

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(s): 02 August 2012

E.E. Report Ref.: 57030

Client Name: Meggitt Aircraft Braking Systems

Client Address: Holbrook Lane
Coventry
CV6 4AA

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

Date of Report: 20 August 2012

Report Written by: N Teixeira

Function: MCERTS Level 2 Team Leader

Report Approved By: T Ledwith

MCERTS Registration No.: MM 03 425

MCERTS Level: MCERTS Level 2

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 Pollution Prevention and Control (England and Wales) Regulations 2000 to operate various processes at the 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 on the 02 August 2012

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

Substances Monitored	Emission Point Identification
	<i>Plating Area Main Stack</i>
Flow	✓
Temperature	✓
Oxides of Nitrogen	✓
Fluorides	✓
Water vapour	✓

1.2 Monitoring Results

Emission Point	Substance to be Monitored	Emission Limit Value	Measured Concentration	Uncertainty	Units	Reference Conditions	Date of Monitoring	Start and End Times	Monitoring Method Reference	Accreditation for use of Method	Operating Status
Plating Area Main Stack	Fluorides	5	0.4	± 0.04	mgm ⁻³	273K and 101.3 kPa, No Oxygen Correction, Wet Basis	02/08/2012	10:45 - 11:50	BS ISO 15713:2006	UKAS MCERTS	Normal
Plating Area Main Stack	Oxides Of Nitrogen - Including Acid Mist (as NO ₂)	200	0.5	± 0.1	mgm ⁻³	273K and 101.3 kPa, No Oxygen Correction, Wet Basis	02/08/2012	12:10 - 13:15	USEPA Method 7d	None*	Normal

* Accreditation applied for.

1.3 Operating Information

Emission Point Reference	Date	Process Type	Process Duration	Feedstock	Abatement
Plating Area Main Stack	02 August 2012	Metal Treatment In Acid Dip Tanks	Batch	Aircraft Components	Wet / Caustic Scrubber

1.4 Monitoring Deviations

Emission Point Reference	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Plating Area Main Stack	None	None	Please note that the analysis was conducted using ion chromatography and therefore the results have been returned as NO ₃ . These results have been converted to Oxides of Nitrogen (as NO ₂) by multiplying by 46/62. The fluoride absorption efficiency was less than 95%, however all analyses were returned at less than 5 times the limit of detection.

Report for the Periodic Monitoring of Emissions to Air

Part 2. Supporting Information



Permit Number: PPC/156

Operator: Meggitt Aircraft Braking Systems

Installation: Coventry Plant

Monitoring Date: 02 August 2012

E.E. Report Ref.: 57030

Client Name: Meggitt Aircraft Braking Systems

Client Address: Holbrook Lane
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MCERTS Registration No.: MM 03 425

MCERTS Level: MCERTS Level 2

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: P Soley
 MCERTS No. MM 12 1187
 Certification Level: Trainee
 Technical Endorsements: None

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/001 & 2
Temperature	BS EN 13284:2002	EE/P/001 & 2
Fluorides	BS ISO 15713:2006	EE/P/017
Oxides Of Nitrogen	USEPA 7d	EE/P/0028
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

