

Report for the Periodic Monitoring of Emissions to Atmosphere

Clean Energy Consultancy at HLC Wood Products Ltd

Permit No: N/A

Installation: HLC Wood Products Ltd

Monitoring Dates: 29 April 2015

Site Address: HLC Wood Products Ltd, Hangar 3, Upwood Air Park, Cambridgeshire, PE26
2RA.

Report Number: 8840

Date of Report: 8th May 2015

Report Author: Luke Oddy

MCERTS No: MM13 1228

Version: 2 Visit: 1

MCERTS Level: 1 (TE1)

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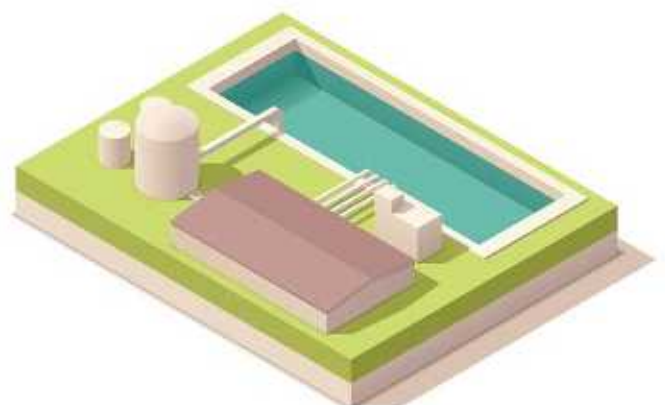
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Executive Summary

Monitoring Objectives

Monitoring was required to demonstrate compliance of an ELBH- CZ s.r.o 930kW Boiler / Jet Exhaust Bag Filter configuration with the Renewable Heat Incentive. The boiler is installed at HLC Wood Products, Upwood Air Park, Cambridgeshire.

Emission Point Identification

Substances to be Monitored	930kW Boiler Exhaust
Total Particulate Matter	✓
Oxides of Nitrogen (as NO ₂)	✓
Oxygen (for correction)	✓
Special requirements	None

Opinions and interpretations expressed within this report are outside the scope of Envirocare Technical Consultancy's MCERTS and UKAS accreditation.

Monitoring Results

Emission Point Reference	Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Units	Uncertainty as % of ELV (95% confidence)	Reference Conditions	Date of Sampling	Start and End Times	Monitoring Method Reference	Accreditation for use of Method	Operating Status		
930kW Boiler Exhaust	Total Particulate Matter	55.5*	13.4	mg/Nm³	0.5	273K, 10 ⁵ Pa, 11% O ₂	29/04/15	12:11-12:52	BS EN 13284	MCFRT3	90% Capacity		
			7.9		0.5			13:08-13:38					
			20.5		0.9			13:53-14:34					
			-		-			-					
		50	7.1	g/GJ	N/A			2:11-12:52					
			4.2					13:08-13:38					
			10.9					13:53-14:34					
			-					-					
	Oxides of Nitrogen (as NO _x)	282.5***	165.9	mg/Nm³	4.9	273K, 10 ⁵ Pa, 11% O ₂	29/04/15	12:11-14:34	BS EN 14792	MCFRT3	90% Capacity		
		150	88.1	g/GJ	N/A								
	Oxygen (for correction)	None	9.8	%	0.8***	273K, 10 ⁵ Pa	29/04/15	2:11-14:34	BS EN 14792	MCL 315	90% Capacity		

*Converted from ELV at 30g/GJ

**Converted from LLV of 150g/GJ

*** Given as % of emission concentration

Operating Information

Emission Point Reference	Date	Process Type	Process Duration	Fuel	Feedstock	Abatement	Load	Comparison of Operator CEMS and Periodic Monitoring Results			
								Substance	CEMS Results	Periodic Monitoring Results	Units
930kW Boiler Exhaust	29/04/15	Combustion	Continuous	Biomass	Wood waste & offcuts	Jel Exhaust Bag Filter	90%	N/A	N/A	N/A	N/A

