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**Stack Emissions Testing Report Commissioned by**
Xaarjet Ltd

**Installation Name & Address**
Xaarjet Ltd
Hurricane Close
Ermine Business Park
Huntingdon
Cambridgeshire
PE29 6XX

PPC Permit: B22/11

**Stack Reference**
LEV 17 - Bay 1 Rear Wall

**Dates of the Monitoring Campaign**
5th March 2020

**Job Reference Number**
EGL-3521

| Report Written by |
|---|
| Nicky Kane<br>Team Leader<br>MCERTS Level 2<br>MM 08 998<br>TE1 TE2 TE3 TE4 |

| Report Approved by |
|---|
| Nicky Kane<br>Team Leader<br>MCERTS Level 2<br>MM 08 998<br>TE1 TE2 TE3 TE4 |

| Report Date |
|---|
| 5th March 2020 |

| Version |
|---|
| Version 1 |

| Signature of Report Approver |
|---|
|  |

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## MONITORING OBJECTIVES

Xaarjet Ltd, Huntingdon
LEV 17 - Bay 1 Rear Wall
5th March 2020

**Overall Aim of the Monitoring Campaign**

Element were commissioned by Xaarjet Ltd to carry out stack emissions testing on the LEV 17 - Bay 1 Rear Wall at Huntingdon.

The aim of the monitoring campaign was to demonstrate compliance with a set of emission limit values (ELVs) as specified in the Site's Permit.

**Special Requirements**

There were no special requirements.

**Target Parameters**

Total VOCs (as Carbon)

# Executive Summary



## MONITORING RESULTS

Xaarjet Ltd, Huntingdon
LEV 17 - Bay 1 Rear Wall
5th March 2020

*where MU = Measurement Uncertainty associated with the Result*

| | | Concentration | | | | Mass Emission | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | | **Units** | **Result** | **MU +/-** | **Limit** | **Units** | **Result** | **MU +/-** | **Limit** |
| Total VOCs (as Carbon) | [1] | mg/m³ | 56.8 | 1.8 | 75 | g/hr | 30.6 | 4.0 | - |
| Stack Gas Temperature | | °C | 13.7 | | | | | | |
| Stack Gas Velocity | | m/s | 3.3 | 0.39 | | | | | |
| Volumetric Flow Rate (ACTUAL) | | m³/hr | 576 | 73.1 | | | | | |
| Volumetric Flow Rate (REF) | [1] | m³/hr | 539 | 68.4 | | | | | |

*NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM THE PRELIMINARY VELOCITY TRAVERSE.*

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

## MONITORING DATE(S) & TIMES

Xaarjet Ltd, Huntingdon
LEV 17 - Bay 1 Rear Wall
5th March 2020

| Parameter | | Units | Concentration | Units | Mass Emission | Sampling Date(s) | Sampling Times | Duration mins |
|---|---|---|---|---|---|---|---|---|
| Total VOCs (as Carbon) | R1 | mg/m³ | 56.0 | g/hr | 30.2 | 05/03/2020 | 10:10 - 10:40 | 30 |
| Total VOCs (as Carbon) | R2 | mg/m³ | 56.2 | g/hr | 30.3 | 05/03/2020 | 10:40 - 11:10 | 30 |
| Total VOCs (as Carbon) | R3 | mg/m³ | 58.2 | g/hr | 31.4 | 05/03/2020 | 11:10 - 11:40 | 30 |
| Velocity Traverse | R1 | | | | | 05/03/2020 | 12:25 - 12:26 | |

All results are expressed at the respective reference conditions.

