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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**  
11th December 2018

**Job Reference Number**  
CAT-4566

|  |
|--|
| <b>Report Written by</b>   |
| Harpreet Badwal<br>Team Leader<br>MCERTS Level 2<br>MM 03 149<br>TE1 TE2 TE3 TE4 |

|   |
|---|
| <b>Report Approved by</b>   |
| James Eldridge<br>Deputy Regional Manager<br>MCERTS Level 2<br>MM 05 641<br>TE1 TE2 TE3 TE4 |

|                    |
|--------------------|
| <b>Report Date</b> |
| 3rd January 2019   |

|                |
|----------------|
| <b>Version</b> |
| Version 1      |

|                                     |
|-------------------------------------|
| <b>Signature of Report Approver</b> |
|                                     |



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## Executive Summary

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### MONITORING OBJECTIVES

Henkel AG & Company, St Neots  
Conservation Vents  
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 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  
 11th December 2018

where MU = Measurement Uncertainty associated with the Result

| Parameter              | Concentration                  |        |           |       |
|------------------------|--------------------------------|--------|-----------|-------|
|                        | Units                          | Result | MU<br>+/- | Limit |
| Total VOCs (as Carbon) | <sup>1</sup> mg/m <sup>3</sup> | 99.0   | 3.1       | -     |
| Water Vapour           | % v/v                          | 0.82   | 0.72      |       |

<sup>1</sup> 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  
 11th December 2018

| Parameter              | Units | Concentration     |      | Sampling Date(s) | Sampling Times | Duration mins |
|------------------------|-------|-------------------|------|------------------|----------------|---------------|
| Total VOCs (as Carbon) | R1    | mg/m <sup>3</sup> | 201  | 11/12/2018       | 09:34 - 09:49  | 15            |
| Total VOCs (as Carbon) | R2    | mg/m <sup>3</sup> | 20.5 | 11/12/2018       | 10:04 - 10:19  | 15            |
| Total VOCs (as Carbon) | R3    | mg/m <sup>3</sup> | 75.0 | 11/12/2018       | 10:40 - 10:55  | 15            |
| Water Vapour           | R1    | % v/v             | 0.90 | 11/12/2018       | 09:34 - 09:49  | 15            |
| Water Vapour           | R2    | % v/v             | 0.91 | 11/12/2018       | 10:04 - 10:19  | 15            |
| Water Vapour           | R3    | % v/v             | 0.64 | 11/12/2018       | 10:40 - 10:55  | 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

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 |

#### Site Specific Operating Conditions

| Parameter  | Status   |
|------------|--|
| Test Run 1 | Discharge Compound From SLC1 Mixer To Storage Tank BT1 |
| Test Run 2 | Charging SLC1 With Solvent From Storage Tank ST1       |
| Test Run 3 | Homogenising From Storage Tank BT1 To Storage Tank BT3 |

## Executive Summary

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### MONITORING & ANALYTICAL METHODS

Henkel AG & Company, St Neots

Conservation Vents

11th December 2018

| 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               | CAT         | CAT-TP-05                                   | Gravimetric          | Yes                | CAT          | Yes            | 0.1 % 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/m <sup>3</sup> |

### 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  | All | 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 | 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.   |
| All          | All | End of pipe sampling was necessary as there were no sampling ports installed on the stack.   |

## SUITABILITY OF SAMPLING LOCATION

### Duct Characteristics

| Parameter           | Units          | Value    |
|---------------------|----------------|----------|
| Type                | -              | Circular |
| Depth               | m              | -        |
| Width               | m              | -        |
| Area                | m <sup>2</sup> | -        |
| 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.

