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Stack Emissions Testing Report Commissioned by
Henkel AG & Company

Installation Name & Address

Henkel AG & Company
5 Cromwell Road
St Neots
Cambridgeshire
PE19 1QL

Stack Reference

Conservation Vents

Dates of the Monitoring Campaign

24th October 2019

Job Reference Number

EST-5222

Report Written by

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Report Date

5th November 2019

Version

Version 1

Signature of Report Approver



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Executive Summary

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MONITORING OBJECTIVES

Henkel AG & Company, St Neots
Conservation Vents
24th October 2019

Overall Aim of the Monitoring Campaign

Element were commissioned by Henkel AG & Company to carry out stack emissions testing on the Conservation Vents at St Neots.

The aim of the monitoring campaign was to perform testing, as requested by the customer, for a number of prescribed pollutants. There are no emission limits set for any of the pollutants at this time.

Special Requirements

There were no special requirements.

Target Parameters

Total VOCs (as Carbon)

Executive Summary

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MONITORING RESULTS

Henkel AG & Company, St Neots
Conservation Vents
24th October 2019

where MU = Measurement Uncertainty associated with the Result

Concentration				
Parameter	Units	Result	MU +/-	Limit
Total VOCs (as Carbon)	¹ mg/m ³	107	4.3	-
Water Vapour	% v/v	0.94	2.2	

¹ Reference Conditions (REF) are: 273K, 101.3kPa, without correction for water vapour content.

Executive Summary
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MONITORING DATE(S) & TIMES

Henkel AG & Company, St Neots
Conservation Vents
24th October 2019

Parameter	Units	Concentration		Sampling Date(s)	Sampling Times	Duration mins
Total VOCs (as Carbon)	R1	mg/m³	257	24/10/2019	09:25 - 09:40	15
Total VOCs (as Carbon)	R2	mg/m³	21.4	24/10/2019	10:03 - 10:18	15
Total VOCs (as Carbon)	R3	mg/m³	42.0	24/10/2019	10:37 - 10:52	15
Water Vapour	R1	% v/v	1.2	24/10/2019	09:25 - 09:40	15
Water Vapour	R2	% v/v	0.67	24/10/2019	10:03 - 10:18	15
Water Vapour	R3	% v/v	1.0	24/10/2019	10:37 - 10:52	15

All results are expressed at the respective reference conditions.

Executive Summary

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PROCESS DETAILS

Henkel AG & Company, St Neots
Conservation Vents
24th October 2019

Standard Operating Conditions

Parameter	Value
Process Status	Normal Operation
Capacity (of 100%) and Tonnes / Hour	Full Operation
Continuous or Batch Process	Batch
Feedstock (if applicable)	Various Applications
Abatement System	None
Abatement System Running Status	N/A
Fuel	N/A
Plume Appearance	None Visible

Site Specific Operating Conditions

Parameter	Status
Test Run 1	Mixer SLC 1 to Bulk Tank BT3
Test Run 2	Storage Tank ST1 to Mixing Vessel SLC 1
Test Run 3	Homegenising From Bulk Tank BT1 to Bulk Tank BT2

Executive Summary

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MONITORING & ANALYTICAL METHODS

Henkel AG & Company, St Neots
 Conservation Vents
 24th October 2019

Parameter	Monitoring				Analysis				MCERTS Testing	LOD (Average)
	Standard	Technical Procedure	ISO 17025 Testing	Testing Lab	Analytical Procedure	Analytical Technique	ISO 17025 Analysis	Analysis Lab		
Water Vapour	EN 14790	CAT-TP-05	Yes	EET	CAT-TP-05	Gravimetric	Yes	EET	Yes	0.1 % v/v
Total VOCs (as Carbon)	EN 12619:2013	CAT-TP-20	Yes	EET	Flame Ionisation Detection by Sick 3006 FID				Yes	0.32 mg/m³

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
All Parameters	All Runs	End of pipe sampling was necessary as there were no sampling ports installed on the stack.
Total VOC's	All Runs	All sample gas was extracted from the stack via a pre-installed length of unheated tubing. The integrity of this tubing could not be accessed. Exova Catalyst's sampling equipment was leak checked as per the requirements of the standard.
Water Vapour	All Runs	The measurement uncertainty for water vapour was greater than 20%. This was due to the low level of water vapour which was found to be present in the stack.

