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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
Cumulative LEV Extraction

Dates of the Monitoring Campaign
11th December 2018

Job Reference Number
CAT-4566

Report Written by
Harpreet Badwal Team Leader MCERTS Level 2 MM 03 149 TE1 TE2 TE3 TE4

Report Approved by
James Eldridge Regional Manager MCERTS Level 2 MM 05 641 TE1 TE2 TE3 TE4

Report Date
3rd January 2019

Version
Version 1

Signature of Report Approver


CONTENTS

Opinions and interpretations expressed herein are outside the scope of Exova Catalyst's ISO 17025 accreditation.

MONITORING OBJECTIVES

Henkel AG & Company, St Neots
Cumulative LEV Extraction
11th December 2018

Overall Aim of the Monitoring Campaign

Exova Catalyst were commissioned by Henkel AG & Company to carry out stack emissions testing on the Cumulative LEV Extraction 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

MONITORING RESULTS

Henkel AG & Company, St Neots
Cumulative LEV Extraction
11th December 2018

where MU = Measurement Uncertainty associated with the Result

		Concentration		
Parameter	**Units**	**Result**	**MU +/-**	**Limit**
Total VOCs (as Carbon) [1]	mg/m³	302	7.1	-
Water Vapour	% v/v	0.65	1.14	

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

Executive Summary

MONITORING DATE(S) & TIMES

Henkel AG & Company, St Neots
Cumulative LEV Extraction
11th December 2018

Parameter		Units	Concentration		Sampling Date(s)	Sampling Times	Duration mins
Total VOCs (as Carbon)	R1	mg/m³	302		11/12/2018	09:27 - 15:27	360
Water Vapour	R1	% v/v	0.65		11/12/2018	11:05 - 11:35	30

All results are expressed at the respective reference conditions.

Executive Summary

PROCESS DETAILS

Henkel AG & Company, St Neots
Cumulative LEV Extraction
11th December 2018

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 from sampling location

Executive Summary

MONITORING & ANALYTICAL METHODS

Henkel AG & Company, St Neots
Cumulative LEV Extraction
11th December 2018

	Monitoring				Analysis					
Parameter	**Standard**	**Technical Procedure**	**ISO 17025 Testing**	**Testing Lab**	**Analytical Procedure**	**Analytical Technique**	**ISO 17025 Analysis**	**Analysis Lab**	**MCERTS Testing**	**LOD (Average)**
Water Vapour	EN 14790	CAT-TP-05	Yes	CAT	CAT-TP-05	Gravimetric	Yes	CAT	Yes	0.10 % v/v
Total VOCs (as Carbon)	EN 12619:2013	CAT-TP-20	Yes	CAT	Flame Ionisation Detection by Sick 3006 FID				Yes	0.32 mg/m³

ANALYSIS LABORATORIES

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

Exova Catalyst (CAT)	ISO 17025 Accreditation Number: 4279

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
Total VOC's	1	End of pipe sampling was necessary as there were no sampling ports installed on the stack.
Total VOC's	1	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	1	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.

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	-
Width	m	-
Area	m²	-
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

PLANT PHOTOS

Photo 1

None Available

Photo 2

None Available

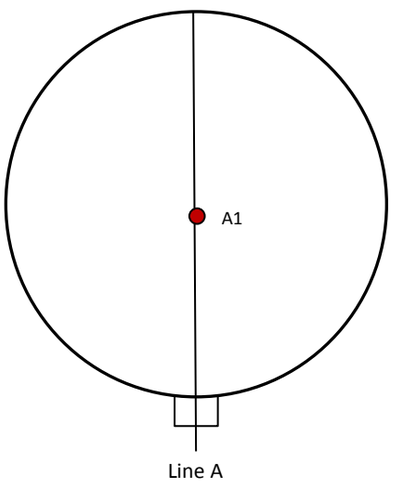
Photo 3

None Available

Photo 4

None Available

SAMPLE POINTS



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

APPENDIX CONTENTS

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
Trainee	Luke Williams	MCERTS Trainee	MM 18 1496	None

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	-
Control Box DGM (2)	-
Box Thermocouples (1)	-
Box Thermocouples (2)	-
Umbilical (1)	-
Umbilical (2)	-
Oven Box (1)	-
Oven Box (2)	-
Heated Probe (1)	-
Heated Probe (2)	-
Heated Probe (3)	-
S-Pitot (1)	-
S-Pitot (2)	-
L-Pitot	-
Site Balance	CAT 17.33
500g / 1Kg Check Weights	CAT 17.33 a & b
Last Impinger Arm	-
Callipers	-
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-350E	-
Horiba PG-250	-
Servomex 4900	-
Eco Physics CLD 822Mh	-
ABB AO2020-URAS26	-
Testo 350 XL	-
Ankersmid APS 313	-
Gasmet DX4000	-
Gasmet Sampling System	-
Bernath 3006 FID	CAT 8.31
M&C PSS	-
Mass Flow Controller (1)	CAT 6.61
Mass Flow Controller (2)	CAT 6.62
Mass View (1)	CAT 25.59
Mass View (2)	CAT 25.60
Hioki 5043 (V)	CAT 11.69
Easylogger EN-EL-12 Bit	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	-
Digital Manometer (2)	-
Digital Temperature Meter	-
Stopwatch	CAT 14.84
Barometer	CAT 13.40
Stack Thermocouple (1)	-
Stack Thermocouple (2)	-
Stack Thermocouple (3)	-
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	-
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	
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