## PROCESS DETAILS

Xaarjet Ltd, Huntingdon
LEV 17 - Bay 1 Rear Wall
5th March 2020

**Standard Operating Conditions**

| Parameter | Value |
|---|---|
| Process Status | Normal Operation |
| Capacity (of 100%) and Tonnes / Hour | Standard Operating Capacity |
| Continuous or Batch Process | Continuous |
| Feedstock (if applicable) | Ink Cartridges |
| Abatement System | None |
| Plume Appearance | None Visible |

## MONITORING & ANALYTICAL METHODS

Xaarjet Ltd, Huntingdon
LEV 17 - Bay 1 Rear Wall
5th March 2020

| | Monitoring | | | | Analysis | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Standard** | **Technical Procedure** | **Sampling Accreditation** | **Testing Lab** | **Analytical Procedure** | **Analytical Technique** | **Analysis Accreditation** | **Analysis Lab** | **Overall Accreditation** | **LOD (Average)** |
| Total VOCs (as Carbon) | EN 12619:2013 | CAT-TP-20 | MCERTS | EET | Flame Ionisation Detection by Sick 3006 FID | | | | MCERTS | 0.32 mg/m³ |
| Velocity & Vol. Flow Rate | EN 16911-1 (MID) | CAT-TP-41 | MCERTS | EET | Pitot Tube and Thermocouple | | | | MCERTS | 1.2 m/s |

## SUMMARY OF SAMPLING DEVIATIONS

| Parameter | Run | Deviation |
|---|---|---|
| All | All | There are no deviations associated with the sampling employed. |

## SUITABILITY OF SAMPLING LOCATION

### Duct Characteristics

| Parameter | Units | Value |
|---|---|---|
| Type | - | Circular |
| Depth | m | 0.25 |
| Width | m | - |
| Area | $m^2$ | 0.05 |
| Port Depth | cm | 0 |
| Orientation of Duct | - | Horizontal |
| Number of Ports | - | 2 |
| Sample Port Size | - | Hole |

### 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

The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations.

### EN 15259 Homogeneity Test Requirements

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

### Sampling Plane Validation Criteria (from EN 15259)

| Criteria in EN 15259 | Units | Traverse 1 | | | | | Required | Compliant |
|---|---|---|---|---|---|---|---|---|
| Lowest Differential Pressure | Pa | 9.2 | | | | | > 5 Pa | Yes |
| Mean Velocity | m/s | 3.3 | | | | | - | - |
| Lowest Gas Velocity | m/s | 3.3 | | | | | - | - |
| Highest Gas Velocity | m/s | 3.3 | | | | | - | - |
| Ratio of Above | : 1 | 1.0 | | | | | < 3 : 1 | Yes |
| Maximum Angle of Swirl | ° | NM | NM | NM | NM | NM | NM | NM |
| No Local Negative Flow | - | Yes | | | | | - | Yes |

Where NM = Not Measured as no Isokinetic sampling was performed.

## PLANT PHOTOS

Photo 1

Photo 2

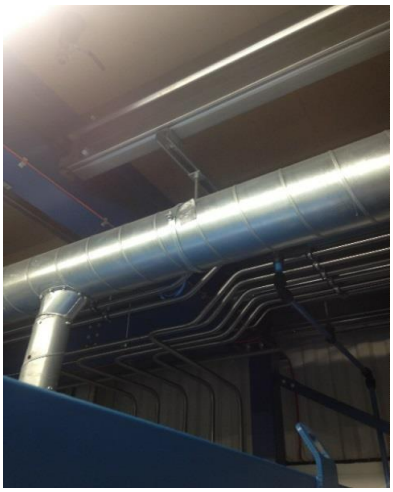
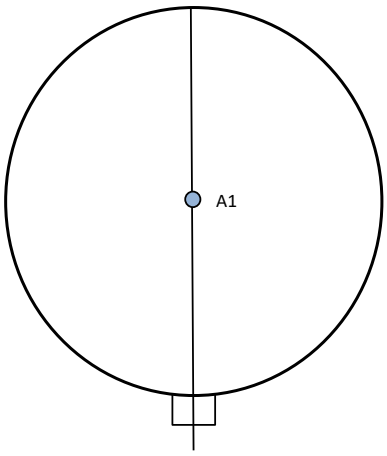


