EMISSIONS MONITORING SURVEY

(on behalf of Advanced Environmental Consulting Limited)

Prepared for:

Aggregate Industries UK Limited.

Doyle Drive
Coventry
West Midlands
CV6 6NW

Permit Number	**: ...**
Variation Number	**: ...**
Installation	**: Aggregate Industries Coventry Coating Plant**
Visit Details	**: Emissions Monitoring 2020**
Job Number	**: P4694**
Report Number	**: R001**
Report Issue Date	**: 7th January 2021**
Survey Dates	**: 18th November 2020**

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Report Issue:		**FINAL**	
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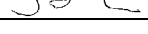
		Signature:	
Date:	14th December 2020	***Date:***	7th January 2021

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mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING
2499

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MCERTS requirements mean that comparison of results with emissions limit values is not permitted within this report.

TABLE OF CONTENTS

Section	Description	Page Number
	Document Control Sheet	
PART 1	EXECUTIVE SUMMARY	4
1	MONITORING OBJECTIVES	4
1.1	Monitoring Results	5
1.2	Operating Information	6
2	MONITORING DEVIATIONS	7
PART 2	SUPPORTING INFORMATION	8
3	SAMPLING STAFF DETAILS	8
4	SAMPLING PROTOCOLS / METHODOLOGIES	9
5	SAMPLE POINT DESCRIPTIONS	10
	EQUIPMENT IDs	11
	TABLES	13
	VELOCITY TRAVERSE PROFILES	16
	FIELD CALIBRATION AND SAMPLING DATA	18
	LABORATORY ANALYSIS RESULTS	21
	UNCERTAINTY CALCULATIONS	23

PART 1 - EXECUTIVE SUMMARY

1 Monitoring Objectives

Environmental Compliance Ltd (ECL) was commissioned by Advance Environmental Consulting Limited, to undertake an emission monitoring survey for **Aggregate Industries UK Limited** at their **Coventry Coating Plant**. This report presents the findings of the study.

The monitoring at this installation was carried out in accordance with our quotation reference **AM/4514/Q003**, for compliance check monitoring of emissions to air. The substances requested for monitoring at each emissions point are listed below:

Substances to be monitored	Emission Point Identification
	Coating Plant Bag Filter Exhaust
Particulates	• U
Velocity / Flowrate	• U

• Denotes the substances to be monitored.

U **Denotes UKAS accreditation is held for monitoring that substance, but does not mean that it has been claimed which will depend on whether the testing could be completed in accordance with the Standard Reference Method.**

Special Requirements: *Normal Operating Conditions*.

1.1 Monitoring Results

Emission Point Reference	Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Units	Uncertainty %	Reference Conditions 273 K, 101.3 kPa	Date of Sampling	Start and End Times	Monitoring Method Reference	Accreditation Claimed For Test Result	Tick if non-conforming test (see Section 2	Operating Status
Coating Plant Bag Filter Exhaust	Particulates $	50	7.07	mg/m^3	13	STP & Wet Gas	18/11/2020	10:29 – 10:59	BS EN 13284-1:2017 & MID	UKAS / MCERTS	✓	Normal
	Particulates $	50	5.56	mg/m^3	14	STP & Wet Gas		11:06 – 11:36	BS EN 13284-1:2017 & MID	UKAS / MCERTS	✓	
	Volumetric Flowrate	...	9.4027	m^3/sec	5	Stack Conditions		09:00 – 09:16	BS EN 16911-1:2013 & MID	UKAS / MCERTS	✓	
	Volumetric Flowrate	...	7.1799	m^3/sec	6	STP & Wet Gas		09:00 – 09:16	BS EN 16911-1:2013 & MID	UKAS / MCERTS	✓	

The volumetric flowrate shown above is that from the initial pitot traverse.
Any other flow measurements made during isokinetic sampling and/ or repeat traverses are shown later in the tables section.

Notes

Emission Limit Value	The emission limit value is that stated in the permit and will be expressed as a concentration or a mass emission.
Periodic Monitoring Result	The result given is expressed in the same terms and units as the emission limit value.
Uncertainty	The uncertainty associated with the quoted result is at the 95% confidence interval. The Uncertainty results **DO NOT** take into account the effect of the sample location limitations.
Reference Conditions	All results are expressed at 273 K and 101.3kPa. The oxygen and moisture corrections are stated.
Monitoring Method Reference	The method stated is in accordance with the Environment Agency Technical Guidance Note M2, or other method approved by the Environment Agency.
Accreditation for use of Method	**The details indicate the accreditation for the use of the complete monitoring method, e.g. MCERTs, UKAS. If use of the method is not accredited " NA" is stated.**
Operating Status	The details indicate the feedstock and the loading rate of the plant during monitoring.
$	Chemical Analysis on sample reagents was performed by an External Laboratory as detailed in Section 4
NU	UKAS Accreditation Held but UKAS Accreditation cannot be claimed for the test as sampling did not comply with the Standard Reference Method (SRM), see section 2 & 5
NA	**Method is NOT UKAS Accredited.**

1.2 Operating Information

Any operating information and CEMS data below has been supplied by the client.

Emission Point Reference	Process Type	Process Duration	Fuel	Feedstock	Abatement	Load	Comparison of Operator CEMS and Periodic Monitoring Results					
							Parameter	Date	Time	CEMS Results	Periodic Monitoring Results	Units
Coating Plant Bag Filter Exhaust	Batch	As Required	Kerosene	Various grades of aggregate	Bag Filter	35 t/hr	Total Particulate Matter	18/11/2020	10:29 – 10:59	4.1319	7.07	mg/m^3
									11:06 – 11:36	2.1076	5.56	mg/m^3

PCME Type – DT 990
Current Cal Factor – 1.635

Notes:

Process Type	State whether the process is a continuous or batch process.
Process Duration	If a batch process, state the duration, frequency and details of the portion of the batch sampled. If continuous state "NA"
Fuel	If applicable, state the fuel type If not applicable state "NA"
Feedstock	State the feedstock type
Abatement	State the type and whether operational during monitoring. If not applicable state "NA"
Load	State the normal load, throughput or rating of the plant
CEMS Data	Enter this data for each CEM installed if it is has been provided by operator otherwise state “NP” (NOT PROVIDED)

2 Monitoring Deviations

The objective of the survey was to measure the concentrations of pollutants from the processes / locations as detailed in Section 1. This survey meets the requirements of the site's **PPC Permit Number: ...** where UKAS and MCERTS accreditation has and could be claimed for the testing in the monitoring results table.

