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Nov. 2011.

Report for the Periodic Monitoring of Emissions to Air

Part 1. Executive Summary



Permit Number: PPC/156

Operator: Meggitt Aircraft Braking Systems

Installation: Coventry Plant

Monitoring Date: 24 March 2011

E.E. Report Ref.: 50115

Client Name: Meggitt Aircraft Braking Systems

Client Address: Holbrook Lane
Coventry
West Midlands
CV6 4AA

Monitoring Organisation: Environmental Evaluation Ltd. (Head Office)
Lawton Square
Delph
Oldham
OL3 5DT

Date of Report: 06 April 2011


Report Written by: N Teixeira

Function: Team Leader

Report Approved By: T Ledwith

MCERTS Registration No.: MM 03 425

Technical Endorsements: TE1, TE2, TE3, TE4

Signed: 

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1 Part 1: Executive Summary

1.1 Monitoring Objectives

Meggitt Aircraft Braking Systems has been permitted under the Environmental Protection Act and associated legislation to operate various processes at their Coventry Plant site, and a condition of that permit is that emission monitoring is undertaken on a regular basis to prove compliance or otherwise against prescribed emission limit values.

This report details the testing undertaken in: March 2011

The substance monitoring requirements for each emission point are detailed below.

Substances Monitored	Emission Point Identification
	<i>Metal Plater</i>
Flow	✓
Temperature	✓
Oxides of Nitrogen	✓
Fluorides	✓
Water vapour	✓

Info in report suggest only unhi 1453

1.2 Monitoring Results

Emission Point	Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Uncertainty	Units	Reference Conditions	Date of Monitoring	Start and End Times	Monitoring Method Reference	Accreditation for use of Method	Operating Status
Metal Plater	Oxides of Nitrogen	400	0.0	± 16.69	mgm ⁻³	273K and 101.3 kPa, No Oxygen Correction, Wet Basis	24/03/2011	14:25 - 15:25	BS EN 14792:2005	UKAS MCERTS	Normal
Metal Plater	Fluorides	10	0.2	± 0.02	mgm ⁻³	273K and 101.3 kPa, No Oxygen Correction, Wet Basis	24/03/2011	13:50 - 15:30	BS ISO 15713:2006	UKAS MCERTS	Normal

1.3 Operating Information

Emission Point Reference	Date	Process Type	Process Duration	Feedstock	Abatement
Metal Plater	24 March 2011	Metal Plating	Batch	Metal Components	Wet Scrubber

1.4 Monitoring Deviations

Emission Point Reference	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Metal Plater	None	Hydrogen Fluoride absorption efficiency was less than that required by the standard because of the low levels observed.	None

no comment on deviation against NOx WREN 17A 92:2008

Report for the Periodic Monitoring of Emissions to Air

Part 2. Supporting Information



1506

Permit Number: PPC/156

Operator: Meggitt Aircraft Braking Systems

Installation: Coventry Plant

Monitoring Date: 24 March 2011

E.E. Report Ref.: 50115

Client Name: Meggitt Aircraft Braking Systems

Client Address: Holbrook Lane
Coventry
West Midlands
CV6 4AA

Monitoring Organisation: Environmental Evaluation Ltd. (Head Office)
Lawton Square
Delph
Oldham
OL3 5DT

Date of Report: 06 April 2011

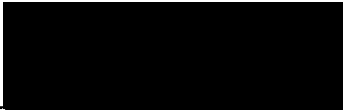
Report Written by: N Teixeira

Function: Team Leader

Report Approved By: T Ledwith

MCERTS Registration No.: MM 03 425

Technical Endorsements: TE1, TE2, TE3, TE4

Signed: 

APPENDICES

Appendix A: General Information

A1. Environmental Evaluation Limited Staff Details

Team Leader:	N Teixeira
MCERTS No.	MM 05 583
Certification Level:	MCERTS Level 2
Technical Endorsements:	TE1, TE2, TE3, TE4
Site Technician:	S White
MCERTS No.	MM 06 776
Certification Level:	MCERTS Level 1
Technical Endorsements:	TE1

A2. Environmental Evaluation Limited Method Details

The indicated substances were measured by the standards and in house methods specified in the table below:

Substance	Standard	EE. Reference
Flow	BS EN 13284:2002	EE/P/002 & 2a
Temperature	BS EN 13284:2002	EE/P/002 & 2a
Oxides of Nitrogen	BS EN 14792:2005	EE/P/009
Fluorides	BS ISO 15713:2006	EE/P/017
Water vapour	BS EN 14790:2005	EE/P/013

A3. Sub-Contract

Analysis was subcontracted to a UKAS accredited laboratory.

