GRINDLE HOUSE,
CHURCH LANE,
CLYST ST MARY,
EXETER, DEVON EX5 1AB
TEL 01392 877770
FAX 01392 874041

ADVANCE
ENVIRONMENTAL

# AGGREGATE INDUSTRIES UK LIMITED
# A14 PROJECT
# ERMINE STREET
# GODMANCHESTER
# HUNTINGDON

Environmental Protection Act
Pollution Prevention & Control

# PARTICULATE EMISSION TEST
# (BS EN 13284-1:2017)

on

## BENNINGHOVEN COATING PLANT
## BAG FILTER EXHAUST

for

## AGGREGATE INDUSTRIES UK LIMITED
## A14 PROJECT
## ERMINE STREET
## GODMANCHESTER
## HUNTINGDON
## PE29 2NH

**Report Prepared by:**

K Gough
Company Principal

A Yelland
Associate

Date Of Test : 12.11.19
Date Of Report : 01.12.19
Report No : 3167
EPR No :

**CONTENTS** **PAGE NO.**

## EXECUTIVE SUMMARY

| EMISSIONS SUMMARY | | | | |
|---|---|---|---|---|
| **Determined** | **Units** | **Results** | **Uncertainty*** +/- | **Limit** |
| Particulate Concentration (STP) | $mg/Nm^3$ | 76.70 | 2.16 | 50 |
| Mass Emission (STP) | Kg/hr | 3.22 | 0.09 | - |
| Stack Temperature | °C | 88 | - | - |
| Gas Velocity | m/s | 17.40 | - | - |
| Stack Volume Flow Rate (Actual) | $m^3/hr$ | 59517 | - | - |
| Stack Volume Flow Rate (STP) | $m^3/hr$ | 44372 | - | - |

All results are reported at reference conditions of 273K, 101.3kPa, wet gas.

*Expanded uncertainty expressed with a level of confidence of 95%

| MONITORING TIMES | | | |
|---|---|---|---|
| **Determined** | **Sampling Date** | **Sampling Times** | **Sampling Duration** |
| Total Particulate Matter Run 1 | 12.11.19 | 13.20 - 14.00 | 40 minutes |
| Preliminary Stack Traverse | 12.11.19 | 13.15 | - |

| PROCESS DETAILS | |
|---|---|
| **Determined** | **Process Details** |
| Process description | BENNINGHOVEN COATING PLANT |
| Continuous or Batch | Continuous - 20mm dense @ 150t.p.h. |
| Particulate type | Aggregate |
| Abatement | Bag Filter |
| Appearance of plume | Steam |

| MONITORING METHODS | | | | |
|---|---|---|---|---|
| **Determined** | **Method** | **Technical Procedure** | **Limit of Detection** | **Calculated MU +/-%** |
| TPM | BS EN 13284-1 | EL18 | 0.08 | 8.4% |
| Velocity | BS EN ISO 16911-1 | EL20 | - | - |
| Volumetric Flow | BS EN ISO 16911-1 | EL20 | - | - |

## 1. BACKGROUND INFORMATION

Particulate emission testing was undertaken by Advance Environmental Consulting Limited, on the roadstone coating plant dust collector exhaust at Aggregate Industries UK Limited, A14 Project, Godmanchester.

The purpose of the emission testing was to ensure compliance with the requirements of the permit issued by the Local Authority under The Environmental Permitting (England and Wales) Regulations 2010.

## 2. MONITORING PROTOCOL

### 2.1 Test Method and references

Isokinetic sampling of the contained emission sources was undertaken using the APEX Instruments Inc Method Five isokinetic sampling apparatus in accordance with the main procedural requirements within the following British Standards and Technical Guidance Notes:-

* BS EN 13284-1:2017 - Stationary source emissions. Determination of low range mass concentration of dust.

* Environment Agency - Technical Guidance Document (Monitoring) M1 Sampling requirements for monitoring stack emissions to air from industrial installations; and

* Environment Agency - Technical Guidance Document (Monitoring) M2 Monitoring of Stack Emissions to Air.

### 2.2 Sampling procedure

The work carried out was, as far as was reasonably practical, in accordance with BS EN 13284-1:2017.

Isokinetic flow means that sample gases laden with particulates are drawn off at the same velocity as the free stream velocity in the flue. Isokinetic sampling thus avoids possible inertial effects of particulates approaching the vicinity of the inlet nozzle which may result in significant

The Apex Instruments test equipment was designed to meet the sampling requirements of US EPA Method 5 and with a modified nozzle design, meets the sampling requirements of BS EN 13284-1.