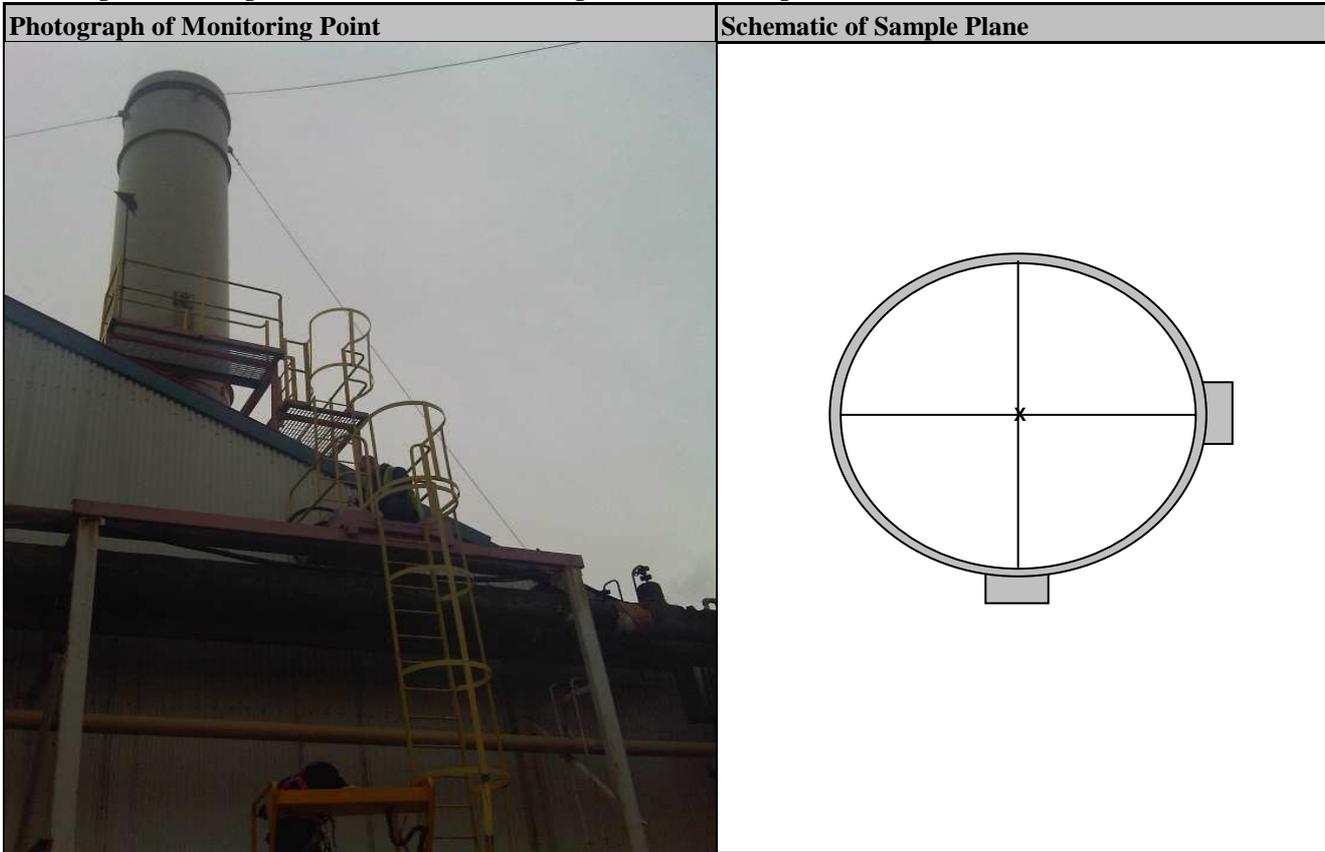
Equipment checklists appropriate to the methods were used.

Equipment Type	EE Equipment Reference Code
Low Flow Kit	LCL44
Pitot	LCL 21 2m L Type
Manometer	LCL 26
Thermosensor	LCL 15
Thermocouple	LCL 17
Tape Measure	LCL 18
Barometer	LCL 23
Probe	LCL 40
Vernier Callipers	LCL 14
Stop Watch	LCL 25
Scales	LCL 22
Check Weight	LCL27

Appendix B: Emission Information

B1 - Plating Area Main Stack Information

B1.1 Diagrams Showing the Dimensions and Monitoring Facilities of Plating Area Main Stack



B1.2 Preliminary Velocity and Temperature Measurement of Plating Area Main Stack

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	21	85	0	21	78	0						
2	21	110	0	21	86	0						
3	21	66	0	21	96	0						
4	21	103	0	21	93	0						
5	21	44	0	21	94	0						
6	21	40	0	21	84	0						
7	21	47	0	21	54	0						
8	21	57	0	21	28	0						
9	21	26	0	21	43	0						
10	21	54	0	21	28	0						
	ΣΔP _A	632		ΣΔP _B	684		ΣΔP _C			ΣΔP _D		

Barometric Pressure (mmHg)	761	Port Depth (mm)	120
Static Pressure (mmH ₂ O)	-5.31	Port Seal Adaptor Depth (mm)	120
Diameter (m)	1.60	Assumed CO ₂ (%)	0.0
---		Assumed O ₂ (%)	20.9
Stack Area (m ²)	2.011	Assumed CO (%)	0.0
Port Size (mm)	100	Assumed H ₂ O (%)	0.0

