mass particulate	m	0.50	um	0.03 mg	5.04	0.02	<5% of limit value
Note - Sampled gas humidity, temperature and pressure are values at the gas meter							
Leak	L	0.2		%	0.19		<=2%
Uncollected Mass (Instack filter - no rinse)	UCM	0		mg	0		<=10%

Intermediate calculations

Factor for std conds	fs	0.66				
uncertainty components	symbol	sensitivity coeff	u (in units of fs)			
	p _m	0.006	0.003			
	H _m	0.007	0.007			
	T _m	0.002	0.003			
	ufs		0.008			1.21
Corrected volume	V	1.59	uV	0.019 m ³	$V = V_m f_s$	1.21
Factor for O2 correction	fc	1.00				
uncertainty components	symbol	sensitivity coeff	u			
	O _{2,m}	0.05	0.000		$f_c = \frac{21 - O_{2,ref}}{21 - O_{2,m}}$	
Factor for O2 Correction	ufc	1.00	0.000			0.00

Parameter	Value	Units	Sensitivity coeff	Uncertainty contribution	Uncertainty as %
Corrected Volume (standard conditi	V	1.59 m ³	0.13	0.00 mg.m ⁻³	1.21 %
Mass	m	0.50 mg	0.41	0.01 mg.m ⁻³	5.04 %
Factor for O2 Correction	fc	1.00	0.20	0.00 mg.m ⁻³	0.00 %
Leak	L	0.00 mg.m ⁻³	1.00	0.00 mg.m ⁻³	0.11 %
Uncollected mass	UCM	0.00 mg	0.41	0.00 mg.m ⁻³	0.00 %
CSA Nozzle		0.00 mg.m ⁻³	1.00	0.00 mg.m ⁻³	0.37 %
Combined measurement uncertainty				0.01 mg.m ⁻³	
Expanded uncertainty as percentage of measured value		10.39	% measured of value	expressed with a level of confidence of 95% (Using a coverage factor k=2)	
Expanded uncertainty in units of measurement		0.02	mg.m ⁻³		
Expanded uncertainty as percentage of limit value		0.04	% ELV		

Client	Viscose Closures	Date	05/10/2023
Emission Point ID	Post RTO	Sample Number	105634/8

Measured TOC concentration (mg/m³)	498.44	Calibration Value (mg/m³)	1759.23
ELV	N/A	Scale used (mg/m³)	1964.30

Performance Characteristic		Specification	Uncertainty	
Response Time (seconds)	3	<200s		
Logger Sampling Interval (seconds)	10			
Measurement Period (minutes)	120			
Number of Readings in Measurements	720			
Standard dev Repeat @ Zero	0.42	≤±2.0% Range	u _{r0}	N/A
Standard dev Repeat @ Span	0.61	≤±2.0% Range	u _{rs}	0.02
Deviation from Linearity (±)	0.02	≤±2.0% Range	u _{fit}	0.23
Zero Drift (During Measurement)	0.00	% full scale	u _{odr}	2.12
Span Drift (During Measurement)	0.66	% full scale		
Losses in the Line (Leak)	0.77	<2% of value	u _{leak}	2.22
Sensitivity to Sample Gas Flow	1.6	<2.0% of the certification range	u _{spres}	0.00
Sensitivity to Ambient Temp @ Span	1.4	<5.0% of the certification range	u _{temp}	0.00
Sensitivity to Ambient Temp @ Zero	-2.4	<5.0% of the certification range		0.00
Influence of voltage variations	0.50	<2.0% of the certification range	u _{volt}	0.00
Effect of oxygen	0.71	<2% of the certification range	u _{int}	0.00
Measurement Uncertainty				
Combined Uncertainty (mg/m ³)	3.07			
Coverage Factor k	2			
Expanded uncertainty (mg/m ³)	6.15			
Expanded Uncertainty (% ELV)	N/A			
Expanded uncertainty (mg/m³)	6.15			
Expanded uncertainty (% Value)	1.23			

Requirement in EA TGN M2 is for uncertainty to be < ±15% of the measured value

ISO 16911 L-Type Pitot Uncertainty

Client	Viscose Closures
Site	Llansamlet
Emission Point	Pre RTO
Date	07/10/2023
Sample Number	105634/8

<u>Uncertainty</u>	<u>Estimated Value %</u>	<u>Measured Value %</u>	<u>sqr est</u>	<u>sqr meas</u>
Equipment Sources				
Master System Velocity Measurements		1	0	1
Master System Air Density Measurement		0.15	0	0.0225
Tape Measure		2	0	4
Testo			0	0
Thermocouples		1	0	1
Sensitivity to Atmospheric Pressure	2		4	0
Sensitivity to Ambient Temperature	2		4	0
Site Sources				
Stack Internal Area		3.18716E-06	0	1.0158E-11
Uncertainty in Flow Measurement Device Calibration	1		1	0
Uncertainty in Differential Pressure Device Calibration	1		1	0
Time	0		0	0
L-Type Blockage Test		-0.17%	0	2.76854E-06
Repeatability at single point			0	0
Swirl/Pitch Meter Position	2		4	0
Temperature on site			0	0
Pressure on Site			0	0
Humidity on Site	0		0	0
Laboratory Sources				
Uncertainty due to Caibration	2		4	0
Repeatability (hPa)		0.97	0	0.9409
Repeatability (m/s)		0.26		
Linearity	2		4	0
Measurement of Duct Diameter		0.67	0	0.4489
Effect of Swirl Angle (Clockwise)		1.2	0	1.44
Effect of Swirl Angle (Anti-clockwise)		0.88	0	0.7744
Sum of squares			31.626703	
		Total Uncertainty	5.6	

Client	Viscose Closures	Date	05/10/2023
Emission Point ID	Post RTO	Sample Number	105634/9

Measured TOC concentration (mg/m³)	139.91	Calibration Value (mg/m³)	1770.62
ELV	150	Scale used (mg/m³)	1964.30