There were modifications to the sampling procedures (TPDs) listed in section 4. , these are as follows:-

Due to high duct gas velocity, in order to maintain isokinetic sampling, it was necessary to use a nozzle with diameter smaller than the recommended minimum of 8mm minimum stated in BS EN 13284-1:2017. Note that there is no absolute minimum nozzle size stated in the standard, as long as the uncertainty of the nozzle area is $<5\%$. **So this does not need to be described as a non-conforming test.**

There were no substance deviations from the original and agreed emissions monitoring schedule.

There were non-conforming tests, as follows.

Line A could not be accessed due to a mesh guard around the bag house blocking access to the sampling port. Both flowrate and particulate samples were taken from a single line. TPM samples were further non-conforming, as due to limited rear clearance, the sample train could only be deployed at a single point on the sample line without overhanging the platform.

The Uncertainty of the reported concentrations for these pollutant results DOES NOT take into account the effect of non-conformities or sample location limitations.

Homogeneity tests have not been completed at this location, such tests are not applicable (as the duct area is $<1m^2$) and were not requested by the client.

PART 2 – SUPPORTING INFORMATION

3 SAMPLING STAFF DETAILS

Site Sampling Team

Names of Site Team	Dates on Site	MCERTS No.	LEVEL	Technical Endorsements
Paul Hannah	18th November 2020	MM 03 477	2	TE1, TE2, TE3, TE4
Lee Harper		MM 17 1423	1	...

Report Reviewer

Name	MCERTS No.	LEVEL	Technical Endorsements
Andy Barnes	MM 03 235	2	TE1, TE2, TE3, TE4

Technical Endorsement Key:-

TE1 – **Isokinetic** Particulates, Temperature & Velocity Profiles, Oxygen.
TE2 – **Isokinetic** Extractive Pollutants:- Metals, Dioxin & Furans, PAHs, PCBs, HCl, HF.
TE3 – **Non-Isokinetic** Extractive Pollutants:- Speciated VOCs, HF, HCl, Cyanide.
TE4 – **Continuous Analysers** (Combustion Gases):- TVOC, CO, NOx, SO2.

4 SAMPLING PROTOCOLS / METHODOLOGIES

Details of the substances monitored, the standard methods used and the Environmental Compliance Limited Technical Procedures used during this survey are shown in the table below. Detailed sampling protocols are included in a separate document which will be sent with the report.

In all cases, where analysis of collected samples was required, the analysis was by a subcontract laboratory. Details of the sub-contract laboratory are shown on the analysis certificates in this report. The UKAS/MCERTs accreditation status of the analysis is also indicated on the certificates.

Any required modifications to the Technical Procedure Documents (TPDs) specified below will be detailed in section 2 of this report.

Determinand	External Reference Method	ECL Technical Procedure Number
Velocity and Flowrate	BS EN 16911-1:2013 & MID	ECL/ TPD/ 022A
Particulates (MST)	BS EN 13284-1:2017 & MID	ECL / TPD / 027

5 SAMPLE POINT DESCRIPTIONS

The homogeneity test is applicable to combustion processes, but may also be requested by the regulator for non-combustion processes.

Homogeneity testing has not been completed at this location.

The test is not usually required for stacks with sampling plane areas of $<1m^2$ (below 1.13m in diameter for circular ducts).

The Uncertainty of the reported concentrations for these pollutant results DOES NOT take into account the effect of non-conformities or sample location limitations.

The sample location that was monitored is detailed below:-

Coating Plant Bag Filter Exhaust

The stack diameter is 0.90m and the sample platform width back from the sample port is 0.5m.

Two sample ports are located on the stack at 90 degrees to each other and are located on the same plane.

These sample ports are located at a height of approximately 1.4m from the working sample platform.

Sampling for Particulates was carried out using an out-of-stack filter system.

Access to the sample platform was attained by means of permanent caged ladders.

EQUIPMENT IDs
(Pre site checklist from SSP)

Aggregate Industries UK Limited
Permit No : ...
Variation No : ...
Report Ref : P4694 : R001

Installation Name : Aggregate Industries Coventry Coating Plant
Visit Details : Emissions Monitoring 2020
Survey Dates : 18th November 2020
Report Issue Date : 7th January 2021

PRE SITE EQUIPMENT CHECKLIST/ EQUIPMENT USED

(Completed before departure to site and when on site in full)

Equipment	Equip. Type	ID No:	ID No:	ID No:	ID No:	ID No:	ID No:	ID No:	ID No:
MST console/pump	E001	U001							
MST Nozzle set		021-027							
MST "S" Type Pitot		635							
MST Probe		135							
MST Hot Box		336							
MST Impinger Arm		657							
Barometer		1221							
Site Balance		088							
Site Check weights		276							
		277							
Horiba	E002								
Heated Probe / Filter									
Chiller									
MFC									
Heated Line									
FID	E003								
Heated Line									
Heated Probe / Filter									
Testo	E004								
FTIR	E005								
Heated Probe / Filter									
Heated Line									
Stackmite	E006								
"L" Type Pitot		488							
Digital Manometer		1205							
Stack Thermocouple		1208							
Thermocouple Reader		1206							
Nozzle Set									
Workhorse Pumps	E007								
Stack Thermocouple									
Tube Thermocouple									
Meter Thermocouple									
High Vac Gauge									
Dioxin Thermocouple									

Quantity of Ice Required / Used for Survey	2	Bags (2kg bags)

TABLES

Aggregate Industries UK Limited
Permit No : ...
Variation No : ...
Report Ref : P4694 : R001

Installation Name : Aggregate Industries Coventry Coating Plant
Visit Details : Emissions Monitoring 2020
Survey Dates : 18th November 2020
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Table 1 – Total Particulate Matter

