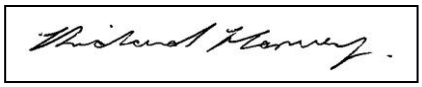
BS EN 14181 Report	
Permit Number:	**RP3133LD**
Operator:	**RWE Generation UK plc.**
Installation:	**Aberthaw Power Station**
Installation Type:	**Coal-Fired Power Station**
Emission Point:	**Unit 9**
Monitoring Dates:	**18th to 20th October 2016**

1709

Contract Reference:	FTBS 29312
Operator:	RWE Generation UK plc.
Address:	Aberthaw Power Plant The Leys Aberthaw, Nr Barry South Glamorgan CF62 4ZW
Client Contact:	Richard Kadim
Monitoring Organisation:	RPS Consultants
Address:	Noble House, Capital Drive, Linford Wood, Milton Keynes. MK14 6QP.
Report Date:	5th January 2017
Report Author:	Glyn Harrison
Report Approved By:	Richard Harvey
Position:	Principal Consultant
MCERTS Qualifications:	Level 2, Technical Endorsements 1, 2, 3 & 4
MCERTS Registration No.:	MM 02 020
Signature:	

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CONTENTS

Section 1 – Executive Summary

1B.1 Result Summary – QAL2

EN 14181 Test Type		QAL2				
Stack designation		Unit 9				
Measurand	**Correlation coefficient of parallel data (R^2)**	**Derived Calibration function (y_i)**		**Calibrated Range**	**Extrapolated Calibrated Range**	**Variability Test**
		y_i= a	**+ bx_i**			
Particulate Matter (Erwin SICK)	0.7810	-1.613[1]	2.201[1]	0 – 60.6 mg/m^3 [2]	0 – 84.1 mg/m^3 [3]	Pass

Notes:

1 – Calibration function derived using Method A.

2 - Calibrated range derived using QAL2 parallel test data extended 100%.

3 - Extrapolated calibrated range from QAL 2 - derived using reference materials

Note: The calibration functions, once applied, only remain valid as long as the QAL 3 data remains within control limits, and there are no manual adjustments made to the CEMS other than those allowed to bring the settings back within the QAL 3 control limits

1C Deviations

SRM deviations	None
Reason for deviation	None
EN 14181 deviations	None
Reason for deviation	N/A
Impact on results	N/A
Further actions required	None

Section 2 - Information about the Regulated Installation

2.1 Regulatory Information

Name of operator	RWE Generation UK plc.
Name of Installation	Aberthaw Power Station
Address of installation	The Leys Aberthaw, Nr Barry South Glamorgan CF62 4ZW
Sector	LCPD
Permit Number	RP3133LD
Date of last QAL 2/AST	March 2016 QAL2

Regulated Determinands

Determinand	Emission Point	Daily Mean	Calendar Monthly	Uncertainty Requirement
Total particulate Matter	Unit 9	35 mg/m^3	20 mg/m^3	30% at the ELV

Note: ELVs at reference conditions 273K, 101.3kPa, 6% oxygen, dry gas

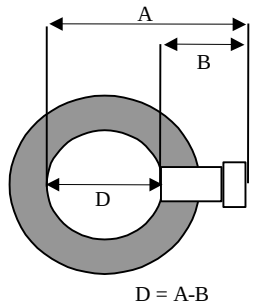
2.2 Operational Information and site monitoring provisions

2.2.1 Process type and emissions variations

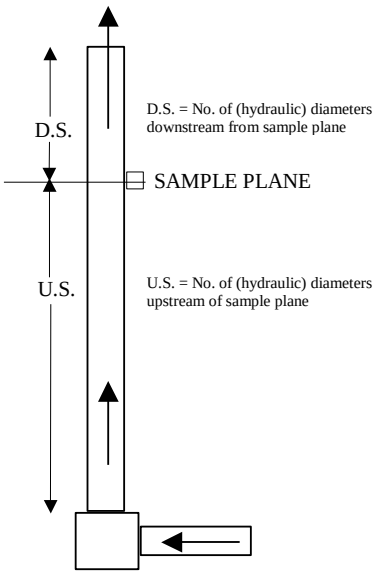
Process Type	Continuous - Coal-Fired Power Station
Process Variations	Once operational at maximum load variation is minimal
Expected emissions variations **1 Total Particulate Matter** **2 Oxygen**	 5 - 30 mg/m^3 - Variable 5.8 – 7.4 % - Constant
Possible low level emissions	None
Provision to deal with low level emissions	N/A
Other factors affecting monitoring results	None
Fuel type	Coal
Abatement	Flue Gas Desulphurisation & Combustion control

2.3 Monitoring Provisions at the installation

2.3.1 Stack & sampling ports



SKETCH OF SAMPLING POINT LOCATIONS, STACK GEOMETRY, MONITORING PLATFORM & SURROUNDS



A =~ 6.5m

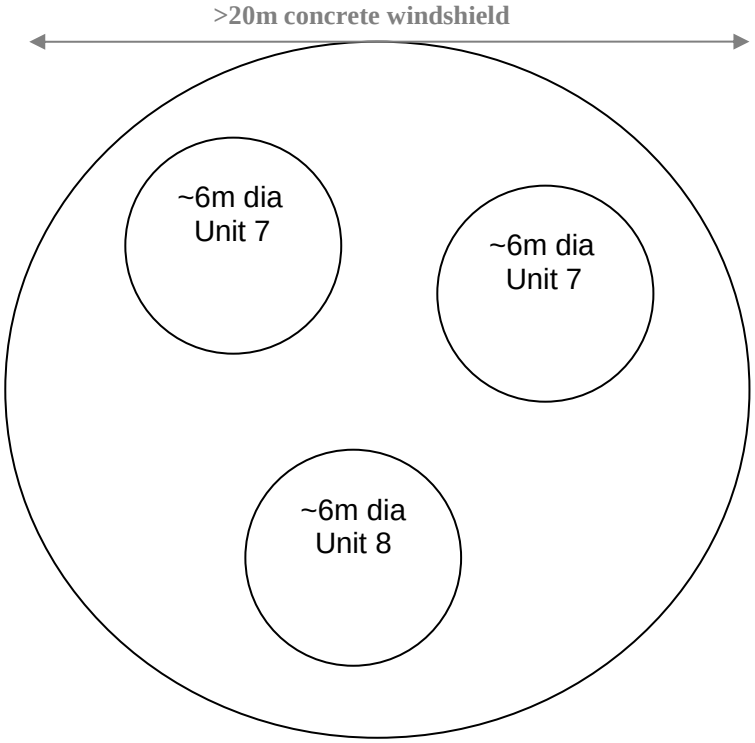
B = ~0.5m

D = ~6.00

D.S. = > 5HD

U.S. = > 5HD

Platform Diagram



Photograph of Stack

Photo of Monitoring Platform

Access was limited to ports due to the stack layout inside the windshield. The port shown is one of four.

2.3.2 Monitoring platform and site provisions

Requirement	Compliant	Notes
• A safe and clean working environment with sufficient space and weather protections.	CEMs cabinet – Monitoring probe -	Both cabinet and probe are located inside the windshield and are thus in a spacious, clean and weatherproof environment.
• Easy and safe access to the CEM.	CEMS cabinet – Monitoring probe -	Stairways to the relevant levels.
• Adequate supplies of reference materials, tools and spare parts.	Yes	
• Facilities to introduce the reference materials for gaseous-monitoring systems, both at the inlet of the sampling line (where present), and at the inlet of the CEM.	N/A	Particulate analyser
• Compliance with TGN M1	No	Unable to access sample port B
• Compliance with EN 15259 – flow stability criteria (if applicable), Stack gas homogeneity.	 Yes Yes	 Stack gas homogeneity carried out previously by Atkins.

Temperature and Velocity Profile

Company Name:
Site Name:
Sampling Point Ref:
Project Reference:

Date:
Run: TPM

Mean Stack Temperature, oC	66.167
Traverse Stack Velocity, m/s	19.572
Stack Gas Volume Flow Rate, m3/s (acms)	553.395
Stack Gas Volume Flow Rate, m3/s. Wet, STP	442.926

Δp Measurement units (Pa or mmH2O)	mmH2O

Pitot Coeficiant	0.831

Barometric	758	mmHg	**Leak Test**		
Static			Instrument range	250	mmH2O
Port A	-25	mmH2O	Δp for leak test	187.5	mmH2O
Port B	-25	mmH2O	Positive leakage rate	0	per 15secs
Mean	**-25**	mmH2O	Negative leakage rate	0	per 15secs
			Pass/Fail	**Pass**	

Stagnation Test		
Static measurement		
Positive side	-25	mmH2O
Negative side	-25	mmH2O
Difference (Pa)	**0**	
Pass/Fail	**Pass**	

Stack Dimensions		
Rectangular A		(Width) m
Rectangular B		(Length) m
Circular diam A	6	m
Circular diam B	6	m
Circular Mean	6	m
Area	**28.27431**	m^2

Traverse Point	Distance	Port A Δ p, mmH2O				Swirl	Temp	Port B Δ p, mmH2O				Swirl	Temp
	m	Reading 1	Reading 2	Reading 3	Average	Degrees	°C	Reading 1	Reading 2	Reading 3	Average	Degrees	°C
1	0.20	30	30	30	**30**	0	67	29	29	29	**29**	0	64
2	0.63	32	32	32	**32**	0	68	31	31	31	**31**	0	66
3	1.16	32	32	32	**32**	0	68	31	31	31	**31**	0	67
4	1.94												
5	4.06												
6	4.84	30	30	30	**30**	0	67	31	31	31	**31**	0	66
7	5.37	31	31	31	**31**	0	67	31	31	31	**31**	0	66
8	5.80	30	30	30	**30**	0	64	28	28	28	**28**	0	64
9													
10													

Gas Data	
Oxygen %	6.00
CO_2 %	13.00
CO %	

Oxygen Correction	
Required Correction Value	
Actual Oxygen Factor	1.00
Leave BLANK if no O2 correction is required	

BS EN 13284-1 & M1 Sample Point Requirements	Requirement Met?
Duct gas Flow: angle with regard to duct access <15$^{o?}$	Y
Duct Gas Flow: No Negative Velocity: Not Permitted	Y
Duct Gas Flow: Ratio of max to min velocity <3:1?	Y
Working Area > 5$m^{2?}$	
Handrails with removable chains / self closing gates across the top of the ladder?	
Handrails (approx 0,5 and 1,0 m high) and vertical baseboards (approx 0,25m high)?	
Scaffold Built to 'Heavy Duty' Scafftag Rating or at least 2.5kN/m2 loading	
Handrails not restricting access to ports?	
Room opposite sampling port equal or greater than the length of the sampling probe plus 1 metre?	
Sufficient Power (Waterproof 110V BS4343 Standard) close or on the platform?	