Photo 3

Photo 4

## 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 | Nicky Kane | MCERTS Level 2 | MM 08 998 | TE1 TE2 TE3 TE4 |
| Technician | Anthony Lovell | MCERTS Level 1 | MM 16 1397 | TE1 & TE4 |

## 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) | CAT 21S.27 |
| L-Pitot | - |
| Site Balance | - |
| 500g / 1Kg Check Weights | - |
| 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 | - |
| Servomex 5200MP | - |
| JCT JCC P1 Cooler | - |
| Gasmet DX4000 | - |
| Gasmet Sampling System | - |
| Bernath 3006 FID | CAT 8.14 |
| M&C PSS | CAT 12.03 |
| Mass Flow Controller (1) | CAT 6.38 |
| Mass Flow Controller (2) | CAT 6.39 |
| Mass View (1) | - |
| Mass View (2) | - |
| Hioki 5043 (V) | CAT 11.108 |
| Hioki 5043 (V) | - |
| Bioaerosols Temperature Logger | - |
| Electronic Refrigerator | - |

| Miscellaneous Items | |
|---|---|
| **Equipment Type** | **Equipment I.D.** |
| Digital Manometer (1) | CAT 3.45 |
| Digital Manometer (2) | - |
| Digital Temperature Meter | CAT 3.45 |
| Stopwatch | CAT 14.53 |
| Barometer | CAT 13.28 |
| Stack Thermocouple (1) | - |
| Stack Thermocouple (2) | CAT 4.00041/4.0004 |
| 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) | CAT 20.143 |
| 20m Heated Line (2) | - |
| Dual Channel Heater Controller | - |
| Single Channel Heater Controller | - |
| Laboratory Balance | |
| Tape Measure | CAT 16.21 |

## METHODS & TECHNICAL PROCEDURES USED

| Parameter | Standard | Technical Procedure |
|---|---|---|
| Total VOCs (as Carbon) | EN 12619:2013 | CAT-TP-20 |
| Velocity & Vol. Flow Rate | EN 16911-1 (MID) | CAT-TP-41 |

# PRELIMINARY STACK SURVEY: CALCULATIONS

## General Stack Details

| Stack Details (from Traverse) | Units | Value |
|---|---|---|
| Stack Diameter / Depth, D | m | 0.25 |
| Stack Width, W | m | - |
| Stack Area, A | $m^2$ | 0.05 |
| Average Stack Gas Temperature, $T_a$ | °C | 13.7 |
| Average Stack Gas Pressure | Pa | 9.2 |
| Average Stack Static Pressure, $P_{static}$ | kPa | 0.150 |
| Average Barometric Pressure, $P_b$ | kPa | 99.5 |
| Average Pitot Tube Calibration Coefficient, $C_p$ | - | 0.84 |

## Stack Gas Composition & Molecular Weights

| Component | Conc ppm | Conc Dry % v/v | Conc Wet % v/v | Volume Fraction r | Molar Mass M | Density kg/m³ p | Conc kg/m³ $p_i$ |
|---|---|---|---|---|---|---|---|
| $CO_2$ (Estimated) | - | 0.06 | 0.06 | 0.0006 | 44.01 | 1.9635 | 0.00118 |
| $O_2$ (Estimated) | - | 20.80 | 20.70 | 0.2080 | 32.00 | 1.4277 | 0.29696 |
| $N_2$ | - | 79.14 | 78.74 | 0.7914 | 28.01 | 1.2498 | 0.98913 |
| Moisture ($H_2O$) (Estimated) | - | - | 0.50 | 0.0050 | 18.02 | 0.8037 | 0.00402 |

NOTE: Moisture has been estimated as no moisture test was performed on the date(s) of testing