Performance Characteristic		Specification	Uncertainty	
Response Time (seconds)	3	<200s		
Logger Sampling Interval (seconds)	10			
Measurement Period (minutes)	120			
Number of Readings in Measurements	720			
Standard dev Repeat @ Zero	0.42	≤±2.0% Range	u_{r0}	N/A
Standard dev Repeat @ Span	0.61	≤±2.0% Range	u_{rs}	0.02
Deviation from Linearity (±)	0.02	≤±2.0% Range	u_{fit}	0.23
Zero Drift (During Measurement)	0.01	% full scale	u_{odr}	0.37
Span Drift (During Measurement)	0.28	% full scale		
Losses in the Line (Leak)	0.07	<2% of value	u_{leak}	0.05
Sensitivity to Sample Gas Flow	1.6	<2.0% of the certification range	u_{spres}	0.00
Sensitivity to Ambient Temp @ Span	1.4	<5.0% of the certification range	u_{temp}	0.00
Sensitivity to Ambient Temp @ Zero	-2.4	<5.0% of the certification range		0.00
Influence of voltage variations	0.50	<2.0% of the certification range	u_{volt}	0.00
Effect of oxygen	0.71	<2% of the certification range	u_{int}	0.00
Measurement Uncertainty				
Combined Uncertainty (mg/m ³)	0.44			
Coverage Factor k	2			
Expanded uncertainty (mg/m ³)	0.88			
Expanded Uncertainty (% ELV)	0.59			
Expanded uncertainty (mg/m³)	0.88			
Expanded uncertainty (% Value)	0.63			

Requirement in EA TGN M2 is for uncertainty to be < ±15% of the measured value

Uncertainty Budget for Oxides of nitrogen



Client	Viscose Closures	Date	05/10/2023
Emission Point ID	RTO	Sample Number	105634/10

Measured NOx concentration (mg/m³)	13.92	Calibration Value (mg/m³)	319.80
ELV	100	Scale used (mg/m³)	512.50

Performance Characteristic		Specification	Uncertainty	
Response Time (seconds)	33	<200s		
Logger Sampling Interval (seconds)	15			
Measurement Period (minutes)	120			
Number of Readings in Measurements	480			
Standard dev Repeat @ Zero	0.04	≤±1.0% Range	u _{r0}	N/A
Standard dev Repeat @ Span	0.08	≤±2.0% Range	u _{rs}	0.00
Deviation from Linearity (±)	0.02	≤±2.0% Range	u _{fit}	0.06
Zero Drift (During Measurement)	0.00	% full scale	u _{odr}	0.09
Span Drift (During Measurement)	0.70	% full scale		
Losses in the Line (Leak)	0.06	<2% of value	u _{leak}	0.01
Sensitivity to Atmospheric Pressure	0.1	<1.5% of the certification range	u _{apres}	0.00
Sensitivity to Sample Gas Flow	0.1	<1.0% of the certification range	u _{spres}	0.00
Sensitivity to Ambient Temp @ Span	1.53	<3.0% of the certification range	u _{temp}	0.00
Sensitivity to Ambient Temp @ Zero	0.04	<3.0% of the certification range		0.00
Sensitivity to Electric Voltage	-0.23	<2.0% of the certification range	u _{volt}	0.00
Cross Sensitivity (Interferents)	0.00	<4% of the certification range	u _{int}	0.00
Uncertainty of calibration gas	1.1	<2% of value	u _{calib}	0.09
Uncertainty in Factor	0.00		u _f	0.00
Measurement Uncertainty				
Combined Uncertainty (mg/m ³)	0.14			
Coverage Factor k	2			
Expanded uncertainty (mg/m ³)	0.28			
Expanded uncertainty to std conditions (mg/m ³)	0.28			
Expanded Uncertainty (% ELV)	0.28			
Expanded uncertainty (mg/m³)	0.28			
Expanded uncertainty (% Value)	2.01			
Requirement in standard is for uncertainty to be < ±10% at ELV at standard conditions				

Uncertainty Budget for Carbon monoxide



Client	Viscose Closures	Date	05/10/2023
Emission Point ID	RTO	Sample Number	105634/10

Measured CO concentration (mg/m³)	2.64	Calibration Value (mg/m³)	124.63
ELV	100	Scale used (mg/m³)	250.00

Performance Characteristic		Specification	Uncertainty	
Response Time (seconds)	28	<200s		
Logger Sampling Interval (seconds)	15			
Measurement Period (minutes)	120			
Number of Readings in Measurements	480			
Standard dev Repeat @ Zero	0.16	≤±1.0% Range	u _{r0}	N/A
Standard dev Repeat @ Span	0.35	≤±2.0% Range	u _{rs}	0.02
Deviation from Linearity (±)	0.02	≤±2.0% Range	u _{fit}	0.03
Zero Drift (During Measurement)	0.10	% full scale	u _{odr}	0.15
Span Drift (During Measurement)	0.30	% full scale		
Losses in the Line (Leak)	0.10	<2% of value	u _{leak}	0.00
Sensitivity to Atmospheric Pressure	0.22	<1.5% of the certification range	u _{apres}	0.00
Sensitivity to Sample Gas Flow	0.1	<1.0% of the certification range	u _{spres}	0.00
Sensitivity to Ambient Temp @ Span	2	<3.0% of the certification range	u _{temp}	0.00
Sensitivity to Ambient Temp @ Zero	-0.2	<3.0% of the certification range		0.00
Sensitivity to Electric Voltage	-0.35	<2.0% of the certification range	u _{volt}	0.00
Cross Sensitivity (Interferents)	0.53	<4% of the certification range	u _{int}	0.00
Uncertainty of calibration gas	1.2	<2% of value	u _{calib}	0.02
Uncertainty in Factor	0.00		u _f	0.00
Measurement Uncertainty				
Combined Uncertainty (mg/m ³)	0.16			
Coverage Factor k	2			
Expanded uncertainty (mg/m ³)	0.32			
Expanded uncertainty to std conditions (mg/m ³)	0.32			
Expanded Uncertainty (% ELV)	0.32			
Expanded uncertainty (mg/m³)	0.32			
Expanded uncertainty (% Value)	11.98			
Requirement in standard is for uncertainty to be < ±6% at ELV at standard conditions				