Data Recorded from Bag Filter Exhaust - Coventry

Emission Parameter	Units	TPM 1	Blank
Stack Diameter	metres	0.90	…
Area of Sample Plane	m^2	0.636	…
Moisture Content	%	3.59	…
Oxygen Content	%	20.90	…
Stack Temperature	^oC	78	…
Gas Velocity (as Measured. Adjusted for Smooth Walls)	m/sec	14.0060	…
Gas Velocity (Reference Conditions)	m/sec*	10.7634	…
Volumetric Flowrate (as Measured)	m^3/sec	8.9102	…
Volumetric Flowrate (Reference Conditions)	m^3/sec*	6.8474	…
Dry Gas Molecular Weight	g/gmole	28.8376	
Sample Date	...	18/11/2020	…
Sample Period	...	10:29 - 10:59	…
Sample Volume (reference Conditions)	m^3*	0.586	0.586
Isokinetic Sampling Rate	%	105.71	…
Sample Reference (ECL ID)	ECL/20/	6355 & 6356	6359 & 6360
Mass of Particulate Matter Collected	mg	4.14	0.54
Concentration of Particulate Matter	mg/m^3*	**7.07**	0.92
Emission Rate of Particulate Matter	kg/hr	0.17	...
Expanded Uncertainty (% Relative)	%	13	...
Emission Limit Value (ELV)	mg/m^3*	50	…
Blank Concentration as Percentage of ELV	%	…	1.84

*Reference Conditions (273K, 101.3kPa, Wet Gas)

Aggregate Industries UK Limited
Permit No : ...
Variation No : ...
Report Ref : P4694 : R001

Installation Name : Aggregate Industries Coventry Coating Plant
Visit Details : Emissions Monitoring 2020
Survey Dates : 18th November 2020
Report Issue Date : 7th January 2021

Table 2 – Total Particulate Matter

Data Recorded from Bag Filter Exhaust - Coventry

Emission Parameter	Units	TPM 2	Blank
Stack Diameter	metres	0.90	…
Area of Sample Plane	m^2	0.636	…
Moisture Content	%	3.37	…
Oxygen Content	%	20.90	…
Stack Temperature	^oC	76	…
Gas Velocity (as Measured. Adjusted for Smooth Walls)	m/sec	14.4000	…
Gas Velocity (Reference Conditions)	m/sec*	11.1137	…
Volumetric Flowrate (as Measured)	m^3/sec	9.1609	…
Volumetric Flowrate (Reference Conditions)	m^3/sec*	7.0702	…
Dry Gas Molecular Weight	g/gmole	28.8376	
Sample Date	...	18/11/2020	…
Sample Period	...	11:06 - 11:36	…
Sample Volume (reference Conditions)	m^3*	0.654	0.654
Isokinetic Sampling Rate	%	114.32	…
Sample Reference (ECL ID)	ECL/20/	6357 & 6358	6359 & 6360
Mass of Particulate Matter Collected	mg	3.64	0.54
Concentration of Particulate Matter	mg/m^3*	**5.56**	0.83
Emission Rate of Particulate Matter	kg/hr	0.14	...
Expanded Uncertainty (% Relative)	%	14	...
Emission Limit Value (ELV)	mg/m^3*	50	…
Blank Concentration as Percentage of ELV	%	…	1.65

*Reference Conditions (273K, 101.3kPa, Wet Gas)

VELOCITY TRAVERSE PROFILES

Environmental Compliance Limited

Aggregate Industries UK Limited
Permit No : ...
Variation No : ...
Report Ref : P4694 : R001

Installation Name : Aggregate Industries Coventry Coating Plant
Visit Details : Emissions Monitoring 2020
Survey Dates : 18th November 2020
Report Issue Date : 7th January 2021

Environmental Compliance Limited	Traverse Data Profoma	Date of Measurement	18/11/2020

Company	Advance Environmental	Stack Diameter Port A (mm)	900	Average Stack Diameter (mm)	900	Pitot tube coefficient	1.00
Site	Aggregate Industries UK Ltd	Stack Diameter Port B (mm)		Port Length (mm)	90	Pitot Id	488
Location	Coventry	Duct Length Port A (mm)		Average Duct Length (mm) L		Stack Thermocouple ID	1208
Stack	Bag Filter Exhaust	Duct Length Port B (mm)		Duct width (mm) B		Stack Temp Reader ID	1206
Job No	P4693	Duct Length Port C (mm)		Barometric Pressure. (mb)	1000	Manometer ID	1205
Operators	PH, LH	Duct Length Port D (mm)		Ave Static Press. (mm $H_2$0)	2.00	Barometer ID	1221

Pre - Traverse Checks Carried Out	Time	Pass/ Fail
Pre - Traverse PITOT Visual Inspection	09:00:00	Pass
Pre - Traverse PITOT Leak Check	09:02:00	Pass

Smooth Walls

Static Pressure Readings (mm H_2O)			
Port A	Port B	Port C	Port D
2.00	2.00		

Port/ Point	Distance to Point (mm)	Time	Temperature Readings (^{o}C)			(ΔP) Pitot Readings (mm H_2O)			Average Temp. (^{o}C)	Average (ΔP) (mm H_2O)	Swirl Test ^{o} From Reference
			1	2	3	1	2	3			
B1	60	09:04:00	80.0	80.0	80.0	10.80	11.10	11.50	80.0	11.13	7
B2	225	09:06:00	80.0	80.0	80.0	11.20	10.90	11.00	80.0	11.03	9
B3	675	09:08:00	80.0	80.0	80.0	10.50	10.80	10.50	80.0	10.60	7
B4	840	09:10:00	80.0	80.0	80.0	10.60	11.20	10.90	80.0	10.90	8
Blockage Check @ A1 (L-Type Pitot Only)		09:12:00	80.0	80.0	80.0	11.20	11.00	11.40	320.0	43.7	Total
			Mean		80.0	Mean		11.2	80.0	11.1	Max
			Difference <5% from Initial ?		0.00	Difference <5% from Initial ?		0.60	80.0	10.6	Min
									80.0	10.9	Average

Stagnation Check (S-type Pitot Only)	Time	Reading
Static Pressure Via Positive Leg (mm H_2O)		
Static Pressure Via Negative Leg (mm H_2O)		
Difference (Pa) < 1 mm $H_2$0 ?		