The principle of the standard is to draw a known volume of dust laden gas isokinetically through a filter. The weight gain on the filter, after sampling, divided by the gas sample volume equates to the particulate concentration, which in turn can be used to calculate a mass emission.

### 2.3 Sampling equipment

The test equipment is inspected prior to use and it's calibration status observed. This includes:-

* *Pitot Tube* - All pitot tubes are checked for damage, alignment and that there are no blockages;

* *Manometer* - Check of oil levels, connectors and orientation level

* *Thermocouple* - Temperature is measured using k type thermocouples. Each thermocouple is inspected for calibration and damage. Digital temperature meters are used in conjunction with k type thermocouples which are also checked for calibration dates;

* *Gas meter* - The calibration of the gas meter is checked before and after sampling using a critical orifice.

* *Nozzles* - All nozzles used have been constructed in accordance with BS EN 13284-1. Each nozzle is checked for damaged and measured using a Vernier calliper on at least 3 planes. Non conforming nozzles will be rejected.

* *Balance* - A Mettler Toledo balance is used to weigh filters. It is calibrated yearly by the manufacturer and checked daily by in-house weights.

* *Filters* - Quartz membrane filters with a collection efficiency of >99.5% at 0.3microns

### 2.4 Preparation for sampling

#### 2.4.1 Filter preparation

Filters are pre-conditioned before arrival on site. The filters are dried in an oven at 180°C for a period of at least one hour and then placed to cool in a desiccator for at least four hours. The filters are then weighed on a five figure balance and placed in individual transport containers. Spare Filters are prepared to obtain blank values.

#### 2.4.2 Sampling location

No site visit was undertaken prior to undertaking the sampling procedure, as monitoring had previously been undertaken at the site, during which time the sampling position, working platform, sampling ports, access and safety precautions were found to be satisfactory.

The internal dimension of the flue was known from previous monitoring undertaken. However, further measurements were taken to check that the internal diameter had not changed.

Prior to sampling a pressure and temperature survey, using a pitot static tube, a micromanometer, a digital thermometer and a nickel-chromium/nickel-aluminiumthermocouple, is carried out to check whether the flow conditions meet with the requirements of BS EN 16911. From this initial survey sample locations, isokinetic flow rates, nozzle size, and sample period can be worked out.

## 2.5 Sample collection

A leak check is carried out before and after sampling to confirm all the suction is drawn through the nozzle.

With the required isokinetic flow rates known the sample probe is inserted into the stack at 90$^{o}$ to the gas flow, this is to stop any particulate matter impinging on the filter before sampling.

The filter head and probe were allowed to obtain the stack gas temperature.

The initial gas meter reading was noted and the suction device and timer started. The correct flow rate for isokinetic sampling was set and the nozzle positioned to face parallel to the gas

Sampling was then carried out for the planned duration and number of sample points, recording all the necessary data for final calculations. On completion, the suction device and timer were stopped and the final gas meter volume recorded.

The probe was removed from the process stack and a further leak test carried out prior to removal of the filter, which was subsequently removed and placed in a storage container.

Any residual particulates upstream of the filter was washed with acetone into an appropriate beaker.

Repeat all of the above procedures to obtain duplicate samples.

At all times during the sampling procedure the sampling technicians were in contact with the process operator to ensure that the plant was in full production and there were no changes in the process that might affect the representative nature of the samples collected.

## 2.6 Analysis of samples

On returning to the laboratory, the used filters were dried in an oven at 160$^{o}$C for a minimumof one hour and then desiccated and weighed as before. The water/acetone washings are first evaporated, without boiling, then dried and weighed as above. The total particulate mass is the sum of the differential filter weight added to the differential water/acetone rinsing's component.

## 2.7 Calculation of results

The calculations were made using the formula specified in BS EN 13284-1.

The recorded filter weights, velocity, temperature, sampling duration and internal flue dimensions were then used to calculate:-

* the mass rate of solids emission in kg/hr; and
* the solids concentration in $mg/m^3$.

## 2.8 Comments

On the completion of sampling, the data from the PCME 980 continuous emission monitor was interrogated and the average results, which were recorded during the measurement period, noted. A level of 61.0406mg/m3 was obtained together with an existing calibration factor of 5.0762. It can be concluded that the monitor would benefit from an adjustment of the current calibration factor to 6.3785.

