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ENVIRONMENTAL SERVICES

Report for the Periodic Monitoring of Emissions to Atmosphere

British Crystal Ltd

EP1 - Furnace Exhaust

Permit No:	PB/98
Installation:	Brierley Hill Crystal
Monitoring Dates:	16th December 2020
Site Address:	Brierley Hill Crystal, Unit 14 Pedmore Road Industrial Estate, Pedmore Rd, Brierley Hill, DY5 1TJ

Report Number:	ES-0309	Version: 1	Visit: 1 in 2020
Date of Report:	19th January 2020		
Report Author:	Thomas Arden		
MCERTS No:	MM 18 1478	MCERTS Level:	2 (TE1, TE3, TE4)

Approved By:	Iain Wilkie	Function:	Operations Manager
MCERTS No:	MM 04 492	MCERTS Level:	2 (TE1, TE2, TE3, TE4)

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MCERTS

UKAS TESTING 2522

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Executive Summary

Monitoring Objectives

Envirocare Technical Consultancy were contracted by British Crystal Ltd to carry out emissions monitoring, to determine the compliance of EP1 - Furnace Exhaust with the conditions specified in the operators permit (PB/98) 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	EP1 - Furnace Exhaust
Volumetric Flow	✓
Lead	✓

Special requirements: none.

Opinions and interpretations expressed within this report are outside the scope of Envirocare Technical Consultancy's MCERTS and UKAS accreditation. Envirocare accepts no responsibility for information in this report that was provided by the client, the client's representative or employees of the client. Where such information has been provided by external sources this is identified in footnotes of the respective tables.

Executive Summary

Monitoring Results

EP1 - Furnace Exhaust

Substance	Emission Limit Value (mg/m^3)	Periodic Monitoring Result (mg/m^3)	Uncertainty as a % of Measured Concentration (95% confidence)	Reference Conditions	Date	Start and End Times	Monitoring Reference Method	Accreditation for Use of Method
Volumetric Flow	N/A	4,846 m^3/h	-	273K, 101.3kPa	16/12/2020	8:40 - 8:45	BS EN 16911-1	MCERTS
Lead	5	1.9	22.0	273K, 101.3kPa, DRY	15/12/2020	14:34-15:34	BS EN 14385	MCERTS

Operating Information

EP1 - Furnace Exhaust

Date	Process Type	Fuel	Feedstock	Abatement	Load	Operating Status
16/12/2020	Continuous - Furnace Process	Natural Gas	Glass	None	Normal usage	Normal Operation

*information provided by Site

Monitoring Deviations

EP1 - Furnace Exhaust

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 B Grant	Team Leader	2 (TE1, TE2, TE3, TE4)	MM 03 200
Mr T Arden	Team Leader	2 (TE1, TE3, TE4)	MM 18 1478
Mr R Bromwell	Technician	Level 1	MM 20 1592

Monitoring Methods

Pollutant Species	Standard	Technique	ISO 17025 Analysis	Analysis Lab	Envirocare Internal Procedure
Volumetric Flow	BS EN ISO 16911-1	Pitot & Thermocouple	Yes	ENV	ETC - SE - 24 a/b
Metals	BS EN 14385	ICP-MS	Yes	RPS	ETC - SE - 09 / 23

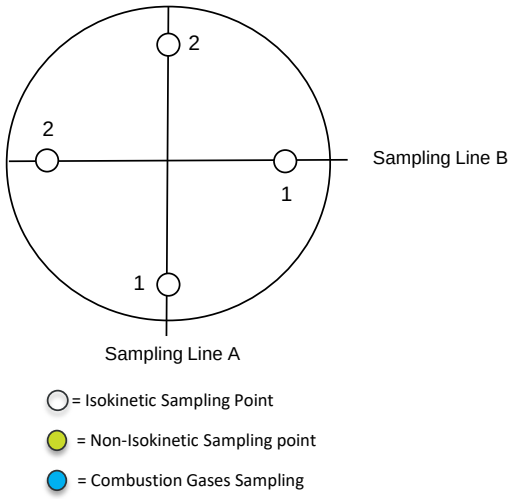
Analysis Laboratories Accreditation Details	
Envirocare (ENV)	ISO 17025 Accreditation Number: 2522
RPS Laboratories Ltd (RPS)	ISO 17025 Accreditation Number: 0605

Equipment Checklist

Equipment ID	Model Number	Purpose
ES-09.03	Oven Box	Sample Filter Heater
ETC-S04.01	Integrated Method 5 Sampling Probe	Integrated Probe
10-17-19-1	S-Type Pitot	Duct Flow Measurement
L-Type 3	L-Type Pitot	Duct Flow Measurement
BA7	Site Balance	Moisture Measurement
VC11	Vernier Caliper	Nozzle measurement
TM69	5M Tape Measure	Duct dimension measurement
SW3	Stopwatch	Sample duration measurement
ES-11.03 (BA13)	Barometer	Ambient pressure measurement
ETC-S24.03a/b	KIMO Micromanometer / Temperature Meter	Differential pressure and temperature measurement

