

# STACK EMISSIONS MONITORING REPORT



2-4 Langlands Place  
Kelvin South Business Park  
East Kilbride  
G75 0YF  
Tel: 01355 246 730

## Your contact at SOCOTEC LTD

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## Operator & Address:

Medite Europe Limited  
Redmonstown,  
Clonmel,  
Co. Tipperary,  
Ireland

## Permit Reference:

IE Licence: P0027-04

## Release Point:

A2-15

## Sampling Date(s):

14 November 2023

|                         |                              |
|-------------------------|------------------------------|
| SOCOTEC Job Number:     | LEK 14129 / Q4               |
| Report Date:            | 08-Dec-23                    |
| Version:                | 1                            |
| Report By:              | Daniel Scully                |
| MCERTS Number:          | MM 19 1563                   |
| MCERTS Level:           | MCERTS Level 2 - Team Leader |
| Technical Endorsements: | 1, 2, 3 & 4                  |
| Report Approved By:     | Enda Flood                   |
| MCERTS Number:          | MM 12 1170                   |
| Business Title:         | MCERTS Level 2 - Team Leader |
| Technical Endorsements: | 1, 2, 3 & 4                  |
| Signature:              |                              |



1015



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## EXECUTIVE SUMMARY

### MONITORING OBJECTIVES

Medite Europe Limited operates a wood production/wood drier process at Clonmel which is subject to IE Licence P0027-04, under the EPA Act 1992.

SOCOTEC LTD were commissioned by Medite Europe Limited to carry out stack emissions monitoring to determine the release of prescribed pollutants from the following Plant under normal operating conditions.

The results of these tests shall be used to demonstrate compliance with a set of emission limit values for prescribed pollutants as specified in the Plant's IE Licence, P0027-04.

#### **Plant**

A2-15

#### **Operator**

Medite Europe Limited  
Redmonstown,  
Clonmel,  
Co. Tipperary,  
Ireland

IE Licence: P0027-04

#### **Stack Emissions Monitoring Test House**

SOCOTEC - East Kilbride Laboratory  
2-4 Langlands Place  
Kelvin South Business Park  
East Kilbride  
G75 0YF  
UKAS and MCERTS Accreditation Number: 1015

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.  
The results of this testing relate only to the emission release point(s) listed in the report.  
MCERTS accredited results will only be claimed where both the sampling and analytical stages are MCERTS accredited.  
This test report shall not be reproduced, except in full, without written approval of SOCOTEC LTD.

## EXECUTIVE SUMMARY

| EMISSIONS SUMMARY                                      |                    |         |                            |                            |               |
|--|--------------------|---------|----------------------------|----------------------------|---------------|
| Parameter  | Units              | Result  | Calculated Uncertainty +/- | Emission Limit Value (ELV) | Accreditation |
| Oxides of Nitrogen (as NO <sub>2</sub> )               | mg/m <sup>3</sup>  | 1       | 4.5                        | 100                        | MCERTS        |
| Oxides of Nitrogen (as NO <sub>2</sub> ) Emission Rate | g/hr               | 49      | 170                        | -                          |               |
| Carbon Monoxide  | mg/m <sup>3</sup>  | 3.47    | 1.96                       | 100                        | MCERTS        |
| Carbon Monoxide Emission Rate                          | g/hr               | 131.03  | 74.06                      | -                          |               |
| Moisture   | %                  | 15.24   | 0.40                       | -                          | MCERTS        |
| Stack Gas Temperature                                  | °C                 | 25      | -                          | -                          | MCERTS        |
| Stack Gas Velocity                                     | m/s                | 11.2    | 0.28                       | -                          |               |
| Gas Volumetric Flow Rate (Actual)                      | m <sup>3</sup> /hr | 48801.2 | 2529.3                     | -                          |               |
| Gas Volumetric Flow Rate (STP, Wet)                    | m <sup>3</sup> /hr | 44608.9 | 2312.0                     | -                          |               |
| Gas Volumetric Flow Rate (STP, Dry)                    | m <sup>3</sup> /hr | 37808.6 | 1959.6                     | -                          |               |
| Gas Volumetric Flow Rate at Reference Conditions       | m <sup>3</sup> /hr | 37808.6 | 1959.6                     | 43200                      |               |

ND = None Detected,

Results at or below the limit of detection are highlighted by bold italic text.

The above volumetric flow rate is calculated using data from the preliminary survey. Mass emissions for non isokinetic tests are calculated using these values. For all isokinetic testing the mass emission is calculated using test specific flow data and not the above values.

Reference conditions are 273K, 101.3kPa, dry gas .

## EXECUTIVE SUMMARY

| MONITORING TIMES           |                  |                |                   |
|----------------------------|------------------|----------------|-------------------|
| Parameter                  | Sampling Date(s) | Sampling Times | Sampling Duration |
| Preliminary Stack Traverse | 14 November 2023 | 13:50          | -                 |

## EXECUTIVE SUMMARY

### PROCESS DETAILS

| Parameter                                     | Process Details            |
|---|----------------------------|
| Description of process                        | wood Production/Wood Drier |
| Continuous or batch                           | Continuous                 |
| Product Details                               | Wood Drier                 |
| Part of batch to be monitored (if applicable) | N/A                        |
| Normal load, throughput or continuous rating  | Normal Production          |
| Fuel used during monitoring                   | N/A                        |
| Abatement                                     | Cyclone                    |
| Plume Appearance                              | Heavy Plume visible        |

## EXECUTIVE SUMMARY

### Monitoring Methods

Declaration: Unless otherwise stated as a deviation, work has been completed to conform to the specific requirements of the Irish EPA's monitoring guidance notes; AG1, AG2, and the index of preferred methods.

| MONITORING METHODS   |   |                                   |                    |                         |                                |                                  |                               |
|----------------------|---|-----------------------------------|--------------------|-------------------------|--------------------------------|----------------------------------|-------------------------------|
| Species              | Method<br>Standard Reference Method /<br>Alternative Method | SOCOTEC<br>Technical<br>Procedure | UKAS Lab<br>Number | Method<br>Accreditation | Limit of<br>Detection<br>(LOD) | Calculated<br>MU<br>+/- % Result | Calculated<br>MU<br>+/- % ELV |
| Oxides of Nitrogen   | SRM - EN 14792:2017   | AE 102                            | 1015               | MCERTS                  | 0.51 mg/m <sup>3</sup>         | 347.6%                           | 4.50%                         |
| Carbon Monoxide      | SRM - EN 15058:2017   | AE 102                            | 1015               | MCERTS                  | 0.28 mg/m <sup>3</sup>         | 56.5%                            | 2.0%                          |
| Moisture             | SRM - EN 14790  | AE 105                            | 1015               | MCERTS                  | 0.02%                          | 2.6%                             | N/A - No ELV                  |
| Velocity             | SRM - EN ISO 16911-1  | AE 154                            | 1015               | MCERTS                  | 5 Pa                           | 2.5%                             | N/A - No ELV                  |
| Volumetric Flow Rate | SRM - EN ISO 16911-1  | AE 154                            | 1015               | MCERTS                  | -                              | 5.2%                             | 4.54%                         |

## EXECUTIVE SUMMARY

### Analytical Methods

The following tables list the analytical methods employed together with the custody details. Unless otherwise stated the samples are archived at the analysis lab location.