Monitoring Deviations

Emission Point Reference	Substance Deviations	Monitoring Deviations	Other Relevant Issues
930kW Boiler Exhaust	None	Only one port safely accessible, sample points doubled on one line to compensate.	During test one the boiler switched off for five minutes and therefore this test has not been reported

Supporting Information

Appendix 1: General Information

Monitoring Organisation Staff Details

Personnel	Function in monitoring campaign	MCERTS Level	MCERTS Number
Mr D Sharples	Team Leader	MCERTS Level 2 (TE1, TE4)	MM12 1184
Mr L Oddy	Technician	MCERTS Level 1 (TE1)	MM13 1228

Monitoring Methods

Pollutant Species	Standard	Technique	Envirocare Internal Procedure
Total Particulate Matter	BS EN 13284	Gravimetric	ETC-M-01
Oxygen	BS EN 14789	Zirconium Cell	ETC-M-25
Oxides of Nitrogen	BS EN 14792	Chemiluminescence	ETC-M-25
Stack Temperature + Velocity	BS EN 13284	Pitot Tube + Thermocouple	ETC-M-46

Equipment Checklist

Equipment ID	Model Number	Purpose
Testo 350	Testo 350	Multi component gas analyser
GPU2	Testo 339	Heated line controller and sample gas conditioner
IP3	JS Holdings Sampling probe	Integrated Probe
CB6	APEX Console	Isokinetic Sampler

Appendix 2: 930kW Boiler Results and Calculations

Photograph of the sampling location and positions



Flow Criteria Measurements

Stack reference:	Boiler
Duct diameter :	49.0 cm
Cross sectional area :	0.189 sq.metres
Barometric pressure:	1009 mbar
Ambient Temperature:	10.0 °C
Molecular weight of Stack Gas	29.000 g/gmole
Pitot Coefficient:	0.825

Sample Line	Traverse Point	Traverse Position (%D)	Differential Pressure cmH ₂ O				Stack Velocity (m/s)	Stack Temp (°C)	Angle of Swirl (°)
			1	2	3	Average			
A	A1	0.067	0.240	0.260	0.300	0.267	5.7	45.0	0
	A2	0.150	0.300	0.320	0.340	0.320	6.6	81.0	0
	A3	0.250	0.400	0.400	0.400	0.400	7.3	82.0	0
	A4	0.350	0.400	0.380	0.380	0.387	7.2	83.0	0
	A5	0.450	0.340	0.340	0.340	0.340	6.8	83.0	0
	A6	0.550	0.300	0.300	0.300	0.300	6.4	84.0	0
	A7	0.650	0.250	0.260	0.240	0.250	5.8	85.0	0
	A8	0.750	0.220	0.220	0.200	0.213	5.4	85.0	0
	A9	0.850	0.200	0.180	0.160	0.180	4.9	85.0	0
	A10	0.933	0.160	0.160	0.180	0.167	4.7	81.0	0

Velocity and Temperature Calculations

Mean Duct Velocity:	6.1	(m/s)
Ratio Highest:Lowest:	1.6	:1
Mean Stack Temperature:	79.4	(°C)
	352.4	(°K)

Volumetric Flow Rate: 4127.5 (m³/hr)

Corrected Gas Volume Flow : **3184.9** (Nm³/hr)

Water Vapour Measurements

Moisture content was found to be between 5.2% and 8.3%

Manual Monitoring Method | Results | Calculations

Sampling Run No: 2

Stack details: Boiler	Duct diameter:	49.0	(cm)	Date:	29/04/2015
	Cross-sectional area:	0.189	(m ²)	Operators:	LJO/DS

Meter Box No:	CB6	g/gmole cm H2O	Barometric Pressure (mbar)		Ambient Temperature (°C)		Leak Check (l/min)		Time	
Gas Meter Coefficient:	1.001		Before	After	Before	After	Before	After	Start	End
Pitot Coefficient	0.825		1009	1009	10.0	10.0	0.20	0.10	11:18	11:48
Molecular weight of Stack Gas	29.00									
Static Pressure in Stack	0.10									

