

Report for the Periodic Monitoring of Emissions to Atmosphere

Dunbia

A1 - Smoker Exhaust

Permit No: BU8002IT
Installation: Llanelli
Monitoring Dates: 27th May 2022
Site Address: Cross Hands Food Park, Cross Hands, Llanelli, SA14 6RF

Report Number: ES-0881 Version: 1 Visit: 1 in 2022

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Contents

Executive Summary

Monitoring Objectives 3

Monitoring Results 4

Operating Information 5

Monitoring Deviations 5

Supporting Information

Appendix 1: General Information 6

Appendix 2: Results and Calculations 7 - 11

Executive Summary

Monitoring Objectives

Envirocare Technical Consultancy were contracted by Dunbia to carry out emissions monitoring, to determine the compliance of A1 - Smoker Exhaust with the conditions specified in the operators permit (BU8002IT) for emissions to atmosphere. The methodologies utilised and the results obtained form the basis of this report.

The substances requested for monitoring are listed below.

Emission Point Identification

Substances to be Monitored	A1 - Smoker Exhaust
Carbon Monoxide	✓
Oxides of Nitrogen (as NO ₂)	✓
Total VOC	✓
Volumetric Flow	✓
Water Vapour	✓

Special requirements: none

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Executive Summary

Monitoring Results

where MU = Measurement Uncertainty associated with the result (95% Confidence)

Substance		Concentration			Reference Conditions	Mass Emission			Sampling Date	Sampling Times
		Limit (mg/m³)	Result (mg/m³)	Measurement Uncertainty (MU) +/-		Limit (g/hr)	Result (g/hr)	Measurement Uncertainty (MU) +/-		
Water Vapour	R1	-	2.6%	-	273K, 101.3kPa	-	-	-	27/05/2022	10:45-11:45
Carbon Monoxide	R1	-	4.7	7.7	273k, 101.3kPa, Dry Gas.	-	0.06	2.0	27/05/2022	10:45-11:45
Oxides of Nitrogen (as NO ₂)	R1	-	0.18	3.4	273k, 101.3kPa, Dry Gas.	-	0.002	0.09	27/05/2022	10:45-11:45
Total VOC	R1	150	0.60	1.1	273k, 101.3kPa, Dry Gas.	-	0.01	0.3	27/05/2022	10:45-11:45
Volumetric Flow	R1	-	12.6 m³/h	423	273k, 101.3kPa, Dry Gas.	-	-	-	27/05/2022	10:32-10:35

Reference conditions (REF) are: 273k, 101.3kPa, Dry Gas.

Supporting Information

Appendix 1: General Information

Operating Information

Parameter	Process Details
Process Type	Meat Smoker
Continuous or Batch Process	Batch
Operating Status	Normal
Feedstock	Cherry Wood Logs
Normal Load, Throughput or Continuous Rating	Normal
Abatement System	Carbon Filter
Abatement System Status	Normal
Process Fuel	-
Plume Appearance	None

Monitoring Deviations

Parameter	Run	Deviation
All Parameters	Run 1	There are no deviations associated with the monitoring undertaken.

Monitoring Organisation Staff Details

Personnel	Position	MCERTS Level	MCERTS Number
Mr K Wells	Team Leader	2 (TE1,TE2,TE4)	MM 06 701
Mr C Welsh	Technician	Trainee	MM 20 1692

Monitoring Methods

Pollutant Species	Standard	Technical Procedure	Testing MCERTS	Analysis Laboratory	Analytical Procedure	Analytical Technique	Analysis MCERTS
Volumetric Flow	BS EN ISO 16911-1	ETC-SE-24a	Yes	Pitot Tube and Thermocouple			
Carbon Monoxide	BS EN 15058	ETC-SE-10 (a/b)	Yes	NDIR by Horiba PG-250 or PG350E			
Oxides of Nitrogen	BS EN 14792	ETC-SE-10 (a/b)	Yes	Chemiluminescence by Horiba PG-250 or Horiba PG-350			
Total VOC	BS EN 12619	ETC-SE-04	Yes	Flame Ionisation Detector by M&C Thermo FID or Sick 3006 FID			
Water Vapour	BS EN 14790	ETC-SE-11	Yes	ENV	ETC-SE-11	Gravimetric	Yes

