EMISSIONS MONITORING SURVEY

Prepared for:

TRW Automotive Braking Systems

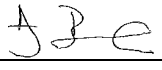
New Road
New Inn
Pontypool
Gwent
NP4 0YZ

Permit Number	**: EPR/DP3430LX**
Variation Number	**: V002**
Installation	**: Zinc Nickel Process Extraction**
Visit Details	**: Compliance - 2018**
Job Number	**: P3616**
Report Number	**: R001**
Report Issue Date	**: 23rd July 2018**
Survey Dates	**: 21st June 2018**

Prepared by:

Environmental Compliance Limited
Unit G1
Main Avenue
Treforest Industrial Estate
Pontypridd
CF37 5BF.

Tel: 01443 841760
Fax: 01443 841761

Report Issue:		**FINAL**	
Report Prepared by:		**Report Reviewed & Approved by** **MCERTS Level Two** **Technical Endorsements TE1, TE2, TE3 & TE4**	
Name:	Paul Hannah	***Name:***	Andy Barnes
		MCERTS No:	MM 03 235
		Signature:	
Date:	19/07/18	***Date:***	23/07/18

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

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PART 1 - EXECUTIVE SUMMARY

1 Monitoring Objectives

Environmental Compliance Ltd (ECL) was commissioned by **TRW Automotive Braking Systems** to undertake an emission monitoring survey at their **Pontypool** site. This report presents the findings of the study.

The monitoring at this installation was carried out in accordance with our quotation reference **PC/P3616/Q001**, 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
	Zinc Nickel Process Extraction *(Test 1 of 2 stacks)*
Velocity / Flowrate	• U
Hydrogen Chloride	• U
Hydrogen Fluoride	• 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: *"Test under 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 for use of Method	Tick if non-conforming test (see Sections 2 & 5)	Operating Status
Zinc Nickel Process Extraction **LHS – A8/1**	Volumetric Flowrate	...	18.6036	m^3/sec	5	Stack Conditions	21/06/18	08:40 – 09:06	BS EN 16911-1:2013 & MID	UKAS / MCERTS	✓	Normal
	Volumetric Flowrate	...	17.0819	m^3/sec	6	& Wet Gas			BS EN 16911-1:2013 & MID	UKAS / MCERTS	✓	
	Hydrogen Chloride $		0.04	mg/m^3	13	& Wet Gas		09:20 – 10:20	BS EN 1911:2010	UKAS / MCERTS		
	Hydrogen Fluoride $		0.05	mg/m^3	13	& Wet Gas		10:30 – 11:30	BS ISO 15713:2006 & 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

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
Zinc Nickel Process Extraction LHS – A8/1	Continuous	n/a	n/a	n/a	Scrubber	Not Known	…	…	…	NP	…	…

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: EPR/DP3430LX** where UKAS and MCERTS accreditation has and could be claimed for the testing in the monitoring results table.

There no modifications to the sampling procedures (TPDs) listed in section 4.

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

Non-conforming tests are as follows.

Flowrate tests are non-conforming, as there is only one sampling port available, rather than two as required by the sampling standards. In order to maintain the UKAS/MCERTS accreditation status of the tests, extra sample points were used on the one available sample line.

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 for pollutants at this sampling 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	21/06/18	MM 03 477	2	TE1, TE2, TE3, TE4
Lee Harper	21/06/18	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

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

Stand alone velocity measurements and those made to support isokinetic sampling are conducted using BS EN 16911-1:2013 & MID.

Pressure, Temperature and Velocity

Testing was carried out using a sampling system in accordance with **BS EN ISO 16911-1:2013 & MID** and In-house technical procedure **ECL/TPD/022A.**

Temperature was recorded using a thermocouple and digital temperature reader.

Velocity and pressure were recorded using an "L" type pitot and digital manometer, data being recorded in Pascals.

Hydrogen Chloride

Testing was carried out non-isokinetically using a Universal Stack Sampling system in accordance with **BS EN 1911:2010** and In-house technical procedure **ECL/TPD/036**. Non-isokinetic sampling can only take place if there are no droplets present in the stack gas.

In this method the stack gases are filtered to remove particulate matter then the gases are passed through a series of impingers. The first two or three impingers each containing 100ml of De-ionised Water and finally through an impinger containing a measured quantity of silica gel.

The impingers containing the de-ionised water are analysed for concentrations of Hydrogen Chloride by IC (Ion Chromatography).

Concept Life Sciences Ltd (CLS) who are situated in Manchester carried out the analysis of the samples. **CLS** is UKAS accredited for this analysis. In addition to the survey samples, appropriate field blanks and efficiency checks are submitted as part of the technical procedure.