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SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	-
Width	m	-
Area	m ²	-
Port Depth	cm	-
Orientation of Duct	-	Vertical
Number of Ports	-	-
Sample Port Size	-	-

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	On Ground
Inside / Outside	Inside

Platform Details

EA Technical Guidance Note M1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	N/A
Platform has vertical base boards (approx. 0.25m high)	N/A
Platform has chains / self closing gates at top of ladders	N/A
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

All platforms should be designed in accordance with the requirements in the Environment Agency's Technical Guidance Note M1 and EN 15259.

EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

Executive Summary

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PLANT PHOTOS

Photo 1

Photo 2

None Available

None Available

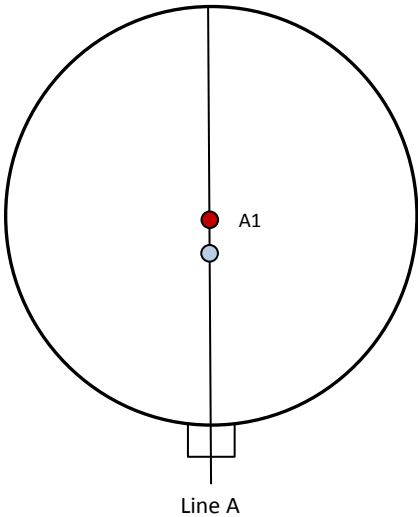
Photo 3

Photo 4

None Available

None Available

SAMPLE POINTS



- where
- = isokinetic point sampled at
 - = isokinetic point not sampled at
 - = combustion gases sample point
 - = non-isokinetic sample point

APPENDICES

APPENDIX CONTENTS

APPENDIX 1 - Stack Emissions Monitoring Personnel, List of Equipment & Methods and Technical Procedures Used

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

APPENDIX 1

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Harpreet Badwal	MCERTS Level 2	MM 03 149	TE1 TE2 TE3 TE4
Technician	Lee Heaton	MCERTS Level 1	MM 17 1433	None

LIST OF EQUIPMENT

Extractive Sampling		Instrumental Analysers		Miscellaneous Items	
Equipment Type	Equipment I.D.	Equipment Type	Equipment I.D.	Equipment Type	Equipment I.D.
Control Box DGM (1)	-	Horiba PG-350E	-	Digital Manometer (1)	-
Control Box DGM (2)	-	Horiba PG-250	-	Digital Manometer (2)	-
Box Thermocouples (1)	-	Servomex 5200 MP	-	Digital Temperature Meter	-
Box Thermocouples (2)	-	Eco Physics CLD 822Mh	-	Stopwatch	CAT 14.84
Umbilical (1)	-	ABB AO2020-URAS26	-	Barometer	CAT 13.40
Umbilical (2)	-	Testo 350 XL	-	Stack Thermocouple (1)	-
Oven Box (1)	-	Ankersmid APS 313	-	Stack Thermocouple (2)	-
Oven Box (2)	-	Gasmeter DX4000	-	Stack Thermocouple (3)	-
Heated Probe (1)	-	Gasmeter Sampling System	-	1m Heated Line (1)	-
Heated Probe (2)	-	Bernath 3006 FID	CAT 8.31	1m Heated Line (2)	-
Heated Probe (3)	-	M&C PSS	CAT 12.107	1m Heated Line (3)	-
S-Pitot (1)	-	Mass Flow Controller (1)	CAT 6.61	5m Heated Line (1)	-
S-Pitot (2)	-	Mass Flow Controller (2)	CAT 6.62	15m Heated Line (1)	-
L-Pitot	-	Mass View (1)	CAT 25.59	20m Heated Line (1)	-
Site Balance	CAT 17.33	Mass View (2)	CAT 25.60	20m Heated Line (2)	-
500g / 1Kg Check Weights	CAT 17.33 a & b	Hioki 5043 (V)	CAT 11.69	Dual Channel Heater Controller	-
Last Impinger Arm	-	Easylogger EN-EL-12 Bit	-	Single Channel Heater Controller	-
Callipers	-	Bioaerosols Temperature Logger	-	Laboratory Balance	-
Tubes Kit Thermocouple	-	Electronic Refrigerator	-	Tape Measure	CAT 16.45

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Water Vapour	EN 14790	CAT-TP-05
Total VOCs (as Carbon)	EN 12619:2013	CAT-TP-20