APPENDIX 6

(Sub-contracted laboratory results)

(14 Pages)

Certificate of Analysis

Report No.: 23-10740-1

Issue No.: 1

Date of Issue 13/10/2023

Customer Details: Anchem Laboratories Ltd, Unit 5A, D'Arcy Business Park, D'Arcy Way, Llandarcy, Neath, SA10 6EJ, Wales

Customer Contact: Philip Ruck

Customer Order No.: 2023/251

Customer Reference: Not Supplied

Quotation Reference: Q23-05735

Description: 4 gas samples

Date Received: 11/10/2023

Date Started: 11/10/2023

Date Completed: 13/10/2023

Test Methods: Details available on request (refer to SOP code against relevant result/s)

Notes: None



Approved By: Joanne Dewhurst, Operational Manager

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service.

This certificate shall not be reproduced except in full without the prior written approval of the laboratory.

Observations and interpretations are outside of the scope of UKAS accreditation.

Results reported herein relate only to the items supplied to the laboratory for testing.

Results on an Interim Report are not dry-weight corrected.

Where the laboratory is not responsible for the sampling, results apply to the sample(s) as they were received.

The laboratory shall not be responsible for any information that is supplied by the customer that may affect the validity of results.

rpsgroup.com

RPS Environmental Management Limited trading as RPS Laboratories. Registered in England No. 01756175.

Unit 12, Waters Edge Business Park, Modwen Road, Salford, M5 3EZ. T +44 161 872 2443

A member of the RPS Group plc. Terms and conditions apply - copy on request

Results Summary

Report No.: 23-10740-1

Customer Reference: Not Supplied

Customer Order No: 2023/251

	Customer Sample No	105634/02	105634/02 Blank	105634/05	105634/05 Blank
	RPS Sample No	207316	207317	207318	207319
	Sample Matrix	TUBE	TUBE	TUBE	TUBE
	Sampling Date	04/10/2023	04/10/2023	04/10/2023	04/10/2023
Determinand					
	CAS No	Codes	SOP	RL	Units
carbon disulfide FRONT	75-15-0	N	G8	10	ug
carbon disulfide BACK	75-15-0	N	G8	10	ug

Deviating Samples

Report No.: 23-10740-1

Customer Reference: Not Supplied

Customer Order No: 2023/251

Our policy on Deviating Samples has been implemented in accordance with UKAS Policy on Deviating Samples (TPS63).

RPS is not responsible for the integrity of samples as received, unless RPS personnel performed the sampling. Samples submitted may be declared to be deviating.

Where applicable the analysis method remains UKAS accredited, however results reported for a deviating sample may be compromised.

Where no sampling date was supplied, samples have been declared to be deviating. If the date can be supplied, results may be reissued if assessed not deviating.

Where the sample container used was unsuitable or broken, the sample is flagged as deviating and re-sampling/re-submission may be required.

RPS No.	Customer No.	Customer ID	Date Sampled	Containers Received	Deviating	Reason for Deviation
207316	105634/02		04/10/2023	Container	No	
207317	105634/02 Blank		04/10/2023	Container	No	
207318	105634/05		04/10/2023	Container	No	
207319	105634/05 Blank		04/10/2023	Container	No	

Report No.: 23-10740-1

Key Code	Description
N	Not Accredited Test
U	UKAS Accredited Test - UKAS accreditation is only implied if the report carries the UKAS logo
UF	UKAS Flexible Scope Test
M	MCERTS Accredited Test - MCERTS accreditation is only implied if the report carries the MCERTS logo
O	Marine Management Organisation (MMO) Validated
SN	Subcontracted to approved laboratory not accredited for the test
SU	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
SIN	Subcontracted to internal RPS Group laboratory not accredited for the test
SIU	Subcontracted to internal RPS Group laboratory UKAS Accredited for the test
SIM	Subcontracted to internal RPS Group laboratory MCERTS/UKAS Accredited for the test
I/S (in results)	Insufficient Sample
U/S (in results)	Unsuitable Sample
S/C (in results)	See Comments
ND (in results)	Not Detected
L (in results)	Result is outside normal limits

Please note that all samples will be destroyed 4 WEEKS after the report has been issued, with the exception of asbestos samples.

Note: Sample retention may be subject to agreement with the customer for particular projects

Certificate Notes	Description
Note 1	This test report shall not be reproduced except in full, without written approval of the Laboratory.
Note 2	Unless otherwise stated, results are not corrected for analytical recoveries.
Note 3	Samples were taken by the customer and, unless otherwise stated, sampling locations were not supplied.
Note 4	Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
Note 5	Unless otherwise stated, method D9 conditioning temperatures are 180°C for pre-weigh and 160°C for re-weigh.
Note 6	The PDF version of the certificate is the definitive copy and the Excel version is uncontrolled and provided for information only.
Note 7	For asbestos analysis, all records, communications and reports pertaining to the analysis are retained for five years from the date of issue of the report. The sample analysed is retained for six months.
Note 8	For asbestos analysis, method of analysis used is stereo microscopy, polarised light microscopy and dispersion staining.

Note: Where the following information is included in this certificate, it has usually been supplied by the customer: Customer Sample ID, Sample Location, Sampling Date and Sample Air Volumes. The laboratory shall not be responsible for any information that is supplied by the customer that may affect the validity of results.