Hydrogen Fluoride

Testing was carried out non-isokinetically using a Universal Stack Sampling system in accordance with **BS ISO 15713:2006 & MID** and In-house technical procedure **ECL/TPD/083**. Non-isokinetic sampling can only take place if there are no droplets present in the stack gas.

In this method the stack gases are filtered (quartz filter) to remove particulate matter then the gases are passed through a series of impingers, the first two or three impingers each containing a measured quantity of 0.1N Sodium Hydroxide and finally through an impinger containing a measured quantity of silica gel.

The impingers containing the sodium hydroxide are analysed for concentrations of Hydrogen Fluoride by IC (Ion Chromatography).

Concept Life Sciences Ltd (CLS) who are situated in Manchester carried out the analysis of the samples. **CLS** is UKAS accredited for this analysis. In addition to the survey samples, appropriate field blanks and efficiency checks are submitted as part of the technical procedure.

Water Vapour

Testing was carried out using a Universal Stack Sampling system in accordance with **BS EN 14790:2017** and In-house technical procedure **ECL/TPD/082**.

In this method the stack gases are filtered (in-stack unheated filter or out-stack heated filter) to remove particulate matter. The gases are then passed through a **heated probe** and then to a cooled moisture trapping unit. All unheated parts of the sample train (outside the sample port) which come into contact with stack gas are weighed pre and post sampling in order to determine the weight gain.

After each test, a visual inspection of the last impinger is made to confirm that at least 50% of the silica gel column has not changed colour. This indicates satisfactory collection of water vapour.

5 SAMPLE POINT DESCRIPTIONS

The homogeneity test is applicable to combustion processes. This includes but is not restricted to, those regulated under the Waste Incineration Directive (**WID**) and the Large Combustion Plant Directive (**LCPD**).

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 sample location that was monitored is detailed below:-

Zinc Nickel Process Extraction (LHS – A8/1)

The stack dimensions are 1.05m by 1.52m and the sample platform width back from the sample port is 1.0m.

One sample ports is located on the longest side of the rectangular duct.

This sample port is located at a height of approximately 0.3m from the working sample platform.

Access to the sample platform was attained by means of permanent ring ladder.

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

EQUIPMENT IDs
(Pre site checklist from SSP)

TRW Automotive Braking Systems
Permit No : EPR/DP3430LX
Variation No : V002
Report Ref : P36163616 : R001001

Installation Name : Zinc Nickel Process Extraction
Visit Details : Compliance - 2018
Survey Dates : 21st June 2018
Report Issue Date : 23rd July 2018

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	U010							
MST Nozzle set		U010							
MST "S" Type Pitot									
MST Probe		649	638						
MST Hot Box		390							
MST Impinger Arm		657							
Barometer		352							
Site Balance		88							
Site Check weights		276							
		277							
Horiba	E002								
Heated Probe / Filter									
Chiller									
Sonimix / MFC									
Heated Line									
FID	E003								
Heated Line									
Heated Probe / Filter									
Testo	E004								
FTIR	E005								
Heated Probe / Filter									
Heated Line									
Stackmite	E006								
"L" Type Pitot		1095							
Digital Manometer		596							
Stack Thermocouple		464							
Thermocouple Reader		414							
Nozzle Set									
Workhorse Pumps	E007								
Low Flow Pumps									

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

TABLES

TRW Automotive Braking Systems
Permit No : EPR/DP3430LX
Variation No : V002
Report Ref : P36163616 : R001001

Installation Name : Zinc Nickel Process Extraction
Visit Details : Compliance - 2018
Survey Dates : 21st June 2018
Report Issue Date : 23rd July 2018

Table 1 – Hydrogen Chloride

Data Recorded from LHS A8/1 - Zinc / Nickel Process Extraction

Emission Parameter	Units	HCl	Blank
Duct Length	metres	1.05	
Duct Width	metres	1.52	…
Area of Sample Plane	m^2	1.596	
Moisture Content	%	0.54	
Oxygen Content	%	20.90	
Stack Temperature	^oC	25	
Gas Velocity (as Measured)	m/sec	11.66	
Gas Velocity (Reference Conditions)	m/sec*	10.70	
Volumetric Flowrate (as Measured)	m^3/sec	18.60	
Volumetric Flowrate (Reference Conditions)	m^3/sec*	17.08	
Dry Gas Molecular Weight	g/gmole	28.8376	
Sample Date	...	21/06/2018	
Sample Period	...	09:20 - 10:20	
Sample Volume (reference Conditions)	m^3*	0.846	0.846
Sample Reference (ECL ID)	ECL/18/	2919/2920	2921
Mass of Hydrogen Chloride Collected	mg	0.03	0.01
Concentration of Hydrogen Chloride	mg/m^3*	**0.04**	0.01
Emission Rate of Hydrogen Chloride	g/hr	2.40	...
Expanded Uncertainty (% Relative)	%	13	...
Impinger Collection Efficiency	%	50	...