2.4.1 Continuous Emissions Monitoring Systems at the installation

	SICK	ABB
Determinand	**Particulate**	**Oxygen**
Type	Cross Duct Forward Scatter	Zirconia Cell
Make	Erwin Sick	ABB
Model	Dusthunter C200	AZ20
MCERTS Certificate	MC090150/00	MC110191/01
QAL1 Compliance?	Yes	Yes
Certification ranges	0 – 0.3 extinction	0 to 25% 0 to 5%
Operational ranges	0 – 50 mg/m^3	0 to 25%vol
Principle	Opacity	Zirconia Cell
Raw data units	Extinction	%
Reference condition of raw data	wet gas, no oxygen, temp or pressure correction	wet gas
Signal output	Fibre optics	4 – 20mA
Provision for logging of 14181 data	Data logged by DCS	
Location of sample	Measurement taken at monitoring platform. SRM sample obtained from monitoring platform.	
Moisture – Measurement or calculated	Measured	Measured

Section 3 – Information about the Monitoring campaign

Table 3.1 - Monitoring Organisation Staff Details

Project Manager	Position	MCERTS Level	Technical Endorsements	Expiry Dates	MCERTS Registration Number
Glyn Harrison	Operations Manager (Stack Emissions)	2	1	10/19	MM 03 228
			2	06/17	
			3	12/21	
			4	07/20	

Site Team	Position	MCERTS Level	Technical Endorsements	Expiry Dates	MCERTS Registration Number
Edwin Powell	Consultant	2	1	12/17	MM 05 621
			2	12/17	
			3	12/17	
			4	12/17	
Daniel Lewis	Technician	1	--	-	MM 14 1291

Report Author	Position	MCERTS Level	Technical Endorsements	Expiry Dates	MCERTS Registration Number
Glyn Harrison	Operational Manager	2	1	10/19	MM 03 228
			2	06/17	
			3	12/21	
			4	07/20	

Report Reviewer	Position	MCERTS Level	Technical Endorsements	Expiry Dates	MCERTS Registration Number
Richard Harvey	Principal Consultant	2	1	11/17	MM 02 020
			2	03/20	
			3	03/21	
			4	12/20	

3.2 - Monitoring Organisation Method Details

Emission Parameter	Standard Method	Monitoring Procedure No.	Monitoring Accreditation Status	Analysis Technique	Expected Uncertainty (%)	Analysis Procedure No.	Analytical Laboratory	Analysis Accreditation Status
Oxygen	BS EN 14789:2005	RPSCE/1/21g	MCERTS	Zirconia Cell	5	N/A	N/A	N/A
Total particulate Matter	BS EN 13284:2002	RPSCE/1/7c	MCERTS	Gravimetric	10 - 30	D9	RPS	UKAS

Equipment details

Emission Parameter	Analysis Technique	Analyser	Analyser Certification Status	Certified Ranges	Operational Ranges	Operating Principle
Oxygen	Zirconia Cell	Horiba PG 250	MCERTs certificate No MC 050056/04	0 – 25%	0-25%	Extractive, multicomponent dry gas analyser. Sample extracted through sample probe and 5metre heated sample line (with integral heated filter) – line temperature 180^{o}C. Sample line connected directly to a gas conditioner (peltier cooler) set at 3^{o}C. Cold dry sample then passes to analyser. Sample is drawn through system by integral pump built into analyser.
Stack Gas Moisture	FTIR	Gasmet DX4000	MCERTs certificate No MC30014/05	0-40%	0-40%	Extractive wet gas analyser. Sample obtained non-isokinetically. Sample extracted through sample probe and filtered before passing through 5metre heated sample line (with integral heated filter) – line temperature 180^{o}C. Sample line connected directly to a heated sample pump which in turn was connected to the FTIR. Hot, wet sample then passes to analyser.
Total Particulate Matter	Multipoint isokinetic sampling with in stack filtration	N/A	N/A	0 – 50mg/m^{3}	-	Extractive manual test. Sample obtained isokinetically through sharp edged nozzle. Sample gas passed through a pre weighed, pre blown filter. Filter holder mounted in-stack.

Section 4A: Data & Calculations – QAL2 – Unit 9, SICK Dusthunter

A4.1 Table 4.1 – Raw monitoring Data – Total Particulate Matter

Test No	Date	Test Start Time	Test End Time	CEMS Raw Value (Extinction)	CEMS Oxygen (dry)	CEMS Moisture (Wet)	CEM Stack Temp	CEM Stack Press	SRM Raw value (dry)	SRM Moisture (Wet FT)	SRM Oxygen (Dry)	SRM Stack Temp	SRM Stack Press	SRM at CEMs Raw conditions
		hr:min		%	(%)	(%)	C	kpa	(mg/m3)	(%)	(%)	C	kpa	(mg/m3)
1	18-Oct-16	10:07	11:07	5.7	5.6	2.2	63.5	101.6	6.4	2.7	5.8	64.0	100.8	5.0
2	18-Oct-16	11:14	12:14	4.4	5.8	2.2	63.5	101.7	14.4	2.7	5.7	64.0	100.8	11.3
3	18-Oct-16	12:20	13:20	5.7	5.9	2.2	64.1	101.7	13.6	2.8	5.7	64.0	100.8	10.7
4	18-Oct-16	13:28	14:28	7.1	6.0	2.1	64.2	101.7	17.1	2.8	5.9	64.0	100.8	13.4
5	18-Oct-16	14:34	15:34	11.6	6.2	1.7	64.1	101.7	30.0	2.6	6.1	64.0	100.8	23.6
6	18-Oct-16	15:41	16:41	9.6	6.1	2.1	65.3	101.7	25.3	2.7	6.0	64.0	100.8	19.8
7	19-Oct-16	9:35	10:35	7.6	5.9	2.3	63.9	101.9	24.1	2.9	5.8	62.0	100.8	19.0
8	19-Oct-16	10:43	11:43	5.6	6.0	2.3	62.4	101.9	13.7	2.9	5.9	62.8	100.8	10.8
9	19-Oct-16	11:50	12:50	5.3	6.1	2.4	61.5	101.9	12.3	2.9	6.0	62.0	100.8	9.7
10	19-Oct-16	12:57	13:57	6.0	6.4	2.4	61.9	101.9	14.7	3.0	6.3	62.3	100.8	11.5
11	19-Oct-16	14:04	15:04	5.7	6.4	2.5	63.6	101.9	13.0	3.0	6.3	65.4	100.8	10.1
12	19-Oct-16	15:10	16:10	7.5	6.3	2.1	65.7	101.9	24.3	3.0	6.2	64.0	100.8	19.0
13	20-Oct-16	10:18	11:18	6.2	7.2	2.1	64.9	101.8	8.9	2.7	7.1	62.0	100.8	7.0
14	20-Oct-16	11:28	12:28	4.2	6.8	2.1	65.5	101.8	11.2	2.7	6.7	62.0	100.8	8.9
15	20-Oct-16	12:35	13:35	3.5	6.9	2.2	64.8	101.8	8.4	2.7	6.8	64.0	100.8	6.6
16	20-Oct-16	13:43	14:43	4.2	7.0	2.2	64.9	101.8	7.1	2.8	6.9	64.0	100.8	5.6
17	20-Oct-16	14:50	15:50	4.6	7.4	1.9	64.7	101.8	13.5	2.8	7.3	64.0	100.8	10.5
18	20-Oct-16	15:56	16:56	3.2	6.4	2.2	65.6	101.8	4.9	2.9	6.3	64.0	100.8	3.8

Note:

Emission concentrations expresed at reference conditions 273K, 101.3kPa.

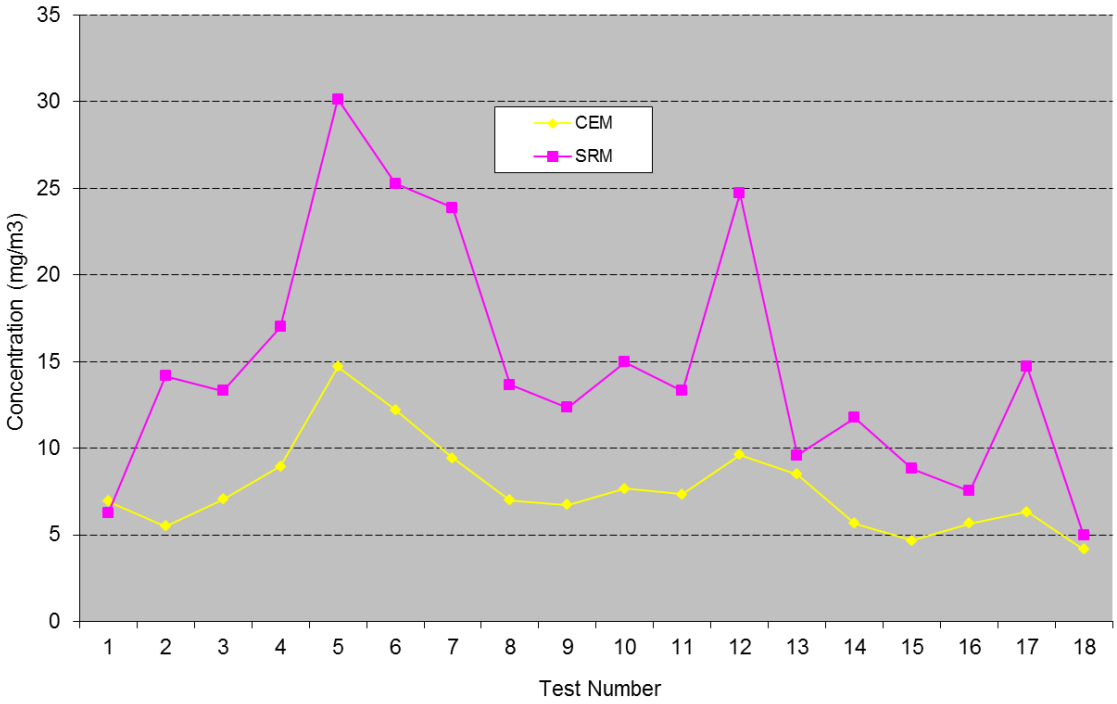
A4.2 Table 4.2 - Standardised monitoring Data – Total Particulate Matter