## 3. QUALITY ASSURANCE

### 3.1 Location

| SAMPLING LOCATION | | | | | |
|---|---|---|---|---|---|
| **Determined** | **Value** | **Units** | **Requirement** | **Compliant** | **Method** |
| Lowest differential pressure | 135 | Pa | >= 5Pa | Yes | BS EN 15259 |
| Highest differential pressure | 159 | Pa | - | - | |
| Ratio of gas pressures | 1.2 | Pa | <9:1 | Yes | BS EN 15259 |
| Mean gas velocity | 17.4 | m/s | - | - | - |
| Temperature deviation | 2 | K | <10% | Yes | BS EN 13284 |
| Max angle of flow | <15 | ° | <15° | Yes | BS EN 15259 |
| No local negative flow | Yes | - | - | Yes | BS EN 15259 |

| Duct Details | | |
|---|---|---|
| | Value | Units |
| Shape | Circular | - |
| Depth | 1.10 | m |
| Width | | m |
| Area | 0.95 | $m^2$ |
| Port | 0.08 | m |

| Duct Details | |
|---|---|
| | Isokinetic |
| Sample port size | 4" BSP |
| Number of lines used | 2 |
| Number of points/line | 4 |
| Duct orientation | Vertical |
| Filtration for TPM | In stack |

### 3.2 Methods

| MONITORING METHODS | | |
|---|---|---|
| **Determined** | **Method** | **Technical Procedure** |
| TPM | Gravimetric | EL18 |
| H2O | Gravimetric | EL5 |

### 3.3 Test Team

| MONITORING TEAM | | | | | | |
|---|---|---|---|---|---|---|
| **Personnel** | **MCERTS Number** | **MCERTS** | | **TE/H&S Qualifications** | | |
| | | **Level** | **Expiry** | **TE1** | **H&S** | |
| Andrew Yelland | MM 02 130 | MCERTS Level 2 | Apr-23 | Apr-23 | Jul-24 | |
| Ryan Carkeek | - | - | - | - | - | |

## 4. ON-SITE SUMMARY/MEASURMENTS

| TOTAL PARTICULATE MATTER SUMMARY | | | | |
|---|---|---|---|---|
| **Determined** | **Sampling Times** | **Concentration mg/m$^3$** | **Uncertainty mg/m$^3$** | **Limit mg/m$^3$** |
| Run 1 | 13.20 - 14.00 | 76.70 | 2.16 | 50 |
| Blank | - | 0.08 | - | - |

| FILTER SUMMARY | | | | | |
|---|---|---|---|---|---|
| **Determined** | **Filter No** | **Filter Start Weight g** | **Filter Start Weight g** | **Acetone Rinse Weight g** | **Combined Mass Gained g** |
| Run 1 | 40 | 0.05597 | 0.10140 | | 0.04543 |
| Blank | 41 | 0.05616 | 0.05621 | | 0.00005 |

| STANDARD UNCERTAINTY SUMMARY | | | | | | |
|---|---|---|---|---|---|---|
| **Measured Quantities** | **Value** | **Standard uncertainty** | | **Uncertainty %** | **Requirement of std** | |
| Sampled Volume - $V_m$ | 0.6615 | $uV_m$ | 0.001 **m$^3$** | 0.15 | <=2% | Pass |
| Sampled gas Temp - $T_m$ | 277 | uTm | 2 k | 0.72 | <=1% | Pass |
| Sampled gas Pressure - ρm | 99.9 | $u\rho_m$ | 0.5 **kPa** | 0.50 | <=1% | Pass |
| Sampled gas Humidity - Hm | 5.43 | $uH_m$ | 1 **% by vol** | 0.18 | <=1% | Pass |
| Oxygen content - O2,m | 17 | $uO_{2,m}$ | 0.1 **% by vol** | 0.59 | <=5% | Pass |
| Mass particulate - m | 45.43 | um | 0.01 **mg** | 0.02 | 0.03 | <5% of limit val |
| Note - Sampled gas humidity, temperature and pressure are values at the gas meter | | | | | | Pass |
| Leak - L | 0.39 | | **%** | 0.39 | <=2% | Pass |
| Uncollected Mass - UCM (In stack filter - no rinse) | 0.05 | | **mg** | 0.11 | <=10% | Pass |

| MOISTURE SUMMARY | | | | | |
|---|---|---|---|---|---|
| **RUN** | **Trap Start Weight g** | **Trap End Weight g** | **Difference g** | **Volume sampled m$^3$** | **Bwo %** |
| Run 1 | 541.5 | 568.9 | 27.4 | 0.5923 | 5.43 |