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

Impinger efficiency test is not required, as measured impinger concentrations are at the analytical limit of detection.

TRW Automotive Braking Systems
Permit No : EPR/DP3430LX
Variation No : V002
Report Ref : P36163616 : R001001

Installation Name : Zinc Nickel Process Extraction
Visit Details : Compliance - 2018
Survey Dates : 21st June 2018
Report Issue Date : 23rd July 2018

Table 2 – Hydrogen Fluoride

Data Recorded from LHS - A8/1 - Zinc / Nickel Extraction

Emission Parameter	Units	HF	Blank
Duct Length	metres	1.05	
Duct Width	metres	1.52	…
Area of Sample Plane	m^2	1.596	
Moisture Content	%	2.89	
Oxygen Content	%	20.90	
Stack Temperature	^oC	25	
Gas Velocity (as Measured)	m/sec	11.66	
Gas Velocity (Reference Conditions)	m/sec*	10.70	
Volumetric Flowrate (as Measured)	m^3/sec	18.60	
Volumetric Flowrate (Reference Conditions)	m^3/sec*	17.08	
Dry Gas Molecular Weight	g/gmole	28.8376	
Sample Date	...	21/06/2018	
Sample Period	...	10:30 - 11:30	
Sample Volume (reference Conditions)	m^3*	0.560	0.560
Sample Reference (ECL ID)	ECL/18/	2916-2917	2922
Mass of Hydrogen Fluoride Collected	mg	0.03	0.01
Concentration of Hydrogen Fluoride	mg/m^3*	**0.05**	0.02
Emission Rate of Hydrogen Fluoride	g/hr	2.91	...
Expanded Uncertainty (% Relative)	%	13	...
Impinger Collection Efficiency	%	74	...

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

Impinger efficiency test is not required, as measured impinger concentrations are at the analytical limit of detection.

VELOCITY TRAVERSE PROFILES

Environmental Compliance Limited

TRW Automotive Braking Systems
Permit No : EPR/DP3430LX
Variation No : V002
Report Ref : P36163616 : R001001

Installation Name : Zinc Nickel Process Extraction
Visit Details : Compliance - 2018
Survey Dates : 21st June 2018
Report Issue Date : 23rd July 2018

Environmental Compliance Limited	Traverse Data Profoma	Date of Measurement	21/06/2018

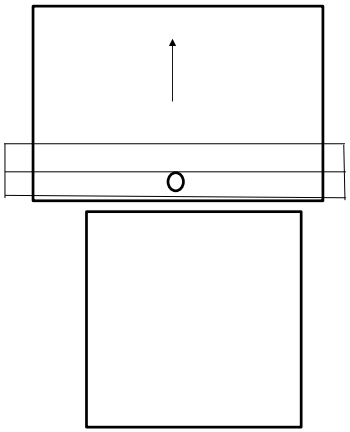
Company	TRW	Stack Diameter Port A (mm)		Average Stack Diameter (mm)		Pitot tube coefficient	1.00
Site	Pontypool	Stack Diameter Port B (mm)		Port Length (mm)		Pitot Id	1095
Location	Zinck / Nickel Extraction	Duct Length Port A (mm)	1050	Average Duct Length (mm) L	1050	Stack Thermocouple ID	464
Stack	LHS - A8/1	Duct Length Port B (mm)		Duct width (mm) B	1520	Stack Temp Reader ID	414
Job No	P3616	Duct Length Port C (mm)		Barometric Pressure. (mb)	1015	Manometer ID	596
Operators	PH, LH	Duct Length Port D (mm)		Ave Static Press. (mm H_20)	3.26	Barometer ID	352

Pre - Traverse Checks Carried Out	Time	Pass/ Fail
Pre - Traverse PITOT Visual Inspection	08:40:00	Pass
Pre - Traverse PITOT Leak Check	08:42:00	Pass