Test No	Date	Test Start Time	Test End Time	CEMS Standardised Value	SRM Standardised Value	SRM Uncertainty
		hr:min		(mg/m3)	mg/m3)	(mg/m3)
1	18-Oct-16	10:07	11:07	6.9	6.3	0.27
2	18-Oct-16	11:14	12:14	5.5	14.2	0.47
3	18-Oct-16	12:20	13:20	7.1	13.3	0.46
4	18-Oct-16	13:28	14:28	8.9	17.0	0.57
5	18-Oct-16	14:34	15:34	14.7	30.1	0.96
6	18-Oct-16	15:41	16:41	12.2	25.3	0.81
7	19-Oct-16	9:35	10:35	9.4	23.9	0.78
8	19-Oct-16	10:43	11:43	7.0	13.7	0.46
9	19-Oct-16	11:50	12:50	6.7	12.3	0.43
10	19-Oct-16	12:57	13:57	7.7	15.0	0.49
11	19-Oct-16	14:04	15:04	7.4	13.3	0.45
12	19-Oct-16	15:10	16:10	9.6	24.7	0.78
13	20-Oct-16	10:18	11:18	8.5	9.6	0.32
14	20-Oct-16	11:28	12:28	5.7	11.8	0.40
15	20-Oct-16	12:35	13:35	4.7	8.8	0.33
16	20-Oct-16	13:43	14:43	5.7	7.5	0.30
17	20-Oct-16	14:50	15:50	6.3	14.7	0.47
18	20-Oct-16	15:56	16:56	4.2	5.0	0.25

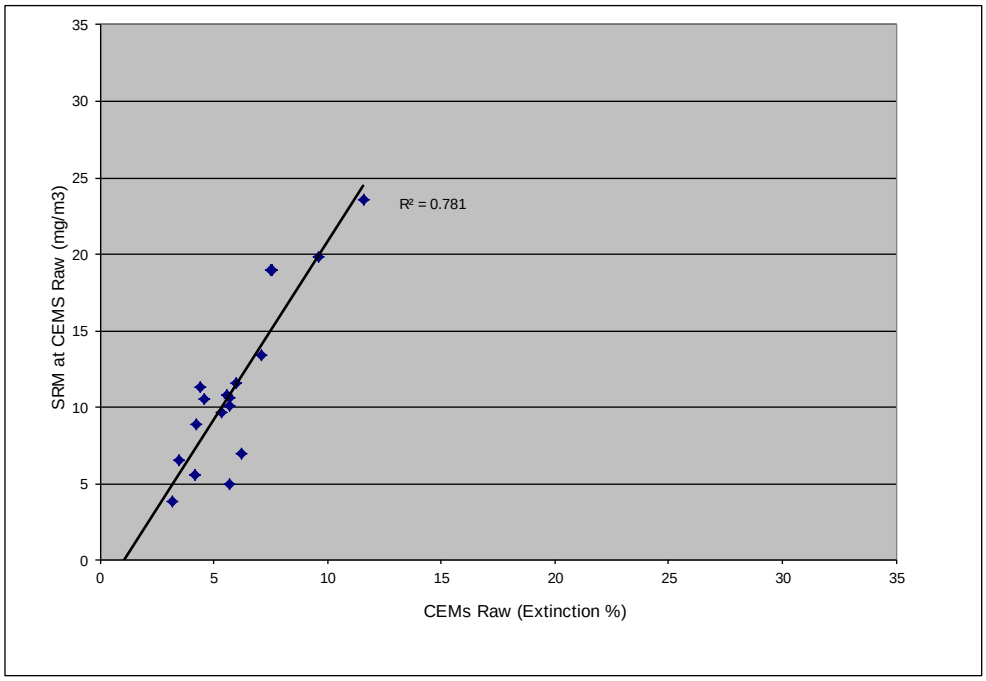
Note:

Emission concentrations expresed at reference conditions 273K, 101.3kPa 6 % Oxygen, dry gas

A4.3 – Plot 1 - Time Series of Standardised CEM versus Standardised SRM data – Total Particulate Matter, (Expressed at reference conditions 273K, 101.3kPa, dry gas, 6% oxygen)



A4.4 – Elimination of Outliers – Total Particulate Matter,



Test No	Test Start Time	Test End Time	CEMS Raw Value (Extinction)	SRM Value at CEMS Raw conditions	Difference Di	Difference Di - $\bar{D}i$	Is Result an Outlier - Di-$\bar{D}i$> 2SD
	hr:min		%	(mg/m3)			
1	10:07	11:07	5.7	5.0	-0.69	-6.17	No
2	11:14	12:14	4.4	11.3	6.87	1.40	No
3	12:20	13:20	5.7	10.7	4.99	-0.49	No
4	13:28	14:28	7.1	13.4	6.29	0.82	No
5	14:34	15:34	11.6	23.6	11.99	6.51	No
6	15:41	16:41	9.6	19.8	10.22	4.75	No
7	09:35	10:35	7.6	19.0	11.42	5.95	No
8	10:43	11:43	5.6	10.8	5.18	-0.30	No
9	11:50	12:50	5.3	9.7	4.37	-1.11	No
10	12:57	13:57	6.0	11.5	5.58	0.10	No
11	14:04	15:04	5.7	10.1	4.44	-1.03	No
12	15:10	16:10	7.5	19.0	11.51	6.04	No
13	10:18	11:18	6.2	7.0	0.80	-4.68	No
14	11:28	12:28	4.2	8.9	4.60	-0.87	No
15	12:35	13:35	3.5	6.6	3.08	-2.40	No
16	13:43	14:43	4.2	5.6	1.37	-4.11	No
17	14:50	15:50	4.6	10.5	5.95	0.48	No
18	15:56	16:56	3.2	3.8	0.60	-4.87	No
				Average $\bar{D}i$	5.48		
			Standard Deviation		3.83		
			Standard Deviation x2		7.66		

A4.5 Determination of Method A or Method B - Total Particulate Matter

Test No	Test Start Time	Test End Time	SRM measured value (y)	SRM Moisture	SRM O2	SRM Standardised
	hr:min		(mg/m3)	(%)	(%)	(mg/m3)
1	10:07	11:07	6.4	2.7	5.8	6.4
2	11:14	12:14	14.4	2.7	5.7	20.4
3	12:20	13:20	13.6	2.8	5.7	19.2
4	13:28	14:28	17.1	2.8	5.9	24.6
5	14:34	15:34	30.0	2.6	6.1	43.4
6	15:41	16:41	25.3	2.7	6.0	36.4
7	9:35	10:35	24.1	2.9	5.8	34.5
8	10:43	11:43	13.7	2.9	5.9	19.7
9	11:50	12:50	12.3	2.9	6.0	17.8
10	12:57	13:57	14.7	3.0	6.3	21.7
11	14:04	15:04	13.0	3.0	6.3	19.2
12	15:10	16:10	24.3	3.0	6.2	35.7
13	10:18	11:18	8.9	2.7	7.1	13.8
14	11:28	12:28	11.2	2.7	6.7	17.0
15	12:35	13:35	8.4	2.7	6.8	12.7
16	13:43	14:43	7.1	2.8	6.9	10.9
17	14:50	15:50	13.5	2.8	7.3	21.2
Sum			257.98			

Emission Limit Value (ELV) =	35	mg/Nm^3	Y_{max}		43.41
Maximum Permissable uncertainty =	30	%	Y_{min}		6.43
Maximum Permissable uncertainty (at	11	mg/Nm^3			36.99
15% of the ELV =	5.25	mg/Nm^3			
Is Ymax - Ymin > MPU at ELV?	Yes		$Y_{max - Ymin}$	36.99	
Is Ymin > 15% of ELV?	Yes				

Derivation of Calibration Function	**Method A**

A4.6 Table 4.3 - Data used to derive calibration function - Total Particulate Matter,

Test No	Test Start Time	Test End Time	SRM at CEMs Raw conditions	CEMS Raw Value (Extinction)
	hr:min		(mg/m3)	%
1	Reference		0.0	0.0
2	10:07	11:07	5.0	5.7
3	11:14	12:14	11.3	4.4
4	12:20	13:20	10.7	5.7
5	13:28	14:28	13.4	7.1
6	14:34	15:34	23.6	11.6
7	15:41	16:41	19.8	9.6
8	9:35	10:35	19.0	7.6
9	10:43	11:43	10.8	5.6
10	11:50	12:50	9.7	5.3
11	12:57	13:57	11.5	6.0
12	14:04	15:04	10.1	5.7
13	15:10	16:10	19.0	7.5
14	10:18	11:18	7.0	6.2
15	11:28	12:28	8.9	4.2
16	12:35	13:35	6.6	3.5
17	13:43	14:43	5.6	4.2
18	14:50	15:50	10.5	4.6
19	15:56	16:56	3.8	3.2
Sum			206.22	107.63

Yi	Xi	Xi * Yi	Xi^2	b
1	2	3	4	
-10.85	-5.66	61.48	32.09	
-5.86	0.02	-0.09	0.00	
0.46	-1.23	-0.56	1.51	
-0.19	0.01	0.00	0.00	
2.54	1.44	3.65	2.07	
12.73	5.93	75.47	35.15	
8.96	3.92	35.14	15.39	
8.14	1.91	15.51	3.63	
-0.07	-0.06	0.00	0.00	
-1.15	-0.32	0.37	0.10	
0.69	0.30	0.21	0.09	
-0.72	0.03	-0.02	0.00	
8.14	1.82	14.80	3.30	
-3.86	0.53	-2.05	0.28	
-2.00	-1.41	2.83	2.00	
-4.29	-2.17	9.32	4.73	
-5.30	-1.48	7.85	2.19	
-0.32	-1.08	0.34	1.17	
-7.05	-2.46	17.37	6.07	
0.00	0.00	241.64	109.80	2.20

A4.7 Determination of Calibration Function - Total Particulate Matter

Method A

If Ymax-Ymin >15% of the ELV, the following formulae are used:

$b=\sum_{i=1}^{N}(xi-x)(y$ where $x=1/N\sum_{i=1}^{N}xi$ $y=1/N\sum_{i=1}^{N}yi$

$x=$ 5.66

$y=$ 10.85

$b=$ 2.201

$a=y-bx$ $a = 10.86 - 5.67 * 2.2$ $a=$ -1.613

The calibration is function $y_i = a + bxi$ or $yi =$ -1.613 + 2.201 * xi

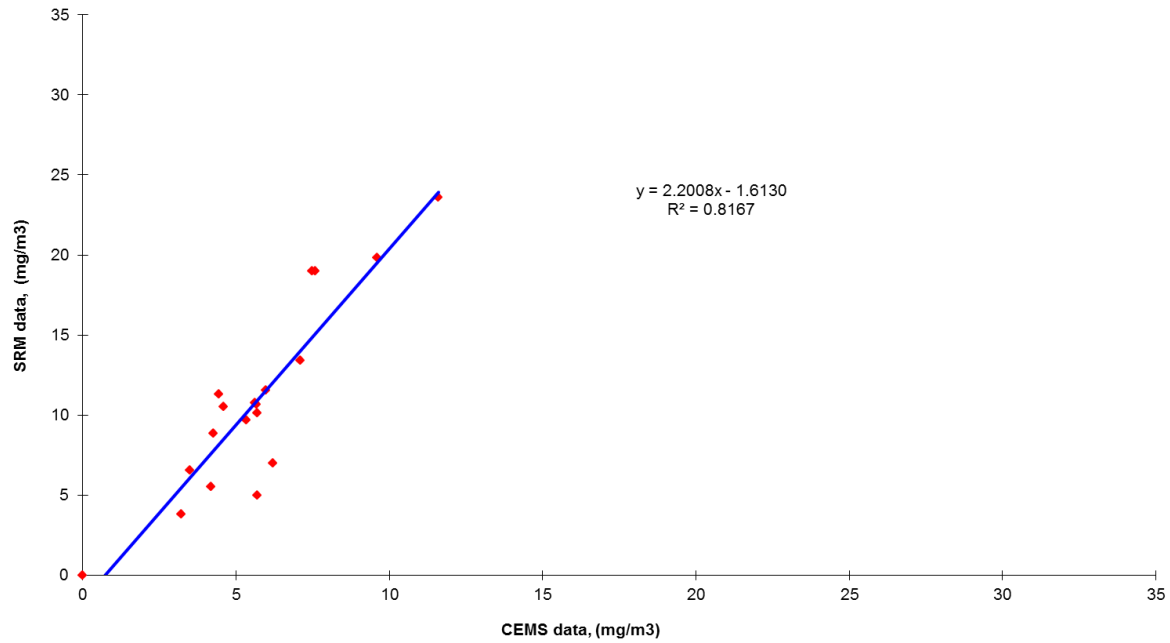
A4.8 Table 4.4 - Calculation of calibrated CEMS values - Total Particulate Matter

Test No	Test Start Time	Test End Time	CEMS Raw Value (Extinction)	CEMS Calibrated signal	CEMS Moisture	CEMS Temp	CEMS Pressure	CEMS Dry Oxygen	CEMS Standardised Value (dry)	CEMS Calibrated Standardised Value	SRM Standardised
	hr:min		%	(mg/m3)	(%)	(°C)	(kPa)	(%)	(mg/Nm^3)	(mg/Nm^3)	(mg/m3)
1	Reference		0.0	-1.6	0.0			0.0	0.0	-1.6	0.0
2	10:07	11:07	5.7	10.9	2.2	63.5	101.6	5.6	6.9	13.3	6.3
3	11:14	12:14	4.4	8.1	2.2	63.5	101.7	5.8	5.5	10.1	14.2
4	12:20	13:20	5.7	10.9	2.2	64.1	101.7	5.9	7.1	13.5	13.3
5	13:28	14:28	7.1	14.0	2.1	64.2	101.7	6.0	8.9	17.7	17.0
6	14:34	15:34	11.6	23.9	1.7	64.1	101.7	6.2	14.7	30.3	30.1
7	15:41	16:41	9.6	19.5	2.1	65.3	101.7	6.1	12.2	24.8	25.3
8	09:35	10:35	7.6	15.0	2.3	63.9	101.9	5.9	9.4	18.7	23.9
9	10:43	11:43	5.6	10.7	2.3	62.4	101.9	6.0	7.0	13.4	13.7
10	11:50	12:50	5.3	10.1	2.4	61.5	101.9	6.1	6.7	12.8	12.3
11	12:57	13:57	6.0	11.5	2.4	61.9	101.9	6.4	7.7	14.8	15.0
12	14:04	15:04	5.7	10.9	2.5	63.6	101.9	6.4	7.4	14.1	13.3
13	15:10	16:10	7.5	14.9	2.1	65.7	101.9	6.3	9.6	19.1	24.7
14	10:18	11:18	6.2	12.0	2.1	64.9	101.8	7.2	8.5	16.5	9.6
15	11:28	12:28	4.2	7.7	2.1	65.5	101.8	6.8	5.7	10.3	11.8
16	12:35	13:35	3.5	6.1	2.2	64.8	101.8	6.9	4.7	8.1	8.8
17	13:43	14:43	4.2	7.6	2.2	64.9	101.8	7.0	5.7	10.3	7.5
18	14:50	15:50	4.6	8.5	1.9	64.7	101.8	7.4	6.3	11.7	14.7
19	15:56	16:56	3.2	5.4	2.2	65.6	101.8	6.4	4.2	7.1	5.0
				Sum					138.11		

Emission Limit Value (ELV) = 35 mg/Nm^3

Reference Oxygen 6 %

A4.9 Plot 2 CEM versus SRM Parallel Test Data at CEM measurement conditions –NOx ppm, wet gas.



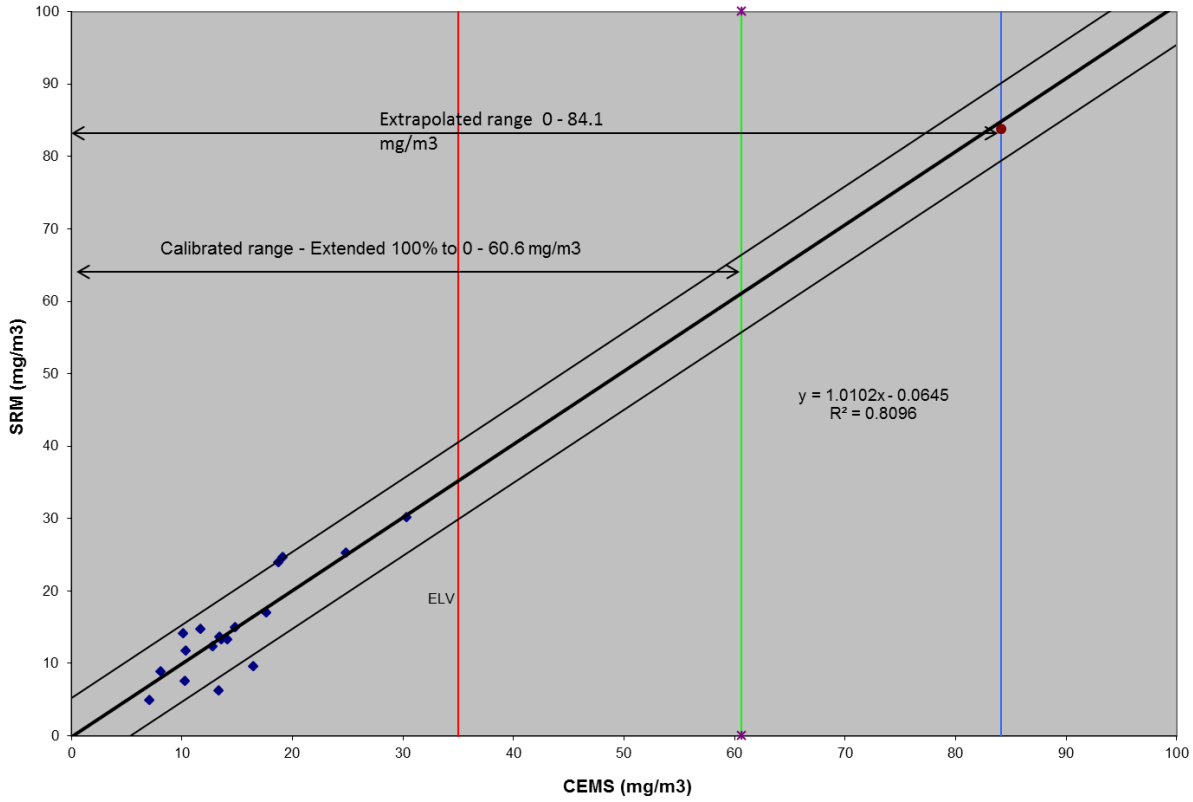
A4.10 Table 4.5 – Data used for the Variability Test – Total Particulate Matter

Test No	Test Start Time	Test End Time	CEMS Calibrated Standardised value	SRM Standardised value	Difference D1	Difference D1 - D	Squared Difference D1 - D
	hr:min		mg/m3	mg/m3			
2	10:07	11:07	13.3	6.3	-7.06	-7.05	49.69
3	11:14	12:14	10.1	14.2	4.07	4.08	16.63
4	12:20	13:20	13.5	13.3	-0.22	-0.21	0.04
5	13:28	14:28	17.7	17.0	-0.64	-0.63	0.40
6	14:34	15:34	30.3	30.1	-0.16	-0.16	0.02
7	15:41	16:41	24.8	25.3	0.45	0.46	0.21
8	09:35	10:35	18.7	23.9	5.14	5.14	26.45
9	10:43	11:43	13.4	13.7	0.29	0.30	0.09
10	11:50	12:50	12.8	12.3	-0.43	-0.42	0.18
11	12:57	13:57	14.8	15.0	0.18	0.19	0.04
12	14:04	15:04	14.1	13.3	-0.80	-0.79	0.63
13	15:10	16:10	19.1	24.7	5.59	5.60	31.37
14	10:18	11:18	16.5	9.6	-6.89	-6.88	47.37
15	11:28	12:28	10.3	11.8	1.43	1.44	2.06
16	12:35	13:35	8.1	8.8	0.72	0.72	0.52
17	13:43	14:43	10.3	7.5	-2.71	-2.71	7.33
18	14:50	15:50	11.7	14.7	3.00	3.01	9.05
19	15:56	16:56	7.1	5.0	-2.09	-2.08	4.34
18 Tests		Mean			-0.01		
Sum							196.44

A4.11 - Variability Test Calculation – Total Particulate Matter

SD=	Root(1-Number).Integral(D1-D)^2		3.40	mg/m3(s,d),6%O2
The uncertainty laid down by the authorities is 30% ELV as a 95% confidence interval. O_0 is therefore calculated as:-				
O_0=	0.3*35 mg/m3 (s,d,6%O2)/1.96		5.36	mg/m3(s,d),6%O2
For 18 tests, t0.95(N-1) =	0.9803			
Therefore variability=		3.4 <= 5.36 * 0.9803		
or	3.40	<=	5.25	
Which is TRUE therefore the CEMS passes the test				

A4.12 Plot 3 –Standardised CEM data versus standardised SRM - Total Particulate Matter – Reference conditions 273K, 101.3kPa, dry gas, 6% oxygen



Section 5 – Results of Functional tests

Table 5.1 - Audit of functional tests

Operator	RWE Generation UK plc.	
Site	Aberthaw Power Plant	
Stack	Unit 9	
Process Sector	LCPD	
Analyser A - Make Model MCERTs Certificate Number	Erwin SICK Dusthunter C200, Cross Duct Forward Scatter MC090150/00	
Parameters Tested	**Daily ELV**	**Certified range**
Total Particulate Matter	35 mg/m^3	Erwin SICK: TPM = 0 – 200 mg/m3

Analyser A	
Organisation carrying out tests -	SICK
Status of organisation – CEMS manufacturer/operator/service contractor	CEMS OEM
Test engineer	P Burgess
Date of tests	5th – 11th October 2016