## 4.1 Preliminary stack survey

### On Site Velocity and Flow Data

| | | | | |
|---|---|---|---|---|
| Company | AGGREGATE INDUSTRIES UK LIMIT | Stack Diameter | 1.10 | m |
| Site | A14 PROJECT | Area | 0.95 | $m^2$ |
| Location | BENNINGHOVEN COATING PLANT | Sample points required | 8 | |
| Job No | 3167 | Barometric Pressure | 99.8 | kPa |
| Operators | AJY/RJC | Stack Pressure | 0.05 | kPa |
| | | Pitot Tube Coefficient | 0.997 | |

| Preliminary readings taken before sampling | | | | |
|---|---|---|---|---|
| | Pitot Traverse A | | Pitot Traverse B | |
| Pitot Settings | D P pa | Temp °C | D P pa | Temp °C |
| 1 | 138 | 88 | 135 | 87 |
| 2 | 142 | 88 | 139 | 87 |
| 3 | 145 | 88 | 144 | 87 |
| 4 | 148 | 88 | 146 | 88 |
| 5 | 152 | 89 | 149 | 88 |
| 6 | 155 | 89 | 153 | 88 |
| 7 | 156 | 89 | 157 | 87 |
| 8 | 154 | 89 | 159 | 87 |
| 9 | 149 | 89 | 152 | 87 |
| 10 | 145 | 89 | 141 | 87 |
| Mean | 148 | 89 | 148 | 87 |

## 4.2 Leak check results

| PITOT LEAK CHECK | | | | | | |
|---|---|---|---|---|---|---|
| Run | Pre traverse leak rate | | | Post traverse leak rate | | |
| | Start value Pa | End value Pa | Difference % | Start value Pa | End value Pa | Difference % |
| Run 1 | 250 | 250 | Pass | 250 | 250 | Pass |

| S-TYPE STAGNATION CHECK | | | |
|---|---|---|---|
| Run | Stagnation Pa | Reference Pa | Difference Permitted +/- 10 Pa |
| Run 1 | 40 | 40 | Pass |

| SAMPLE TRAIN LEAK CHECK | | | | | |
|---|---|---|---|---|---|
| Run | Mean Sampling Rate litres/min | Pre-sampling Leak Rate litres/min | Post-sampling Leak Rate litres/min | Acceptable Leak Rate litres/min | Maximum Leak Rate % |
| Run 1 | 20.51 | 0.08 | 0.08 | 0.41 | Yes |

| SAMPLE TRAIN LEAK CHECK | | | | |
|---|---|---|---|---|
| Run | Blank Value $mg/m^3$ | Emission Limit Value $mg/m^3$ | Acceptable Blank Value $mg/m^3$ | Blank Value Acceptable $mg/m^3$ |
| Blank 1 | 0.08 | 50 | 5 | Yes |

## 5. SAMPLING RECORDS

### 5.1 Process Conditions

| | |
|---|---|
| Arrestment Plant: | Bag Filter |
| Particulate Type: | Aggregate |
| Plant Loading: | Continuous - 20mm dense @ 150t.p.h. |
| Appearance of plume: | Steam |

## 5.2 Sampling Results

| | Test Run No. 1. | Test Run No. 2. | Average |
|---|---|---|---|
| Time of Test: | 13.20 - 14.00 | | |
| Sampling Duration: (mins) | 40 | | |
| Gas Temperature (°C) | 88 | n/a | 88 |
| Mean Velocity at Sampling Points: (m/s) | 17.41 | n/a | 17.41 |
| Gas Flow Rate at STP (1): ($m^3$/min) | 700.4 | n/a | 700.4 |
| Particulate Loading at STP (1): (mg/$m^3$) | 76.70 | n/a | 76.70 |
| Particulate at Normalised Conditions (2): (mg/$m^3$) | ----- | | ----- |

(1) Particulate stated at 273K, 101.3kPa without correction for water vapour.

(2) State normalised conditions (e.g. 11% $O_2$ etc).