PLANT PHOTOS

Photo 1

Photo 2

None Available

None Available

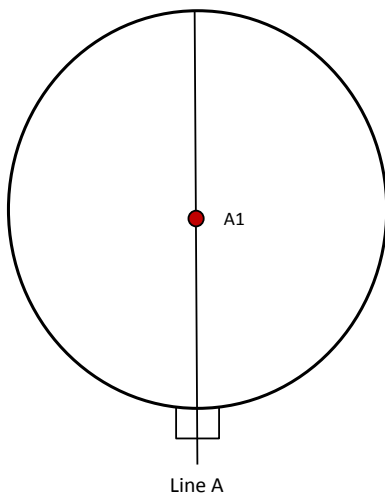
Photo 3

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

**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      |                 | 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 4900                  | -              | 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)             | -               | Gasmet DX4000                  | -              | Stack Thermocouple (3)           | -              |
| Heated Probe (1)         | -               | Gasmet Sampling System         | -              | 1m Heated Line (1)               | -              |
| Heated Probe (2)         | -               | Bernath 3006 FID               | CAT 8.26       | 1m Heated Line (2)               | -              |
| Heated Probe (3)         | -               | M&C PSS                        | -              | 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 11.72      | 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           |

## 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  | 0.90  | 0.91  | 0.64  | 0.82 |
| Uncertainty   | ±% v/v | 0.71  | 0.71  | 0.75  | 0.72 |

### 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             | -              | 09:34 - 09:49 | 10:04 - 10:19 | 10:40 - 10:55 |
| Sampling Dates             | -              | 11/12/2018    | 11/12/2018    | 11/12/2018    |
| Sampling Device            | -              | MFC / MV      | MFC / MV      | MFC / MV      |
| Duration                   | mins           | 15            | 15            | 15            |
| Volume Sampled (STP, Dry)  | m <sup>3</sup> | 0.0411        | 0.0407        | 0.0389        |
| Volume Sampled (STP, Wet)  | m <sup>3</sup> | 0.0414        | 0.0411        | 0.0392        |
| Sample Flow Rate           | l/min          | 2.74          | 2.71          | 2.59          |
| Liquid Trap Start Mass     | g              | 4483.2        | 4481.4        | 4481.0        |
| Liquid Trap End Mass       | g              | 4481.4        | 4480.6        | 4480.0        |
| Silica Trap Start Mass     | g              | 1520.4        | 1522.7        | 1523.8        |
| Silica Trap End Mass       | g              | 1522.5        | 1523.8        | 1525.0        |
| Total Mass Of Water Vapour | g              | 0.3           | 0.3           | 0.2           |
| Calculated Water Vapour    | % v/v          | 0.90          | 0.91          | 0.64          |

**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 | Run 2 | Run 3 |  |
|-------------------------|-------|-------|-------|-------|--|
| Mean Sampling Rate      | l/min | 2.7   | 2.7   | 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 | 0.05  | 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) | %     | 78.5  | 78.5  | 117.7 |  |
| 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<br>(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. Exova Catalyst'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 |  |

**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 <sub>m</sub> | 0.0411 | 0.0407 | 0.0389 | uV <sub>m</sub>      | m <sup>3</sup> | 0.0008 | 0.0008 | 0.0008 |
| Repeatability of Weighing | R <sub>w</sub> | 0.30   | 0.30   | 0.20   | uR <sub>w</sub>      | g              | 0.12   | 0.12   | 0.12   |
| Reading of Balance        | R <sub>b</sub> | 0.30   | 0.30   | 0.20   | uR <sub>b</sub>      | g              | 0.00   | 0.00   | 0.00   |
| Leak                      | L              | 0.37   | 0.37   | 0.39   |                      | %              | -      | -      | -      |

| Measured Quantities       | Uncertainty as a Percentage |       |       |       | Requirement of Standard |
|---------------------------|-----------------------------|-------|-------|-------|-------------------------|
|                           | Units                       | Run 1 | Run 2 | Run 3 |                         |
| Sampled Volume (STP)      | %                           | 2.00  | 2.00  | 2.00  | ≤2%                     |
| Repeatability of Weighing | %                           | 40.00 | 40.00 | 60.00 | No Requirement          |
| Reading of Balance        | %                           | 0.50  | 0.50  | 0.50  | No Requirement          |
| Leak                      | %                           | 0.37  | 0.37  | 0.39  | ≤2%                     |