Smooth Walls

Static Pressure Readings (Pascals)			
Port A	Port B	Port C	Port D
32.00			

Diagram/ Description of Cross Section of Stack/Duct



Port/ Point	Distance to Point (mm)	Time	Temperature Readings (°C) 1	2	3	(ΔP) Pitot Readings (Pa) 1	2	3	Average Temp. (°C)	Average (ΔP) (Pa)	Swirl Test ° From Reference
A1	58	08:44:00	25.0	25.0	25.0	68.8	72.4	74.6	25.0	71.9	7
A2	175	08:46:00	25.0	25.0	25.0	78.2	80.4	81.4	25.0	80.0	6
A3	292	08:48:00	25.0	25.0	25.0	88.4	89.2	90.4	25.0	89.3	9
A4	408	08:50:00	25.0	25.0	25.0	85.4	86.8	84.6	25.0	85.6	15
A5	525	08:52:00	25.0	25.0	25.0	79.8	80.6	81.4	25.0	80.6	12
A6	642	08:54:00	25.0	25.0	25.0	86.4	87.2	90.4	25.0	88.0	14
A7	758	08:56:00	25.0	25.0	25.0	76.2	74.6	72.8	25.0	74.5	13
A8	875	08:58:00	25.0	25.0	25.0	80.4	83.8	84.6	25.0	82.9	11
A9	992	09:00:00	25.0	25.0	25.0	72.6	74.6	73.2	25.0	73.5	13
Blockage Check @ A1 (L-Type Pitot Only)		09:02:00	25.0	25.0	25.0	69.4	71.8	75.2	225.0	726.4	Total
			Mean		25.0	Mean		72.1	25.0	89.3	Max
			Difference <5% from Initial ?		0.00	Difference <5% from Initial ?		0.28	25.0	71.9	Min
									25.0	80.7	Average

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

Single port - extra points used on single line

Post - Traverse Checks Carried Out	Time	Pass/ Fail
Post - Traverse Visual Inspection	09:04:00	Pass
Post - Traverse PITOT Leak Check	09:06:00	Pass

Average temp (K)	298.000

Stagnation Check (S-type Pitot Only)	Time	Reading
Static Pressure Via Positive Leg (Pa)		
Static Pressure Via Negative Leg (Pa)		
Difference (Pa) < 10Pa ?		

Suitability of Sampling Position	Actual Stack Conditions
Highest:lowest flow pressure ratio < 9:1?	1.3:1
Maximum deviation of flow from axis < 15° ?	15
X-sectional area for stacks = πr2	m^2
X-sectional area for ducts = L x B	1.596 m^2
Suitability of Position for Sampling	OK

Compliance With Positional Requirements?

Height of sample ports from Platform	0.3m
Number of sample ports	1
Width of platform (port back to handrail)	1.0m

Nearest downstream disturbance	Exit	1.5m
Nearest upstream disturbance	Fan	2.5m
Disturbances are classed as bends, fans or diameter variations		

Stack Moisture	1.715	%	Gas Velocity (as Measured) Adjusted for Smooth Walls	11.65639	m/sec
Measured Oxygen	20.9	%	Gas Velocity (Reference Conditions) Adjusted for Smooth Walls	10.70295	m/sec*
Measured Carbon Dioxide	0	%	Volumetric Flowrate (as Measured) Adjusted for Smooth Walls	18.60359	m^3/sec
Dry Gas Molecular Weight	28.83600	g/g mole	Volumetric Flowrate (Ref Cond) Adjusted for Smooth Walls	17.08191	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°

FIELD CALIBRATION AND SAMPLING DATA

Environmental Compliance Limited

TRW Automotive Braking Systems		Installation Name	: Zinc Nickel Process Extraction
Permit No	: EPR/DP3430LX	Visit Details	: Compliance - 2018
Variation No	: V002	Survey Dates	: 21st June 2018
Report Ref	: P36163616 : R001001	Report Issue Date	: 23rd July 2018

Environmental Compliance Limited	NON ISOKINETIC SAMPLING PROFORMA	Date of Measurement	21/06/2018

If moisture was not measured see detailed notes below.

ECL/TPD/	36	Time taken to change Ports?	0	Start Time	09:20	End Time	10:20
				Test Duration	60 mins		

Client	TRW	Stack Profile	Rectangular	Console id	U-010	Barometer id	352
Site	Pontypool	Stack Area (m^2)	1.60	Pump id	U-010	Nozzle Id	n/a
Location	Zinc / Nickel Process Extractio	Barometric Pressure (mb)	1015	Probe id	649	Nozzle size	n/a
Stack ID	LHS A8/1	Static Pres. (mm H_20)	3.2	DGM Yd	0.9616	Filter Id	QMA
Test No.	HCl	Pitot coefficient	n/a	ΔH@	44.1	Pitot ID	n/a
Job No	P3616	Probe Heater Setting (°C)	160	Impinger Id	657	Hot Box ID	390
ECL Site Staff	PH, LH	Hot Box Setting (°C)	160	Balance Id	88		

Required Sample Flowrate l/min	Suggested ΔH Entered Below
3	1
6	3
10	10
15	25
25	50
Initial ΔH	25
Reference Oxygen Percentage	11

