HARD ANODISING SURFACE TREATMENTS LTD

Environmental Permit Application Document

&

BAT Assessment

March 2026

Table of Contents page

Part A - Application Forms

The following application forms are attached with this document and are appropriate to the type of application being made.

- Application Form Part A
- Application Form Part B2
- Application Form Part B3
- Application Form Part B6
- Application Form Part F1

Part B - Non-Technical Summary

Overview of the Scope of the Permit Application

This environmental permit application is for the Installation associated with Hard Anodising Surface Treatments Ltd which is located in Kidderminster.

This document contains full details of the current operating techniques which are undertaken at the Installation. The use of 'Best Available Techniques' (BAT) are described within this document (where applicable) and the BAT are also summarised in **Table 2** which is present in **Part E Section 2.**

Representative plans for the Installation are included in **Section G**, they include:

- Figure 1 – Site Location Plan
- Figure 2 – Installation Boundary Plan
- Figure 3a – Factory 1 Layout Plan
- Figure 3b – Factory 2 Layout Plan
- Figure 4a – Factory 1 Drainage Plan
- Figure 4b – Factory 2 Drainage Plan
- Figure 5 – Emissions to Sewer Plan
- Figure 6 - Emissions to Atmosphere Plan
- Figure 7 – Waste Storage Location Plan

Application Content

This document has been compiled using the Environment Agency's 'The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07)' guidance document in relation to environmental permits.

In order to satisfy the requirements of the Environment Agency (EA) such that an environmental permit can be granted, the permit variation application includes the following documents and assessments:

- EA application forms A, B2, B3, B6 and F1
- Site plans (**Section G**)
- A Site Condition Report (CL1002)
- A Risk Assessment for Emission to Atmosphere (CL1003)
- A Surface Water Pollution Risk Assessment (CL1004)
- A Detailed Air Dispersion Modelling Report (CL1005)
- Other supporting information (e.g. EMS, accident management plan, waste records) as presented in **Section G** of this document.

This application is being made in accordance with the Environmental Permitting Regulations and using the relevant available Environment Agency tools and guidance documents.

Summary of Activities

Details of the Schedule 1 activities and directly associated activities undertaken at the site are summarised in **Table 1a**.

Emissions

There are no direct wastewater emissions to groundwater or surface water bodies associated with the installation.

There are two effluent treatment plants on site which treat the trade effluent from the Installation prior to discharge into the public sewer systems. The wastewater emission points are F1 and F2.

Surface water runoff from the installation (i.e. uncontaminated rainwater) is captured by the external drains which are present around both factories. It is then discharged to a dedicated storm water drainage system located on Oldington Lane. The water is ultimately discharged into the Staffs and Worcester Canal.

There are 18 air emission points associated with the Installation. Six of these are wall mounted fans, three are roof fans and nine are stacks.

Table 1a – Types of Activities		
Activity listed in Schedule 1 of the EP Regulations	**Description of specified activity**	**Limits of specified activity**
S2.3 Parts A(1)(a)	Surface treatment of metals using anodising and passivation chemistries.	Receipt of raw materials, surface treatment and despatch of finished parts. Total scheduled activity vat volume capacity is approx.117m^3
S2.3 Part B(a)	Surface treatment of metals by passivation and processes generating oxides of nitrogen	Receipt of raw materials, surface treatment and despatch of finished parts. Total scheduled activity vat volume capacity is approx. 20m^3
Directly Associated Activity		
Directly Associated Activity	Delivery, distribution, storing and handling of chemicals	Storage of chemicals in appropriate packaging/containers in secure area.
Directly Associated Activity	Water treatment, rinsing, drying and post-treatment	Water treatment, rinsing and drying of treated work and post-treatment of work, where necessary to complete the surface treatment.
Directly Associated Activity	Mechanical preparation	Substrate cleaning, prior to surface treatment and fume abatement by extraction (via built LEVs).
Directly Associated Activity	Degreasing	Degreasing/general purpose cleaning at room temperature in an ultra-sonic cleaner. and fume abatement by extraction (via built LEVs.
Directly Associated Activity	Chemical Cleaning	Chemical cleaning using aqueous cleaners on a closed loop system on both anodising and passivation lines.
Directly Associated Activity	Rinsing	Rinsing is counter flow on closed loop system. Dedicated operations used to maintain water quality.
Directly Associated Activity	Drying	The drying process includes a water dip to allow the parts to air dry quickly. No external emissions.
Directly Associated Activity	Paint Spraying	Paint spraying (aerosols and brush applications) of some parts. Small scale activity only. Emissions to air from this activity controlled by dedicated wall fans.
Directly Associated Activity	Chemical Etching	Chromic/Phosphoric Etch LEV dedicated to remove process fume emissions to air.
Directly Associated Activity	Storage and handling of Wastes	Storage and collection of waste, empty containers, general and residual waste from activities to be removed from the installation via licensed waste management contractor. Site operates a dedicated waste storage facility with Factory 2.

Table 1a – Types of Activities		
Activity listed in Schedule 1 of the EP Regulations	**Description of specified activity**	**Limits of specified activity**
Directly Associated Activity	Effluent Treatment	Waste waters are dealt with via 2 off dedicated Effluent Treatment Plants. Effluent concentrations are monitored twice daily by site personnel and quarterly by STWA. pH probes calibrated on a regular schedule by 3rd party contractor. Site limits are specified via Consent to Discharge Trade Effluent documentation.
Directly Associated Activity	Fume extraction and fume abatement	Local exhaust ventilation (LEV) on all major process tanks. All LEVs are subject to annual Inspection and Testing via a 3rd. party contractor. All release to air stacks is listed, numbered and located on a site map.
Directly Associated Activity	Monitoring of water flow rates	Factory 2 has an MCERTS accredited flow meter. Factory 1 has a non MCERTS flow meter. Both are subject to scheduled inspection and calibration.
Directly Associated Activity	Chemical Dying	Use of dedicated, purpose formulated, bone fide dye stuffs to treat surface of components. LEV dedicated to remove process fume emissions to air.

Part C - Process Description

Introduction

Hard Anodising Surface Treatments Limited is a company specialising in the anodising, electroplating, passivation, sealing and colouring of metal substrates and produces high quality finishing, working in close association with the international automotive and surface finishing industry. The company has been metal finishing since 1976 and is fully independent. The Installation is divided into 2 sites (see Installation Boundary Plan in **Section G**); they are:

- Factory 1
- Factory 2

Hard Anodising Surface Treatments Limited employs approximately 50 people. The plant operates a 5-day week from 7.30 am – 4.00 pm day shift Monday to Friday with a 9.00pm – 7.00am Monday to Thursday night shift. Some limited production and maintenance take place, as required, on Saturday and Sunday.

The following main processes are undertaken at the Installation:

- Anodising
- Nickel plating
- Surface passivation and sealing

There are two effluent treatment plants present on site: one per factory. They treat all waste process water prior to discharge to the main public sewer on Oldington Lane.

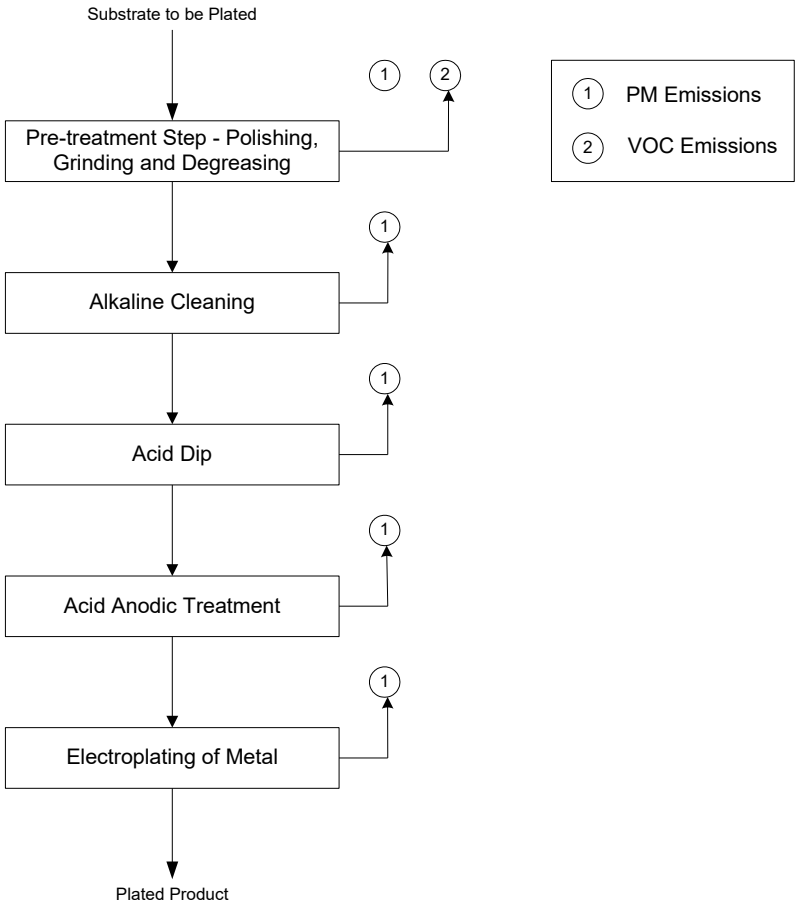
The main site processes are summarised below, and additional information such as tank layout plans, tank volumes and makeup control and control measures/procedures are included in **Section G**.

Electroplating

Electroplating involves the application of a metallic coating onto various articles, such as metals and plastics, to achieve decorative or engineering requirements. Process Flow Diagram 1 below shows this process and highlights the potential emission points for particulate matter (PM) and volatile organic compounds (VOCs).

The electroplating process involves passing an electric current through an electrolyte in contact with the article to be plated. This forms a surface that has different properties than material intended for plating. Special pre-coating products, (e.g. metallic loaded paints) can be applied to non-electrical surfaces, such as plastic, to produce an electrically active surface for plating.

The metals used in electroplating at the Installation are chromium and nickel. Electroplated materials are generally used for a specific property or function, although there are cases where they can serve a dual purpose (e.g. when a material may be electroplated for decorative use, as well as for corrosion resistance).

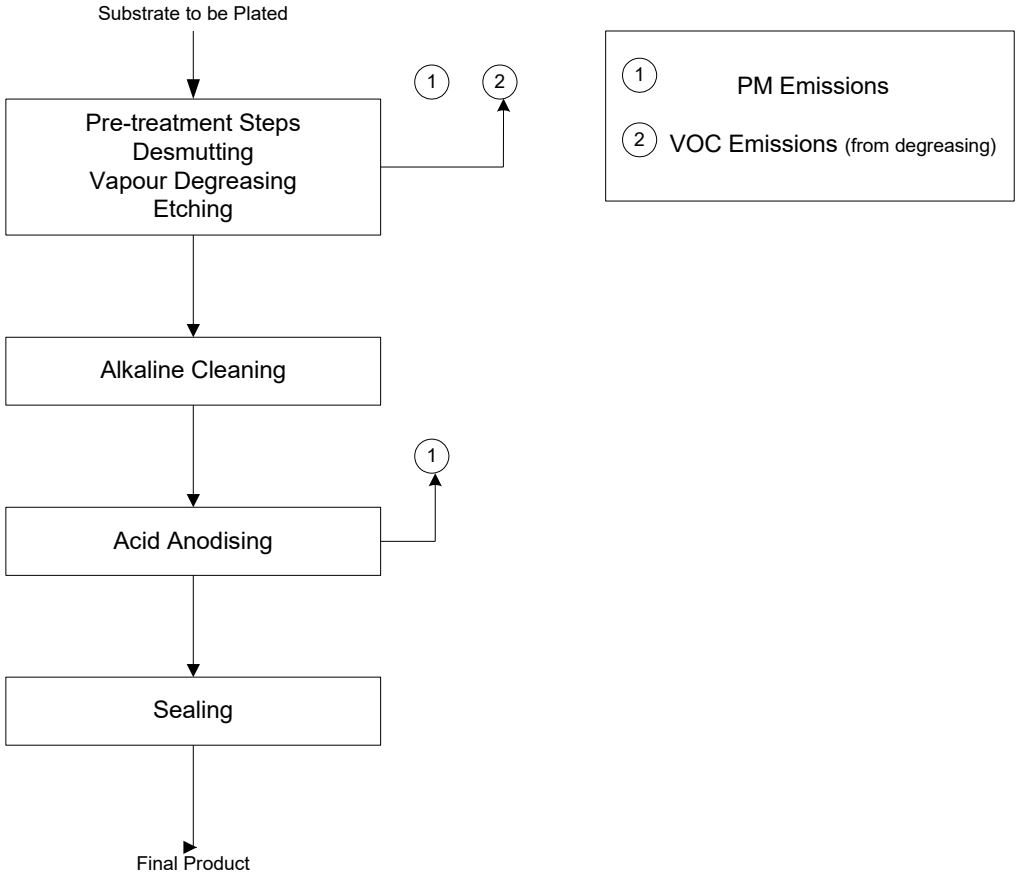


Process Flow Diagram 1 – Electroplating

Anodising

Anodising is an electrolyte process that converts the metal surface to an insoluble oxide coating. Anodised coatings provide corrosion protection, decorative surfaces, a base for painting and other coating processes, and special electrical and mechanical properties. Aluminium is the most frequently anodised material. Common aluminium anodising processes include chromic acid anodising, sulphuric acid anodising and Hard Anodising Surface Treatments. The sulphuric acid process is the most common method.

Following anodising, parts are generally rinsed then proceed through a sealing operation that improves the corrosion resistance of the coating. Common sealants include chromic acid, nickel acetate, nickel-cobalt acetate and hot water. Process Flow Diagram 2 shows this process the potential emission points.



Process Flow Diagram 2 - Anodising

Electroless Plating

Electroless plating is the chemical deposition of a metal coating onto a plastic object, by immersion of the object in a plating solution. Nickel electroless plating is commonly used for printed circuit boards. Immersion plating baths are usually formulations of metal salts, alkalis and complexing agents (such as lactic, glycolic, malic acid salts). Electroless plating and immersion plating commonly generate more pollutant emissions than other plating techniques.

Emission and Control Techniques

This section details the raw material inputs, the equipment used, and the processes employed that can result in emissions of NPI-listed substances. This section also provides a concise description of the potential fate (to air, land and water) of these emissions. For the purposes of providing comprehensive information on the emissions from electroplating and anodising facilities, the fabrication of metal products prior to surface preparation, and coating and metal finishing operations are also included. Table C1 summarises the process material inputs, and the emissions of NPI-listed substances generated.

Table C1 – Material Inputs and Pollutant Emission for Electroplating, Anodising and Other Metal Coating Processes

Process	Material Input	Emissions to Air	Emissions to Water	Discharge to Land
Surface Finishing				
Anodising	Acids	Metal-ion-bearing mists, and acid mists	Acid wastes	Spent solutions, wastewater sludges and base metals
Chemical Conversion Coating	Metals and acids	Metal-ion-bearing mists, and acid mists	Metal salts, acid, and base wastes	Spent solutions, sludges, and base metals
Electroplating	Acid solutions metal and cyanide solutions	Metal-ion-bearing mists, and acid mists	Acid / alkaline, cyanide and metal wastes	Metal and reactive wastes
Plating	Metals (e.g. salts) complexing agents, alkalis	Metal-ion-bearing mists	Cyanide and metal wastes	Cyanide and metal wastes
Painting	Solvents and paints	Solvents	Solvent wastes	Still bottoms, paint solvents and metals
Other Finishing Methods	Metals and acids	Metal fumes and acid fumes	Metal and acid wastes	Polishing and etching sludges

Anodising

Anodising operations produce air emissions, wastewaters and solid wastes containing NPI-listed substances. Mists and gas bubbles arising from heated fluids are a source of air emissions and may contain metals or other substances present in the bath. When dyeing of anodised coatings occurs wastewaters produced may contain nickel acetate, non-nickel sealers or substitutes from the dye. Other potential pollutants include complexes and metals from dyes and sealers.

The wet scrubbers used to control emissions of chromic acid mist from chromic acid anodising operations are single and double packed-bed scrubbers. Other scrubber types used less frequently include fan-separator, packed-bed and centrifugal flow scrubbers. Scrubbers remove chromic acid droplets from the gas stream by humidifying it to increase the mass of the droplet particles which are then removed by impingement on a packed bed. Once through or recirculated water is generally used as the scrubbing liquid, because chromic acid is highly soluble in water.

Wastewaters generated by anodising are usually combined with other metal finishing wastewaters and treated on-site by conventional hydroxide precipitation. Wastewaters containing chromium are treated to reduce hexavalent chromium to its trivalent state. The conventional treatment process generates a sludge that is usually transferred off-site for metals reclamation and disposal.

Other wastes generated by anodising include spent solutions, and wastewater treatment sludges. Anodising solutions may be contaminated with the base metal being used because of the anodic nature of the process. These solutions eventually reach an intolerable concentration of dissolved metal and require processing to remove the dissolved metal to a tolerable level for treatment and disposal.

Chemical Conversion Coating

Chemical conversion coating includes chromating, phosphating, metal colouring and passivating operations. Chromate conversion coatings are produced on various metals by chemical or electrochemical treatment. Solutions, usually containing hexavalent chromium and other compounds, react with the metal surface to form a layer containing a complex mixture of compounds consisting of chromium, other constituents, and the base metal. Phosphate coatings may be formed by the immersion of steel, iron or zinc-plated steel in a dilute solution of phosphate salts, phosphoric acid, and other reagents to condition the surfaces for further processing. They are used to provide a good base for paints and other organic coatings, to condition the surfaces for cold forming operations by providing a base for drawing compounds and lubricants, and to impart corrosion resistance to the surface metal.

Metal colouring involves chemically converting the metal surface into an oxide or similar metallic compound to produce a decorative finish, such as a green or blue patina on copper or steel, respectively. Passivating is the process of forming a protective film on metals by immersion into an acid solution, usually nitric acid, or nitric acid with sodium dichromate. Stainless steel is often passivated to prevent corrosion and extend the life of the product.

Part D - Section 1 – Managing your Activities

Management Systems

Hard Anodising Surface Treatments has procedures and systems in place to systematically identify hazards, assess the associated risk and determine necessary control measures across its operations and in relation to the Environment, Health and Safety.