Appendix B1.3 - Gaseous Fluorides to BS ISO 15713:2006 - Plating Area Main Stack

Company	Meggitt Aircraft Braking Systems	Test Conducted by	N Teixeira & P Soley		
Site	Coventry Plant	Date of Test	02 August 2012		
Plant Identification	Plating Area Main Stack				
Volume of Water Vapour at Standard Conditions V_{wstd}					
$V_{wstd} = (0.00124) \times V_{lc}$	=	Blank	Test 1	Test 2	Units
			0.0009		m³
Where:					
Constant	=	---	0.00124		
Initial Dryer mass	=	---	645		g
Final Dryer mass	=	---	645.7		g
V_{lc} is the mass of water collected	=	---	0.7		g
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		Units
		0.1501	0.1501		m³
Sample reference number - first Impinger	=	57030-02/08/12-S3	57030-02/08/12-S1		---
Sample reference number - second Impinger	=	---	57030-02/08/12-S2		---
Meter calibration factor Y_d	=	1.2105	1.2105		---
Test start time	=	---	10:45		---
Test end time	=	---	11:50		---
Test Duration	=	65	65		minutes
Initial meter reading	=	---	0		litres
Final meter reading	=	---	133.4		litres
Total meter volume V_m	=	0.1334	0.1334		m ³
Meter Pressure P_m	=	761	761		mm.Hg
Final meter temperature	=	---	21.0		(°C)
Initial meter temperature	=	---	21.0		(°C)
Average meter temperature T_m	=	21.0	21.0		(°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		Units
		0.1	0.4		mgm⁻³
Where:					
Impinger reference numbers	=	57030-02/08/12-S3	57030-02/08/12-S1		
Solution Concentration Impinger 1		0.06	0.23		mg l ⁻¹
Solution Volume Impinger 1		140	210		ml
Mn1 is the Hydrogen Fluoride mass in Impinger	=	0.0084	0.0483		mg
Second impinger reference number	=	---	57030-02/08/12-S2		
Solution Concentration Impinger 1		---	0.08		mg l ⁻¹
Solution Volume Impinger 1		---	160		ml
Mn2 is the Hydrogen Fluoride mass in Impinger	=	---	0.0128		mg
Absorption efficiency	=	---	79.1		%
V_{mstd} is the volume of gas metered, standard con	=	0.1501	0.1501		m ³

Appendix B1.3 - Gaseous Fluorides to BS ISO 15713:2006 - Plating Area Main Stack

Gaseous Fluoride Concentration at STP - Wet Basis - mgm^{-3}				
$C_{\text{mgm}^{-3}(\text{wet})} = C_{\text{mgm}^{-3}} \times \frac{(100 - W_v)}{100}$	=	Blank 1 0.1	Test 1 0.4	mgm^{-3}
Gaseous concentration at STP - Dry Basis	=	0.1	0.4	mgm^{-3}
Wv is the water vapour content	=	0.6	0.6	%

Concentration at 273k and 101.3kPa, Uncorrected for Oxygen, Wet Basis				
$C_{\text{atX}\%} = C_{\text{mgm}^{-3}} \frac{20.9 - O_{2\text{ref}}}{20.9 - O_{2\text{meas}}}$	=	Blank 1 0.1	Test 1 0.4	mgm^{-3}
Gaseous concentration at STP	=	0.1	0.4	mgm^{-3}
Atmospheric oxygen concentration	=	20.9	20.9	%
$O_{2\text{ref}}$ is the reference oxygen concentration	=	N/A	N/A	%
$O_{2\text{meas}}$ is the measured oxygen concentration	=	N/A	N/A	%

Gaseous Fluoride Rate of Discharge ghr^{-1}				
$E_{\text{g/hr}} = C \times Q_{\text{std}} \times \frac{60}{1000}$	=	Blank 1 4	Test 1 29	ghr^{-1}
Gaseous concentration at STP - Dry Basis	=	0.1	0.4	mgm^{-3}
Dry Total Flow Rate of Stack Gas Q_{std}	=	1183.2	1183.2	$\text{m}^3 \text{min}^{-1}$
60/1000 Conversion factor	=	0.06	0.06	

Comments on Compliance with BS ISO 15713:2006	
Hydrogen Fluoride absorption efficiency >95%	N/A
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

Were all of the requirements of BS ISO 15713:2003 fulfilled during the test?



Yes



No

Appendix B1.3 - Gaseous Fluorides to BS ISO 15713:2006 - Plating Area Main Stack

Uncertainty Calculations						
Measurement Data						
Measured Quantities	Symbol	Value	Standard Uncertainty		Units	
Sampled Volume	V_m	0.1334	(1%) uV_m	0.00133	m^3	
Sampled Gas Temperature	T_m	294.0	uT_m	3	k	
Sampled Gas Pressure	p_m	101.4	up_m	0.1	kPa	
Sampled Gas Humidity	H_m	0.6	uH_m	0.1	% by volume	
Oxygen Content	$O_{2,m}$	N/A	$uO_{2,m}$	0.01	% by volume	
Mass	m	0.40	um_m	0.02	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	0.92				
Uncertainty Components	symbol	Sensitivity Coefficient		u (in units of f_s)		
	p_m	0.009		0.001		
	H_m	0.009		0.001		
	T_m	0.003		0.009		
	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	3.28	0.01	$mg.m^{-3}$
Mass	m	0.40	mg	1.00	0.02	$mg.m^{-3}$
Factor for O ₂ Correction	f_c	1.00		0.40	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					0.02	$mg.m^{-3}$
Expanded Uncertainty K=2					10.87	%
Expanded Uncertainty K=2					0.04	$mg.m^{-3}$