Certificate of Analysis

Report No.: 23-10725-1

Issue No.: 1

Date of Issue 13/10/2023

Customer Details: Anchem Laboratories Ltd, Unit 5A, D'Arcy Business Park, D'Arcy Way, Llandarcy, Neath, SA10 6EJ, Wales

Customer Contact: Philip Ruck

Customer Order No.: 2023/252

Customer Reference: Not Supplied

Quotation Reference: Q23-05735

Description: 4 liquid samples

Date Received: 10/10/2023

Date Started: 10/10/2023

Date Completed: 13/10/2023

Test Methods: Details available on request (refer to SOP code against relevant result/s)

Notes: None



Approved By: Joanne Dewhurst, Operational Manager

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service.

This certificate shall not be reproduced except in full without the prior written approval of the laboratory.

Observations and interpretations are outside of the scope of UKAS accreditation.

Results reported herein relate only to the items supplied to the laboratory for testing.

Results on an Interim Report are not dry-weight corrected.

Where the laboratory is not responsible for the sampling, results apply to the sample(s) as they were received.

The laboratory shall not be responsible for any information that is supplied by the customer that may affect the validity of results.



0605



rpsgroup.com

RPS Environmental Management Limited trading as RPS Laboratories. Registered in England No. 01756175.

Unit 12, Waters Edge Business Park, Modwen Road, Salford, M5 3EZ. T +44 161 872 2443

A member of the RPS Group plc. Terms and conditions apply - copy on request

Results Summary

Report No.: 23-10725-1

Customer Reference: Not Supplied

Customer Order No: 2023/252

Customer Sample No	Impinger - 105634/03	Impinger - 105634/06	Blank Impinger - 105634/03	Blank Impinger - 105634/06						
	RPS Sample No	207241	207242	207243	207244					
	Sample Matrix	SOLUTION	SOLUTION	SOLUTION	SOLUTION					
	Sampling Date	04/10/2023	04/10/2023	04/10/2023	04/10/2023					
Determinand		CAS No	Codes	SOP	RL	Units				
volume of sample supplied			U	N/A	n/a	ml	52	45	35	20
hydrogen sulphide		7783-06-4	UM	M120	0.5	ug/mL	4.92	< 0.50	S/C	S/C

Comments

Report No.: 23-10725-1

Customer Reference: Not Supplied

Customer Order No: 2023/252

RPS Sample Number	Customer Number	Sample Comments
207243	Blank Impinger - 105634/03	<0.64ug/ml NB: LOD raised due to dilution; insufficient sample provided
207244	Blank Impinger - 105634/06	<1.13ug/ml NB: LOD raised due to dilution; insufficient sample provided

Deviating Samples

Report No.: 23-10725-1

Customer Reference: Not Supplied

Customer Order No: 2023/252

Our policy on Deviating Samples has been implemented in accordance with UKAS Policy on Deviating Samples (TPS63).

RPS is not responsible for the integrity of samples as received, unless RPS personnel performed the sampling. Samples submitted may be declared to be deviating.

Where applicable the analysis method remains UKAS accredited, however results reported for a deviating sample may be compromised.

Where no sampling date was supplied, samples have been declared to be deviating. If the date can be supplied, results may be reissued if assessed not deviating.

Where the sample container used was unsuitable or broken, the sample is flagged as deviating and re-sampling/re-submission may be required.

RPS No.	Customer No.	Customer ID	Date Sampled	Containers Received	Deviating	Reason for Deviation
207241	Impinger - 105634/03		04/10/2023	Container	No	
207242	Impinger - 105634/06		04/10/2023	Container	No	
207243	Blank Impinger - 105634/03		04/10/2023	Container	No	
207244	Blank Impinger - 105634/06		04/10/2023	Container	No	

Report No.: 23-10725-1

Key Code	Description
N	Not Accredited Test
U	UKAS Accredited Test - UKAS accreditation is only implied if the report carries the UKAS logo
UF	UKAS Flexible Scope Test
M	MCERTS Accredited Test - MCERTS accreditation is only implied if the report carries the MCERTS logo
O	Marine Management Organisation (MMO) Validated
SN	Subcontracted to approved laboratory not accredited for the test
SU	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
SIN	Subcontracted to internal RPS Group laboratory not accredited for the test
SIU	Subcontracted to internal RPS Group laboratory UKAS Accredited for the test
SIM	Subcontracted to internal RPS Group laboratory MCERTS/UKAS Accredited for the test
I/S (in results)	Insufficient Sample
U/S (in results)	Unsuitable Sample
S/C (in results)	See Comments
ND (in results)	Not Detected
L (in results)	Result is outside normal limits

Please note that all samples will be destroyed 4 WEEKS after the report has been issued, with the exception of asbestos samples.

Note: Sample retention may be subject to agreement with the customer for particular projects

Certificate Notes	Description
Note 1	This test report shall not be reproduced except in full, without written approval of the Laboratory.
Note 2	Unless otherwise stated, results are not corrected for analytical recoveries.
Note 3	Samples were taken by the customer and, unless otherwise stated, sampling locations were not supplied.
Note 4	Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
Note 5	Unless otherwise stated, method D9 conditioning temperatures are 180°C for pre-weigh and 160°C for re-weigh.
Note 6	The PDF version of the certificate is the definitive copy and the Excel version is uncontrolled and provided for information only.
Note 7	For asbestos analysis, all records, communications and reports pertaining to the analysis are retained for five years from the date of issue of the report. The sample analysed is retained for six months.
Note 8	For asbestos analysis, method of analysis used is stereo microscopy, polarised light microscopy and dispersion staining.

Note: Where the following information is included in this certificate, it has usually been supplied by the customer: Customer Sample ID, Sample Location, Sampling Date and Sample Air Volumes. The laboratory shall not be responsible for any information that is supplied by the customer that may affect the validity of results.