The site operates an Environmental Management System which complies with the requirements ISO 14001:2015. A copy of the EMS certificate is provided in **Section G**.

Hard Anodising Surface Treatments ensures that appropriate communications and consultation with the workforce is undertaken. This is undertaken via departmental meetings, involvement in accident investigations, being advised on matters concerning the Health and Safety of employees and undertaking workplace inspections.

The site conducts a safety induction programme for all new employees on starting work. A training plan for everyone is created after basic site induction. Training and competence are closely managed through Learning and Development. All staff are re-assessed on an annual basis with regards to individual process requirements.

The site utilises a mixture of leading and trailing performance indicators to monitor performance. Examples of these include:

- Environmental monitoring
- Audit, inspections and surveys
- Environmental complaints
- Consent compliance issues

A list of the written work procedures and instructions that are in place at the site is included in **Section G**.

Part D - Section 1 – Managing your Activities

Accident Prevention and Control

There is an Accident Management Plan in place for the site. A copy of this is included in **Section G**. This document contains an accident risk assessment for the site.

As part of the environmental management system for the Installation, an environmental aspects register is in place for the site to manage environmental risks and this is reviewed on a regular basis.

Part D - Section 1 – Managing your Activities

1.1 Energy Efficiency

Information on electricity and gas consumption is included in **Appendix G**.

A copy of an Energy Efficiency Report that has been prepared for the site is included in **Appendix G**.

Further information on the BAT measures in place at the installation for engery efficiency purposes are detailed in **Table 2** which is present in **Part E Section 2** .

Part D - Section 1 Managing Your Activities

1.2 Efficient Use of Raw Materials and Water

Raw Materials

The raw materials inventory for the installation is present in the Site Condition Report (Ref. CL1002). Due to the volume of Materials Safety Data Sheets copies have not been included within this document, but copies can be provided separately upon request.

Water Use

Information on annual water usage is included in **Section G**.

The BAT measures that are in place at the installation to ensure that water usage is kept to a minimum are detailed in Table 2 which is present in **Part E Section 2**.

Part D - Section 1 – Managing your Activities

1.3 Avoidance, Recovery and Disposal of Waste

There are different types of waste streams generated by the processes undertaken at the installation.

The waste is collected on a regular basis by several licensed waste management contractors. They include:

- B&M – weekly collection of general waste bins
- Davies Skip Hire – collection every 3 months for general skip waste
- LTS – collection every 8 weeks of chemical waste (solid and liquid)

There are other waste contractors who collect waste from site, but not as frequent to those listed above.

Site personnel hold and file all waste consignment notes in original paper formats. Some example waste consignment notes are included in **Section G**, along with a copy of the annual waste return which contains the EWC codes and quantities for the different waste streams generated at the site.

Information on chemical waste generated by the on-site processes is included in **Section G**. All of this waste is stored in a designated waste storage area in IBCs or chemical drums, on drip trays whilst they wait collection by a licensed waste management contractor.

There are two effluent treatment plants (ETPs) on site, one for Factory 1 and one for Factory 2. Trade effluent from each factory is sent to the corresponding ETP for pH adjustment via chemical dosing and testing prior to release to the nearby public sewer. The site has a discharge consent from Severn Trent Water Ltd to discharge trade effluent from the ETPs into the main public sewer. No more than 30 tonnes per day of non-hazardous wastewater is processed at the Installation.

Part E -Section 2 – BAT Assessment

A BAT appraisal for the installation is presented in **Table 2**. Information is support of the BAT appraisal is presented in **Section G**.

Table 1 - BAT Assessment

Identification Number			Indicative BAT The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07)	Compliance to BAT
1			**Managing Your Activities**	
1			Management Systems	
1			Environmental Management System (preferably with external certification) Written procedures, training and maintenance	ISO 14001 accredited - copy of certificate included in Section G of 'Main Permit Application' Document. Written procedures for site operations. Training records for all staff. Maintenance programme in place for plant equipment. Service agreements in place for plant equipment with suitably qualified contractors.
1			Accident prevention and control	
1			Written procedures for emptying vats, transferring liquors and chemicals Secure storage arrangements for raw materials and chemicals Well maintained drainage system	Accident risk assessment in place and updated as and when changes occur on site. Written procedures for chemical storage. Emergency preparedness procedures. Chemicals only handled by trained operators. Vats emptied by trained operators. Raw materials stored in secure area away from process lines. In compatible materials are stored as far away as reasonably practicable within the main storage area. Routine drainage inspections in place.
1	**1.1**		Energy efficiency	
1	**1.1**	1	High efficiency dewatering techniques to minimise drying energy.	All heaters are controlled, all operated at minimum temperature. Preventative maintenance on heaters to ensure efficient, high efficiency dewatering technique in place. Written procedures in place.
1	**1.1**	2	Minimisation of water use and closed circulating water systems.	Closed water circulating systems where possible Month on month water consumption bar chart produced. If disparity, then identify a leak. Visual inspection of tank integrity SPMP in place
1	**1.1**	3	Using spent cooling water (which is raised in temperature) for rinsing purposes.	This occurs on some tanks where applicable
1	**1.1**	4	Automated control for DC rectifiers.	N/A - something to be considered in future but need to consider energy cost consumption/benefit.
1	**1.1**	5	Electrolytic processes that operate under thermally stable conditions without the need for heating or cooling.	This only occurs on certain tanks. Processes operate at minimum temperature but do need cooling or heating
1	**1.1**	6	Minimum use of fume extraction consistent with COSHH Regulations.	LEV testing on systems on an annual basis
1	**1.1**	7	Inverter speed control or flow damper for fume extraction centrifugal fans.	No
1	**1.2**		Efficient Use of Raw Materials and Water	

Table 1 - BAT Assessment

	Identification Number		Indicative BAT The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07)	Compliance to BAT
1	**1.2**	1	Ion exchange or other treatment unit to re-circulate rinse waters.	There is an ion exchange unit in Factory 2
1	**1.2**	2	Closed loop operation with three to four stage cascade rinsing, so that drag-out can be returned upstream to balance the evaporative loss and minimise waste.	Present in Factory 2
1	**1.2**	3	Spent pickle acid for pH control in the effluent treatment facility.	Some spent acids (nitric and sulphuric). pH probes on both effluent treatment plants and are maintained
1	**1.2**	4	Proprietary plating electrolytes that have a low concentration of dissolved solids and operate with minimum energy requirements for heating or cooling. These should avoid cadmium where possible and should require relatively simple effluent treatment.	No usage of cadmium on site Total dissolved solids meters in place
1	**1.2**	5	Minimise drag-out by maximising the drainage time of the work over the tank or in a separate drainage tank.	No high volumes - very little drag out outside of the tanks
1	**1.2**	6	ECO-rinse tank(s) to reduce mass drag-out and subsequent rinse-water consumption.	No ECO-rinse tanks but do have operational procedures and training to minimise drag out on all jobs. All work is supervised.
1	**1.2**	7	Electrochemical metals recovery technology for unreturned drag-out.	Not undertaken on site. Very little drag out in on site operations.
1	**1.2**	8	Evaporation technology in conjunction with 3-5 stage cascade rinsing to allow closed loop operation.	Not undertaken on site but do have 3 stage tank cascade rinsing on some operations.
1	**1.2**	9	Hydrogen peroxide in the pickling tanks to reduce NOx emission and acid consumption.	not undertaken on site.
1	**1.2**	10	Low temperature processes consistent with good metal deposition rate. The use of lids on process tanks operating at 60°C and above, and hexagons or croffles should be considered for all manually operated tanks.	Operate at minimum operating temperature and minimum chemical composition. Lids are present on the chrome and the dichromate seal tanks. Croffles are used where applicable.
1	**1.2**	11	Recycle trade effluent to less critical rinsing stages.	Trade effluent is not recycled on site.
1	**1.2**	12	Proprietary cleaners that allow a lower operating temperature.	Do use them for operating at minimum temperatures
1	**1.2**	13	A low temperature biological cleaner system in place of the traditional alkaline soak cleaner for a long production life, low waste and low energy consumption.	No
1	**1.3**		Avoidance, Recovery and Disposal of Wastes	
1	**1.3**	1	Effluent treatment facilities should be designed to process spent process fluids and recover anode metals for reuse, e.g. cadmium, copper and nickel.	No recovery from effluent
1	**1.3**	2	Spent alkaline cleaners and acid pickles should be used for pH control in the effluent treatment facility.	Yes
1	**1.3**	3	You should evaluate the use of phosphating sludge as a filler for agricultural and horticultural use.	N/A
1	**1.3**	4	Filter cake may have uses, and these should be investigated in preference to landfill disposal.	N/A
1	**1.3**	5	Filter cake presses should be operated at not less than 7 bar and preferably 10-15 bar to reduce its mass, volume and water content.	N/A

Table 1 - BAT Assessment

	Identification Number		Indicative BAT The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07)	Compliance to BAT
1	**1.3**	6	Consider use of a low temperature biological cleaner system in place of the traditional alkaline soak cleaner for a long production life, low waste and low energy consumption.	N/A
1	**1.3**	7	Consider use of ion exchange or other treatment unit to re-circulate rinse waters.	Currently being considered - cost benefit analysis required
1	**1.3**	8	Consider use of closed loop operation with three to four stage cascade rinsing, so that drag-out can be returned upstream to balance the evaporative loss and minimise waste.	See above
1	**1.3**	9	Minimise drag-out by maximising the drainage time of the work over the tank or in a separate drainage tank.	Yes
1	**1.3**	10	Use electrochemical metals recovery technology for unreturned drag-out.	N/A
1	**1.3**	11	Use electrodialysis technology for the re-oxidation of hexavalent chromium [chromate, or Cr(VI)] degraded to trivalent chromium [Cr(III)] in chromic acid anodising electrolytes.	N/A
2			**Operations**	
2	**2.1**		Material storage and handling	
2	**2.1**	1	There is no indicative BAT in EPR 2.07 but the main control measures are: - Prevention of fugitive emissions to air from material handling and storage - Prevention of accidents during material handling and storage	Dedicated storage areas, they have primary and secondary bunding. All IBCs and containers are lidded during storage. Any materials received showing signs of damage will not be offloaded. A spillage and containment procedure are in place at the site. Spillage kits are maintained in Factory 1 and Factory 2. Practice spillage control on a yearly basis. In the event of a spill, all SDS are readily available for trained personnel to look at. Cut off valves are readily available, and personnel trained in their use. All drains are colour coded.
2	**2.2**		Surface preparation	
2	**2.2**		Mechanical	
2	**2.2**	1	You should ensure that emissions from the local exhaust ventilation do not have an adverse environmental impact.	Testing of LEV emissions is undertaken to ensure no environmental impact.
2	**2.2**		Degreasing using solvents	
2	**2.2**	1	You must comply with the requirements of the Solvent Emissions Directive, as implemented by the Solvent Emissions (England and Wales) Regulations 2004. Compliance with the SED goes beyond the technical measures described in this guidance.	No solvents present on site.

Table 1 - BAT Assessment

	Identification Number		Indicative BAT The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07)	Compliance to BAT
2	**2.2**	2	The main control measures are: • control of point source emissions to air (from the degreaser vents system) • control of fugitive emissions to air • recovery of solvent in spent solvent waste • disciplined use of properly positioned and closed lids, except when loading and unloading conventional degreasers • the use of top-loading multiple door facilities • the use of totally sealed end-loading degreasers with solvent vapour condensation and condensate recycle.	N/A
2	**2.2**		Chemical cleaning using aqueous cleaners	
2	**2.2**	1	The key areas of control are: • energy consumption • fugitive emissions to air • rinse water efficiency • cleaning fluid lifetime • disposal of spent cleaners.	Minimum operating temperature and chemical concentrations are used in the onsite processes. Ongoing measuring fugitive emissions to air from doorways and windows.
2	**2.2**	2	Consider use of ion exchange or other treatment unit to re-circulate rinse waters.	See above - considering ion exchange systems
2	**2.2**	3	Closed loop operation with three to four stage cascade rinsing, so that drag-out can be returned upstream, is a particularly effective way to balance the loss of water by evaporation and minimise waste of costly process chemicals.	See above
2	**2.2**	4	Where appropriate, generate turbulence by means of an eductor to provide improved cleaning, and maintain particulates in suspension so that they can be removed continuously by external filtration.	Yes - eductors are used where applicable
2	**2.2**	5	Where appropriate, use membrane filtration to remove oil and grease, emulsions and dispersants	N/A - no cleaning of oil required
2	**2.2**	6	Where possible, maintain adequate freeboard above the cleaner level (minimum of 150 mm) to minimise entrainment of liquid and subsequent emissions to air. Extraction lip ducts should be mounted at least 50mm above the top of the tank lip angle, and you should use the minimum air flow consistent with satisfactory extraction.	Procedure in place
2	**2.2**	7	Where appropriate, use “hexagons” or “croffles” to reduce evaporative loss and reduce energy consumption. Use automated lids on large cleaner tanks to reduce fume extraction energy costs as well as to reduce consumption for process heating.	Croffles are used where applicable Lids are present on some of the cleaner tanks
2	**2.2**	8	Consider the use of proprietary cleaners that allow a lower operating temperature.	Yes - all cleaners are low temperature formulations
2	**2.2**	9	Consider use of a low temperature biological cleaner system in place of the traditional alkaline soak cleaner for a long production life, low waste and low energy consumption.	No, not used on site
2	**2.2**		Pickling	

Table 1 - BAT Assessment

	Identification Number		Indicative BAT The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07)	Compliance to BAT
2	**2.2**	1	The key areas of control are: • rinse water economy • prevention and control of point source and fugitive emissions to air • pickle efficiency • acid regeneration • acid recycling • use of inhibitors which are readily biodegradable.	N/A - No pickling undertaken on site
2	**2.2**	2	There should be two or three stage cascade pickling with continuous pickle acid feed and continuous discharge to the effluent treatment facility	N/A
2	**2.2**	3	There should be a minimum of two stages of cascade rinsing with agitation.	N/A
2	**2.2**	4	Consider ion exchange or other treatment unit to re-circulate rinse waters.	N/A
2	**2.2**	5	Consider use of spent pickle acid for pH control in the effluent treatment facility.	N/A
2	**2.3**		Surface treatment	
2	**2.3**		Electroplating	
	2.3	1	The main areas of control are: • rinse water economy – Section 1 • mass drag-out reduction • return of drag-out • recovery of higher value metals from drag-out which cannot be returned • energy consumption – section 1 • prevention of fugitive emissions to air – section 3	N/A - Electroplating is not undertaken on site
	2.3	2	You should give full consideration to using substances other than cadmium, chromium (VI) and other hazardous materials. Where alternatives are not available, you must provide proper controls.	N/A
	2.3	3	Maximise stages of cascade rinsing, with agitation where appropriate.	N/A
	2.3	4	Use ion exchange or other treatment units to re-circulate rinse waters.	N/A
	2.3	5	Use proprietary plating electrolytes that have a low concentration of dissolved solids and operate with minimum energy requirements for heating or cooling. These should avoid cadmium where possible and should require relatively simple effluent treatment.	N/A
	2.3	6	Replace EDTA by QUADROL in autocatalytic copper systems.	N/A
	2.3	7	Minimise drag-out by maximising the drainage time of the work over the tank or in a separate drainage tank.	N/A

Table 1 - BAT Assessment

	Identification Number		Indicative BAT The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07)	Compliance to BAT
	2.3	8	Use ECO-rinse tank(s) to reduce mass drag-out and subsequent rinse-water consumption.	N/A
2	**2.3**	9	Use electrochemical metals recovery technology for unreturned drag-out.	N/A
	2.3	10	Use evaporation technology in conjunction with 3-5 stage cascade rinsing to allow closed loop operation.	N/A
	2.3	11	Generate turbulence by hydraulic power and eductors.	N/A
	2.3	12	Use electrodialysis technology for the re-oxidation of chromium (VI) reduced to chromium (III) in chromic acid anodising electrolytes.	N/A
	2.3	13	Use hydrogen peroxide in the pickling tanks to reduce NOx emission and acid consumption.	N/A
	2.3	14	Employ low temperature processes consistent with good metal deposition rate. You should use lids on process tanks operating at 60°C and above, and you should consider hexagons or croffles for all manually operated tanks.	N/A
	2.3	15	A minimum of 4 and preferably 5 stages of cascade rinsing after chromic/sulphuric acid etch, with techniques for minimising drag-out. Consider alternatives to chromic/sulphuric acid as an etchant.	N/A
	2.3	16	Provide jig or barrel supports whilst draining for manually operated process tanks.	N/A
2	**2.3**	17	Use continuous filtration and removal of sludge from phosphating process tanks.	N/A
2	**2.3**		Anodising	
2	**2.3**	1	The main areas of control are: • rinse water economy – see Section 1 • mass drag-out reduction – see electroplating • energy consumption – see Section 1 • prevention of fugitive emissions to air – see Section 3 • removal of dissolved aluminium for the anodising electrolyte • chromium (VI) plating.	Chromium VI used in anodising process and etching See above for other points Chrome tanks are all extracted with LEV
2	**2.3**		Electropolishing	
2	**2.3**	1	The main areas of control are: • rinse water economy – see Section 1 • mass drag-out reduction – see electroplating • energy consumption – see Section 1 • prevention of fugitive emissions – see Section 3 • prolongation of the descaling and electropolishing process fluids by basis metal removal • NOx control.	N/A - not undertaken on site
2	**2.3**		Plating on plastics	

Table 1 - BAT Assessment

	Identification Number		Indicative BAT The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07)	Compliance to BAT
2	**2.3**	1	The main areas of control are: • rinse water economy – see Section 1 • mass drag-out reduction and return of drag-out – see electroplating • energy consumption – see Section 1 • prevention of fugitive emissions – see Section 3 • prolongation of the life of process fluids in the pre-treatment stage.	N/A - not undertaken on site
2	**2.3**		Autocatalytic plating	
2	**2.3**	1	The main areas of control are: • rinse water economy – see Section 1 • mass drag-out reduction – see electroplating • energy consumption – see Section 1 • prevention of fugitive emissions – see Section 3 • prolongation of process fluid life • avoidance of the use of cadmium salt as a brightener in autocatalytic nickel systems • disposal of spent process fluid • avoidance of the use of EDTA in autocatalytic copper systems.	N/A - not undertaken on site
2	**2.3**		Dip treatments	
2	**2.3**	1	The main areas of control are: • rinse water economy – see Section 1 • mass drag-out reduction – see electroplating • energy consumption – see Section 1 • prevention of fugitive emissions – see Section 3 • prolongation of process fluid life.	See above Ongoing routine laboratory testing of dip treatment tanks to prolong the life of process fluid life.
2	**2.4**		Rinsing	
	2.4	1	The main areas of control are: • water economy – see Section 1 • mass drag-out reduction – see electroplating.	See Section 1
	2.4	2	Multistage cascade rinsing.	On several tanks
	2.4	3	Closed-loop or recirculation systems with rinse water treatment (ion exchange, reverse osmosis, electrodialysis, air swept evaporation or vacuum evaporation).	On appropriate tanks - see above
	2.4	4	Conductivity probes.	Yes handheld conductivity probes - written procedure in place for this
	2.4	5	Water meters on each line.	Flow meter for Factory 1 and MCERTS flow meter for Factory 2 Water consumption measured by bar chart
	2.4	6	Flow restrictors.	No
	2.4	7	Minimised drag-out by employing a drainage time over the process tanks of at least 20 seconds for rack work and 30 seconds for barrelled work.	Yes - everyone trained appropriately in this and there is a written procedure in place.