Functional Test compliance with EN 14181

Requirement	Compliance Y/N	Notes
1 – Alignment and cleanliness All checks specified in MID 14181 carried out ? – Sampling System A visual inspection of the sampling system shall be performed, noting the condition of the following components, when fitted: - sampling probe; - gas conditioning systems; - pumps; - all connections; - sample lines; - power lines; - filters. The sampling system shall be in good condition and free of any visible faults, which may decrease the quality of the testing.	Yes	Yes – Optics cleaned
	Yes	
2 - Leak Test Leak testing shall be performed according to the AMS manuals. The test shall cover the entire sampling system.	N/A	N/A
Results of leak check compliant with requirements of relevant standards	N/A	
3 - Zero and Span Check Analyser Reference zero and span materials shall be used to verify the corresponding readings of the AMS.	Yes	Yes – although based on the use of filters
Results compliant with requirements of relevant standards Parameter:		
TPM	Yes	Span values recorded as mA signals

Requirement	Compliance Y/N	Notes
4 - Zero and Span Check Full System Reference zero and span materials shall be used to verify the corresponding readings of the AMS.	N/A	Analyser is 'in situ type' and therefore there is as such, no 'full system'.
5 – NOx converter efficiency check	N/A	
6 - Linearity The linearity of the analysers shall be checked using five different reference materials, including zero concentration.	Yes	Yes – although based on the use of filters
The reference material with zero concentration, as well as the reference materials with four different concentrations, shall have a verifiable quantity and quality.	Yes	Yes – although based on the use of filters
The reference material concentrations shall be selected such that the measured values are approximately 20%, 40%, 60% and 80% of two times the emission limit.	See note	Used 8 points using filters
The dry test reference material shall be applied to the inlet of the AMS. Reference materials can be introduced directly into the analyser as long as the integrity of the sample system has been proved	N/A	N/A

Requirement	Compliance Y/N	Notes
6 – Linearity (continued) After each change in concentration, the first instrument readings shall be taken after a time period equal to at least three times the response time of the AMS. At each reference material concentration, at least three readings shall be made. The time period between the start of each of the three readings shall be separated by at least four times the response time. A risk based approach may be adopted in order to reduce the time for the linearity tests	No N/A	No times stated in report
Linearity Test Pass Parameter		Yes
TPM	Yes	
6 – Interferences (only required in the event of a failure of the QAL 2/AST)	N/A	
7 – Zero and Span Drift (Audit)	Yes	
8- Response time The response of the AMS shall be checked. This can be performed, if appropriate, by feeding the reference material at the end of the sampling probe. The response time shall not exceed the measured value as identified during QAL 1.	Yes	Yes

Requirement	Compliance Y/N	Notes
9c – Service Report		
• Document reference	Yes	
• Instrument manufacturer	Yes	
• Instrument Type	Yes	
• Instrument model	Yes	
• Instrument Serial No's	Yes	
• Operating principal	Yes	
• Operating range	Yes	
• Certification details	Yes	
• Compliance with MCERTS	Yes	
• Location	Yes	
• Date and time of work	Yes	Date Only
• Equipment used - Type serial no's etc	Yes	On Linearity Sheet
• Gases used – certificate numbers, expiry dates, type	N/A	Linearity carried out using filters. Filter set serial numbers stated (F1 to F8)
• NOx converter efficiency check	N/A	
• Calibration and linearity data	Yes	
• Logged data for period of calibration/linearity	Yes	Data supplied separately by client
• Name & signature of test engineer	Yes	

Unit 9 – Dusthunter C200

Customer data

Customer:	RWE nPower	Customer no:	SVON019128
Country:	UK	City:	Cardiff
Plant:	Aberthaw Power Station	Location:	Unit 9 - Stack

1. Device data

Device type:	DHC200	Device no:	T1044863 / R1044865
Seral no:	T11278660 R11278667		
Purge air version:	integrated MCU ☐	External blower ☒	

2. Plant data

Location:	Outside ☐	Under cover ☐	Inside ☒		
Orientation of the stack/duct	Horizontal ☐	Vertical ☒	Angle of		°
Orientation of the DUSTHUNTER	Horizontal ☐	Vertical ☒	Angle of		°
Flange-Flange distance	7344	mm	Active measurement distance	7344	mm
Zero point distance	7344	mm	Differential pressure		hpa
Ambient temperature	20	°C	Gas temperature	60	°C
MCU on site	☒		MCU relocated	☐	
Plant operating status	DH in W/Shop		Dew point		°C

3. Prerequisite

		Y	N	Remarks
3.1.	Documentation + Delivery complete	☒	☐	Yes
3.2.	Platform at measurement spot has suitable dimension?	☒	☐	Yes
3.3.	Has an official institute acknowledged this measurement spot, if it is under a legal regulation?	☒	☐	EA
3.4.	Customer specific data for parameterization available?	☒	☐	Yes
3.5.	External purge air unit installed and electrically connected? (option)	☒	☐	Instrument Air used as purge
3.6.	MCU unit installed and electrically connected?	☒	☐	Yes
3.7.	Zero point stands / tube available and distance corresponding to Fl/Fl at measuring point ?	☒	☐	Yes

4. Preliminary work		Y	N	Remarks
4.1.	Mounting of flanges as described in the Operating Instruction?	☒	☐	Correctly Installed
4.2.	Check for damage	☒	☐	No damage
4.3.	Check ambient conditions (ref. ch. 2)	☒	☐	Good
4.4.	Check mounting conditions (ref. ch. 2)	☒	☐	Good
4.5.	Check mounting	☒	☐	Aligned and secure
4.6.	Check cables / wires for correct installation	☒	☐	Good
4.7.	Check main power supply voltage	☒	☐	

5. Purge Air Unit (integrated or external version)		Y	N	Remarks
5.1.	Purge air unit type			Instrument Air
5.2.	Check the rotation direction	☐	☐	NA
5.3.	Check hoses for correct installation	☒	☐	Leak free
5.4.	Purge air heating installed? (Option)	☐	☒	No
5.5.	Differential pressure monitor installed? (Option)	☐	☒	NA

6. Sender/receiver, reflector/scattered light receiver unit and MCU			
	Y	N	Remarks
6.1. Clean all optical surfaces	☒	☐	All optical surfaces cleaned
6.2. Check power supply voltages	☒	☐	240V
6.3. Check emission free zero point	☒	☐	Checked on test stands
6.4. Adjust DUSTHUNTER at zero point stands or tube (focussing, alignment and adjustment of the DUSTHUNTER according operating instruction - transmission and scattered light beam)	☒	☐	Reading Zero, no adjustments made
6.5. Connect purge air to the DUSTHUNTER	☐	☒	NA
6.6. Check and adjust differential pressure monitor (option)	☐	☒	NA
6.7. Install the DUSTHUNTER at the measuring point.	☒	☐	Device re-installed
6.8. Check self alignment	☒	☐	High Range well aligned Low Range (laser) required alignment
6.9. Standard parameterization with SOPAS ET	☒	☐	OK
6.10. DUST calibration values available	☒	☐	Refer to linearity report
6.11. Interface modul parameterization (option)	☒	☐	AO2 & AO3 now used
6.12. Check parameterization and start measuring	☒	☐	Parameterisation correct
6.13. Check signals and function control	☒	☐	Signals checked to DCS
6.14. Check if measured values are plausible (ref. Ch. 8)	☒	☐	As expected
6.15. Note software revision DUSTHUNTER	☒	☐	Version 1.1
6.16. Note Software revision MCU	☒	☐	Version 1.8
6.17. Save device data	☒	☐	SOPAS project saved
6.18. Instruct the operator personnel	☒	☐	Well informed engineers
6.19. Instruct reading of the measured values	☒	☐	As above
6.20. Instruct maintenance (hand over the maintenance manual)	☒	☐	As above
6.21. Instruct reading warnings and error messages and steps	☒	☐	As above

7. Input / Output / Ranges MCU

7.1. Analog output / Display

Live zero: mA | Output of control values: Y ☒ / N ☐

Analog output	Source	Range Start	Range End	Unit	Reading (actual)	Control value ☐	Zero point		Span point	
										mA
1	NOT USED					☐		mA		mA
2	Extinction	0.0	1.6	Ex	0.00	☒	4.0	mA	15.2	mA
3	Scattered Light	0.0	60	mg/m^3	0.00	☒	4.0	mA	15.2	mA

7.2. Analog input

Analog input	Source	Unit	Live zero	Start	End
1					
2					

7.3. Digital output

Digital output	Signal	Inv.
1		☐
2		☐
3		☐
4		☐
5		☐

7.4. Digital input

Digital input	Source	Inv.
1		☐
2		☐
3		☐
4		☐

8. Dust measurement values after commissioning

	Unit	Range	Reading	Zero point	Span point
Opacity	%		0%		
Dust (Trans.)	mg/m³		0.0		
Transm.	%		94.9%		
Extinction	-	0 – 1.6	0.0245	0.00%	70.00%
Rel.Opacity	%		2.7%		
Dust (SL)	mg/m³	0 – 60	0.0	0.0439	70.0096
Scattered Light	-		-0.005		

Remarks

All ok.

Date : 05.10.2016

Name

Plant personnel: Ian Jauncey

Engineer: Paul Burgess.