**Where:** $p = M / 22.41$

$p_i = r \times p$

## Calculation of Stack Gas Densities

| Determinand | Units | Result |
|---|---|---|
| Dry Density (STP), $P_{STD}$ | kg/m³ | 1.3 |
| Wet Density (STP), $P_{STW}$ | kg/m³ | 1.3 |
| Dry Density (Actual), $P_{Actual}$ | kg/m³ | 1.2 |
| Average Wet Density (Actual), $P_{ActualW}$ | kg/m³ | 1.2 |

**Where:** $P_{STD}$ = sum of component concentrations, kg/m³ (not including water vapour)

$P_{STW}$ = sum of all wet concentrations / 100 x density, kg/m³ (including water vapour)

$P_{Actual} = P_{STD} \times (T_{STP} / (P_{STP})) \times ((P_{static} + P_b) / T_a)$

$P_{ActualW}$ (at each sampling point) $= P_{STW} \times (T_s / P_s) \times (P_a / T_a)$

## Calculation of Stack Gas Volumetric Flowrate, Q

| Duct gas flow conditions | Units | Actual | REF [1] |
|---|---|---|---|
| Temperature | °C | 13.7 | 0.0 |
| Total Pressure | kPa | 99.6 | 101.3 |
| Moisture | % | 0.50 | 0.50 |

| Gas Volumetric Flowrate (from Traverse) | Units | Result |
|---|---|---|
| Gas Volumetric Flowrate (Actual) | m³/hr | 576 |
| Gas Volumetric Flowrate (STP, Wet) | m³/hr | 539 |
| Gas Volumetric Flowrate (STP, Dry) | m³/hr | 537 |
| Gas Volumetric Flowrate REF [1] | m³/hr | 539 |

## PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID)

(1 of 1)

| Parameter | Units | Value |
|---|---|---|
| Date of Survey | - | 05/03/2020 |
| Time of Survey | - | 12:25 - 12:26 |
| Atmospheric Pressure | kPa | 99.5 |
| Average Stack Static Pressure | Pa | 150 |
| Result of Pitot Stagnation Test | - | Pass |
| Are Water Droplets Present? | - | No |
| Device Used | S-Type Pitot with KIMO MP 210 (500Pa) | |

| Parameter | Units | Value |
|---|---|---|
| Initial Pitot Leak Check | - | Pass |
| Final Pitot Leak Check | - | Pass |
| Orientation of Duct | - | Horizontal |
| Pitot Tube, $C_p$ | - | 0.84 |
| Number of Lines Available | - | 1 |
| Number of Lines Used | - | 1 |

**Sampling Line A**

| Traverse Point | Depth m | ΔP Pa | Temp °C | Wet Density kg/m³ | Velocity m/s | Swirl ° |
|---|---|---|---|---|---|---|
| *STATIC (Units: Pa)* | | *149.9* | | | | |
| **Mean** | | **9.2** | **13.7** | **1.204** | **3.26** | |
| 1 | 0.13 | 9.2 | 13.7 | 1.204 | 3.26 | |

## PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID) - MEASUREMENT UNCERTAINTY

(1 of 1)