RPS Laboratories Ltd (RPS) - Accreditation Number: 0605 | Marchwood Scientific Services - Accreditation Number: 1668 | Olfasense - Accreditation Number: 2430

Equipment Checklist

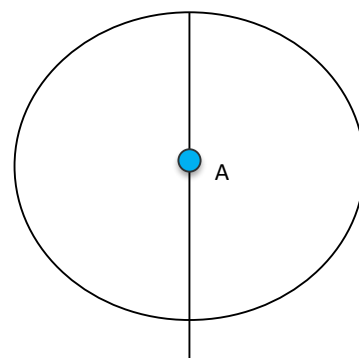
Extractive Sampling		Instrumental Analysers		Miscellaneous Items	
Equipment Type	Equipment I.D.	Equipment Type	Equipment I.D.	Equipment Type	Equipment I.D.
Control Box DGM	ETC-S8.04b	Horiba PG-250	-	Tape Measure	ETC-S17.05
Box Thermocouples	-	Horiba PG-250 SRM	-	Bevel Box	-
Box Thermocouple In	-	Horiba PG-350	ETC-S12.01	Stopwatch	ETC-S10.14
Box Thermocouple Out	-	JCT JCC Cooler	-	Barometer	ETC-SMet office
Control Box Timer	ETC-S8.04b	MAK10 Cooler	-	Digital Manometer	ETC-S24.04
Umbilical	-	Horiba PS200 Cooler	-	Digital Temperature Meter	ETC-S24.04
Oven Box	-	M&C PSS Gas Preparation	ETC-S3.41b	Dual Channel Heat Controller	-
Heated Probe (1)	-	Gasmet DX4000 FTIR	-	1m Heated Line	-
Heated Probe (2)	-	Gasmet Sampling System	-	3m Heated Line	-
Stack Thermocouple (1)	ETC-S1.14	SK-Thermo FID	ETC-S13.07	5m Heated Line	-
Stack Thermocouple (2)	-	Bernath 3006 FID	-	10m Heated Line	ETC-S5.08
S-Type Pitot (1)	-	Testo 350XL	-	20m Heated Line	-
S-Type Pitot (2)	-	M&C PSP 4000	ETC-S7.08	30m Heated Line	-
L-Type Pitot	ETC-S20.03l	Easylogger EN-EL-12 Bit	-	Impinger Arm Thermocouple (1)	-
Site Balance	ETC-S18.02	Hioki 5043 (V)	-	Impinger Arm Thermocouple (2)	-
500g Check Weight	ETC-S18.02a	Analyser Temperature Logger	-	Dioxins Kit Thermocouple	-
1KG Check Weight	ETC-S18.02b	-	-	Sample Temperature Logger	-

Appendix 2: A1 - Smoker Exhaust Results and Calculations

Picture of the sampling location



Sampling Points Diagram



Sampling Line

- = Isokinetic sampling point
- = Isokinetic point not sampled
- = Non-Isokinetic sampling point
- = Combustion Gases, VOC Sampling point

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.12
Width	m	-
Area	m ²	0.01
Port Depth	cm	0.00
Orientation of Stack / Duct	-	Horizontal
Sampling Port Size	-	Hole
Number of Ports	-	1

Manual Sampling Points	Used / Required
Number of Sampling Lines	1 / 1
Number of Sampling Points	1 / 1
Instrumental Sampling Points	Used / Required
Number of Sampling Lines	1 / 1
Number of Sampling Points	1 / 1

Platform Type and Location	
Platform Type - Permanent / Temporary	Temporary
Location - Inside / Outside	Outside