A4. Equipment Used in the Monitoring Campaign

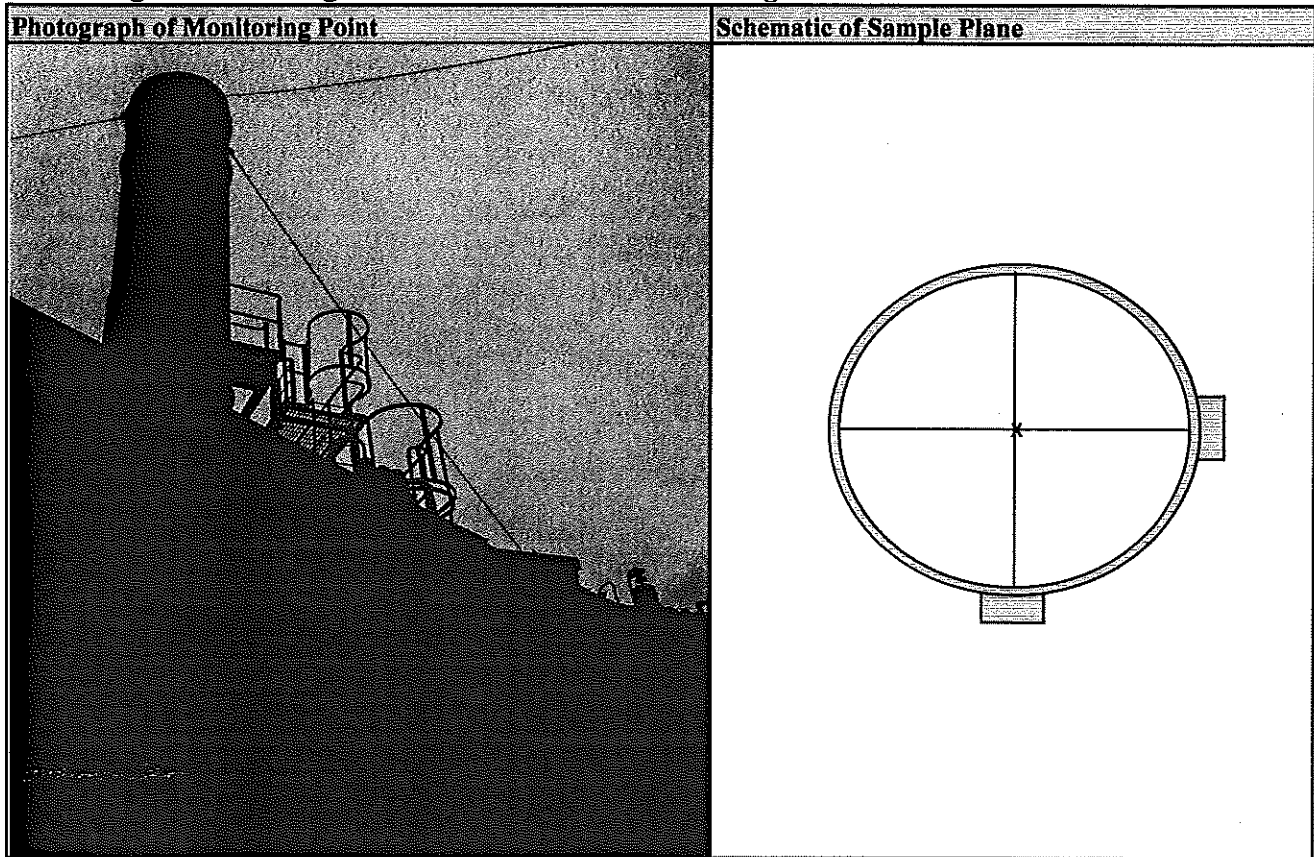
Equipment checklists appropriate to the methods were used.