Appendix 2: EP1 - Furnace Exhaust Results and Calculations

Picture of the sampling location and positions



Flow Criteria Measurements

Duct Diameter (cm)	Cross Sectional Area (m²)	Barometric Pressure (mbar)	Ambient Temperature (°C)	Stack Gas Mr (g/mol)	Pitot Coefficient
40.0	0.126	1002	15.0	29.00	0.85

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	5.84	1.22	1.22	1.22	1.22	12.28	32.0	7
	A2	34.16	1.15	1.15	1.15	1.15	11.94	33.0	7

Sample Line	Traverse Point	Position (cm)	Differential Pressure Reading (cmH2O)				Stack Velocity (m/s)	Stack Temp (°C)	Angle of Swirl
			1	2	3	Average			
B	B1	5.84	1.15	1.15	1.15	1.15	11.96	34.0	7
	B2	34.16	1.24	1.24	1.24	1.24	12.42	34.0	7

Parameter	Mean Duct Velocity	Velocity Ratio (Max:Min)	Mean Stack Temperature	Mean Stack Temperature	Stack Gas Volume Flow	Corrected Stack Gas Volume Flow
Value	12.15	1.0:1	33.3	306.3	5496.1	4846.2
Units	m/s	-	°C	K	m³/hr	Nm³/hr

Metals - Run 1 Calculations

Parameter	Value	Unit
Meter Box Number	ES-8.02	-
Gas Meter Coefficient	1.082	-
Pitot Coefficient	0.849	-
Stack Gas Molecular Weight	29.0	g/mole
Static Pressure in Stack	<0.24	cmH_2O

Date	Operators
15/12/2020	TA/RB/BG

Parameter	Before	After	Unit
Barometric Pressure	1002	1002	mbar
Ambient Temperature	22.0	21.0	°C
Leak Check	0.05	0.05	L/min
Time	14:34	15:34	-

Parameter	Value	Unit
Nozzle Diameter	6.20	mm
Average Gas Meter Temperature	16.9	°C
Average Stack Temperature	33.4	°C
Average Stack Velocity	12.16	m/s
Isokineticity	105.4	%
Total Sampling Time	60	min
Gas Meter Difference	1206.0	L
Corrected Gas Meter Volume	1304.9	L
Mean Sampling Rate	21.7	L/min

Parameter	Value	Unit
STP Dry Gas Meter Volume	1215.6	NL
Mass of Water Vapour Collected	9.8	g
Volume of Water Vapour Collected	12.2	NL
Stack Gas Water Vapour Content	1.0	% v/v

Measured	Impinger Mass (g)							Collected Mass (g)
	1	2	3	4	5	6	7	
Before	882.3	866.3	849.3	640.3	976.3	-	-	9.8
After	880.7	871.7	851.7	640.6	979.6	-	-	

Metal	Rinse (µg)	Filter (µg)	Impinger (µg)				Total Run (µg)	Total Blank (µg)	Absorb Eff.	Blank (mg/m3)	Emission (mg/m3)	O_2 Corr. Emission
			1+2	3	4	5						
Lead	52	2210	41	8.3	-	-	2312.02	0.76	99.6%	0.00063	**1.9**	N/A

Uncertainty

Uncertainty of Metals - Run 1

Parameter	Value	Unit
Mean Sampling Rate	21.7	L/min
Leak Rate	0.05	L/min
Barometric Pressure	1002	mbar
Average StackTemperature	33.4	°C
Sampled Stack Gas Volume	1206	L

Parameter	Value	Unit
Monitoring Duration	60	min
Console ID	ES-8.02	-
Temperature Uncertainty	0.24	°C
Gas Meter Uncertainty	0.37	%
Barometer Uncertainty	1.0	mbar

Source of Uncertainty	ASD*	BS EN 14385		Envirocare Certified Value	Units	% Actual Value	Source Uncertainty u	Combined Uncertainty u²
		Uncertainty Criteria	Max. Value					
Leak Rate	Rect	<2% of sampling rate	0.43	0.05	L/min	0.23	0.003	0.000006
Time	Std	1sec in 1hour = 0.028%	2.0	1.0	sec	0.03	0.0005	0.0000003
Gasmeter Volume	Std	<2%	24.1	4.5	L	0.37	0.007	0.00005
Temperature	Std	1% of value	3.1	0.24	°C	0.72	0.01	0.0002
Pressure	Std	1% of value	10.0	1.0	mbar	0.10	0.002	0.000004
							Total	0.0002

Metal	Analysis		Analysis Unc. U (mg)	Analysis u2	Sampling u2	Total sqrt(u2)	Measurement Uncertainty (95% Confidence) (mg/Nm3)	Expanded Total Uncertainty as a percentage of (95% Confidence)	
	(µg)	Unc (%)						Emissions Concentration	Emission Limit Value
Lead	2312.02	9.2	0.21	0.05	0.0002	0.21	0.42	22.0	8.4