| SAMPLING METHODS WITH SUBSEQUENT ANALYSIS |                      |                      |                 |                        |              |                                      |                |
|---|----------------------|----------------------|-----------------|------------------------|--------------|--------------------------------------|----------------|
| Species                                   | Analytical Technique | Analytical Procedure | UKAS Lab Number | Analysis Accreditation | Analysis Lab | Analysis Report No. Date of Analysis | Archive Period |
| -   | -                    | -                    | -               | -                      | -            | -                                    | -              |

| ON-SITE TESTING    |                          |                      |                 |               |                         |                         |                |
|--------------------|--------------------------|----------------------|-----------------|---------------|-------------------------|-------------------------|----------------|
| Species            | Analytical Technique     | Analytical Procedure | UKAS Lab Number | Accreditation | Laboratory              | Data Archive Location   | Archive Period |
| Oxides of Nitrogen | Chemiluminescence        | AE 102               | 1015            | MCERTS        | SOCOTEC (East Kilbride) | SOCOTEC (East Kilbride) | 5 years        |
| Carbon Monoxide    | Non Dispersive Infra Red | AE 102               | 1015            | MCERTS        | SOCOTEC (East Kilbride) | SOCOTEC (East Kilbride) | 5 years        |
| Moisture           | Gravimetric              | AE 105               | 1015            | MCERTS        | SOCOTEC (East Kilbride) | -                       | -              |



## EXECUTIVE SUMMARY

| SAMPLING LOCATION                              |        |            |                |           |          |
|--|--------|------------|----------------|-----------|----------|
| Sampling Plane Validation Criteria             | Value  | Units      | Requirement    | Compliant | Method   |
| Lowest Differential Pressure                   | 10     | Pa         | $\geq 5$ Pa    | Yes       | EN 15259 |
| Lowest Gas Velocity                            | 10.6   | m/s        | -              | -         | -        |
| Highest Gas Velocity                           | 12.7   | m/s        | -              | -         | -        |
| Ratio of Gas Velocities                        | 1.2    | :1         | $< 3 : 1$      | Yes       | EN 15259 |
| Mean Velocity                                  | 11.2   | m/s        | -              | -         | -        |
| Maximum angle of flow with regard to duct axis | $< 15$ | $^{\circ}$ | $< 15^{\circ}$ | Yes       | EN 15259 |
| No local negative flow                         | Yes    | -          | -              | Yes       | EN 15259 |

| DUCT CHARACTERISTICS |          |                |
|----------------------|----------|----------------|
|                      | Value    | Units          |
| Shape                | Circular | -              |
| Depth                | 1.24     | m              |
| Width                | -        | m              |
| Area                 | 1.21     | m <sup>2</sup> |
| Port Depth           | 90       | mm             |

| SAMPLING LINES & POINTS |            |                 |
|-------------------------|------------|-----------------|
|                         | Isokinetic | Non-Iso & Gases |
| Sample port size        | 4" BSP     | 4" BSP          |
| Number of lines used    | 2          | 2               |
| Number of points / line | 4          | 4               |
| Duct orientation        | Vertical   | Vertical        |
| Filtration              | In Stack   | Out Stack       |

| SAMPLING PLATFORM  |           |
|--|-----------|
| General Platform Information                                       |           |
| Permanent / Temporary Platform / Ground level / Floor Level / Roof | Permanent |
| Inside / Outside   | Out side  |

| AG1 Platform requirements   |     |
|---|-----|
| Is there a sufficient working area so work can be performed in a compliant manner | Yes |
| Platform has 2 levels of handrails (approximately 0.5 m & 1.0 m high)             | Yes |
| Platform has vertical base boards (approximately 0.25 m high)                     | Yes |
| Platform has removable chains / self closing gates at the top of ladders          | Yes |
| Handrail / obstructions do not hamper insertion of sampling equipment             | N/A |
| Depth of Platform = $>$ Stack depth / diameter + wall and port thickness + 1.5m   | Yes |

### Sampling Platform Improvement Recommendations (if applicable)

The sampling location meets all the requirements as specified in EPA Guidance Note AG1

## EXECUTIVE SUMMARY

### **Sampling & Analytical Method Deviations**

In this instance there were no deviations from the sampling and analytical methods employed.

APPENDICES

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APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

APPENDIX 3 - Measurement Uncertainty Budget Calculations

APPENDIX 1 - Monitoring Schedule, Calibration Checklist & Monitoring Team

| MONITORING SCHEDULE |   |                                   |                    |                                |                      |
|---------------------|---|-----------------------------------|--------------------|--------------------------------|----------------------|
| Species             | Method<br>Standard Reference Method /<br>Alternative Method | SOCOTEC<br>Technical<br>Procedure | UKAS Lab<br>Number | MCERTS<br>Accredited<br>Method | Number of<br>Samples |
| Oxides of Nitrogen  | SRM - EN 14792:2017   | AE 102                            | 1015               | MCERTS                         | 1                    |
| Carbon Monoxide     | SRM - EN 15058:2017   | AE 102                            | 1015               | MCERTS                         | 1                    |
| Oxygen              | SRM - EN 14789:2017   | AE 102                            | 1015               | MCERTS                         | 1                    |
| Moisture            | SRM - EN 14790  | AE 105                            | 1015               | MCERTS                         | 1                    |
| Velocity            | SRM - EN ISO 16911-1  | AE 154                            | 1015               | MCERTS                         | 1                    |

APPENDIX 1 - Monitoring Schedule, Calibration Checklist & Monitoring Team

| CALIBRATEABLE EQUIPMENT CHECKLIST |                |                                 |                |                           |                |
|-----------------------------------|----------------|---------------------------------|----------------|---------------------------|----------------|
| Extractive Sampling               |                | Instrumental Analyser/s         |                | Miscellaneous             |                |
| Equipment                         | Equipment I.D. | Equipment                       | Equipment I.D. | Equipment                 | Equipment I.D. |
| Control Box DGM                   | LEK 9.47       | Horiba PG-250 Analyser          | LEK 12.15      | Laboratory Balance        | LEK 15.21      |
| Box Thermocouples                 | LEK 9.48       | FT-IR                           | -              | Tape Measure              | LEK 20.16      |
| Meter In Thermocouple             | LEK 9.48       | FT-IR Oven Box                  | -              | Stopwatch                 | -              |
| Meter Out Thermocouple            | LEK 9.48       | Bernath 3006 FID                | -              | Protractor                | -              |
| Control Box Timer                 | LEK 17.26      | Signal 3030 FID                 | -              | Barometer                 | LEK 16.8       |
| Oven Box                          | -              | Servomex                        | -              | Digital Micromanometer    | LEK 1.20       |
| Probe                             | LEK 6.22       | JCT Heated Head Filter          | LEK 13.21b     | Digital Temperature Meter | LEK 2.20       |
| Probe Thermocouple                | -              | Thermo FID                      | -              | Stack Thermocouple        | -              |
| Probe                             | -              | Stackmaster                     | -              | Mass Flow Controller      | -              |
| Probe Thermocouple                | -              | FTIR Heater Box for Heated Line | -              | MFC Display module        | -              |
| S-Pitot                           | LEK 6.22       | Anemometer                      | -              | 1m Heated Line (1)        | -              |
| L-Pitot                           | -              | Ecophysics NOx Analyser         | -              | 1m Heated Line (2)        | -              |
| Site Balance                      | LEK 23.12      | Chiller (JCT/MAK 10)            | LEK 12.16      | 1m Heated Line (3)        | -              |
| Last Impinger Arm                 | -              | Heated Line Controller (1)      | LEK 8.53       | 5m Heated Line (1)        | -              |
| Dioxins Cond. Thermocouple        | -              | Heated Line Controller (2)      | LEK 8.21       | 10m Heated Line (1)       | -              |
| Callipers                         | LEK 15.1F      | Site temperature Logger         | -              | 10m Heated Line (2)       | -              |
| Small DGM                         | -              |                                 |                | 15m Heated Line (1)       | LEK 8.21       |
| Heater Controller                 | -              |                                 |                | 20m Heated Line (1)       | LEK 8.531      |
| Inclinometer (Swirl Device)       | LEK 24.10      |                                 |                | 20m Heated Line (2)       | -              |