APPENDIX 2

WATER VAPOUR: RESULTS SUMMARY

Henkel AG & Company, St Neots
Conservation Vents

Sample Runs

Parameter	Units	Run 1	Run 2	Run 3		Mean
Concentration	% v/v	1.2	0.67	0.96		0.94
Uncertainty	±% v/v	2.1	2.4	2.3		2.2

General Sampling Information

Parameter	Value
Standard	EN 14790
Technical Procedure	CAT-TP-05

WATER VAPOUR: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1	Run 2	Run 3	
Sampling Times	-	09:25 - 09:40	10:03 - 10:18	10:37 - 10:52	
Sampling Dates	-	24/10/2019	24/10/2019	24/10/2019	
Sampling Device	-	MFC / MV	MFC / MV	MFC / MV	
Duration	mins	15	15	15	
Volume Sampled (STP, Dry)	m ³	0.0417	0.0367	0.0384	
Volume Sampled (STP, Wet)	m ³	0.0422	0.0369	0.0388	
Sample Flow Rate	l/min	2.78	2.44	2.56	
Liquid Trap Start Mass	g	4142.7	4140.5	4137.7	
Liquid Trap End Mass	g	4140.5	4137.7	4135.3	
Silica Trap Start Mass	g	1447.6	1450.2	1453.2	
Silica Trap End Mass	g	1450.2	1453.2	1455.9	
Total Mass Of Water Vapour	g	0.4	0.2	0.3	
Calculated Water Vapour	% v/v	1.18	0.67	0.96	

Where: MFC stands for Mass Flow Controller, MV stands for Mass View Flowmeter

APPENDIX 2

WATER VAPOUR: QUALITY ASSURANCE

Sample Runs

Leak Test Results	Units	Run 1	Run 2	Run 3	
Mean Sampling Rate	l/min	2.8	2.4	2.6	
Pre-Sampling Leak Rate	l/min	0.01	0.01	0.01	
Post-Sampling Leak Rate	l/min	0.01	0.01	0.01	
Allowable Leak Rate	l/min	0.06	0.05	0.05	
Leak Test Acceptable	-	Yes	Yes	Yes	

Water Droplets	Units	Run 1	Run 2	Run 3	
Are Water Droplets Present	-	No	No	No	

Measurement Uncertainty	Units	Run 1	Run 2	Run 3	
Measurement Uncertainty (MU)	%	176.8	353.0	235.5	
Allowable MU	%	20.0	20.0	20.0	
MU Acceptable	%	No	No	No	

Silica Gel	Units	Run 1	Run 2	Run 3	
Less than 50% Faded	%	Yes	Yes	Yes	

Test Conditions	Units	Run 1	Run 2	Run 3	
Ambient Temperature Recorded?	-	Yes	Yes	Yes	

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number			
	1	2	3	
All sample gas was extracted from the stack via a pre-installed length of unheated tubing. The integrity of this tubing could not be accessed. Element's sampling equipment was leak checked as per the requirements of the standard.	x	x	x	
The measurement uncertainty for water vapour was greater than 20%. This was due to the low level of water vapour which was found to be present in the stack.	x	x	x	
End of pipe sampling was necessary as there were no sampling ports installed on the stack.	x	x	x	

APPENDIX 2

WATER VAPOUR: MEASUREMENT UNCERTAINTY CALCULATIONS

Measured Quantities	Value				Standard uncertainty				
	Symbol	Run 1	Run 2	Run 3	Symbol	Units	Run 1	Run 2	Run 3
Sampled Volume (STP)	V_m	0.0417	0.0367	0.0384	uV_m	m ³	0.0008	0.0007	0.0008
Repeatability of Weighing	R_w	0.40	0.20	0.30	uR_w	g	0.12	0.12	0.12
Reading of Balance	R_b	0.40	0.20	0.30	uR_b	g	0.00	0.00	0.00
Leak	L	0.36	0.41	0.39		%	-	-	-

Uncertainty as a Percentage					Requirement of Standard
Measured Quantities	Units	Run 1	Run 2	Run 3	
Sampled Volume (STP)	%	2.00	2.00	2.00	≤2%
Repeatability of Weighing	%	30.00	60.00	40.00	No Requirement
Reading of Balance	%	0.50	0.50	0.50	No Requirement
Leak	%	0.36	0.41	0.39	≤2%