Equipment Type	EE Equipment Reference Code
Pitot	LCL 20 1M L Type
Manometer	LCL 26
Thermosensor	LCL 15
Thermocouple	LCL 17
Tape Measure	LCL 18
Barometer	LCL 23
Combustion Gas Analyser	LCL 52

Appendix B: Emission Information

B1 - Metal Plater Information

B1.1 Diagrams Showing the Dimensions and Monitoring Facilities of Metal Plater



B1.2 Preliminary Velocity and Temperature Measurement of Metal Plater

Traverse Point	Sample Line A			Sample Line B			Sample Line C			Sample line D		
	Stack Temp. (°C)	ΔP (Pa)	Swirl Angle (°)	Stack Temp. (°C)	ΔP (Pa)	Swirl Angle (°)	Stack Temp. (°C)	ΔP (Pa)	Swirl Angle (°)	Stack Temp. (°C)	ΔP (Pa)	Swirl Angle (°)
1	20	90	0	20	95	0						
2	20	90	0	20	90	0						
3	20	100	0	20	110	0						
4	20	115	0	20	115	0						
5	20	110	0	20	120	0						
6	20	115	0	20	120	0						
7	20	120	0	20	120	0						
8	20	115	0	20	125	0						
9	20	115	0	20	120	0						
10	20	120	0	20	115	0						
	ΣΔP _A	1090		ΣΔP _B	1130		ΣΔP _C			ΣΔP _D		

Barometric Pressure (mmHg)	770	Port Depth (mm)	90
Static Pressure (mmH ₂ O)	5.61	Port Seal Adaptor Depth (mm)	0
Diameter (m)	1.50	Assumed CO ₂ (%)	0.0
		Assumed O ₂ (%)	20.9
Stack Area (m ²)	1.767	Assumed CO (%)	0.0
Port Size (mm)	110	Assumed H ₂ O (%)	0.0

Appendix B1.3 - Combustion Gases - Metal Plater

Company		Meggitt Aircraft Braking System		Test Conducted by		N Teixeira & S White			
Site		Coventry Plant		Date of Test		24 March 2011			
Plant Identification		Metal Plater		File Name					
Choice of Measurement Range and Span Gas Concentration									
Parameter	ELV mgm ⁻³	ELV ppm	2% of ELV ppm	Repeatability at Zero ppm	Ideal Analyser Range	Actual Analyser Range	Ideal Span Gas Conc.		
NOx	400	194.8	3.9	1.25	292	250	125 - 225		
SO ₂									
CO									
CO ₂		---							
O ₂		---							
Analyser and System, Zero and Span Checks									
Parameter	Actual Zero Gas Value	Actual Span Gas Value	Analyser Zero	Analyser Span	Analyser Zero Check	Time	14:15	Time	15:30
						Pre Test System Zero Check	Pre-Test System Span Check	Post Test System Zero Check	Post Test System Span Check
NOx (ppm)	0	151	0	151	0.2	0.2	150.5	0.4	150.8
SO ₂ (ppm)									
CO (ppm)									
CO ₂ (%)									
O ₂ (%)									
Zero, Span and Drift Checks									
Parameter	Pre-Test Analyser Zero Check		Zero Drift Check		Span Drift Check		Overall Calibration Acceptability		
NOx (ppm)	0.2	Pass	0.2	Pass	0.3	Pass	Pass		
SO ₂ (ppm)									
CO (ppm)									
CO ₂ (%)									
O ₂ (%)									
Correction of Data for Drift Affect									
Parameter		Adjustment	Check	Deviation	Drift Per Minute				
NOx (ppm)	Span	1.0047	1.0040	-0.0007	0.0000				
	Zero	-0.2009	-0.4016	-0.2007	-0.0027				
SO ₂ (ppm)	Span								
	Zero								
CO (ppm)	Span								
	Zero								
CO ₂ (%)	Span								
	Zero								
O ₂ (%)	Span								
	Zero								