	Sample	Leak 1	Leak 2	Leak 3	Leak 4	Leak 5	Total
Start Volume	1277986.0						
Final Volume	1278915.0						
Total Volume	929.0	0.0	0.0	0.0	0.0	0.0	929.0
Leak Check	First	Second	Third	Fourth	Fifth		
Leak rate l/min	0	0				Dry O_2 (Atmospheric)	20.90
Vaccum "Hg	-5	-6				Dry Carbon Dioxide %	0.01
Time of Check	09:13	10:22				Dry Carbon Monoxide ppm	
Set Rate l/min	18	16					
Leak < 2%?	YES	YES					

Traverse Point	CP	CP	CP	CP	CP	CP			Total
Time/Point (mins)	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60			
ΔP (mm H20)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
K factor	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
ΔH (Orifice)	25.00	25.00	25.00	25.00	25.00	25.00			25.00
Meter (Tm in)	16.00	16.00	17.00	18.00	20.00	21.00			18.00
Meter (Tm out)	16.00	16.00	17.00	18.00	20.00	21.00			18.00
Stack Temp (Ts)	25.00	25.00	25.00	25.00	25.00	25.00			25.00
Impinger T Outlet	13.00	14.00	14.00	16.00	16.00	17.00			15.00
Vaccum (" Hg)	0.00	0.00	0.00	0.00	0.00	0.00			0.00

Traverse Point									Total
Time/Point(mins)									
ΔP (mm H20)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
K factor	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
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)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
K factor	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
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)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
K factor	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
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
	DiH2O	DiH2O	DiH2O	Empty	Silica			
SOL/	3471	3471	3471					
Start Weight (g)	648.8	661.3	662.2	602.3	818.4			
End Weight (g)	643.1	661.5	663.1	603.5	825.5			
Total weight (g)	-5.7	0.2	0.9	1.2	7.1	0		0

Total (g)	3.70
Silica < 50% used at End of Test? Y/N	YES

Rinse Solutions used	
Solution	SOL NO
DI Water	3471
Acetone	

Additional Moisture Weighings

Item Name	Start Weight (g)	End Weight (g)	Total weight (g)
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0

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.

Environmental Compliance Limited	NON ISOKINETIC SAMPLING PROFORMA	Date of Measurement	21/06/2018

If moisture was not measured see detailed notes below.

ECL/TPD/	83	Time taken to change Ports?	0	Start Time	10:30	End Time	11:30
				Test Duration	60 mins		

Client	TRW	Stack Profile	Rectangular	Console id	U-010	Barometer id	352
Site	Pontypool	Stack Area (m^2)	1.60	Pump id	U-010	Nozzle Id	n/a
Location	Zinc / Nickel Extraction	Barometric Pressure (mb)	1015	Probe id	638	Nozzle size	n/a
Stack ID	LHS - A8/1	Static Pres. (mm H_20)	3.2	DGM Yd	0.9616	Filter Id	QMA
Test No.	HF	Pitot coefficient	n/a	ΔH@	44.1	Pitot ID	n/a
Job No	P3616	Probe Heater Setting (°C)	160	Impinger Id	657	Hot Box ID	390
ECL Site Staff	PH, LH	Hot Box Setting (°C)	160	Balance Id	88		

Required Sample Flowrate l/min	Suggested ΔH Entered Below
3	1
6	3
10	10
15	25
25	50
Initial ΔH	10
Reference Oxygen Percentage	11

	Sample	Leak 1	Leak 2	Leak 3	Leak 4	Leak 5	Total
Start Volume	1279106.4						
Final Volume	1279712.6						
Total Volume	606.2	0.0	0.0	0.0	0.0	0.0	606.2
Leak Check	First	Second	Third	Fourth	Fifth		
Leak rate l/min	0	0				Dry O_2 (Atmospheric)	20.90
Vaccum "Hg	-5	-6				Dry Carbon Dioxide %	0.01
Time of Check	10:28	11:32				Dry Carbon Monoxide ppm	
Set Rate l/min	10	10					
Leak < 2%?	YES	YES					

Traverse Point	CP	CP	CP	CP	CP	CP			Total
Time/Point (mins)	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60			
ΔP (mm H20)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
K factor	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
ΔH (Orifice)	10.00	10.00	10.00	10.00	10.00	10.00			10.00
Meter (Tm in)	20.00	20.00	20.00	21.00	21.00	22.00			20.67
Meter (Tm out)	20.00	20.00	20.00	21.00	21.00	22.00			20.67
Stack Temp (Ts)	25.00	25.00	26.00	25.00	25.00	25.00			25.17
Impinger T Outlet	18.00	19.00	19.00	20.00	20.00	21.00			19.50
Vaccum (" Hg)	2.00	2.00	2.00	2.00	2.00	2.00			2.00

Traverse Point									Total
Time/Point(mins)									
ΔP (mm H20)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
K factor	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
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)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
K factor	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
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)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
K factor	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
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
	0.1 NaOH	0.1 NaOH	MT	Empty	Silica			
SOL/	3411	3411	3411					
Start Weight (g)	540.3	545.4	560		724.1			
End Weight (g)	541.7	546.9	560.8		733.4			
Total weight (g)	1.4	1.5	0.8	0	9.3	0	0	0

Total (g)	13.00
Silica < 50% used at End of Test? Y/N	YES

Rinse Solutions used	
Solution	SOL NO
DI Water	
Acetone	
0.1 NaOH	3411

Additional Moisture Weighings

Item Name	Start Weight (g)	End Weight (g)	Total weight (g)
			0
			0
			0
			0
			0
			0
			0
			0
			0
			0

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.