Report No.: 23-10725-1

Determinand	CAS No	Media	SOP	% Recovery	% Uncertainty
acetaldehyde	75-07-0	tube	A40	98	16.2
benzaldehyde	100-52-7	tube	A40	100	19.4
butyraldehyde	123-72-8	tube	A40	92	11.5
formaldehyde	50-00-0	tube	A40	97	12.8
hexanal	66-25-1	tube	A40	89	11
propionaldehyde	123-38-6	tube	A40	96	12.6
valeraldehyde	110-62-3	tube	A40	93	12.3
ammonia	7664-41-7	sulphuric acid solution	A6	n/a	8.9
chlorine	7782-50-5	sodium hydroxide solution	C27	n/a	15.2
hydrogen bromide	10035-10-6	sulphuric acid solution	C27	n/a	10.9
hydrogen chloride	7647-01-0	deionised water	C27	n/a	7.9
hydrogen chloride	7647-01-0	sulphuric acid solution	C27	n/a	13.3
hydrogen fluoride	7664-3-3	sodium hydroxide solution	C27	n/a	7.9
sulphur dioxide	7446-09-5	hydrogen peroxide solution	C27	n/a	7.7
nitrogen oxide	10102-43-9	potassium permanganate solution	C27	n/a	11.7
particulates	n/a	filter	D9	n/a	12.2
particulates	n/a	wash solution	D9	n/a	14.8
formaldehyde	50-00-0	deionised water	M103	n/a	23.7
2,4- & 2,6-toluene diisocyanate (TDI)	n/a	filter	M119	n/a	8.6
hexamethylene diisocyanate (HDI)	822-06-0	filter	M119	n/a	5.6
methylene diphenyl diisocyanate (MDI)	101-68-8	filter	M119	n/a	11.8
hydrogen sulphide	7783-06-4	zinc acetate solution	M120	n/a	4.2
antimony	7440-36-0	filter	M31	n/a	10.3
arsenic	7440-38-2	filter	M31	n/a	17.1
cadmium	7440-43-9	filter	M31	n/a	12.1
chromium	7440-47-3	filter	M31	n/a	17.1
cobalt	7440-48-4	filter	M31	n/a	13.1
copper	7440-50-8	filter	M31	n/a	14
lead	7439-92-1	filter	M31	n/a	9.8
manganese	7439-96-5	filter	M31	n/a	17.5
nickel	7440-02-0	filter	M31	n/a	14.4
thallium	7440-28-0	filter	M31	n/a	15.3
tin	7440-31-5	filter	M31	n/a	18.5
vanadium	7440-62-2	filter	M31	n/a	12.1
zinc	7440-66-6	filter	M31	n/a	15.2
antimony	7440-36-0	nitric acid wash	M31	n/a	10.3
arsenic	7440-38-2	nitric acid wash	M31	n/a	17.1
cadmium	7440-43-9	nitric acid wash	M31	n/a	12.1
chromium	7440-47-3	nitric acid wash	M31	n/a	17.1
cobalt	7440-48-4	nitric acid wash	M31	n/a	13.1
copper	7440-50-8	nitric acid wash	M31	n/a	14
lead	7439-92-1	nitric acid wash	M31	n/a	9.8
manganese	7439-96-5	nitric acid wash	M31	n/a	17.5
nickel	7440-02-0	nitric acid wash	M31	n/a	14.4
selenium	7782-49-2	nitric acid wash	M31	n/a	15.1
thallium	7440-28-0	nitric acid wash	M31	n/a	15.3
tin	7440-31-5	nitric acid wash	M31	n/a	18.5
vanadium	7440-62-2	nitric acid wash	M31	n/a	12.1
zinc	7440-66-6	nitric acid wash	M31	n/a	15.2
antimony	7440-36-0	nitric/peroxide solution	M31	n/a	5.9
arsenic	7440-38-2	nitric/peroxide solution	M31	n/a	6.8
cadmium	7440-43-9	nitric/peroxide solution	M31	n/a	6.3
chromium	7440-47-3	nitric/peroxide solution	M31	n/a	7.2
cobalt	7440-48-4	nitric/peroxide solution	M31	n/a	5.2
copper	7440-50-8	nitric/peroxide solution	M31	n/a	6.8
lead	7439-92-1	nitric/peroxide solution	M31	n/a	8.6
manganese	7439-96-5	nitric/peroxide solution	M31	n/a	9.6
nickel	7440-02-0	nitric/peroxide solution	M31	n/a	5.5
selenium	7782-49-2	nitric/peroxide solution	M31	n/a	8.7
thallium	7440-28-0	nitric/peroxide solution	M31	n/a	7.7
tin	7440-31-5	nitric/peroxide solution	M31	n/a	5.8
vanadium	7440-62-2	nitric/peroxide solution	M31	n/a	6.7
zinc	7440-66-6	nitric/peroxide solution	M31	n/a	11.9
1,2,4-trimethylbenzene	95-63-6	tube	O8	88	8.1
1,3,5-trimethylbenzene	108-67-8	tube	O8	92	7.7
2-ethyltoluene	611-14-3	tube	O8	91	8.4
3- & 4-ethyltoluene	n/a	tube	O8	91	8.4
benzene	71-43-2	tube	O8	90	13.9
butyl acetate	123-86-4	tube	O8	90	10.3
decane	124-18-5	tube	O8	97	6.7
dichloromethane	75-09-2	tube	O8	88	24
ethyl acetate	141-78-6	tube	O8	n/a	n/a
ethyl benzene	100-41-4	tube	O8	92	9.8
heptane	142-82-5	tube	O8	94	10.5
hexane	110-54-3	tube	O8	n/a	n/a
limonene	138-86-3	tube	O8	93	13
m- & p-xylene	n/a	tube	O8	90	9.3
methyl isobutyl ketone (MIBK)	108-10-1	tube	O8	86	10
methyl tert-butyl ether (MTBE)	1634-04-4	tube	O8	92	15
o-xylene	95-47-6	tube	O8	86	9.9
propylbenzene	103-65-1	tube	O8	92	7.5
tetrachloroethylene	127-18-4	tube	O8	91	9.3
tetrahydrofuran (THF)	109-99-9	tube	O8	87	14.7
toluene	108-88-3	tube	O8	89	10.7
trichloroethylene	79-01-6	tube	O8	91	10.6
m- & p-cresol	n/a	tube	P1	n/a	11
m- & p-xenol	n/a	tube	P1	n/a	11.9
o-cresol	95-48-7	tube	P1	n/a	10.8
o-xenol	526-75-0	tube	P1	n/a	12
phenol	108-95-2	tube	P1	n/a	10.4