Table 1 - BAT Assessment

	Identification Number		Indicative BAT The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07)	Compliance to BAT
	2.4	8	Drag-in – drag-out tanks (ECO rinse system) to reduce mass drag-out and subsequent rinse water consumption.	No ECO tanks, but minimisation of drag out from work
	2.4	9	Continuous filtration and removal of sludge from phosphating process tanks.	N/A
2	**2.4**	10	Recycling of trade effluent to less critical rinsing stages.	N/A
2	**2.5**		Drying	
2	**2.5**	1	Centrifugal drying for small work.	Not used on site
	2.5	2	Providing lids for hot water tank driers.	Only on certain tanks
2	**2.5**	3	Providing a continuous bleed-off from hot-water driers as supply for the preceding cascade rinsing system, with equivalent water feed to hot water tank driers to make-up for evaporative loss and the bleed to the rinsing tanks.	N/A
3			**Emissions and Monitoring**	
3	**3.1**		Point source emissions to water	
3	**3.1**		Handling	
3	**3.1**	7	You should normally use buffer storage tanks to contain process fluid dumps (e.g. spent alkaline cleaners, pickles, passivates), which are preferably treated in the effluent treatment facility rather than removed by a licensed waste disposal contractor. You will usually have a dedicated storage tank for alkaline, acidic, and Cr (VI) dumps. In such cases you should be able to release the spent materials to the effluent treatment facility at a slow, controlled rate.	Some buffer storage tanks in place. Redundant IBCs are used for storage. These are maintained in a dedicated storage facility.
3	**3.1**	8	For larger surface treatment operations where there are several process lines, the effluent flow will vary in accord with the number of lines in operation. You should ensure that peak loads do not exceed the capacity of the effluent treatment facility.	It is ensured that peak loads do not exceed peak capacity by using flow meters.
3	**3.1**	9	Small effluent treatment facilities are preferably operated on a batch basis, only releasing trade effluent to the sewer after confirmation that it is within the Sewerage Undertaker's consent limits. Larger facilities may be operated on a continuous basis provided that adequate monitoring is in place.	Trade effluent is tested to ensure that it is within limits prior to release to public sewer. Testing is completed twice a day.
3	**3.1**	10	The effluent system should be designed so as to prevent process effluent by-passing the effluent treatment plant.	Yes - there is no by-pass on either ETPs.
	3.1		Treatment objectives	

Table 1 - BAT Assessment

Identification Number		Indicative BAT The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07)	Compliance to BAT
3.1	11	You should justify the choice and performance of the effluent treatment facility against the following objectives: • the removal of dissolved metals including basis metals, e.g. iron, aluminium, copper, and zinc, and plating metals e.g. chromium, copper, nickel, lead, tin, silver, and zinc • the control of the trade effluent pH within the Sewerage Undertaker's consent limits • formal consent limits may also be set for suspended solids, oil and grease, sulphate, detergents, COD, and cyanide • your permit may also set limits on the discharge.	The ETPs were designed to deal with Cr, Cu, Ni and acids and purpose specified for operating scenarios. Both ETPs have pH control. There is a formal trade effluent consent y local sewage undertaker. Testing in accordance with the parameters on this consent is undertaken.
3.1		Primary Treatment	
3.1	12	Whether multistage cascade or rinse water re-circulation with ion-exchange (or other treatment unit) is used for water conservation, the primary stage of effluent treatment is the precipitation of the dissolved metals from the effluent. Any Cr (VI) present must first be reduced to the trivalent state in a turbulent tank reactor. Any effluent stream containing cyanide requires a cyanide oxidation step, again in a turbulent tank reactor. The dissolved metals in the combined effluent stream are then precipitated in a turbulent tank reactor by adjusting the pH within the range 6-10 depending on the metals present. Mixing in circular tank reactors is preferably promoted by slow speed propellor or turbine agitation and wall baffles. PID control rather than on-off control systems for dosing chemicals may improve pH stability.	Chromium VI is a primary concern for the site and is dealt with in a turbulent tank reactor. Cyanide is dealt with in the same manner. A quarterly check is undertaken by an independent company on cyanide, chromium and metals to ensure they are ok to discharge.
3.1	13	The next step is the separation of the precipitate in a void tank settler or a lamellar clarifier, often with chemical pre-treatment (e.g. polyelectrolytes, inorganic coagulants and bentonite) to enhance the removal of colloidal solids, and/or to reduce the settlement time. Settling equipment works best with a steady continuous flow. Pumping tanks should preferably be fitted with a level sensing device with a proportional output that is used to control the flow. The settled sludge containing 2-3% solids is periodically discharged to a secondary settlement tank where the solids level is allowed to attain a level of around 8%.	N/A - no separation required
3.1	14	The sludge is then filtered in a high-pressure batch filter press for further water removal. The discharged filter cake containing 20-30% solids is removed by a licensed waste disposal contractor to landfill. The filtrate is recycled to the precipitation reactor. Filter press pumps providing an operational pressure of 10-15 bar will increase the solids content of the filter cake to 35-40%.	N/A
3.1	15	The clean water flow from the settler/clarifier is usually discharged directly to the foul sewer as trade effluent.	N/A
3.1		Secondary/tertiary treatment	
3.1	16	Filtration to remove fine suspended solids to achieve trade effluent consent limits for metals of 1-3mg/l is common.	N/A - checks are undertaken on suspended solids on a quarterly basis.
3.1	17	Trade effluent, whether filtered or not, may be recycled to the less critical rinsing steps and thus reduce input water usage by up to 30%.	N/A

Table 1 - BAT Assessment

	Identification Number		Indicative BAT The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07)	Compliance to BAT
3	**3.1**	18	Where multistage cascade rinsing is in place, the effluent flow may be very low. “End of pipe” treatment with such techniques as activated carbon, bone charcoal, selective cationic ion-exchange, membrane filtration technology, and reverse osmosis may be considered, thus enabling a further reduction in water usage.	N/A
3	**3.2**		Point source emissions to air	
		1	If you use local exhaust ventilation (LEV) to control harmful substances, you should use the minimum extraction rates that enable COSHH requirements to be met; and where possible extraction should not be used at all, as described above.	LEV present on all main tanks and is inspected on an annual basis
		2	Process tank lip ducts should be located with at least a 50mm gap between the top of the tank and the bottom of the lip duct.	Yes
3	**3.2**	3	Fume extraction through the upper sides of process tanks is not recommended.	Understood, but it is required on site in some tanks
3	**3.2**	4	A mist eliminator should be installed in the suction side of the extraction fan, with mist-eliminator drainage and washings being discharged to the effluent treatment facility.	Chemical mist eliminators are added to process tanks where applicable
3	**3.3**		Fugitive emissions to air	
3	**3.3**	1	Where there are opportunities for reductions, your permit may require you to submit a regularly updated inventory of fugitive emissions.	Understood
3	**3.3**	2	A simple water scrubber should be fitted to the vent outlet of hydrochloric acid tonnage storage vessels (for use during filling operations).	N/A
3	**3.3**	3	You should regularly clean fume extraction ducting and mist eliminators.	Yes - work in progress

Part F -Section 3 – Emissions and Monitoring

3.1 Point Source Emissions to Water

There are currently no direct wastewater emissions to groundwater or surface water bodies from the Installation.

There are two Effluent Treatment Plants (ETPs) present on site: one at each factory. Waste process water is sent to the ETPs and treated and tested prior to discharge to the main public foul sewer which is located on Oldington Lane. There are two wastewater emission points (i.e. F1 and F2) and the location of these are shown on **Figure 6** in **Section G**.

Treatment is pH adjustment using sodium hydroxide. This is undertaken to ensure that the pH is between 6 and 10 before being released into the public foul sewer. Automated continuous testing is undertaken to make sure pH is correct before water leaves the site.

The site has a trade effluent consent from Severn Trent Water to allow release of treated process water into the main public sewer. Testing of the treated effluent is undertaken by site personnel twice a day and Severn Trent Water every couple of months.

The wastewater is non-hazardous.

No more than 30 tonnes per day of wastewater is discharged from the site.

There is a settlement tank connected to each ETP, and the precipitate is removed via tanker using a licensed waste management company every few years.

Surface water runoff from the Installation is captured by an on-site drainage system which is present around both factories. This is then discharged to a dedicated storm water drainage system located on Oldington Lane. The water is ultimately discharged into the Staffs and Worcester Canal. For Factory 1, a soakaway is present too. The location of the storm water discharge points and the soakaway are shown on **Figure 4a** and **Figure 4b** in **Section G**.

A risk assessment (Ref. CL1004) of the wastewater emissions has been undertaken using sampling data from between 2023 and 2026. A copy of the sampling reports is included in **Section G**. The risk assessment has identified that emissions to water from the installation are not significant.

Part F -Section 3 – Emissions and Monitoring

3.2 Point Source Emissions to Air

There are 18 air emission points associated with the Installation. Six of these are wall mounted fans, three are roof fans and nine are stacks. The location of the emission points is shown on **Figure 6** and additional information on them and the processes which they are associated with is presented in **Section G**.

Testing of the stack emission points was undertaken by Element on the 5th and 6th of January 2026. A copy of the test reports is included in **Section G**.

A risk assessment (Ref. CL1003) of the air emissions from the stacks at installation has been undertaken using existing test data for the emission points and detailed air dispersion modelling (Ref. CL1005) was undertaken for the contaminants which could not be ruled out as “insignificant” in the H1 risk assessment. This modelling identified that the process contributions for both substances would not present a harm to human health.

Monitoring

Sample ports were installed in appropriate positions at each of the air emission points at the Installation, in accordance with section 6 and appendix A of BS EN 15259. This work was completed in December 2025.

Access adjacent to the sampling ports is large enough to provide sufficient working area, support and clearance for a sample team to work safely with their equipment throughout the duration of the required tests at each sampling location.

Sampling has been completed by an MCERTS accredited company.

Part F - Section 3 – Emissions and Monitoring

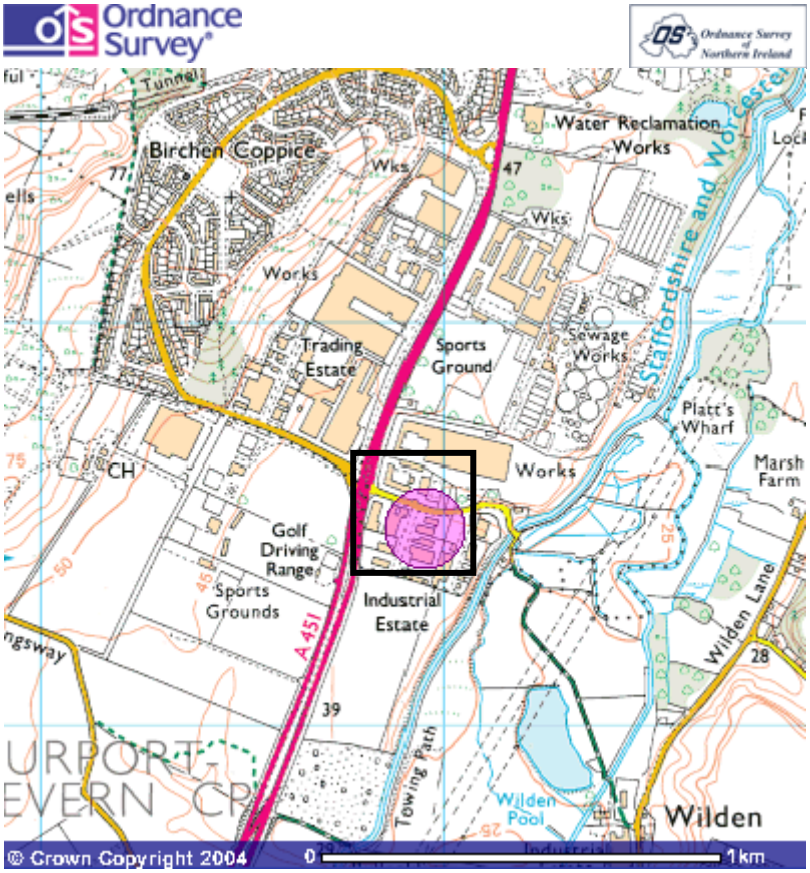
3.3 Fugitive Emissions to Air

The potential for fugitive emissions to air at the installation is negligible. This is because regular cleaning of the extraction system is undertaken to ensure that no fugitive emissions occur. Furthermore, the presence of the free board on the process lines will limit the potential for fugitive air emissions.

Part G - Supporting Documentation

Figures

Figure 1 – Site Location Plan



www.ordnancesurvey.co.uk/**getamap**

Image produced from Ordnance Survey's Get-a-map service.
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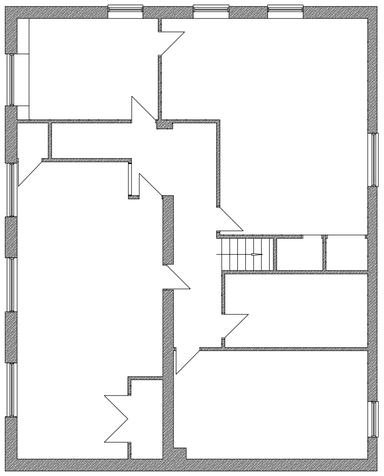
Figure 1 – Site Location Plan

Figure 2 – Installation Boundary Plan

Figure 2 - Installation Boundary Plan

Figure 3a – Factory 1 Layout Plan



first floor plan 1:100

ground floor plan 1:100

PLEASE PRINT PLAN AT A1

Roger Knight & Co.
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Stourport on Severn, Worcs. DY13 9AQ
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email: roger.knight3@virginmedia.com

PROJECT:
SURVEY FLOOR PLANS OF FACTORY 1 AT HARD ANODISING Ltd., FIRS INDUSTRIAL ESTATE, KIDDERMINSTER, WORCS.

CLIENT:
HARD ANODISING Ltd.

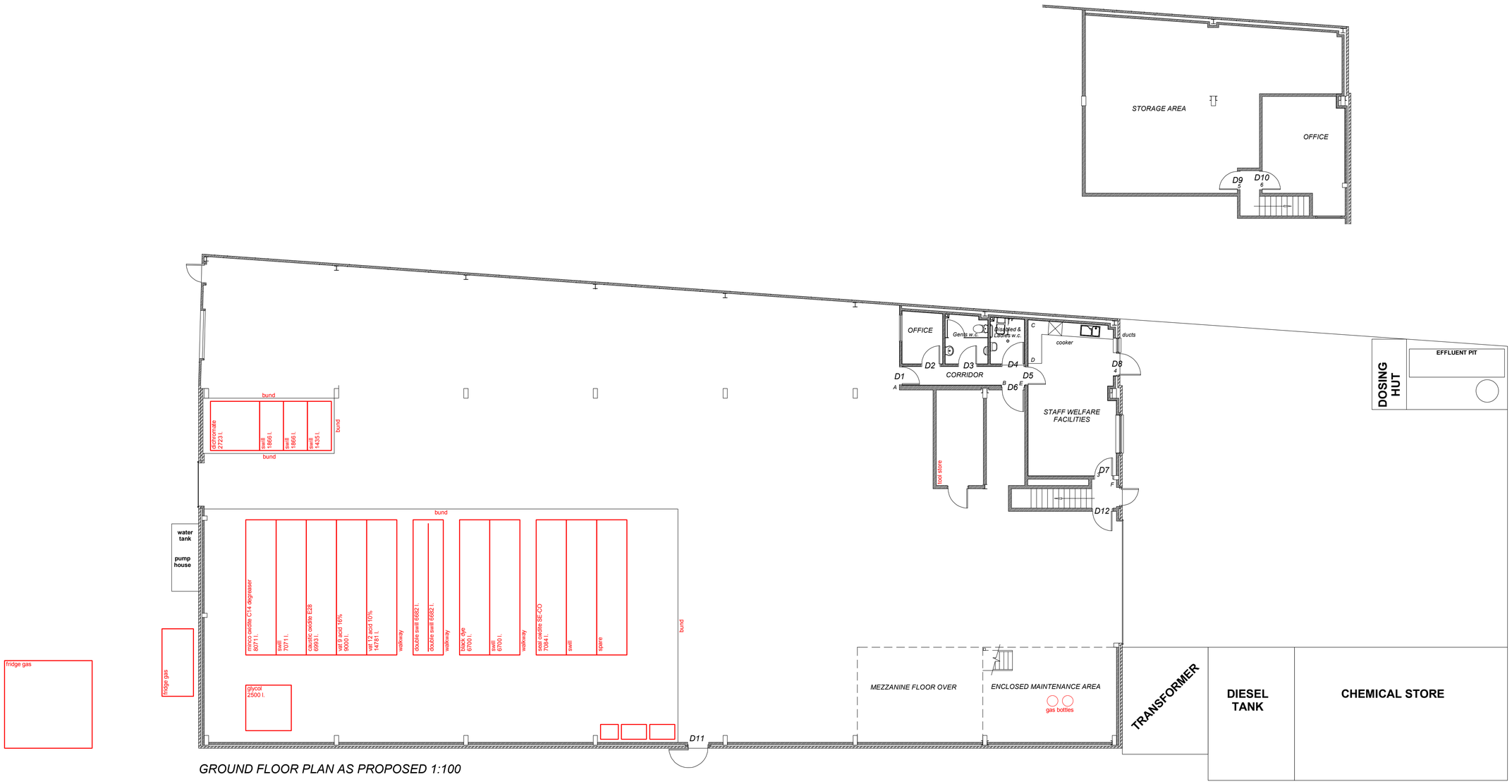
DRAWING TITLE:
FLOOR PLAN SHOWING TANK LAYOUTS AND CHEMICAL STORES

SCALE: *1:100*
DATE: *JAN 2012*
DRAWN BY: *S. MUMFORD*

DRAWING NUMBER: ***11/018/01***
REVISION: ***A***

REVISION DESCRIPTIONS:
A: TANK ARRANGEMENT AMENDED

Figure 3b – Factory 2 Layout Plan



GROUND FLOOR PLAN AS PROPOSED 1:100

PLEASE PRINT PLAN AT A1

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PROJECT:
AS BUILT PLANS OF FACTORY 2 AT HARD ANODISING Ltd., FIRS INDUSTRIAL ESTATE, KIDDERMINSTER, WORCS.