LABORATORY ANALYSIS RESULTS

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

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Concept Life Sciences

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2404

Report Number: 747283-2

Date of Report: 06-Jul-2018

Customer: Environmental Compliance Ltd
Unit G1
Main Avenue
Treforest Industrial Estate
Pontypridd
CF37 5BF

Customer Contact: Mr Paul Hannah

Customer Job Reference: P3616
Customer Purchase Order: E8056
Date Job Received at Concept: 26-Jun-2018
Date Analysis Started: 27-Jun-2018
Date Analysis Completed: 05-Jul-2018

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

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

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

UKAS TESTING
1549

Report checked
and authorised by :
Emma Spear
Customer Service Advisor

Issued by :
Emma Spear
Customer Service Advisor

TRW Automotive Braking Systems
Permit No : EPR/DP3430LX
Variation No : V002
Report Ref : P36163616 : R001001

Installation Name : Zinc Nickel Process Extraction
Visit Details : Compliance - 2018
Survey Dates : 21st June 2018
Report Issue Date : 23rd July 2018

Concept Reference: 747283
Customer Reference: P3616

Impinger (sodium hydroxide) Analysed as Impinger (sodium hydroxide)
Hydrogen Fluoride & Volume

					Concept Reference	747283 001	747283 002	747283 007
					Customer Sample Reference	ECL/18/2916	ECL/18/2917	ECL/18/2922
					Test Sample	AR	AR	AR
					Date Sampled	21-JUN-2018	21-JUN-2018	21-JUN-2018
Determinand	Method	LOD	Units	Symbol				
Hydrogen Fluoride	IC (acetate separation method)	0.05	mg/l	U		<0.05	<0.05	<0.05
Volume	Vol	1	ml	U		390	140	260

Concept Reference: 747283
Customer Reference: P3616

Impinger(DI water) Analysed as Impinger(DI water)
Hydrogen Chloride & Volume

					Concept Reference	747283 003	747283 005	747283 006
					Customer Sample Reference	ECL/18/2918	ECL/18/2920	ECL/18/2921
					Test Sample	AR	AR	AR
					Date Sampled	21-JUN-2018	21-JUN-2018	21-JUN-2018
Determinand	Method	LOD	Units	Symbol				
Hydrogen Chloride	IC	0.05	mg/l	U		<0.05	<0.05	<0.05
Volume	Vol	1	ml	U		330	330	170

Index to symbols used in 747283-2

Value	Description
AR	As Received
U	Analysis is UKAS accredited

UNCERTAINTY CALCULATIONS

TRW Automotive Braking Systems
Permit No : EPR/DP3430LX
Variation No : V002
Report Ref : P36163616 : R001001

Installation Name : Zinc Nickel Process Extraction
Visit Details : Compliance - 2018
Survey Dates : 21st June 2018
Report Issue Date : 23rd July 2018

Site: Pontypool
Location: LHS A8/1

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

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
HCl								
...	...	...	...	...	...	...	...	...
Hydrogen Chloride	...	0.0330	0.0330	...	0.00429	...	0.00215	0.00215
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...								
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...

	HCl			Standard Uncertainty @ 95%		
Sampled Volume (V_m)	0.93	m^3	uV_m	0.001	m^3	
Meter Correction Factor (Yd)	0.96	...	...	...	...	
Meter Temperature (T_m)	291.00	k	uT_m	1.5	k	
Average Differential Pressure (ΔH)	25.00	mmH_2O	$u\Delta H$	0.25	mmH_2O	
Barometric Pressure (ρ_b)	761.31	mmHg	up_b	3.8	mmHg	
$\Delta H + \rho s$ (ρ_m)	101.74	kPa		...	...	
Oxygen content ($O_{2,m}$)	20.90	% by volume	$uO_{2,m} = \sigma/\sqrt{n}$	0.00		% by volume
Moisture Content (H_2O)	0.54	% by volume	uH_2O	0.18		% 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:

HCl:

$$f_{s,wet} = \frac{100}{(100 - H_2O)} = \quad 1.01$$

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

HCl:

$$f_s = \frac{273}{760} \times \frac{P_b + \frac{\Delta H}{13.6}}{T_m} \times Y_d = \quad 0.911$$