Uncertainty in Measurement Units						Sensitivity Coefficient		
Measured Quantities	Symbol	Units	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3
Sampled Volume (STP)	V_m	m ³	0.0417	0.0367	0.0384	28.29	18.41	25.06
Repeatability of Weighing	R_w	g	0.40	0.20	0.30	2.95	3.37	3.21
Reading of Balance	R_b	g	0.40	0.20	0.30	2.95	3.37	3.21
Leak	L	% v/v	0.00	0.00	0.00	1.00	1.00	1.00

Uncertainty in Result				
Measured Quantities	Units	Run 1	Run 2	Run 3
Sampled Volume (STP)	% v/v	0.024	0.013	0.019
Repeatability of Weighing	% v/v	0.354	0.405	0.385
Reading of Balance	% v/v	0.006	0.003	0.005
Leak	% v/v	0.002	0.002	0.002

Parameter	Units	Run 1	Run 2	Run 3
Combined uncertainty	% v/v	0.35	0.41	0.39
Expanded uncertainty (95% confidence)	% v/v	0.70	0.79	0.76
Expanded uncertainty (95% confidence), estimated with Method Deviations	% v/v	2.09	2.38	2.27
Uncertainty if Water Droplets are present	% v/v	N/A	N/A	N/A
Reported Uncertainty	% v/v	2.09	2.38	2.27
Expanded uncertainty (95% confidence)	%	58.9	117.7	78.5
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	176.8	353.0	235.5
Uncertainty if Water Droplets are present	%	N/A	N/A	N/A
Reported Uncertainty	%	176.8	353.0	235.5

APPENDIX 2

TOTAL VOCs (as CARBON): RESULTS SUMMARY

Henkel AG & Company, St Neots
Conservation Vents

Sample Runs

Parameter	Units	Run 1	Run 2	Run 3	Mean
Concentration	mg/m ³	257	21.4	42.0	107
Uncertainty	±mg/m ³	8.0	2.2	2.6	4.3
Mass Emission	g/hr				
Uncertainty	±g/hr				

General Sampling Information

Parameter	Value
Standard	EN 12619:2013
Technical Procedure	CAT-TP-20
Probe Material	Stainless Steel
Filtration Type / Size	0.1µm Glass Fibre
Heated Head Filter Used	No
Heated Line Temperature	180°C
Span Gas Type	Propane In Synthetic Air (5 Grade)
Span Gas Reference Number	CYL 1.0335a
Span Gas Expiry Date	21/08/2023
Span Gas Start Pressure (bar)	150
Gas Cylinder Concentration (ppm)	79.9
Span Gas Set Point (ppm)	79.90
Span Gas Uncertainty (%)	N/A
Zero Gas Type	Synthetic Air (5 Grade)
Number of Sampling Lines Used	1 / 1
Number of Sampling Points Used	1 / 1
Sample Point I.D.'s	A1