| Performance characteristics (Uncertainty Components) | Uncertainty | Value | Units |
|---|---|---|---|
| Standard Uncertainty on the coefficient of the Pitot Tube | u(k) | 0.005 | - |
| Standard Uncertainty associated with the mean local dynamic pressures | u(Δpi) | 1.046 | Pa |
| *- Resolution* | u(res) | 0.00087 | |
| *- Calibration* | u(cal) | 0.009 | |
| *- Drift* | u(drift) | 0.083 | |
| *- Lack of Fit* | u(fit) | 0.002 | |
| *- Overall corrections to dynamic measurements* | u(Cf) | 0.095 | |
| Standard uncertainty associated with the molar mass of the gas | u(M) | 0.00003 | - |
| *- $\varphi O_2,w$* | - | 20.696 | |
| *- $\varphi CO_2,w$* | - | 0.060 | |
| *- Oxygen, dry* | u($\phi O_2$,d) | 0.637 | |
| *- Carbon Dioxide, dry* | u($\phi CO_2$,d) | 0.002 | |
| *- Water Vapour* | u($\phi H_2O$) | 0.026 | |
| *- Oxygen, wet* | u($\phi O_2$,w) | 0.634 | |
| *- Carbon Dioxide, wet* | u($\phi CO_2$,w) | 0.002 | |
| Standard uncertainty associated with the stack temperature | u(Tc) | 1.463 | K |
| Standard uncertainty associated with the absolute pressure in the duct | u(pc) | 175.695 | Pa |
| *- Atmospheric Pressure* | u(patm) | 175.692 | |
| *- Static Pressure* | u(pstat) | 1.046 | |
| Standard uncertainty associated with the density in the duct | u(ρ) | 0.00650 | - |
| Standard uncertainty associated with the local velocities | u(vi) | 0.197 | Pa |
| Standard uncertainty associated with the mean velocity | u(v) | 0.197 | m/s |
| Standard uncertainty associated with the mean velocity (95% Confidence) | Uc(v) | 0.386 | m/s |
| Standard uncertainty associated with the mean velocity (95% Confidence), relative | Uc,rel(v) | 11.85 | % |
| Standard uncertainty associated with the volume flow rate (95% Confidence) | Uc(qV,w) | 73.1 | $m^3/hr$ |
| *- $u^2(a)/a^2$* | - | 0.00053 | |
| *- $u^2(qV,w)/q^2V,w$* | - | 0.00419 | |
| *- $u^2(qV,w)$* | - | 1390 | |
| *- $u(qV,w)$* | - | 37.3 | |
| Standard uncertainty associated with the volume flow rate (95% Confidence), relative | Uc,rel(qV,w) | 12.69 | % |

## TOTAL VOCs (as CARBON): RESULTS SUMMARY

Xaarjet Ltd, Huntingdon
LEV 17 - Bay 1 Rear Wall

### Sample Runs

| Parameter | Units | Run 1 | Run 2 | Run 3 | Mean |
|---|---|---|---|---|---|
| Concentration | mg/m³ | 56.0 | 56.2 | 58.2 | 56.8 |
| Uncertainty | ±mg/m³ | 1.8 | 1.8 | 1.9 | 1.8 |
| Mass Emission | g/hr | 30.2 | 30.3 | 31.4 | 30.6 |
| Uncertainty | ±g/hr | 4.0 | 4.0 | 4.1 | 4.0 |