| Measured Quantities       | Uncertainty in Measurement Units |                |        |        |        | Sensitivity Coefficient |       |       |
|---------------------------|----------------------------------|----------------|--------|--------|--------|-------------------------|-------|-------|
|                           | Symbol                           | Units          | Run 1  | Run 2  | Run 3  | Run 1                   | Run 2 | Run 3 |
| Sampled Volume (STP)      | V <sub>m</sub>                   | m <sup>3</sup> | 0.0411 | 0.0407 | 0.0389 | 21.96                   | 22.35 | 16.36 |
| Repeatability of Weighing | R <sub>w</sub>                   | g              | 0.30   | 0.30   | 0.20   | 3.01                    | 3.03  | 3.18  |
| Reading of Balance        | R <sub>b</sub>                   | g              | 0.30   | 0.30   | 0.20   | 3.01                    | 3.03  | 3.18  |
| Leak                      | L                                | % v/v          | 0.00   | 0.00   | 0.00   | 1.00                    | 1.00  | 1.00  |

| Measured Quantities       | Uncertainty in Result |       |       |       |
|---------------------------|-----------------------|-------|-------|-------|
|                           | Units                 | Run 1 | Run 2 | Run 3 |
| Sampled Volume (STP)      | % v/v                 | 0.018 | 0.018 | 0.013 |
| Repeatability of Weighing | % v/v                 | 0.361 | 0.364 | 0.382 |
| Reading of Balance        | % v/v                 | 0.005 | 0.005 | 0.003 |
| Leak                      | % v/v                 | 0.002 | 0.002 | 0.001 |

| Parameter   | Units | Run 1 | Run 2 | Run 3 |
|---|-------|-------|-------|-------|
| Combined uncertainty  | % v/v | 0.36  | 0.36  | 0.38  |
| Expanded uncertainty (95% confidence)                                   | % v/v | 0.71  | 0.71  | 0.75  |
| Expanded uncertainty (95% confidence), estimated with Method Deviations | % v/v | 0.71  | 0.71  | 0.75  |
| Uncertainty if Water Droplets are present                               | % v/v | N/A   | N/A   | N/A   |
| Reported Uncertainty  | % v/v | 0.71  | 0.71  | 0.75  |
| Expanded uncertainty (95% confidence)                                   | %     | 78.5  | 78.5  | 117.7 |
| Expanded uncertainty (95% confidence), estimated with Method Deviations | %     | 78.5  | 78.5  | 117.7 |
| Uncertainty if Water Droplets are present                               | %     | N/A   | N/A   | N/A   |
| Reported Uncertainty  | %     | 78.5  | 78.5  | 117.7 |

## 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 <sup>3</sup>  | 201   | 20.5  | 75.0  | 99.0 |
| Uncertainty   | ±mg/m <sup>3</sup> | 4.9   | 1.9   | 2.5   | 3.1  |
| Mass Emission | g/hr               |       |       |       |      |
| Uncertainty   | ±g/hr              |       |       |       |      |