Oxygen Level % 12.6
Oxygen Ref % 11.0

Nozzle diameter=	9.55	mm
Average Gas Meter Temperature=	15.00	°c
Average Stack Temperature	67.8	°c
Average Stack Velocity=	6.2	metres/second
Isokineticity =	102	%
Total Sampling Time=	30.0	minutes
Gasmeter Difference=	643.8	litres
Corrected Gasmeter Volume	644.4	(Gasmeter Coefficient)
Mean Sampling Rate =	21.5	litres/minute

Number of sample points 4

Filter Reference	Type
2-15-922	37mm QMA

Emission Calculations

Corrected Total Dry Gas Volume =	608.47	Litres (273K; 101.3kPa)
Mass of water collected Run1=	26.8	g
Volume of Mass of Water =	33.4	NLitres
Water Content =	5.2	%
Corrected Total Particulate Matter Emission =	13.4	mg/Nm ³ (273K; 101.3kPa, 11% O2 and dry gas)
Corrected Total Particulate Matter Emission =	7.1	g/GJ (11% O2)
Mass emission rate (M1) =	0.043	kg/hr

Sampling Run No: 3

Stack details: Boiler	Duct diameter:	49.0	(cm)	Date:	29/04/2015
	Cross-sectional area:	0.189	(m ²)	Operators:	LJO/DS

Meter Box No:	CB6	g/gmole cm H ₂ O	Barometric Pressure (mbar)		Ambient Temperature (°C)		Leak Check (l/min)		Time	
Gas Meter Coefficient:	1.001		Before	After	Before	After	Before	After	Start	End
Pitot Coefficient	0.825		1009	1009	10.0	12.0	0.10	0.20	13:08	13:38
Molecular weight of Stack Gas	29.00									
Static Pressure in Stack	0.10									

Oxygen Level % 9.1
Oxygen Ref % 11.0

Nozzle diameter=	9.55	mm
Average Gas Meter Temperature=	18.17	°C
Average Stack Temperature	68.0	°C
Average Stack Velocity=	6.1	metres/second
Isokineticity =	103	%
Total Sampling Time=	30.0	minutes
Gasmeter Difference=	626.6	litres
Corrected Gasmeter Volume	627.2	(Gasmeter Coefficient)
Mean Sampling Rate =	20.9	litres/minute

Number of sample points 4

Filter Reference	Type
2-15-923	37mm QMA

Emission Calculations

Corrected Total Dry Gas Volume =	585.77	Litres (273K; 101.3kPa)
Mass of water collected Run1=	42.5	g
Volume of Mass of Water =	52.9	NLitres
Water Content =	8.3	%
Corrected Total Particulate Matter Emission =	7.9	mg/Nm ³ (273K; 101.3kPa, 11% O ₂ and dry gas)
Corrected Total Particulate Matter Emission =	4.2	g/GJ (11% O ₂)
Mass emission rate (M1) =	0.025	kg/hr

Sampling Run No: 4

Stack details: Boiler	Duct diameter:	49.0	(cm)	Date:	29/04/2015
	Cross-sectional area:	0.189	(m ²)	Operators:	LJO/DS

Meter Box No:	CB6	g/gmole cm H2O	Barometric Pressure (mbar)		Ambient Temperature (°C)		Leak Check (l/min)		Time	
Gas Meter Coefficient:	1.001		Before	After	Before	After	Before	After	Start	End
Pitot Coefficient	0.825		1009	1009	11.0	11.0	0.30	0.40	13:53	14:34
Molecular weight of Stack Gas	29.00									
Static Pressure in Stack	0.10									

Oxygen Level % 7.6
Oxygen Ref % 11.0

Nozzle diameter=	9.55	mm
Average Gas Meter Temperature=	19.83	°c
Average Stack Temperature	72.2	°c
Average Stack Velocity=	6.1	metres/second
Isokineticity =	101	%
Total Sampling Time=	30.0	minutes
Gasmeter Difference=	618.0	litres
Corrected Gasmeter Volume	618.6	(Gasmeter Coefficient)
Mean Sampling Rate =	20.6	litres/minute