NOTE: If the equipment I.D is represented by a dash (-), then this piece of equipment has not been used for this test.

| CALIBRATION GASES            |                     |          |     |   |                            |
|------------------------------|---------------------|----------|-----|---|----------------------------|
| Gas (traceable to ISO 17025) | Cylinder I.D Number | Supplier | ppm | % | Analytical Tolerance +/- % |
| -                            | -                   | -        | -   | - | -                          |

**STACK EMISSIONS MONITORING TEAM**

| MONITORING TEAM |               |                |        |   |        |        |        |        |
|-----------------|---------------|----------------|--------|---|--------|--------|--------|--------|
| Personnel       | MCERTS Number | MCERTS         |        | TE / H&S Qualifications and Expiry Date |        |        |        |        |
|                 |               | Level          | Expiry | TE1                                     | TE2    | TE3    | TE4    | H&S    |
| Enda Flood      | MM 12 1170    | MCERTS Level 2 | Apr-23 | Mar-24                                  | Mar-24 | Jun-23 | Nov-23 | Apr-23 |
| Daniel Scully   | MM 19 1563    | MCERTS Level 2 | Oct-24 | Nov-26                                  | Nov-28 | Mar-28 | Jul-27 | Oct-24 |

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

**COMBUSTION GASES SUMMARY**

| Test               | Sampling Time and Date            | Concentration<br>mg/m <sup>3</sup> | LOD<br>mg/m <sup>3</sup> | ELV<br>mg/m <sup>3</sup> | Emission<br>Rate g/hr |
|--------------------|-----------------------------------|------------------------------------|--------------------------|--------------------------|-----------------------|
| Oxides of Nitrogen | 14:06 - 14:36<br>14 November 2023 | 1.3                                | 0.51                     | 100                      | 49                    |
| Carbon Monoxide    | 14:06 - 14:36<br>14 November 2023 | 3.5                                | 0.28                     | 100                      | 131.03                |

| Test   | Sampling Time and Date            | Concentration<br>% | LOD<br>% |
|--------|-----------------------------------|--------------------|----------|
| Oxygen | 14:06 - 14:36<br>14 November 2023 | 20.90              | 0.01     |

Reference conditions are 273K, 101.3kPa, dry gas .

**PRE-SAMPLING CALIBRATION DATA**

|            |                  |
|------------|------------------|
| Date       | 14 November 2023 |
| Start Time | 10:46            |
| End Time   | 10:55            |

|                          |       |
|--------------------------|-------|
| Chiller Temperature (°C) | 2.7   |
| Requirement              | < 4°C |
| Compliant                | Yes   |

| Gas             | Range<br>(ppm / %) | Zero Reading<br>at analyser | Span Reading<br>at analyser | Zero Check<br>at analyser | Zero Check<br>down line | Span Check<br>down line | Response<br>Time (Secs) | Leak Rate<br>% |
|-----------------|--------------------|-----------------------------|-----------------------------|---------------------------|-------------------------|-------------------------|-------------------------|----------------|
| Nitric Oxide    | 250                | 0.00                        | 200.2                       | 0.10                      | 0.00                    | 199.7                   | 40                      | 0.23           |
| Carbon Monoxide | 200                | -0.10                       | 163.9                       | 0.13                      | 0.10                    | 163.4                   | 40                      | 0.31           |
| Oxygen          | 25                 | -0.01                       | 20.67                       | 0.11                      | 0.04                    | 20.76                   | 40                      | -0.44          |

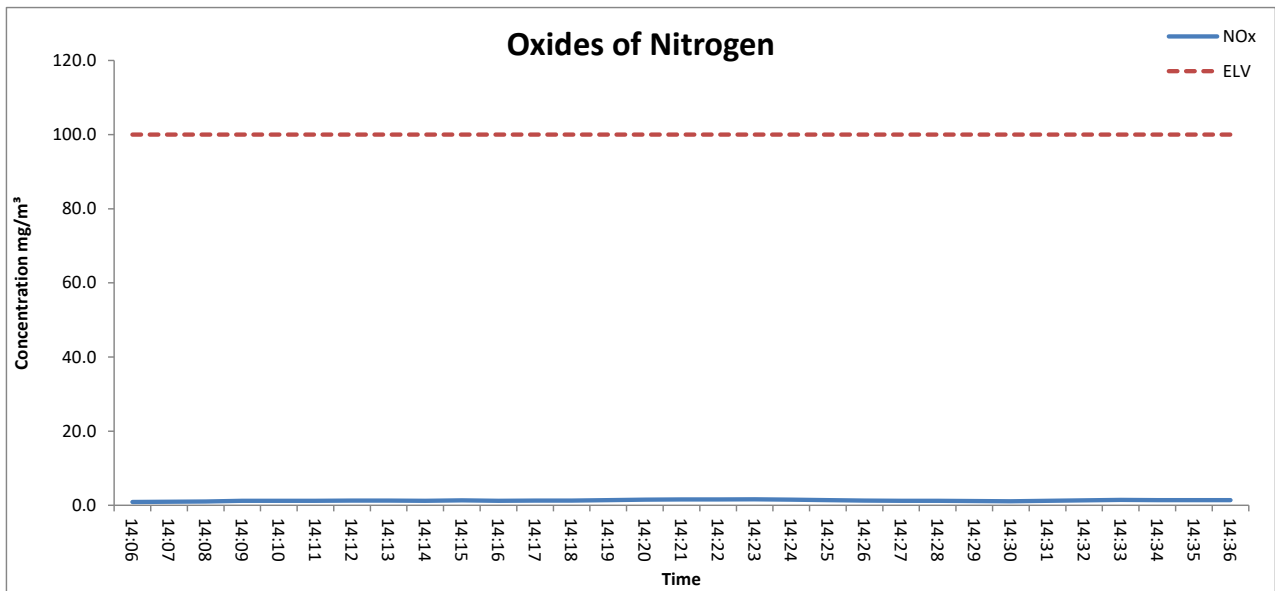
**POST-SAMPLING CALIBRATION DATA**

|            |                  |
|------------|------------------|
| Date       | 14 November 2023 |
| Start Time | 14:40            |
| End Time   | 14:45            |