Post - Traverse Checks Carried Out	Time	Pass/ Fail
Post - Traverse PITOT Visual Inspection	09:14:00	Pass
Post - Traverse PITOT Leak Check	09:16:00	Pass

Average temp (K)	353.000

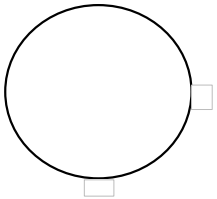
Suitability of Sampling Position	Actual Stack Conditions
Highest:lowest flow pressure ratio < 9:1?	1.07:1
Maximum deviation of flow from axis < 15^o ?	9
X-sectional area for stacks = πr2	0.64 m^2
X-sectional area for ducts = L x B	m^2
Suitability of Position for Sampling	OK

Stack Moisture	3.48	%	Gas Velocity (as Measured) Adjusted for Smooth Walls	14.78015	m/sec
Measured Oxygen	20.9	%	Gas Velocity (Reference Conditions) Adjusted for Smooth Walls	11.28606	m/sec*
Measured Carbon Dioxide	0	%	Volumetric Flowrate (as Measured) Adjusted for Smooth Walls	9.40273	m^3/sec
Dry Gas Molecular Weight	28.83600	g/g mole	Volumetric Flowrate (Ref Cond) Adjusted for Smooth Walls	7.17988	m^3/sec*

*Reference Conditions: 273K, 101.3kPa, Wet Gas

NOTE: Velocity / volume flowrate calculations exclude contributions from the measurement point(s) where swirl > 15°

Diagram/ Description of Cross Section of Stack/Duct



Notes
Including expected or actual deviations from procedures / non-conformities

Only one line could be traversed and sampled due to stack and platform setup.

Mesh guarding around bag house blocked access. See site photos

Compliance With Positional Requirements?

Height of sample ports from Platform	1.4m
Number of sample ports	2
Width of platform (port back to handrail)	0.5m

Nearest downstream disturbance	Exit	3.0m
Nearest upstream disturbance	Fan	5.0m
Disturbances are classed as bends, fans or diameter variations		

SAMPLING DATA

Environmental Compliance Limited

Aggregate Industries UK Limited			Installation Name	: Aggregate Industries Coventry Coating Plant
Permit No	: ...		Visit Details	: Emissions Monitoring 2020
Variation No	: ...		Survey Dates	: 18th November 2020
Report Ref	: P4694	: R001	Report Issue Date	: 7th January 2021

Environmental Compliance Limited		PARTICULATE DATA SAMPLING PROFORMA		Date of Measurement	18/11/2020
ECL/TPD/	027	Time taken to change Ports?	0	Start Time	10:29
				Test Duration	30 mins
				End Time	10:59

Client	Advance Environmental	Stack Profile	Circular	Console id	U001	Barometer id	1221
Site	Aggregate Industries UK Ltd	Stack Area (m^2)	0.64	Pump id	U001	Nozzle Id	021-027
Location	Coventry	Barometric Pressure (mb)	1000	Probe id	135	Nozzle size	6.02
Stack ID	Bag Filter Exhaust	Static Pres. (mm H_20)	2	DGM Yd	1.0393	Filter Id	209629-1866
Test No.	TPM 1	Pitot coefficient	0.86	ΔH@	43.56	Pitot ID	635
Job No	P4693	Probe Heater Setting (^OC)	160	Impinger Id	657	Hot Box ID	336
ECL Site Staff	PH, LH	Hot Box Setting (^OC)	160	Balance Id	88		

IF SAMPLING FOR PARTICULATES NO LEAK CHECKS ARE ALLOWED AFTER SAMPLING HAS STARTED (NOT EVEN IF TRAIN IS BROKEN DOWN)
FOR OTHER SAMPLING (WITHOUT PARTICULATES) LEAK CHECKS ARE ALLOWED AFTER SAMPLING HAS STARTED (BUT ARE NOT MANDATORY)

Silica <50% Spent at End of Test?	YES

	Sample	Leak 1	Leak 2	Leak 3	Leak 4	Leak 5	Total
Start Volume	262889.0						
Final Volume	263476.2						
Total Volume	587.2	0.0	0.0	0.0	0.0	0.0	587.2

Original K Factor Settings	
Meter Temp.	15
Stack Temp	80
%Moisture	5.00

Leak Check	First	Second	Third	Fourth	Fifth
Leak rate l/min	0				
Vaccum "Hg	-7				
Time of Check	09:50				
Set Rate l/min	20				
Leak <2%?	YES				

Dry O_2 (☐ Atmospheric)	20.90	K factor	2.6
Dry Carbon Dioxide %	0.01	Reference Oxygen Percentage	n/a

Smooth Walls

Traverse Point	B3	B3	B3	B3	B3	B3			Total
Time/Point (mins)	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30			
ΔP (mm H20)	13.00	13.00	14.00	13.50	12.50	14.00			13.33
K factor	2.60	2.60	2.60	2.60	2.60	2.60			
ΔH (Orifice)	33.80	33.80	36.40	35.10	32.50	36.40			34.67
Meter (Tm in)	18.00	18.00	21.00	23.00	25.00	25.00			21.67
Meter (Tm out)	15.00	15.00	16.00	17.00	18.00	18.00			16.50
Stack Temp (Ts)	76.00	81.00	77.00	78.00	77.00	77.00			77.67
Impinger T Outlet	10.00	11.00	11.00	11.00	12.00	12.00			11.17
Vaccum (" Hg)	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50			-0.50

Traverse Point									Total
Time/Point(mins)									
ΔP (mm H20)									
K factor									
ΔH (Orifice)									
Meter (Tm in)									
Meter (Tm out)									
Stack Temp (Ts)									
Impinger T Outlet									
Vaccum (" Hg)									

Traverse Point									Total
Time/Point(mins)									
ΔP (mm H20)									
K factor									
ΔH (Orifice)									
Meter (Tm in)									
Meter (Tm out)									
Stack Temp (Ts)									
Impinger T Outlet									
Vaccum (" Hg)									

Traverse Point									Total
Time/Point(mins)									
ΔP (mm H20)									
K factor									
ΔH (Orifice)									
Meter (Tm in)									
Meter (Tm out)									
Stack Temp (Ts)									
Impinger T Outlet									
Vaccum (" Hg)									

	Impinger 1	Impinger 2	Impinger3	Impinger 4	Impinger 5	Impinger 6	Impinger 7	Impinger 8
(Contents)	H2O	H2O	H2O	Empty	Silica			
SOL/								
Start Weight (g)	717.2	743	814.3	500.9	948.9			
End Weight (g)	717.7	749	817.2	501.6	955.7			
Total weight (g)	0.5	6	2.9	0.7	6.8	0	0	0

Total (g)	16.90

PRE-Sample PITOT **Visual Inspection**	
Time	09:46
Pass ? (Y/N)	Y

PRE-Sample PITOT **Leak Check**	
Time	09:48
Pass ? (Y/N)	Y

Rinse Solutions used	
Solution	SOL NO
DI Water	4164
Acetone	4088

If moisture was not measured and gas was dried before entering the gas meter, impinger weights must be included to produce the moisture concentration used in the isokinetic calculations. If the gas was not dried before it entered the gas meter then impinger weights may be included to produce a nominal 0.1% moisture value.