Unit 9 – Dusthunter C200

Customer data

Customer:	RWE nPower	Customer no:	SVON019128
Country:	UK	City:	Cardiff
Plant:	Aberthaw Power Station	Location:	Unit 7 - Stack

1. Device data

Device type:	DHC200	Device no:	T1044863 / R1044865
Seral no:	T11278662 R11278666		
Purge air version:	integrated MCU ☐	External blower ☒	

2. Plant data

Location:	Outside ☐	Under cover ☐	Inside ☒		
Orientation of the stack/duct	Horizontal ☐	Vertical ☒	Angle of		°
Orientation of the DUSTHUNTER	Horizontal ☐	Vertical ☒	Angle of		°
Flange-Flange distance	7344	mm	Active measurement distance	7344	mm
Zero point distance	7344	mm	Differential pressure		hpa
Ambient temperature	20	°C	Gas temperature	60	°C
MCU on site	☒		MCU relocated	☐	
Plant operating status	ON STACK		Dew point		°C

3. Prerequisite

		Y	N	Remarks
3.1.	Documentation + Delivery complete	☒	☐	Yes
3.2.	Platform at measurement spot has suitable dimension?	☒	☐	Yes
3.3.	Has an official institute acknowledged this measurement spot, if it is under a legal regulation?	☒	☐	EA
3.4.	Customer specific data for parameterization available?	☒	☐	Yes
3.5.	External purge air unit installed and electrically connected? (option)	☒	☐	2 x BLOWERS
3.6.	MCU unit installed and electrically connected?	☒	☐	Yes
3.7.	Zero point stands / tube available and distance corresponding to FI/FI at measuring point ?	☒	☐	Yes

4. Preliminary work	Y	N	Remarks
4.1. Mounting of flanges as described in the Operating Instruction?	☒	☐	Correctly Installed
4.2. Check for damage	☒	☐	No damage
4.3. Check ambient conditions (ref. ch. 2)	☒	☐	Good
4.4. Check mounting conditions (ref. ch. 2)	☒	☐	Good
4.5. Check mounting	☒	☐	Aligned and secure
4.6. Check cables / wires for correct installation	☒	☐	Good
4.7. Check main power supply voltage	☒	☐	ok

5. Purge Air Unit (integrated or external version)	Y	N	Remarks
5.1. Purge air unit type			2 X BLOWERS
5.2. Check the rotation direction	☒	☐	OK
5.3. Check hoses for correct installation	☒	☐	Leak free
5.4. Purge air heating installed? (Option)	☐	☒	No
5.5. Differential pressure monitor installed? (Option)	☒	☐	Closes on fail

6. Sender/receiver, reflector/scattered light receiver unit and MCU	Y	N	Remarks
6.1. Clean all optical surfaces	☒	☐	All optical surfaces cleaned
6.2. Check power supply voltages	☒	☐	240V
6.3. Check emission free zero point	☒	☐	Checked on test stands
6.4. Adjust DUSTHUNTER at zero point stands or tube (focussing, alignment and adjustment of the DUSTHUNTER according operating instruction - transmission and scattered light beam)	☒	☐	Reading Zero, no adjustments made
6.5. Connect purge air to the DUSTHUNTER	☒	☐	OK
6.6. Check and adjust differential pressure monitor (option)	☒	☐	OK
6.7. Install the DUSTHUNTER at the measuring point.	☒	☐	Device re-installed
6.8. Check self alignment	☒	☐	OK
6.9. Standard parameterization with SOPAS ET	☒	☐	OK
6.10. DUST calibration values available	☒	☐	YES
6.11. Interface modul parameterization (option)	☒	☐	AO2 & AO3 now used
6.12. Check parameterization and start measuring	☒	☐	Parameterisation correct
6.13. Check signals and function control	☒	☐	Signals checked to DCS
6.14. Check if measured values are plausible (ref. Ch. 8)	☒	☐	As expected
6.15. Note software revision DUSTHUNTER	☒	☐	Version 1.1
6.16. Note Software revision MCU	☒	☐	Version 1.8
6.17. Save device data	☒	☐	SOPAS project saved
6.18. Instruct the operator personnel	☒	☐	Well informed engineers
6.19. Instruct reading of the measured values	☒	☐	As above
6.20. Instruct maintenance (hand over the maintenance manual)	☒	☐	As above
6.21. Instruct reading warnings and error messages and steps	☒	☐	As above

7. Input / Output / Ranges MCU

7.1. Analog output / Display

Live zero: mA | Output of control values: Y ☐ / N ☒

Analog output	Source	Range Start	Range End	Unit	Reading (actual)	Control value ☐	Zero point		Span point	
								mA		mA
1	NOT USED					☐		mA		mA
2	Extinction	0.0	1.6	Ex	0.00	☒	4.0	mA	15.2	mA
3	Scattered Light	0.0	60	mg/m^3	0.00	☒	4.0	mA	15.2	mA

7.2. Analog input

Analog input	Source	Unit	Live zero	Start	End
1					
2					

7.3. Digital output

Digital output	Signal	Inv.
1		☐
2		☐
3		☐
4		☐
5		☐

7.4. Digital input

Digital input	Source	Inv.
1		☐
2		☐
3		☐
4		☐

8. Dust measurement values after service

	Unit	Range	Reading	Zero point	Span point
Opacity	%		5.9%		
Dust (Trans.)	mg/m³		0.0		
Transm.	%		94%		
Extinction	-	0 – 1.6	0.0239	0.00%	70.00%
Rel.Opacity	%		2.8%		
Dust (SL)	mg/m³	0 – 60	16.7	0.02	70.00
Scattered Light	-		-0.005		

Remarks

All ok.

Date : 11.10.2016

Name

Plant personnel: Ian Jauncey

Engineer: Paul Burgess

Unit 9 – Dusthunter C200

Customer data

Customer:	RWE nPower	Customer no:	SVON019128
Country:	UK	City:	Cardiff
Plant:	Aberthaw Power Station	Location:	Unit 9 - Stack

1. Device data

Device type:	DHC200	Device no:	T1044863 / R1044865
Seral no:	T11278663 R11278664		
Purge air version:	integrated MCU ☐	External blower ☒	

2. Plant data

Location:	Outside ☐	Under cover ☐	Inside ☒		
Orientation of the stack/duct	Horizontal ☐	Vertical ☒	Angle of		°
Orientation of the DUSTHUNTER	Horizontal ☐	Vertical ☒	Angle of		°
Flange-Flange distance	7344	mm	Active measurement distance	7344	mm
Zero point distance	7344	mm	Differential pressure		hpa
Ambient temperature	20	°C	Gas temperature	60	°C
MCU on site	☒		MCU relocated	☐	
Plant operating status	DH in W/Shop		Dew point		°C

3. Prerequisite

		Y	N	Remarks
3.1.	Documentation + Delivery complete	☒	☐	Yes
3.2.	Platform at measurement spot has suitable dimension?	☒	☐	Yes
3.3.	Has an official institute acknowledged this measurement spot, if it is under a legal regulation?	☒	☐	EA
3.4.	Customer specific data for parameterization available?	☒	☐	Yes
3.5.	External purge air unit installed and electrically connected? (option)	☒	☐	2 x BLOWERS
3.6.	MCU unit installed and electrically connected?	☒	☐	Yes
3.7.	Zero point stands / tube available and distance corresponding to FI/FI at measuring point ?	☒	☐	Yes

4. Preliminary work	Y	N	Remarks
4.1. Mounting of flanges as described in the Operating Instruction?	☒	☐	Correctly Installed
4.2. Check for damage	☒	☐	No damage
4.3. Check ambient conditions (ref. ch. 2)	☒	☐	Good
4.4. Check mounting conditions (ref. ch. 2)	☒	☐	Good
4.5. Check mounting	☒	☐	Aligned and secure
4.6. Check cables / wires for correct installation	☒	☐	Good
4.7. Check main power supply voltage	☒	☐	ok

5. Purge Air Unit (integrated or external version)	Y	N	Remarks
5.1. Purge air unit type			2 X BLOWERS
5.2. Check the rotation direction	☒	☐	OK
5.3. Check hoses for correct installation	☒	☐	Leak free
5.4. Purge air heating installed? (Option)	☐	☒	No
5.5. Differential pressure monitor installed? (Option)	☒	☐	

6. Sender/receiver, reflector/scattered light receiver unit and MCU	Y	N	Remarks
6.1. Clean all optical surfaces	☒	☐	All optical surfaces cleaned
6.2. Check power supply voltages	☒	☐	240V
6.3. Check emission free zero point	☒	☐	Checked on test stands
6.4. Adjust DUSTHUNTER at zero point stands or tube (focussing, alignment and adjustment of the DUSTHUNTER according operating instruction - transmission and scattered light beam)	☒	☐	Reading Zero, no adjustments made
6.5. Connect purge air to the DUSTHUNTER	☒	☐	OK
6.6. Check and adjust differential pressure monitor (option)	☒	☐	OK
6.7. Install the DUSTHUNTER at the measuring point.	☒	☐	Device re-installed
6.8. Check self alignment	☒	☐	OK
6.9. Standard parameterization with SOPAS ET	☒	☐	OK
6.10. DUST calibration values available	☒	☐	Refer to linearity report
6.11. Interface modul parameterization (option)	☒	☐	AO2 & AO3 now used
6.12. Check parameterization and start measuring	☒	☐	Parameterisation correct
6.13. Check signals and function control	☒	☐	Signals checked to DCS
6.14. Check if measured values are plausible (ref. Ch. 8)	☒	☐	As expected
6.15. Note software revision DUSTHUNTER	☒	☐	Version 1.1
6.16. Note Software revision MCU	☒	☐	Version 1.8
6.17. Save device data	☒	☐	SOPAS project saved
6.18. Instruct the operator personnel	☒	☐	Well informed engineers
6.19. Instruct reading of the measured values	☒	☐	As above
6.20. Instruct maintenance (hand over the maintenance manual)	☒	☐	As above
6.21. Instruct reading warnings and error messages and steps	☒	☐	As above

7. Input / Output / Ranges MCU

7.1. Analog output / Display

Live zero: mA | Output of control values: Y ☐ / N ☒

Analog output	Source	Range Start	Range End	Unit	Reading (actual)	Control value ☐	Zero point		Span point	
										mA
1	NOT USED					☐		mA		mA
2	Extinction	0.0	1.6	Ex	0.00	☒	4.0	mA	15.2	mA
3	Scattered Light	0.0	60	mg/m^3	0.00	☒	4.0	mA	15.2	mA

7.2. Analog input

Analog input	Source	Unit	Live zero	Start	End
1					
2					

7.3. Digital output

Digital output	Signal	Inv.
1		☐
2		☐
3		☐
4		☐
5		☐

7.4. Digital input

Digital input	Source	Inv.
1		☐
2		☐
3		☐
4		☐

8. Dust measurement values after commissioning

	Unit	Range	Reading	Zero point	Span point
Opacity	%		12.1%		
Dust (Trans.)	mg/m³		0.1		
Transm.	%		88.1%		
Extinction	-	0 – 1.6	0.0583	0.00%	70.00%
Rel.Opacity	%		6%		
Dust (SL)	mg/m³	0 – 60	27	-0.01	69.99
Scattered Light	-		-0.005		

Remarks

All ok.