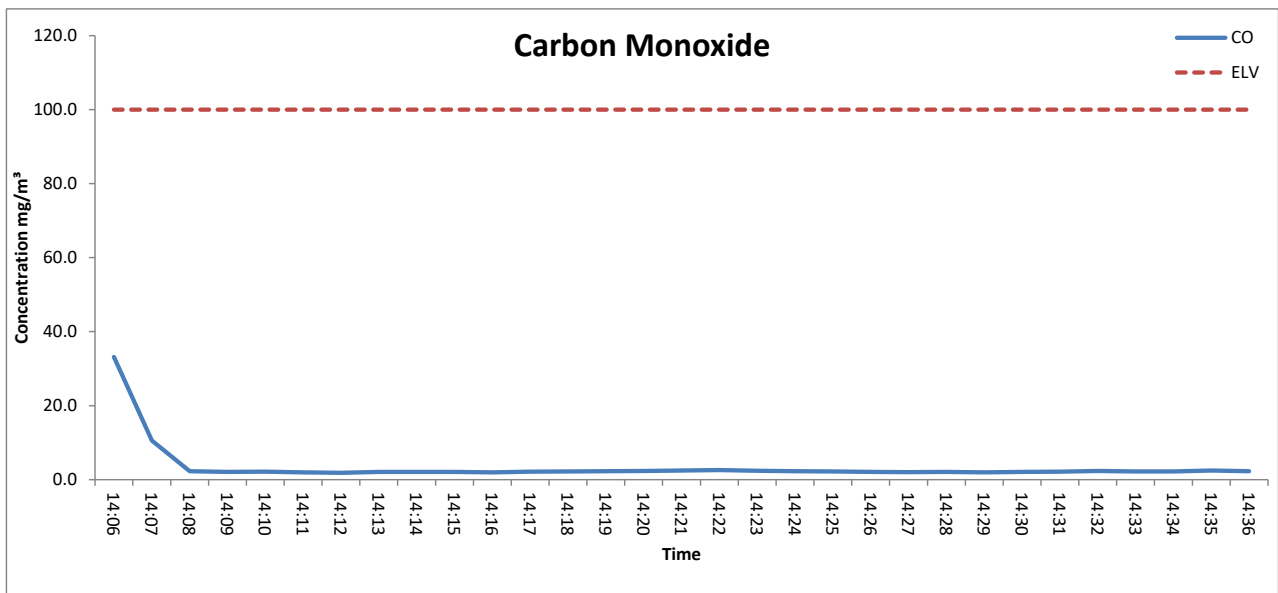
|                          |       |
|--------------------------|-------|
| Chiller Temperature (°C) | 2.7   |
| Requirement              | < 4°C |
| Compliant                | Yes   |

| Gas             | Zero Check<br>at Analyser | Span Check<br>at Analyser | Zero Drift<br>(%) | Span Drift<br>(%) | Corrected for<br>Zero Drift | Corrected for<br>Span Drift | Corrected Values<br>ppm / % |
|-----------------|---------------------------|---------------------------|-------------------|-------------------|-----------------------------|-----------------------------|-----------------------------|
| Nitric Oxide    | -0.10                     | 196.2                     | -0.10             | -1.88             | x                           | x                           | N/A - not corrected         |
| Carbon Monoxide | 0.13                      | 161.3                     | 0.00              | -1.57             | x                           | x                           | N/A - not corrected         |
| Oxygen          | -0.16                     | 20.78                     | -1.31             | 1.80              | x                           | x                           | N/A - not corrected         |

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts  
**OXIDES OF NITROGEN (as NO<sub>2</sub>) EMISSIONS CHART**

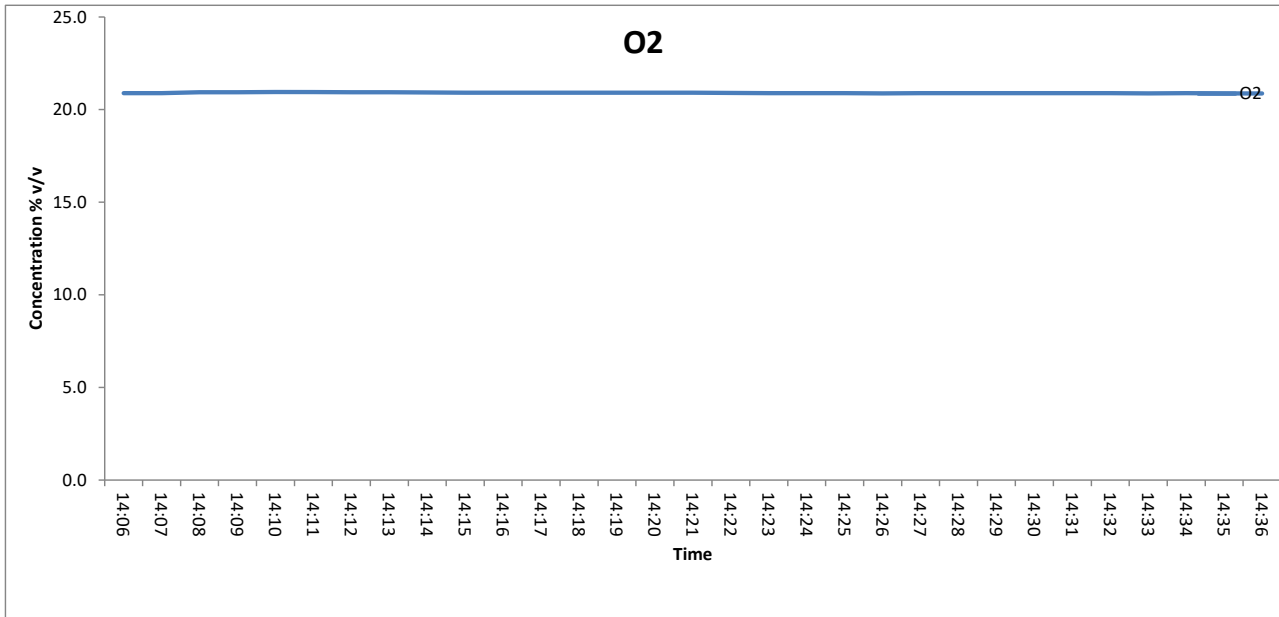


**CARBON MONOXIDE EMISSIONS CHART**



APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

**OXYGEN EMISSIONS CHART**





APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

**MOISTURE CALCULATIONS**

| Moisture Determination - Non Isokinetic |                                 |              |            |            |               |      |             |
|---|---------------------------------|--------------|------------|------------|---------------|------|-------------|
| Test Number                             | Sampling Time and Date          | Start Weight | End Weight | Total gain | Concentration | LOD  | Uncertainty |
|   |                                 | kg           | kg         | kg         | %             | %    | %           |
| Run 1                                   | 14:05-14:35<br>14 November 2023 | 3.5600       | 3.6540     | 0.0940     | 15.2          | 0.02 | 2.6         |

| Moisture Quality Assurance |                   |                      |               |                 |               |                      |                        |
|----------------------------|-------------------|----------------------|---------------|-----------------|---------------|----------------------|------------------------|
| Test Number                | Sampling Duration | Total Volume Sampled | Sampling Rate | Start Leak Rate | End Leak Rate | Acceptable Leak Rate | Leak Tests Acceptable? |
|                            | mins              | l                    | l/min         | l/min           | l/min         | l/min                |                        |
| Run 1                      | 30                | 651                  | 21.7          | 0.00            | 0.00          | 0.43                 | Yes                    |