EA Technical Guidance Note M1 Platform Requirements		
Load Baring Capacity	Load bearing capacity of platform sufficient to fulfil the measurement objective	Yes
Position & Work Space	Sufficient work area to manipulate probe & operate the measurement instruments	Yes
	Depth of work area > internal diameter of stack and wall thickness plus 1.5m	Yes
	Ports on vertical ducts 1.2m to 1.5m above platform floor	N/A
	Platform has chains / self closing gates at top of ladders	No
Fall Prevention	Platform has adequate drainage to prevent accumulation of free-standing water	N/A
	Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	No
	Gaps between handrails not >0,5m	N/A
Access	Platform has vertical base boards (approx. 0.25m high)	N/A
	Access to sampling ports unhindered by obstructions	Yes
	Easy & safe access and egress available	No

Sampling Location / Platform Recommendations

Although the platform does not meet the requirements specified in Environment Agency Guidance Note M1 and BS EN 15259, it is adequate for the monitoring specified in the Site Specific Protocol.

Water Vapour Measurements

Parameter	Value	Unit
Sampling Date	27/05/2022	-
Start Time	10:45	-
End Time	11:45	-
Barometric Pressure	1007	mbar

Parameter	Value	Unit
Stack Temperature	22.0	°C
Corrected Volume	-	L
Collected Mass	3.1	g
Stack Gas Water Vapour Content	2.6	% v/v

Flow Criteria Measurements

Duct Diameter (m)	Cross Sectional Area (m²)	Barometric Pressure (mbar)	Ambient Temperature (°C)	Mean Oxygen (%)	Mean Carbon Dioxide (%)	Mean Water Vapour (%)	Stack Gas Molecular mass (g/mol)	Pitot Coefficient
0.12	0.01	1007	11.0	20.80	0.06	2.6	28.6	0.846

Sample Line	Traverse Point	Position (cm)	Differential Pressure Reading (cmH2O)				Stack Velocity (m/s)	Stack Temp (°C)	Angle of Swirl
			1	2	3	Average			
A	A1	6.00	0.001	0.001	0.001	0.001	0.35	22.0	12

Parameter	Mean Duct Velocity	Velocity Ratio (Max:Min)	Mean Stack Temperature	Mean Stack Temperature	Stack Gas Volume Flow Actual	Stack Gas Volume Flow @ STP Wet	Stack Gas Volume Flow @ REF Conditions
Value	0.35	1.0:1	22.0	295	14.1	13.0	12.6
Units	m/s	-	°C	K	m³/hr	Nm³/hr	Nm³/hr

Instrumental Gas Analyser Calibrations

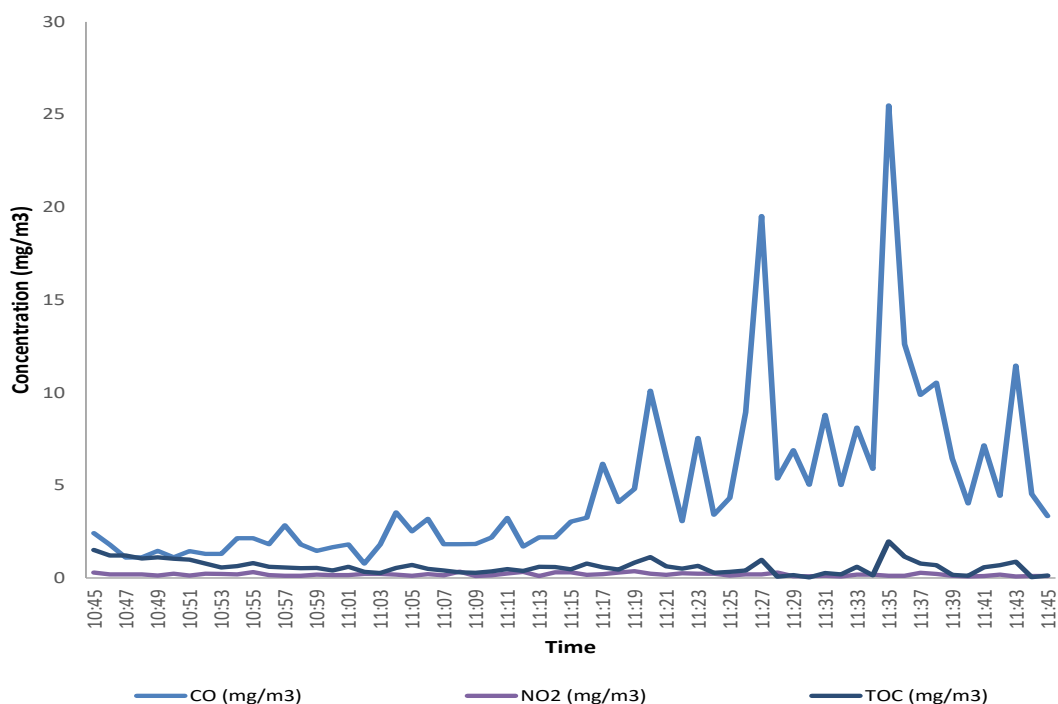
Date	Operators	Combustion Gas Analyser	Flame Ionisation Detector
27/05/2022	KW/CW	ETC-S12.01	ETC-S13.07