CLIENT:
HARD ANODISING Ltd.

DRAWING TITLE:
TANK AND CHEMICAL STORE LAYOUT

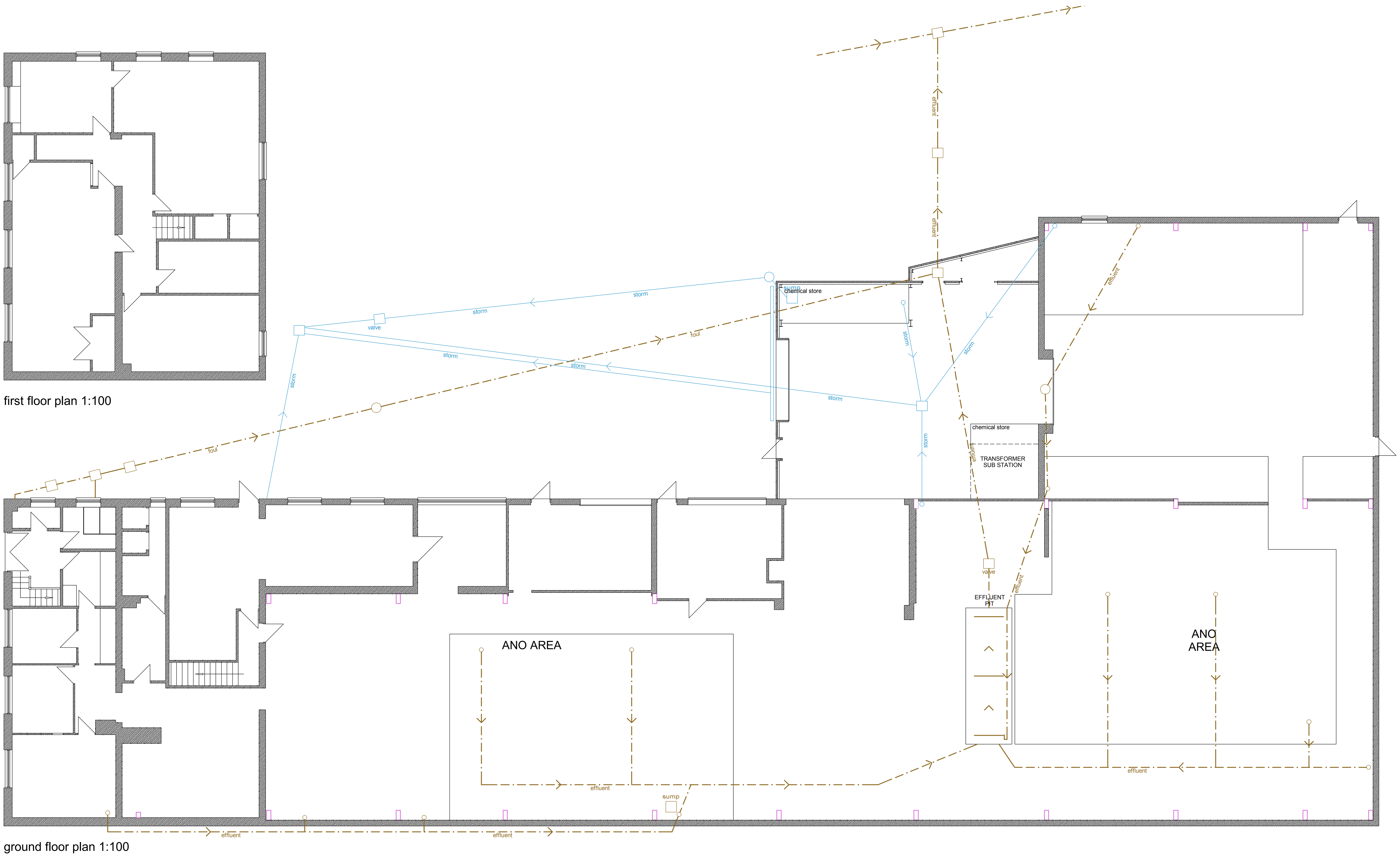
SCALE:	DATE:	DRAWN BY:
1:100	JAN 2012	S. MUMFORD

DRAWING NUMBER: **10/01/09**

REVISION:

REVISION DESCRIPTIONS:

Figure 4a –Factory 1 Drainage Plan



PLEASE PRINT PLAN AT A1

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PROJECT:
SURVEY FLOOR PLANS OF FACTORY 1 AT HARD ANODISING Ltd., FIRS INDUSTRIAL ESTATE, KIDDERMINSTER, WORCS.

CLIENT:
HARD ANODISING Ltd.

DRAWING TITLE:
SERVICES LAYOUT
STORM AND FOUL DRAINAGE

SCALE:	DATE:	DRAWN BY:
1:100	OCT 2012	S. MUMFORD

DRAWING NUMBER: **11/018/01**
REVISION:

REVISION DESCRIPTIONS:

Figure 4b –Factory 2 Drainage Plan

GROUND FLOOR PLAN AS PROPOSED 1:100

PLEASE PRINT PLAN AT A1

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PROJECT:
AS BUILT PLANS OF FACTORY 2 AT HARD ANODISING Ltd., FIRS INDUSTRIAL ESTATE, KIDDERMINSTER, WORCS.

CLIENT:
HARD ANODISING Ltd.

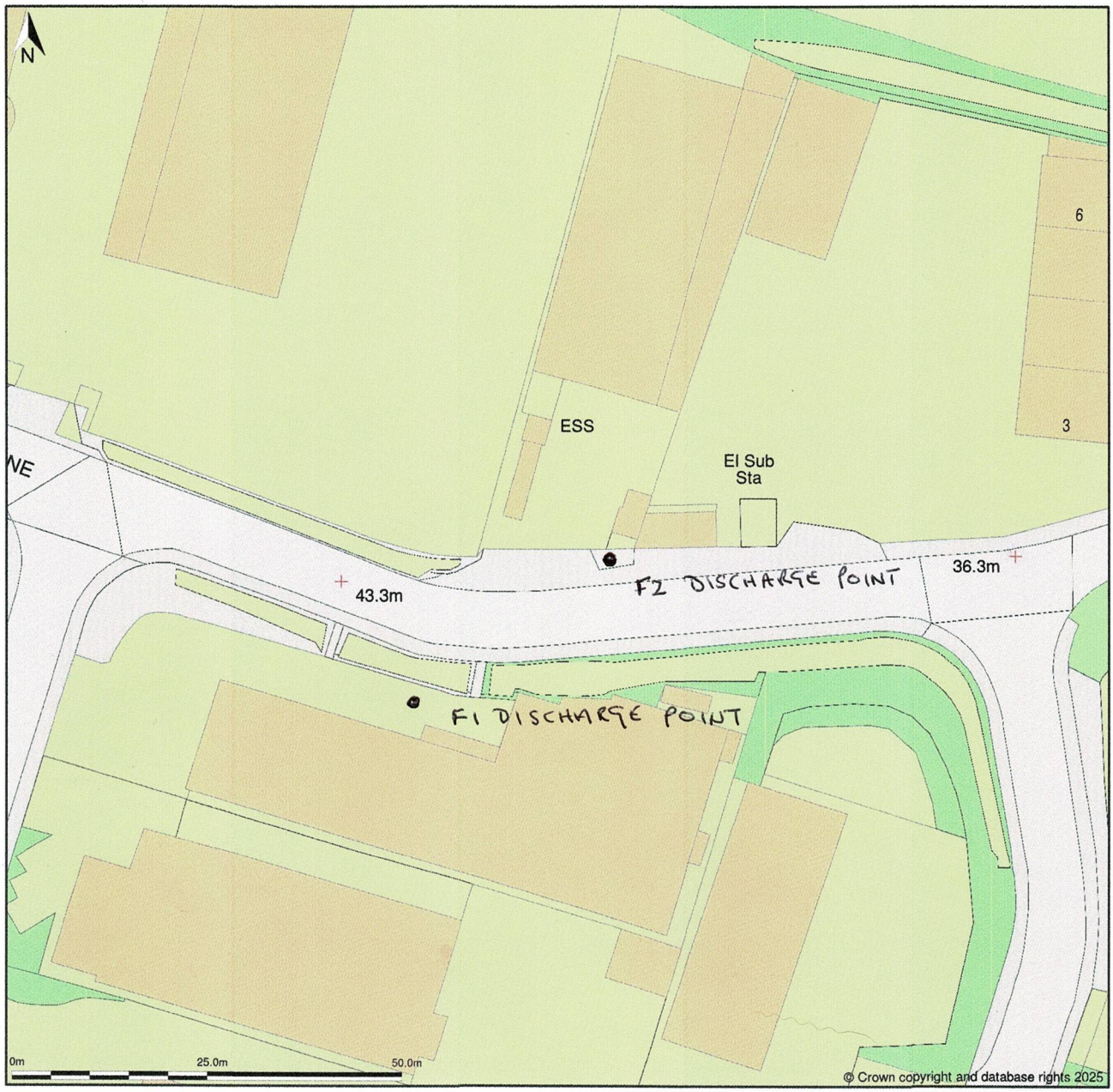
DRAWING TITLE:
SERVICES LAYOUT
DRAINAGE LAYOUTS

SCALE: 1:100 | DATE: OCT 2012 | DRAWN BY: S. MUMFORD

DRAWING NUMBER: **10/01/08** REVISION:

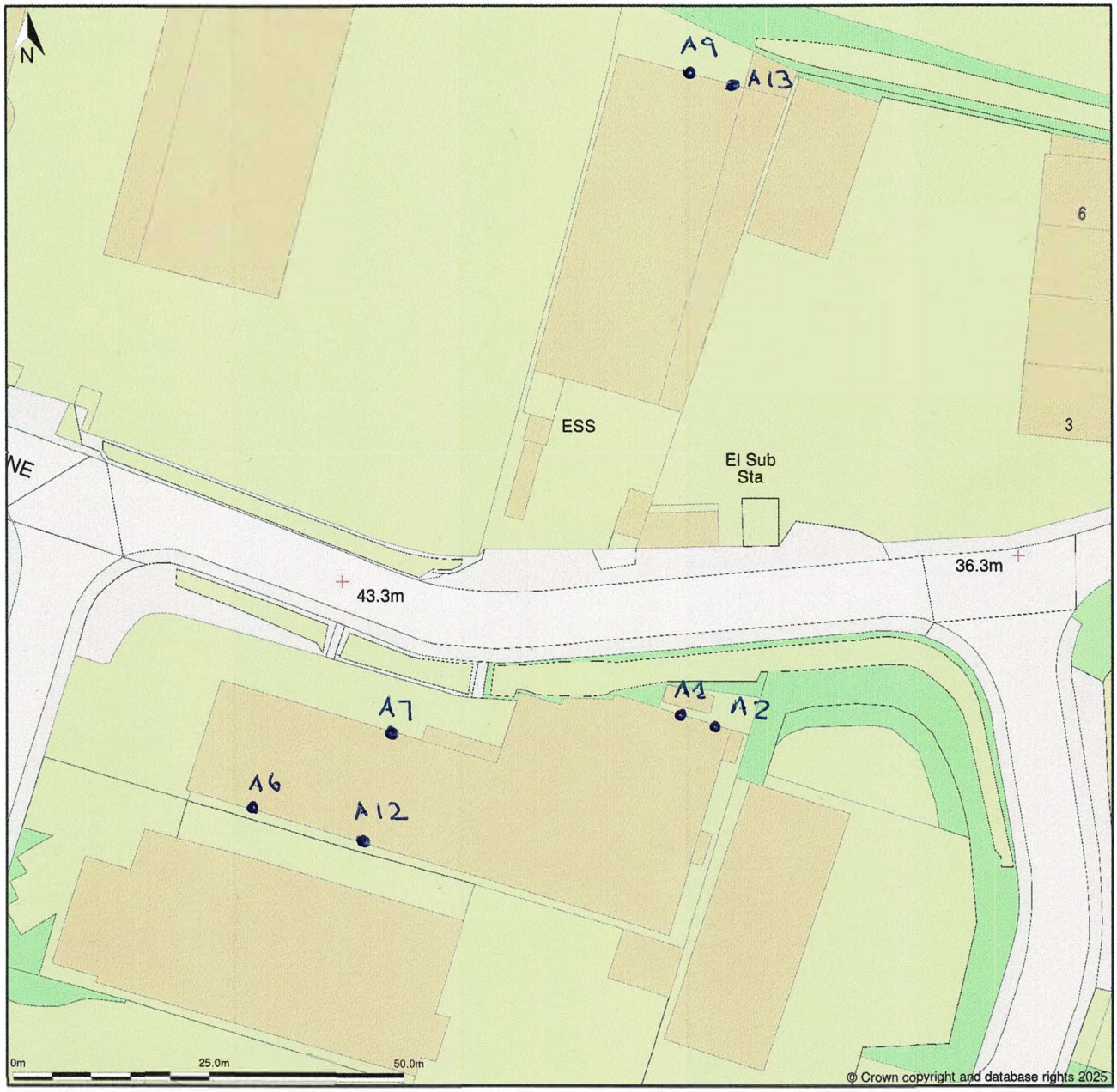
REVISION DESCRIPTIONS:

Figure 5 – Emissions to Sewer Plan



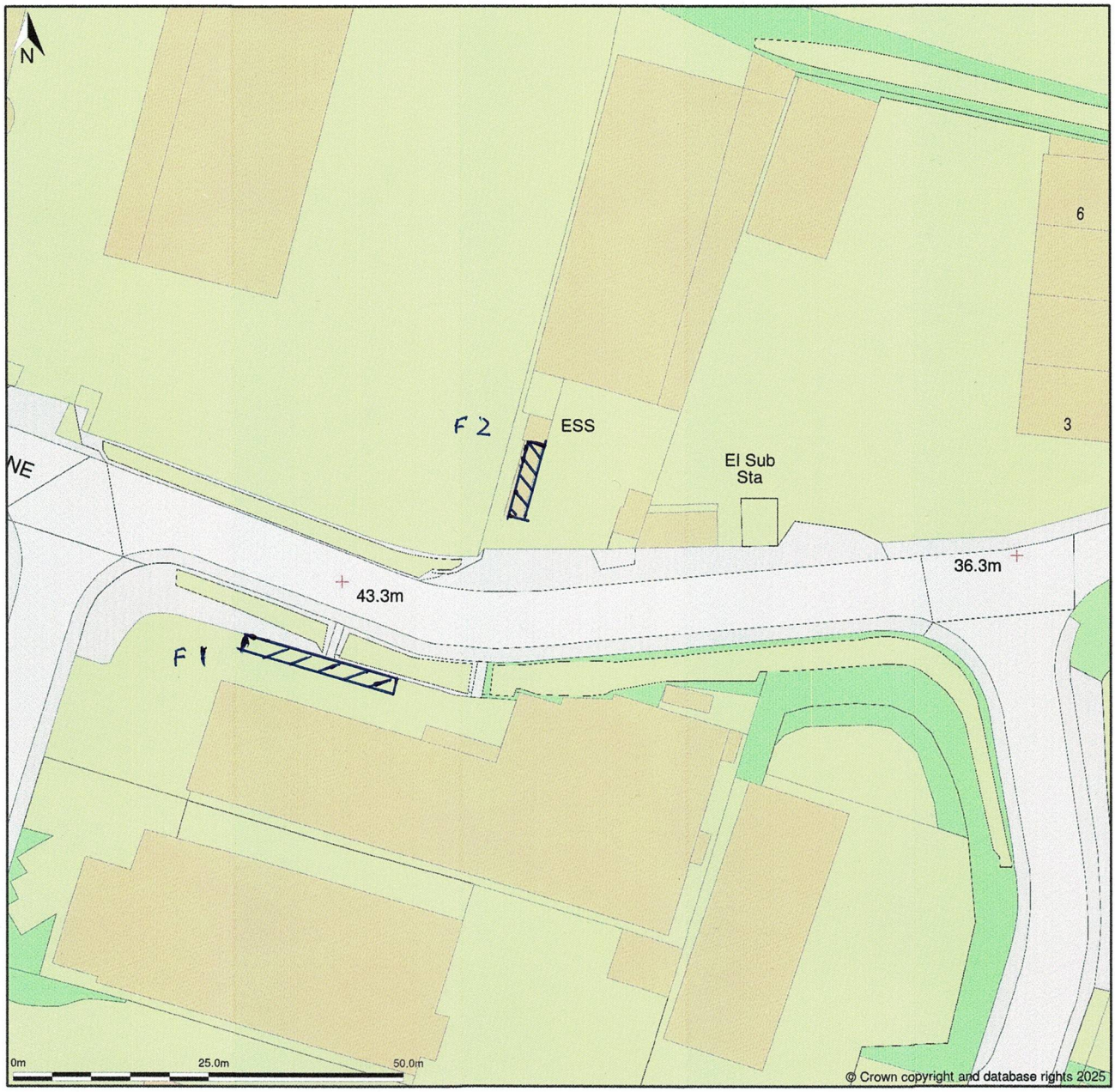
F1 AND F2 DISCHARGE POINTS

Figure 6 – Emissions to Atmosphere Plan



F1 AND F2 STACK LOCATIONS

Figure 7 – Waste Storage Location Plan



F1 SKIPS AND BINS LOCATION

F2 WASTE PROCESS CHEMICALS STORAGE ENCLOSURE

Information to Inform Process Descriptions & Process Controls

Hard Anodising Surface Treatments Ltd

Tank Index & Capacities

PROCEDURE: TANK INDEX. CONTENTS AND CAPACITIES - APRIL 2025

INTRODUCTION

The following defines the process tank index, contents and capacities located on site in April 2025.