Number of sample points 4

Filter Reference	Type
2-15-927+2-15-925	37mm QMA

Emission Calculations

Corrected Total Dry Gas Volume =	574.44	Litres (273K; 101.3kPa)
Mass of water collected Run1=	41.0	g
Volume of Mass of Water =	51.1	NLitres
Water Content =	8.2	%
Corrected Total Particulate Matter Emission =	20.5	mg/Nm ³ (273K; 101.3kPa, 11% O2 and dry gas)
Corrected Total Particulate Matter Emission =	10.9	g/GJ (11% O2)
Mass emission rate (M1) =	0.065	kg/hr

Analysis Results

Boiler Run 2

Total Particulate Matter Weighing Analysis Results

FILTER WEIGHINGS

Filter type	37mm QMA	
Filter reference	2-15-922	2-15-924
	Run 2 mg	Blank mg
Filter weight post site	96.05	90.72
Filter weight pre site	90.19	90.64
Filter weight change	5.86	0.08
Probe wash weight	0.99	0.89
Total deposit	6.85	0.97

MOISTURE WEIGHINGS

	No.1 (g)	No.2(g)	No.3(g)	No.4(g)
Impinger end	753.0	797.8	646.3	941.9
Impinger start	733.9	796.0	645.9	936.4
Moisture in each impinger	19.1	1.8	0.4	5.5
Total Moisture	26.8	g		

PROBE WASH WEIGHINGS

	Run 2 (mg)	Blank (mg)
Deposit + container	27259.27	29706.48
Container	27258.07	29705.38
Probe wash	1.20	1.10
Corrected Probe wash	0.99	0.89

CONTROL CRUCIBLE WEIGHINGS

	Crucible 1 (mg)	Crucible 2 (mg)	Crucible 3 (mg)
Pre-weights	30142.56	28468.89	23173.75
Post-weights	30142.79	28469.09	23173.96
Weight change	0.23	0.20	0.21
Average weight change	0.21		

Emission Limit Value	56.5	mg/m ³	Date of Analysis	05/05/2015
Overall Blank Value	1.59	mg/m ³	Analytical Laboratory	Envirocare
Is overall blank less than 10% of emission limit value?	YES		Analytical Method	ETC-M-02
Data entered by:	LJO		Accreditation	ISO 17025

Boiler Run 3

Total Particulate Matter Weighing Analysis Results

FILTER WEIGHINGS

Filter type	37mm QMA	
Filter reference	2-15-923	2-15-924
	Run 3 mg	Blank mg
Filter weight post site	95.49	90.72
Filter weight pre site	90.75	90.64
Filter weight change	4.74	0.08
Probe wash weight	0.74	0.89
Total deposit	5.48	0.97

MOISTURE WEIGHINGS

	No.1 (g)	No.2(g)	No.3(g)	No.4(g)
Impinger end	783.9	801.9	647.5	948.2
Impinger start	753.0	797.8	646.3	941.9
Moisture in each impinger	30.9	4.1	1.2	6.3
Total Moisture	42.5	g		

PROBE WASH WEIGHINGS

	Run 3 (mg)	Blank (mg)
Deposit + container	28390.06	29706.48
Container	28389.11	29705.38
Probe wash	0.95	1.10
Corrected Probe wash	0.74	0.89

CONTROL CRUCIBLE WEIGHINGS

	Crucible 1 (mg)	Crucible 2 (mg)	Crucible 3 (mg)
Pre-weights	30142.56	28468.89	23173.75
Post-weights	30142.79	28469.09	23173.96
Weight change	0.23	0.20	0.21
Average weight change	0.21		

