

# Report for the Periodic Monitoring of Emissions to Air From Poeton Industries Ltd Cardiff Site

**Permit Number: BP1772IZ**

**07 July 2016**

## Part 1: Executive Summary

|                          |                                                                                                                                                                                                                       |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Contract Reference:      | POETON-03125                                                                                                                                                                                                          |
| Client:                  | Poeton Industries Ltd                                                                                                                                                                                                 |
| Address:                 | Penarth Road<br>Cardiff CF11 8UL                                                                                                                                                                                      |
| Site Contact:            | Chris Rochelle                                                                                                                                                                                                        |
| Monitoring Organisation: | NWG Environmental Solutions<br>40 Court Road Industrial Estate<br>Cwmbran, Torfaen, NP44 3AS<br>Telephone: (01633) 862950 Fax: (01633) 865087<br><a href="http://www.nwg-solutions.co.uk">www.nwg-solutions.co.uk</a> |

This report relates to tested items only.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

Report written by  
Designation

Darren Price .....  
Air Quality Senior Project Manager

Date 15 July 2016

Report Approved by  
Designation  
MCERTS Registration Number  
MCERTS Qualifications

Glenn McMorow .....  
Air Quality Senior Project Manager  
MM02 059  
Level 2, Technical Endorsements 1,2,3,4

Date 15 July 2016

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|          | Analyser Calibration                                    |             |

## 1.1 Monitoring Objectives

The scope of work of the monitoring as shown in the following table was required to demonstrate emission concentrations.

| Location      | Determinands to be Measured |
|---------------|-----------------------------|
| Paint Booth 1 | Volatile Organic Compounds  |
| Paint Booth 2 | Volatile Organic Compounds  |
| Paint Booth 3 | Volatile Organic Compounds  |
| Paint Booth 4 | Volatile Organic Compounds  |
| LP Booth 1    | Volatile Organic Compounds  |

## 1.2 Monitoring Results

**Job Type** Monitoring Emissions to Atmosphere

**Process Status** Simulation designed to reflect normal operation.

**Reference conditions (See Note 3)** 273K, 101.3kPa, Wet Gas

| Location      | Substance to be Monitored | Run | Units              | Emission Limit Value | Date of Sampling | Start and End Times | Periodic Monitoring Result | Uncertainty ( $\pm$ ) | Vol. Flow (Nm <sup>3</sup> /min) | Moisture (%H <sub>2</sub> O) | Monitoring Method Reference | Accreditation for use of Method |
|---------------|---------------------------|-----|--------------------|----------------------|------------------|---------------------|----------------------------|-----------------------|----------------------------------|------------------------------|-----------------------------|---------------------------------|
| Paint Booth 1 | VOCs as Carbon            | One | mg/Nm <sup>3</sup> | None                 | 07-Jul-16        | 12:25-13:55         | 4.8                        | 7.5                   | Not Measured                     | Not Measured                 | BS EN 12619                 | MCERTS                          |
| Paint Booth 2 | VOCs as Carbon            | One | mg/Nm <sup>3</sup> | None                 | 07-Jul-16        | 11:48-12:18         | 32.5                       | 7.6                   | Not Measured                     | Not Measured                 | BS EN 12619                 | MCERTS                          |
| Paint Booth 3 | VOCs as Carbon            | One | mg/Nm <sup>3</sup> | None                 | 07-Jul-16        | 10:52-11:22         | 13.8                       | 7.5                   | Not Measured                     | Not Measured                 | BS EN 12619                 | MCERTS                          |
| Paint Booth 4 | VOCs as Carbon            | One | mg/Nm <sup>3</sup> | None                 | 07-Jul-16        | 10:15-11:15         | 7.1                        | 7.5                   | Not Measured                     | Not Measured                 | BS EN 12619                 | MCERTS                          |
| LP Booth 5    | VOCs as Carbon            | One | mg/Nm <sup>3</sup> | None                 | 07-Jul-16        | 13:57-14:27         | 8.4                        | 7.5                   | Not Measured                     | Not Measured                 | BS EN 12619                 | MCERTS                          |

**Note 1** Uncertainty of measurement is stated at a 95% confidence level

### 1.3 Operating Information

| Emission Point Reference | Date      | Process Type   | Fuel | Feedstock                   | Abatement     | Load                                             | Comparison of Operator CEMS and Periodic Monitoring Results |              |                             |       |
|--------------------------|-----------|----------------|------|-----------------------------|---------------|--------------------------------------------------|-------------------------------------------------------------|--------------|-----------------------------|-------|
|                          |           |                |      |                             |               |                                                  | Substance                                                   | CEMS Results | Periodic Monitoring Results | Units |
| Paint Booth 1            | 07-Jul-16 | Batch Spraying | NA   | High Solids Primer          | Filter        | Simulation designed to reflect normal operation. | No CEMs Installed                                           |              |                             |       |
| Paint Booth 2            | 07-Jul-16 | Batch Spraying | NA   | Solvent Based Dry Film Lube | Filter        | Simulation designed to reflect normal operation. | No CEMs Installed                                           |              |                             |       |
| Paint Booth 3            | 07-Jul-16 | Batch Spraying | NA   | Solvent Based Primer        | Filter        | Simulation designed to reflect normal operation. | No CEMs Installed                                           |              |                             |       |
| Paint Booth 4            | 07-Jul-16 | Batch Spraying | NA   | Solvent Based Paint         | Filter        | Simulation designed to reflect normal operation. | No CEMs Installed                                           |              |                             |       |
| LP Booth 5               | 07-Jul-16 | Batch Spraying | NA   | Liquid Penetrant            | Electrostatic | Simulation designed to reflect normal operation. | No CEMs Installed                                           |              |                             |       |

## 1.4

## Monitoring Deviations

| Emission Point Reference | Substance Deviations | Monitoring Deviations | Other Relevant Issues                                                                           |
|--------------------------|----------------------|-----------------------|-------------------------------------------------------------------------------------------------|
| Paint Booth 1            | None                 | None                  | The sample location was not suitable to take moisture, velocity or stack diameter measurements. |
| Paint Booth 2            | None                 | None                  | The sample location was not suitable to take moisture, velocity or stack diameter measurements. |
| Paint Booth 3            | None                 | None                  | The sample location was not suitable to take moisture, velocity or stack diameter measurements. |
| Paint Booth 4            | None                 | None                  | The sample location was not suitable to take moisture, velocity or stack diameter measurements. |
| LP Booth 5               | None                 | None                  | The sample location was not suitable to take moisture or velocity or measurements.              |

## **2.1 Appendix 1: General Information**

2.1.1 Monitoring Organisation Staff Details

2.1.2 Monitoring Organisation Method Details

2.1.3 Monitoring Organisation Equipment Checklist Reference

2.1.4 Manual Monitoring Method Result Calculation

**2.1.1****Monitoring organisation staff details**

| Name                 | Position                           | MCERTS Level | TE1 | TE2 | TE3 | TE4 | MCERTS registration No. |
|----------------------|------------------------------------|--------------|-----|-----|-----|-----|-------------------------|
| Sampling Team        |                                    |              |     |     |     |     |                         |
| Darren Price         | Air Quality Senior Project Manager | II           | ✓   | ✓   | ✓   | ✓   | MM03 176                |
| Dale Padfield        | Air Quality Technician             | II           | ✓   | ✓   | ✓   | ✓   | MM13 1224               |
| Report Writing       |                                    |              |     |     |     |     |                         |
| Darren Price         | Air Quality Senior Project Manager | II           | ✓   | ✓   | ✓   | ✓   | MM03 176                |
| Report Authorisation |                                    |              |     |     |     |     |                         |
| Glenn McMorro        | Air Quality Senior Project Manager | II           | ✓   | ✓   | ✓   | ✓   | MM02 059                |

**2.1.2****Monitoring organisation method details**

| Determinand | In House Method ID | Reference Standard | Analytical Laboratory |
|-------------|--------------------|--------------------|-----------------------|
| VOCs        | A57                | BS EN 12619        | N/A                   |

**2.1.3****Monitoring organisation equipment check list references**

|                                                  |
|--------------------------------------------------|
| Equipment Checklist Ref: POETON-032125 June 2016 |
|--------------------------------------------------|

#### 2.1.4 Calculation of Stack Gas Velocities, Volumetric Flow, Emission Concentrations and Mass Emission Rates

|                                                                   |                                                                                                                                                                                                   |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Total pressure (mm Hg) =                                          | Atmospheric pressure(mm Hg) + static pressure (mm Hg)                                                                                                                                             |
| Dry Gas volume sampled @ ntp (Nm3) =                              | $\frac{\text{Dry gas volume sampled(l)} \times 273 \times \text{Atmospheric pressure(mm Hg)}}{1000 \times \text{average ambient temp(K)} \times 760}$                                             |
| Bws =                                                             | $\frac{\text{mass H2O collected (g)} \times 0.00124}{\text{Dry gas volume sampled@ntp(Nm/s)} + (\text{mass H2O collected(g)} \times 0.00124)}$                                                    |
| % Moisture =                                                      | 100* Bws                                                                                                                                                                                          |
| Wet Gas volume sampled @ ntp (Nm3) - dry gas meter measurements = | Dry gas volume sampled@ntp(Nm/s)*(100/100-% moisture)                                                                                                                                             |
| Wet Gas volume sampled @ ntp (Nm3) - sorbent tubes =              | $\frac{\text{Average rotameter reading (l/min)} \times \text{sampling time (mins)} \times 273 \times \text{Atmospheric pressure (mm Hg)}}{1000 \times \text{ambient temperature (K)} \times 760}$ |
| Mol. Wt. of wet gas =                                             | Mol. Wt. dry gas * (1-Bws) + 18*Bws      Default value for wt. of dry gas = 28.84 (Non-comb. Process)                                                                                             |
| Actual mean gas velocity (m/s) =                                  | $\frac{34.97 \times \text{Pitot Coefficient} \times \text{root delta P (mm H2O)} \times (\text{Stack temp. (K)}^{0.5})}{(\text{Mol wt of wet gas} \times \text{total pressure(mm Hg)})^{0.5}}$    |
| Actual mean gas velocity @ ntp (m/s) =                            | $\frac{\text{Actual gas velocity(m/s)} \times \text{total pressure(mm Hg)} \times 273}{\text{stack temperature(K)} \times 760}$                                                                   |
| Stack cross section area (m2) =                                   | 3.14 * (stack diameter(m)/2)^2                                                                                                                                                                    |
| Actual volume flow (m³/min) =                                     | 60* c.s.a.(m2)* actual gas velocity (sampling) (m/s)                                                                                                                                              |
| Corrected Volume flow @ ntp (Nm³/min) =                           | 60*stack c.s.a(m2)*mean actual gas velocity (m/s)*ref temp (K)/Duct temp (K)*total pressure (mmHg)/ref. Pressure                                                                                  |
| Pollutant Concentration @ ntp (mg/Nm3) - wet basis =              | $\frac{\text{Mass of Pollutant collected (mg)}}{\text{Wet Gas volume sampled @ ntp(Nm3)}}$                                                                                                        |
| Pollutant Concentration @ ntp (mg/Nm3) - dry basis =              | $\frac{\text{Mass of Pollutant collected (mg)}}{\text{Dry Gas volume sampled @ ntp(Nm3)}}$                                                                                                        |
| Pollutant Mass emission rate (kg/hr) =                            | Pollutant conc (@ ntp wet basis)*Vol. flow (@ ntp wet basis) *60/1000000<br><u>or</u><br>Pollutant conc (@ ntp dry basis)*Vol. flow (@ ntp dry basis) *60/1000000                                 |

#### Conversion of ppm to mg/Nm<sup>3</sup> (Direct reading instrument)

|                                           |                                                                       |
|-------------------------------------------|-----------------------------------------------------------------------|
| Conc of pollutant as mg/Nm <sup>3</sup> = | Conc of pollutant in ppm * (Molecular wt of pollutant / Molar volume) |
|-------------------------------------------|-----------------------------------------------------------------------|

#### Correction of pollutant concentration to oxygen reference

|                                         |                                                                                       |
|-----------------------------------------|---------------------------------------------------------------------------------------|
| Conc of pollutant at ref oxygen level = | Conc of pollutant (@ ntp) * ((21- O <sub>2 ref</sub> )/(21-O <sub>2 measured</sub> )) |
|-----------------------------------------|---------------------------------------------------------------------------------------|