## 5.3 - Calculations Sample Run No. 1

**On-site measurements**

| | | | | | |
|---|---|---|---|---|---|
| O2 = | 17 % | CO2 = | 2.2 % | N2 = | 80.8 % |
| Bws = | 0.05 | Ps = | 99.9 kPa | Ts = | 360.8 K |

Md = Molecular weight of gas at DGM (g/g mole)

Md = $(0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

= 29.03 g/g mole

Ms = Molecular weight of gas wet (g/g mole)

= 28.48 g/g mole

**Stack gas velocity at sample points**

V = Kp x Cp x Ö(Ts.DP/Ps.Ms)

= 17.41 m/s

Kp = 4.07

DP = 145.1 av. Dp at sample plane

Cp = 1.00 pitot tube coefficient

**Stack gas volume at sample points**

Q = V x A x 60

= 992.7 $m^3$/min

A = 0.95 area of stack $m^2$

**Volume of water vapour collected, standard conditions ($m^3$)**

Vwstd = 0.00124 x Vlc

= 0.034 $m^3$

Vlc = 27 ml

**Volume of gas metered, standard conditions ($m^3$)**

$$Vmstd = \frac{2.695 \times Vm \times (Pa + (DH/102)) \times Yd}{(T + Tm)}$$

= 0.5923 $m^3$

Tm = 4 °C

Vm = 0.6615 $m^3$

Pa = 99.8 kPa

DH = 23.5 mm $H_2O$

Yd = 0.920

**Moisture content**

Bwo = Vwstd/(Vwstd +Vmstd)

= 0.0543

## 5.3 - Calculations Sample Run No. 1 Cont.

**Dry total flow of stack gas, standard conditions ($m^3$/min)**

$$Qstd = \frac{Q \times Ps(2.695)(1 - Bwo)}{Ts + 273}$$

Ts = 87.8 °C

Ps = 99.9 kPa

= 700 $m^3$/min

**Percent isokinetic**

$$\%I = \frac{(6.184 \times 10^5)(Ts + 273) \times Vmstd}{Ps \times V \times Aa \times t \times (1-Bwo)}$$

Aa = 19.6 area of nozzle $mm^2$

= 102.3 %

**Filter & rinsing weights sample no. 1**

| | | |
|---|---|---|
| weight gain on filters = | 45.43 | mg |
| weight of acetone wash = | | mg |
| total weight gain (M) = | 45.43 | mg |

**Particulate concentration ($mg/m^3$)**

$$C = M/Vmstd$$

M = 45.43 mg

= 76.70 $mg/m^3$

**Particulate emission rate (kg/hr)**

$$E = (C \times Qstd \times 60)/1000000$$

= 3.22 kg/hr

## 5.4 - Sample Blank

An overall sample blank was taken after the measurement series, following the sampling procedure in the methodology without starting the suction device and keeping the blank in the duct for 15 minutes with the sampling nozzle 180o from the direction of flow. This leads to an estimation of the dispersion of results related to the whole procedure.

weight gain on filters = 0.00005 mg

weight of acetone wash = mg

total weight gain (M) = 0.00005 mg

**Particulate concentration (mg/m$^3$)**

C = M/Vmstd M = 0.05 mg

= 0.08 mg/m$^3$

## 5.6 - Sampling Conditions

| | Sample Run No. 1 | | |
|---|---|---|---|
| Sample Position | Stack Temp °C | Velocity Pressure DP (Pa) | Nozzle Area $mm^2$ |
| 0.065D | 88 | 138 | 19.6 |
| 0.25D | 88 | 145 | 19.6 |
| 0.75D | 89 | 154 | 19.6 |
| 0.935D | 89 | 145 | 19.6 |
| 0.065D | 87 | 135 | 19.6 |
| 0.25D | 87 | 144 | 19.6 |
| 0.935D | 87 | 159 | 19.6 |
| 0.935D | 87 | 141 | 19.6 |

## 5.7 - Weighing Results

The below filters and acetone rinsing's were weighed on a balance in a temperature controlled room with corrections made for differences in atmospheric pressure. Control parts and blank filters are used to confirm accuracy of weighing's.