	Maximum	Minimum	Sensitivity	ufstp
$u\Delta H$	0.91	0.91	0.0000878	0.0000219
up_b	0.92	0.91	0.00119	0.00448
uT_m	0.92	0.91	0.00313	0.00470
H_2O	0.91	0.91	0.00916	0.00165

$$\frac{uf_s}{f_s} = \sqrt{\left(\frac{\sqrt{(u\Delta H)^2 + (uP_s)^2}}{(P_m/101.3)}\right)^2 + \left(\frac{uT_m}{(T_m/273.15)}\right)^2 + \left(\frac{uH_2O}{100/(100 - H_2O)}\right)^2} = \quad 0.00590$$

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

HCl:

$$V_{std} = V_{measured} \times f_s = \quad 0.846$$

	Maximum m^3	Minimum m^3	Sensitivity	Standard Uncertainty (m^3)
Effect of uV_{std}	0.85	0.84	0.93	0.00548
Effect of uV_m	0.85	0.85	0.91	0.000911

Combined Standard Uncertainty

$$\frac{uV_{std}}{V_{std}} = \sqrt{\left(\frac{uV_{std}}{f_s}\right)^2 + \left(\frac{uV_m}{V_m}\right)^2} = \quad 0.00516$$

Uncertainty of Oxygen Correction Factor (%):-

HCl:

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

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

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

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

Determinand	HCl: Maximum mg/Nm³	Minimum mg/Nm³	Sensitivity	uM mg/Nm³
...	...	...	...	...
Hydrogen Chloride	0.0415	0.0365	1.18	0.00254
...	...	...	...	...
...	...	...	...	...

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	HCl: uL mg/Nm³
...	...
Hydrogen Chloride	0.000450
...	...
...	...

Uncertainty in final measurement @ Reference Conditions due to uVstp

Determinand	HCl: Maximum mg/Nm³	Minimum mg/Nm³	Sensitivity	uVstp mg/Nm³
...	...	...	...	...
Hydrogen Chloride	0.0392	0.0388	0.0461	0.000238
...	...	...	...	...
...	...	...	...	...

Combined Uncertainty excluding oxygen contribution

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

Determinand	HCl: Combined Uncertainty mg/Nm³	Expanded Uncertainty mg/Nm³	Measured Concentration mg/Nm³	Percent of Measured Concentration
...	...	...	...	...
Hydrogen Chloride	0.00259	0.00517	0.0390	13.26
...	...	...	...	...
...	...	...	...	...

Combined Uncertainty including oxygen contribution

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

Determinand	Measurement Uncertainty of Determinand	Measurement Uncertainty of Oxygen Corrn Factor	Overall Measurement Uncertainty inc O_2 Corr^n factor (Ucombined)
...	...	...	...
Hydrogen Chloride	13.26	0.00	13.26
...	...	...	...
...	...	...	...

Site: Pontypool
Location: LHS - A8/1

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

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
				HF				
...	...	...	...	...	...	...	...	...
Hydrogen Fluoride	...	0.0265	0.0265	...	0.00345	...	0.00172	0.00172
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
				...				
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...

	HF			Standard Uncertainty @ 95%		
Sampled Volume (V_m)	0.61	m^3	uV_m	0.001	m^3	
Meter Correction Factor (Yd)	0.96	...		...	...	
Meter Temperature (T_m)	293.67	k	uT_m	1.5	k	
Average Differential Pressure (ΔH)	10.00	mmH_2O	$u\Delta H$	0.25	mmH_2O	
Barometric Pressure (ρ_b)	761.31	mmHg	up_b	3.8	mmHg	
$\Delta H + \rho s$ (ρ_m)	101.60	kPa		...	...	
Oxygen content ($O_{2,m}$)	20.90	% by volume	$uO_{2,m} = \sigma/\sqrt{n}$	0.00		% by volume
Moisture Content (H_2O)	2.89	% by volume	uH_2O	0.28		% by volume

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

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:

HF:

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

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

HF:

$$f_s = \frac{273}{760} \times \frac{P_b + \frac{\Delta H}{13.6}}{T_m} \times Y_d = \quad 0.923$$

	Maximum	Minimum	Sensitivity	ufstp
$u\Delta H$	0.92	0.92	0.0000891	0.0000223
up_b	0.93	0.92	0.00121	0.00454
uT_m	0.93	0.92	0.00314	0.00471
H_2O	0.93	0.92	0.00951	0.00269

$$\frac{uf_s}{f_s} = \sqrt{\left(\frac{\sqrt{(u\Delta H)^2 + (uP_s)^2}}{(P_m/101.3)}\right)^2 + \left(\frac{uT_m}{(T_m/273.15)}\right)^2 + \left(\frac{uH_2O}{100/(100 - H_2O)}\right)^2} = \quad 0.00630$$