## **Appendix 2: Measurement Information Paint Booth 1**

**Stack:**

**Stack Diagram**

**Flow Measurements**

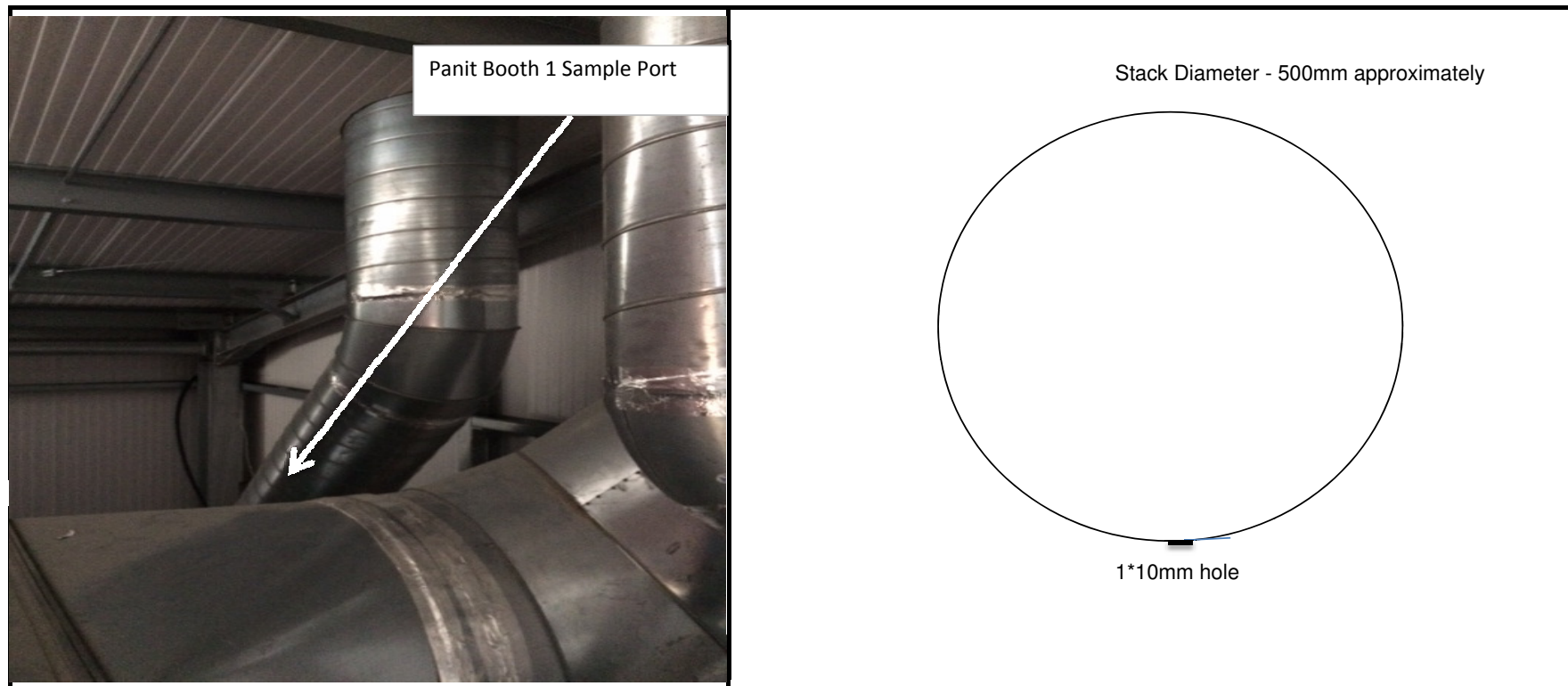
**Minute Averaged VOC Data**

**Uncertainty of Measurement**

**Analyser Calibration**

| Permit Number           | Operator Name         | Installation Name | Installation Address            |
|-------------------------|-----------------------|-------------------|---------------------------------|
| Permit Number: BP1772IZ | Poeton Industries Ltd | Cardiff Site      | Penarth Road, Cardiff, CF11 8UL |

### Paint Booth 1



|      |    |         |              |       |            |           |                     |                                  |
|------|----|---------|--------------|-------|------------|-----------|---------------------|----------------------------------|
| Page | of | Job No. | POETON-03125 | Date: | 07/07/2016 | Operators | D Price, D Padfield | A70 - ISO 16911-1 Traverse Sheet |
|------|----|---------|--------------|-------|------------|-----------|---------------------|----------------------------------|

|                     |               |            |          |                 |           |          |                          |                          |       |                 |                    |                    |                                          |    |                  |    |    |                         |
|---------------------|---------------|------------|----------|-----------------|-----------|----------|--------------------------|--------------------------|-------|-----------------|--------------------|--------------------|------------------------------------------|----|------------------|----|----|-------------------------|
| Client              | Poeton        | Probe ID   | NA       | Pitot checks    |           |          | Gas Composition in Stack |                          |       | Static Pressure |                    |                    | Repeatability of velocity @ single point |    |                  |    |    |                         |
| Plant               | Cardiff       | Pitot ID   | NA       | Pyhsical checks |           | NA       | O <sub>2</sub>           | NA                       | % wet | Side A          | NA                 | cmH <sub>2</sub> O | Mins                                     | 1  | 2                | 3  | 4  | 5                       |
| Stack               | Paint Booth 1 | Pitot type | NA       | Leak Checks     |           |          | CO <sub>2</sub>          | NA                       | % wet | Side B          | NA                 | cmH <sub>2</sub> O | cm H <sub>2</sub> O                      | NA | NA               | NA | NA | NA                      |
| Diameter            | 500 mm        | Pitot Cp   | NA       |                 | 0 mins    | 15s / 5m | H <sub>2</sub> O         | NA                       | % wet | Pass/Fail       | NA                 |                    | Pa                                       | NA | NA               | NA | NA | NA                      |
| Port Length         | 0 mm          | Barometer  | 690      | Side A          | NA        | NA       | If unknown:              |                          |       | Average         | NA                 |                    | m/s                                      | NA | NA               | NA | NA | NA                      |
| Bar. Pressure (kPa) |               | 102        | T/C ID   | 1046            | Side B    | NA       | NA                       | Combustion use 10, 10, 5 |       |                 | Minimum Velocity   |                    | 0                                        |    | Average velocity |    | NA | Std Dev as % of average |
| Ambient Temp.       |               | 15         | Meter ID | NA              | Pass/Fail | NA       | NA                       | Non-comb. use 20.9, 0, 0 |       |                 | Velocity Variation |                    | #DIV/0!                                  |    | Std Dev velocity |    | NA | NA                      |

| Port 1     |                                               |                         |   |   |     |    |       |                   |                | Port 2     |                                               |                         |   |   |        |         |       |                   |                |            |  |     |
|------------|-----------------------------------------------|-------------------------|---|---|-----|----|-------|-------------------|----------------|------------|-----------------------------------------------|-------------------------|---|---|--------|---------|-------|-------------------|----------------|------------|--|-----|
| Point - mm | Temp (°C)                                     | Δp (cmH <sub>2</sub> O) |   |   |     | Pa | Angle | v <sub>meas</sub> | v <sub>c</sub> | Point - mm | Temp (°C)                                     | Δp (cmH <sub>2</sub> O) |   |   |        | Pa      | Angle | v <sub>meas</sub> | v <sub>c</sub> |            |  |     |
|            |                                               | 1                       | 2 | 3 | Ave |    |       |                   |                |            |                                               | 1                       | 2 | 3 | Ave    |         |       |                   |                |            |  |     |
| 73         | Port Not Accessible for Velocity Measurements |                         |   |   |     |    |       |                   |                | 73         | Port Not Accessible for Velocity Measurements |                         |   |   |        |         |       |                   |                |            |  |     |
| 427        |                                               |                         |   |   |     |    |       |                   |                |            |                                               |                         |   |   |        |         |       |                   |                |            |  |     |
| Averages   | -                                             |                         |   |   |     | -  | -     |                   |                | -          | -                                             |                         |   |   | Signed | D Price |       |                   | A              | D Padfield |  | NTA |
| Std Dev    |                                               |                         |   |   |     | -  | -     |                   |                |            |                                               |                         |   |   |        |         |       |                   |                |            |  |     |

| Gas Emission Data from Paint Booth 1 |                                        |
|--------------------------------------|----------------------------------------|
| Time                                 | VOC as Carbon<br>(mg/Nm <sup>3</sup> ) |
| 07-Jul-16                            |                                        |
| 12:25                                | 6.0                                    |
| 12:26                                | 3.8                                    |
| 12:27                                | 3.3                                    |
| 12:28                                | 2.8                                    |
| 12:29                                | 2.7                                    |
| 12:30                                | 7.2                                    |
| 12:31                                | 9.1                                    |
| 12:32                                | 8.8                                    |
| 12:33                                | 10.9                                   |
| 12:34                                | 5.6                                    |
| 12:35                                | 4.4                                    |
| 12:36                                | 3.6                                    |
| 12:37                                | 3.1                                    |
| 12:38                                | 3.6                                    |
| 12:39                                | 2.8                                    |
| 12:40                                | 2.7                                    |
| 12:41                                | 2.7                                    |
| 12:42                                | 2.7                                    |
| 12:43                                | 2.7                                    |
| 12:44                                | 2.5                                    |
| 12:45                                | 2.5                                    |
| 12:46                                | 2.5                                    |
| 12:47                                | 2.5                                    |
| 12:48                                | 2.3                                    |
| 12:49                                | 4.4                                    |
| 12:50                                | 7.2                                    |
| 12:51                                | 7.2                                    |
| 12:52                                | 7.5                                    |
| 12:53                                | 7.2                                    |
| 12:54                                | 8.3                                    |
| 12:55                                | 6.5                                    |
| <b>Average</b>                       | <b>4.8</b>                             |

## VOC Uncertainty Calculations

## Paint Booth 1

|                        |                             |
|------------------------|-----------------------------|
| <b>Range 0 - ? ppm</b> | <b>VOC</b>                  |
| <b>100</b>             | <b>161 mg/m<sup>3</sup></b> |

|                                 |                       |
|---------------------------------|-----------------------|
| studied concentration VOC (VLE) | 4.8 mg/m <sup>3</sup> |
| measuring time                  | 281 minutes           |

| Conditions of operation                             |                             |
|-----------------------------------------------------|-----------------------------|
| Measurement are performed in an environment where   |                             |
| fluctuations of ambient temperature (in °C)         | 298 to 318 K                |
| fluctuations of sample pressure are within (in kPa) | 100 +/- 5                   |
| fluctuations of voltage (in V)                      | 200-220                     |
| atmospheric pressure variations (in kPa)            | 99-100                      |
| frequency of adjustment (in hours)                  | 10                          |
| O2 concentration measured                           | NA                          |
| NH3 range : unknown                                 | Default values : 0-20 mg/m3 |
| CO2 range                                           | 8-15 %                      |
| H2O range                                           | 10-20%                      |
| O2 reference concentration                          | NA                          |

| Performance characteristics        | Value  | *                   | specification          |
|------------------------------------|--------|---------------------|------------------------|
| Response time                      | L 5    | seconds             | 1 minute               |
| Repeatability at zero              | L 1    | % of the full scale | 0,2% of the full scale |
| Repeatability at span level        | L 1    | % of the full scale | 2% of the full scale   |
| Deviation from linearity           | L 0.5  | % of value          | +/-5% of elv           |
| Zero drift ***                     | L 0.00 | % of fs/24h         | +/-5% of fs/24h        |
| Span drift ***                     | L 0.00 | % of fs/24h         | +/-5% of fs/24h        |
| volume or pressure flow dependence | L 0.02 | % of fs/kPa         | 1% of fs/30kPa         |
| atmospheric pressure dependence    | L 0.8  | % of value/kPa      | 3% of value/4kPa       |
| ambient temperature dependence     | L 3    | %fs/10K             | 3%fs/10K               |
| dependence on voltage              | L 1    | %fs/10V             | 2%fs/10V               |
| losses in the line (leak)          | F 2    | % of value          | 2% of value            |
| Uncertainty of calibration gas     | F 2    | % of value          |                        |

L=laboratory F=Field

| Measurement performance related to dynamic conditions |                        |
|-------------------------------------------------------|------------------------|
| Requirement for response time                         | 120 sec                |
| Measured response time                                | 2 minutes              |
| <b>Conclusion</b>                                     | <b>requirement met</b> |

| Measurement performance related to stationary conditions |  |                    |  |                                    |      |
|----------------------------------------------------------|--|--------------------|--|------------------------------------|------|
| Performance characteristic                               |  | Uncertainty        |  | Value of uncertainty quantity      |      |
| Standard deviation of repeatability at zero              |  | U <sub>r0</sub>    |  | 0.0015*410                         | 1.61 |
| Standard deviation of repeatability at span level        |  | U <sub>rs</sub>    |  | 0.008*410                          | 1.61 |
| Lack of fit                                              |  | U <sub>fit</sub>   |  | 0.007*410/3 <sup>1/2</sup>         | 0.46 |
| Zero drift                                               |  | U <sub>odr</sub>   |  | 0.0001*410/3 <sup>1/2</sup>        | 0.00 |
| Span drift                                               |  | U <sub>sdr</sub>   |  | 0.01*410/3 <sup>1/2</sup>          | 0.00 |
| volume or pressure flow dependence                       |  | U <sub>spres</sub> |  | (0.0002*410)*5/3 <sup>1/2</sup>    | 0.09 |
| atmospheric pressure dependence                          |  | U <sub>apres</sub> |  | (0.008*200/1)*0.5/3                | 0.01 |
| ambient temperature dependence                           |  | U <sub>temp</sub>  |  | (0.003*410/10)*10/3 <sup>1/2</sup> | 2.78 |
| dependence on voltage                                    |  | U <sub>volt</sub>  |  | 0.0012/10*410*10/3 <sup>1/2</sup>  | 0.93 |
| losses in the line (leak)                                |  | U <sub>leak</sub>  |  | 0.02*200/3 <sup>1/2</sup>          | 0.06 |
| Uncertainty of calibration gas                           |  | U <sub>calib</sub> |  | 0.02*200/3                         | 0.06 |

| Measurement uncertainty at         | 4.8  | mg/m <sup>3</sup> |
|------------------------------------|------|-------------------|
| U <sub>tot</sub>                   | 3.74 | mg/m <sup>3</sup> |
| U <sub>tot</sub> /C <sub>lim</sub> | 78   | %                 |
| U <sub>tot,rel</sub>               | 156  | %                 |