Emission Limit Value	56.5	mg/m ³	Date of Analysis	05/05/2015
Overall Blank Value	1.65	mg/m ³	Analytical Laboratory	Envirocare
Is overall blank less than 10% of emission limit value?	YES		Analytical Method	ETC-M-02
Data entered by:	LJO		Accreditation	ISO 17025

Boiler Run 4

Total Particulate Matter Weighing Analysis Results

FILTER WEIGHINGS

Filter type	37mm QMA	
Filter reference	2-15-927+2-15-925	2-15-924
	Run 4 mg	Blank mg
Filter weight post site	197.05	90.72
Filter weight pre site	182.23	90.64
Filter weight change	14.82	0.08
Probe wash weight	0.95	0.89
Total deposit	15.77	0.97

MOISTURE WEIGHINGS

	No.1 (g)	No.2(g)	No.3(g)	No.4(g)
Impinger end	810.2	806.8	649.7	955.8
Impinger start	783.9	801.9	647.5	948.2
Moisture in each impinger	26.3	4.9	2.2	7.6
Total Moisture	41	g		

PROBE WASH WEIGHINGS

	Run 4 (mg)	Blank (mg)
Deposit + container	31392.67	29706.48
Container	31391.51	29705.38
Probe wash	1.16	1.10
Corrected Probe wash	0.95	0.89

CONTROL CRUCIBLE WEIGHINGS

	Crucible 1 (mg)	Crucible 2 (mg)	Crucible 3 (mg)
Pre-weights	30142.56	28468.89	23173.75
Post-weights	30142.79	28469.09	23173.96
Weight change	0.23	0.20	0.21
Average weight change	0.21		

Emission Limit Value	56.5	mg/m ³	Date of Analysis	05/05/2015
Overall Blank Value	1.68	mg/m ³	Analytical Laboratory	Envirocare
Is overall blank less than 10% of emission limit value?	YES		Analytical Method	ETC-M-02
Data entered by:	LJO		Accreditation	ISO 17025

Instrumental Gas Analyser Site Calibration Measurements

ANALYSER CALIBRATIONS
Combustion Gases Emissions from Boiler (29/04/15)
 Data entered by: LJO
Combustion Gas Analyser: Testo 350

Type of Gas	NO		O ₂	
Certified Calibration Values	203.3	ppm +/-2%	11.15	% +/-2%
Response Time T90	4.0	seconds	10.00	seconds
Period				
Span PreCal direct to analyser	203.0	ppm	11.15	%
Zero PreCal through sample line	1.0	ppm	0.04	%
Span PreCal through sample line	209.0	ppm	11.13	%
Zero PostCal through sample line	6.0	ppm	0.06	%
Span PostCal through sample line	212.0	ppm	11.16	%
Span Drift	-1.5	%	-0.3	%
Zero Drift	-2.5	%	-0.2	%
Is data valid without adjustment	NO		YES	
Does data require adjustment	YES		NO	
Is data invalid	NO		NO	