Date : 05.10.2016

Name

Plant personnel: Dan Peters

Engineer: Paul Burgess

Dust Hunter C200 - Linearity Report

Customer	RWE Aberthaw
Site	Aberthaw
CEM Location	Stack
Permit Ref	
Contact	Dan Peters
Service Ref No.	19128
Survey Date	11/10/2016
Device Type	Dusthunter C200
Serial Number	T 1044863. R 1044865
MCERTS Cert No	MC090150/00
Certification Details	See Certificate
Measurement Principle	Transmission/Back Scattered Light
Filter Set Serial Number	11308606
SICK Engineer	Paul Burgess
Signature	

Sick (UK) Ltd
Waldkirch House
39 Hedley Road
St.Albans
Hertfordshire
AL1 5BN

Tel: +44 (0) 1727 831121
Fax: +44 (0) 1727 855332
E-Mail: info@sick.co.uk

Particulate Linearity Extinction

Customer	RWE Aberthaw
Plant	Aberthaw
Site Contact	Dan Peters
Product	DH C200
MCERTS Certificate Number	MC090150/00
Location	Stack

Site Permit Ref	0
SVON No	19128
Order Number	
QAL2/AST/Routine	QAL2
Date	11/10/2016
Engineer	Paul Burgess

Filter Set S/N	11308606
Calibration Date	NA
Results Visible on DCS?	No
Corrections Applied?	No

Response time (T_{90}) seconds	3
Permit Daily ELV for Dust mg.m^{-3}	
Plant ELV x 2, mg.m^{-3} (c_v)	60
Analyser Range mg.m^{-3}	0 - 1.6

Component 1	Particulate
Set pt time ($4xT_{90}$) sec	12
Log time ($3xT_{90}$) sec	9

Linearity Results

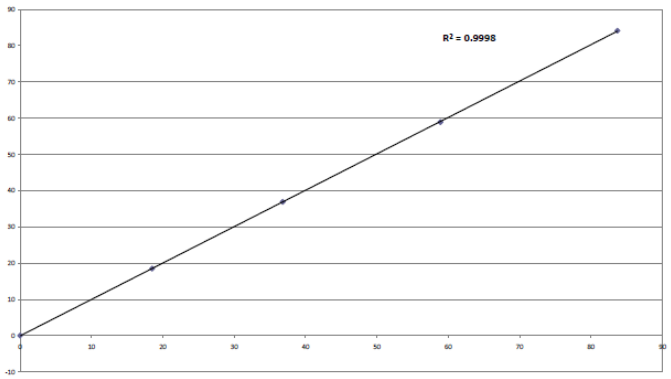
Expected Transmission (%)	Reading 1	Reading 2	Reading 3	Average Reading	DCS	Time
18.5	18.47	18.47	18.47	18.47		NA
36.8	36.90	36.90	36.90	36.90		NA
58.9	58.90	58.90	58.90	58.90		NA
83.7	84.13	84.13	84.13	84.13		NA

Zero Results

ZERO	Expected Transmission	Analyser Reading mg.m^{-3}	DCS mg.m^{-3}	Time
Zero Reading 1	0.00	0.01		NA
Zero Reading 2	0.00	0.01		NA
Zero Reading 3	0.00	0.01		NA
Zero Reading 4	0.00	0.01		NA
Zero Reading 5	0.00	0.01		NA
Zero Reading 6	0.00	0.01		NA
AVERAGE		0.01		

Actual Transmission (%)	Average CEM Reading mg.m^{-3}	$d_{c,rel}$	$d_{c,rel}$ <5% (EN 14181)
0.00	0.01	0.09%	PASS
18.50	18.47	-0.10%	PASS
36.80	36.90	0.00%	PASS
58.90	58.90	-0.31%	PASS
83.70	84.13	0.24%	PASS

Actual Transmission (%) v CEM Reading (mg.m^{-3})



Engineer	Paul Burgess
Signature	
Comments	

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Sick (UK) Ltd
Waldkirch House
39 Hedley Road
St.Albans
Hertfordshire
AL1 5BN

Tel: +44 (0) 1727 831121
Fax: +44 (0) 1727 855332
E-Mail: info@sick.co.uk

Particulate Linearity Scattered light

Customer	RWE Aberthaw
Plant	Aberthaw
Site Contact	Dan Peters
Product	DH C200
MCERTS Certificate Number	MC090150/00
Location	Stack

Site Permit Ref	0
SVON No	19128
Order Number	
QAL2/AST/Routine	QAL2
Date	11/10/2016
Engineer	Paul Burgess

Filter Set S/N	11308606
Calibration Date	na
Results Visible on DCS?	No
Corrections Applied?	No

Response time (T_{90}) seconds	5
Permit Daily ELV for Dust mg.m^{-3}	30
Plant ELV x 2, mg.m^{-3} (c_{ELV})	60
Analyser Range mg.m^{-3}	0 - 60

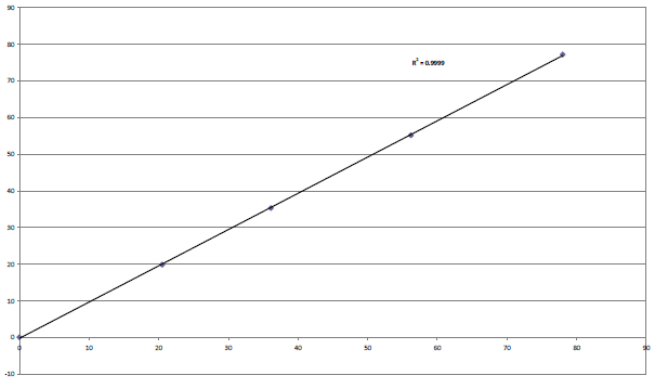
Component 1	Particulate
Set pt time (4xT_{90}) sec	20
Log time (5xT_{90}) sec	15

Linearity Results						
Expected Transmission (%)	Reading 1	Reading 2	Reading 3	Average Reading	DCS	Time
20.5	19.89	19.89	19.89	19.89		NA
36.1	35.30	35.30	35.30	35.30		NA
55.2	55.17	55.17	55.17	55.17		NA
78.0	77.19	77.19	77.19	77.19		NA

Zero Results				
ZERO	Expected Transmission	Analyser Reading mg.m^{-3}	DCS mg.m^{-3}	Time
Zero Reading 1	0.00	0.09		NA
Zero Reading 2	0.00	0.09		NA
Zero Reading 3	0.00	0.09		NA
Zero Reading 4	0.00	0.09		NA
Zero Reading 5	0.00	0.09		NA
Zero Reading 6	0.00	0.09		NA
AVERAGE		0.09		

Actual Transmission (%)	Average CEM Reading mg.m^{-3}	$d_{c,rel}$	$d_{c,rel}$ <5% (EN 14181)
0.00	0.09	0.09%	PASS
20.50	19.89	-0.10%	PASS
36.10	35.30	0.00%	PASS
55.20	55.17	-0.31%	PASS
78.00	77.19	0.24%	PASS

Actual Transmission (%) v CEM Reading (mg.m^{-3})



Engineer	Paul Burgess
Signature	
Comments	

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CERTIFICATE OF CALIBRATION

Unit No	**U 9**
Application	**Stack Flue Gas Oxygen Analyser**
Probe Serial No	**3k220000139812**
WOC No	**3-16-513046-00**

TESTED AGAINST		
Calibration Meter	**Type**	**Beamex**
	Serial No	**25514526**
	Calibration Date	**05-02-16**
2 % Oxygen	**Certified Input Valve**	**1.98 %**
	Cylinder No	**S1358263**
	Expiry Date	**04/10/2017**
	Theoretical Output	**7.168 mA**
8 % Oxygen	**Certified Input Valve**	**8.04 %**
	Cylinder No	**S1144548**
	Expiry Date	**19/06/2019**
	Theoretical Output	**16.864 mA**

Results

		Local Display	**Current**	**Procal ACU Display**
1.98 % Oxygen (7.168 mA)	**Before**	**2.06%**	**7.22mA**	**2.2%**
	After	**1.99%**	**7.17mA**	**2.1%**
8.04 % Oxygen (16.864 mA)	**Before**	**8.19%**	**17.116mA**	**8.4%**
	After	**8.02%**	**16.85mA**	**8.2%**

Signed – Ian Jauncey

Date – 16/02 /16

RWE Npower
C & I Department
Aberthaw Power Station
West Aberthaw
The Leys
Barry
CF62 4ZW

Table 5.2 - Functional Tests carried out by RPS

Requirement	Compliance	Notes
10 Documentation of Records The following documentation shall be controlled, readily accessible and up to date: - a plan of the CEMS; - all manuals (maintenance, users, etc.);	Yes Yes	A plan of the AMS resides in the Electrical Control & Instrumentation section offices and at the analyser. .
- log books to document possible malfunctions and action taken; - service reports;	Yes Yes	 All service reports are filed.
- QAL 3 documentation including actions taken as a result of out of control situations	Yes	There is a well established QAL3 system in place and analyser drift is routinely monitored using shewart charts. Evidence was provided to RPS.
Management system procedures for maintenance, calibration and training;	Yes	The Performance dept manage and review maintenance and calibration and training carried out by the EC&I team.
Training records/certificates	Yes	Evidence was provided to RPS

Requirement	Compliance	Notes
Maintenance schedules.	Yes	Maintenance scheduled by Performance.
Auditing Plans & Records – Evidence that the operator includes procedures for the management of the CEMS within the auditing cycle of the management system.	Yes	Carried out using dedicated Technical Team from Swindon Head Office. An auditor witnessed the parallel tests, which suggest a good level of organisation.

APPENDIX 1: SRM Calibration Data

Table A1.1– SRM On-Site Calibrations

Sample Date	Equipment Name	Equipment ID Number	Span Gas Type	ID Number	Span Gas Concentration	Pre-Sampling Result*		Post-Sampling Result*	
						Zero	Span	Zero	Span
18/10/16	Horiba PG 250	0955	O_2 (17025 validated)	216463	14.63 %	0.08 %	14.61 %	0.06 %	14.66 %
19/10/16	Horiba PG 250	0955	O_2 (17025 validated)	216463	14.63 %	0.06 %	14.66 %	0.16 %	14.55 %
20/10/16	Horiba PG 250	0955	O_2 (17025 validated)	216463	14.63 %	0.16 %	14.55 %	0.14 %	14.59 %

Notes

- **- Calibration values are those for the entire sample system.*
- *- Zero gas 99.999% N_2*

APPENDIX 2 – Accreditation Schedule

Schedule of Accreditation

issued by

United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

1709

Accredited to ISO/IEC 17025:2005

The Environmental Consultancy Ltd trading as RPS Consultants

Issue No: 066 **Issue date:** 15 April 2016

35 New Bridge Street, **London** **EC4V 6BW**	**Contact: Mr S Hurst** **Tel: +44 (0) 20 7280 3200** **Fax: +44 (0) 20 7283 9248** **E-Mail: hursts@rpsgroup.com** **Website: www.rpsgroup.com**

Testing performed by the Organisation at the locations specified below

Locations covered by the organisation and their relevant activities

Laboratory locations:

Location details		Activity	Location code
Address 35 New Bridge Street London EC4V 6BW United Kingdom	**Local contact** Mr D Blyton Tel: +44 (0)20 7280 3200 Fax: +44 (0) 20 7283 9248 Email: rpslo@rpsgroup.com	Health and Hygiene Support Functions: Quality Management, including contract review, document control, auditing and quality control	D
Address Noble House Capital Drive Linford Wood Milton Keynes MK14 6QP	**Local contact** Mr M Bates Tel: +44 (0)1235 437 100 Fax: +44 (0)1908 669899 Email: rpsmk@rpsgroup.com	Health and Hygiene	E
Address Suite 4C Rhodes Business Park Silburn Way Middleton Manchester M24 4NE	**Local contact** Mr S Pepper Tel: +44 (0) 161 6549069 Fax: +44 (0)161 6436495 Email: rpswn@rpsgroup.com	Health and Hygiene	F