Note: Uncertainties for which the results are below the LOD have been calculated at the results shown above.

|           |    |              |              |       |           |
|-----------|----|--------------|--------------|-------|-----------|
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|-----------|----|--------------|--------------|-------|-----------|

|                 |        |                      |           |                      |                 |     |                   |    |
|-----------------|--------|----------------------|-----------|----------------------|-----------------|-----|-------------------|----|
| Client:         | Poeton | Plant:               | Cardiff   | Location:            | Booths 1-4 & LP |     |                   |    |
| Operators:      | DP/DPd | Test For:            | VOCs      | In-house Method No.: | A57             |     |                   |    |
| Laptop ID:      | 1196   | Start:               | Temp (°C) | 15                   | Pressure (kPa)  | 102 | Flow Rate (l/min) | NA |
| Data Logger ID: | 1024   | End:                 | 15        | 102                  | 102             | 102 | 102               | NA |
| Chiller ID      | NA     | Chiller Temp. & Time | NA        |                      |                 |     |                   |    |

| Action                     | O2  | CO | SO2 | NO | NOx | CO2 | VOC       |
|----------------------------|-----|----|-----|----|-----|-----|-----------|
| Analysers & Cylinder Info. |     |    |     |    |     |     | 1427      |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 1001      |
| Analysers & Cylinder Info. |     |    |     |    |     |     | VCSMG4986 |
| Analysers & Cylinder Info. | 1   | 1  | 1   | 1  | 1   | 1   | 1         |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 40        |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 25        |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 37 75     |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 100       |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 32        |
| Span & Divider Information | N/A |    |     |    |     |     | 102.70    |
| Span & Divider Information |     |    |     |    |     |     | 70.00     |
| Span & Divider Information |     |    |     |    |     |     | 69.97     |
| Span & Divider Information |     |    |     |    |     |     | 71.9      |
| Span & Divider Information |     |    |     |    |     |     | 64.7      |
| Analysers Calibration      |     |    |     |    |     |     | 5         |
| Analysers Calibration      |     |    |     |    |     |     | 15        |
| Analysers Calibration      |     |    |     |    |     |     | 0.00      |
| Analysers Calibration      |     |    |     |    |     |     | 71.90     |
| Analysers Calibration      |     |    |     |    |     |     | 0.00      |
| Analysers Calibration      |     |    |     |    |     |     | N/A       |
| Analysers Calibration      |     |    |     |    |     |     | N/A       |
| Analysers Calibration      |     |    |     |    |     |     | PASS      |
| Initial Line Checks        |     |    |     |    |     |     | 15        |
| Initial Line Checks        |     |    |     |    |     |     | 45        |
| Initial Line Checks        |     |    |     |    |     |     | 0.30      |
| Initial Line Checks        |     |    |     |    |     |     | 0.4172    |
| Initial Line Checks        |     |    |     |    |     |     | PASS      |
| Initial Line Checks        |     |    |     |    |     |     | 71.70     |
| Initial Line Checks        |     |    |     |    |     |     | -0.28     |
| Initial Line Checks        |     |    |     |    |     |     | PASS      |
| Final Line Checks          |     |    |     |    |     |     | 0.30      |
| Final Line Checks          |     |    |     |    |     |     | 0.0000    |
| Final Line Checks          |     |    |     |    |     |     | PASS      |
| Final Line Checks          |     |    |     |    |     |     | 72.40     |
| Final Line Checks          |     |    |     |    |     |     | 0.97      |
| Final Line Checks          |     |    |     |    |     |     | PASS      |

|   |              |    |               |
|---|--------------|----|---------------|
| A | Darren Price | NA | Dale Padfield |
|---|--------------|----|---------------|

## **Appendix 3: Measurement Information Paint Booth 2**

**Stack:**

**Stack Diagram**

**Flow Measurements**

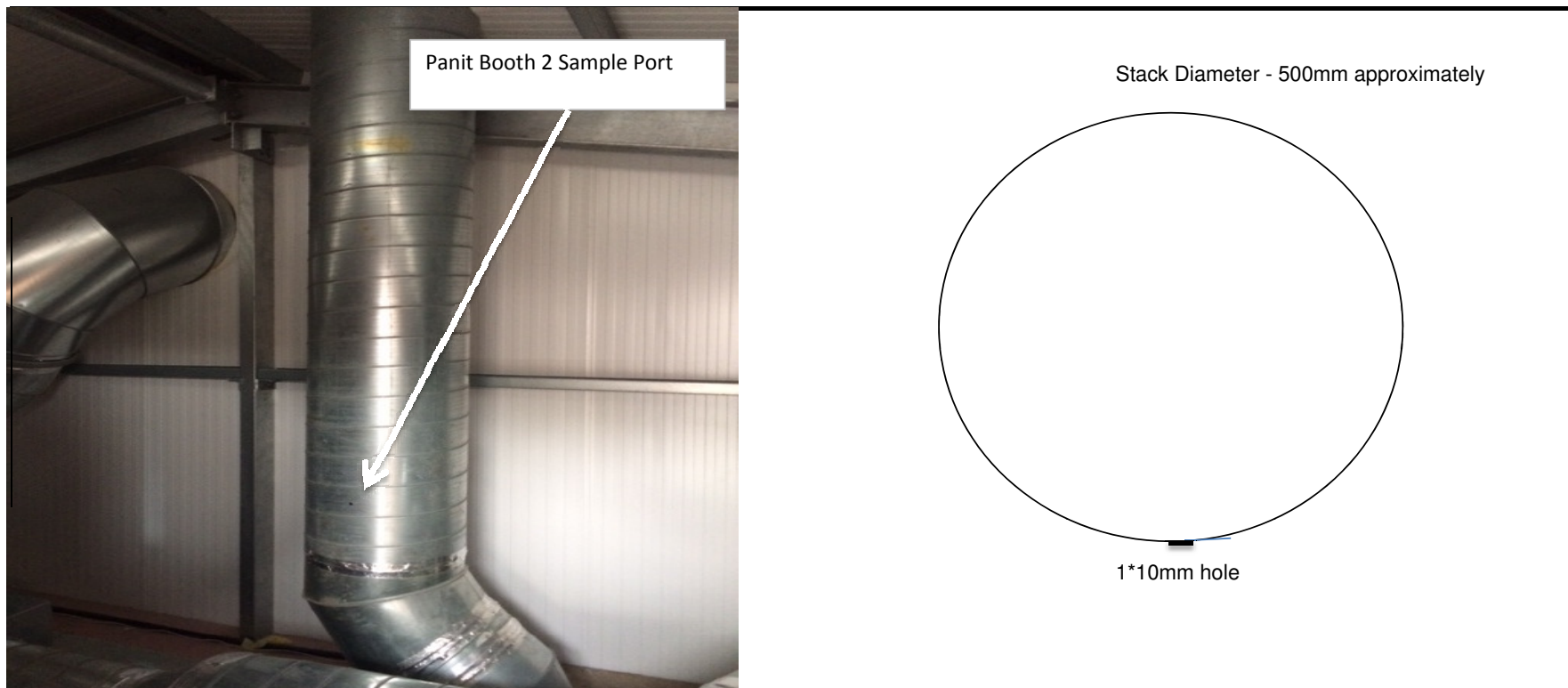
**Minute Averaged VOC Data**

**Uncertainty of Measurement**

**Analyser Calibration**

| Permit Number           | Operator Name         | Installation Name | Installation Address            |
|-------------------------|-----------------------|-------------------|---------------------------------|
| Permit Number: BP1772IZ | Poeton Industries Ltd | Cardiff Site      | Penarth Road, Cardiff, CF11 8UL |

### Paint Booth 2



|      |    |         |              |       |            |           |                     |                                  |
|------|----|---------|--------------|-------|------------|-----------|---------------------|----------------------------------|
| Page | of | Job No. | POETON-03125 | Date: | 07/07/2016 | Operators | D Price, D Padfield | A70 - ISO 16911-1 Traverse Sheet |
|------|----|---------|--------------|-------|------------|-----------|---------------------|----------------------------------|

|                     |               |            |          |                 |           |          |                          |                          |       |                 |                    |                                          |                     |                  |    |    |                         |    |
|---------------------|---------------|------------|----------|-----------------|-----------|----------|--------------------------|--------------------------|-------|-----------------|--------------------|------------------------------------------|---------------------|------------------|----|----|-------------------------|----|
| Client              | Poeton        | Probe ID   | NA       | Pitot checks    |           |          | Gas Composition in Stack |                          |       | Static Pressure |                    | Repeatability of velocity @ single point |                     |                  |    |    |                         |    |
| Plant               | Cardiff       | Pitot ID   | NA       | Pyhsical checks |           | NA       | O <sub>2</sub>           | NA                       | % wet | Side A          | NA                 | cmH <sub>2</sub> O                       | Mins                | 1                | 2  | 3  | 4                       | 5  |
| Stack               | Paint Booth 2 | Pitot type | NA       | Leak Checks     |           |          | CO <sub>2</sub>          | NA                       | % wet | Side B          | NA                 | cmH <sub>2</sub> O                       | cm H <sub>2</sub> O | NA               | NA | NA | NA                      | NA |
| Diameter            | 600 mm        | Pitot Cp   | NA       |                 | 0 mins    | 15s / 5m | H <sub>2</sub> O         | NA                       | % wet | Pass/Fail       | NA                 | Pa                                       | NA                  | NA               | NA | NA | NA                      | NA |
| Port Length         | 0 mm          | Barometer  | 690      | Side A          | NA        | NA       | If unknown:              |                          |       | Average         | NA                 | m/s                                      | NA                  | NA               | NA | NA | NA                      | NA |
| Bar. Pressure (kPa) |               | 102        | T/C ID   | 1046            | Side B    | NA       | NA                       | Combustion use 10, 10, 5 |       |                 | Minimum Velocity   |                                          | 0                   | Average velocity |    | NA | Std Dev as % of average |    |
| Ambient Temp.       |               | 15         | Meter ID | NA              | Pass/Fail | NA       | NA                       | Non-comb. use 20.9, 0, 0 |       |                 | Velocity Variation |                                          | #DIV/0!             | Std Dev velocity |    | NA | NA                      |    |

| Port 1     |                                               |                         |   |   |     |    |       |                   |                | Port 2     |                                               |                         |   |   |     |            |       |                   |                |
|------------|-----------------------------------------------|-------------------------|---|---|-----|----|-------|-------------------|----------------|------------|-----------------------------------------------|-------------------------|---|---|-----|------------|-------|-------------------|----------------|
| Point - mm | Temp (°C)                                     | Δp (cmH <sub>2</sub> O) |   |   |     | Pa | Angle | v <sub>meas</sub> | v <sub>c</sub> | Point - mm | Temp (°C)                                     | Δp (cmH <sub>2</sub> O) |   |   |     | Pa         | Angle | v <sub>meas</sub> | v <sub>c</sub> |
|            |                                               | 1                       | 2 | 3 | Ave |    |       |                   |                |            |                                               | 1                       | 2 | 3 | Ave |            |       |                   |                |
| 73         | Port Not Accessible for Velocity Measurements |                         |   |   |     |    |       |                   |                | 73         | Port Not Accessible for Velocity Measurements |                         |   |   |     |            |       |                   |                |
| 427        |                                               |                         |   |   |     |    |       |                   |                |            |                                               |                         |   |   |     |            |       |                   |                |
| Averages   | -                                             |                         |   |   |     | -  | -     |                   |                | Signed     | D Price                                       |                         |   |   | A   | D Padfield |       | NTA               |                |
| Std Dev    |                                               |                         |   |   |     | -  | -     |                   |                |            |                                               |                         |   |   |     |            |       |                   |                |

| Gas Emission Data from Paint Booth 2 |                       |
|--------------------------------------|-----------------------|
| Time                                 | VOC as Carbon         |
| 07-Jul-16                            | (mg/Nm <sup>3</sup> ) |
| 11:48                                | 2.5                   |
| 11:49                                | 5.3                   |
| 11:50                                | 24.5                  |
| 11:51                                | 48.7                  |
| 11:52                                | 46.0                  |
| 11:53                                | 29.6                  |
| 11:54                                | 36.6                  |
| 11:55                                | 18.2                  |
| 11:56                                | 6.2                   |
| 11:57                                | 17.0                  |
| 11:58                                | 26.9                  |
| 11:59                                | 6.2                   |
| 12:00                                | 3.7                   |
| 12:01                                | 3.1                   |
| 12:02                                | 2.6                   |
| 12:03                                | 2.7                   |
| 12:04                                | 3.0                   |
| 12:05                                | 80.3                  |
| 12:06                                | 26.5                  |
| 12:07                                | 46.3                  |
| 12:08                                | 98.6                  |
| 12:09                                | 15.2                  |
| 12:10                                | 26.8                  |
| 12:11                                | 58.0                  |
| 12:12                                | 23.9                  |
| 12:13                                | 77.3                  |
| 12:14                                | 17.1                  |
| 12:15                                | 37.8                  |
| 12:16                                | 41.7                  |
| 12:17                                | 119.4                 |
| 12:18                                | 56.4                  |
| <b>Average</b>                       | <b>32.5</b>           |