**PRELIMINARY STACK SURVEY**

| Stack Characteristics         |        |                |
|-------------------------------|--------|----------------|
| Stack Diameter / Depth, D     | 1.24   | m              |
| Stack Width, W                | -      | m              |
| Stack Area, A                 | 1.21   | m <sup>2</sup> |
| Average stack gas temperature | 25     | °C             |
| Stack static pressure         | 0.0775 | kPa            |
| Barometric Pressure           | 101    | kPa            |

| Stack Gas Composition & Molecular Weights |              |                             |                |                       |                               |                |                       |                               |
|---|--------------|-----------------------------|----------------|-----------------------|-------------------------------|----------------|-----------------------|-------------------------------|
| Component                                 | Molar Mass M | Density kg/m <sup>3</sup> p | Conc Dry % Vol | Dry Volume Fraction r | Dry Conc kg/m <sup>3</sup> pi | Conc Wet % Vol | Wet Volume Fraction r | Wet Conc kg/m <sup>3</sup> pi |
| CO <sub>2</sub>                           | 44           | 1.963059                    | 0.028571       | 0.000286              | 0.000561                      | 0.024216       | 0.000242              | 0.000475                      |
| O <sub>2</sub>                            | 32           | 1.427679                    | 20.904973      | 0.209050              | 0.298456                      | 17.718166      | 0.177182              | 0.252959                      |
| N <sub>2</sub>                            | 28           | 1.249219                    | 79.066456      | 0.790665              | 0.987713                      | 67.013365      | 0.670134              | 0.837144                      |
| H <sub>2</sub> O                          | 18           | 0.803070                    | -              | -                     | -                             | 15.244253      | 0.152443              | 0.122422                      |

Where:  $p = M / 22.41$      $pi = r \times p$

| Calculation of Stack Gas Densities          |        |                   |
|---|--------|-------------------|
| Determinand                                 | Result | Units             |
| Dry Density (STP), $P_{STD}$                | 1.2867 | kg/m <sup>3</sup> |
| Wet Density (STP), $P_{STW}$                | 1.2130 | kg/m <sup>3</sup> |
| Dry Density (Actual), $P_{Actual}$          | 1.1762 | kg/m <sup>3</sup> |
| Average Wet Density (Actual), $P_{ActualW}$ | 1.109  | kg/m <sup>3</sup> |

Where:

$P_{STD}$  = sum of component concentrations, kg/m<sup>3</sup> (not including water vapour)

$P_{Actual} = P_{STD} \times (Ts / Ps) \times (Pa / Ta)$

$P_{STW} = (P_{STD} + pi \text{ of } H_2O) / (1 + (pi \text{ of } H_2O / 0.8036))$

$P_{ActualW} = P_{STW} \times (Ts / Ps) \times (Pa / Ta)$

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

**PRELIMINARY STACK SURVEY**

**TRAVERSE 1**

|                              |                  |
|------------------------------|------------------|
| Date of Survey               | 14 November 2023 |
| Time of Survey               | 13:50            |
| Velocity Measurement Device: | S-Type Pitot     |

| Sampling Line A |                        |                                     |   |         |              |   |                         |                  |
|-----------------|------------------------|-------------------------------------|---|---------|--------------|---|-------------------------|------------------|
| Traverse Point  | Distance into duct (m) | DP pt Pa<br>(average of 3 readings) | DP pt mmH <sub>2</sub> O<br>(average of 3 readings) | Temp °C | Velocity m/s | Volumetric Flow Rate (actual) m <sup>3</sup> /s | O <sub>2</sub> %<br>Vol | Angle of Swirl ° |
| 1               | 0.08                   | 86.6                                | 8.8   | 31      | 10.6         | 12.8  | -                       | <15              |
| 2               | 0.31                   | 93.1                                | 9.5   | 31      | 11.0         | 13.3  | -                       | <15              |
| 3               | 0.93                   | 90.2                                | 9.2   | 31      | 10.9         | 13.1  | -                       | <15              |
| 4               | 1.16                   | 91.5                                | 9.3   | 31      | 10.9         | 13.2  | -                       | <15              |
| -               | -                      | -                                   | -   | -       | -            | -   | -                       | -                |
| -               | -                      | -                                   | -   | -       | -            | -   | -                       | -                |
| -               | -                      | -                                   | -   | -       | -            | -   | -                       | -                |
| -               | -                      | -                                   | -   | -       | -            | -   | -                       | -                |
| -               | -                      | -                                   | -   | -       | -            | -   | -                       | -                |
| -               | -                      | -                                   | -   | -       | -            | -   | -                       | -                |
| Mean            | -                      | 90.3                                | 9.2   | 31      | 10.9         | 13.1  | -                       | -                |

| Sampling Line B |                        |                                     |   |         |              |   |                         |                  |
|-----------------|------------------------|-------------------------------------|---|---------|--------------|---|-------------------------|------------------|
| Traverse Point  | Distance into duct (m) | DP pt Pa<br>(average of 3 readings) | DP pt mmH <sub>2</sub> O<br>(average of 3 readings) | Temp °C | Velocity m/s | Volumetric Flow Rate (actual) m <sup>3</sup> /s | O <sub>2</sub> %<br>Vol | Angle of Swirl ° |
| 1               | 0.08                   | 123.5                               | 12.6  | 19      | 12.7         | 15.3  | -                       | <15              |
| 2               | 0.31                   | 85.6                                | 8.7   | 19      | 10.6         | 12.8  | -                       | <15              |
| 3               | 0.93                   | 92.4                                | 9.4   | 19      | 11.0         | 13.3  | -                       | <15              |
| 4               | 1.16                   | 112.0                               | 11.4  | 19      | 12.1         | 14.6  | -                       | <15              |
| -               | -                      | -                                   | -   | -       | -            | -   | -                       | -                |
| -               | -                      | -                                   | -   | -       | -            | -   | -                       | -                |
| -               | -                      | -                                   | -   | -       | -            | -   | -                       | -                |
| -               | -                      | -                                   | -   | -       | -            | -   | -                       | -                |
| -               | -                      | -                                   | -   | -       | -            | -   | -                       | -                |
| -               | -                      | -                                   | -   | -       | -            | -   | -                       | -                |
| Mean            | -                      | 103.4                               | 10.6  | 19      | 11.6         | 14.0  | -                       | -                |

**PRELIMINARY STACK SURVEY QUALITY ASSURANCE CHECKLIST**

| PITOT LEAK CHECK |                                |                              |              |         |                                |                              |              |         |
|------------------|--------------------------------|------------------------------|--------------|---------|--------------------------------|------------------------------|--------------|---------|
| Run              | Pre Traverse Leak Rate         |                              |              |         | Post Traverse Leak Rate        |                              |              |         |
|                  | Start Value mmH <sub>2</sub> O | End Value mmH <sub>2</sub> O | Difference % | Outcome | Start Value mmH <sub>2</sub> O | End Value mmH <sub>2</sub> O | Difference % | Outcome |
| Run 1            | 133                            | 130                          | 2.3          | Pass    | 125                            | 125                          | 0.0          | Pass    |