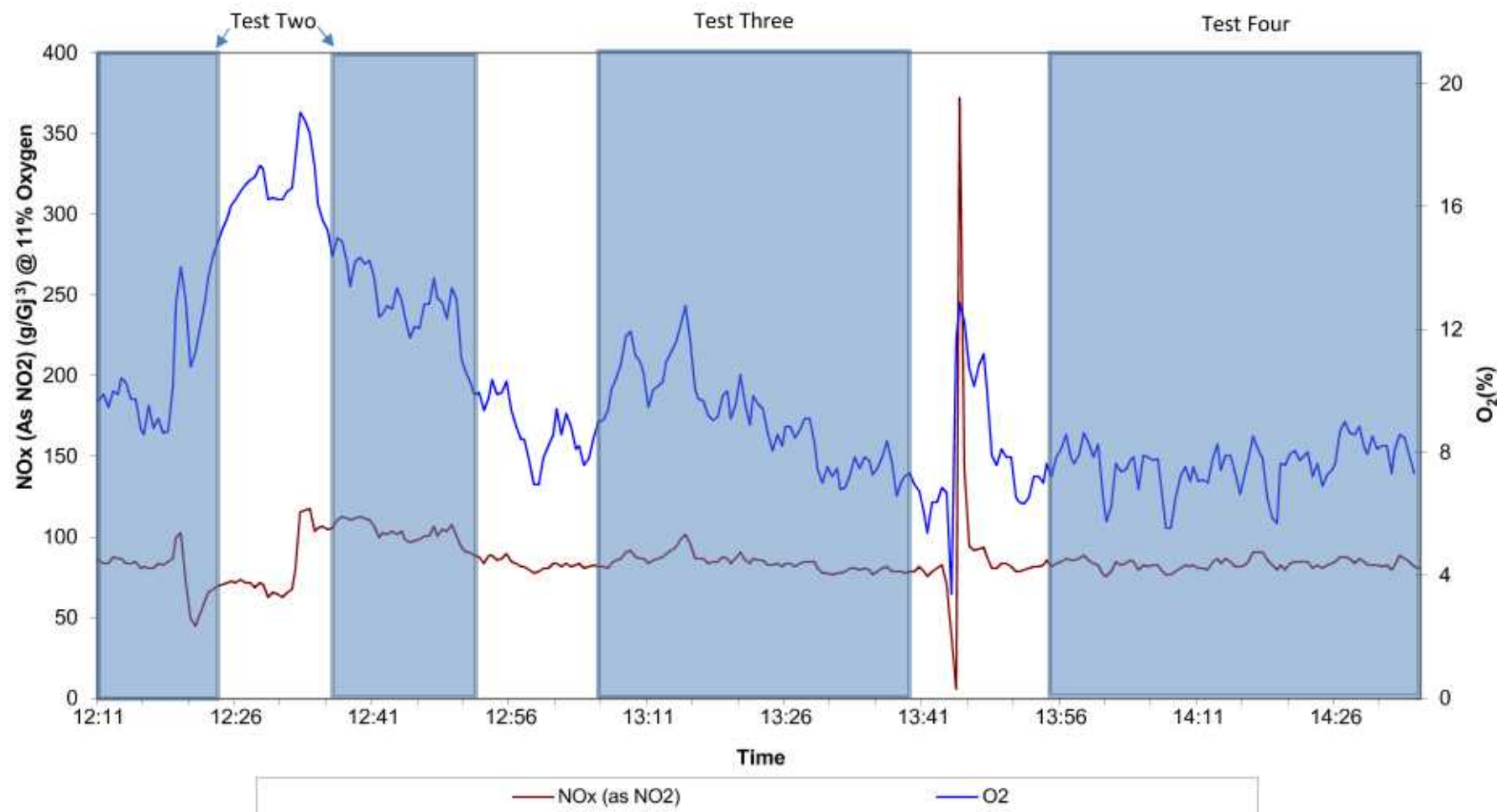
Instrumental Gas Analyser Results

Gaseous Analysis using Test 350 Analyser
 HLC Wood Products Ltd, Cambridgeshire
Combustion Gas Emissions from Boiler (29/04/15)

Oxygen Reference: 11
 Data entered by: LJO

	Oxygen O ₂ (%)	Oxides of Nitrogen NOx (ppm)	Adjusted for Span/Zero Drift			Conversion from mg/Nm ³ to g/GJ	
			O ₂ (%)	NOx (ppm)	NOx (as NO ₂) (mg/Nm ³)	NOx (as NO ₂) (mg/Nm ³)	NOx (as NO ₂) (g/GJ)
Average	9.8	85.6	9.8	88.8	182.3	165.9	88.1
Maximum	19.1	111.5	19.1	115.3	236.7	221.3	117.5
Minimum	5.5	17.0	5.5	20.5	42.0	127.5	67.7

Combustion Gas Emissions from Boiler HLC Wood Products, Cambridgeshire (29/04/15)