## VOC Uncertainty Calculations

## Paint Booth 2

|                        |                             |
|------------------------|-----------------------------|
| <b>Range 0 - ? ppm</b> | <b>VOC</b>                  |
| <b>100</b>             | <b>161 mg/m<sup>3</sup></b> |

|                                 |                        |
|---------------------------------|------------------------|
| studied concentration VOC (VLE) | 32.5 mg/m <sup>3</sup> |
| measuring time                  | 281 minutes            |

| Conditions of operation                             |                             |
|-----------------------------------------------------|-----------------------------|
| Measurement are performed in an environment where   |                             |
| fluctuations of ambient temperature (in °C)         | 298 to 318 K                |
| fluctuations of sample pressure are within (in kPa) | 100 +/- 5                   |
| fluctuations of voltage (in V)                      | 200-220                     |
| atmospheric pressure variations (in kPa)            | 99-100                      |
| frequency of adjustment (in hours)                  | 10                          |
| O2 concentration measured                           | NA                          |
| NH3 range : unknown                                 | Default values : 0-20 mg/m3 |
| CO2 range                                           | 8-15 %                      |
| H2O range                                           | 10-20%                      |
| O2 reference concentration                          | NA                          |

| Performance characteristics        | Value  | *                   | specification          |
|------------------------------------|--------|---------------------|------------------------|
| Response time                      | L 5    | seconds             | 1 minute               |
| Repeatability at zero              | L 1    | % of the full scale | 0,2% of the full scale |
| Repeatability at span level        | L 1    | % of the full scale | 2% of the full scale   |
| Deviation from linearity           | L 0.5  | % of value          | +/-5% of elv           |
| Zero drift ***                     | L 0.00 | % of fs/24h         | +/-5% of fs/24h        |
| Span drift ***                     | L 0.00 | % of fs/24h         | +/-5% of fs/24h        |
| volume or pressure flow dependence | L 0.02 | % of fs/kPa         | 1% of fs/30kPa         |
| atmospheric pressure dependence    | L 0.8  | % of value/kPa      | 3% of value/4kPa       |
| ambient temperature dependence     | L 3    | %fs/10K             | 3%fs/10K               |
| dependence on voltage              | L 1    | %fs/10V             | 2%fs/10V               |
| losses in the line (leak)          | F 2    | % of value          | 2% of value            |
| Uncertainty of calibration gas     | F 2    | % of value          |                        |

L=laboratory F=Field

| Measurement performance related to dynamic conditions |                        |
|-------------------------------------------------------|------------------------|
| Requirement for response time                         | 120 sec                |
| Measured response time                                | 2 minutes              |
| <b>Conclusion</b>                                     | <b>requirement met</b> |

| Measurement performance related to stationary conditions |  |                    |  |                                    |      |
|----------------------------------------------------------|--|--------------------|--|------------------------------------|------|
| Performance characteristic                               |  | Uncertainty        |  | Value of uncertainty quantity      |      |
| Standard deviation of repeatability at zero              |  | U <sub>r0</sub>    |  | 0.0015*410                         | 1.61 |
| Standard deviation of repeatability at span level        |  | U <sub>rs</sub>    |  | 0.008*410                          | 1.61 |
| Lack of fit                                              |  | U <sub>lit</sub>   |  | 0.007*410/3 <sup>1/2</sup>         | 0.46 |
| Zero drift                                               |  | U <sub>odr</sub>   |  | 0.0001*410/3 <sup>1/2</sup>        | 0.00 |
| Span drift                                               |  | U <sub>sdr</sub>   |  | 0.01*410/3 <sup>1/2</sup>          | 0.00 |
| volume or pressure flow dependence                       |  | U <sub>spres</sub> |  | (0.0002*410)*5/3 <sup>1/2</sup>    | 0.09 |
| atmospheric pressure dependence                          |  | U <sub>apres</sub> |  | (0.008*200/1)*0.5/3                | 0.08 |
| ambient temperature dependence                           |  | U <sub>temp</sub>  |  | (0.003*410/10)*10/3 <sup>1/2</sup> | 2.78 |
| dependence on voltage                                    |  | U <sub>volt</sub>  |  | 0.0012/10*410*10/3 <sup>1/2</sup>  | 0.93 |
| losses in the line (leak)                                |  | U <sub>leak</sub>  |  | 0.02*200/3 <sup>1/2</sup>          | 0.38 |
| Uncertainty of calibration gas                           |  | U <sub>calib</sub> |  | 0.02*200/3                         | 0.38 |

| Measurement uncertainty at         | 32.5 | mg/m <sup>3</sup> |
|------------------------------------|------|-------------------|
| U <sub>tot</sub>                   | 3.78 | mg/m <sup>3</sup> |
| U <sub>tot</sub> /C <sub>lim</sub> | 12   | %                 |
| U <sub>tot,rel</sub>               | 23   | %                 |

Note: Uncertainties for which the results are below the LOD have been calculated at the results shown above.

|           |    |              |              |       |           |
|-----------|----|--------------|--------------|-------|-----------|
| Page No.: | OF | Project No.: | POETON-03125 | Date: | 07-Jul-16 |
|-----------|----|--------------|--------------|-------|-----------|

|                 |        |                      |           |                      |                 |     |                   |    |
|-----------------|--------|----------------------|-----------|----------------------|-----------------|-----|-------------------|----|
| Client:         | Poeton | Plant:               | Cardiff   | Location:            | Booths 1-4 & LP |     |                   |    |
| Operators:      | DP/DPd | Test For:            | VOCs      | In-house Method No.: | A57             |     |                   |    |
| Laptop ID:      | 1196   | Start:               | Temp (°C) | 15                   | Pressure (kPa)  | 102 | Flow Rate (l/min) | NA |
| Data Logger ID: | 1024   | End:                 | 15        | 102                  | 102             | 102 | 102               | NA |
| Chiller ID      | NA     | Chiller Temp. & Time | NA        |                      |                 |     |                   |    |

| Action                     | O2  | CO | SO2 | NO | NOx | CO2 | VOC       |
|----------------------------|-----|----|-----|----|-----|-----|-----------|
| Analysers & Cylinder Info. |     |    |     |    |     |     | 1427      |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 1001      |
| Analysers & Cylinder Info. |     |    |     |    |     |     | VCSMG4986 |
| Analysers & Cylinder Info. | 1   | 1  | 1   | 1  | 1   | 1   | 1         |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 40        |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 25        |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 37 75     |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 100       |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 32        |
| Span & Divider Information | N/A |    |     |    |     |     | 102.70    |
| Span & Divider Information |     |    |     |    |     |     | 70.00     |
| Span & Divider Information |     |    |     |    |     |     | 69.97     |
| Span & Divider Information |     |    |     |    |     |     | 71.9      |
| Span & Divider Information |     |    |     |    |     |     | 64.7      |
| Analysers Calibration      |     |    |     |    |     |     | 5         |
| Analysers Calibration      |     |    |     |    |     |     | 15        |
| Analysers Calibration      |     |    |     |    |     |     | 0.00      |
| Analysers Calibration      |     |    |     |    |     |     | 71.90     |
| Analysers Calibration      |     |    |     |    |     |     | 0.00      |
| Analysers Calibration      |     |    |     |    |     |     | N/A       |
| Analysers Calibration      |     |    |     |    |     |     | N/A       |
| Analysers Calibration      |     |    |     |    |     |     | PASS      |
| Initial Line Checks        |     |    |     |    |     |     | 15        |
| Initial Line Checks        |     |    |     |    |     |     | 45        |
| Initial Line Checks        |     |    |     |    |     |     | 0.30      |
| Initial Line Checks        |     |    |     |    |     |     | 0.4172    |
| Initial Line Checks        |     |    |     |    |     |     | PASS      |
| Initial Line Checks        |     |    |     |    |     |     | 71.70     |
| Initial Line Checks        |     |    |     |    |     |     | -0.28     |
| Initial Line Checks        |     |    |     |    |     |     | PASS      |
| Final Line Checks          |     |    |     |    |     |     | 0.30      |
| Final Line Checks          |     |    |     |    |     |     | 0.0000    |
| Final Line Checks          |     |    |     |    |     |     | PASS      |
| Final Line Checks          |     |    |     |    |     |     | 72.40     |
| Final Line Checks          |     |    |     |    |     |     | 0.97      |
| Final Line Checks          |     |    |     |    |     |     | PASS      |

|   |              |    |               |
|---|--------------|----|---------------|
| A | Darren Price | NA | Dale Padfield |
|---|--------------|----|---------------|

## **Appendix 4: Measurement Information Paint Booth 3**

**Stack:**

**Stack Diagram**

**Flow Measurements**

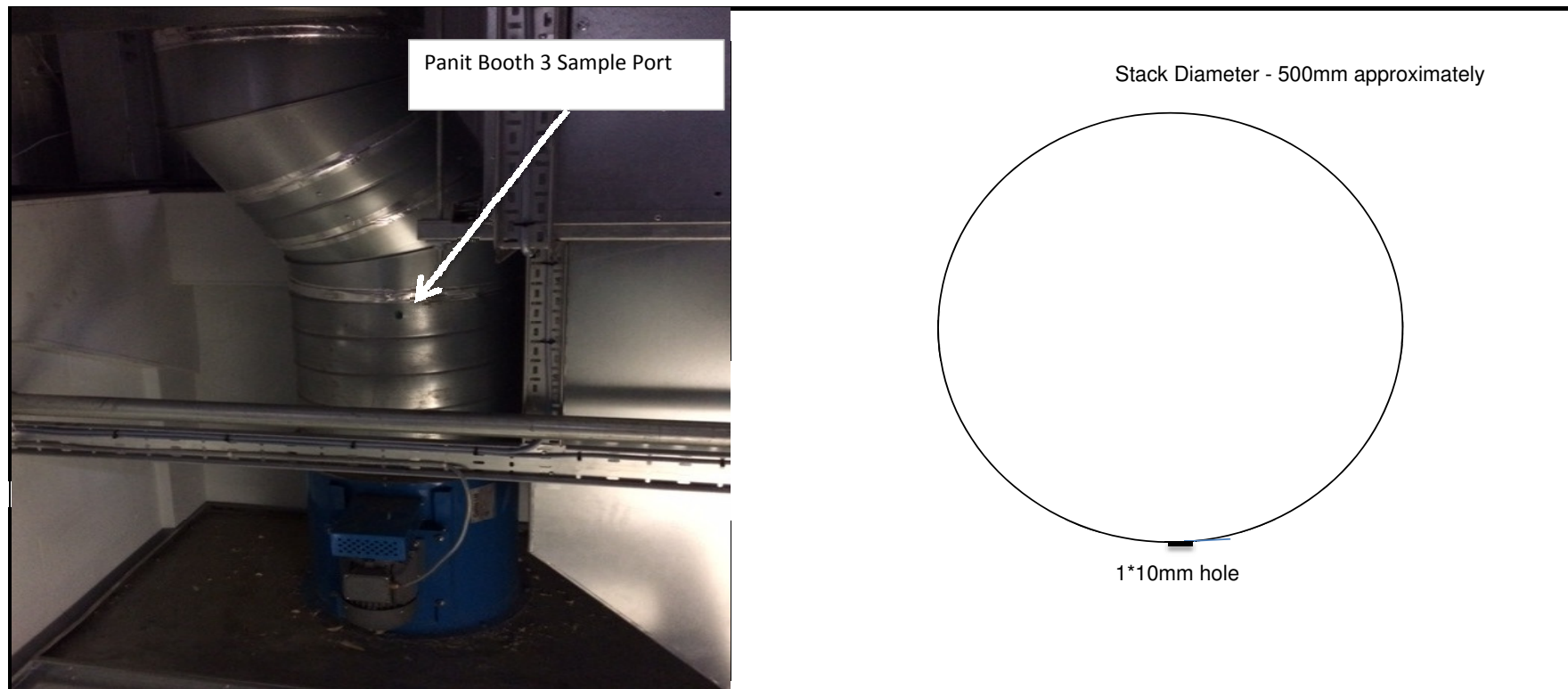
**Minute Averaged VOC Data**

**Uncertainty of Measurement**

**Analyser Calibration**

| Permit Number           | Operator Name         | Installation Name | Installation Address            |
|-------------------------|-----------------------|-------------------|---------------------------------|
| Permit Number: BP1772IZ | Poeton Industries Ltd | Cardiff Site      | Penarth Road, Cardiff, CF11 8UL |