To complete a compliant pitot leak check a pressure of over 80 mmH<sub>2</sub>O (or 800 Pa) is applied and the pressure drop monitored over 5 mins. A drop of less than 5% must be observed.

| S-Type Pitot Stagnation Check |                 |                |                 |                               |
|-------------------------------|-----------------|----------------|-----------------|-------------------------------|
| Run                           | Stagnation (Pa) | Reference (Pa) | Difference (Pa) | Outcome (Permitted +/- 10 Pa) |
| Run 1                         | 62              | 59             | 3.0             | Pass                          |

APPENDIX 2 - Summaries, Calculations, Raw Data and Charts

**PRELIMINARY STACK SURVEY (CONTINUED)**

| Sampling Plane Validation Criteria             |        |       |             |           |
|--|--------|-------|-------------|-----------|
| EA Technical Guidance Note (Monitoring) M1     | Result | Units | Requirement | Compliant |
| Lowest Average Differential Pressure           | 86     | Pa    | >= 5 Pa     | Yes       |
| Lowest Gas Velocity                            | 10.6   | m/s   | -           | -         |
| Highest Gas Velocity                           | 12.7   | m/s   | -           | -         |
| Ratio of Gas Velocities                        | 1.2    | -     | < 3 : 1     | Yes       |
| Maximum angle of flow with regard to duct axis | <15    | °     | < 15°       | Yes       |
| No local negative flow                         | Yes    | -     | -           | Yes       |

| Calculation of Stack Gas Velocity, V   |      |     |
|--|------|-----|
| Velocity at Traverse Point, $V = K_{pt} \times (1-e) \times \sqrt{2 \times DP_{pt} / P_{ActualW}}$ |      |     |
| <b>Where:</b>  |      |     |
| $K_{pt}$ = Pitot tube calibration coefficient  |      |     |
| (1-e) = Compressibility correction factor, assumed at a constant 0.998                             |      |     |
| Average Stack Gas Velocity, Va   | 11.2 | m/s |

| Calculation of Stack Gas Volumetric Flowrate, Q |          |           |       |
|---|----------|-----------|-------|
| Duct gas flow conditions                        | Actual   | Reference | Units |
| Temperature                                     | 25       | 0         | °C    |
| Total Pressure                                  | 101.0775 | 101.3     | kPa   |
| Oxygen  | 20.9     | 21        | %     |
| Moisture  | 15.24    | 0.00      | %     |
| Pitot tube calibration coefficient, $K_{pt}$    | 0.85     |           |       |

| Gas Volumetric Flowrate                           | Result   | Units              |
|---|----------|--------------------|
| Average Stack Gas Velocity (Va)                   | 11.22    | m/s                |
| Stack Area (A)                                    | 1.21     | m <sup>2</sup>     |
| Gas Volumetric Flowrate (Actual), $Q_{Actual}$    | 48801.18 | m <sup>3</sup> /hr |
| Gas Volumetric Flowrate (STP, Wet), $Q_{STP}$     | 44608.93 | m <sup>3</sup> /hr |
| Gas Volumetric Flowrate (STP, Dry), $Q_{STP,Dry}$ | 37808.63 | m <sup>3</sup> /hr |
| Gas Volumetric Flowrate (REF), $Q_{Ref}$          | 37808.63 | m <sup>3</sup> /hr |

**Where:**

$Q_{Actual} = Va \times A \times 3600$   
 $Q_{STP} = Q (Actual) \times (Ts / Ta) \times (Pa / Ps) \times 3600$   
 $Q_{STP,Dry} = Q (STP) / (100 - (100 / Ma)) \times 3600$   
 $Q_{Ref} = Q (STP) \times ((100 - Ma) / (100 - Ms)) \times ((21 - O_{2a}) / (21 - O_{2s}))$

**Nomenclature:**

$T_s$  = Absolute Temperature, Standard Conditions, 273 K  
 $P_s$  = Absolute Pressure, Standard Conditions, 101.3 kPa  
 $T_a$  = Absolute Temperature, Actual Conditions, K  
 $P_a$  = Absolute Pressure, Actual Conditions, kPa  
 $Ma$  = Water vapour, Actual Conditions, % Vol  
 $Ms$  = Water vapour, Reference Conditions, % Vol  
 $O_{2a}$  = Oxygen, Actual Conditions, % Vol  
 $O_{2s}$  = Oxygen, Reference Conditions, % Vol



APPENDIX 3 - Measurement Uncertainty Budget Calculations

**MEASUREMENT UNCERTAINTY BUDGET - MOISTURE**

| Run                | Sampled Volume<br>m <sup>3</sup> | Sampled Gas Temp<br>K | Sampled Gas Pressure<br>kPa | Sampled Gas Humidity<br>% by volume | Oxygen Content<br>% by volume | Leak<br>%   |
|--------------------|----------------------------------|-----------------------|-----------------------------|-------------------------------------|-------------------------------|-------------|
| <b>MU required</b> | <b>≤ 2%</b>                      | <b>≤ 2%</b>           | <b>≤ 1%</b>                 | <b>≤ 1%</b>                         | <b>≤ 10%</b>                  | <b>≤ 2%</b> |
| Run 1              | 0.000                            | 2.0                   | 0.50                        | 1.0                                 | N/A                           | -           |
| as a %             | 0.07                             | 0.67                  | 0.49                        | 1.0                                 | N/A                           | 0.00        |
| <b>compliant?</b>  | <b>Yes</b>                       | <b>Yes</b>            | <b>Yes</b>                  | <b>Yes</b>                          | <b>N/A</b>                    | <b>Yes</b>  |

| Run         | Volume (STP)<br>m <sup>3</sup> | Mass Gained<br>mg | O2 Correction<br>- | Leak<br>mg/m <sup>3</sup> | Uncollected Mass<br>mg | Combined uncertainty |
|-------------|--------------------------------|-------------------|--------------------|---------------------------|------------------------|----------------------|
| Run 1       | 0.6                            | 94000             | 1.0                | 0.0                       | 58                     | -                    |
| MU as % v/v | 0.24                           | 0.02              | -                  | 0.00                      | 0.01                   | <b>0.24</b>          |
| MU as %     | 1.3                            | 0.1               | -                  | 0.0                       | 0.1                    | -                    |

|   |             |              |             |          |
|---|-------------|--------------|-------------|----------|
| <b>R1 - Uncertainty expressed at a 95% confidence level (where k = 2)</b> | <b>0.48</b> | <b>% v/v</b> | <b>2.62</b> | <b>%</b> |
|---|-------------|--------------|-------------|----------|

Reference – SOCOTEC Technical Procedure AE150 Estimation of Uncertainty of Measurement