Appendix B1.4 - Oxides Of Nitrogen - Including Acid Mist (as NO2) to USEPA Method 7d - Plating Area Main Stack

Company	Meggitt Aircraft Braking Systems	Test Conducted by	N Teixeira & P Soley
Site	Coventry Plant	Date of Test	02 August 2012
Plant Identification	Plating Area Main Stack		

Volume of Water Vapour at Standard Conditions V_{wstd}

$V_{wstd} = (0.00124) \times V_{lc}$	=	Blank	Test 1	Test 2	Units
			0.0007		m³

Where:

Constant	=	---	0.00124		
Initial Dryer mass	=	---	675		g
Final Dryer mass	=	---	675.6		g
V_{lc} is the mass of water collected	=	---	0.6		g

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		Units
		0.1363	0.1363		m³

Sample reference number	=	57030-02/08/12-S5	57030-02/08/12-S4		---
Meter calibration factor Y_d	=	1.2105	1.2105		---
Test start time	=	---	12:10		---
Test end time	=	---	13:15		---
Test Duration (mins)	=	65	65		minutes
Initial meter reading (litres)	=	---	0		litres
Final meter reading (litres)	=	---	121.1		litres
Total meter volume V_m (m ³)	=	0.1211	0.1211		m ³
Meter Pressure P_m (mmHg)	=	761	761		mm.Hg
Final meter temperature (°C)	=	---	21.0		(°C)
Initial meter temperature (°C)	=	---	21.0		(°C)
Average meter temperature T_m (°C)	=	21.0	21.0		(°C)
Correction to standard conditions	=	0.3592	0.3592		

Concentration at STP - Dry Basis - mgm^{-3}

$C_{mgm^{-3}} = \frac{M_n}{V_{mstd}}$	=	Blank 1	Test 1		Units
		0.46	0.54		mgm⁻³

Sample reference number	=	57030-02/08/12-S5	57030-02/08/12-S4		
Mass of analyte	=	0.063	0.074		mg
Volume of gas metered, standard conditions V_{mstd}	=	0.1363	0.1363		m ³

Concentration at STP - Wet Basis - mgm^{-3}

$C_{mgm^{-3}(wet)} = C_{mgm^{-3}} \times \frac{(100 - Wv)}{100}$	=	Blank 1	Test 1		Units
		0.46	0.54		mgm⁻³

Gaseous concentration at STP - Dry Basis	=	0.46	0.54		mgm ⁻³
Wv is the water vapour content %	=	0.5	0.5		%

Appendix B1.4 - Oxides Of Nitrogen - Including Acid Mist (as NO2) to USEPA Method 7d - Plating Area Main Stack

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 0.46	Test 1 0.54	mgm ⁻³
Gaseous concentration at STP	=	0.46	0.54	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	%
Oxides Of Nitrogen - Including Acid Mist (as NO2) Rate of Discharge mg/hr				
$E_{g/hr} = C \times Q_{std} \times \frac{60}{1000}$	=	Blank 1 32.85	Test 1 38.64	ghr ⁻¹
Compound				
Gaseous concentration at STP - Dry Basis	=	0.46	0.54	mgm ⁻³
Dry total flow rate of stack gas Q _{std}	=	1183.2	1183.2	m ³ min ⁻¹
60/1000 Conversion factor	=	0.06	0.06	

Appendix B1.4 - Oxides Of Nitrogen - Including Acid Mist (as NO2) to USEPA Method 7d - Plating Area Main Stack