### Paint Booth 3



|      |    |         |              |       |            |           |                     |                                  |
|------|----|---------|--------------|-------|------------|-----------|---------------------|----------------------------------|
| Page | of | Job No. | POETON-03125 | Date: | 07/07/2016 | Operators | D Price, D Padfield | A70 - ISO 16911-1 Traverse Sheet |
|------|----|---------|--------------|-------|------------|-----------|---------------------|----------------------------------|

|                     |               |            |          |                 |           |          |                          |                          |       |                 |                    |                    |                                          |    |                  |    |    |                         |
|---------------------|---------------|------------|----------|-----------------|-----------|----------|--------------------------|--------------------------|-------|-----------------|--------------------|--------------------|------------------------------------------|----|------------------|----|----|-------------------------|
| Client              | Poeton        | Probe ID   | NA       | Pitot checks    |           |          | Gas Composition in Stack |                          |       | Static Pressure |                    |                    | Repeatability of velocity @ single point |    |                  |    |    |                         |
| Plant               | Cardiff       | Pitot ID   | NA       | Pyhsical checks |           | NA       | O <sub>2</sub>           | NA                       | % wet | Side A          | NA                 | cmH <sub>2</sub> O | Mins                                     | 1  | 2                | 3  | 4  | 5                       |
| Stack               | Paint Booth 3 | Pitot type | NA       | Leak Checks     |           |          | CO <sub>2</sub>          | NA                       | % wet | Side B          | NA                 | cmH <sub>2</sub> O | cm H <sub>2</sub> O                      | NA | NA               | NA | NA | NA                      |
| Diameter            | 600 mm        | Pitot Cp   | NA       |                 | 0 mins    | 15s / 5m | H <sub>2</sub> O         | NA                       | % wet | Pass/Fail       | NA                 |                    | Pa                                       | NA | NA               | NA | NA | NA                      |
| Port Length         | 0 mm          | Barometer  | 690      | Side A          | NA        | NA       | If unknown:              |                          |       | Average         | NA                 |                    | m/s                                      | NA | NA               | NA | NA | NA                      |
| Bar. Pressure (kPa) |               | 102        | T/C ID   | 1046            | Side B    | NA       | NA                       | Combustion use 10, 10, 5 |       |                 | Minimum Velocity   |                    | 0                                        |    | Average velocity |    | NA | Std Dev as % of average |
| Ambient Temp.       |               | 15         | Meter ID | NA              | Pass/Fail | NA       | NA                       | Non-comb. use 20.9, 0, 0 |       |                 | Velocity Variation |                    | #DIV/0!                                  |    | Std Dev velocity |    | NA | NA                      |

| Port 1     |                                               |                         |   |   |     |    |       |                   |                | Port 2     |                                               |                         |   |        |         |    |       |                   |                |  |     |
|------------|-----------------------------------------------|-------------------------|---|---|-----|----|-------|-------------------|----------------|------------|-----------------------------------------------|-------------------------|---|--------|---------|----|-------|-------------------|----------------|--|-----|
| Point - mm | Temp (°C)                                     | Δp (cmH <sub>2</sub> O) |   |   |     | Pa | Angle | v <sub>meas</sub> | v <sub>c</sub> | Point - mm | Temp (°C)                                     | Δp (cmH <sub>2</sub> O) |   |        |         | Pa | Angle | v <sub>meas</sub> | v <sub>c</sub> |  |     |
|            |                                               | 1                       | 2 | 3 | Ave |    |       |                   |                |            |                                               | 1                       | 2 | 3      | Ave     |    |       |                   |                |  |     |
| 73         | Port Not Accessible for Velocity Measurements |                         |   |   |     |    |       |                   |                | 73         | Port Not Accessible for Velocity Measurements |                         |   |        |         |    |       |                   |                |  |     |
| 427        |                                               |                         |   |   |     |    |       |                   |                | 427        |                                               |                         |   |        |         |    |       |                   |                |  |     |
| Averages   | -                                             |                         |   |   |     | -  | -     |                   |                | -          | -                                             |                         |   | Signed | D Price |    |       | A                 | D Padfield     |  | NTA |
| Std Dev    |                                               |                         |   |   |     | -  | -     |                   |                |            |                                               |                         |   |        |         |    |       |                   |                |  |     |

| Gas Emission Data from Paint Booth 3 |                       |
|--------------------------------------|-----------------------|
| Time                                 | VOC as Carbon         |
| 07-Jul-16                            | (mg/Nm <sup>3</sup> ) |
| 10:52                                | 7.6                   |
| 10:53                                | 5.2                   |
| 10:54                                | 25.1                  |
| 10:55                                | 80.9                  |
| 10:56                                | 14.0                  |
| 10:57                                | 7.4                   |
| 10:58                                | 5.4                   |
| 10:59                                | 4.3                   |
| 11:00                                | 19.9                  |
| 11:01                                | 8.0                   |
| 11:02                                | 5.5                   |
| 11:03                                | 4.3                   |
| 11:04                                | 3.6                   |
| 11:05                                | 26.0                  |
| 11:06                                | 86.8                  |
| 11:07                                | 11.9                  |
| 11:08                                | 11.0                  |
| 11:09                                | 17.4                  |
| 11:10                                | 8.2                   |
| 11:11                                | 5.6                   |
| 11:12                                | 4.6                   |
| 11:13                                | 29.3                  |
| 11:14                                | 8.5                   |
| 11:15                                | 5.3                   |
| 11:16                                | 4.2                   |
| 11:17                                | 3.8                   |
| 11:18                                | 3.3                   |
| 11:19                                | 3.0                   |
| 11:20                                | 2.8                   |
| 11:21                                | 2.7                   |
| 11:22                                | 2.5                   |
| <b>Average</b>                       | <b>13.8</b>           |

## VOC Uncertainty Calculations

## Paint Booth 3

|                        |                             |
|------------------------|-----------------------------|
| <b>Range 0 - ? ppm</b> | <b>VOC</b>                  |
| <b>100</b>             | <b>161 mg/m<sup>3</sup></b> |

|                                 |                        |
|---------------------------------|------------------------|
| studied concentration VOC (VLE) | 13.8 mg/m <sup>3</sup> |
| measuring time                  | 281 minutes            |

| Conditions of operation                             |                             |
|-----------------------------------------------------|-----------------------------|
| Measurement are performed in an environment where   |                             |
| fluctuations of ambient temperature (in °C)         | 298 to 318 K                |
| fluctuations of sample pressure are within (in kPa) | 100 +/- 5                   |
| fluctuations of voltage (in V)                      | 200-220                     |
| atmospheric pressure variations (in kPa)            | 99-100                      |
| frequency of adjustment (in hours)                  | 10                          |
| O2 concentration measured                           | NA                          |
| NH3 range : unknown                                 | Default values : 0-20 mg/m3 |
| CO2 range                                           | 8-15 %                      |
| H2O range                                           | 10-20%                      |
| O2 reference concentration                          | NA                          |

| Performance characteristics        | Value  | *                   | specification          |
|------------------------------------|--------|---------------------|------------------------|
| Response time                      | L 5    | seconds             | 1 minute               |
| Repeatability at zero              | L 1    | % of the full scale | 0,2% of the full scale |
| Repeatability at span level        | L 1    | % of the full scale | 2% of the full scale   |
| Deviation from linearity           | L 0.5  | % of value          | +/-5% of elv           |
| Zero drift ***                     | L 0.00 | % of fs/24h         | +/-5% of fs/24h        |
| Span drift ***                     | L 0.00 | % of fs/24h         | +/-5% of fs/24h        |
| volume or pressure flow dependence | L 0.02 | % of fs/kPa         | 1% of fs/30kPa         |
| atmospheric pressure dependence    | L 0.8  | % of value/kPa      | 3% of value/4kPa       |
| ambient temperature dependence     | L 3    | %fs/10K             | 3%fs/10K               |
| dependence on voltage              | L 1    | %fs/10V             | 2%fs/10V               |
| losses in the line (leak)          | F 2    | % of value          | 2% of value            |
| Uncertainty of calibration gas     | F 2    | % of value          |                        |

L=laboratory F=Field

| Measurement performance related to dynamic conditions |                        |
|-------------------------------------------------------|------------------------|
| Requirement for response time                         | 120 sec                |
| Measured response time                                | 2 minutes              |
| <b>Conclusion</b>                                     | <b>requirement met</b> |

| Measurement performance related to stationary conditions |  |                    |  |                                    |      |
|----------------------------------------------------------|--|--------------------|--|------------------------------------|------|
| Performance characteristic                               |  | Uncertainty        |  | Value of uncertainty quantity      |      |
| Standard deviation of repeatability at zero              |  | U <sub>r0</sub>    |  | 0.0015*410                         | 1.61 |
| Standard deviation of repeatability at span level        |  | U <sub>rs</sub>    |  | 0.008*410                          | 1.61 |
| Lack of fit                                              |  | U <sub>lit</sub>   |  | 0.007*410/3 <sup>1/2</sup>         | 0.46 |
| Zero drift                                               |  | U <sub>odr</sub>   |  | 0.0001*410/3 <sup>1/2</sup>        | 0.00 |
| Span drift                                               |  | U <sub>sdr</sub>   |  | 0.01*410/3 <sup>1/2</sup>          | 0.00 |
| volume or pressure flow dependence                       |  | U <sub>spres</sub> |  | (0.0002*410)*5/3 <sup>1/2</sup>    | 0.09 |
| atmospheric pressure dependence                          |  | U <sub>apres</sub> |  | (0.008*200/1)*0.5/3                | 0.03 |
| ambient temperature dependence                           |  | U <sub>temp</sub>  |  | (0.003*410/10)*10/3 <sup>1/2</sup> | 2.78 |
| dependence on voltage                                    |  | U <sub>volt</sub>  |  | 0.0012/10*410*10/3 <sup>1/2</sup>  | 0.93 |
| losses in the line (leak)                                |  | U <sub>leak</sub>  |  | 0.02*200/3 <sup>1/2</sup>          | 0.16 |
| Uncertainty of calibration gas                           |  | U <sub>calib</sub> |  | 0.02*200/3                         | 0.16 |

| Measurement uncertainty at         | 13.8 | mg/m <sup>3</sup> |
|------------------------------------|------|-------------------|
| U <sub>tot</sub>                   | 3.75 | mg/m <sup>3</sup> |
| U <sub>tot</sub> /C <sub>lim</sub> | 27   | %                 |
| U <sub>tot,rel</sub>               | 54   | %                 |

Note: Uncertainties for which the results are below the LOD have been calculated at the results shown above.