Calibration Gas	Certified Concentration	Analyser Range	T90 Time	Analyser Span	Pre-sample Cal		Post-sample Cal		Zero Drift	Span Drift	Drift Acceptable
					Zero	Span	Zero	Span			
Carbon Monoxide	160.81ppm	200ppm	14	160.8	0.00	160.8	0.00	155.4	0.00	-3.4	Yes
Nitrogen Monoxide	201.66ppm	250ppm	12	201.7	0.10	201.7	0.10	200.3	0.05	-0.74	Yes
Propane	81.6ppm	100ppm	12	81.6	0.09	80.92	0.09	80.54	0.11	-1.4	Yes

Instrumental Gas Analyser Results

Substance	Run	Corrected Concentration			Units	Basis	O ₂ Correction
		Average	Max	Min			
Carbon Monoxide	1	4.7	25.5	0.8	mg/m ³	-	-
Oxides of Nitrogen (as NO ₂)	1	0.18	0.36	0.07	mg/m ³	NO _x as NO ₂	-
Total VOC	1	0.6	2.0	0.0	mg/m ³	VOC as C	-

Instrumental Gas Analyser Chart - Run 1



Uncertainty

Uncertainty of Carbon Monoxide by Horiba Analyser

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m ³
Reading	3.8	ppm
Span Gas Certified Value	160.8	ppm
Range	200	ppm

Cal Gas
CO

Source of Uncertainty	Uncertainty Criteria	Probability Distribution	Divisor	Source Uncertainty u	Combined Uncertainty u ²
Zero Drift/Lower limit of detection (ppm)	0.00	Rectangular	1.7	0.00	0.00
Span Drift (ppm)	5.4	Rectangular	1.7	3.1	9.7
Linearity (% of value)	1.11	Rectangular	1.7	0.02	0.001
Setting Gas Divider (% of value)	0.35	Normal	1.0	0.01	0.0002
Interference (% of value)	-0.48	Rectangular	1.7	-0.01	0.0001
Standard deviation of repeatability at zero point (% of range)	0.10	Rectangular	-	0.20	0.04
Standard deviation of repeatability at span point (% of range)	0.20	Rectangular	-	0.40	0.16
Total					9.9
Combined Standard Uncertainty [(sum u²)^{0.5}]					3.1
Expanded Total Uncertainty (ppm) (95% confidence)					6.2
Expanded Total Uncertainty as a % of emission conc. (95% confidence)					164
Expanded Total Uncertainty (mg/m³) (95% confidence)					7.7

Uncertainty of Oxides of Nitrogen by Horiba gas Analyser

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m ³
Reading	0.1	ppm
Span Gas Certified Value	201.7	ppm
Range	250	ppm