Uncertainty Calculations

MEASUREMENT UNCERTAINTY CALCULATION - RUN 2

Boiler Run 2

Emission Limit value =	56.5	mg/Nm ³	Mean Emission Concentration =	13.40	mg/Nm ³
Mean Sampling Rate =	21.48	litres/minute	Monitoring Time =	30.0	mins
Leak Rate =	0.15	litres/minute	Envirocare Console used =	CB6	
Barometric Pressure =	1009	mbar	Temperature uncertainty =	0.24	°C
Duct Temperature =	79.4	°C	Gasmeter uncertainty =	0.37	%
Sampled Gas Volume =	643.80	litres	Barometer used =	BA11	
			Barometer uncertainty =	1	mbar

Source of Uncertainty	ASD *	BS EN 13284		Envirocare Certified Value	Units	% Actual value	Source Uncert u	Combined Uncert u ²
		Uncertainty Criteria	Max Uncert Value					
Weighing Procedure	Std	5% of limit value	2.825	0.122	mg	0.22	0.1220	0.01488
Leak Rate	Rect	<2% of sampling rate	0.43	0.15	l/min	0.70	0.0540	0.00292
Time	Std	1sec in 1hour = 0.028%	2	0.50	secs	0.03	0.0037	0.00001
Gasmeter Volume	Std	<2%	12.88	2.38	litres	0.37	0.0496	0.00246
Std Ref Conditions Corrections								
Temperature	Std	1% of value	3.5	0.24	°C	0.30	0.0405	0.00164
Pressure	Std	1% of value	10.09	1	mbar	0.10	0.0133	0.00018
Total								0.02209
Combined Standard Uncertainty [(Sum u ²)*0.5]								0.15
Expanded Total Uncertainty as a percentage of emission concentration(95% Confidence)								2.2
Expanded Total Uncertainty (mg/Nm ³) (95% Confidence)								0.29
Expanded Total Uncertainty as a percentage of ELV (95% Confidence)								0.5

MEASUREMENT UNCERTAINTY CALCULATION - RUN 3

Boiler Run 3

Emission Limit value =	56.5	mg/Nm ³	Mean Emission Concentration =	7.86	mg/Nm ³
Mean Sampling Rate =	20.91	litres/minute	Monitoring Time =	30.0	mins
Leak Rate =	0.15	litres/minute	Envirocare Console used =	CB6	
Barometric Pressure =	1009	mbar	Temperature uncertainty =	0.24	°C
Duct Temperature =	79.4	°C	Gasmeter uncertainty =	0.37	%
Sampled Gas Volume =	626.60	litres	Barometer used =	BA11	
			Barometer uncertainty =	1	mbar

Source of Uncertainty	ASD *	BS EN 13284		Envirocare Certified Value	Units	% Actual value	Source Uncert u	Combined Uncert u ²
		Uncertainty Criteria	Max Uncert Value					
Weighing Procedure	Std	5% of limit value	2.825	0.122	mg	0.22	0.1220	0.01488
Leak Rate	Rect	<2% of sampling rate	0.42	0.15	l/min	0.72	0.0325	0.00106
Time	Std	1sec in 1hour = 0.028%	2	0.50	secs	0.03	0.0022	0.00000
Gasmeter Volume	Std	<2%	12.53	2.32	litres	0.37	0.0291	0.00085
Std Ref Conditions Corrections								
Temperature	Std	1% of value	3.5	0.24	°C	0.30	0.0237	0.00056
Pressure	Std	1% of value	10.09	1	mbar	0.10	0.0078	0.00006
Total								0.01742
Combined Standard Uncertainty [(Sum u ²)*0.5]								0.13
Expanded Total Uncertainty as a percentage of emission concentration(95% Confidence)								3.3
Expanded Total Uncertainty (mg/Nm ³) (95% Confidence)								0.26
Expanded Total Uncertainty as a percentage of ELV (95% Confidence)								0.5