### General Sampling Information

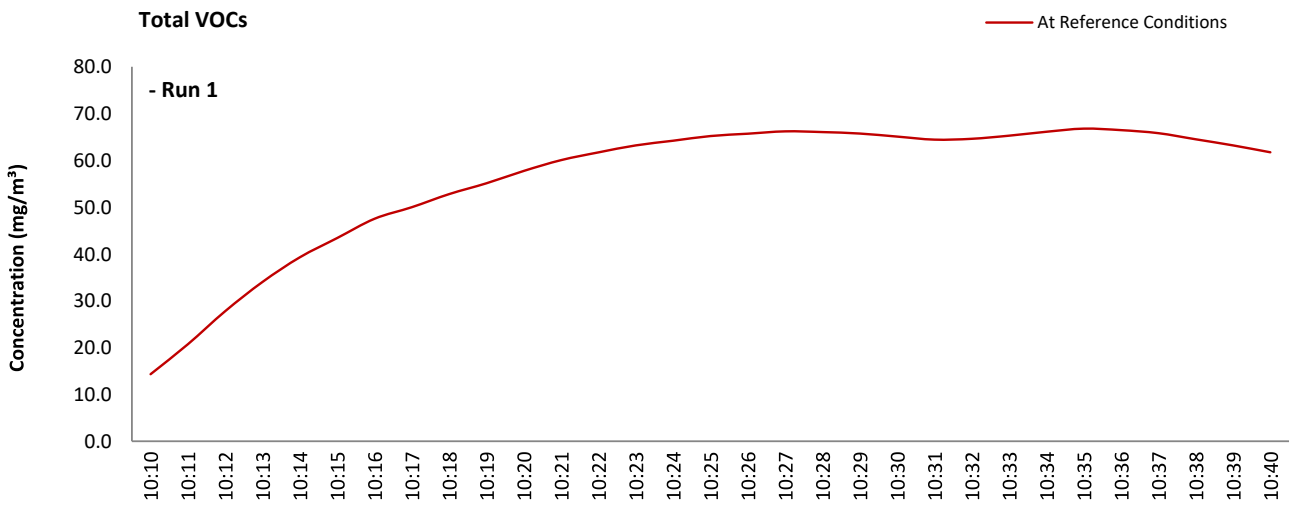
| Parameter | Value | |
|---|---|---|
| Standard | EN 12619:2013 | |
| Technical Procedure | CAT-TP-20 | |
| Probe Material | Stainless Steel | |
| Filtration Type / Size | 0.1µm Glass Fibre | |
| Heated Head Filter Used | Yes | |
| Heated Line Temperature | 180°C | |
| Span Gas Type | Propane In Synthetic Air (5 Grade) | |
| Span Gas Reference Number | CYL 1.0273a | |
| Span Gas Expiry Date | 17/03/2022 | |
| Span Gas Start Pressure (bar) | 30 | |
| Gas Cylinder Concentration (ppm) | 79.8 | |
| Span Gas Set Point (ppm) | 79.80 | |
| Span Gas Uncertainty (%) | 2 | |
| 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 | |