Uncertainty Calculations					
Measurement Data					
Measured Quantities	Symbol	Value	Standard Uncertainty		Units
Sampled Volume	V_m	0.1211	(1%) uV_m	0.00121	m^3
Sampled Gas Temperature	T_m	294.0	uT_m	3	k
Sampled Gas Pressure	ρ_m	101.4	$u\rho_m$	0.1	kPa
Sampled Gas Humidity	H_m	0.5	uH_m	0.1	% by volume
Oxygen Content	$O_{2,m}$	N/A	$uO_{2,m}$	0.01	% by volume
Mass	m	0.07	um_m	0.00	mg
Leak	L	2	%	0.02	
Uncollected Mass	UCM	0			mg
Intermediate Calculation to Correct for Standardisation of Conditions					
Factor for Std Conditions	fs	0.92			
Uncertainty Components	symbol	Sensitivity Coefficient		u (in units of fs)	
	ρ_m	0.009		0.001	
	H_m	0.009		0.001	
	T_m	0.003		0.009	
	ufs			0.010	
Corrected Volume	V	0.11	uV	0.002	m^3
Intermediate Calculation to Correct for Oxygen Correction					
Factor for O ₂ Correction	fc	1.00			
Uncertainty Components	symbol	Sensitivity Coefficient		u (in units of fc)	
	$O_{2,m}$	1.00		0.010	
Factor for O ₂ Correction	ufc	1.00		0.010	%
Calculation of Expanded Uncertainty					
Parameter		Value	Units	Sensitivity Coefficient	Uncertainty in Result
Volume (Std conditions)	V	0.11	m^3	4.83	0.01
Mass	m	0.07	mg	7.30	0.03
Factor for O ₂ Correction	fc	1.00		0.54	0.01
Leak	L	0.01	$mg.m^{-3}$	1.00	0.01
Uncollected mass	UCM	0.00	mg	0.00	0.00
Combined uncertainty					0.03
Expanded Uncertainty K=2					10.87
Expanded Uncertainty K=2					0.06
					%
					$mg.m^{-3}$

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 M16 9FE

Scientific Analysis Laboratories Ltd Certificate of Analysis

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Report Number: 290185-1

Date of Report: 10-Aug-2012

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

Customer Contact: Mr Neil Teixeira

Customer Job Reference: 57030
Customer Purchase Order: 11659NT
Date Job Received at SAL: 06-Aug-2012
Date Analysis Started: 07-Aug-2012
Date Analysis Completed: 10-Aug-2012

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 :
Kayleigh McCann
Project Manager

Issued by :
Kayleigh McCann
Project Manager

Signature valid
Digitally signed by Kayleigh McCann
Date: 2012.08.10 17:12:19 BST
Reason: Issue
Location: SAL

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SAL Reference: 290185 Customer Reference: 57030 Impinger (sodium hydroxide) Analysed as Impinger (sodium hydroxide) Miscellaneous							
		SAL Reference		290185 001	290185 002	290185 003	
		Customer Sample Reference		57030/02/08/12 S1	57030/02/08/12 S2	57030/02/08/12 S3	
		Test Sample		AR	AR	AR	
Determinand	Method	LOD	Units	Symbol			
Hydrogen Fluoride	IC (acetate separation method)	0.05	mg/l	U	(13) 0.23	(13) 0.08	(13) 0.06
Volume	Vol	1	ml	U	210	160	140

SAL Reference: 290185 Customer Reference: 57030 Impinger(permanganate) Analysed as Impinger(permanganate) Miscellaneous							
		SAL Reference		290185 004	290185 005		
		Customer Sample Reference		57030/02/08/12 S4	57030/02/08/12 S5		
		Test Sample		AR	AR		
Determinand	Method	LOD	Units	Symbol			
Nitrate	IC	0.50	mg/l	N	(13) <0.50	(13) <0.50	
Volume	Vol	1	ml	N	200	170	

Index to symbols used in 290185-1

Value	Description
AR	As Received
13	Results have been blank corrected.
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

MCERTS Certificates



Certificate of Personnel Competence

This is to certify that

Neil Teixeira

has been assessed by Sira Certification Service and
has demonstrated competence to the required standard of

Level 2 (team leader)

as defined in

**MCERTS Personnel Competency Standard
for Manual Stack-Emission Monitoring : April 2011, Version 7.2**

for the following Technical Endorsements:

TE1 - Particulate monitoring by isokinetic sampling techniques	expires Jun 2016
TE2 - Multi-phase sampling techniques	expires Jun 2016
TE3 - Gases/vapours by manual techniques	expires Jun 2017
TE4 - Gases/vapours by instrumental techniques	expires Mar 2017

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Certificate issued : Dec 2011
Level 2 renewal date : Jun 2016
H&S renewal date : Sep 2015

Certificate expiry date : Sep 2015

Certificate No : Sira MP05 333 /5
Registration No : MM05 583


R. Cooper Eng MInstMC
Technical Director

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End of Report