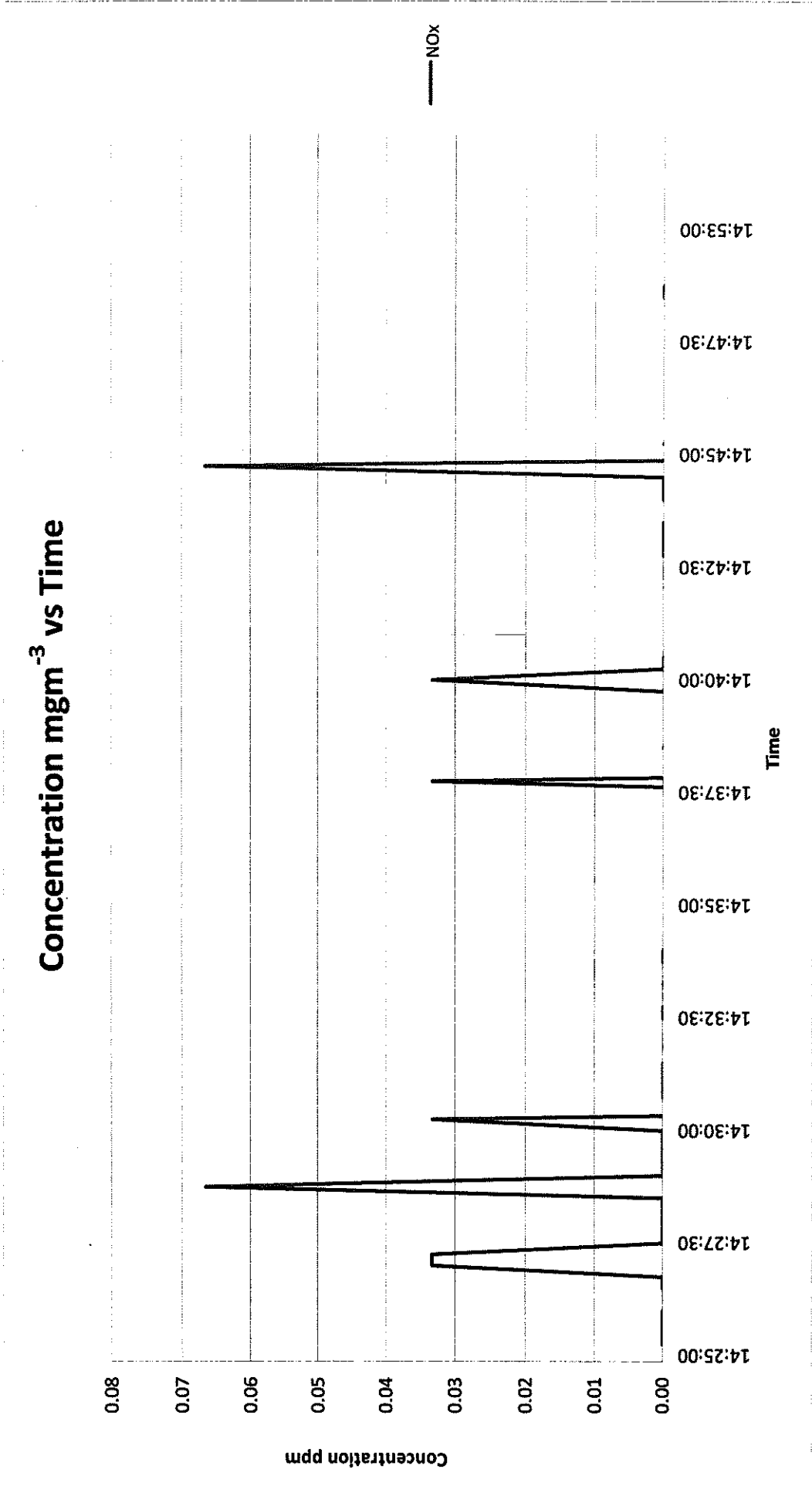
Appendix B1.3 - Combustion Gases - Metal Plater