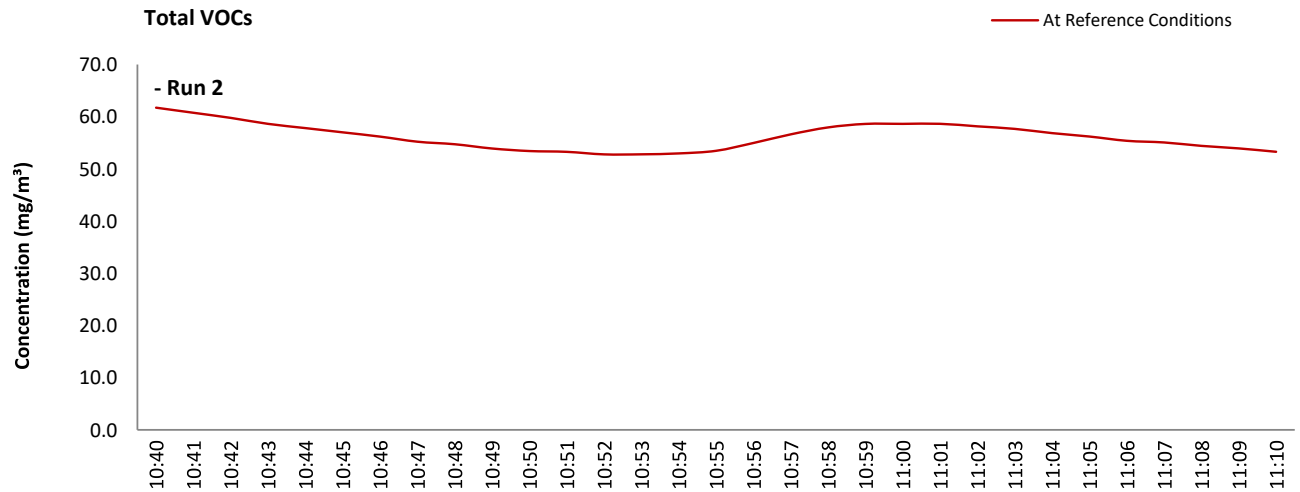
### Reference Conditions

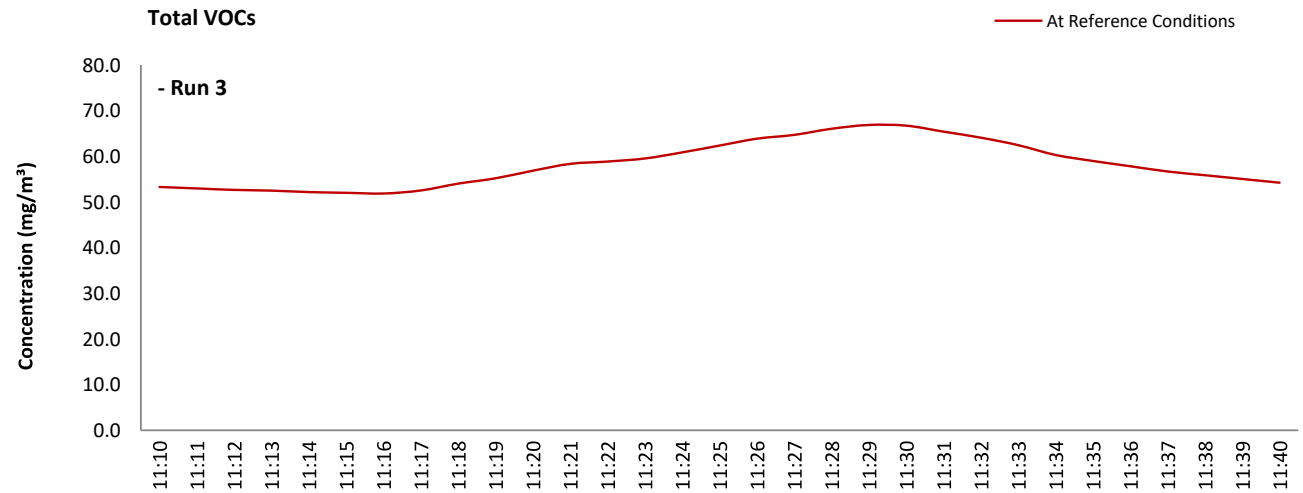
Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

## 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 | - | 10:10 - 10:40 | 10:40 - 11:10 | 11:10 - 11:40 |
| Sampling Dates | - | 05/03/2020 | 05/03/2020 | 05/03/2020 |
| Instrument Range | ppm | 100 | 100 | 100 |
| Span Gas Value | ppm | 79.8 | 79.8 | 79.8 |

## Quality Assurance

| | Zero Drift | Units | Run 1 | Run 2 | Run 3 |
|---|---|---|---|---|---|
| CAL 1 | Zero Down Sampling Line (Pre) | ppm | 0.10 | 0.10 | 0.10 |
| CAL 1 | Zero Down Sampling Line (Post) | ppm | -0.20 | -0.20 | -0.20 |
| CAL 1 | Zero Drift | ppm | -0.30 | -0.30 | -0.30 |
| | Allowable Zero Drift | ± ppm | 3.99 | 3.99 | 3.99 |
| | Zero Drift Acceptable | - | Yes | Yes | Yes |

| | Span Drift | Units | Run 1 | Run 2 | Run 3 |
|---|---|---|---|---|---|
| CAL 1 | Span Down Sampling Line (Pre) | ppm | 78.30 | 78.30 | 78.30 |
| CAL 1 | Span Down Sampling Line (Post) | ppm | 76.80 | 76.80 | 76.80 |
| CAL 1 | Span Drift | ppm | -1.50 | -1.50 | -1.50 |
| | Allowable Span Drift | ± ppm | 3.99 | 3.99 | 3.99 |
| | Span Drift Acceptable | - | Yes | Yes | Yes |

| Test Conditions | Units | Run 1 | Run 2 | Run 3 |
|---|---|---|---|---|
| Run Ambient Temperature Range | °C | 8 / 9 | 8 / 9 | 8 / 9 |

