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ENVIRONMENTAL
SERVICES

Report for the Periodic Monitoring of Emissions to Atmosphere

Stack Emissions Test Report Commissioned by: Environmental Monitoring Solutions Ltd

Bakkavör Group Plc

Paint Extraction 3 - Soups

Permit No: N/A
Installation: Spalding
Monitoring Dates: 7th May 2021
Site Address: West Marsh Road, Spalding, Lincolnshire, PE11 2BB

Report Number: ES-0434 Version: 1 Visit: 1 in 2021
Date of Report: 7th June 2021
Report Author: Thomas Arden
MCERTS No: MM 18 1478 MCERTS Level: 2 (TE1, TE3, TE4)

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MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING 2522

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Executive Summary

Monitoring Objectives

Envirocare Technical Consultancy were contracted by Bakkavör Group Plc to carry out emissions monitoring, to determine the emissions to atmosphere of Paint Extraction 3 - Soups. 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	Paint Extraction 3 - Soups
Methyl Ethyl Ketone (MEK)	✓
Volumetric Flow	✓

Special requirements: none.

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Executive Summary

Monitoring Results

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

Substance		Concentration				Mass Emission				
		Limit (mg/m³)	Result (mg/m³)	Measurement Uncertainty (MU) +/-	Reference Conditions	Limit (g/hr)	Result (g/hr)	Measurement Uncertainty (MU) +/-	Sampling Date	Sampling Times
Methyl Ethyl Ketone (MEK)	R1	-	124	33.2	273K, 101.3kPa, DRY	-	170	46.6	10/05/2021	10:05-10:35
Volumetric Flow	R1	-	1,371 m³/h	85.4	273K, 101.3kPa, DRY	-	-	-	05/05/2021	09:55-10:01

Operating Information

Paint Extraction 3 - Soups

Date	Process Type	Fuel	Feedstock	Abatement	Load	Operating Status
07/05/2021	Batch - cleaning on printing machine used to print dates on food packaging	N/A	MEK paint stripper and black ink.	None	Normal cleaning operation on single printer	Normal

*information provided by Site

Monitoring Deviations

Paint Extraction 3 - Soups

Substance Deviations	Monitoring Deviations	Other Relevant Issues
None	None	None

Supporting Information

Appendix 1: General Information

Monitoring Organisation Staff Details

Personnel	Position	MCERTS Level	MCERTS Number
Mr T Arden	Team Leader	2 (TE1, TE3, TE4)	MM 18 1478
Mr J Perrin	Technician	Trainee	MM 19 1572

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			
Methyl Ethyl Ketone (MEK)	PD CEN/TS 13649-1	ETC-SE-06 (a/b)	Yes	RPS	O8	GC-MS	No

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

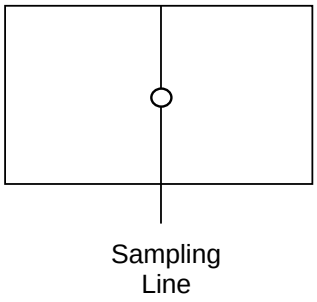
Equipment Checklist

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-S8.03/8.05(B)	Horiba PG-250	-	Tape Measure	ETC-S17.02
Box Thermocouples	ETC-S2.03	Horiba PG-250 SRM	ETC-S12.04	Bevel Box	-
Box Thermocouple In	ETC-S3.22	Horiba PG-350	ETC-S12.01	Stopwatch	ETC-S10.03/10.11
Box Thermocouple Out	ETC-S3.25	JCT JCC Cooler	-	Barometer	ETC-S11.04
Control Box Timer	ETC-S10.03	MAK10 Cooler	-	Digital Manometer	ETC-S24.a/b
Umbilical	ETC-SS.3	Horiba PS200 Cooler	-	Digital Temperature Meter	ETC-S24.a/b
Oven Box	ETC-S9.04	M&C PSS Gas Preparation	ETC-S3.42b	Dual Channel Heat Controller	-
Heated Probe (1)	ETC-S4.05	Gasmet DX4000 FTIR	-	1m Heated Line	-
Heated Probe (2)	ETC-S4.06	Gasmet Sampling System	-	3m Heated Line	-
Stack Thermocouple (1)	ETC-S4670	SK-Thermo FID	ETC-S13.07	5m Heated Line	ETC-S5.09
Stack Thermocouple (2)	ETC-S4.05	Bernath 3006 FID	-	10m Heated Line	ETC-S5.05
S-Type Pitot (1)	ETC-S4670	Testo 350XL	-	20m Heated Line	ETC-S5.11
S-Type Pitot (2)	ETC-S10-17-19-1	M&C PSP 4000	ETC-S7.03	30m Heated Line	-
L-Type Pitot	ETC-SL-Type 03	Easylogger EN-EL-12 Bit	-	Impinger Arm Thermocouple (1)	ETC-S3.05
Site Balance	ETC-SETC-S18.03	Hioki 5043 (V)	-	Impinger Arm Thermocouple (2)	ETC-S3.09
500g Check Weight	ETC-S18229	Analyser Temperature Logger	-	Dioxins Kit Thermocouple	-
1KG Check Weight	ETC-S143069	-	-	Sample Temperature Logger	-
Digital Callipers	ETC-S16.01	-	-	Laboratory Balance	-