Additional Moisture Weighings	
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0
Item Name	
Start Weight (g)	
End Weight (g)	
Total weight (g)	0

Post-Sample Blockage Check (L-type)	
Time	
Reading (mm H_2O)	
Pass (<5%) ?	

POST-Sample PITOT **Visual Inspection**	
Time	11:00
Pass ? (Y/N)	Y

POST-Sample PITOT **Leak Check**	
Time	11:01
Pass ? (Y/N)	Y

Environmental Compliance Limited

Aggregate Industries UK Limited		**Installation Name**	**: Aggregate Industries Coventry Coating Plant**
Permit No	**: …**	**Visit Details**	**: Emissions Monitoring 2020**
Variation No	**: …**	**Survey Dates**	**: 18th November 2020**
Report Ref	**: P4694 : R001**	**Report Issue Date**	**: 7th January 2021**

Environmental Compliance Limited	PARTICULATE DATA SAMPLING PROFORMA	Date of Measurement	18/11/2020

ECL/TPD/	027	Time taken to change Ports?	0	Start Time	11:06	End Time	11:36
				Test Duration	30 mins		

Client	Advance Environmental	Stack Profile	Circular	Console id	U001	Barometer id	1221
Site	Aggregate Industries UK Ltd	Stack Area (m^2)	0.64	Pump id	U001	Nozzle Id	021-027
Location	Coventry	Barometric Pressure (mb)	1000	Probe id	135	Nozzle size	6.02
Stack ID	Bag Filter Exhaust	Static Pres. (mm H_20)	2	DGM Yd	1.0393	Filter Id	197753-1203
Test No.	TPM 2	Pitot coefficient	0.86	ΔH@	43.56	Pitot ID	635
Job No	P4693	Probe Heater Setting (^OC)	160	Impinger Id	657	Hot Box ID	336
ECL Site Staff	PH, LH	Hot Box Setting (^OC)	160	Balance Id	88		

IF SAMPLING FOR PARTICULATES NO LEAK CHECKS ARE ALLOWED AFTER SAMPLING HAS STARTED (NOT EVEN IF TRAIN IS BROKEN DOWN)
FOR OTHER SAMPLING (WITHOUT PARTICULATES) LEAK CHECKS ARE ALLOWED AFTER SAMPLING HAS STARTED (BUT ARE NOT MANDATORY)

Silica <50% Spent at End of Test?	YES
Original K Factor Settings	
Meter Temp.	15
Stack Temp	80
%Moisture	5.00

	Sample	Leak 1	Leak 2	Leak 3	Leak 4	Leak 5	Total
Start Volume	263509.4						
Final Volume	264176.4						
Total Volume	667.0	0.0	0.0	0.0	0.0	0.0	667.0

Leak Check	First	Second	Third	Fourth	Fifth
Leak rate l/min	0				
Vaccum "Hg	-9				
Time of Check	11:05				
Set Rate l/min	20				
Leak <2%?	YES				

Dry O_2 (☐ Atmospheric)	20.90	K factor	2.6
Dry Carbon Dioxide %	0.01	Reference Oxygen Percentage	n/a

Smooth Walls

Traverse Point	B3	B3	B3	B3	B3	B3			Total
Time/Point (mins)	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30			
ΔP (mm H20)	14.50	13.00	14.00	14.50	14.50	14.50			14.17
K factor	2.60	2.60	2.60	2.60	2.60	2.60			
ΔH (Orifice)	37.70	33.80	36.40	37.70	37.70	37.70			36.83
Meter (Tm in)	26.00	26.00	26.00	26.00	29.00	29.00			27.00
Meter (Tm out)	19.00	19.00	19.00	20.00	21.00	22.00			20.00
Stack Temp (Ts)	72.00	76.00	77.00	78.00	79.00	75.00			76.17
Impinger T Outlet	11.00	12.00	12.00	13.00	13.00	13.00			12.33
Vaccum (" Hg)	0.00	0.00	0.00	-1.00	-1.00	-2.00			-0.67

Traverse Point									Total
Time/Point(mins)									
ΔP (mm H20)									
K factor									
ΔH (Orifice)									
Meter (Tm in)									
Meter (Tm out)									
Stack Temp (Ts)									
Impinger T Outlet									
Vaccum (" Hg)									

Traverse Point									Total
Time/Point(mins)									
ΔP (mm H20)									
K factor									
ΔH (Orifice)									
Meter (Tm in)									
Meter (Tm out)									
Stack Temp (Ts)									
Impinger T Outlet									
Vaccum (" Hg)									

Traverse Point									Total
Time/Point(mins)									
ΔP (mm H20)									
K factor									
ΔH (Orifice)									
Meter (Tm in)									
Meter (Tm out)									
Stack Temp (Ts)									
Impinger T Outlet									
Vaccum (" Hg)									

Impinger	Impinger 1	Impinger 2	Impinger3	Impinger 4	Impinger 5	Impinger 6	Impinger 7	Impinger 8
Contents	H2O	H2O	H2O	Empty	Silica			
SOL/								
Start Weight (g)	717.7	749	817.2	501.6	955.7			
End Weight (g)	718.1	756	819.5	502.3	963			
Total weight (g)	0.4	7	2.3	0.7	7.3	0	0	0

Total (g)	17.70

Rinse Solutions used	
Solution	SOL NO
DI Water	4164
Acetone	4088

If moisture was not measured and gas was dried before entering the gas meter, impinger weights must be included to produce the moisture concentration used in the isokinetic calculations. If the gas was not dried before it entered the gas meter then impinger weights may be included to produce a nominal 0.1% moisture value.

Additional Moisture Weighings

	1	2	3	4	5	6	7	8
Item Name								
Start Weight (g)								
End Weight (g)								
Total weight (g)	0	0	0	0	0	0	0	0

PRE-Sample PITOT **Visual Inspection**	
Time	11:00
Pass ? (Y/N)	Y

PRE-Sample PITOT **Leak Check**	
Time	11:01
Pass ? (Y/N)	Y

Post-Sample Blockage Check (L-type)	
Time	
Reading (mm H_2O)	
Pass (<5%) ?	