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

HF:

$$V_{std} = V_{measured} \times f_s = \quad 0.560$$

	Maximum m^3	Minimum m^3	Sensitivity	Standard Uncertainty (m^3)
Effect of uV_{std}	0.56	0.56	0.61	0.00382
Effect of uV_m	0.56	0.56	0.92	0.000923

Combined Standard Uncertainty

$$\frac{uV_{std}}{V_{std}} = \sqrt{\left(\frac{uV_{std}}{f_s}\right)^2 + \left(\frac{uV_m}{V_m}\right)^2} = \quad 0.00247$$

Uncertainty of Oxygen Correction Factor (%):-

HF:

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

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

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

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

Determinand	HF: Maximum mg/Nm^3	Minimum mg/Nm^3	Sensitivity	uM mg/Nm^3
...	...	...	...	...
Hydrogen Fluoride	0.0504	0.0443	1.79	0.00308
...	...	...	...	...
...	...	...	...	...

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	HF: uL mg/Nm^3
...	...
Hydrogen Fluoride	0.000547
...	...
...	...

Uncertainty in final measurement @ Reference Conditions due to uVstp

Determinand	HF: Maximum mg/Nm^3	Minimum mg/Nm^3	Sensitivity	uVstp mg/Nm^3
...	...	...	...	...
Hydrogen Fluoride	0.0476	0.0472	0.0846	0.000209
...	...	...	...	...
...	...	...	...	...

Combined Uncertainty excluding oxygen contribution

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

Determinand	HF: Combined Uncertainty mg/Nm^3	Expanded Uncertainty mg/Nm^3	Measured Concentration mg/Nm^3	Percent of Measured Concentration
...	...	...	...	...
Hydrogen Fluoride	0.00313	0.00627	0.0474	13.23
...	...	...	...	...
...	...	...	...	...

Combined Uncertainty including oxygen contribution

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

Determinand	Measurement Uncertainty of Determinand	Measurement Uncertainty of Oxygen Corrn Factor	Overall Measurement Uncertainty inc O_2 Corr^n factor (Ucombined)
...	...	...	...
Hydrogen Fluoride	13.23	0.00	13.23
...	...	...	...
...	...	...	...

TRW Automotive Braking Systems		Installation Name	: Zinc Nickel Process Extraction
Permit No	: EPR/DP3430LX	Visit Details	: Compliance - 2018
Variation No	: V002	Survey Dates	: 21st June 2018
Report Ref	: P36163616 : R001001	Report Issue Date	: 23rd July 2018

Stack Reference LHS - A8/1

Measurement Uncertainty Calculations - Velocity at Stack Conditions

Contribution From	Standard u/c (Pa)	
Pitot Calibration Uncertainty Contribution	0.40	A
Manometer Calibration Uncertainty Contribution	0.403555556	B
Variation in Actual Pitot reading at sample points	1.58	C
Combined u/c (Pa) =	**Combined u/c (Pa)**	
SQRT $(A/\sqrt{3})^2 + (B/\sqrt{3})^2 + (C/\sqrt{3})^2$)	0.97	
Expanded Uncertainty of Flow Measurements Pa	**1.94**	
	Standard u/c (K)	
Temperature Calibration (K)	1.49	D
Variation in Actual Temp reading at sample points	0.00	E
Combined u/c of Temp (K)	**Combined u/c (K)**	
SQRT $((D/\sqrt{3^2}) + (E/\sqrt{3})^2$)	0.86	
Expanded Uncertainty of Temp Measurements (K)	**1.72**	
Measured Average Velocity (m/s) at Stack Conds	11.71	
Maximum Average Velocity (m/s) at Stack Conds	11.89	
Standard Uncertainty Velocity at Stack Conditions (%)	1.48	
Expanded Uncertainty Velocity (at Stack Conditions)	**2.97 (%)**	

Measurement Uncertainty Calculations - Flowrate at Stack Conditions

Contribution From	Standard u/c (m^2)
Area (m2)	0.01596
Measured Average Flowrate (m^3/s) at Stack Conds	18.70
Maximum Average Flowrate (m^3/s) at Stack Conds	19.16
Standard Uncertainty Flowrate (m^3/s) at Stack Conditions (%)	2.50
Expanded Uncertainty Flowrate (m^3/s) at Stack Conditions	**5.00 (%)**

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	17.16
Maximum Average Flowrate (m^3/s) at STP Wet	17.67
Standard Uncertainty Flowrate (m^3/s) at STP Wet	2.97
Expanded Uncertainty Flowrate (m^3/s) at STP Wet	**5.94 (%)**