Factory 1 Shop 1

Tank Reference	Chemical Stored	Capacity (lts)
1	Kem – Sol Wax	200
2	Chrome / Phosphoric etch	360
3	VAT Bund	5060
4	Aqueous Cleaner Degreaser	500
5	Dichromate Seal	1392
6	Static Swill	550
7	Hot Water Dip	452
8	Spare Tank	-
9	PTFE / PFA	450
10	R/O Water Storage Tank	1000
11	Boiling Water Seal	2760
12	Sulphuric Acid Vat 3	11200
13	Acid Swill Cascade Water	2500
14	Acidic Desmut	2500
15	Clean Swill Mains Water	2500
16	Nickel Fluoride Seal	2910
17	Black Dye	700
18	Clean Swill Mains Water	700
19	Alkaline Etch	1000
20	Acid Swill Cascade Water	250
21	Sulphuric Acid Vat 1	8300
22	Sulphuric Acid Vat 2	2100

Factory 1 Shop 2

Tank Reference	Chemical Stored	Capacity (lts)
1	Empty	-
2	Hot Dip	3600
3	Oxidite C30	3600
4	Oxidite SE CO	3600
5	Black Dye Seal	3600
6	Clean Swill	3200
7	Acid Swill	3200
8	Sulphuric Acid Vat 5	5700
9	Sulphuric Acid Vat 6	4300
10	Caustic Etch	3200
11	Boiling Water Seal	2760
12	Blue Dye	1050
13	Red Dye	1050
14	Gold Dye	1050
15	Oxidite	3800
16	R/O Water Storage Tank	1000

PROCEDURE: TANK INDEX. CONTENTS AND CAPACITIES - APRIL 2025

Factory 1 Shop 3

Tank Reference	Chemical Stored	Capacity (lts)
1	Key cote	1800
2	Swill	1800
3	De smut	1800
4	Niklad	1800
5	R/O swill	1800
6	Microtech 66	1800
7	Swill – Mains Water	1800
8	Metex 629	1800
9	Bondal	1800
10	Metex PE	1800
11	Keynote 245 Seal	1800
12	Static Swill	1800
13	Oxidite C8	1800
14	Not in Use	-
15	Chromic Aci Vat 10	10403
16	Nitric Acid	830
17	Swill – Mains Water	700
18	Cr 6 Conversion Coating	288
19	Cr 6 Conversion Coating	300
20	Swill - Mains Water	500
21	Cr 3 Conversion / Passivate	500
22	Non – Chrom Conversion Coating	600

Factory 2

Tank Reference	Chemical Stored	Capacity (lts)
1	Spare Tank	-
2	Spare Tank	-
3	Oxidite SE CO	7084
4	Swill Mains Water	6700
5	Cr 3 Conversion / Passivate	7440
6	Swill Mains Water	6682
7	Iridite TCP III	6683
8	Acid Swill	9000
9	Bondal	1800
10	Sulphuric Acid Vat 12	14701
11	Sulphuric Acid Vat 9	9000
12	Oxidite C8	6993
13	Hot Dip Water	6400
14	Swill 3	1435
15	Dichromate Swill	1866
16	Dichromate Swill	1866
17	Sodium Dichromate	2723
18	Dichromate Swill	1700
19	PTFE / PFA	2023
20	R/O Holding Tank	1000
21	Hot Water Dip	1000
22	PTFE	1500
23	425 Dye	1000
24	Not in use	-

PROCEDURE: TANK INDEX. CONTENTS AND CAPACITIES - APRIL 2025

Date of Issue:	04/2025			**Procedure Ref:**
Issue:	01			HE 25 / 7455
Issued By:	TG			

HARD 7455 TANK INDEX CONTENTS AND CAPACITY APRIL 2025

Hard Anodising Surface Treatments Ltd

VAT/Tank Volumes, Make-up Details & Control Criteria

VAT/TANK: VOLUMES, MAKE-UP DETAILS AND CONTROL CRITERIA.

INTRODUCTION

The control of process solution is critical to the efficiency and performance of hard anodising and related processes. All critical solutions are checked on a regular basis for parameters as described below:-

1. Vat volumes are determined in the following pages and operating working levels are indicated on the vat.

2. As shown in this procedure, and after any remake, the solution is sampled, as far as possible, while in the working condition.
   If process solutions are not within the required specifications then:-
   a) Processes are ceased until the vat is brought into specification or
   b) If work is in progress, continue until complete and cease all production thereafter. Annotate w/o and inform 'A' stamp holder immediately. See process cessation procedure below.

3. The required checks are carried out according to the relevant procedure and the amount of titre used and results achieved (concentration) are recorded on the relevant test result sheets (manual titration). Electrolyte analyses are recorded on Titrator print outs (automatic titration). Back up personnel are provided to cover Laboratory staff absences.

4. If new process chemistry is being introduced or any other chemistry is being replaced, the system must mandate that the laboratory and another 'A' stamp holder review the TDS to determine if it can be analysed in the lab or sent out for analysis. Furthermore, it must be determined that solutions must have top and bottom limit tolerances on parameters such as concentrations, pH etc. Any analysis results must detail these parameters and their top and bottom limit tolerances in order to determine whether the solution is in or out of specification. If analysis is not possible, or if the TDS does not have measurable top and bottom limits, then this chemistry shall not be used in processing.

5. In the instance where working vat solutions are collected and sent away for external analysis, the laboratory technician must review the analytical results to ensure that either the results obtained are within the specifications contained within the TDS, or that any recommended additions are sufficient to take the chemical concentration to approximately mid-point or slightly above.

   NB. Recommendations advised by external analysis are not final. It is the responsibility of the laboratory technician at HASTL to decide on the additions required and a vat adjustment sheet completed accordingly.

Issue Status:	*22*	*23*	*24*	*25*	*26*	*27*	***28***	**Approved:**
Date of Issue	*21.11.22*	*08.03.23*	*30.03.23*	*22.06.23*	*13.09.23*	04.03.24	***24.03.25***	*C Connon*

6. The results of the procedure are compared with the requirements set out in this procedure. Any adjustments necessary are recorded on the appropriate forms and issued to the relevant department for additions to be made within an appropriate time scale.

7. Frequency of analysis will be increased for tanks which are found to be out of shop target limits after two consecutive analyses or three out of the last 10, whichever occurs first. See solution Control Procedure.

8. Trend analysis of all important process parameters are maintained by the laboratory to ensure that no unacceptable deviations or drifts are observed. All non-conformances or anomalous results are compared against data held for the vat operating parameters and this shall form part of the discussion of each individual NCR at successive Quality and Environmental Meetings. The discussion will decide whether the NCR is attributable to trends found within the processing parameters.

9. Tank labelling is reviewed annually to ensure all parameters are in accordance with those detailed in this work instruction (WI 3100). All analyses are carried out using certified chemicals.

10. Where testing is carried out by an independent laboratory, the external test reports are reviewed by approved personnel, then signed/stamped and dated as proof of review.

11. Any changes in the tank volumes and makeup criteria must be added to the relevant WI, in order for this to happen systematically the responsibility for informing quality personnel must be placed on the shoulders of those who have instigated the change.

PROCESS TANKS

In order to achieve consistent conformity throughout our processes, all tanks that require uniformity of temperature and solution concentration must be agitated. This may be achieved either by air agitation, agitation by vertical filter pump or by hand stirring prior to the commencement of the process

Issue Status:	22	23	24	25	26	27	**28**	Approved:
Date of Issue	21.11.22	08.03.23	30.03.23	22.06.23	13.09.23	04.03.24	**24.03.25**	C Connon

PROCESS CESSATION PROCEDURE

This procedure is to be implemented if the laboratory analysis identifies an out of tolerance condition existing with the process chemistry or other operating parameters.

1. The Laboratory must issue a cessation notice to relevant operatives and attach copy to tank or control panel where appropriate.

2. No processing may be carried out in effected tanks until notice is removed.

3. Laboratory to make necessary changes to bring tank into compliance.
   When changes have been made and tank is back within set parameters then the notice can be removed.

4. An investigation of any work processed out in the tank concerned, between the previous analysis and cessation, will be carried out to determine potential non conforming work and any customers informed.
   At monthly meetings a trend analysis of selected chemistries is reviewed and frequency is revised if trend shows negative or adverse situations.

5. Any action taken under this procedure is to be reported at the next QE Meeting for discussion and closure.

CLEANING OF TRANSFER PUMPS

After every transfer of chemicals, ensure the transfer pump is thoroughly cleaned by pumping through with clean water to prevent contamination and ensure operator safety.

Reference Forms: 3100/1: Vat Adjustment
3100/3: Electrolyte Condition Monitoring
3100/4: Aqua Blasting Machine Record Sheet
3100/5A: Work Cessation Notice
3100/5B: Work Cessation Notice - Vat

Issue Status:	*22*	*23*	*24*	*25*	*26*	*27*	***28***	**Approved:**
Date of Issue	*21.11.22*	*08.03.23*	*30.03.23*	*22.06.23*	*13.09.23*	04.03.24	***24.03.25***	*C Connon*

SOLUTION CONTROL PROCEDURE

If solution parameter is outside Specification Range:
Stop Processing
Review parts processed since last analysis
Make corrections to solution
Re-analyse constituent(s)
Resume processing

If solution parameter is outside Shop Target Range:
Make adjustments
Re-analyse constituent or re-check temperature

If solution parameter is inside Shop Target Range:
Adjustments may be made if desired

VAT ADJUSTMENT PROCEDURE

The lab will issue a Vat Adjustment form (3100/1) to relevant department for required additions to be carried out.

When additions have been made, the form should be dated, signed and stamped by the operator responsible for making the additions to verify that the correct chemicals and quantity have been used and additions have been made in a timely manner.

Completed forms are returned to the lab, who will recheck the vat to ensure it is within specification. If further additions are required then a separate form must be raised and completed as above.

When vat adjustments are carried out directly by the lab, a form will be raised in the same way and completed by the lab personnel responsible as with production staff.

Finally all forms are attached to the titration results and filed for future reference.

Issue Status:	*22*	*23*	*24*	*25*	*26*	*27*	***28***	Approved:
Date of Issue	*21.11.22*	*08.03.23*	*30.03.23*	*22.06.23*	*13.09.23*	04.03.24	***24.03.25***	*C Connon*

If the last two analyses are outside the Shop Target Range, then increase sampling frequency to the next level – see table.
If three of the last ten analyses are outside the Shop Target Range, then increase sampling frequency to the next level.
If the last ten analyses are within the Shop Target Range, the sampling frequency can be reduced to the next level.
N.B. The frequency cannot be reduced beyond that shown in the solution control log

INCREASED FREQUENCY		DECREASED FREQUENCY	
	LEVEL	LEVEL	
Monthly	1	4	Daily
2 Weekly	2	3	Weekly
Weekly	3	2	2 Weekly
Daily	4	1	Monthly

Issue Status:	22	23	24	25	26	27	**28**	Approved:
Date of Issue	21.11.22	08.03.23	30.03.23	22.06.23	13.09.23	04.03.24	**24.03.25**	C Connon

Sulphuric Acid (H^2SO_4) Anodising Vats

Vat I.D.	Vat capacity (ltrs)	Solution Make up as new		Control				
		Chemical quantity + R/O Balance	Change in v/v% by adding 1 drum H^2SO_4	Sulphuric Acid (v/v%)		Aluminium (g/l)	Chloride (g/l)	Temp (°C)
				Operating Range	Vat target control limit	maximum limit	maximum limit	Operating Range
Vat 1 : Shop 1	8300	45 drums	0.24	8 - 12	9.5 - 11.5	15	0.2	2 - 8
Vat 2 : Shop 1	2100	21 drums	0.95	16 - 24#	17 - 23	15	0.2	2 - 5
Vat 3 : Shop 1	11200	50 drums	0.18	8 - 10	8.5 - 9.5	15	0.2	2 - 8
Vat 5 : Shop 2	3700	33 drums	0.54	16 - 20	17 - 19	15	0.2	2 - 14
Vat 6 : Shop 2	4300	38 drums	0.47	16 - 20	17 - 19	15	0.2	16 - 22
Vat 9 : Factory 2	9000	45 drums	0.22	8 - 12	8.5 - 11.5	15	0.2	2 – 8 H 16 – 22 S
Vat 12 : Factory 2	14781	74 drums	0.14	8 - 12	8.5 - 11.5	15	0.2	2 – 8 H 16 – 22 S
Check / Analysis Frequency				Fortnightly # Weekly	Fortnightly	Fortnightly	Quarterly	Before & During process

1 drum = 20ltrs H = Hard Anodising S = Sulphuric Anodising

N.B. Operating Range – all vats can operate satisfactorily 2% below minimum and 2% above maximum sulphuric acid concentration in the control range.

Check / analysis frequency may vary with process requirements.

Issue Status:	22	23	24	25	26	27	**28**	Approved:
Date of Issue	21.11.22	08.03.23	30.03.23	22.06.23	13.09.23	04.03.24	**24.03.25**	C Connon

Conversion Coatings

Vat I.D.	Vat capacity (ltrs)	Solution Make up as new		Control			
		Chemical quantity + R/O Balance	Amount required to change conc by...	Operating Range	Vat Target Control Limit	pH Operating range	Temp (°C)
Alocrom 1200 : Shop 3	395	3.95 kg	1g/ltr - 395g	8 - 12g/ltr	9 - 11g/ltr	1.6 - 2.2 *	18 - 27
Check / Analysis Frequency				Weekly			As Required
SurTec 650V : Shop 3	395	45 ltrs	1% - 4ltrs	5 - 30%v/v	7 - 28%	2.5 – 3.95	30 - 40
Iridite TCP 111 : Factory 2	7440	Iridite TCP 111-A 200 ltrs Iridite TCP 111-B 125 ltrs	1ml/ltr – 7.5 ltrs 1ml/ltr – 7.5 ltrs	20 – 40ml/ltr 10 – 20ml/ltr	As per MacDermid procedure #	3.8 – 4.0	30 - 40
Iridite NCP : Shop 3	395	18 ltrs	1% - 3 ltrs	4 - 6%v/v	4.5 - 5.5%	3.5 - 5.5	28 - 45
Check / Analysis Frequency				Weekly # Tested by MacDermid - Monthly			As Required

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* All pH adjustments done with concentrated Nitric Acid 1.42 S.G.

SurTec 650 pH is adjusted as follows: If pH is high, dose using 5% Sulphuric Acid.
If pH is low, dose using 1% Sodium Hydroxide solution.

Issue Status:	22	23	24	25	26	27	**28**	Approved:
Date of Issue	21.11.22	08.03.23	30.03.23	22.06.23	13.09.23	04.03.24	**24.03.25**	C Connon

Chromic Acid Anodising Vat

Vat I.D.	Vat capacity (ltrs)	Solution Make up as new		Control				
				Free Chromic Acid		Total Chromic Acid	Chloride	Temp Operating Range
		Chemical quantity + R/O Balance	Amount required to change conc by 1 g/ltr	Operating Range	Vat Target Control Limit			
Vat 10 : Shop 3	1400	56 kg	1.4 kg	31 – 52g/ltr	35 – 50g/ltr	< 107g/ltr	0.2g/ltr max	To process instruction sheets
Check/ Analysis Frequency				Fortnightly			Quarterly	

Dichromate Seal Vats

Vat I.D.	Vat capacity (ltrs	Solution Make up as new			Control			
		Chemical quantity + R/O Balance		Amount required to change conc by 1 g/ltr	Operating Range	Vat Target Control Limit	pH Operating Range	Temp (°C)
		Sodium Dichromate	Sodium Hydroxide					
Dichromate Seal Shop 1	1392	126 kg	18 kg	1g/ltr - 1.4kg#	45 - 64g/ltr	50 – 60g/ltr	5.0 – 6.0	96°C +/- 2.8°C
Dichromate Seal Factory 2	2723	150 kg	35 kg	1g/ltr - 2.7kg#	60 - 80g/ltr	65 - 75g/ltr	6.3 - 7.2	96°C +/- 2.8°C
Check/ Analysis Frequency					Fortnightly/As required			As required

Values shown are for the adjustment of Sodium Dichromate.

Issue Status:	22	23	24	25	26	27	**28**	Approved:
Date of Issue	21.11.22	08.03.23	30.03.23	22.06.23	13.09.23	04.03.24	**24.03.25**	C Connon

Seal Vats - Oxidite SE-CO						
Vat I.D.	**Vat capacity (ltrs)**	**Solution Make up as new**		**Control**		
		Chemical quantity + R/O Balance	**Amount required to change conc by 1 g/ltr**	**Operating Range**	**pH Operating range**	**Temp (°C)**
Seal 1 : Shop 1	2500	10 kg	2.5 kg	3-5 g/l	5.5 – 6.5	25 – 32°C
Seal 2 : Shop 2	3600	14.4 kg	3.6 kg	3–5g/1	5.5 – 6.5	25 – 32°C
Seal 3 : Factory 2	7084	28 kg	7k g	3-5g/l	5.5 – 6.5	25 – 32°C
Seal Vats – Hot Water Seal						
Shop 1	2760	5.5ltr Oxidite S-54	2.75 ltr	2ml/l min	5.6 – 6.0	96°C min
		55.2 ltr Oxidite S-52	27.6 ltr	2 – 3% v/v		
Check / Analysis Frequency				Fortnightly	Weekly	Weekly

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Check / analysis frequency may vary with process requirements.