Cal Gas
NO

Source of Uncertainty	Uncertainty Criteria	Probability Distribution	Divisor	Source Uncertainty u	Combined Uncertainty u ²
Zero Drift/Lower limit of detection (ppm)	0.00	Rectangular	1.7	0.00	0.00
Span Drift (ppm)	1.4	Rectangular	1.7	0.81	0.65
Linearity (% of value)	0.63	Rectangular	1.7	0.0003	0.0000001
Setting Gas Divider (% of value)	0.35	Normal	1.0	0.0003	0.0000001
Interference (% of value)	0.63	Rectangular	1.7	0.0003	0.0000001
Standard deviation of repeatability at zero point (% of range)	0.00	Rectangular	-	0.00	0.00
Standard deviation of repeatability at span point (% of range)	0.10	Rectangular	-	0.25	0.06
Total					0.72
Combined Standard Uncertainty [(sum u²)^{0.5}]					0.85
Expanded Total Uncertainty (ppm) (95% confidence)					1.7
Expanded Total Uncertainty as a % of emission conc. (95% confidence)					1868
Expanded Total Uncertainty (mg/m³) (95% confidence)					3.4

Uncertainty of Total VOC by SK - Run 1

Parameter	Value	Unit
Emission Limit Value (ELV)	150	mg/m ³
Reading	0.4	ppm
Span Gas Certified Value	81.6	ppm
Range	100	ppm

Cal Gas
C ₃ H ₈

Source of Uncertainty	Uncertainty Criteria	Probability Distribution	Divisor	Source Uncertainty u	Combined Uncertainty u ²
Zero Drift/Lower limit of detection (ppm)	0.00	Rectangular	1.7	0.00	0.00
Span Drift (ppm)	0.38	Rectangular	1.7	0.22	0.05
Linearity (% of value)	0.40	Rectangular	1.7	0.001	0.000001
Setting Gas Divider (% of value)	0.35	Normal	1.0	0.001	0.000002
Noise (ppm)	0.10	Rectangular	1.7	0.06	0.003
Temperature Drift (% of value)	1.0	Rectangular	1.7	0.002	0.000005
Standard deviation of repeatability at zero point (% of range)	0.20	Rectangular	-	0.20	0.04
Standard deviation of repeatability at span point (% of range)	0.20	Rectangular	-	0.20	0.04
Total					0.13
Combined Standard Uncertainty [(sum u²)^{0.5}]					0.36
Expanded Total Uncertainty (ppm) (95% confidence)					0.71
Expanded Total Uncertainty as a % of emission conc. (95% confidence)					192
Expanded Total Uncertainty (mg/m³) (95% confidence)					1.1
Expanded Total Uncertainty as a % of emission limit value (95% confidence)					0.76

Uncertainty of Volumetric Flow - Run 1

Parameter	Value	Unit
Measured Volumetric Flow Rate Actual	14	L/min

Performance Characteristics & Source Value	Value	Units
Standard Uncertainty - Pitot tube Coefficient	0.01	-
Standard Uncertainty - Mean Local Dynamic Pressure	1.1	Pa
Standard Uncertainty - Molar Mass of Stack Gas	0.00003	-
Standard Uncertainty - Stack Gas Temperature	0.50	K
Standard Uncertainty - Absolute Pressure in Duct	176	Pa
Standard Uncertainty - Density of Stack Gas	0.03	-
Standard Uncertainty - Mean Velocity	5.9	m/s
Expanded Uncertainty Mean Velocity (95% confidence)	11.6	m/s
Expanded Uncertainty Mean Velocity (95% Confidence), Relative	3354	%
Standard Uncertainty - Volumetric Flow Rate	241	-
Standard Uncertainty - Volumetric Flow Rate (95% Confidence)	472	m ³ /hr
Standard Uncertainty - Volumetric Flow Rate (95% Confidence), Relative	3353	%

95% confidence interval factor - 1.96

Document Version Number	Record of change within different version numbers
V1	Original version of the document issued to client.