Certificate of Analysis

Report No.: 23-10726-1

Issue No.: 1

Date of Issue 23/10/2023

Customer Details: Anchem Laboratories Ltd, Unit 5A, D'Arcy Business Park, D'Arcy Way, Llandarcy, Neath, SA10 6EJ, Wales

Customer Contact: Philip Ruck

Customer Order No.: 2023/250

Customer Reference: Not Supplied

Quotation Reference: Q23-05735

Description: 7 liquid samples

Date Received: 10/10/2023

Date Started: 10/10/2023

Date Completed: 23/10/2023

Test Methods: Details available on request (refer to SOP code against relevant result/s)

Notes: None



Approved By: Joanne Dewhurst, Operational Manager

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service.

This certificate shall not be reproduced except in full without the prior written approval of the laboratory.

Observations and interpretations are outside of the scope of UKAS accreditation.

Results reported herein relate only to the items supplied to the laboratory for testing.

Results on an Interim Report are not dry-weight corrected.

Where the laboratory is not responsible for the sampling, results apply to the sample(s) as they were received.

The laboratory shall not be responsible for any information that is supplied by the customer that may affect the validity of results.



0605



rpsgroup.com

RPS Environmental Management Limited trading as RPS Laboratories. Registered in England No. 01756175.

Unit 12, Waters Edge Business Park, Modwen Road, Salford, M5 3EZ. T +44 161 872 2443

A member of the RPS Group plc. Terms and conditions apply - copy on request

Results Summary

Report No.: 23-10726-1

Customer Reference: Not Supplied

Customer Order No: 2023/250

Customer Sample No	Impinger 1 & 2 Solution - 105634/01	Impinger 1 & 2 Solution - 105634/04	Impinger 1 & 2 & 3 Blank Solution - 105634/01	Impinger 1 & 2 & 3 Blank Solution - 105634/04	Impinger 3 Solution - 105634/01	Impinger 3 Solution - 105634/04	Blank Absorption solution					
	RPS Sample No	207245	207246	207247	207248	207249	207250	207251				
	Sample Matrix	SOLUTION	SOLUTION	SOLUTION	SOLUTION	SOLUTION	SOLUTION	SOLUTION				
	Sampling Date	04/10/2023	04/10/2023	04/10/2023	04/10/2023	04/10/2023	04/10/2023	04/10/2023				
Determinand		CAS No	Codes	SOP	RL	Units						
volume of sample supplied		U	N/A	n/a	ml	447	275	305	272	155	282	192
ammonia	7664-41-7	UM	A6	0.1	ug/mL	151	6.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Deviating Samples

Report No.: 23-10726-1

Customer Reference: Not Supplied

Customer Order No: 2023/250

Our policy on Deviating Samples has been implemented in accordance with UKAS Policy on Deviating Samples (TPS63).

RPS is not responsible for the integrity of samples as received, unless RPS personnel performed the sampling. Samples submitted may be declared to be deviating.

Where applicable the analysis method remains UKAS accredited, however results reported for a deviating sample may be compromised.

Where no sampling date was supplied, samples have been declared to be deviating. If the date can be supplied, results may be reissued if assessed not deviating.

Where the sample container used was unsuitable or broken, the sample is flagged as deviating and re-sampling/re-submission may be required.

RPS No.	Customer No.	Customer ID	Date Sampled	Containers Received	Deviating	Reason for Deviation
207245	Impinger 1 & 2 Solution - 105634/01		04/10/2023	Container	No	
207246	Impinger 1 & 2 Solution - 105634/04		04/10/2023	Container	No	
207247	Impinger 1 & 2 & 3 Blank Solution - 105634/01		04/10/2023	Container	No	
207248	Impinger 1 & 2 & 3 Blank Solution - 105634/04		04/10/2023	Container	No	
207249	Impinger 3 Solution - 105634/01		04/10/2023	Container	No	
207250	Impinger 3 Solution - 105634/04		04/10/2023	Container	No	
207251	Blank Absorption solution		04/10/2023	Container	No	

Report No.: 23-10726-1

Key Code	Description
N	Not Accredited Test
U	UKAS Accredited Test - UKAS accreditation is only implied if the report carries the UKAS logo
UF	UKAS Flexible Scope Test
M	MCERTS Accredited Test - MCERTS accreditation is only implied if the report carries the MCERTS logo
O	Marine Management Organisation (MMO) Validated
SN	Subcontracted to approved laboratory not accredited for the test
SU	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
SIN	Subcontracted to internal RPS Group laboratory not accredited for the test
SIU	Subcontracted to internal RPS Group laboratory UKAS Accredited for the test
SIM	Subcontracted to internal RPS Group laboratory MCERTS/UKAS Accredited for the test
I/S (in results)	Insufficient Sample
U/S (in results)	Unsuitable Sample
S/C (in results)	See Comments
ND (in results)	Not Detected
L (in results)	Result is outside normal limits

Please note that all samples will be destroyed 4 WEEKS after the report has been issued, with the exception of asbestos samples.