MEASUREMENT UNCERTAINTY CALCULATION - RUN 4

Boiler Run 4

Emission Limit value =	56.5	mg/Nm ³	Mean Emission Concentration =	20.48	mg/Nm ³
Mean Sampling Rate =	20.62	litres/minute	Monitoring Time =	30.0	mins
Leak Rate =	0.35	litres/minute	Envirocare Console used =	CB6	
Barometric Pressure =	1009	mbar	Temperature uncertainty =	0.24	°C
Duct Temperature =	79.4	°C	Gasmeter uncertainty =	0.37	%
Sampled Gas Volume =	618.00	litres	Barometer used =	BA11	
			Barometer uncertainty =	1	mbar

Source of Uncertainty	ASD *	BS EN 13284		Envirocare Certified Value	Units	% Actual value	Source Uncert u	Combined Uncert u ²
		Uncertainty Criteria	Max Uncert Value					
Weighing Procedure	Std	5% of limit value	2.825	0.122	mg	0.22	0.1220	0.01488
Leak Rate	Rect	<2% of sampling rate	0.41	0.35	l/min	1.70	0.2007	0.04029
Time	Std	1sec in 1hour = 0.028%	2	0.50	secs	0.03	0.0057	0.00003
Gasmeter Volume	Std	<2%	12.36	2.29	litres	0.37	0.0758	0.00574
Std Ref Conditions Corrections								
Temperature	Std	1% of value	3.5	0.24	°C	0.30	0.0619	0.00383
Pressure	Std	1% of value	10.09	1	mbar	0.10	0.0203	0.00041
Total								0.06519
Combined Standard Uncertainty [(Sum u²)^{0.5}]								0.26
Expanded Total Uncertainty as a percentage of emission concentration(95% Confidence)								2.4
Expanded Total Uncertainty (mg/Nm³) (95% Confidence)								0.50
Expanded Total Uncertainty as a percentage of ELV (95% Confidence)								0.9

UNCERTAINTY OF OXYGEN BY Testo 350

Reading =	9.8	vol%
Span Gas Certified Value =	11.15	vol% +/-2%
Range	25	vol%

Parameter	Uncertainty criteria	Probability distribution	Divisor	U	U ²	
Zero Drift/Lower limit of detection (%vol)	-0.02	Rectangular	1.732	-0.0115	0.0001	
Span Drift (%vol)	-0.03	Rectangular	1.732	-0.0173	0.0003	
Linearity (% of value)	0.27	Rectangular	1.732	0.0153	0.0002	
Setting Gas Divider (% of value)	0.25	Normal	1	0.0245	0.0006	
Standard deviation of repeatability at span point (% of range)	0.06	Rectangular	-	0.0150	0.0002	
				Sum U ²	0.00	
				Combined Standard Uncertainty (vol%)		0.04
				Expanded Total Uncertainty (vol%) (95% Confidence)		0.08
				Expanded Total Uncertainty as a percentage of emission concentration(95% Confidence)		0.8

UNCERTAINTY OF OXIDES OF NITROGEN BY Testo 350

Reading =	85.6	ppm
Span Gas Certified Value =	203.3	ppm
Range	250	ppm
Emission Limit Value	282.5	mg/Nm ³

Parameter	Uncertainty criteria	Probability distribution	Divisor	U	U^2	
Zero Drift/Lower limit of detection (ppm)	-5.00	Rectangular	1.732	-2.8868	8.3338	
Span Drift (ppm)	-3.00	Rectangular	1.732	-1.7321	3.0002	
Linearity (% of value)	0.35	Rectangular	1.732	0.1730	0.0299	
Setting Gas Divider (% of value)	0.25	Normal	1	0.2140	0.0458	
Standard deviation of repeatability at span point (% of range)	0.25	Rectangular	-	0.6250	0.3906	
				Sum U^2	11.80	
				Combined Standard Uncertainty (ppm)		3.44
				Expanded Total Uncertainty (ppm) (95% Confidence)		6.73
				Expanded Total Uncertainty as a percentage of emission concentration(95% Confidence)		7.9
				Expanded Total Uncertainty (mg/Nm ³) (95% Confidence)		13.82
				Expanded Total Uncertainty as a percentage of ELV (95% Confidence)		4.9