FORMAT: Number Used / Number Required

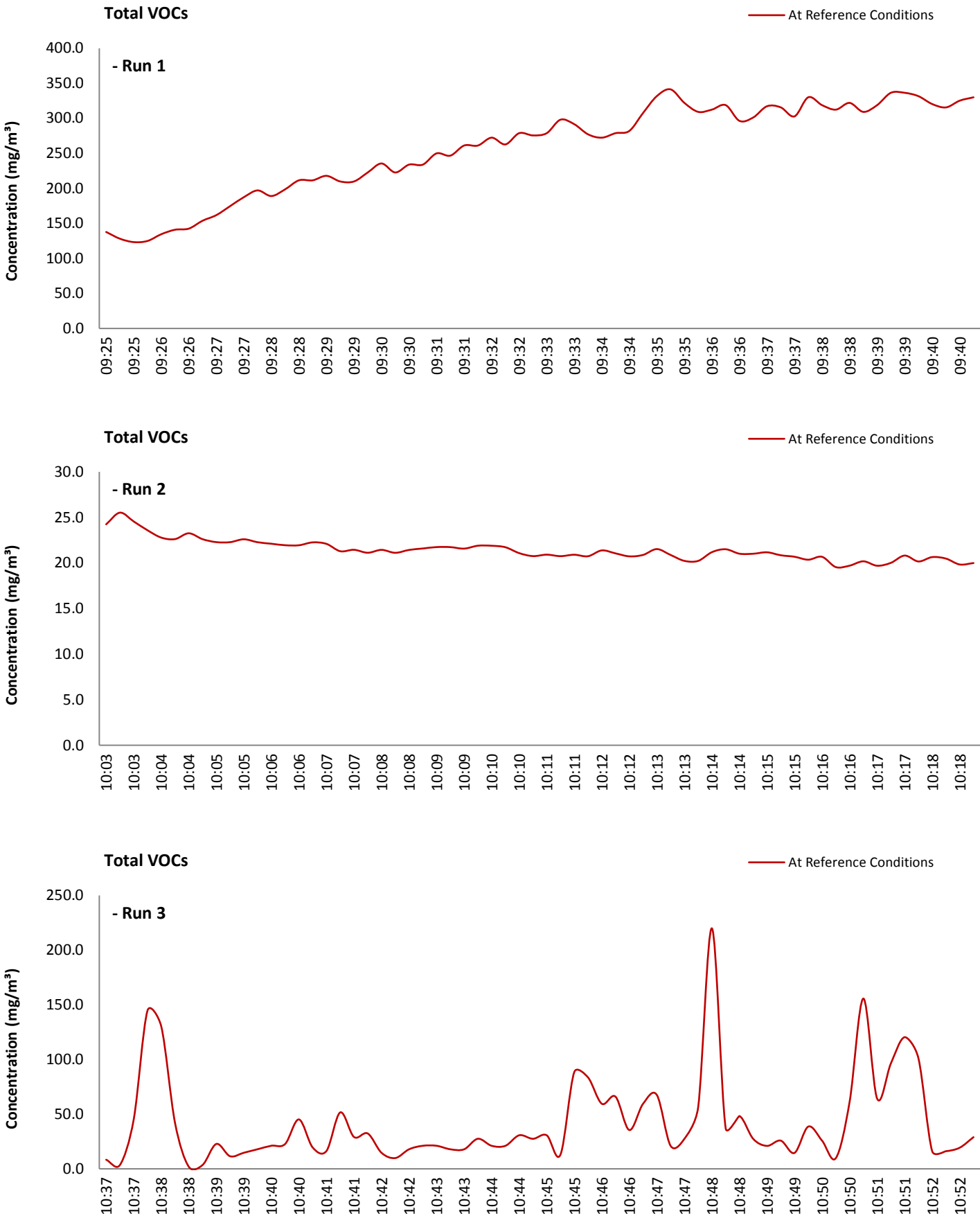
FORMAT: Number Used / Number Required

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL VOCs (as CARBON): DATA TREND

Graphical Trend of Data



TOTAL VOCs (as CARBON): SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1	Run 2	Run 3
Sampling Times	-	09:25 - 09:40	10:03 - 10:18	10:37 - 10:52
Sampling Dates	-	24/10/2019	24/10/2019	24/10/2019
Instrument Range	ppm	1000	1000	1000
Span Gas Value	ppm	79.9	79.9	79.9

Quality Assurance

Zero Drift		Units	Run 1	Run 2	Run 3
CAL 1	Zero Down Sampling Line (Pre)	ppm	0.00	0.00	0.00
	Zero Down Sampling Line (Post)	ppm	1.00	1.00	1.00
	Zero Drift	ppm	1.00	1.00	1.00
	Allowable Zero Drift	± ppm	4.00	4.00	4.00
	Zero Drift Acceptable	-	Yes	Yes	Yes
Span Drift		Units	Run 1	Run 2	Run 3
CAL 1	Span Down Sampling Line (Pre)	ppm	80.00	80.00	80.00
	Span Down Sampling Line (Post)	ppm	81.00	81.00	81.00
	Span Drift	ppm	1.00	1.00	1.00
	Allowable Span Drift	± ppm	4.00	4.00	4.00
	Span Drift Acceptable	-	Yes	Yes	Yes
Test Conditions		Units	Run 1	Run 2	Run 3
Run Ambient Temperature Range		°C	11 - 15	11 - 15	11 - 15

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number		
	1	2	3
All sample gas was extracted from the stack via a pre-installed length of unheated tubing. The integrity of this tubing could not be accessed. Element's sampling equipment was leak checked as per the requirements of the standard.	x	x	x
End of pipe sampling was necessary as there were no sampling ports installed on the stack.	x	x	x