|           |    |              |              |       |           |
|-----------|----|--------------|--------------|-------|-----------|
| Page No.: | OF | Project No.: | POETON-03125 | Date: | 07-Jul-16 |
|-----------|----|--------------|--------------|-------|-----------|

|                 |        |                      |           |                      |                   |
|-----------------|--------|----------------------|-----------|----------------------|-------------------|
| Client:         | Poeton | Plant:               | Cardiff   | Location:            | Booths 1-4 & LP   |
| Operators:      | DP/DPd | Test For:            | VOCs      | In-house Method No.: | A57               |
| Laptop ID:      | 1196   | Start:               | Temp (°C) | 15                   | Pressure (kPa)    |
| Data Logger ID: | 1024   | End:                 | 15        | 102                  | Flow Rate (l/min) |
| Chiller ID      | NA     | Chiller Temp. & Time | NA        | 102                  | NA                |

| Action                     | O2                                         | CO   | SO2 | NO | NOx | CO2 | VOC       |
|----------------------------|--------------------------------------------|------|-----|----|-----|-----|-----------|
| Analysers & Cylinder Info. | Analysers ID                               |      |     |    |     |     | 1427      |
|                            | Gas Divider ID                             | 1001 |     |    |     |     |           |
|                            | Span Gas Lot Number                        |      |     |    |     |     | VCSMG4986 |
|                            | Span Gas Uncertainty (±%)                  | 1    | 1   | 1  | 1   | 1   | 1         |
| ELVs & Ranges              | Half hourly or Daily ELV (mg/m³)           |      |     |    |     |     | 40        |
|                            | Half hourly or Daily ELV (ppm)             |      |     |    |     |     | 25        |
|                            | Ideal Range [150%] to [300%] (ppm)         |      |     |    |     |     | 37 75     |
|                            | Range Used                                 |      |     |    |     |     | 100       |
| Span & Divider Information | Span Range [50%] to [90%] (ppm)            | N/A  |     |    |     |     | 32        |
|                            | Span Certified Value of Cylinder (ppm)     |      |     |    |     |     | 102.70    |
|                            | Proposed Span Value (ppm)                  |      |     |    |     |     | 70.00     |
|                            | Actual Gas Divider %                       |      |     |    |     |     | 69.97     |
|                            | Actual Span value to be used (ppm) (A)     |      |     |    |     |     | 71.9      |
|                            | T <sub>90</sub> Value (ppm) of (A)         |      |     |    |     |     | 64.7      |
| Analysers Calibration      | T <sub>90</sub> Time Analyser (seconds)    |      |     |    |     |     | 5         |
|                            | 3 x T <sub>90</sub> Time Between Readings  |      |     |    |     |     | 15        |
|                            | Zero Response                              |      |     |    |     |     | 0.00      |
|                            | Span Response (B)                          |      |     |    |     |     | 71.90     |
|                            | Re-Zero Response                           |      |     |    |     |     | 0.00      |
|                            | Analysers Repeatability                    |      |     |    |     |     | N/A       |
|                            | <2 x Repeatability                         |      |     |    |     |     | N/A       |
| Initial Line Checks        | T <sub>90</sub> Time System (seconds)      |      |     |    |     |     | 15        |
|                            | 3 x T <sub>90</sub> Time Between Readings  |      |     |    |     |     | 45        |
|                            | System Check: Zero (C)                     |      |     |    |     |     | 0.30      |
|                            | C/B*100 =                                  |      |     |    |     |     | 0.4172    |
|                            | C/B*100 = <2%                              |      |     |    |     |     | PASS      |
|                            | System Check: Span (D)                     |      |     |    |     |     | 71.70     |
|                            | (D-B)/B*100 =                              |      |     |    |     |     | -0.28     |
|                            | (D-B)/B*100 = <2% (= <5% SO <sub>2</sub> ) |      |     |    |     |     | PASS      |
| Final Line Checks          | System Check: Zero (E)                     |      |     |    |     |     | 0.30      |
|                            | (E-C)/D*100 =                              |      |     |    |     |     | 0.0000    |
|                            | Drift: (E-C)/D*100 = <5%                   |      |     |    |     |     | PASS      |
|                            | System Check: Span (F)                     |      |     |    |     |     | 72.40     |
|                            | (F-D)/B*100 =                              |      |     |    |     |     | 0.97      |
|                            | Drift: (F-D)/B*100 = <5%                   |      |     |    |     |     | PASS      |

|   |              |    |               |
|---|--------------|----|---------------|
| A | Darren Price | NA | Dale Padfield |
|---|--------------|----|---------------|

## **Appendix 5: Measurement Information Paint Booth 4**

**Stack:**

**Stack Diagram**

**Flow Measurements**

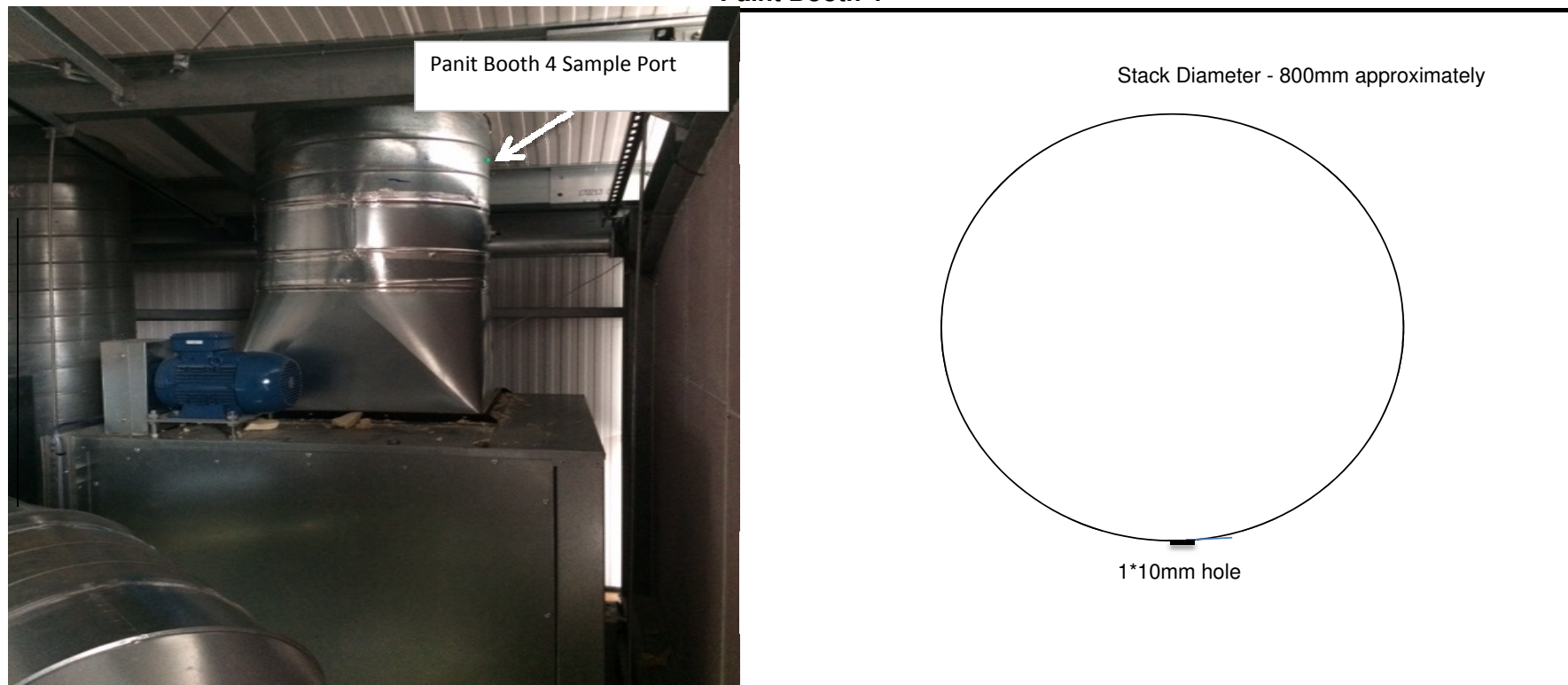
**Minute Averaged VOC Data**

**Uncertainty of Measurement**

**Analyser Calibration**

| Permit Number           | Operator Name         | Installation Name | Installation Address            |
|-------------------------|-----------------------|-------------------|---------------------------------|
| Permit Number: BP1772IZ | Poeton Industries Ltd | Cardiff Site      | Penarth Road, Cardiff, CF11 8UL |

#### Paint Booth 4



|      |    |         |              |       |            |           |                     |                                  |
|------|----|---------|--------------|-------|------------|-----------|---------------------|----------------------------------|
| Page | of | Job No. | POETON-03125 | Date: | 07/07/2016 | Operators | D Price, D Padfield | A70 - ISO 16911-1 Traverse Sheet |
|------|----|---------|--------------|-------|------------|-----------|---------------------|----------------------------------|

|                     |               |            |          |                 |           |          |                          |                          |       |                 |                    |                    |                                          |                  |    |    |                         |    |
|---------------------|---------------|------------|----------|-----------------|-----------|----------|--------------------------|--------------------------|-------|-----------------|--------------------|--------------------|------------------------------------------|------------------|----|----|-------------------------|----|
| Client              | Poeton        | Probe ID   | NA       | Pitot checks    |           |          | Gas Composition in Stack |                          |       | Static Pressure |                    |                    | Repeatability of velocity @ single point |                  |    |    |                         |    |
| Plant               | Cardiff       | Pitot ID   | NA       | Pyhsical checks |           | NA       | O <sub>2</sub>           | NA                       | % wet | Side A          | NA                 | cmH <sub>2</sub> O | Mins                                     | 1                | 2  | 3  | 4                       | 5  |
| Stack               | Paint Booth 4 | Pitot type | NA       | Leak Checks     |           |          | CO <sub>2</sub>          | NA                       | % wet | Side B          | NA                 | cmH <sub>2</sub> O | cm H <sub>2</sub> O                      | NA               | NA | NA | NA                      | NA |
| Diameter            | 800 mm        | Pitot Cp   | NA       |                 | 0 mins    | 15s / 5m | H <sub>2</sub> O         | NA                       | % wet | Pass/Fail       | NA                 | Pa                 | NA                                       | NA               | NA | NA | NA                      | NA |
| Port Length         | 0 mm          | Barometer  | 690      | Side A          | NA        | NA       | If unknown:              |                          |       | Average         | NA                 | m/s                | NA                                       | NA               | NA | NA | NA                      | NA |
| Bar. Pressure (kPa) |               | 102        | T/C ID   | 1046            | Side B    | NA       | NA                       | Combustion use 10, 10, 5 |       |                 | Minimum Velocity   |                    | 0                                        | Average velocity |    | NA | Std Dev as % of average |    |
| Ambient Temp.       |               | 15         | Meter ID | NA              | Pass/Fail | NA       | NA                       | Non-comb. use 20.9, 0, 0 |       |                 | Velocity Variation |                    | #DIV/0!                                  | Std Dev velocity |    | NA | NA                      |    |

| Port 1     |                                               |                         |   |   |     |    |       |                   |                | Port 2     |                                               |                         |   |   |     |            |       |                   |                |
|------------|-----------------------------------------------|-------------------------|---|---|-----|----|-------|-------------------|----------------|------------|-----------------------------------------------|-------------------------|---|---|-----|------------|-------|-------------------|----------------|
| Point - mm | Temp (°C)                                     | Δp (cmH <sub>2</sub> O) |   |   |     | Pa | Angle | v <sub>meas</sub> | v <sub>c</sub> | Point - mm | Temp (°C)                                     | Δp (cmH <sub>2</sub> O) |   |   |     | Pa         | Angle | v <sub>meas</sub> | v <sub>c</sub> |
|            |                                               | 1                       | 2 | 3 | Ave |    |       |                   |                |            |                                               | 1                       | 2 | 3 | Ave |            |       |                   |                |
| 73         | Port Not Accessible for Velocity Measurements |                         |   |   |     |    |       |                   |                | 73         | Port Not Accessible for Velocity Measurements |                         |   |   |     |            |       |                   |                |
| 427        |                                               |                         |   |   |     |    |       |                   |                |            |                                               |                         |   |   |     |            |       |                   |                |
| Averages   | -                                             |                         |   |   |     | -  | -     |                   |                | Signed     | D Price                                       |                         |   |   | A   | D Padfield |       | NTA               |                |
| Std Dev    |                                               |                         |   |   |     | -  | -     |                   |                |            |                                               |                         |   |   |     |            |       |                   |                |

| Gas Emission Data from Paint Booth 4 |                       |
|--------------------------------------|-----------------------|
| Time                                 | VOC as Carbon         |
| 07-Jul-16                            | (mg/Nm <sup>3</sup> ) |
| 10:15                                | 2.2                   |
| 10:16                                | 2.0                   |
| 10:17                                | 2.1                   |
| 10:18                                | 2.1                   |
| 10:19                                | 2.1                   |
| 10:20                                | 2.3                   |
| 10:21                                | 2.1                   |
| 10:22                                | 2.3                   |
| 10:23                                | 2.3                   |
| 10:24                                | 2.8                   |
| 10:25                                | 2.3                   |
| 10:26                                | 2.1                   |
| 10:27                                | 2.1                   |
| 10:28                                | 14.2                  |
| 10:29                                | 4.6                   |
| 10:30                                | 7.3                   |
| 10:31                                | 4.2                   |
| 10:32                                | 3.2                   |
| 10:33                                | 2.7                   |
| 10:34                                | 24.4                  |
| 10:35                                | 7.0                   |
| 10:36                                | 18.4                  |
| 10:37                                | 12.6                  |
| 10:38                                | 6.3                   |
| 10:39                                | 4.6                   |
| 10:40                                | 13.1                  |
| 10:41                                | 20.6                  |
| 10:42                                | 7.9                   |
| 10:43                                | 26.7                  |
| 10:44                                | 9.8                   |
| 10:45                                | 4.9                   |
| <b>Average</b>                       | <b>7.1</b>            |