## Method Deviations

| Nature of Deviation (x = deviation applies to the associated run) | Run Number 1 | 2 | 3 |
|---|---|---|---|
| There are no deviations associated with the sampling employed. | x | x | x |

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

| Performance characteristics | RUN 1 | RUN 2 | RUN 3 | Units |
|---|---|---|---|---|
| Limit value | 75.0 | 75.0 | 75.0 | mg/m³ (REF) |
| TGN M2 Allowable MU | 15.0 | 15.0 | 15.0 | % |
| Measured concentration | 56.25 | 56.44 | 58.51 | mg/m³ (STP, dry) |
| Range Used | 100.0 | 100.0 | 100.0 | ppm |
| Range Used [A] | 160.6 | 160.6 | 160.6 | mg/m³ |
| Cal gas conc. | 79.8 | 79.8 | 79.8 | ppm |
| Conversion | 1.61 | 1.61 | 1.61 | ppm to mg/m³ |
| MCERTS Range [B] | 15.0 | 15.0 | 15.0 | mg/m³ |
| Lower of [A] or [B] | 15.0 | 15.0 | 15.0 | mg/m³ |
| Cal gas conc. | 128.2 | 128.2 | 128.2 | mg/m³ |

| Performance characteristics | RUN 1 | RUN 2 | RUN 3 | Units |
|---|---|---|---|---|
| Response time | 45 | 45 | 45 | seconds |
| Number of readings in measurement | 30 | 30 | 30 | - |
| 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 | 0.46 | 0.46 | 0.46 | % of value |
| Zero drift | -0.38 | -0.38 | -0.38 | % full scale |
| Span drift | -1.92 | -1.92 | -1.92 | % 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) | 1.88 | 1.88 | 1.88 | % 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/m³ |
| Standard deviation of repeatability at span level | 0.00 | 0.00 | 0.00 | mg/m³ |
| Lack of fit | 0.04 | 0.04 | 0.04 | mg/m³ |
| Drift | 0.00 | 0.00 | 0.00 | mg/m³ |
| Volume or pressure flow dependence | 0.00 | 0.00 | 0.00 | mg/m³ |
| Atmospheric pressure dependence | 0.01 | 0.01 | 0.01 | mg/m³ |
| Ambient temperature dependence | 0.20 | 0.20 | 0.20 | mg/m³ |
| Combined interference (from MCERTS Certificate) | 0.04 | 0.04 | 0.04 | mg/m³ |
| Dependence on voltage | 0.06 | 0.06 | 0.06 | mg/m³ |
| Losses in the line (leak) | 0.61 | 0.61 | 0.63 | mg/m³ |
| Uncertainty of calibration gas | 0.65 | 0.65 | 0.68 | mg/m³ |

| | | | RUN 1 | RUN 2 | RUN 3 | Units |
|---|---|---|---|---|---|---|
| **Measurement uncertainty** | | **Result** | 56.25 | 56.44 | 58.51 | mg/m³ |
| Combined uncertainty | | | 0.92 | 0.92 | 0.95 | mg/m³ |
| Expanded uncertainty | k = | 1.96 | 1.80 | 1.81 | 1.87 | mg/m³ |
| Uncertainty corrected to std conds. ($O_2$) | | | 1.80 | 1.81 | 1.87 | mg/m³ (REF) |

| | RUN 1 | RUN 2 | RUN 3 | Units |
|---|---|---|---|---|
| Expanded uncertainty (no $O_2$) - at 95% Confidence | 3.20 | 3.20 | 3.19 | % of Value |
| Expanded uncertainty (no $O_2$) - at 95% Confidence | 2.40 | 2.41 | 2.49 | % at ELV |
| Overall Allowable uncertainty (no $O_2$) - at 95% Confidence | 15.0 | 15.0 | 15.0 | % at ELV |
| **Result of Compliance with Uncertainty Requirement in M2** | **COMPLIANT** | **COMPLIANT** | **COMPLIANT** | - |

| | 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 $O_2$ 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.*