### General Sampling Information

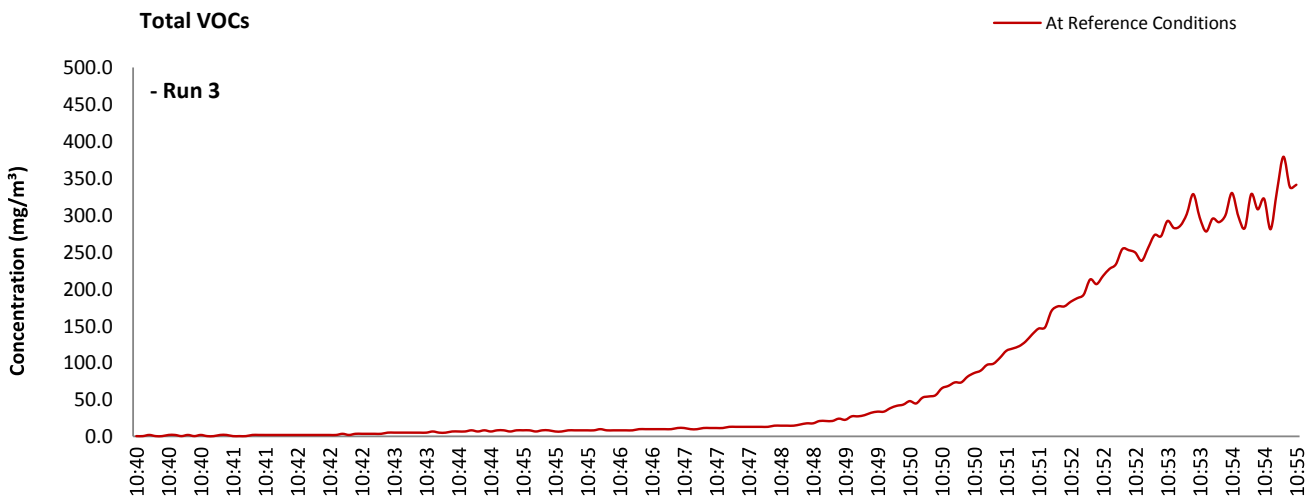
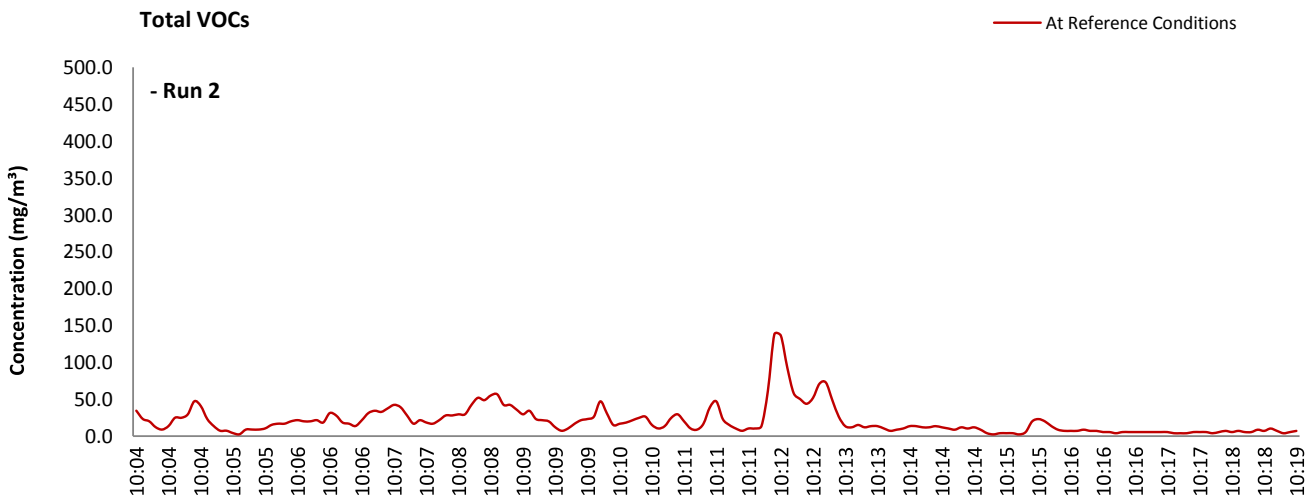
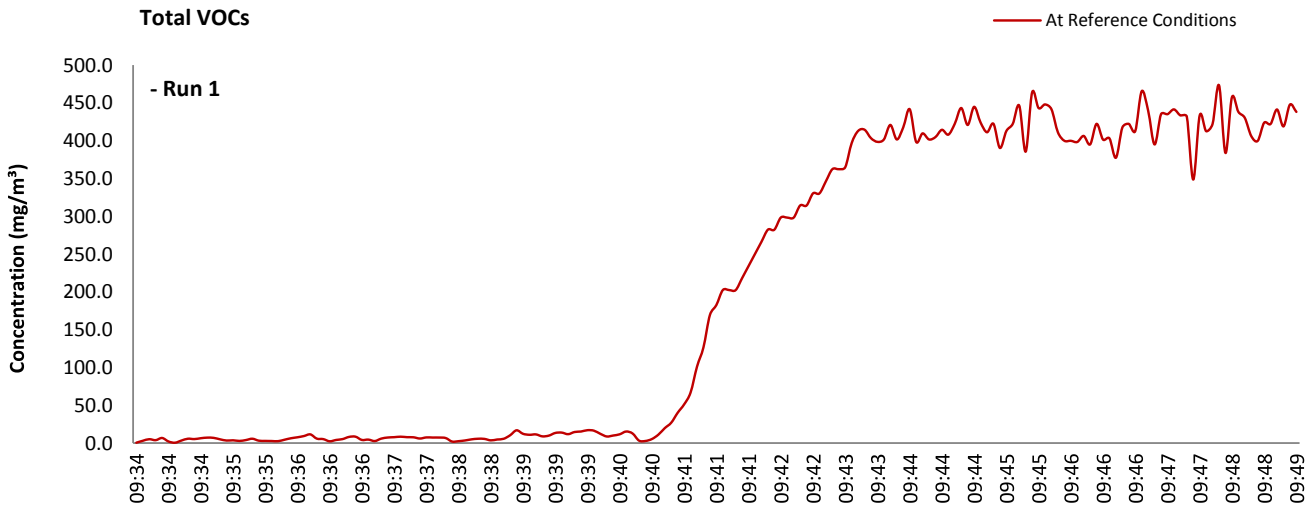
| Parameter                        | Value                              |                                       |
|----------------------------------|------------------------------------|---------------------------------------|
| Standard                         | EN 12619:2013                      |                                       |
| 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 1.0297a                        |                                       |
| Span Gas Expiry Date             | 11/10/2022                         |                                       |
| Span Gas Start Pressure (bar)    | 70                                 |                                       |
| 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                                | 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         | Run 2         | Run 3         |
|------------------|-------|---------------|---------------|---------------|
| Sampling Times   | -     | 09:34 - 09:49 | 10:04 - 10:19 | 10:40 - 10:55 |
| Sampling Dates   | -     | 11/12/2018    | 11/12/2018    | 11/12/2018    |
| 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   | 79.90 | 79.90 | 79.90 |
|            | Span Down Sampling Line (Post) | ppm   | 82.00 | 82.00 | 82.00 |
|            | Span Drift                     | ppm   | 2.10  | 2.10  | 2.10  |
|            | 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    | 3 - 10 | 3 - 10 | 3 - 10 |