WATER VAPOUR: RESULTS SUMMARY

Henkel AG & Company, St Neots
Cumulative LEV Extraction

Sample Runs

Parameter	Units	Run 1	Mean
Concentration	% v/v	0.65	0.65
Uncertainty	±% v/v	1.14	1.14

General Sampling Information

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

WATER VAPOUR: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	11:05 - 11:35
Sampling Dates	-	11/12/2018
Sampling Device	-	MFC / MV
Duration	mins	30
Volume Sampled (STP, Dry)	m^3	0.0766
Volume Sampled (STP, Wet)	m^3	0.0771
Sample Flow Rate	l/min	2.55
Liquid Trap Start Mass	g	4480.4
Liquid Trap End Mass	g	4479.5
Silica Trap Start Mass	g	1525.0
Silica Trap End Mass	g	1526.3
Total Mass Of Water Vapour	g	0.4
Calculated Water Vapour	% v/v	0.65

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

WATER VAPOUR: QUALITY ASSURANCE

Sample Runs

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

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

Measurement Uncertainty	Units	Run 1
Measurement Uncertainty (MU)	%	176.8
Allowable MU	%	20.0
MU Acceptable	%	No

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

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
End of pipe sampling was necessary as there were no sampling ports installed on the stack.	x	
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.	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	

WATER VAPOUR: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (STP)	V_m	0.0766	uV_m	m^3	0.0015
Repeatability of Weighing	R_w	0.40	uR_w	g	0.12
Reading of Balance	R_b	0.40	uR_b	g	0.00
Leak	L	0.39		%	-

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

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	0.0766	8.44
Repeatability of Weighing	R_w	g	0.40	1.62
Reading of Balance	R_b	g	0.40	1.62
Leak	L	% v/v	0.00	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	% v/v	0.013
Repeatability of Weighing	% v/v	0.194
Reading of Balance	% v/v	0.003
Leak	% v/v	0.001

Parameter	**Units**	**Run 1**
Combined uncertainty	% v/v	0.19
Expanded uncertainty (95% confidence)	% v/v	0.38
Expanded uncertainty (95% confidence), estimated with Method Deviations	% v/v	1.14
Uncertainty if Water Droplets are present	% v/v	N/A
Reported Uncertainty	% v/v	1.14
Expanded uncertainty (95% confidence)	%	58.9
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	176.8
Uncertainty if Water Droplets are present	%	N/A
Reported Uncertainty	%	176.8

TOTAL VOCs (as CARBON): RESULTS SUMMARY

Henkel AG & Company, St Neots
Cumulative LEV Extraction

Sample Runs

Parameter	Units	Run 1	Mean
Concentration	mg/m³	302	302
Uncertainty	±mg/m³	7.1	7.1
Mass Emission	g/hr		
Uncertainty	±g/hr		

General Sampling Information

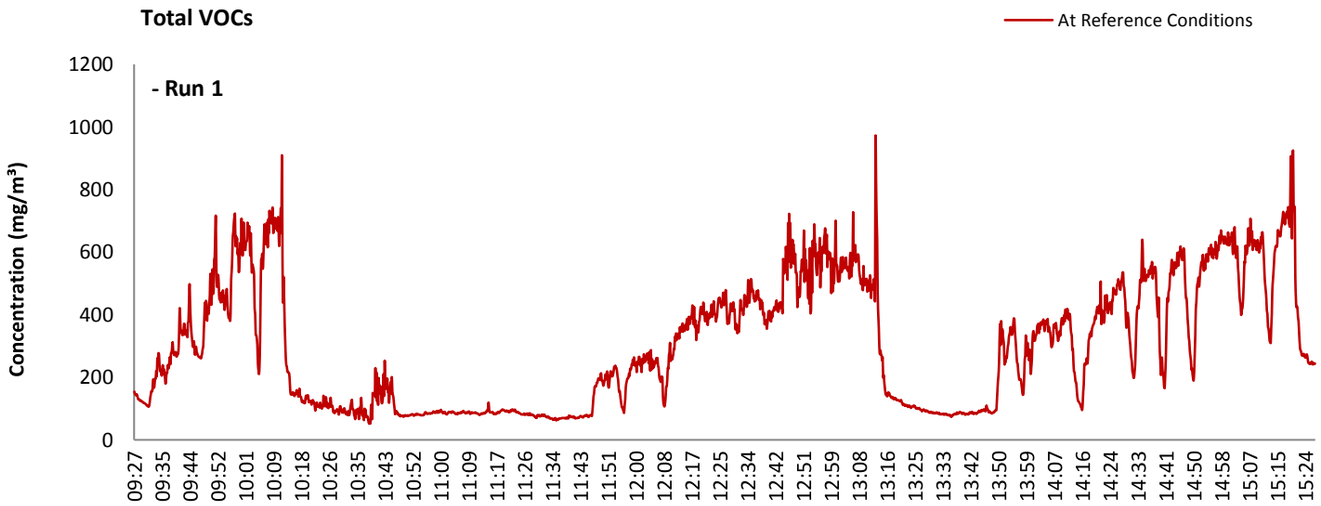
Parameter	Value	
Standard	EN 12619:2013	
Technical Procedure	CAT-TP-20	
Probe Material	Stainless Steel	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	No	
Heated Line Temperature	180°C	
Span Gas Type	Propane In Synthetic Air (5 Grade)	
Span Gas Reference Number	CYL 1.0271a	
Span Gas Expiry Date	15/03/2022	
Span Gas Start Pressure (bar)	140	
Gas Cylinder Concentration (ppm)	802	
Span Gas Set Point (ppm)	802.00	
Span Gas Uncertainty (%)	N/A	
Zero Gas Type	Synthetic Air (5 Grade)	
Number of Sampling Lines Used	1/1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1/1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