APPENDIX 3 - Measurement Uncertainty Budget Calculations

**MEASUREMENT UNCERTAINTY BUDGET - OXIDES OF NITROGEN**

|                                |     |                   |
|--------------------------------|-----|-------------------|
| Limit value                    | 100 | mg/m <sup>3</sup> |
| Concentration @ Ref conditions | 1.3 | mg/m <sup>3</sup> |
| Cal gas conc                   | 410 | mg/m <sup>3</sup> |
| Analyser Full Scale            | 513 | mg/m <sup>3</sup> |

|  | Value | Units                         | specification      | MU Met? |
|--|-------|-------------------------------|--------------------|---------|
| Response time                              | 40    | seconds                       | 180                | Yes     |
| Logger sampling interval                   | 60    | seconds                       | -                  | -       |
| Measurement period                         | 30    | minutes                       | -                  | -       |
| Number of readings in measurement          | 30    | -                             | -                  | -       |
| Repeatability at zero                      | 0.11  | % full scale                  | <1 % range         | Yes     |
| Repeatability at span level                | 0.1   | % full scale                  | <2 % range         | Yes     |
| Deviation from linearity                   | -0.40 | % of value                    | <2 % range         | Yes     |
| Zero drift                                 | -0.10 | % full scale                  | <5% range / 24hr   | Yes     |
| Span drift                                 | -1.88 | % full scale                  | <5% range / 24hr   | Yes     |
| volume or pressure flow dependence         | 0.25  | % of full scale/3 kPa         | <2 % / 3 kPa       | Yes     |
| atmospheric pressure dependence            | 0.25  | % of full scale/2 kPa         | <3% / 2 kPa        | Yes     |
| ambient temperature dependence zero / span | 0.00  | % full scale/10K              | <3% range / 10 K   | Yes     |
| Combined interference                      | -0.01 | % range                       | <4% of Range       | Yes     |
| dependence on voltage                      | 0.00  | % full scale/10V              | < 0.1%vol /10 volt | Yes     |
| Influence of Vibration                     | N/A   | % of upper limit of Cal range | <2%                | -       |
| losses in the line (leak)                  | 0.00  | % of value                    | < 2% of value      | Yes     |

| Performance characteristic        | Uncertainty | Value of uncertainty quantity |
|-----------------------------------|-------------|-------------------------------|
| repeatability                     | $U_r = S_r$ | 0.0037                        |
| lack of fit                       | $U_{lof}$   | -0.2309                       |
| short term zero drift             | $U_{d,z}$   | -0.0583                       |
| short term span drift             | $U_{d,s}$   | -1.0874                       |
| influence of Ambient Temp at Zero | $U_{t,z}$   | 0.0000                        |
| influence of Ambient Temp at Span | $U_{t,s}$   | 0.0000                        |
| influence of sample gas pressure  | $U_p$       | 0.0000                        |
| influence of sample gas flow      | $U_{fit}$   | 0.1732                        |
| influence of supply voltage       | $U_v$       | 0.0014                        |
| Combined Interference             | $U_i$       | -0.0018                       |
| Uncertainty of Cal gas            | $U_{adj}$   | 2.0000                        |

|  |      |                   |
|--|------|-------------------|
| Measurement uncertainty (Concentration Measured) | 1.29 | mg/m <sup>3</sup> |
| Combined uncertainty                             | 2.30 | mg/m <sup>3</sup> |
| Expanded at a 95% confidence interval            | 4.50 | mg/m <sup>3</sup> |

|  |      |       |
|--|------|-------|
| Expanded uncertainty expressed with a level of confidence of 95% | 4.50 | % ELV |
|--|------|-------|

|  |     |                   |
|--|-----|-------------------|
| Expanded uncertainty expressed with a level of confidence of 95% | 4.5 | mg/m <sup>3</sup> |
|--|-----|-------------------|

|  |       |         |
|--|-------|---------|
| Expanded uncertainty expressed with a level of confidence of 95% | 347.6 | % value |
|--|-------|---------|

APPENDIX 3 - Measurement Uncertainty Budget Calculations

**MEASUREMENT UNCERTAINTY BUDGET - CARBON MONOXIDE**

|                                |       |                   |
|--------------------------------|-------|-------------------|
| Limit value                    | 100   | mg/m <sup>3</sup> |
| Concentration @ Ref conditions | 3.5   | mg/m <sup>3</sup> |
| Cal gas conc                   | 205.0 | mg/m <sup>3</sup> |
| Analyser Full Scale            | 250   | mg/m <sup>3</sup> |

| Performance characteristics                | Value | Units                         | specification      | MU Met? |
|--|-------|-------------------------------|--------------------|---------|
| Response time                              | 40    | seconds                       | 180                | Yes     |
| Logger sampling interval                   | 60    | seconds                       | -                  | -       |
| Measurement period                         | 30    | minutes                       | -                  | -       |
| Number of readings in measurement          | 30    | -                             | -                  | -       |
| Repeatability at zero                      | 0.1   | % full scale                  | <1 % range         | Yes     |
| Repeatability at span level                | 0.2   | % full scale                  | <2 % range         | Yes     |
| Deviation from linearity                   | 0.61  | % of value                    | <2 % range         | Yes     |
| Zero drift                                 | 0.00  | % full scale                  | <5% range / 24hr   | Yes     |
| Span drift                                 | -1.57 | % full scale                  | <5% range / 24hr   | Yes     |
| volume or pressure flow dependence         | 0.2   | % of full scale/3 kPa         | <2 % / 3 kPa       | Yes     |
| atmospheric pressure dependence            | 0.44  | % of full scale/2 kPa         | <3% / 2 kPa        | Yes     |
| ambient temperature dependence zero / span | -0.8  | % full scale/10K              | <3% range / 10 K   | Yes     |
| Combined interference                      | -0.01 | % of Range                    | <4% of Range       | Yes     |
| dependence on voltage                      | -0.06 | % full scale/10V              | < 0.1%vol /10 volt | Yes     |
| Influence of Vibration                     | N/A   | % of upper limit of Cal range | <2%                | N/A     |
| losses in the line (leak)                  | 0.00  | % of value                    | < 2% of value      | Yes     |
| Uncertainty of calibration gas             | 1.00  | % of value                    | < 2% of value      | Yes     |

N/A - Horiba's are not effected by Vibration

| Performance characteristic       | Uncertainty | Value of uncertainty quantity |
|----------------------------------|-------------|-------------------------------|
| repeatability                    | $U_r = S_r$ | 0.003                         |
| lack of fit                      | $U_{lof}$   | 0.12                          |
| short term zero drift            | $U_{dz}$    | 0.35                          |
| short term span drift            | $U_{ds}$    | 0.00                          |
| influence of Ambient Temp zero   | $U_{tz}$    | 0.00                          |
| influence of Ambient Temp span   | $U_{ts}$    | 0.00                          |
| influence of sample gas pressure | $U_p$       | 0.00                          |
| influence of sample gas flow     | $U_{fit}$   | 0.14                          |
| influence of supply voltage      | $U_v$       | -0.09                         |
| Combined Interference            | $U_i$       | -0.40                         |
| Uncertainty of Cal gas           | $U_{adj}$   | 0.82                          |

|  |     |                   |
|--|-----|-------------------|
| Measurement uncertainty (Concentration Measured) | 3.5 | mg/m <sup>3</sup> |
| Combined uncertainty                             | 1.0 | mg/m <sup>3</sup> |
| Expanded uncertainty                             | 2.0 | mg/m <sup>3</sup> |

|   |             |                         |
|---|-------------|-------------------------|
| <b>Expanded uncertainty expressed with a level of confidence of 95%</b> | <b>2.0</b>  | <b>% ELV</b>            |
| <b>Expanded uncertainty expressed with a level of confidence of 95%</b> | <b>2.0</b>  | <b>mg/m<sup>3</sup></b> |
| <b>Expanded uncertainty expressed with a level of confidence of 95%</b> | <b>56.5</b> | <b>% value</b>          |