POST-Sample PITOT **Visual Inspection**	
Time	11:37
Pass ? (Y/N)	Y

POST-Sample PITOT **Leak Check**	
Time	11:39
Pass ? (Y/N)	Y

LABORATORY ANALYSIS RESULTS

Laboratory analysis for Total Particulate Matter was subcontracted to RPS laboratories, a UKAS Accredited Testing Laboratory, Number 0605. RPS does hold UKAS & MCERTS accreditation for this analysis. As required by the MCERTS Performance Standard for Organisations, the analysis results are shown below.

Aggregate Industries UK Limited
Permit No : ...
Variation No : ...
Report Ref : P4694 : R001

Installation Name : Aggregate Industries Coventry Coating Plant
Visit Details : Emissions Monitoring 2020
Survey Dates : 18th November 2020
Report Issue Date : 7th January 2021

Results Summary

Report No.: 20-01062-1

Customer Reference: Not Supplied

Customer Order No: Not Supplied

Determinand	CAS No	Codes	SOP	RL	Customer Sa	ECL/20/6352	ECL/20/6353	ECL/20/6354	ECL/20/6355	ECL/20/6356	ECL/20/6357	ECL/20/6358	ECL/20/6359	ECL/20/6360
					RPS Sa	4500	4501	4502	4503	4504	4505	4506	4507	4508
					Samp	SOLUTION	FILTER	SOLUTION	FILTER	SOLUTION	FILTER	SOLUTION	FILTER	SOLUTION
					Sampl	17/11/2020	17/11/2020	17/11/2020	18/11/2020	18/11/2020	18/11/2020	18/11/2020	18/11/2020	18/11/2020
particulates		UM	D9	0.04		< 0.04		< 0.04		< 0.04		< 0.04		
particulates		UM	D9	0.5	< 0.5		< 0.5		4.1		3.6		< 0.5	

UNCERTAINTY CALCULATIONS

Aggregate Industries UK Limited		Installation Name	: Aggregate Industries Coventry Coating Plant
Permit No	: ...	Visit Details	: Emissions Monitoring 2020
Variation No	: ...	Survey Dates	: 18th November 2020
Report Ref	: P4694 : R001	Report Issue Date	: 7th January 2021

Stack Reference Bag Filter Exhaust

Measurement Uncertainty Calculations - Velocity at Stack Conditions

Contribution From	Standard u/c (mm H_2O)	
Pitot Calibration Uncertainty Contribution	0.055	A
Manometer Calibration Uncertainty Contribution	0.055	B
Variation in Actual Pitot reading at sample points	0.24	C
Combined u/c (mm H_2O) =	**Combined u/c (mm H_2O)**	
SQRT $(A/\sqrt{3})^2 + (B/\sqrt{3})^2 + (C/\sqrt{3})^2$)	0.14	
Expanded Uncertainty of Flow Measurements (mm H_2O)	**0.29**	
	Standard u/c (K)	
Temperature Calibration (K)	1.77	D
Variation in Actual Temp reading at sample points	0.00	E
Combined u/c of Temp (K)	**Combined u/c (K)**	
SQRT $((D/\sqrt{3^2}) + (E/\sqrt{3})^2)$	1.02	
Expanded Uncertainty of Temp Measurements (K)	**2.04**	
Measured Average Velocity (m/s) at Stack Conds	14.85	
Maximum Average Velocity (m/s) at Stack Conds	15.09	
Standard Uncertainty Velocity at Stack Conditions (%)	1.60	
Expanded Uncertainty Velocity (at Stack Conditions)	**3.21 (%)**	

Measurement Uncertainty Calculations - Flowrate at Stack Conditions

Contribution From	Standard u/c (m^2)
Area (m2)	0.00636
Measured Average Flowrate (m^3/s) at Stack Conds	9.45
Maximum Average Flowrate (m^3/s) at Stack Conds	9.70
Standard Uncertainty Flowrate (m^3/s) at Stack Conditions (%)	2.62
Expanded Uncertainty Flowrate (m^3/s) at Stack Conditions	**5.24 (%)**

Measurement Uncertainty Calculations - Flowrate at STP & Wet Gas

Contribution From	Standard u/c (%)
Temperature Calibration (K)	0.5
Barometer Calibration	0.5
Measured Average Flowrate (m^3/s) at STP Wet	7.21
Maximum Average Flowrate (m^3/s) at STP Wet	7.43
Standard Uncertainty Flowrate (m^3/s) at STP Wet	3.02
Expanded Uncertainty Flowrate (m^3/s) at STP Wet	**6.03 (%)**

Aggregate Industries UK Limited		**Installation Name**	**: Aggregate Industries Coventry Coating Plant**
Permit No	**: ...**	**Visit Details**	**: Emissions Monitoring 2020**
Variation No	**: ...**	**Survey Dates**	**: 18th November 2020**
Report Ref	**: P4694 : R001**	**Report Issue Date**	**: 7th January 2021**

Site: Aggregate Industries UK Ltd
Location: Bag Filter Exhaust

$$u_{mass} = \sqrt{\sum (u_{filter})^2 + (u_{solution})^2}$$

Determinand	Filter mg	Solution mg	Recovered Mass mg	LAB Method Uncert (%) K = 2 Filter mg	LAB Method Uncert (%) K = 2 Solution mg	Standard Uncertainty Filter mg	Standard Uncertainty Solution mg	Combined Uncertainty mg
			TPM 1					
Particulates	0.0400	4.10	4.14	0.10	0.50	0.0500	0.25	0.25
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...

	TPM 1			Standard Uncertainty @ 95%		
Sampled Volume (V_m)	0.59	**m^3**	**uV_m**	0.001	**m^3**	
Meter Correction Factor (Yd)	1.04	**...**		...	**...**	
Meter Temperature (T_m)	292.08	**k**	**uT_m**	1.5	**k**	
Average Differential Pressure (ΔH)	34.67	**mmH_2O**	**uΔH**	0.25	**mmH_2O**	
Barometric Pressure (ρ_b)	750.06	**mmHg**	**up_b**	3.8	**mmHg**	
Δ H + ρs (ρ_m)	100.34	**kPa**		...	**...**	
Oxygen content ($O_{2,m}$)	20.90	**% by volume**	$uO_{2,m} = \sigma/\sqrt{n}$	0.00		**% by volume**
Moisture Content (H_2O)	3.59	**% by volume**	**uH_2O**	0.28		**% by volume**

Note: In the following calculations, the sensitivity coefficient (C) is estimated using: $C_i = \frac{\partial f}{\partial x_i}$

For each factor, uncertainty is then calculated by $C_i u_i$ where C is the sensitivity coefficient, u is the standard uncertainty and i is the index identifying the contributing factor e.g. i = uV_m, uT_m etc.