As Determined Concentrations Dry Basis						
		CO (ppm)	SO ₂ (ppm)	NO _x (ppm)	CO ₂ (%)	O ₂ (%)
$C_{ppm} = \frac{\sum 1 - n}{n}$	=			0		
where:						
Σ 1 - n is the sum of the readings	=			-8		
n is the total number of readings	=			229		
Concentrations at 273k and 101.3kPa Dry Basis						
		CO mgm ⁻³	SO ₂ mgm ⁻³	NO ₂ mgm ⁻³	CO ₂ (%)	O ₂ (%)
$C_{mgm-3} = C_{ppm} \times \frac{mw}{22.4}$	=			0.0		
where:						
C _{ppm} is the average concentration in ppm	=			0.0	---	---
mw is the molecular weight of the gas under test	=			46	---	---
22.4 is the volume of 1 mole at STP (litres)	=			22.4	---	---
Concentrations at 273k and 101.3kPa Wet Basis						
		CO mgm ⁻³	SO ₂ mgm ⁻³	NO ₂ mgm ⁻³	CO ₂ (%)	O ₂ (%)
$C_{mgm-3(wet)} = C_{mgm-3} \times \frac{(100 - Wv)}{100}$	=			0.0		
where:						
Concentrations at 273k and 101.3kPa Dry Basis	=			0.0		
Wv is the water vapour content %	=			0.0		
Concentration at 273k and 101.3kPa, Uncorrected for Oxygen, Wet Basis						
		CO mgm ⁻³	SO ₂ mgm ⁻³	NO ₂ mgm ⁻³	CO ₂ (%)	O ₂ (%)
$C_{at\%} = C_{mgm-3} \times \frac{20.9 - O_{2ref}}{20.9 - O_{2meas}}$	=			0.0		
where:						
20.9 is the atmospheric concentration of oxygen	=			20.9	---	---
O _{2ref} is the reference concentration	=			N/A	---	---
O _{2 meas} is the measured concentration	=			N/A	---	---
Actual Rates of Discharge						
		CO ghr ⁻¹	SO ₂ ghr ⁻¹	NO ₂ ghr ⁻¹	CO ₂ ghr ⁻¹	O ₂ ghr ⁻¹
$E_{g/hr} = C \times Q_{std} \times \frac{60}{1000}$	=			0.0		
where:						
C is the dry concentration at STP	=			0.0		
Q _{std} is the dry flow rate at STP	=			1370.9		
60/1000 is the conversion factor	=			0.060		

Appendix B1.3 - Combustion Gases - Metal Plater

Uncertainty Calculation of Oxides of Nitrogen to BS EN 14792:2005							
Symbol	Source of Uncertainty	Value +/- ppm	Probability Distribution	Divisor	Ci	Ui () +/- ppm	V₁ or V_{eff}
U _{LD}	Linearity Deviation	5	Normal(K=2)	2	1	2.5	
U _R	Repeatability	2.5	Normal(K=2)	2	1	1.25	
U _{ZD}	Zero Drift	2.5	Normal(K=2)	2	1	1.25	
U _{cg}	Span Drift	2.5	Normal(K=2)	2	1	1.25	
U _{CG}	Error in calibration	5	Normal(K=2)	2	1	2.5	
U _C ()	Combined standard		normal			4.15	
U	Expanded		enter coverage	1.96		8.13	ppm
U	Expanded		enter coverage	1.96		16.69	mgm ⁻³