TOTAL VOCs (as CARBON): MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1	RUN 2	RUN 3	Units
Limit value	-	-	-	mg/m ³ (REF)
TGN M2 Allowable MU	15.0	15.0	15.0	%
Measured concentration	259.86	21.62	42.39	mg/m ³ (STP, dry)
Range Used	1000.0	1000.0	1000.0	ppm
Range Used [A]	1606.1	1606.1	1606.1	mg/m ³
Cal gas conc.	79.9	79.9	79.9	ppm
Conversion	1.61	1.61	1.61	ppm to mg/m ³
MCERTS Range [B]	15.0	15.0	15.0	mg/m ³
Lower of [A] or [B]	15.0	15.0	15.0	mg/m ³
Cal gas conc.	128.3	128.3	128.3	mg/m ³

Performance characteristics	RUN 1	RUN 2	RUN 3	Units
Response time	45	45	45	seconds
Number of readings in measurement	15	15	15	-
Repeatability at zero	2.00	2.00	2.00	% full scale
Repeatability at span level	0.00	0.00	0.00	% full scale
Deviation from linearity	0.33	0.33	0.33	% of value
Zero drift	1.25	1.25	1.25	% full scale
Span drift	1.25	1.25	1.25	% full scale
Volume or pressure flow dependence	1.60	1.60	1.60	% of full scale
Atmospheric pressure dependence	0.30	0.30	0.30	% of value/kPa
Ambient temperature dependence	1.40	1.40	1.40	% full scale/10K
Combined interference	0.45	0.45	0.45	% range
Dependence on voltage	0.50	0.50	0.50	% full scale/10V
Losses in the line (leak)	0.00	0.00	0.00	% of value
Uncertainty of calibration gas	2.00	2.00	2.00	% of value

Performance characteristic	RUN 1	RUN 2	RUN 3	Units
Standard deviation of repeatability at zero	use rep at span	use rep at span	use rep at span	mg/m ³
Standard deviation of repeatability at span level	0.00	0.00	0.00	mg/m ³
Lack of fit	0.03	0.03	0.03	mg/m ³
Drift	2.80	1.08	1.23	mg/m ³
Volume or pressure flow dependence	0.00	0.00	0.00	mg/m ³
Atmospheric pressure dependence	0.01	0.01	0.01	mg/m ³
Ambient temperature dependence	0.20	0.20	0.20	mg/m ³
Combined interference (from MCERTS Certificate)	0.04	0.04	0.04	mg/m ³
Dependence on voltage	0.06	0.06	0.06	mg/m ³
Losses in the line (leak)	0.00	0.00	0.00	mg/m ³
Uncertainty of calibration gas	3.00	0.25	0.49	mg/m ³

Measurement uncertainty	Result	RUN 1	RUN 2	RUN 3	Units
Combined uncertainty		259.86	21.62	42.39	mg/m ³
Expanded uncertainty	k = 1.96	8.06	2.22	2.63	mg/m ³
Uncertainty corrected to std conds. (O ₂)		8.06	2.22	2.63	mg/m ³ (REF)

	RUN 1	RUN 2	RUN 3	Units
Expanded uncertainty (no O ₂) - at 95% Confidence	3.10	10.26	6.21	% of Value
Expanded uncertainty (no O ₂) - at 95% Confidence	N/A	N/A	N/A	% at ELV
Overall Allowable uncertainty (no O ₂) - at 95% Confidence	N/A	N/A	N/A	% at ELV
Result of Compliance with Uncertainty Requirement in M2	N/A	N/A	N/A	-

	RUN 1	RUN 2	RUN 3	Units
Expanded uncertainty (with O ₂) - at 95% Confidence	N/A	N/A	N/A	% of Value
Expanded uncertainty (with O ₂) - at 95% Confidence	N/A	N/A	N/A	% at ELV
Overall Allowable uncertainty (with O ₂) - at 95% Confidence	N/A	N/A	N/A	% at ELV
Result of Compliance with Uncertainty Requirement in M2	N/A	N/A	N/A	-

Requirement for SRM is that Uncertainty should be <15% of the value at the ELV, on a dry gas basis, or if O₂ correction is applied less than 15% + the uncertainty associated with the O₂ correction (using sqrt of sum squares to add uncertainty components). Ref EA TGN M2.