## VOC Uncertainty Calculations

## Paint Booth 4

|                        |                             |
|------------------------|-----------------------------|
| <b>Range 0 - ? ppm</b> | <b>VOC</b>                  |
| <b>100</b>             | <b>161 mg/m<sup>3</sup></b> |

|                                 |                       |
|---------------------------------|-----------------------|
| studied concentration VOC (VLE) | 7.1 mg/m <sup>3</sup> |
| measuring time                  | 281 minutes           |

| Conditions of operation                             |                             |
|-----------------------------------------------------|-----------------------------|
| Measurement are performed in an environment where   |                             |
| fluctuations of ambient temperature (in °C)         | 298 to 318 K                |
| fluctuations of sample pressure are within (in kPa) | 100 +/- 5                   |
| fluctuations of voltage (in V)                      | 200-220                     |
| atmospheric pressure variations (in kPa)            | 99-100                      |
| frequency of adjustment (in hours)                  | 10                          |
| O2 concentration measured                           | NA                          |
| NH3 range : unknown                                 | Default values : 0-20 mg/m3 |
| CO2 range                                           | 8-15 %                      |
| H2O range                                           | 10-20%                      |
| O2 reference concentration                          | NA                          |

| Performance characteristics        | Value  | *                   | specification          |
|------------------------------------|--------|---------------------|------------------------|
| Response time                      | L 5    | seconds             | 1 minute               |
| Repeatability at zero              | L 1    | % of the full scale | 0,2% of the full scale |
| Repeatability at span level        | L 1    | % of the full scale | 2% of the full scale   |
| Deviation from linearity           | L 0.5  | % of value          | +/-5% of elv           |
| Zero drift ***                     | L 0.00 | % of fs/24h         | +/-5% of fs/24h        |
| Span drift ***                     | L 0.00 | % of fs/24h         | +/-5% of fs/24h        |
| volume or pressure flow dependence | L 0.02 | % of fs/kPa         | 1% of fs/30kPa         |
| atmospheric pressure dependence    | L 0.8  | % of value/kPa      | 3% of value/4kPa       |
| ambient temperature dependence     | L 3    | %fs/10K             | 3%fs/10K               |
| dependence on voltage              | L 1    | %fs/10V             | 2%fs/10V               |
| losses in the line (leak)          | F 2    | % of value          | 2% of value            |
| Uncertainty of calibration gas     | F 2    | % of value          |                        |

L=laboratory F=Field

| Measurement performance related to dynamic conditions |                        |
|-------------------------------------------------------|------------------------|
| Requirement for response time                         | 120 sec                |
| Measured response time                                | 2 minutes              |
| <b>Conclusion</b>                                     | <b>requirement met</b> |

| Measurement performance related to stationary conditions |  |                    |  |                                    |      |
|----------------------------------------------------------|--|--------------------|--|------------------------------------|------|
| Performance characteristic                               |  | Uncertainty        |  | Value of uncertainty quantity      |      |
| Standard deviation of repeatability at zero              |  | U <sub>r0</sub>    |  | 0.0015*410                         | 1.61 |
| Standard deviation of repeatability at span level        |  | U <sub>rs</sub>    |  | 0.008*410                          | 1.61 |
| Lack of fit                                              |  | U <sub>lit</sub>   |  | 0.007*410/3 <sup>1/2</sup>         | 0.46 |
| Zero drift                                               |  | U <sub>odr</sub>   |  | 0.0001*410/3 <sup>1/2</sup>        | 0.00 |
| Span drift                                               |  | U <sub>sdr</sub>   |  | 0.01*410/3 <sup>1/2</sup>          | 0.00 |
| volume or pressure flow dependence                       |  | U <sub>spres</sub> |  | (0.0002*410)*5/3 <sup>1/2</sup>    | 0.09 |
| atmospheric pressure dependence                          |  | U <sub>apres</sub> |  | (0.008*200/1)*0.5/3 <sup>1/2</sup> | 0.02 |
| ambient temperature dependence                           |  | U <sub>temp</sub>  |  | (0.003*410/10)*10/3 <sup>1/2</sup> | 2.78 |
| dependence on voltage                                    |  | U <sub>volt</sub>  |  | 0.0012/10*410*10/3 <sup>1/2</sup>  | 0.93 |
| losses in the line (leak)                                |  | U <sub>leak</sub>  |  | 0.02*200/3 <sup>1/2</sup>          | 0.08 |
| Uncertainty of calibration gas                           |  | U <sub>calib</sub> |  | 0.02*200/3 <sup>1/2</sup>          | 0.08 |

| Measurement uncertainty at         | 7.1  | mg/m <sup>3</sup> |
|------------------------------------|------|-------------------|
| U <sub>tot</sub>                   | 3.74 | mg/m <sup>3</sup> |
| U <sub>tot</sub> /C <sub>lim</sub> | 52   | %                 |
| U <sub>tot,rel</sub>               | 105  | %                 |

Note: Uncertainties for which the results are below the LOD have been calculated at the results shown above.

|           |    |              |              |       |           |
|-----------|----|--------------|--------------|-------|-----------|
| Page No.: | OF | Project No.: | POETON-03125 | Date: | 07-Jul-16 |
|-----------|----|--------------|--------------|-------|-----------|

|                 |        |                      |           |                      |                 |     |                   |    |
|-----------------|--------|----------------------|-----------|----------------------|-----------------|-----|-------------------|----|
| Client:         | Poeton | Plant:               | Cardiff   | Location:            | Booths 1-4 & LP |     |                   |    |
| Operators:      | DP/DPd | Test For:            | VOCs      | In-house Method No.: | A57             |     |                   |    |
| Laptop ID:      | 1196   | Start:               | Temp (°C) | 15                   | Pressure (kPa)  | 102 | Flow Rate (l/min) | NA |
| Data Logger ID: | 1024   | End:                 | 15        | 102                  | 102             | 102 | 102               | NA |
| Chiller ID      | NA     | Chiller Temp. & Time | NA        |                      |                 |     |                   |    |

| Action                     | O2  | CO | SO2 | NO | NOx | CO2 | VOC       |
|----------------------------|-----|----|-----|----|-----|-----|-----------|
| Analysers & Cylinder Info. |     |    |     |    |     |     | 1427      |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 1001      |
| Analysers & Cylinder Info. |     |    |     |    |     |     | VCSMG4986 |
| Analysers & Cylinder Info. | 1   | 1  | 1   | 1  | 1   | 1   | 1         |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 40        |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 25        |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 37 75     |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 100       |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 32        |
| Span & Divider Information | N/A |    |     |    |     |     | 102.70    |
| Span & Divider Information |     |    |     |    |     |     | 70.00     |
| Span & Divider Information |     |    |     |    |     |     | 69.97     |
| Span & Divider Information |     |    |     |    |     |     | 71.9      |
| Span & Divider Information |     |    |     |    |     |     | 64.7      |
| Analysers Calibration      |     |    |     |    |     |     | 5         |
| Analysers Calibration      |     |    |     |    |     |     | 15        |
| Analysers Calibration      |     |    |     |    |     |     | 0.00      |
| Analysers Calibration      |     |    |     |    |     |     | 71.90     |
| Analysers Calibration      |     |    |     |    |     |     | 0.00      |
| Analysers Calibration      |     |    |     |    |     |     | N/A       |
| Analysers Calibration      |     |    |     |    |     |     | N/A       |
| Analysers Calibration      |     |    |     |    |     |     | PASS      |
| Initial Line Checks        |     |    |     |    |     |     | 15        |
| Initial Line Checks        |     |    |     |    |     |     | 45        |
| Initial Line Checks        |     |    |     |    |     |     | 0.30      |
| Initial Line Checks        |     |    |     |    |     |     | 0.4172    |
| Initial Line Checks        |     |    |     |    |     |     | PASS      |
| Initial Line Checks        |     |    |     |    |     |     | 71.70     |
| Initial Line Checks        |     |    |     |    |     |     | -0.28     |
| Initial Line Checks        |     |    |     |    |     |     | PASS      |
| Final Line Checks          |     |    |     |    |     |     | 0.30      |
| Final Line Checks          |     |    |     |    |     |     | 0.0000    |
| Final Line Checks          |     |    |     |    |     |     | PASS      |
| Final Line Checks          |     |    |     |    |     |     | 72.40     |
| Final Line Checks          |     |    |     |    |     |     | 0.97      |
| Final Line Checks          |     |    |     |    |     |     | PASS      |

|   |              |    |               |
|---|--------------|----|---------------|
| A | Darren Price | NA | Dale Padfield |
|---|--------------|----|---------------|

## **Appendix 6: LP Booth 1**

**Stack:**

**Stack Diagram**

**Flow Measurements**

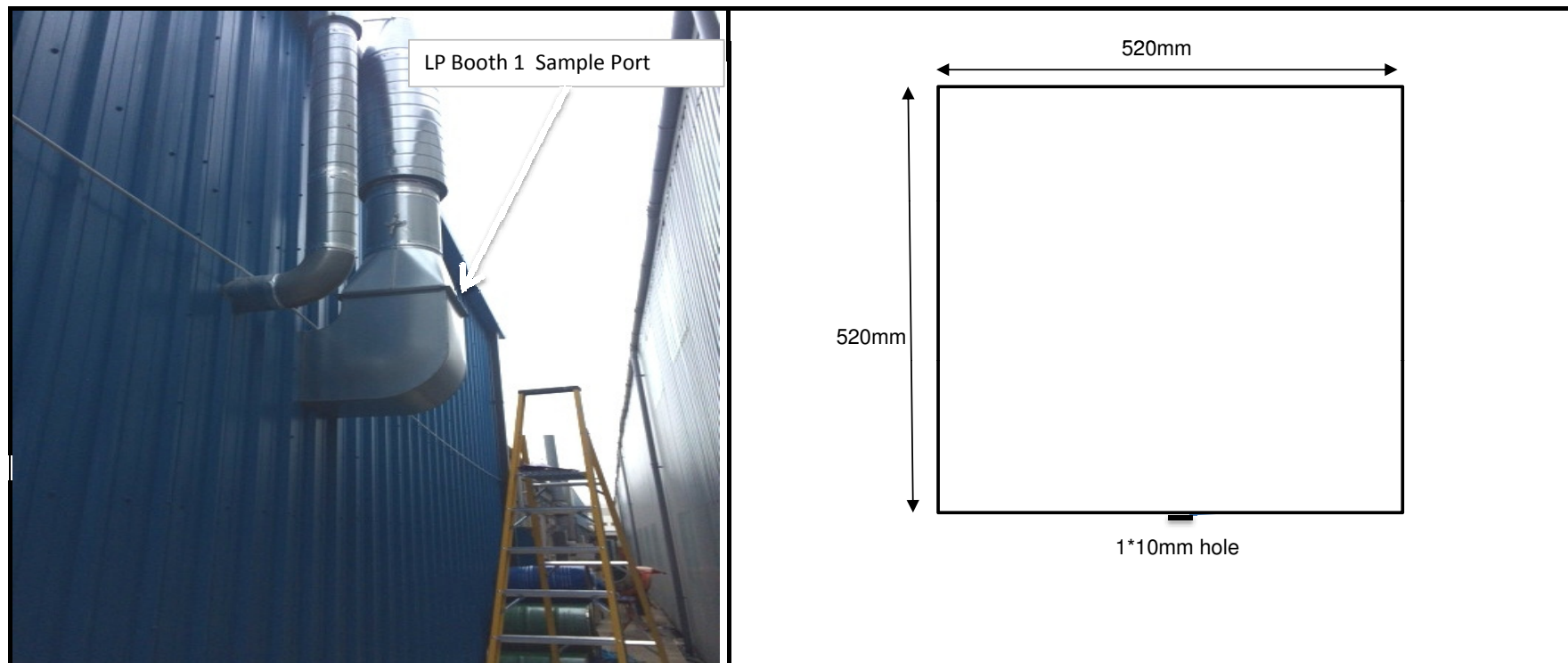
**Minute Averaged VOC Data**

**Uncertainty of Measurement**

**Analyser Calibration**

| Permit Number           | Operator Name         | Installation Name | Installation Address            |
|-------------------------|-----------------------|-------------------|---------------------------------|
| Permit Number: BP1772IZ | Poeton Industries Ltd | Cardiff Site      | Penarth Road, Cardiff, CF11 8UL |