Reference – SOCOTEC Technical Procedure AE150 Estimation of Uncertainty of Measurement

APPENDIX 3 - Measurement Uncertainty Budget Calculations

**MEASUREMENT UNCERTAINTY BUDGET - OXYGEN**

|                        |       |      |
|------------------------|-------|------|
| Reference              | N/A   | %vol |
| Reported Concentration | 20.90 | %vol |
| Calibration gas        | 20.95 | %vol |
| Analyser Full Scale    | 25    | %vol |

|                                    | Value | Units                 | specification      | MU Met? |
|------------------------------------|-------|-----------------------|--------------------|---------|
| Response time                      | 40    | seconds               | 180                | Yes     |
| Logger sampling interval           | 60    | seconds               | -                  | -       |
| Measurement period                 | 30    | minutes               | -                  | -       |
| Number of readings in measurement  | 30    | -                     | -                  | -       |
| Repeatability at zero              | 0.25  | % full scale          | <1 % range         | Yes     |
| Repeatability at span level        | 0.15  | % full scale          | <2 % range         | Yes     |
| Deviation from linearity           | 0.13  | % of value            | <2 % range         | Yes     |
| Zero drift                         | -1.31 | % full scale          | <5% range / 24hr   | Yes     |
| Span drift                         | 1.80  | % full scale          | <5% range / 24hr   | Yes     |
| volume or pressure flow dependence | 0.03  | % of full scale/3 kPa | <2 % / 3 kPa       | Yes     |
| atmospheric pressure dependence    | 0.05  | % of full scale/2 kPa | <3% / 2 kPa        | Yes     |
| ambient temperature dependence     | -0.05 | % full scale/10K      | <3% range / 10 K   | Yes     |
| Combined interference              | 0.01  | % range               | <4% of Range       | Yes     |
| dependence on voltage              | 0.00  | % full scale/10V      | < 0.1%vol /10 volt | Yes     |
| losses in the line (leak)          | 0.01  | % of value            | < 2% of value      | Yes     |
| Uncertainty of calibration gas     | 0.0   | % of value            | < 2% of value      | Yes     |

| Performance characteristic        | Uncertainty | Value of uncertainty quantity |
|-----------------------------------|-------------|-------------------------------|
| repeatability                     | $U_r = S_r$ | 0.0083                        |
| lack of fit                       | $U_{lof}$   | 0.0751                        |
| short term zero drift             | $U_{dz}$    | -0.7585                       |
| short term span drift             | $U_{ds}$    | 1.0417                        |
| influence of Ambient Temp at Zero | $U_{tz}$    | 0.0000                        |
| influence of Ambient Temp at Span | $U_{ts}$    | 0.0000                        |
| influence of sample gas pressure  | $U_p$       | 0.0000                        |
| influence of sample gas flow      | $U_{fit}$   | 0.0173                        |
| influence of supply voltage       | $U_v$       | 0.0001                        |
| Combined Interference             | $U_i$       | 0.0017                        |
| Uncertainty of Cal gas            | $U_{adj}$   | 0.1048                        |

|  |       |   |
|--|-------|---|
| Measurement uncertainty (Concentration Measured) | 20.90 | % |
| Combined uncertainty                             | 1.30  | % |
| Expanded uncertainty                             | 2.54  | % |

|  |     |   |
|--|-----|---|
| Expanded uncertainty expressed with a level of confidence of 95% | 2.5 | % |
|--|-----|---|

|  |       |       |
|--|-------|-------|
| Expanded uncertainty expressed with a level of confidence of 95% | 12.14 | % vol |
|--|-------|-------|



**MEASUREMENT UNCERTAINTY BUDGET - VELOCITY & VOLUMETRIC FLOW RATE**

|  |       |                    |
|--|-------|--------------------|
| Measured Velocity at Actual Conditions             | 11.2  | m/s                |
| Measured Volumetric Flow rate at Actual Conditions | 48801 | m <sup>3</sup> /hr |

| Performance Characteristics & Source of Value                 | Units             | Values  | Requirement                                | Compliant |
|---|-------------------|---------|--|-----------|
| Uncertainty of Local Gas Velocity Determination               | -                 | 0.010   |  |           |
| Uncertainty of pitot tube coefficient                         | -                 | 0.87    |  |           |
| Uncertainty of mean local dynamic pressures                   | -                 | 0.591   | minimum 3                                  | Yes       |
| Factor loading, function of the number of measurements.       | 3 readings        |         |  |           |
| Range of measurement device                                   | pa                | 1000    |  |           |
| Resolution  | pa                | 1.00    |  |           |
| Calibration uncertainty                                       | pa                | 15.91   | <1% of Value or 20 Pa whichever is greater | Yes       |
| Drift   | % range           | 0.10    |  |           |
| Linearity   | % range           | 0.06    | <2% of value                               | Yes       |
| Uncertainty of gas density determination                      | kg/mol            | 0.00003 |  |           |
| Uncertainty of molar mass determination                       | K                 | 1.52    | <1% of value                               | Yes       |
| Uncertainty of temperature measurement                        | pa                | 516     |  |           |
| Uncertainty of absolute pressure in the duct                  | kg/m <sup>3</sup> | 0.008   |  |           |
| Uncertainty associated with the calculation of density        | -                 | 0.0001  |  |           |
| Uncertainty associated with the measurement of local velocity | -                 | 0.0002  |  |           |
| Uncertainty associated with the measurement of mean velocity  | -                 |         |  |           |

| Measurement Uncertainty - Velocity                | m/s  |
|---|------|
| Combined uncertainty                              | 0.14 |
| Expanded uncertainty at a 95% Confidence Interval | 0.28 |

Note - The expanded uncertainty uses a coverage factor of  $k = 2$ .

| Expanded Measurement Uncertainty of Velocity at a 95% Confidence Interval | %   |
|---|-----|
| Expressed as a % of the Measured Velocity                                 | 1.3 |
| Expanded uncertainty at a 95% Confidence Interval                         | 2.5 |

| Measurement Uncertainty Volumetric Flow Rate      | m <sup>3</sup> /hr |
|---|--------------------|
| Combined uncertainty                              | 1290               |
| Expanded uncertainty at a 95% Confidence Interval | 2529               |

Note - The expanded uncertainty uses a coverage factor of  $k = 2$ .

| Expanded Measurement Uncertainty of Volumetric Flow Rate at a 95% Confidence Interval | %   |
|---|-----|
| Expressed as a % of the Measured Volumetric Flow Rate                                 | 2.6 |
| Expanded uncertainty at a 95% Confidence Interval                                     | 5.2 |

Reference – SOCOTEC Technical Procedure AE150 Estimation of Uncertainty of Measurement

## END OF REPORT

*Thank you for choosing SOCOTEC for your environmental monitoring needs. We hope our services have met your requirements and that you are fully satisfied with your experience of working with us, we really do value your custom and would welcome your feedback. We would appreciate it if you could take a moment to complete a short online questionnaire so that we can improve our operations and address any areas that have not met with your expectations, by clicking on the following*

[https://www.surveymonkey.co.uk/r/CAE\\_customer\\_feedback\\_weblink](https://www.surveymonkey.co.uk/r/CAE_customer_feedback_weblink)