Note: Sample retention may be subject to agreement with the customer for particular projects

Certificate Notes	Description
Note 1	This test report shall not be reproduced except in full, without written approval of the Laboratory.
Note 2	Unless otherwise stated, results are not corrected for analytical recoveries.
Note 3	Samples were taken by the customer and, unless otherwise stated, sampling locations were not supplied.
Note 4	Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
Note 5	Unless otherwise stated, method D9 conditioning temperatures are 180°C for pre-weigh and 160°C for re-weigh.
Note 6	The PDF version of the certificate is the definitive copy and the Excel version is uncontrolled and provided for information only.
Note 7	For asbestos analysis, all records, communications and reports pertaining to the analysis are retained for five years from the date of issue of the report. The sample analysed is retained for six months.
Note 8	For asbestos analysis, method of analysis used is stereo microscopy, polarised light microscopy and dispersion staining.

Note: Where the following information is included in this certificate, it has usually been supplied by the customer: Customer Sample ID, Sample Location, Sampling Date and Sample Air Volumes. The laboratory shall not be responsible for any information that is supplied by the customer that may affect the validity of results.

Report No.: 23-10726-1

Determinand	CAS No	Media	SOP	% Recovery	% Uncertainty
acetaldehyde	75-07-0	tube	A40	98	16.2
benzaldehyde	100-52-7	tube	A40	100	19.4
butyraldehyde	123-72-8	tube	A40	92	11.5
formaldehyde	50-00-0	tube	A40	97	12.8
hexanal	66-25-1	tube	A40	89	11
propionaldehyde	123-38-6	tube	A40	96	12.6
valeraldehyde	110-62-3	tube	A40	93	12.3
ammonia	7664-41-7	sulphuric acid solution	A6	n/a	8.9
chlorine	7782-50-5	sodium hydroxide solution	C27	n/a	15.2
hydrogen bromide	10035-10-6	sulphuric acid solution	C27	n/a	10.9
hydrogen chloride	7647-01-0	deionised water	C27	n/a	7.9
hydrogen chloride	7647-01-0	sulphuric acid solution	C27	n/a	13.3
hydrogen fluoride	7664-3-3	sodium hydroxide solution	C27	n/a	7.9
sulphur dioxide	7446-09-5	hydrogen peroxide solution	C27	n/a	7.7
nitrogen oxide	10102-43-9	potassium permanganate solution	C27	n/a	11.7
particulates	n/a	filter	D9	n/a	12.2
particulates	n/a	wash solution	D9	n/a	14.8
formaldehyde	50-00-0	deionised water	M103	n/a	23.7
2,4- & 2,6-toluene diisocyanate (TDI)	n/a	filter	M119	n/a	8.6
hexamethylene diisocyanate (HDI)	822-06-0	filter	M119	n/a	5.6
methylene diphenyl diisocyanate (MDI)	101-68-8	filter	M119	n/a	11.8
hydrogen sulphide	7783-06-4	zinc acetate solution	M120	n/a	4.2
antimony	7440-36-0	filter	M31	n/a	10.3
arsenic	7440-38-2	filter	M31	n/a	17.1
cadmium	7440-43-9	filter	M31	n/a	12.1
chromium	7440-47-3	filter	M31	n/a	17.1
cobalt	7440-48-4	filter	M31	n/a	13.1
copper	7440-50-8	filter	M31	n/a	14
lead	7439-92-1	filter	M31	n/a	9.8
manganese	7439-96-5	filter	M31	n/a	17.5
nickel	7440-02-0	filter	M31	n/a	14.4
thallium	7440-28-0	filter	M31	n/a	15.3
tin	7440-31-5	filter	M31	n/a	18.5
vanadium	7440-62-2	filter	M31	n/a	12.1
zinc	7440-66-6	filter	M31	n/a	15.2
antimony	7440-36-0	nitric acid wash	M31	n/a	10.3
arsenic	7440-38-2	nitric acid wash	M31	n/a	17.1
cadmium	7440-43-9	nitric acid wash	M31	n/a	12.1
chromium	7440-47-3	nitric acid wash	M31	n/a	17.1
cobalt	7440-48-4	nitric acid wash	M31	n/a	13.1
copper	7440-50-8	nitric acid wash	M31	n/a	14
lead	7439-92-1	nitric acid wash	M31	n/a	9.8
manganese	7439-96-5	nitric acid wash	M31	n/a	17.5
nickel	7440-02-0	nitric acid wash	M31	n/a	14.4
selenium	7782-49-2	nitric acid wash	M31	n/a	15.1
thallium	7440-28-0	nitric acid wash	M31	n/a	15.3
tin	7440-31-5	nitric acid wash	M31	n/a	18.5
vanadium	7440-62-2	nitric acid wash	M31	n/a	12.1
zinc	7440-66-6	nitric acid wash	M31	n/a	15.2
antimony	7440-36-0	nitric/peroxide solution	M31	n/a	5.9
arsenic	7440-38-2	nitric/peroxide solution	M31	n/a	6.8
cadmium	7440-43-9	nitric/peroxide solution	M31	n/a	6.3
chromium	7440-47-3	nitric/peroxide solution	M31	n/a	7.2
cobalt	7440-48-4	nitric/peroxide solution	M31	n/a	5.2
copper	7440-50-8	nitric/peroxide solution	M31	n/a	6.8
lead	7439-92-1	nitric/peroxide solution	M31	n/a	8.6
manganese	7439-96-5	nitric/peroxide solution	M31	n/a	9.6
nickel	7440-02-0	nitric/peroxide solution	M31	n/a	5.5
selenium	7782-49-2	nitric/peroxide solution	M31	n/a	8.7
thallium	7440-28-0	nitric/peroxide solution	M31	n/a	7.7
tin	7440-31-5	nitric/peroxide solution	M31	n/a	5.8
vanadium	7440-62-2	nitric/peroxide solution	M31	n/a	6.7
zinc	7440-66-6	nitric/peroxide solution	M31	n/a	11.9
1,2,4-trimethylbenzene	95-63-6	tube	O8	88	8.1
1,3,5-trimethylbenzene	108-67-8	tube	O8	92	7.7
2-ethyltoluene	611-14-3	tube	O8	91	8.4
3- & 4-ethyltoluene	n/a	tube	O8	91	8.4
benzene	71-43-2	tube	O8	90	13.9
butyl acetate	123-86-4	tube	O8	90	10.3
decane	124-18-5	tube	O8	97	6.7
dichloromethane	75-09-2	tube	O8	88	24
ethyl acetate	141-78-6	tube	O8	n/a	n/a
ethyl benzene	100-41-4	tube	O8	92	9.8
heptane	142-82-5	tube	O8	94	10.5
hexane	110-54-3	tube	O8	n/a	n/a
limonene	138-86-3	tube	O8	93	13
m- & p-xylene	n/a	tube	O8	90	9.3
methyl isobutyl ketone (MIBK)	108-10-1	tube	O8	86	10
methyl tert-butyl ether (MTBE)	1634-04-4	tube	O8	92	15
o-xylene	95-47-6	tube	O8	86	9.9
propylbenzene	103-65-1	tube	O8	92	7.5
tetrachloroethylene	127-18-4	tube	O8	91	9.3
tetrahydrofuran (THF)	109-99-9	tube	O8	87	14.7
toluene	108-88-3	tube	O8	89	10.7
trichloroethylene	79-01-6	tube	O8	91	10.6
m- & p-cresol	n/a	tube	P1	n/a	11
m- & p-xenol	n/a	tube	P1	n/a	11.9
o-cresol	95-48-7	tube	P1	n/a	10.8
o-xenol	526-75-0	tube	P1	n/a	12
phenol	108-95-2	tube	P1	n/a	10.4