**Method Deviations**

| Nature of Deviation<br>(x = deviation applies to the associated run)   | Run Number |   |   |
|--|------------|---|---|
|  | 1          | 2 | 3 |
| End of pipe sampling was necessary as there were no sampling ports installed on the stack.   | x          | x | 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          | x | x |

**TOTAL VOCs (as CARBON): MEASUREMENT UNCERTAINTY CALCULATIONS**

| Performance characteristics | RUN 1  | RUN 2  | RUN 3  | Units                        |
|-----------------------------|--------|--------|--------|------------------------------|
| Limit value                 | -      | -      | -      | mg/m <sup>3</sup> (REF)      |
| TGN M2 Allowable MU         | 15.0   | 15.0   | 15.0   | %                            |
| Measured concentration      | 203.02 | 20.71  | 75.63  | mg/m <sup>3</sup> (STP, dry) |
| Range Used                  | 1000.0 | 1000.0 | 1000.0 | ppm                          |
| Range Used [A]              | 1606.1 | 1606.1 | 1606.1 | mg/m <sup>3</sup>            |
| Cal gas conc.               | 79.9   | 79.9   | 79.9   | ppm                          |
| Conversion                  | 1.61   | 1.61   | 1.61   | ppm to mg/m <sup>3</sup>     |
| MCERTS Range [B]            | 15.0   | 15.0   | 15.0   | mg/m <sup>3</sup>            |
| Lower of [A] or [B]         | 15.0   | 15.0   | 15.0   | mg/m <sup>3</sup>            |
| Cal gas conc.               | 128.3  | 128.3  | 128.3  | mg/m <sup>3</sup>            |

| 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           | 0.45  | 0.45  | 0.45  | % of value       |
| Zero drift                         | 1.25  | 1.25  | 1.25  | % full scale     |
| Span drift                         | 0.00  | 0.00  | 0.00  | % 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 <sup>3</sup> |
| Standard deviation of repeatability at span level | 0.00            | 0.00            | 0.00            | mg/m <sup>3</sup> |
| Lack of fit                                       | 0.04            | 0.04            | 0.04            | mg/m <sup>3</sup> |
| Drift   | 0.93            | 0.93            | 0.93            | mg/m <sup>3</sup> |
| Volume or pressure flow dependence                | 0.00            | 0.00            | 0.00            | mg/m <sup>3</sup> |
| Atmospheric pressure dependence                   | 0.01            | 0.01            | 0.01            | mg/m <sup>3</sup> |
| Ambient temperature dependence                    | 0.20            | 0.20            | 0.20            | mg/m <sup>3</sup> |
| Combined interference (from MCERTS Certificate)   | 0.04            | 0.04            | 0.04            | mg/m <sup>3</sup> |
| Dependence on voltage                             | 0.06            | 0.06            | 0.06            | mg/m <sup>3</sup> |
| Losses in the line (leak)                         | 0.00            | 0.00            | 0.00            | mg/m <sup>3</sup> |
| Uncertainty of calibration gas                    | 2.34            | 0.24            | 0.87            | mg/m <sup>3</sup> |

| Measurement uncertainty                               | Result   | RUN 1  | RUN 2 | RUN 3 | Units                   |
|---|----------|--------|-------|-------|-------------------------|
| Combined uncertainty                                  |          | 203.02 | 20.71 | 75.63 | mg/m <sup>3</sup>       |
| Expanded uncertainty                                  | k = 1.96 | 4.96   | 1.93  | 2.53  | mg/m <sup>3</sup>       |
| Uncertainty corrected to std conds. (O <sub>2</sub> ) |          | 4.96   | 1.93  | 2.53  | mg/m <sup>3</sup> (REF) |

|  | RUN 1      | RUN 2      | RUN 3      | Units      |
|--|------------|------------|------------|------------|
| Expanded uncertainty (no O <sub>2</sub> ) - at 95% Confidence          | 2.44       | 9.30       | 3.35       | % of Value |
| Expanded uncertainty (no O <sub>2</sub> ) - at 95% Confidence          | N/A        | N/A        | N/A        | % at ELV   |
| Overall Allowable uncertainty (no O <sub>2</sub> ) - at 95% Confidence | N/A        | N/A        | N/A        | % at ELV   |
| <b>Result of Compliance with Uncertainty Requirement in M2</b>         | <b>N/A</b> | <b>N/A</b> | <b>N/A</b> | <b>-</b>   |

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

Requirement for SRM is that Uncertainty should be <15% of the value at the ELV, on a dry gas basis, or if O<sub>2</sub> correction is applied less than 15% + the uncertainty associated with the O<sub>2</sub> correction (using sqrt of sum squares to add uncertainty components). Ref EA TGN M2.