

Report for the Periodic Monitoring of Emissions to Atmosphere

British Crystal Ltd EP3 - Wet Arrestment Plant

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 2021
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)

Signed:



T: 01274 738668
E: sales@envirocare.org
Envirocare Technical Consultancy Ltd
Bradford Chamber Business Park, New Lane, Bradford, BD4 8BX

YOUR INDUSTRY EXPERTS



Contents

| | |
|--------------------------------------|-------|
| Executive Summary | |
| Monitoring Objectives | 3 |
| Monitoring Results | 4 |
| Operating Information | 4 |
| Monitoring Deviations | 4 |
| Supporting Information | |
| Appendix 1: General Information | 5 |
| Appendix 2: Results and Calculations | 6 - 8 |

Executive Summary

Monitoring Objectives

Envirocare Technical Consultancy were contracted by British Crystal Ltd to carry out emissions monitoring, to determine the compliance of EP3 - Wet Arrestment Plant 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 | EP3 - Wet Arrestment Plant |
|----------------------------|----------------------------|
| 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

EP3 - Wet Arrestment Plant

| 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 | 6,947 m ³ /h | - | 273K, 101.3kPa | 16/12/2020 | 08:40-08:45 | BS EN 16911-1 | MCERTS |
| Lead | 5 | 0.98 | 23.8 | 273K, 101.3kPa, DRY | 15/12/2020 | 10:13-11:13 | BS EN 14385 | MCERTS |

Operating Information

EP3 - Wet Arrestment Plant

| Date | Process Type | Fuel | Feedstock | Abatement | Load | Operating Status |
|------------|------------------------------------|------|----------------------------|----------------|--------------|------------------|
| 16/12/2020 | Continuous - Local Extraction Vent | None | Glass & Cutting Abrasives. | Wet Arrestment | Normal usage | Normal Operation |

*information provided by Site

Monitoring Deviations

EP3 - Wet Arrestment Plant

| 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 |

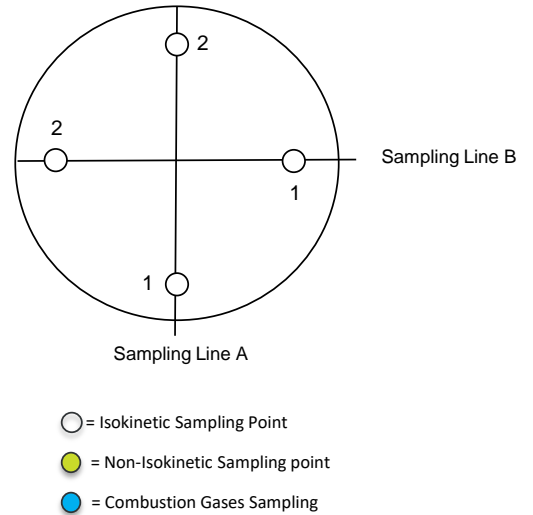
| Analysis Laboratories Accreditation Details | |
|---|--------------------------------------|
| Envirocare (ENV) | ISO 17025 Accreditation Number: 2522 |
| RPS Laboratories Ltd (RPS) | ISO 17025 Accreditation Number: 0605 |

Equipment Checklist

| Equipment ID | Model Number | Purpose |
|-----------------|---|---|
| ETC-S08.03 | Millenium Console | Isokinetic Sampler |
| 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: EP3 - Wet Arrestment Plant Results and Calculations

Picture of the sampling location and positions



Flow Criteria Measurements

| Duct Diameter (cm) | Cross Sectional Area (m ²) | Barometric Pressure (mbar) | Ambient Temperature (°C) | Stack Gas Mr (g/mol) | Pitot Coefficient |
|--------------------|--|----------------------------|--------------------------|----------------------|-------------------|
| 63.0 | 0.312 | 1002 | 15.0 | 29.0 | 0.85 |

| Sample Line | Traverse Point | Position (cm) | Differential Pressure Reading (cmH ₂ O) | | | | Stack Velocity (m/s) | Stack Temp (°C) | Angle of Swirl |
|-------------|----------------|---------------|--|------|------|---------|----------------------|-----------------|----------------|
| | | | 1 | 2 | 3 | Average | | | |
| A | A1 | 9.198 | 0.31 | 0.31 | 0.31 | 0.31 | 5.98 | 12.0 | 7 |
| | A2 | 53.802 | 0.42 | 0.42 | 0.42 | 0.42 | 6.99 | 14.0 | 7 |

| Sample Line | Traverse Point | Position (cm) | Differential Pressure Reading (cmH ₂ O) | | | | Stack Velocity (m/s) | Stack Temp (°C) | Angle of Swirl |
|-------------|----------------|---------------|--|------|------|---------|----------------------|-----------------|----------------|
| | | | 1 | 2 | 3 | Average | | | |
| B | B1 | 9.198 | 0.20 | 0.22 | 0.22 | 0.21 | 4.96 | 12.0 | 7 |
| | B2 | 53.802 | 0.59 | 0.59 | 0.59 | 0.59 | 8.27 | 13.0 | 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 | 6.55 | 1.7:1 | 12.8 | 286 | 7351 | 6947 |
| Units | m/s | - | °C | K | m ³ /hr | Nm ³ /hr |