Issue Status:	*22*	*23*	*24*	*25*	*26*	*27*	***28***	**Approved:**
Date of Issue	*21.11.22*	*08.03.23*	*30.03.23*	*22.06.23*	*13.09.23*	04.03.24	***24.03.25***	*C Connon*

Dye Vats

Vat I.D.	Vat capacity (ltrs)	Solution Make up as new			Control			
		Chemical quantity + R/O Balance	Sodium Acetate	Saniprot	Amount required to change conc by:	Operating Range	pH Operating range	Temp (°C)
Black : Shop 1	1600	16kg	N/A	N/A	1g/ltr :- 1.6kg	9 – 11g/ltr	4.0 - 5.0	50 – 60
Black : Shop 2	3600	32 ltr	29kg	180ml	1ml/ltr :- 3.6ltr	8 - 10ml/ltr	5.0 - 6.0	35 – 65
Blue : Shop 2	1050	2.1kg	N/A	50ml	0.1g/ltr :- 105g	1 - 3g/ltr	2.5 - 3.5	35 – 65
Gold : Shop 2	1050	420g	N/A	50ml	0.1g/ltr :- 105g	0.3 - 0.6g/ltr	4.0 - 5.5	35 – 65
Red : Shop 2	1050	11.5kg	N/A	50ml	1g/ltr :- 1kg	10 - 12g/ltr	4.5 - 6.0	35 – 65
Green : Shop 2	180	360g	N/A	9ml	1g/ltr :- 180g	1 – 3g/ltr	5.0 – 6.0	35 – 65
Check / Analysis Frequency						Fortnightly	Weekly	Weekly

Analysed prior to use due to infrequent process requirement

Check / analysis frequency may vary with process requirements.

The above operating ranges are recommended but not compulsory, due to the complex nature of organic dyes, dyes will operate successfully outside these limits.

PH Adjustment – All dyes use acetic acid or ammonium except Blue Dye which uses sulphuric acid or sodium hydroxide.

Issue Status:	22	23	24	25	26	27	**28**	Approved:
Date of Issue	21.11.22	08.03.23	30.03.23	22.06.23	13.09.23	04.03.24	**24.03.25**	C Connon

Non-Etch Cleaner – Oxidite C-8						
Vat I.D.	**Vat capacity (ltrs)**	**Solution Make up as new**		**Control**		
		Chemical quantity + R/O Balance	**Amount required to change conc by 1g/ltr**	**Operating Range**	**Vat Target Control Limit**	**Temp (°C)**
Oxidite C-8 : Shop 1	2916	100 kg	2.9 kg	25 – 40g/ltr	30 – 35g/ltr	65 - 70
Oxidite C-8 : Shop 2	3800	125 kg	3.8 kg	25 – 40g/ltr	30 – 35g/ltr	65 - 70
Oxidite C-8 : Factory 2	6400	225 kg	6.4 kg	25 – 40g/ltr	30 – 35g/ltr	65 - 70
Oxidite C-8 : ENP	1800	65 kg	1.8 kg	25 – 40g/ltr	30 – 35g/ltr	65 - 70
Desmut – Oxidite D-30						
Oxidite D-30 : Shop 1	2100	325 ltrs	1% - 21 ltrs	5 – 25%	35 – 45g/ltr	21 - 43
Oxidite D-30 : Shop 2	1300	195 ltrs	1% -13 ltrs			
Check / Analysis Frequency				Weekly		As Required

Check / analysis frequency may vary with process requirements

Issue Status:	*22*	*23*	*24*	*25*	*26*	*27*	***28***	**Approved:**
Date of Issue	*21.11.22*	*08.03.23*	*30.03.23*	*22.06.23*	*13.09.23*	04.03.24	***24.03.25***	*C Connon*

Caustic Etch Solutions

Vat I.D.	Vat capacity (ltrs)	Solution Make up as new		Control			
		Chemical quantity + R/O Balance	Amount required to change conc by...	Operating Range		Vat Target Control Limit	Temp (°C)
				NaOH	$NaAl(OH)_4$	NaOH	
Caustic Etch – Shop 2	3374	169kg	1g/ltr – 3.4kg	4.0 – 6.5%w/v	< 150g/ltr	4.5 – 6.0	20 - 40
				Monthly			
Oxidite E28 – Shop 1	2650	100 ltrs	1ml/ltr - 2.65 ltrs	68 - 95ml/ltr		73 - 90ml/ltr	20 -70
Oxidite E28 – Factory 2	6993	552 ltrs	1ml/ltr – 7 ltrs	68 - 95ml/ltr		73 - 90ml/ltr	20 - 70
Check / Analysis Frequency				Weekly			As required

Issue Status:	22	23	24	25	26	27	**28**	Approved:
Date of Issue	21.11.22	08.03.23	30.03.23	22.06.23	13.09.23	04.03.24	**24.03.25**	C Connon

Electroless Nickel Plating – Shop 3

Chemical Name		Vat capacity (ltrs)	Solution Make up		Control				
			Chemical amount + R/O Balance	Concentration	Operating Range	Shop Control Limit	Temp °C	pH	Analysis Frequency
Woods Nickel Strike	Nickel Chloride	288	70kg	240g/ltr	220 –260g/ltr	N/A	Ambient	N/A	Monthly
	HCl		24.5ltrs	85ml/ltr	70-100ml/ltr				
Niklad 767		370	Niklad 767A – 18 ltrs Niklad 767B – 55 ltrs	5% 15%	90 – 105% activity	92 – 102	82-91°C	4.9 - 5.1 (1)	Constant (2) adjustment
Niklad 767		1800	Niklad 767A – 90 ltrs Niklad 767B – 270 ltrs	5% 15%	90 – 105% activity	92 – 102	82-91°C	4.9 - 5.1 (1)	Constant (2) adjustment
Niklad ELV 824		1800	Barrett SNR-24 Niklad 824B	3% 20%	80 – 105% activity	85 - 103	82-91°C	6.0 – 6.6	Constant adjustment
Nitric Acid 60%		830	415ltrs	50%	500mls/ltr	N/A	Ambient	N/A	N/A
Metex Dekote EN (Concentrate) Metex Dekote (Base Salts)		208	104ltrs 25kg	500ml/ltr 120g/ltr	40 – 60v/v%	N/A	80°C min	N/A	N/A
Alumon AC-70		1800	Sulphuric acid 98% – 360 ltrs Nitric acid 65% – 1100 ltrs Alumon AC-70 – 150 kg	200ml/ltr 600ml/ltr 80g/ltr	100 – 250ml/ltr 500 – 700ml/ltr 40 – 120g/ltr	N/A	Ambient	N/A	Analysis by MacDermid
Vand-Aloy 4100N		1800	Part A – 108ltrs Part B – 270ltrs	6% 15%	95 – 105% activity	90 – 102%	85-91^{0}C	4.8 – 5.2	Constant adjustment
66 Microetch Sulphuric Acid (96%)		1800	90 kg 36 ltrs	50g/ltr 20ml/ltr	45 – 55g/ltr 2%	N/A	18-25^{0}C	N/A	Monthly

(1) pH adjustments done with Ammonia in ¼ ltr increments
(2) Titrate after every turnover. If activity is below 90% add 3ltrs A and 3ltrs C (This will increase activity to approx 100%). (Titration result x 4.89 will indicate activity) A & B makeup, A & C replenishment / control.
(3) Constant adjustment of ELV808M & 808HA in equal amounts (see table in TDS)

Issue Status:	22	23	24	25	26	27	**28**	Approved:
Date of Issue	21.11.22	08.03.23	30.03.23	22.06.23	13.09.23	04.03.24	**24.03.25**	C Connon

Electroless Nickel Plating – Shop 3

Chemical Name	Vat capacity (ltrs)	Solution Make up		Control				
		Chemical amount + R/O Balance	Concentration	Operating Range	Shop Control Limit	Temp °C	pH	Analysis Frequency
Keykote 245 (Steel) (Keykote 501C)	1800	245:- 100 ltrs (501C:- 25 ltrs)	50 ml/ltr	20 - 70 ml/ltr	30 - 60 ml/ltr	35 - 80°C	N/A	Monthly
Metex PE Emphax	1800	135 kg	75 g/ltr	50 - 100 g/ltr	60 - 90 g/ltr	60 - 95°C	N/A	Monthly
Metex M-629	1800	325 kg	120 - 240 g/ltr	120 - 240 g/ltr	140 - 200 g/ltr	Ambient - 49°C	N/A	Monthly
Keykote 245 (Aluminium) (Keykote 501C)	1800	245:- 75 ltrs (501C:- 25 ltrs)	30 ml/ltr	10 - 60 ml/ltr	15 - 55 ml/ltr	35 - 60°C	N/A	Monthly
Niklad Ice	288	Elnic 101-C5 Niklad Ice 5	200 ml/ltr 1 - 2 ml/ltr	Niklad Ice 1-10 g/ltr Activity 90 - 105%	As per MacDermid procedure	82 - 88°C	4.8 - 5.2	Analysis by McDermid
Bondal	1800	As supplied	As supplied	N/A	N/A	18 - 30°C	N/A	Analysis by McDermid
Irridite 15	288	11.25 kg	37.5 g/ltr	30 - 50 g/ltr	35 - 45 g/ltr	22 - 38°C	0.2 - 0.6	As required
New Dimension Supreme	365	36 ltrs	10%	5 - 10%	As per MacDermid procedure	Ambient - 65°C	N/A	Analysis by McDermid

* Adjustments done with Irridite NCP Replenish

** Al pH adjustments done with concentrated Nitric Acid 1.42 S.G. in 200ml increments

Issue Status:	22	23	24	25	26	27	**28**	Approved:
Date of Issue	21.11.22	08.03.23	30.03.23	22.06.23	13.09.23	04.03.24	**24.03.25**	C Connon

Chromic/Phosphoric Stripper

Vat I.D.	Vat capacity (ltrs)	Solution Make up as new				Control		
		Chemical quantity + R/O Balance		Amount required to change conc by 1%		Operating Range		Temp (°C)
		Phosphoric Acid	Chromic Acid	Phosphoric Acid	Chromic Acid	Phosphoric Acid (75 – 81% conc)	Chromic Acid	
Stripper : Shop 1	360ltrs	15 ltrs	9 kg	3.6 ltrs	3.6 kg	3.5 – 5.0%v/v	20 – 25g/ltr	45 - 60
Check / Analysis Frequency						As required		

Kem-Sol WX (Lacquer remover)

Vat I.D.	Vat capacity (ltrs)	Solution Make up	Control	
			Operating Range	Temp °C
Kemsol : Shop 1	200	Use as supplied	Replenish when not working efficiently	35 - 45

Issue Status:	22	23	24	25	26	27	**28**	Approved:
Date of Issue	21.11.22	08.03.23	30.03.23	22.06.23	13.09.23	04.03.24	**24.03.25**	C Connon

Hot Water Dips				
Vat I.D.	**Vat capacity (ltrs)**	**Solution Make up**	pH Operating Range	Temperature (°C)
Shop 1	452	R/O Water	5.0 – 6.5	50 – 65°C
Shop 2	208			
Shop 3 - ENP	288			
Factory 2	910			
Check / Analysis Frequency			Weekly	Weekly

PTFE Dip/Seal				
Vat I.D.	**Vat capacity (ltrs)**	**Solution Make up (ltrs)**	**Operating Range**	**Temperature (°C)**
PTFE – Shop 1	450	54	8 – 16 v/v%	Ambient
PTFE – Factory 2	2023	140	8 – 16 v/v%	Ambient
Check / Analysis Frequency			Weekly	

Issue Status:	*22*	*23*	*24*	*25*	*26*	*27*	***28***	**Approved:**
Date of Issue	*21.11.22*	*08.03.23*	*30.03.23*	*22.06.23*	*13.09.23*	04.03.24	***24.03.25***	*C Connon*

Clean Swill Vats			
Vat I.D.	**Vat capacity (ltrs)**	**Solution Make up**	**pH Operating Range**
Vats 1 - 4	N/A	Mains Water	5.0 – 9.0
Check/ Analysis Frequency			Weekly

R/O Water		
pH Operating Range	**Conductivity (µs)**	**Silica mg/ltr**
6.0 – 9.4	<50	<10
Check/ Analysis Frequency	Weekly	

Plant Effluent			
	pH Operating Range	**Chromium**	**Nickel**
	6.0 – 10.0	<3mg/ltr (consent limit: 1mg/ltr	<10mg/ltr (consent limit: 1mg/ltr
Check/ Analysis Frequency	Daily	Weekly	Weekly

Chloride analysis of incoming water is carried out by Severn Trent and information is readily available on their web site and well within specifications

Issue Status:	22	23	24	25	26	27	**28**	Approved:
Date of Issue	21.11.22	08.03.23	30.03.23	22.06.23	13.09.23	04.03.24	**24.03.25**	C Connon

Glycol		
	pH Operating Range	**S.G. (vol 33%)**
	7.0 min	1.03 – 1.04
Check/ Analysis Frequency	Weekly / As required	

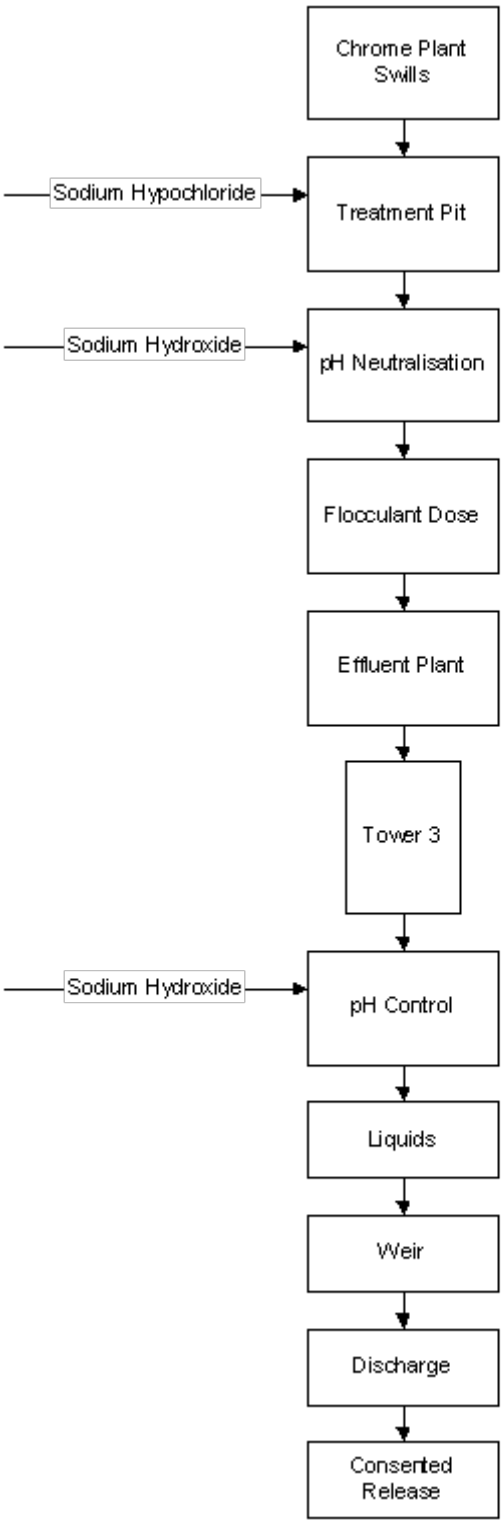
Aqua Blast – Shop 2		
Temperature °C Operating Range	**Blasting Media Check Frequency**	**Blasting Media Additions**
45 - 55	Weekly	Grade 149 – 250 glass bead 2 cupfuls to be added per day when in use

Issue Status:	*22*	*23*	*24*	*25*	*26*	*27*	***28***	Approved:
Date of Issue	*21.11.22*	*08.03.23*	*30.03.23*	*22.06.23*	*13.09.23*	04.03.24	***24.03.25***	*C Connon*

Hard Anodising Surface Treatments Ltd

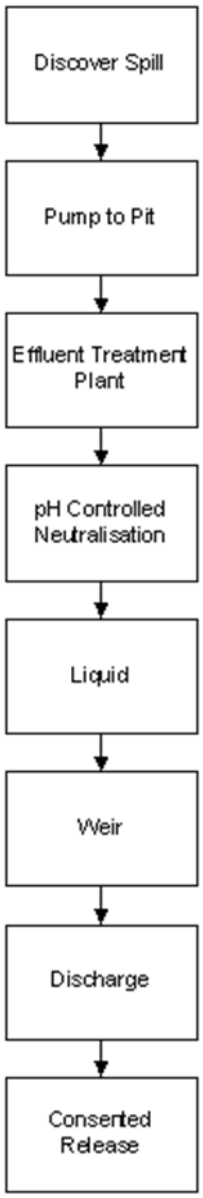
Chrome Neutralisation Flow Chart

Chrome Neutralisation Flow Chart



Yard Spillage & Containment Flow Chart

Yard Spillage and Containment Flow Chart



Hard Anodising Surface Treatments Ltd

Management Systems

Hard Anodising Surface Treatments Ltd

ISO14001 Certificate

British Assessment Bureau
Part of the Amtivo group

CERTIFICATE OF REGISTRATION

The management system of certificate number **232698**

Hard Anodising Surface Treatments Limited

Firs Estate, Stourport Road, Kidderminster, DY11 7QN

has been assessed and certified as meeting the requirements of:

ISO 14001:2015

Coating of metals by electrolytic and chemical process Globally.

Further clarifications regarding the scope of this certificate and the applicability of requirements may be obtained by consulting the certifier.

UKAS MANAGEMENT SYSTEMS
8289

IAF MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT

Valid from:
Initial certification: 11 July 2004
Latest issue: 20 May 2024
Expiry date: 09 May 2026
Recertification before: 09 May 2026
Subject to annual assessments.

Authorised by

Mike Tims
Chief Executive Officer

british-assessment.co.uk

Certificate issued by Amtivo Group Limited T/A British Assessment Bureau Ltd.
Certification is conditional on maintaining the required performance standards throughout the certified period of registration.
Amtivo Group Limited. 30 Tower View, Kings Hill, Kent, ME19 4UY.