Appendix B1.3 - Combustion Gases - Metal Plater



Appendix B1.4 - Gaseous Fluorides to BS ISO 15713:2006 - Metal Plater

Company	Meggitt Aircraft Braking System	Test Conducted by	N Teixeira & S White	
Site	Coventry Plant	Date of Test	24 March 2011	
Plant Identification	Metal Plater			
Volume of Gas Metered, Standard Conditions V_{mstd}				
$V_{mstd} = Y_d \times V_m \times 0.3592 \times \frac{P_m}{(273 + T_m)}$	=	Blank 1	Test 1	m^3
		0.1185	0.1185	
Sample reference number - first Impinger	=	50115-24/03/11-S3	50115-24/03/11-S1	---
Sample reference number - second Impinger	=		50115-24/03/11-S2	---
Meter calibration factor Y_d	=	1	1	---
Test start time	=	---	13:50	---
Test end time	=	---	15:30	---
Test Duration	=	100	100	minutes
Initial meter reading	=	---	0	litres
Final meter reading	=	---	122.1	litres
Total meter volume V_m	=	0.1221	0.1221	m^3
Meter Pressure P_m	=	770	770	mm.Hg
Final meter temperature	=	---	12.0	(°C)
Initial meter temperature	=	---	12.0	(°C)
Average meter temperature T_m	=	12.0	12.0	(°C)
Correction to standard conditions	=	0.3592	0.3592	
Hydrogen Fluoride Concentration $C_{mgm^{-3}}$ - Dry Basis				
$C_{mgm^{-3}} = \frac{M_n}{V_{mstd}}$	=	Blank	Test 1	mgm^{-3}
		0.1	0.2	
Where:				
Impinger reference numbers	=	50115-24/03/11-S3	50115-24/03/11-S1	
Solution Concentration Impinger 1		0.05	0.05	$mg l^{-1}$
Solution Volume Impinger 1		200	210	ml
Mn1 is the Hydrogen Fluoride mass in Impinger 1	=	0.01	0.0105	mg
Second impinger reference number	=		50115-24/03/11-S2	
Solution Concentration Impinger 1		---	0.05	$mg l^{-1}$
Solution Volume Impinger 1		---	200	ml
Mn2 is the Hydrogen Fluoride mass in Impinger 1	=	---	0.01	mg
Absorption efficiency	=	---	51.2	%
V_{mstd} is the volume of gas metered, standard con	=	0.1185	0.1185	m^3
Gaseous Fluoride Concentration at STP - Wet Basis - mgm^{-3}				
$C_{mgm^{-3}(wet)} = C_{mgm^{-3}} \times \frac{(100 - Wv)}{100}$	=	Blank 1	Test 1	mgm^{-3}
		0.1	0.2	
Gaseous concentration at STP - Dry Basis	=	0.1	0.2	mgm^{-3}
Wv is the water vapour content	=	0.0	0.0	%

Appendix B1.4 - Gaseous Fluorides to BS ISO 15713:2006 - Metal Plater

Concentration at 273k and 101.3kPa, Uncorrected for Oxygen, Wet Basis				
$C_{atX\%} = C_{mgm^{-3}} \frac{20.9 - O_{2ref}}{20.9 - O_{2meas}}$	=	Blank 1 0.1	Test 1 0.2	mgm ⁻³
Gaseous concentration at STP	=	0.1	0.2	mgm ⁻³
Atmospheric oxygen concentration	=	20.9	20.9	%
O _{2ref} is the reference oxygen concentration	=	N/A	N/A	%
O _{2meas} is the measured oxygen concentration	=	N/A	N/A	%
Gaseous Fluoride Rate of Discharge ghr⁻¹				
$E_{g/hr} = C \times Q_{std} \times \frac{60}{1000}$	=	Blank 1 7	Test 1 14	ghr ⁻¹
Gaseous concentration at STP - Dry Basis	=	0.1	0.2	mgm ⁻³
Dry Total Flow Rate of Stack Gas Q _{std}	=	1370.9	1370.9	m ³ min ⁻¹
60/1000 Conversion factor	=	0.06	0.06	
Comments on Compliance with BS ISO 15713:2006				
Hydrogen Fluoride absorption efficiency >95%				Fail
Temperature maintained above 150°C				Pass
Leak Rate <2%				Pass
Overall Blank Value <10% of the LV ^a				Pass
Duct gas flow with regard to stack axis <15°				Pass
Duct gas flow: negative velocity - not permitted				Pass
Duct gas flow: differential pressure at the pitot tube >5pa				Pass
Duct gas flow: ratio of max to min velocity <3:1				Pass
<p>Were all of the requirements of BS ISO 15713:2003 fulfilled during the test?</p> <p style="text-align: right;"> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </p> <p><i>efflux velocity → 1370 m³/min⁻¹</i></p>				