Metals - Run 1 Calculations

| Parameter | Value | Unit |
|----------------------------|---------|--------------------|
| Meter Box Number | ES-8.02 | - |
| Gas Meter Coefficient | 1.082 | - |
| Pitot Coefficient | 0.851 | - |
| Stack Gas Molecular Weight | 29.0 | g/mole |
| Static Pressure in Stack | <0.24 | cmH ₂ O |

| Parameter | Value | Unit |
|-------------------------------|--------|-------|
| Nozzle Diameter | 8.98 | mm |
| Average Gas Meter Temperature | 16.0 | °C |
| Average Stack Temperature | 14.1 | °C |
| Average Stack Velocity | 5.81 | m/s |
| Isokineticity | 106.1 | % |
| Total Sampling Time | 60 | min |
| Gas Meter Difference | 1293.0 | L |
| Corrected Gas Meter Volume | 1399.0 | L |
| Mean Sampling Rate | 23.3 | L/min |

| 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 | 10:13 | 11:13 | - |

| Parameter | Value | Unit |
|----------------------------------|--------|-------|
| STP Dry Gas Meter Volume | 1307.0 | NL |
| Mass of Water Vapour Collected | 9.4 | g |
| Volume of Water Vapour Collected | 11.7 | 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 | 933.2 | 846.4 | 830.6 | 639.7 | 972.8 | - | - | 9.4 |
| After | 924.5 | 859.1 | 831.9 | 640.3 | 976.3 | - | - | |

| Metal | Rinse (µg) | Filter (µg) | Impinger (µg) | | | | Total Run (µg) | Total Blank (µg) | Absorb Eff. | Blank (mg/m ³) | Emission (mg/m ³) | O ₂ Corr. Emission |
|-------|------------|-------------|---------------|------|---|---|----------------|------------------|-------------|----------------------------|-------------------------------|-------------------------------|
| | | | 1+2 | 3 | 4 | 5 | | | | | | |
| Lead | 906 | 375 | 4.2 | 0.35 | - | - | 1286 | 1.9 | 100.0% | 0.001 | 0.98 | N/A |

Uncertainty

Uncertainty of Metals - Run 1

| Parameter | Value | Unit |
|---------------------------|-------|-------|
| Mean Sampling Rate | 23.3 | L/min |
| Leak Rate | 0.05 | L/min |
| Barometric Pressure | 1002 | mbar |
| Average Stack Temperature | 14.1 | °C |
| Sampled Stack Gas Volume | 1293 | 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 u ² |
|-----------------------|------|------------------------|------------|----------------------------|-------|----------------|----------------------|-------------------------------------|
| | | Uncertainty Criteria | Max. Value | | | | | |
| Leak Rate | Rect | <2% of sampling rate | 0.47 | 0.05 | L/min | 0.21 | 0.001 | 0.000001 |
| Time | Std | 1sec in 1hour = 0.028% | 2.0 | 1.0 | sec | 0.03 | 0.0003 | 0.00000007 |
| Gasmeter Volume | Std | <2% | 25.9 | 4.8 | L | 0.37 | 0.004 | 0.00001 |
| Temperature | Std | 1% of value | 2.9 | 0.24 | °C | 1.7 | 0.02 | 0.0003 |
| Pressure | Std | 1% of value | 10.0 | 1.0 | mbar | 0.10 | 0.001 | 0.000001 |
| Total | | | | | | | | 0.0003 |

| Metal | Analysis | | Analysis Unc. U (mg) | Analysis u2 | Sampling u2 | Total sqrt(u2) | Measurement Uncertainty (95% Confidence) (mg/Nm ³) | Expanded Total Uncertainty as a percentage of (95% Confidence) | |
|-------|----------|---------|----------------------|-------------|-------------|----------------|--|--|----------------------|
| | (µg) | Unc (%) | | | | | | Emissions Concentration | Emission Limit Value |
| Lead | 1286 | 9.2 | 0.12 | 0.01 | 0.0003 | 0.12 | 0.23 | 23.8 | 4.7 |