### LP Booth 1



|      |    |         |              |       |            |           |                     |                                  |
|------|----|---------|--------------|-------|------------|-----------|---------------------|----------------------------------|
| Page | of | Job No. | POETON-03125 | Date: | 07/07/2016 | Operators | D Price, D Padfield | A70 - ISO 16911-1 Traverse Sheet |
|------|----|---------|--------------|-------|------------|-----------|---------------------|----------------------------------|

|                     |            |            |          |                 |           |          |                                                                     |                    |       |                 |                  |                    |                                          |                  |    |    |                         |    |
|---------------------|------------|------------|----------|-----------------|-----------|----------|---------------------------------------------------------------------|--------------------|-------|-----------------|------------------|--------------------|------------------------------------------|------------------|----|----|-------------------------|----|
| Client              | Poeton     | Probe ID   | NA       | Pitot checks    |           |          | Gas Composition in Stack                                            |                    |       | Static Pressure |                  |                    | Repeatability of velocity @ single point |                  |    |    |                         |    |
| Plant               | Cardiff    | Pitot ID   | NA       | Pyhsical checks |           | NA       | O <sub>2</sub>                                                      | NA                 | % wet | Side A          | NA               | cmH <sub>2</sub> O | Mins                                     | 1                | 2  | 3  | 4                       | 5  |
| Stack               | LP Booth 1 | Pitot type | NA       | Leak Checks     |           |          | CO <sub>2</sub>                                                     | NA                 | % wet | Side B          | NA               | cmH <sub>2</sub> O | cm H <sub>2</sub> O                      | NA               | NA | NA | NA                      | NA |
| Diameter            | 520*520 mm | Pitot Cp   | NA       |                 | 0 mins    | 15s / 5m | H <sub>2</sub> O                                                    | NA                 | % wet | Pass/Fail       | NA               |                    | Pa                                       | NA               | NA | NA | NA                      | NA |
| Port Length         | 0 mm       | Barometer  | 690      | Side A          | NA        | NA       | If unknown:<br>Combustion use 10, 10, 5<br>Non-comb. use 20.9, 0, 0 |                    |       | Average         | NA               |                    | m/s                                      | NA               | NA | NA | NA                      | NA |
| Bar. Pressure (kPa) |            | 102        | T/C ID   | 1046            | Side B    | NA       |                                                                     |                    |       | NA              | Minimum Velocity |                    | 0                                        | Average velocity |    | NA | Std Dev as % of average |    |
| Ambient Temp.       |            | 15         | Meter ID | NA              | Pass/Fail | NA       | NA                                                                  | Velocity Variation |       | #DIV/0!         | Std Dev velocity |                    | NA                                       | NA               |    |    |                         |    |

| Port 1     |                                               |                         |   |   |     |    |       |                   |                | Port 2     |                                               |                         |         |   |     |    |            |                   |                |
|------------|-----------------------------------------------|-------------------------|---|---|-----|----|-------|-------------------|----------------|------------|-----------------------------------------------|-------------------------|---------|---|-----|----|------------|-------------------|----------------|
| Point - mm | Temp (°C)                                     | Δp (cmH <sub>2</sub> O) |   |   |     | Pa | Angle | v <sub>meas</sub> | v <sub>c</sub> | Point - mm | Temp (°C)                                     | Δp (cmH <sub>2</sub> O) |         |   |     | Pa | Angle      | v <sub>meas</sub> | v <sub>c</sub> |
|            |                                               | 1                       | 2 | 3 | Ave |    |       |                   |                |            |                                               | 1                       | 2       | 3 | Ave |    |            |                   |                |
| 65         | Port Not Accessible for Velocity Measurements |                         |   |   |     |    |       |                   |                | 65         | Port Not Accessible for Velocity Measurements |                         |         |   |     |    |            |                   |                |
| 195        |                                               |                         |   |   |     |    |       |                   |                |            |                                               |                         |         |   |     |    |            |                   |                |
| 325        |                                               |                         |   |   |     |    |       |                   |                |            |                                               |                         |         |   |     |    |            |                   |                |
| 455        |                                               |                         |   |   |     |    |       |                   |                |            |                                               |                         |         |   |     |    |            |                   |                |
| Averages   | -                                             |                         |   |   | -   | -  |       |                   | -              | -          |                                               | Signed                  | D Price |   |     | A  | D Padfield |                   | NTA            |
| Std Dev    |                                               |                         |   |   | -   | -  |       |                   |                |            |                                               |                         |         |   |     |    |            |                   |                |

| Gas Emission Data from LP Booth 1 |                       |
|-----------------------------------|-----------------------|
| Time                              | VOC as Carbon         |
| 07-Jul-16                         | (mg/Nm <sup>3</sup> ) |
| 13:57                             | 10.3                  |
| 13:58                             | 10.1                  |
| 13:59                             | 11.5                  |
| 14:00                             | 12.0                  |
| 14:01                             | 12.2                  |
| 14:02                             | 11.5                  |
| 14:03                             | 10.9                  |
| 14:04                             | 10.0                  |
| 14:05                             | 9.2                   |
| 14:06                             | 8.4                   |
| 14:07                             | 8.7                   |
| 14:08                             | 8.3                   |
| 14:09                             | 8.4                   |
| 14:10                             | 7.9                   |
| 14:11                             | 7.5                   |
| 14:12                             | 7.8                   |
| 14:13                             | 8.1                   |
| 14:14                             | 8.4                   |
| 14:15                             | 7.9                   |
| 14:16                             | 7.5                   |
| 14:17                             | 6.7                   |
| 14:18                             | 6.4                   |
| 14:19                             | 6.4                   |
| 14:20                             | 6.5                   |
| 14:21                             | 6.4                   |
| 14:22                             | 5.4                   |
| 14:23                             | 5.1                   |
| 14:24                             | 5.6                   |
| 14:25                             | 6.8                   |
| 14:26                             | 8.5                   |
| 14:27                             | 10.2                  |
| <b>Average</b>                    | <b>8.4</b>            |

## VOC Uncertainty Calculations

## LP Booth 1

|                        |                             |
|------------------------|-----------------------------|
| <b>Range 0 - ? ppm</b> | <b>VOC</b>                  |
| <b>100</b>             | <b>161 mg/m<sup>3</sup></b> |

|                                 |                       |
|---------------------------------|-----------------------|
| studied concentration VOC (VLE) | 8.4 mg/m <sup>3</sup> |
| measuring time                  | 281 minutes           |

| Conditions of operation                             |                             |
|-----------------------------------------------------|-----------------------------|
| Measurement are performed in an environment where   |                             |
| fluctuations of ambient temperature (in °C)         | 298 to 318 K                |
| fluctuations of sample pressure are within (in kPa) | 100 +/- 5                   |
| fluctuations of voltage (in V)                      | 200-220                     |
| atmospheric pressure variations (in kPa)            | 99-100                      |
| frequency of adjustment (in hours)                  | 10                          |
| O2 concentration measured                           | NA                          |
| NH3 range : unknown                                 | Default values : 0-20 mg/m3 |
| CO2 range                                           | 8-15 %                      |
| H2O range                                           | 10-20%                      |
| O2 reference concentration                          | NA                          |

| Performance characteristics        | Value | *                     | specification          |
|------------------------------------|-------|-----------------------|------------------------|
| Response time                      | L     | 5 seconds             | 1 minute               |
| Repeatability at zero              | L     | 1 % of the full scale | 0,2% of the full scale |
| Repeatability at span level        | L     | 1 % of the full scale | 2% of the full scale   |
| Deviation from linearity           | L     | 0.5 % of value        | +/-5% of elv           |
| Zero drift ***                     | L     | 0.00 % of fs/24h      | +/-5% of fs/24h        |
| Span drift ***                     | L     | 0.00 % of fs/24h      | +/-5% of fs/24h        |
| volume or pressure flow dependence | L     | 0.02 % of fs/kPa      | 1% of fs/30kPa         |
| atmospheric pressure dependence    | L     | 0.8 % of value/kPa    | 3% of value/4kPa       |
| ambient temperature dependence     | L     | 3 %fs/10K             | 3%fs/10K               |
| dependence on voltage              | L     | 1 %fs/10V             | 2%fs/10V               |
| losses in the line (leak)          | F     | 2 % of value          | 2% of value            |
| Uncertainty of calibration gas     | F     | 2 % of value          |                        |

L=laboratory F=Field

| Measurement performance related to dynamic conditions |                        |
|-------------------------------------------------------|------------------------|
| Requirement for response time                         | 120 sec                |
| Measured response time                                | 2 minutes              |
| <b>Conclusion</b>                                     | <b>requirement met</b> |

| Measurement performance related to stationary conditions |             |                                             |      |
|----------------------------------------------------------|-------------|---------------------------------------------|------|
| Performance characteristic                               | Uncertainty | Value of uncertainty quantity               |      |
| Standard deviation of repeatability at zero              | $U_{r0}$    | $0.0015 \cdot 410$                          | 1.61 |
| Standard deviation of repeatability at span level        | $U_{rs}$    | $0.008 \cdot 410$                           | 1.61 |
| Lack of fit                                              | $U_{fit}$   | $0.007 \cdot 410 / 3^{0.5}$                 | 0.46 |
| Zero drift                                               | $U_{odr}$   | $0.0001 \cdot 410 / 3^{0.5}$                | 0.00 |
| Span drift                                               | $U_{edr}$   | $0.01 \cdot 410 / 3^{0.5}$                  | 0.00 |
| volume or pressure flow dependence                       | $U_{spres}$ | $(0.0002 \cdot 410) \cdot 5 / 3^{0.5}$      | 0.09 |
| atmospheric pressure dependence                          | $U_{apres}$ | $(0.008 \cdot 200 / 1) \cdot 0.5 / 3$       | 0.02 |
| ambient temperature dependence                           | $U_{temp}$  | $(0.003 \cdot 410 / 10) \cdot 10 / 3^{0.5}$ | 2.78 |
| dependence on voltage                                    | $U_{volt}$  | $0.0012 / 10 \cdot 410 \cdot 10 / 3^{0.5}$  | 0.93 |
| losses in the line (leak)                                | $U_{leak}$  | $0.02 \cdot 200 / 3^{0.5}$                  | 0.10 |
| Uncertainty of calibration gas                           | $U_{calib}$ | $0.02 \cdot 200 / 3$                        | 0.10 |

| Measurement uncertainty at | 8.4  | mg/m <sup>3</sup> |
|----------------------------|------|-------------------|
| $U_{tot}$                  | 3.74 | mg/m <sup>3</sup> |
| $U_{tot}/C_{lim}$          | 44   | %                 |
| $U_{tot,rel}$              | 89   | %                 |

Note: Uncertainties for which the results are below the LOD have been calculated at the results shown above.

|           |    |              |              |       |           |
|-----------|----|--------------|--------------|-------|-----------|
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|                 |        |                      |           |                      |                 |     |                   |    |
|-----------------|--------|----------------------|-----------|----------------------|-----------------|-----|-------------------|----|
| Client:         | Poeton | Plant:               | Cardiff   | Location:            | Booths 1-4 & LP |     |                   |    |
| Operators:      | DP/DPd | Test For:            | VOCs      | In-house Method No.: | A57             |     |                   |    |
| Laptop ID:      | 1196   | Start:               | Temp (°C) | 15                   | Pressure (kPa)  | 102 | Flow Rate (l/min) | NA |
| Data Logger ID: | 1024   | End:                 | 15        | 102                  | 102             | 102 | 102               | NA |
| Chiller ID      | NA     | Chiller Temp. & Time | NA        |                      |                 |     |                   |    |

| Action                     | O2  | CO | SO2 | NO | NOx | CO2 | VOC       |
|----------------------------|-----|----|-----|----|-----|-----|-----------|
| Analysers & Cylinder Info. |     |    |     |    |     |     | 1427      |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 1001      |
| Analysers & Cylinder Info. |     |    |     |    |     |     | VCSMG4986 |
| Analysers & Cylinder Info. | 1   | 1  | 1   | 1  | 1   | 1   | 1         |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 40        |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 25        |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 37 75     |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 100       |
| Analysers & Cylinder Info. |     |    |     |    |     |     | 32        |
| Span & Divider Information | N/A |    |     |    |     |     | 102.70    |
| Span & Divider Information |     |    |     |    |     |     | 70.00     |
| Span & Divider Information |     |    |     |    |     |     | 69.97     |
| Span & Divider Information |     |    |     |    |     |     | 71.9      |
| Span & Divider Information |     |    |     |    |     |     | 64.7      |
| Analysers Calibration      |     |    |     |    |     |     | 5         |
| Analysers Calibration      |     |    |     |    |     |     | 15        |
| Analysers Calibration      |     |    |     |    |     |     | 0.00      |
| Analysers Calibration      |     |    |     |    |     |     | 71.90     |
| Analysers Calibration      |     |    |     |    |     |     | 0.00      |
| Analysers Calibration      |     |    |     |    |     |     | N/A       |
| Analysers Calibration      |     |    |     |    |     |     | N/A       |
| Analysers Calibration      |     |    |     |    |     |     | PASS      |
| Initial Line Checks        |     |    |     |    |     |     | 15        |
| Initial Line Checks        |     |    |     |    |     |     | 45        |
| Initial Line Checks        |     |    |     |    |     |     | 0.30      |
| Initial Line Checks        |     |    |     |    |     |     | 0.4172    |
| Initial Line Checks        |     |    |     |    |     |     | PASS      |
| Initial Line Checks        |     |    |     |    |     |     | 71.70     |
| Initial Line Checks        |     |    |     |    |     |     | -0.28     |
| Initial Line Checks        |     |    |     |    |     |     | PASS      |
| Final Line Checks          |     |    |     |    |     |     | 0.30      |
| Final Line Checks          |     |    |     |    |     |     | 0.0000    |
| Final Line Checks          |     |    |     |    |     |     | PASS      |
| Final Line Checks          |     |    |     |    |     |     | 72.40     |
| Final Line Checks          |     |    |     |    |     |     | 0.97      |
| Final Line Checks          |     |    |     |    |     |     | PASS      |

|   |              |    |               |
|---|--------------|----|---------------|
| A | Darren Price | NA | Dale Padfield |
|---|--------------|----|---------------|