Appendix B1.4 - Gaseous Fluorides to BS ISO 15713:2006 - Metal Plater

Uncertainty Calculations						
Measurement Data						
Measured Quantities	Symbol	Value	Standard Uncertainty		Units	
Sampled Volume	V_m	0.1221	(1%) uV_m	0.00122	m^3	
Sampled Gas Temperature	T_m	285.0	uT_m	3	k	
Sampled Gas Pressure	p_m	102.6	up_m	0.1	kPa	
Sampled Gas Humidity	H_m	0.0	uH_m	0.1	% by volume	
Oxygen Content	$O_{2,m}$	N/A	$uO_{2,m}$	0.01	% by volume	
Mass	m	0.17	um_m	0.01	mg	
Leak	L	2	%	0.02		
Uncollected Mass	UCM	0			mg	
Intermediate Calculation to Correct for Standardisation of Conditions						
Factor for Std Conditions	f_s	0.97				
Uncertainty Components	symbol	Sensitivity Coefficient		u (in units of f_s)		
	p_m	0.009		0.001		
	H_m	0.010		0.001		
	T_m	0.003		0.010		
	u_{f_s}			0.010		
Corrected Volume	V	0.12	uV	0.002	m^3	
Intermediate Calculation to Correct for Oxygen Correction						
Factor for O_2 Correction	f_c	1.00				
Uncertainty Components	symbol	Sensitivity Coefficient		u (in units of f_c)		
	$O_{2,m}$	1.00		0.010		
Factor for O_2 Correction	u_{f_c}	1.00		0.010	%	
Calculation of Expanded Uncertainty						
Parameter		Value	Units	Sensitivity Coefficient	Uncertainty in Result	
Volume (Std conditions)	V	0.12	m^3	1.46	0.00	$mg.m^{-3}$
Mass	m	0.17	mg	1.00	0.01	$mg.m^{-3}$
Factor for O_2 Correction	f_c	1.00		0.17	0.00	$mg.m^{-3}$
Leak	L	0.00	$mg.m^{-3}$	1.00	0.00	$mg.m^{-3}$
Uncollected mass	UCM	0.00	mg	0.00	0.00	$mg.m^{-3}$
Combined uncertainty					0.01	$mg.m^{-3}$
Expanded Uncertainty K=2					10.87	%
Expanded Uncertainty K=2					0.02	$mg.m^{-3}$

Test Certificates



Scientific Analysis Laboratories is a limited company registered in England and Wales (No 2514788) whose address is at Hadfield House, Hadfield Street, Manchester M18 9FE

Scientific Analysis Laboratories Certificate of Analysis

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Report Number: 232525-1

Date of Report: 04-Apr-2011

Customer: Environmental Evaluation
Unit 10
Greenwood Court
Ramridge Road
Luton
LU2 0TN

Customer Contact: Mr Neil Teixeira

Customer Job Reference: 50115
Customer Purchase Order: 10404NT
Date Job Received at SAL: 28-Mar-2011
Date Analysis Started: 28-Mar-2011
Date Analysis Completed: 04-Apr-2011

The results reported relate to samples received in the laboratory
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 SAL SOPs



Report checked
and authorised by :
Ms Jennifer Hughes
Customer Service Manager
(Air Division)

Issued by : **Signature valid**
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Date: 2011.04.04 10:20:31 BST
Reason: I am the issuer
Location: SAL

Page 1 of 2

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SAL Reference: 232525							
Customer Reference: 50115							
Impinger (sodium hydroxide)		Analysed as Impinger (sodium hydroxide)					
Miscellaneous							
SAL Reference		232525 001	232525 002	232525 003			
Customer Sample Reference		50115-24/3/11-81	50115-24/3/11-82	50115-24/3/11-83			
Test Sample		AR	AR	AR			
Determinand	Method	LOD	Units	Symbol	(13)	(13)	(13)
Hydrogen Fluoride	IC (acetate separation method)	0.05	mg/l	U	<0.05	<0.05	<0.05
Volume	Vol	1	ml	U	210	200	200

Index to symbols used in 232525-1

Value	Description
AR	As Received
13	Results have been blank corrected.
U	Analysis is UKAS accredited

End of Report