| Sample Run No.1. | Ref No. | Weight gms | | | Sample time at each point (mins) | % weight gain |
|---|---|---|---|---|---|---|
| | | Before | After | Collected | | |
| Filter Acetone | 40 | 0.05597 | 0.10140 | 0.04543 | 5.0 | 81.2% |
| **Total weight =** 0.04543 | | | | | | |
| Sample Blank | Ref No. | Weight gms | | | Sample time at each point (mins) | |
| | | Before | After | Collected | | |
| Filter Acetone | 41 | 0.05616 | 0.05621 | 0.00005 | n/a | 0.1% |
| **Total weight =** 0.00005 | | | | | | |

## 6. Uncertainty calculation for EN 13284-1:2017

**Sample Run No. 1**

| | | | | | |
|---|---|---|---|---|---|
| **Limit value** | 50 | **mg.m$^{-3}$** | O2 Ref | 21 | **%** |
| **Measured conc.** | 76.70 | **mg.m$^{-3}$** | | | |

Measurement Equation

$$c = \frac{m}{V} f_c$$

| **Measured Quantities** | **Symbol** | **Value** | **Standard uncertain** | | **Units** | **Uncertainty %** | | **Requirement of std** |
|---|---|---|---|---|---|---|---|---|
| Sampled Volume | $V_m$ | 0.6615 | $uV_m$ | 0.001 | **m$^3$** | 0.15 | | <=2% |
| Sampled gas Tem | $T_m$ | 277.0 | uTm | 2 | k | 0.72 | | <=1% |
| Sampled gas Pressure | $\rho_m$ | 99.9 | $u\rho_m$ | 0.5 | **kPa** | 0.50 | | <=1% |
| Sampled gas Humidity | $H_m$ | 5.43 | $uH_m$ | 1 | **% by vol** | 0.18 | | <=1% |
| Oxygen content | $O_{2,m}$ | 17 | $uO_{2,m}$ | 0.1 | **% by vol** | 0.59 | | <=5% |
| Mass particulate | m | 45.43 | um | 0.01 | **mg** | 0 | 0.03 | <5% of limit val |
| Note - Sampled gas humidity, temperature and pressure are values at the gas meter | | | | | | | | |
| Leak | L | 0.39 | | | **%** | 0.39 | | <=2% |
| Uncollected Mass (In stack filter - no rinse) | UCM | 0.05 | | | **mg** | 0.11 | | <=10% |

Intermediate calculations

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Factor for std conds | fs | 0.90 | | | | | |
| uncertainty components | symbol | **sensitivity coeff** | | **u (in units of fs)** | | | |
| | $\rho_m$ | 0.009 | | 0.004 | | $f_s = \frac{(100 - H_m)}{100} \frac{273}{T_m} \frac{\rho_m}{101.3}$ | |
| | $H_m$ | 0.009 | | 0.009 | | | |
| | $T_m$ | 0.003 | | 0.006 | | | |
| | ufs | | | 0.012 | | | 1.37 |
| Corrected volume | V | 0.59 | uV | 0.008 | **m$^3$** | $V = V_m f_s$ | 1.39 |
| Factor for O2 correction | fc | 1.00 | | | | | |
| uncertainty components | symbol | **sensitivity coeff** | | **u** | | $f_c = \frac{21 - O_{2,ref}}{21 - O_{2,m}}$ | |
| | $O_{2,m}$ | 0.25 | | 0.025 | | | |
| Factor for O2 Corr | ufc | 1.00 | | 0.025 | | | 1.00 |

| **Parameter** | **Uncertainty** | **Value** | **Units** | **ens coeff** | **Uncertainty in Resu** | | **Uncertainty as %** |
|---|---|---|---|---|---|---|---|
| Volume(stp) | V | 0.59 | m$^3$ | 129.50 | 1.06 | mg.m$^{-3}$ | 1.39 % |
| Mass | m | 45.43 | mg | 1.69 | 0.02 | mg.m$^{-3}$ | 0.02 |
| Factor for O2 Correction | fc | 1.00 | | 0.00 | 0.00 | mg.m$^{-3}$ | 0.00 % |
| Leak | L | 0.17 | mg.m$^{-3}$ | 1.00 | 0.17 | mg.m$^{-3}$ | |
| Uncollected mass | UCM | 0.03 | mg | 1.69 | 0.05 | mg.m$^{-3}$ | |
| **Combined uncertainty** | | | | | **1.08** | mg.m$^{-3}$ | |

**Expanded uncertainty expressed with a level of confidence of 95%** **2.81 %**

**Expanded uncertainty expressed with a level of confidence of 95%** **2.16 mg.m$^{-3}$**