Site activities performed away from the locations listed above:

Location details	Activity	Location code
Premises including domestic, commercial and industrial	Health and Hygiene Environmental Sampling and Testing	London - K Milton Keynes - L Middleton - M
Customers sites requiring Stack Emissions Testing	Stack emissions Testing	Milton Keynes - L
Mobile Laboratories	Health and Hygiene	London - J

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Testing performed by the Organisation at the locations specified	

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
	Health and Hygiene	Health and Safety Executive Asbestos: The analysts' guide for sampling, analysis and clearance procedures (HSG 248)	
ASBESTOS FIBRES IN AIR	Sampling of air for fibre counting	HSG 248:February 2005 (Documented In-House Procedure)	K, L, M
	Fibre counting	HSG 248:February 2005 (Documented In-House Procedure)	E, F, J, K, L, M
	4 Stage Clearance Process	HSG 248:February 2005 (Documented In-House Procedure)	K,L, M
ASBESTOS IN BULK MATERIALS including materials and products suspected of containing asbestos	Sampling of bulk materials for asbestos identification	HSG 248:February 2005 (Documented In-House Procedure)	K, L, M
	Identification of: Amosite Chrysotile Crocidolite Fibrous Actinolite Fibrous Anthophyllite Fibrous Tremolite	HSG 248:February 2005 (Documented In-House Procedure using stereo-microscopy, polarised light microscopy and dispersion staining)	F

Assessment Manager: PH1 Page 2 of 9

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Issue No: 066 **Issue date:** 15 April 2016

Testing performed by the Organisation at the locations specified

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Testing of Stack Emissions to Atmosphere	Sampling with subsequent analysis by an ISO/IEC 17025 accredited laboratory	National, International and other recognised standards using documented in-house work instructions to meet the requirements of DD CEN/TS 15675:2007/ BS EN 15259:2007	
	Gaseous Organic Compounds - sorbent tube method	USEPA Method 18 (RPSCE/1/19a)	L
	Total Particulate Matter (20 to 1000 mg/m^3)	BS ISO 9096:2003 (RPSCE/1/7/d)	L
Testing of Stack Emissions to Atmosphere	Sampling and On-Line Analysis		
	Pressure, Temperature and Velocity	BS EN 13284-1:2002 BS ISO 9096:2003 (RPSCE/1/2)	L
Testing of Stack Emissions to Atmosphere	Sampling with subsequent analysis by an ISO/IEC 17025 accredited laboratory	National, European, International and Environment Agency specified standards including MIDs and documented in-house work instructions to meet the requirements of the Environment Agency (MCERTS) Performance Standard and DD CEN/TS 15675:2007/ BS EN 15259:2007	
	Total Particulate Matter	BS EN 13284-1:2002 (RPSCE/1/7c)	L
	Hydrogen Chloride	BS EN 1911:2010 (RPSCE/1/8b)	L
	Halides and Halogens: Hydrogen Bromide Chlorine Bromine	US EPA Method 26 and 26A (RPSCE/1/8a)	L

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Page 3 of 9

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Testing performed by the Organisation at the locations specified

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Testing of Stack Emissions to Atmosphere (cont'd)	Sampling with subsequent analysis by an ISO/IEC 17025 accredited laboratory (cont'd)	National, European, International and Environment Agency specified standards including MIDs and documented in-house work instructions to meet the requirements of the Environment Agency (MCERTS) Performance Standard and DD CEN/TS 15675:2007/ BS EN 15259:2007	
	Sulphur dioxide	BS EN 14791:2005 (RPSCE/1/23)	L
	Hydrogen Fluoride	BS ISO 15713:2006 (RPSCE/1/8c)	L
	Mercury	BS EN 13211:2002 (RPSCE/1/9b)	L
	Metals	BS EN 14385:2004 (RPSCE/1/9c)	L
	Dioxins and furans	BS EN 1948-1:2006 (RPSCE/1/10b)	L
	Dioxin-like Polychlorinated Biphenyls (PCBs)	BS EN 1948-4:2010 (RPSCE/1/10b)	L
	Polycyclic Aromatic hydrocarbons (PAH's)	BS ISO 11338-1:2003 (RPSCE/1/10c)	L
	Formaldehyde	US EPA Method 316 (RPSCE/1/22)	L
	Formaldehyde – sorbent tube method	PD CEN/TS 13649:2014 RPSCE/1/19b Rev D	L

Assessment Manager: PH1 Page 4 of 9

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Testing performed by the Organisation at the locations specified	

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Testing of Stack Emissions to Atmosphere (cont'd)	Sampling with subsequent analysis by an ISO/IEC 17025 accredited laboratory (cont'd)	National, European, International and Environment Agency specified standards including MIDs and documented in-house work instructions to meet the requirements of the Environment Agency (MCERTS) Performance Standard and DD CEN/TS 15675:2007/ BS EN 15259:2007	
	Speciated VOCs (carbon and other suitable tubes) (Dry stacks only): Aliphatic VOCs Aromatic VOCs Aliphatic amines Aromatic amines Cresols Phenols Acetic acid	PD CEN/TS 13649:2014 (RPSCE/1/19b)	L
	Amines (Total aromatic and aliphatic)	PD CEN/TS 13649:2014, NIOSH method 2010 + 2002 (RPSCE/1/19c)	L
	Isocyanates	USEPA Method 207-1 (documented in-house method RPSCE/1/18C)	L
	Isocyanates	USEPA CTM 036 (documented in-house method RPSCE/1/18D Rev A)	L
	Hydrogen cyanide	US EPA OTM 29 (RPSCE/1/16a)	L
	Hydrogen sulphide	US EPA Method 11 (RPSCE/1/17)	L
	Ammonia	BS EN 14791:2005 (RPSCE/1/14b)	L

Assessment Manager: PH1 Page 5 of 9

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Issue No: 066 **Issue date:** 15 April 2016

Testing performed by the Organisation at the locations specified

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Testing of Stack Emissions to Atmosphere (cont'd)	Sampling with subsequent analysis by an ISO/IEC 17025 accredited laboratory (cont'd)	National, European, International and Environment Agency specified standards including MIDs and documented in-house work instructions to meet the requirements of the Environment Agency (MCERTS) Performance Standard and DD CEN/TS 15675:2007/ BS EN 15259:2007	
	$PM_{10}/PM_{2.5}$ at low concentrations (0-40 mg/m^3)	BS EN ISO 23210 (RPSCE/1/26 Rev A)	L
	Chrome VI	USEPA Method 0061 (RPSCE/1/9d Rev A)	L
Testing of Stack Emissions to Atmosphere	Sampling and On-Site Analysis	National, European, International and Environment Agency specified standards including MIDs and Documented In-House work instructions to meet the requirements of the Environment Agency (MCERTS) Performance Standard and DD CEN/TS 15675:2007/ BS EN 15259:2007	
	Water Vapour	BS EN 14790:2005 (RPSCE/1/12b)	L

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Page 6 of 9

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Testing performed by the Organisation at the locations specified	

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Testing of Stack Emissions to Atmosphere (cont'd)	Sampling and On-Line Analysis	National, European, International and Environment Agency specified standards including MIDs and Documented In-House work instructions to meet the requirements of the Environment Agency (MCERTS) Performance Standard and DD CEN/TS 15675:2007/ BS EN 15259:2007	
	Pressure, Temperature and Velocity (Point Velocity Method)	BS EN 16911-1:2013 (RPSCE 1/2 – Differential Pressure Device (Pitot Tube) Method	L
	Water Vapour*	EA TGN M22 (RPSCE/1/24 - Validated FTIR analyser)	L
	Carbon Monoxide*	BS EN 15058:2006 (RPSCE/1/21h - NDIR analyser) EA TGN M22 (RPSCE/1/24 - Validated FTIR analyser)	L
	Carbon Dioxide*	ISO 12039:2001 (RPSCE/1/21e - NDIR analyser) EA TGN M22 (RPSCE/1/24 - FTIR analyser)	L
	Nitrogen Monoxide (NO)*	BS EN 14792:2005 (RPSCE/1/21f - Chemiluminescence analyser) EA TGN M22 (RPSCE/1/24 - Validated FTIR analyser)	L
	Nitrogen Dioxide (NO_2)*	EA TGN M22 (RPSCE/1/24 - Validated FTIR analyser)	L

Assessment Manager: PH1 Page 7 of 9

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Testing performed by the Organisation at the locations specified

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Testing of Stack Emissions to Atmosphere (cont'd)	Sampling and On-Line Analysis (cont'd)	National, European, International and Environment Agency specified standards including MIDs and Documented In-House work instructions to meet the requirements of the Environment Agency (MCERTS) Performance Standard and DD CEN/TS 15675:2007/ BS EN 15259:2007	
	Oxides of Nitrogen (NOx)*	BS EN 14792:2005 (RPSCE/1/21f - Chemiluminescence analyser) EA TGN M22 (RPSCE/1/24 - Validated FTIR analyser)	L
	Nitrous Oxide (N_2O)*	EA TGN M22 (RPSCE/1/24 Rev B - Validated FTIR analyser)	L
	Sulphur dioxide*	EA TGN M22 (RPSCE/1/24 - FTIR analyser)	L
	Oxygen*	BS EN 14789:2005 (RPSCE/1/21g - validated Zirconium cell analyser)	L
	Total Gaseous Organic Carbon* (TOC/VOC) (0 to 1000 mg/m³)	BS EN 12619:2013 (RPSCE/1/4b - FID analyser)	L

Assessment Manager: PH1 Page 8 of 9

UKAS TESTING 1709 Accredited to ISO/IEC 17025:2005	**Schedule of Accreditation** issued by **United Kingdom Accreditation Service** 2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK **The Environmental Consultancy Ltd** **trading as RPS Consultants** **Issue No:** 066 **Issue date:** 15 April 2016
Testing performed by the Organisation at the locations specified	

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Stack Emissions - Continuous Emissions Monitoring Systems (CEMS)	QAL 2 and the Annual Surveillance Test (AST) for CEMS	Documented in house procedure RPSCE/1/25 to meet the requirements of BS EN 14181:2014, Environment Agency MID 14181 (TGN M20 Annex A) and other requirements of the Environment Agency (MCERTS) Performance Standard and DD CEN/TS 15675:2007/ BS EN 15259:2007	L
END			

* - The scale range of the analyser used for this test must be that detailed on its current MCERTS certificate or a range validated by the organisation to meet MCERTS requirements.