Hard Anodising Surface Treatments Ltd

Work Instruction Index

HARD ANODISING SURFACE TREATMENTS LIMITED
WORK INSTRUCTION INDEX (24.03.25)

W.I. Number		W.I. Title	Issue No.
WORK INSTRUCTION 3001	-	OGL COMPUTER SYSTEM	6
WORK INSTRUCTION 3002	-	CRITICAL MATERIALS	28
WORK INSTRUCTION 3003	-	CONTRACT REVIEW	5
WORK INSTRUCTION 3100	-	VATS/TANKS: VOLUME,MAKE-UP DETAILS, CONTROL CRITERIA	28
WORK INSTRUCTION 3101	-	ANALYSIS FOR SILICA	4
WORK INSTRUCTION 3102	-	ANALYSIS OF SULPHURIC ACID ANODISING ELECTROLYTE	6
WORK INSTRUCTION 3103	-	ANALYSIS OF CHROMATIC ACID ELECTROLYTE	6
WORK INSTRUCTION 3104	-	ANALYSIS OF TRICHLOROETHYLENE	4
WORK INSTRUCTION 3105	-	ANALYSIS OF CAUSTIC ETCHES	4
WORK INSTRUCTION 3106	-	ANALYSIS OF PHOSCLENE	3
WORK INSTRUCTION 3107	-	ANALYSIS OF COLD SEAL	3
WORK INSTRUCTION 3108	-	ANALYSIS OF DICHROMATE SEAL SOLUTION	4
WORK INSTRUCTION 3109	-	ANALYSIS OF NICKEL ACETATE SEAL	3
WORK INSTRUCTION 3110	-	CONTROL OF BLACK DYE	7
WORK INSTRUCTION 3111	-	CONTROL OF RED DYE	6
WORK INSTRUCTION 3112	-	CONTROL OF BLUE DYE	6
WORK INSTRUCTION 3113	-	CONTROL OF GOLD DYE	6
WORK INSTRUCTION 3114	-	DENSITY DETERMINATION OF PTFE SUSPENSION	5
WORK INSTRUCTION 3115	-	DETERMINATION OF ACTIVITY PERCENATAGE OF NIKLAD 794 PLATING SOLUTION	4
WORK INSTRUCTION 3116	-	ANALYSIS OF ISOPREP 44	3
WORK INSTRUCTION 3117	-	ANALYSIS OF FERROPREP 170	3
WORK INSTRUCTION 3118	-	ANALYSIS OF ALZINATE	5
WORK INSTRUCTION 3119	-	ANALYSIS OF ARP 350	3
WORK INSTRUCTION 3120	-	ANALYSIS OF ALPREP 291	3
WORK INSTRUCTION 3121	-	ANALYSIS OF HYDROCHLORIC ACID ETCHING SOLUTION	3
WORK INSTRUCTION 3122	-	CONTROL OF Ph OF SEALS AND DIPS	3
WORK INSTRUCTION 3123	-	WOOD'S NICKEL STRIKE	3
WORK INSTRUCTION 3124	-	MANUAL ANALYSIS OF ALOCROM 1200 SOLUTION	3
WORK INSTRUCTION 3125	-	MANUAL ANALYSIS OF NIKLAD 752R (reducer)	3

HARD ANODISING SURFACE TREATMENTS LIMITED
WORK INSTRUCTION INDEX (24.03.25)

W.I. Number		W.I. Title	Issue No.
WORK INSTRUCTION 3126	-	MANUAL ANALYSIS OF OXIDITE S-52L (HOT SEAL)	2
WORK INSTRUCTION 3127	-	MANUAL ANALYSIS OF NIKLAD 767	4
WORK INSTRUCTION 3128	-	MANUAL ANALYSIS OF NIKLAD ELV 808	3
WORK INSTRUCTION 3129	-	MANUAL ANALYSIS OF METEX PE COOLEC	3
WORK INSTRUCTION 3130	-	MANUAL ANALYSIS OF METEX ACS- DAS	3
WORK INSTRUCTION 3131	-	MANUAL ANALYSIS OF OXIDITE E-28	2
WORK INSTRUCTION 3132	-	MANUAL ANALYSIS OF IRIDITE NCP	2
WORK INSTRUCTION 3133	-	MANUAL ANALYSIS OF MINCO CLEANER	2
WORK INSTRUCTION 3134	-	MANUAL ANALYSIS OF METTEX PS COOLSOAK	3
WORK INSTRUCTION 3135	-	MANUAL ANALYSIS OF ALUMINIUM VIOLET CLW DYE	2
WORK INSTRUCTION 3136	-	MANUAL ANALYSIS OF OXIDITE D-30	2
WORK INSTRUCTION 3137	-	MANUAL ANALYSIS OF ALUMINIUM BLACK CRO DYE	2
WORK INSTRUCTION 3138	-	MANUAL ANALYSIS OF 66 MICROETCH	2
WORK INSTRUCTION 3139	-	MANUAL ANALYSIS OF ALUCLEAN 245-SA	2
WORK INSTRUCTION 3140	-	MANUAL ANALYSIS OF VAND-ALOY 4100N	2
WORK INSTRUCTION 3141	-	MANUAL ANALYSIS OF METEX M-629	2
WORK INSTRUCTION 3142	-	MANUAL ANALYSIS OF OXIDITE SE-CO	2
WORK INSTRUCTION 3143	-	MANUAL ANALYSIS OF ND 7 SUPREME	2
WORK INSTRUCTION 3144	-	MANUAL ANALYSIS OF METEX PE EMPHAX	2
WORK INSTRUCTION 3145	-	MANUAL ANALYSIS OF OXIDITE C-14	3
WORK INSTRUCTION 3146	-	MANUAL ANALYSIS OF ALOCROM 1000	2
WORK INSTRUCTION 3147	-	MANUAL ANALYSIS OF MASCO 245-DMX	2
WORK INSTRUCTION 3148	-	MANUAL ANALYSIS OF SURTEC 650	2
WORK INSTRUCTION 3149	-	AUTO ANALYSIS OF CAUSTIC ETCHES	3
WORK INSTRUCTION 3150	-	AUTO ANALYSIS OF CAUSTIC ETCHES	5
WORK INSTRUCTION 3151	-	AUTO ANALYSIS OF SULPHURIC ACID ANODISING ELECTROLYTE	3
WORK INSTRUCTION 3152	-	AUTO ANALYSIS OF CHLORINE IN ELECTROLYTES	3
WORK INSTRUCTION 3153	-	AUTO ANALYSIS OF OXALIC ACID IN SULPHURIC ACID ELECTROLYTE	4

HARD ANODISING SURFACE TREATMENTS LIMITED
WORK INSTRUCTION INDEX (24.03.25)

W.I. Number		W.I. Title	Issue No.
WORK INSTRUCTION 3154	-	AUTO SATANDARDISATION OF AMMONIUM IRON II SULPHATE (F.A.S)	3
WORK INSTRUCTION 3155	-	AUTO ANALYSIS OF CHROMIC ACID ELECTROLYTE	4
WORK INSTRUCTION 3156	-	FREE CHROMIC ACID (FRESH ELECTROLYTE) DETERMINATION	3
WORK INSTRUCTION 3157	-	FREE CHROMIC ACID (USED ELECTROLYTE) DETERMINATION	3
WORK INSTRUCTION 3158	-	AUTO-ANALYSIS OF DICHROMATE SEAL SOLUTION	3
WORK INSTRUCTION 3159	-	AUTO ANALYSIS OF ARP 350	4
WORK INSTRUCTION 3160	-	AUTO-ANALYSIS OF NICKEL ACETATE SEAL	4
WORK INSTRUCTION 3161	-	AUTO-ANALYSIS OF COLD SEAL	3
WORK INSTRUCTION 3162	-	AUTO-ANALYSIS OF NIKLAD 794 PLATING SOLUTION	4
WORK INSTRUCTION 3163	-	AUTO ANALYSIS OF NICKEL CHLORIDE CONTENT OF WOOD'S NICKEL STRIKE	5
WORK INSTRUCTION 3164	-	AUTO ANALYSIS OF HYDROCHLORIC ACID CONTENT OF WOOD'S NICKEL STRIKE	3
WORK INSTRUCTION 3165	-	AUTO ANALYSIS OF FERROPREP 170	3
WORK INSTRUCTION 3166	-	AUTO-ANALYSIS OF PHOSCLENE	3
WORK INSTRUCTION 3167	-	AUTO-ANALYSIS OF ISOPREP 44	3
WORK INSTRUCTION 3168	-	AUTO ANALYSIS OF HYDROCHLORIC ACID ETCHING SOLUTION	3
WORK INSTRUCTION 3169	-	AUTO CALIBRATION OF AMMONIUM IRON (II) SULPHATE (FAS) (BLANK ALPREP 291)	3
WORK INSTRUCTION 3170	-	AUTO ANALYSIS OF ALPREP 291	3
WORK INSTRUCTION 3171	-	AUTO ANALYSIS OF SANODAL GOLD DYE (Ferric Gold)	4
WORK INSTRUCTION 3172	-	AUTO ANALYSIS OF ALOCROM 1200 SOLUTION	4
WORK INSTRUCTION 3173	-	AUTO ANALYSIS OF ACID ETCH (BRIGHTENER)	3
WORK INSTRUCTION 3174	-	AUTO ANALYSIS OF SODIUM HYPOPHOSPHITE IN ENP	3
WORK INSTRUCTION 3175	-	AUTO STANDARDISATION OF IODINE SOLUTION	4
WORK INSTRUCTION 3176	-	AUTO ANALYSIS OF ORTHOPHOSPHITE IN ENP SOLUTION	3
WORK INSTRUCTION 3177	-	AUTO ANALYSIS OF ALZINATE	3
WORK INSTRUCTION 3178	-	AUTO ANALYSIS OF BLACKFAST	3
WORK INSTRUCTION 3179	-	AUTO ANALYSIS OF PMD 505	4

HARD ANODISING SURFACE TREATMENTS LIMITED
WORK INSTRUCTION INDEX (24.03.25)

W.I. Number		W.I. Title	Issue No.
WORK INSTRUCTION 3180	-	AUTO ANALYSIS OF PASSIVATOR (NITRIC ACID CONTENT)	3
WORK INSTRUCTION 3181	-	AUTO ANALYSIS OF ALOCROM 1000	3
WORK INSTRUCTION 3182	-	AUTO ANALYSIS OF FREE CHROMIC ACID IN STRIPPER	4
WORK INSTRUCTION 3183	-	AUTO ANALYSIS OF PHOSPHORIC ACID IN STRIPPER	3
WORK INSTRUCTION 3185	-	MANUAL ANALYSIS OF KEKOTE 245	2
WORK INSTRUCTION 3186	-	AUTO ANALYSIS OF PMD 606	3
WORK INSTRUCTION 3187	-	AUTO ANALYSIS OF ECONOCLENSE NS	3
WORK INSTRUCTION 3188	-	AUTO ANALYSIS OF ACTIVITY OF NIKLAD 752 (Nickel – Boron plating solution)	3
WORK INSTRUCTION 3190	-	AUTO ANALYSIS OF ECONOVATE	3
WORK INSTRUCTION 3191	-	AUTO ANALYSIS OF SULPHATE DETERMINATION IN CHROMIC ACID	2
WORKIINSTRUCTION 3192	-	DETERMINATION OF SALT CONCENTRATION FROM COLLECTED CONDENSATE	2
WORK INSTRUCTION 3193	-	VAT SAMPLING PRIOR TO ANALYSIS	2
WORK INSTRUCTION 3194	-	MANUAL ANALYSIS OF ALFIDEOX 79	2
WORK INSTRUCTION 3195	-	CONTROL OF OXIDITE C-8	2
WORK INSTRUCTION 3196	-	DETERMINATION OF ETCH RATE FOR ETCHANTS & CLEANERS	2
WORK INSTRUCTION 3200	-	CALIBRATION AND USE OF pH METERS	7
WORK INSTRUCTION 3201	-	CALIBRATION AND USE OF CONDUCTIVITY METER	6
WORK INSTRUCTION 3203	-	TEMPERATURE MEASUREMENT	3
WORK INSTRUCTION 3204	-	SPOT TEST SEALING	7
WORK INSTRUCTION 3205	-	TABER ABRASION TEST	9
WORK INSTRUCTION 3206	-	COATING THICKNESS MEASUREMENT	16
WORK INSTRUCTION 3207	-	CORROSION TEST	5
WORK INSTRUCTION 3208	-	VOLTAGE BREAKDOWN TEST AND RESISTIVITY TEST	8
WORK INSTRUCTION 3210	-	CALIBRATION OF VAT AMMETERS	6
WORK INSTRUCTION 3211	-	CALIBRATION OF VAT VOLTMETERS	6
WORK INSTRUCTION 3212	-	CALIBRATION OF THERMOMETERS	6
WORK INSTRUCTION 3213	-	CALIBRATION OF EXTERNAL MICROMETERS	3

HARD ANODISING SURFACE TREATMENTS LIMITED
WORK INSTRUCTION INDEX (24.03.25)

W.I. Number		W.I. Title	Issue No
WORK INSTRUCTION 3216	-	ABRASION RESISTANCE TEST (SUGA)	5
WORK INSTRUCTION 3217	-	VICKERS HARDNESS TEST	7
WORK INSTRUCTION 3218	-	PREPARATION OF TEST PIECE MOULD	3
WORK INSTRUCTION 3219	-	COATING TESTS – ELECTROLESS NICKEL PLATING & CONVERSION COATING	8
WORK INSTRUCTION 3220	-	MATERIALS TESTING PROCEDURE FLOW CHART	6
WORK INSTRUCTION 3221	-	PERIODIC/LOT AND SAMPLE TESTING (MATRIX ATTACHMENT)	8
WORK INSTRUCTION 3222	-	SALT SPRAY TESTING PROCEDURE	7
WORK INSTRUCTION 3223	-	TITANIUM CLEANING	2
WORK INSTRUCTION 3224	-	CALIBRATION OF TIMERS	2
WORK INSTRUCTION 3225	-	CALIBRATION OF OVENS	5
WORK INSTRUCTION 3226	-	OVEN OPERATIONG PROCEDURE	2
WORK INSTRUCTION 3227	-	VAPOUR BLASTING OPERATING PROCEDURE	2
WORK INSTRUCTION 3320	-	OBSOLETE	
WORK INSTRUCTION 3400	-	CHEMICAL DELIVERY/STORAGE PROCEDURE	2
WORK INSTRUCTION 3401	-	LABORATORY CHEMICAL STORAGE PROCEDURE	4
WORK INSTRUCTION 3500	-	VERIFYING PRODUCT QUANTITY DURING THE PRODUCTION REALISATION PROCESS – AEROSPACE / AS9100 REQUIREMENTS	2
WORK INSTRUCTION 3501	-	CONTRACT REVIEW CHECKLIST – NEW JOBS/NEW CUSTOMERS	2
WORK INSTRUCTION 3600	-	RISK ANALYSIS	6
WORK INSTRUCTION 3601	-	SHOP FLOOR BASIC OUTLINE	19
WORK INSTRUCTION 3602	-	8D PROBLEM SOLVING METHODOLOGY	2
WORK INSTRUCTION 3701	-	CONTINGENCY PLANS	4
WORK INSTRUCTION 3702	-	PRICING GUIDELINES	1

Procedure Index

PROCEDURE: PROCEDURES AND WORK INSTRUCTIONS SUMMARY APRIL 2025

INTRODUCTION

The following summary defines the procedure and work instructions being used on site in April 2025.

Item	Document Reference	Subject
1	HE 24 / 7103	CoSHH Exposure Testing
2	HE 24 / 7242	Quarterly Testing of ETP Releases for the EA
3	HE 24 / 6966	Site Protection Monitoring Program
4	HE 24 / 6881	Surface Tension Testing of Chrome Solutions
5	HE 24 / 6812	Chrome Releases to Drainage WI
6	HE 24 / 6806	MCERTS Stack Testing WI
7	HE 24 / 6787	Bulk Material Delivery Procedure
8	HE 24 / 6252	Disposal of Contaminated Clothing WI
9	HE 24 / 6808	Above Tank Testing WI
10	HE 24 / 6807	Inspection of LEVs Procedure
11	HE 24 / 6810	EHS Impacts Awareness Procedure
12	HE 24 / 6882	Site Control Plan
13	HE 23 / 6719	LEV Maintenance Log
14	HE 23 / 6718	LEV Physical Condition Log
15	HE 23 / 6717	Operation of LEVs WI
16	HE 23 / 6716	MCERTS Stack Emission Testing WI
17	HE 23 / 6709	Hexavalent Chromium CoSHH Test log
18	HE 23 / 5919	Chrome Tank Freeboard Test WI
19	3rd Party	ETP CoSHH Monitoring (Annual)
20	3rd Party	Hexavalent Chromium Above Tank Testing (Quarterly)
21	3rd Party	CoSHH Personal Monitoring (Annual)
22	3rd Party	Statutory Compliance Review
23	3rd Party	Urine Testing (MOHS)
24	Inhouse	Twice Daily ETP Sampling and Analysis
25	Inhouse	Scheduling of MCERTS Contractor
26	Inhouse	Testing of Spillage & Containment Procedure
27	Inhouse	Operation of Emergency Shut-Off Valves Procedure
28	Inhouse	QA/QC Monitoring of Tank Solutions
29	Inhouse	Planned Preventative Maintenance Procedures
30	Inhouse	Maintenance of Skills Matrix
31	HE 23 / 6666	Energy Efficiency Audit 2 Yearly Basis
32	HE 23 / 6639	Water Minimisation Audit
33	Inhouse	Response to STWA Monitoring Results
34	Inhouse	Electricity Envirometric (Monthly)
35	Inhouse	Gas Envirometric (Monthly)
36	Inhouse	Water Consumption (Monthly)
37	Inhouse	Review of Envirometrics (Annual)
38	Inhouse	Guage Calibration Schedule
39	Inhouse	Accident Management Plan

All procedures and WIs are fully documented and reviewed

Date of Issue:	04/2025			**Procedure Ref:**
Issue:	01			HE 25 / 7460
Issued By:	TG			

Hard Anodising Surface Treatments Ltd

Accident Management Plan

HARD ANODISING SURFACE TREATMENTS LIMITED

ACCIDENT MANAGEMENT PLAN

(HARD 7502 ACC MGT PLAN – MAY 2025)

MAY 2025

1 INTRODUCTION

1.1 SITE LOCATION

The installation is located at Firs Estate, Stourport Road, Kidderminster, DY11 7QN approximately 3 km SW of Kidderminster in an area of surrounding Industrial Premises. Hard Anodising Surface Treatments Limited is located on two sites, as Factory 1 and Factory 2.