Where results are required at wet conditions, the following correction factor is used to convert the data from the dry gas meter:

TPM 1 :

$$f_{s,wet} = \frac{100}{(100 - H_2O)} = \quad 1.04$$

Uncertainty in correction factor to STP due to measured ΔH uncertainty component (uΔH), measured stack pressure uncertainty component (up_b) & measured temperature of dry gas uncertainty component ($uT_{m\ Dry}$)

TPM 1 :

$$f_s = \frac{273}{760} \times \frac{P_b + \frac{\Delta H}{13.6}}{T_m} \times Y_d = \quad 0.998$$

	Maximum	Minimum	Sensitivity	ufstp
uΔH	1.00	1.00	0.0000975	0.0000244
up_b	1.00	0.99	0.00133	0.00497
uT_m	1.00	0.99	0.00342	0.00512
H_2O	1.00	0.99	0.0103	0.00286

$$\frac{uf_s}{f_s} = \sqrt{\left(\frac{\sqrt{(u\Delta H)^2 + (uP_s)^2}}{(P_m/101.3)}\right)^2 + \left(\frac{uT_m}{(T_m/273.15)}\right)^2 + \left(\frac{uH_2O}{100/(100 - H_2O)}\right)^2} = \quad 0.00745$$

Uncertainty in volume @ STP due to volume correction factor uncertainty component (uV_{std}) & volume uncertainty component (uV_m)

TPM 1 :

$$V_{std} = V_{measured} \times f_s = \quad 0.586$$

	Maximum m^3	Minimum m^3	Sensitivity	Standard Uncertainty (m^3)
Effect of uV_{std}	0.59	0.58	0.59	0.00438
Effect of uV_m	0.59	0.58	1.00	0.000998

Combined Standard Uncertainty

$$\frac{uV_{std}}{V_{std}} = \sqrt{\left(\frac{uV_{std}}{f_s}\right)^2 + \left(\frac{uV_m}{V_m}\right)^2} = \quad 0.00276$$

Uncertainty of Oxygen Correction Factor (%):-

TPM 1 :

$$f_{o_2} = \frac{20.9\% - O_{2,\,ref}}{20.9\% - O_{2,\,measured}} = \quad 1.00$$

$$uCorr^{n}{}_{o_2} = \frac{20.9\% - O_{2,\,ref}}{(20.9\% - O_{2,\,measured}) x (20.9\% - O_{2,\,measured})} x\, Uncertainty\ of\ O_2\ Measurement = \quad 1.00$$

$$uf_{o_2} = \frac{uCorr^{n}{}_{o_2}}{f_{o_2}} x100 \quad 0.00\ \%$$

Aggregate Industries UK Limited		Installation Name	: Aggregate Industries Coventry Coating Plant
Permit No	: ...	Visit Details	: Emissions Monitoring 2020
Variation No	: ...	Survey Dates	: 18th November 2020
Report Ref	: P4694 : R001	Report Issue Date	: 7th January 2021

Uncertainty in final measurement @ reference conditions due to mass uncertainty component (uM)

Determinand	TPM 1 :			
	Maximum mg/Nm^3	Minimum mg/Nm^3	Sensitivity	uM mg/Nm^3
Particulates	7.50	6.63	1.71	0.44
Hydrogen Chloride	...	...	...	...
Sulphur Dioxide	...	...	...	...
Ammonia	...	...	...	...

Uncertainty in final measurement @ reference conditions due to uncertainty component arrising from leak and/or loss (assumed 2% max) in the sample system (uL)

Determinand	TPM 1 :
	uL mg/Nm^3
Particulates	0.0816
Hydrogen Chloride	...
Sulphur Dioxide	...
Ammonia	...

Uncertainty in final measurement @ Reference Conditions due to uVstp

Determinand	TPM 1 :			
	Maximum mg/Nm^3	Minimum mg/Nm^3	Sensitivity	uVstp mg/Nm^3
Particulates	7.10	7.03	12.06	0.0332
Hydrogen Chloride	...	...	...	...
Sulphur Dioxide	...	...	...	...
Ammonia	...	...	...	...

Measurement Uncertainty of Determinand (excluding correction for oxygen)

$$u_{combined} = \sqrt{\sum (u_M)^2 + (u_L)^2 + (uV_{stp})^2}$$

Determinand	TPM 1 :				
	Measurement Uncertainty mg/Nm^3	Expanded Uncertainty mg/Nm^3	Measured Concentration mg/Nm^3	Percent of Measured Concentration	Uncertainty as Percentage of ELV
Particulates	0.44	0.89	7.07	12.57	1.78
Hydrogen Chloride	...	...	...	...	
Sulphur Dioxide	...	...	...	...	
Ammonia	...	...	...	...	

$$u_{combined} = \sqrt{\sum (uf_{O_2})^2 + (Uncertainty\ of\ Measurement\ of\ Determinand)^2}$$

Determinand	TPM 1 :		
	Measurement Uncertainty of Determinand	Measurement Uncertainty of Oxygen Corr^n Factor	Overall Measurement Uncertainty inc O_2 Corr^n factor ($Ucombined$)
Particulates	12.57	0.00	12.57
Hydrogen Chloride	...	...	...
Sulphur Dioxide	...	...	...
Ammonia	...	...	...

Aggregate Industries UK Limited		**Installation Name**	**: Aggregate Industries Coventry Coating Plant**
Permit No	**: ...**	**Visit Details**	**: Emissions Monitoring 2020**
Variation No	**: ...**	**Survey Dates**	**: 18th November 2020**
Report Ref	**: P4694 : R001**	**Report Issue Date**	**: 7th January 2021**

Site: Aggregate Industries UK Ltd
Location: Bag Filter Exhaust

$$u_{mass} = \sqrt{\sum (u_{filter})^2 + (u_{solution})^2}$$

Determinand	Filter mg	Solution mg	Recovered Mass mg	LAB Method Uncert (%) K = 2 Filter mg	Solution mg	Standard Uncertainty Filter mg	Solution mg	Combined Uncertainty mg
			TPM 2					
Particulates	0.0400	3.60	3.64	0.10	0.50	0.0500	0.25	0.25
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...