Appendix 2: Paint Extraction 3 - Soups Results and Calculations

Picture of the sampling location

Sampling Points Diagram



Duct Characteristics

Parameter	Units	Value
Type	-	Rectangular
Depth	m	0.27
Width	m	0.27
Area	m²	0.07
Port Depth	cm	0.0
Orientation of Stack / Duct	-	Vertical
Sampling Port Size	-	4" BSP
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	Permanent
Location - Inside / Outside	Inside

EA Technical Guidance Note M1 Platform Requirements		
Load Baring Capacity	Load baring 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	No
	Platform has chains / self closing gates at top of ladders	N/A
	Platform has adequate drainage to prevent accumulation of free-standing water	N/A
Fall Prevention	Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	N/A
	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	Yes

Sampling Location / Platform Recommendations

All sampling platforms should be designed in accordance with the requirements specified in Environment Agency Guidance Note M1 and BS EN 15259.

Flow Criteria Measurements

Duct Dimensions (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
0.27 x 0.27	0.07	1010	21.0	21.0	0.06	1.0	28.6	0.99

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	13.5	0.20	0.20	0.20	0.20	5.7	21.0	3

Parameter	Mean Duct Velocity	Velocity Ratio (Max:Min)	Mean Stack Temperature	Mean Stack Temperature	Stack Gas Volume Flow	Corrected Stack Gas Volume Flow @ STP WET	-
Value	5.7	1.0:1	21.0	294	1495	1385	-
Units	m/s	-	°C	K	m³/hr	Nm³/hr	Nm³/hr

Methyl Ethyl Ketone (MEK) - Run 1 Calculations

Sampling Details		
Collection Media	SKC 226-09	
Sampling Rate	200	mL/min
Test Duration	30.0	min
Sample Volume	6.0	L
Corrected Sample Volume	5.6	NL

Analysis Details		
1st Collector Reference	S1.12	
1st Collector Concentration	701	µg
2nd Collector Reference	S1.12	
2nd Collector Concentration	<2	µg
Blank Concentration	0.36	mg/Nm³
Has breakthrough occurred?	No	-

Date	Operators
10/05/21	TA/JP

Parameter	Before	After	Unit
Barometric Pressure	1010	1010	mbar
Operating Temperature	17.0	17.0	°C
Leak Check	Pass	Pass	-
Time	10:05	10:35	-

Emissions Calculations		
Emission Limit Value	-	mg/Nm³
Corrected Emission	124	mg/Nm³
Corrected to 11% Oxygen	N/A	mg/Nm³

Uncertainty

Uncertainty of Methyl Ethyl Ketone (MEK) by Pump - Run 1

Parameter	Value	Unit
Emission Limit Value (ELV)	-	mg/m³
Mean Sampling Rate	0.20	L/min
Barometric Pressure	1010	mbar

Parameter	Value	Unit
Emission Concentration	124	mg/m³
Monitoring Duration	30	min
Average Stack Temperature	17.0	°C

Source of Uncertainty	Uncertainty Criteria	Actual Source Value	Units	% Actual Value	Source Uncertainty u	Combined Uncertainty u²
Analysis	25% of result (95% confidence)	15.6	mg	12.5	15.6	242
Leak Rate	<2% of sampling rate	0.01	L/min	5.0	2.5	6.2
Time	1 minute	0.50	min	0.03	0.03	0.001
Sampling Flow Rate	2% of value	0.01	L/min	5.0	6.2	38.7
Temperature	1% of value	0.50	°C	0.17	0.21	0.05
Pressure	1% of value	5.0	mbar	0.50	0.62	0.38
					Total	287
					Combined Standard Uncertainty [(sum u²)$^{0.5}$]	17.0
					Expanded Total Uncertainty as a % of emission conc. (95% confidence)	26.7
					Expanded Total Uncertainty (mg/m³) (95% confidence)	33.2
					Expanded Total Uncertainty as a % of emission limit value (95% confidence)	-

Uncertainty of Volumetric Flow - Run 1

Parameter	Value	Unit
Measured Volumetric Flow Rate Actual	1495	L/min

Performance Characteristics & Source Value	Value	Units
Standard Uncertainty - Pitot tube Coefficient	0.005	-
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	0.08	m/s
Expanded Uncertainty Mean Velocity (95% confidence)	0.16	m/s
Expanded Uncertainty Mean Velocity (95% Confidence), Relative	2.8	%
Standard Uncertainty - Volumetric Flow Rate	47.5	-
Standard Uncertainty - Volumetric Flow Rate (95% Confidence)	93.2	m³/hr
Standard Uncertainty - Volumetric Flow Rate (95% Confidence), Relative	6.2	%

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.