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
Sampling Times	-	09:27 - 15:27
Sampling Dates	-	11/12/2018
Instrument Range	ppm	1000
Span Gas Value	ppm	802.0

Quality Assurance

	Zero Drift	Units	Run 1
CAL 1	Zero Down Sampling Line (Pre)	ppm	0.00
	Zero Down Sampling Line (Post)	ppm	1.00
	Zero Drift	ppm	1.00
	Allowable Zero Drift	± ppm	40.10
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span Down Sampling Line (Pre)	ppm	802.00
	Span Down Sampling Line (Post)	ppm	841.00
	Span Drift	ppm	39.00
	Allowable Span Drift	± ppm	40.10
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	4 - 9

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
End of pipe sampling was necessary as there were no sampling ports installed on the stack.	x	
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.	x	

TOTAL VOCs (as CARBON): MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	-		mg/m³ (REF)
TGN M2 Allowable MU	15.0		%
Measured concentration	304.40		mg/m³ (STP, dry)
Range Used	1000.0		ppm
Range Used [A]	1606.1		mg/m³
Cal gas conc.	802.0		ppm
Conversion	1.61		ppm to mg/m³
MCERTS Range [B]	15.0		mg/m³
Lower of [A] or [B]	15.0		mg/m³
Cal gas conc.	1288.1		mg/m³

Performance characteristics	RUN 1		Units
Response time	45		seconds
Number of readings in measurement	360		-
Repeatability at zero	2.00		% full scale
Repeatability at span level	0.00		% full scale
Deviation from linearity	0.07		% of value
Zero drift	0.12		% full scale
Span drift	0.00		% full scale
Volume or pressure flow dependence	1.60		% of full scale
Atmospheric pressure dependence	0.30		% of value/kPa
Ambient temperature dependence	1.40		% full scale/10K
Combined interference	0.45		% range
Dependence on voltage	0.50		% full scale/10V
Losses in the line (leak)	0.00		% of value
Uncertainty of calibration gas	2.00		% of value

Performance characteristic	RUN 1		Units
Standard deviation of repeatability at zero	use rep at span		mg/m³
Standard deviation of repeatability at span level	0.00		mg/m³
Lack of fit	0.01		mg/m³
Drift	0.93		mg/m³
Volume or pressure flow dependence	0.00		mg/m³
Atmospheric pressure dependence	0.01		mg/m³
Ambient temperature dependence	0.20		mg/m³
Combined interference (from MCERTS Certificate)	0.04		mg/m³
Dependence on voltage	0.06		mg/m³
Losses in the line (leak)	0.00		mg/m³
Uncertainty of calibration gas	3.51		mg/m³

Measurement uncertainty		Result	RUN 1		Units
Combined uncertainty			304.40		mg/m³
Expanded uncertainty	k =	1.96	3.64		mg/m³
Uncertainty corrected to std conds. (O_2)			7.14		mg/m³
			7.14		mg/m³ (REF)

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	2.34		% of Value
Expanded uncertainty (no O_2) - at 95% Confidence	N/A		% at ELV
Overall Allowable uncertainty (no O_2) - at 95% Confidence	N/A		% at ELV
Result of Compliance with Uncertainty Requirement in M2	**N/A**		-

	RUN 1		Units
Expanded uncertainty (with O_2) - at 95% Confidence	N/A		% of Value
Expanded uncertainty (with O_2) - at 95% Confidence	N/A		% at ELV
Overall Allowable uncertainty (with O_2) - at 95% Confidence	N/A		% at ELV
Result of Compliance with Uncertainty Requirement in M2	**N/A**		-

Requirement for SRM is that Uncertainty should be <15% of the value at the ELV, on a dry gas basis, or if O_2 correction is applied less than 15% + the uncertainty associated with the O_2 correction (using sqrt of sum squares to add uncertainty components). Ref EA TGN M2.