	TPM 2			Standard Uncertainty @ 95%		
Sampled Volume (V_m)	0.67	**m^3**	**uV_m**	0.001	**m^3**	
Meter Correction Factor (Yd)	1.04	**...**		...	**...**	
Meter Temperature (T_m)	296.50	**k**	**uT_m**	1.5	**k**	
Average Differential Pressure (ΔH)	36.83	**mmH_2O**	**uΔH**	0.25	**mmH_2O**	
Barometric Pressure (ρ_b)	750.06	**mmHg**	**up$_b$**	3.8	**mmHg**	
ΔH + ρs (ρ_m)	100.36	**kPa**		...	**...**	
Oxygen content ($O_{2,m}$)	20.90	**% by volume**	$uO_{2,m} = \sigma/\sqrt{n}$	0.00		**% by volume**
Moisture Content (H_2O)	3.37	**% by volume**	**uH_2O**	0.25		**% by volume**

Note: In the following calculations, the sensitivity coefficient (C) is estimated using: $C_i = \frac{\partial f}{\partial x_i}$

For each factor, uncertainty is then calculated by $C_i u_i$ where C is the sensitivity coefficient, u is the standard uncertainty and i is the index identifying the contributing factor e.g. i = uV$_m$, uT$_m$ etc.

Where results are required at wet conditions, the following correction factor is used to convert the data from the dry gas meter:

TPM 2:

$$f_{s,wet} = \frac{100}{(100 - H_2O)} = \quad 1.03$$

Uncertainty in correction factor to STP due to measured ΔH uncertainty component (uΔH), measured stack pressure uncertainty component (up$_s$) & measured temperature of dry gas uncertainty component (uT$_{m\,Dry}$)

TPM 2:

$$f_s = \frac{273}{760} \times \frac{P_b + \frac{\Delta H}{13.6}}{T_m} \times Y_d = \quad 0.981$$

	Maximum	Minimum	Sensitivity	ufstp
uΔH	0.98	0.98	0.0000958	0.0000240
up$_b$	0.99	0.98	0.00130	0.00489
uT$_m$	0.99	0.98	0.00331	0.00496
H_2O	0.98	0.98	0.0102	0.00253

$$\frac{uf_s}{f_s} = \sqrt{\left(\frac{\sqrt{(u\Delta H)^2 + (uP_s)^2}}{(P_m/101.3)}\right)^2 + \left(\frac{uT_m}{(T_m/273.15)}\right)^2 + \left(\frac{uH_2O}{100/(100 - H_2O)}\right)^2} = \quad 0.00702$$

Uncertainty in volume @ STP due to volume correction factor uncertainty component (uV$_{std}$) & volume uncertainty component (uV$_m$)

TPM 2:

$$V_{std} = V_{measured} \times f_s = \quad 0.654$$

	Maximum m^3	Minimum m^3	Sensitivity	Standard Uncertainty (m^3)
Effect of uV$_{std}$	0.66	0.65	0.67	0.00468
Effect of uV$_m$	0.66	0.65	0.98	0.000981

Combined Standard Uncertainty

$$\frac{uV_{std}}{V_{std}} = \sqrt{\left(\frac{uV_{std}}{f_s}\right)^2 + \left(\frac{uV_m}{V_m}\right)^2} = \quad 0.00327$$

Uncertainty of Oxygen Correction Factor (%):-

TPM 2:

$$f_{o_2} = \frac{20.9\% - O_{2,\,ref}}{20.9\% - O_{2,\,measured}} = \quad 1.00$$

$$uCorr^{n}{}_{o_2} = \frac{20.9\% - O_{2,\,ref}}{(20.9\% - O_{2,\,measured}) x (20.9\% - O_{2,\,measured})} \; x\, Uncertainty\ of\ O_2\ Measurement = \quad 1.00$$

$$uf_{o_2} = \frac{uCorr^{n}{}_{o_2}}{f_{o_2}} x100 \quad 0.00\ \%$$

Aggregate Industries UK Limited
Permit No : ...
Variation No : ...
Report Ref : P4694 : R001

Installation Name : Aggregate Industries Coventry Coating Plant
Visit Details : Emissions Monitoring 2020
Survey Dates : 18th November 2020
Report Issue Date : 7th January 2021

Uncertainty in final measurement @ reference conditions due to mass uncertainty component (uM)

Determinand	TPM 2:			
	Maximum mg/Nm^3	Minimum mg/Nm^3	Sensitivity	uM mg/Nm^3
Particulates	5.95	5.17	1.53	0.39
Hydrogen Chloride	...	...	...	...
Sulphur Dioxide	...	...	...	...
Ammonia	...	...	...	...

Uncertainty in final measurement @ reference conditions due to uncertainty component arrising from leak and/or loss (assumed 2% max) in the sample system (uL)

Determinand	TPM 2:
	uL mg/Nm^3
Particulates	0.0642
Hydrogen Chloride	...
Sulphur Dioxide	...
Ammonia	...

Uncertainty in final measurement @ Reference Conditions due to uVstp

Determinand	TPM 2:			
	Maximum mg/Nm^3	Minimum mg/Nm^3	Sensitivity	uVstp mg/Nm^3
Particulates	5.59	5.54	8.50	0.0278
Hydrogen Chloride	...	...	...	...
Sulphur Dioxide	...	...	...	...
Ammonia	...	...	...	...

Measurement Uncertainty of Determinand (excluding correction for oxygen)

$$u_{combined} = \sqrt{\sum (u_M)^2 + (u_L)^2 + (uV_{stp})^2}$$

Determinand	TPM 2:				
	Measurement Uncertainty mg/Nm^3	Expanded Uncertainty mg/Nm^3	Measured Concentration mg/Nm^3	Percent of Measured Concentration	Uncertainty as Percentage of ELV
Particulates	0.40	0.79	5.56	14.23	1.58
Hydrogen Chloride	...	...	...	...	
Sulphur Dioxide	...	...	...	...	
Ammonia	...	...	...	...	

$$u_{combined} = \sqrt{\sum (uf_{O_2})^2 + (Uncertainty\ of\ Measurement\ of\ Determinand)^2}$$

Determinand	TPM 2:		
	Measurement Uncertainty of Determinand	Measurement Uncertainty of Oxygen Corr^n Factor	Overall Measurement Uncertainty inc O_2 Corr^n factor ($Ucombined$)
Particulates	14.23	0.00	14.23
Hydrogen Chloride	...	...	...
Sulphur Dioxide	...	...	...
Ammonia	...	...	...