APPENDIX 7

Instrument Analyser Details

(2 Pages)

Principle of Gas Conditioning

The sampling for oxides of nitrogen and carbon monoxide was carried out using a Horiba PG-350 combustion gas analyser fed via a heated sampling system comprising of a sampling probe, 20m sampling line (set at 120°C) and a PD100 permeation dryer gas conditioning system.

The sample gas enters a heated filter (approx. 100°C), separating all particles larger than 2µm. After filtration the sample gas proceeds to the permeation dryer, equipped with a temperature gradient. The installed permeation dryer is operated with dry purge gas, running in inverted direction flow. Due to the difference in partial pressure between sample and purge gas, humidity is driven out of the sample by equalization. The water is extracted from the sample gas through a semi permeable membrane and transported into an outer tube filled with the purge gas. This process does not have a distinguishable effect on the sample gas composition. The conditioned gas is then passed to the gas analyser for quantification.

Oxides of nitrogen are analysed using a standard technique called Chemiluminescence and during the sampling was set to cover the range 0-500 ppm for Line 3 Cupola and range 0 – 250 ppm for line 2 Cupola.

Carbon monoxide is analysed using a standard technique called Non-dispersive infra-red spectroscopy (N.D.I.R.) and was set to cover the range 0-200 ppm

Performance Characteristic	Minimum performance characteristic			
	NO _x	CO	O ₂	SO ₂
Response Time (Required)	≤200 s	≤200 s	≤200 s	≤200 s
Results	<50	<50	<40	<60
Detection Limit	≤± 2% Range	≤± 2% Range	≤± 0.2% relative of Range	≤± 2%
Results	<0.1	<0.2	<0.05	<0.15
Lack of Fit (Linearity)	≤± 2% Range	≤± 2% Range	≤± 0.3% volume	≤± 2%
Results	<2 (R ² >0.9996)	<2 (R ² >0.9999)	<2 (R ² >0.9998)	<2 (R ² >0.9997)
Zero Drift	≤± 2% Range/24 hours	≤± 2% Range/24 hours	≤± 0.2% Volume/24 hours	≤± 2%/24 hours
Results	0.05%	0.08%	0.02%	0.04%
Span Drift	≤± 2% Range/24 hours	≤± 2% Range/24 hours	≤± 0.2% Volume/24 hours	≤± 2%/24 hours
Results	0.69%	0.09%	0.00%	0.49%
Sensitivity to Atmos Pressure	≤± 3% Range/2 kPa	≤± 3% Range/2 kPa	≤± 3% of Range for 2 kPa	≤± 3%/2 kPa
Results	≤± 3% Range/2 kPa	≤± 3% Range/2 kPa	≤± 3% of Range for 2 kPa	≤± 3%/2 kPa
Sensitivity to Sample Volume/pressure	-	-	-	≤± 1%
Results	-	-	-	≤± 1%
Sensitivity to ambient temperature	≤± 3% Range/10 K	≤± 3% Range/10 K	≤± 0.3% Volume/10 K	≤± 3% Range/10 K
Results	≤± 3% Range/10 K	≤± 3% Range/10 K	≤± 0.3% Volume/10 K	≤± 3% Range/10 K
Sensitivity to Electric Voltage	≤± 2% Range/10 V	≤± 2% Range/10 V	≤± 0.1% Volume/10 V	≤± 2% Range/10 V
Results	≤± 2% Range/10 V	≤± 2% Range/10 V	≤± 0.1% Volume/10 V	≤± 2% Range/10 V
Interferents	Total ≤± 4% Range	Total ≤± 4% Range	Total ≤± 0.2% Volume	Total ≤± 4%
Results	-0.52%	-0.87%	0%	-1.82%
Converter Efficiency	≥95.0%			
Results	95.20%			
Losses & Leakage in Sampling Line and Conditioning System	≤± 2% of measured value	≤± 2% of measured value	≤± 2.0% relative of the measured value	≤± 5%
Results	<2%	<2%	<2%	<5%
Std Deviation of repeatability in Lab at zero	≤± 1% Range	≤± 1% Range	≤± 0.20% relative of the range	≤± 1%
Results	0.04%	0.23%	0.09%	0.09%
Std Deviation of repeatability in Lab at span level	≤± 2% Range	≤± 2% Range	≤± 0.40% relative of the range	≤± 2%
Results	0.30%	0.22%	0.07%	0.42%

APPENDIX 8

(Annual calibration details & analysis data retained at permanent laboratory)