The sites are accessed from Stourport Road, which is the main road serving the industrial estate. The centre of the site is at National Grid Reference SO 819 734. The site covers an area of 2 acres and can be seen in Appendix 1. Approx. 400 m to the rear of the properties is the Staffs & Worcester Canal. A further 300 m beyond that lies a small lake and a further 200 m beyond that lies the R Stour.

The R Stour eventually merges with the R. Severn as does the Staffs & Worcester Canal. The site activities warrant a Part A1 Permit under the Pollution Prevention and Control (England and Wales) Regulations 2000 by virtue of section 2.3 (surface treating metals and plastic materials) of Schedule 1 of the regulations, which requires any activity involving surface treating of metals and plastic materials using an electrolyte or chemical process where the aggregated volume of the treatment vats is more than $30m^3$ to obtain a permit to operate. The aggregated volume of treatment tanks at Hard Anodising Surface Treatments Limited is > $30m^3$.

Access around the factory premises has been included within the installation boundary to address any potential likelihood of spillages of materials or wastes during collection or delivery.

The installation not only operates process tanks for chemical and electrolytic surface treatment activities but also directly has associated activities which have a technical connection with the surface treatment activities and which may have an effect on emissions and pollution. These include:

- Storage and handling of input chemicals and anode metals
- Water treatment
- Chemical preparation of the work to be treated
- Rinsing of the work being treated
- Drying of the treated work
- Post-treatment of the work (where necessary to complete the surface treatment)
- Fume extraction and fume abatement system
- Effluent treatment
- Handling of spent process fluids
- Handling of wastes

The operation comprises of the following main processes:

- Anodising
- Surface passivation and sealing

As such these processes encompass the use, storage, handling and disposal of mineral acids including sulphuric, hydrofluoric, phosphoric and hydrochloric, alkalis including sodium hydroxide and sodium carbonate and bicarbonate, in addition to aqueous sodium hypochlorite, aqueous hexavalent chromium, sodium and potassium salt solutions and nickel solutions.

The potential impacts on aquatic environments are considered such that site management operate a containment strategy to eliminate or at least minimise any losses.

All deliveries and movement of products are restricted to daytime hours only. Wastes are treated in the site's dedicated 2 off effluent treatment systems.

The plant encompasses double and single skinned tanks which contain specific solutions (hot and cold) of process chemicals. The process operator passes the work in a defined series of operation for specific

periods of time. By completing the sequence in the order chemical processes are used to clean, rinse, etch, de-smut, anodise and colour as the work is being processed.

Hard Anodising Surface Treatments Limited also operates a consent to discharge trade effluent to sewer granted by Severn Trent Water Authority and currently employs approx. 35 people on a full-time basis.

The major risks to land pollution from hazardous materials used by Hard Anodising Surface Treatments Limited during normal and abnormal conditions are:

- Hazardous liquid spillage and entry into groundwater or surface water during delivery of chemicals, storage or handling / movement around the site

- Escape of hazardous waste materials to groundwater or surface water during storage or collection for off-site disposal

- Release of hazardous materials to sewer above trade effluent consent limits from failure of the effluent treatment plant

1.2 ASSESSMENT AND REPORTING PROCEDURES

Three levels of response are formally addressed as follows:

- Repair immediately
- Repair within 1 week
- Repair within 1 month

The following table of criteria defines how the different levels of response are applied for preventative maintenance issues associated with the potential for land contamination.

Criteria for Different Levels of Response for Preventative Maintenance Issues Associated with Potential Land Contamination Issues Table 1

Response Level	Criterion
Repair Immediately	Serious damage to hard standing, factory floor, bunds, tanks, pipework etc. likely to lead to immediate loss of primary, secondary or tertiary containment
Repair within 1 week	Minor damage to hard standing, factory floor, bunds, tanks, pipework etc. likely to lead to potential loss of primary, secondary or tertiary containment
Repair within 1 month	Minor damage to hard standing, factory floor, bunds, tanks, pipework etc. which could develop into more serious damage which could lead to potential loss of primary, secondary or tertiary containment

1.3 REPORTING PROCEDURS

Summaries of the monitoring data will be sent to the Agency every 2 years along with the results of the data assessment, and any recommendations for amendments to the monitoring programme.

The list of environmental procedures carried out in each area of the factory is current and valid.

As well as meeting Environment Agency annual reporting requirements, these records are stored on site by the Environment Team for the life of the LA PPC/EPR permit in order to provide Hard Anodising Surface Treatments Limited with data to aid in the process of surrendering the permit.

Summaries of maintenance inspections will be sent to the Environment Agency every 2 years along with any recommendations for amendments to the Monitoring Programme. Copies of these reports are stored on site by the Environment Team for the life of the permit.

EMS emergency plans detail the responsibilities and reporting requirements should the infrastructure testing and inspection programme detect any loss of containment and / or pollution of ground or groundwater.

1.4 EMERGENCY RESPONSE ACTIONS

The emergency response actions for the site are as follows:

- The Environmental Representative or, in his absence a senior member of staff, will be notified and will decide upon the action to be taken. The Environmental Representative will notify the Authorities where appropriate.

- All spillages within the main process area and site bunded area will be directed to the effluent treatment plant. If the materials and / or quantities involved are deemed sufficient to cause an overloading of the effluent treatment system, then all water supplies to the site will be switched off and the settlement tanks will be closed to effectively eliminate the possibility of any escape of materials from the site.

- The Environmental Representative will then arrange for the spillage materials to be treated through effluent treatment plant, if possible, or pumped out of the site bunded area to a tanker for off-site disposal.

- In the event of a leak, further leakages will be stopped and leaked substances prevented from migrating via site service corridors or other conduits (e.g. drains and ducts). Spilled material will be prevented from escaping from the site by collection within the site bunded areas.

- All spill incidents will be documented, including the actions taken and final outcome. Incident reports will be reviewed at management review meetings to decide whether changes to operations are required.

Spillage and containment procedures and responsibilities and energy numbers are contained as Appendices 4 and 6. Fire Marshalls and fire responsibilities are well defined.

Materials contaminated with the leaked substances will be handled carefully and properly disposed of in accordance with the Duty of Care Regulations.

Waste will be collected and deposited in polythene bags (and / or lidded UN drums, IBCs or bulk tanker), clearly identified and labelled with the contents, and disposed of via approved Waste Contractors.

The formats for standard and emergency reporting procedures remain as per the original SPMP.

1.5 INCIDENT REPORTING PROCEDURE

Depending on the specific circumstances of the incident, a number of the emergency and regulatory authorities will be contacted.

Two reporting levels will be considered for the reporting of incidents:

LEVEL 1: LIFE AND PROPERTY INCIDENTS: POTENTIALLY POLLUTING INCIDENTS

The first level of reporting will be concerned with personal safety as first priority and significant property damage. Those parties to be informed will be involved in dealing with injured people and preventing fire and explosion, e.g. ambulance, fire brigade and / or police.

Once the site has been made safe in terms of an immediate fore explosion risk, the Environmental Representative will initiate the reporting actions, concerned with informing those parties whose responsibility it is to protect sources from the impact of the release, e.g. the Environment Agency, Water Company and Local Authority.

These parties will be contacted once the site has been made safe.

There have been no major plant failures reported since the permit's inception.

LEVEL 2: MINOR INCIDENTS

If the incident has not resulted in any Health and Safety or off-site environmental impact, external reporting of the incident will not be necessary unless required by the EPR Permit. The majority of minor spillages will fall into this category. However, the incident will still be responded to, investigated and reported internally in accordance with the sites Environmental Management System.

1.6 RECORDING AND DATA MANAGEMENT

The list of preventative maintenance checks carried out in each area of the factory is included herein. This checklist is supplemented by records/digital photographs to provide a formal, auditable record of visual of preventative maintenance inspections carried out. As well as meeting Environmental Management criteria for the life of the permit, this aspect is undertaken in order to provide management with data to aid in the process of surrendering the Permit. A plan has been compiled as per the permit.

Data recording will be maintained to include; -

(i) all environmental incidents, their consequences and remedial actions.

(ii) the disposal of all chemicals and process wastes from site (via consignment notes).

(iii) all planned maintenance records.

(iv) all opportunistic monitoring records.

(v) all clearance activities involving chemical processes and plant.

All records will be maintained in accordance with the archiving provisions defined in the site's EMS.

All records are reviewed on an annual basis and at the monthly meetings.

1.7 OTHER ISSUES

1.7.1 CHEMICAL DELIVERY AND STORAGE

1. All containment vessels are bone fide, purpose built.

2. All containment structure is purpose built in accordance with Engineering specifications.

3. All bunding is subject to scheduled inspection record and corrective action.

4. All bunds are visually monitored using document "Bund Contaminant Integrity Test Log".

5. All containment and bunding losses are subject to a site "Spillage & Containment" procedures as documented within its ISO14001 EMS.

6. All containment and bunding is subject to internal audit and services.

7. Bulk containment and enclosures are subject to British Standards in respect of suitable materials.

8. Spillage control kits are maintained on site.

9. All materials supplied to site require submission of appropriate material health & safety data sheets prior to commencement of supply.

10. All materials supplied to site are delivered in appropriate containers albeit 5, 10, 25, 50, 100,1000 litre packages.

11. Dry materials e.g. Hydrated Lime, are supplied in suitable bags.

12. Assessments of adequacy of containment are undertaken by competent personnel.

13. All localised spillages are subject to appropriate address by the site management and supervision.

14. Significant spillages are subject to immediate, formal notification of the Environmental Agency using the procedure defined in the site's ISO 14001 EMS.

15. All containers of product are visually inspected / examined as part of the acceptance process. Damaged containers are rejected.

16. All 25kg dry sacks are to UN standard 5H4

17. All 1000lt IBCs are to UN Standard 31 HA1

18. All 25lt Polyethylene containers are to UN standard 3H1 or RH1.

19. All loading / unloading activities take place on hardstanding.

20. All procedures outlined in the site's ISO 14001 EMS are subject to 3rd party audit on a prescheduled basis.

21. All FLT drivers are formally made aware of what to do in the event of an accident, incident or unauthorised release of product during delivery, storage or general transport

All site drainage is identified as per the chart included in herein.

These risks are minimised by locating the effluent treatment plant and all chemicals storage areas and hazardous wastes storage areas inside the site's bunded areas, which is described in the Application Site Report. Operation of the site's Penstock Valve and the importance of keeping this area are maintained via free access, are included.

The effluent treatment plants are located within the site's bunded areas with an effective containment. Sudden and unexpected loss of this tank would result in the already treated waste passing into the foul drainage system.

Site general arrangements are defined and included herein

Hard Anodising Surface Treatments Limited operates a comprehensive maintenance management system, which is described in the main EPR application document. The management system includes quarterly visual inspections of:

- All bunded areas, drainage channels to detect any signs of deterioration, leaks, spillage, or blockage. Any corrective action required is reported to and implemented by the Environmental Team.

- Equipment in all process areas, to identify equipment wear and tear which need to be addressed as part of the company's planned / predictive maintenance programme. Particular attention is paid to pipework, tanks, supports, ducting, motors, pumps and filters, and compressed air.

The list of quarterly preventative maintenance checks is carried out in each area of the factory. This checklist is supplemented by digital photographs to provide formal, auditable records of visual preventative inspections, carried out for each quarter.

Annual testing of bunded areas and drainage channels is also carried out including:

Site foul and storm drainage plans are included in Appendix 10.

- Leak testing of bunded areas and sumps
- Detailed inspection of integrity of drainage channels

The maintenance management system is incorporated within and managed by an ISO 14001 Environmental Management System. This ensures that the maintenance management system is audited at least once per year. Any corrective action is reported to and implemented by the Environmental Team.

The results are recorded and reviewed at the annual management review meeting. These will immediately be enacted should the infrastructure testing and inspection programme detect any loss of containment and / or pollution of ground or groundwater.

In addition to the skills and competencies required for each job, all staff receive formal environmental training and regular refresher training.

This is recorded on the training records held for all employees. The content of the environmental training is recorded; the training was extended so that it now includes;

- Awareness of the regulatory implications of the EPR Permit for Hard Anodising management and workforce and their work activities.

- Awareness of all potential environmental effects from operation under normal and abnormal circumstances (i.e. planned maintenance, process shut-down, start-up).

- Prevention of environmental accidents and action to be taken if accidents occur.

- The major risk to land pollution during an emergency scenario would be:

- Damage to tanks in the effluent treatment plant causing loss of containment.

1.7.2 PERSONNEL ISSUES

Personnel responsibilities for the inspection, testing and maintenance of pollution prevention infrastructure are to be trained to an appropriate level to ensure compliance with the Programme. Roles and responsibilities for undertaking the Accident Management Plan and ensuring adequate competence of staff is continued as per the original permit.

1.8 THE ACCIDENT MANAGEMENT PLAN

This Accident Management Plan is based on:

(i) a risk assessment; carried out to identify potential hazards arising from the Hard Anodising Surface Treatments Limited Factory 1 and 2 facilities and any possible pathways and receptors

(ii) mitigation measures; designed to minimise the risk, and consequences of, an accident

(iii) the core procedure for the prevention and management of accidents, which forms part of the operator's Environmental Management System.

1.9 PATHWAYS AND RECEPTORS

Table 1 lists the potential hazards that have been considered at the Hard Anodising Factory 1 and 2 facilities and identifies the possible pathways and receptors.

Table 1 - Potential environmental hazards, pathways and receptors

Hazard	Pathway	Receptor
Inadequate procedures resulting in the receipt of materials including all chemicals and their associated solid and liquid process wastes or incompatible raw materials.	Airborne/land based.	Site personnel, visitors, local residents and neighbouring workforces.
Inadequate storage leading to litter and dust	Airborne/land based.	Site personnel, visitors, local residents and neighbouring workforces.
Transfer of substances leading to spillage	Airborne/land based.	Site personnel, visitors, local residents and neighbouring workforces.
Overfilling of vessels leading to spillage	Airborne/land based	Site personnel, visitors, local residents and neighbouring workforces.
Emissions from plant or equipment (e.g. leakage from joints, over pressurisation of vessels, blocked drains).	Airborne, land, water.	Site personnel, visitors, local residents and neighbouring workforces. Groundwater, surface water, air quality and soils.
Failure of containment	Absorption to ground, run-off and site drains.	Groundwater, surface waters and soils.
Fires and explosions	Airborne.	Site personnel, visitors, local residents and neighbouring workforces. Air quality.
Failure to contain firewater	Absorption to ground, run-off and site drains.	Groundwater, surface waters and soils. Neighbouring buildings.
Wrong connections made in drains or other systems	Absorption to ground, run-off and site drains.	Groundwater, surface waters and soils.
Failure of main services	Airborne.	Air quality.
Operator error	Airborne, land, water.	Site personnel, visitors, local residents and neighbouring workforces. Groundwater, surface water, air quality and soils.

Contamination from materials including all chemicals and their associated solid and liquid process wastes and handling operations and site roads etc.	Airborne.	Site personnel, visitors, local residents and neighbouring workforces.
Chemical contamination of the public highway due to activities at the site.	Hard F1 and F2 facility roads and entrance.	Users of access roads
Breach in site security.	Fences and gates.	Site personnel, plant and intruders.
Release of effluent before adequate checks have been undertaken.	Absorption to ground, run-off and site drains.	Groundwater, surface waters and soils.

1.9.2 Environmental risks have been considered, during the operational and closure phases of the Factory 1 and 2 areas. The facility has been designed to minimise risks on decommissioning.

1.9.3 It is necessary to apportion a level of significance to the environmental risks identified in Table 1.

The risk prioritisation methodology, detailed in A Practical Guide to Environmental Risk Assessment (Environment Agency, 2000), has been used to achieve this. This methodology includes a scoring system within which scores are apportioned to:

- The probability of the hazard occurring, without the use of protective measures
- The consequences of the hazard to the environment or human health and,
- The effectiveness of the mitigation used to prevent the hazard occurring.

1.9.4 Tables 2, 3 and 4 identify the scoring system.

1.9.5 The probability of the hazard occurring is multiplied by the consequences of the hazard to the environment, or human health, to give a risk factor. The risk factor is then divided by the mitigation factor, to give the mitigated risk factor. The higher the mitigated risk factor, the greater the level of risk.

1.9.6 The risk assessment matrix, for the Factory 1 and 2 areas, is shown in Table 5.

Table 2 - Probability of hazard occurring without the use of protective measures	
Frequency	**Score**
Never	0
Annually or less frequently	1
Monthly or less frequently	2
Weekly or less frequently	3
Daily or less frequently	4
More frequently than daily	5

Table 3 - Consequence of hazard to the environment or human health	
Consequence	**Score**
Harmless	0
Almost harmless	5
Some harm	10
Harmful	15
Very harmful	20
Extremely harmful	25

Table 4 - Mitigation Factor	
Mitigation	**Score**
Ineffective or non-existent	1
Partly effective	2
Effective	3
Very effective	4
Entirely effective	5

Table 5 - Risk Assessment Matrix						
Hazard	**Probability of Hazard Occurring Without Protective Measures**	**Consequence of Hazard**	**Risk Factor (Probability x Consequence)**	**Summary of Preventative Measures/Controls**	**Mitigation Factor**	**Mitigated Risk Factor (Risk Factor/ Mitigation Factor)**
Inadequate procedures	5	10	50	On arrival at the Factory 1 and 2 facility, raw materials including all chemicals will be checked against the details given on delivery tickets. All raw materials loads will be inspected visually on deposit. Any leaking/dented/ripped packages will be reloaded onto the delivery vehicle for off-site removal or placed in a quarantine area.	4	12.5
Inappropriate storage	5	10	50	After inspection, raw materials including all chemicals will be stored in the designated location to await processing.	5	10
Transfer of substances (e.g. filling or emptying of vessels)	2	15	30	All chemical containing packaging will either, be self-bunded or, surrounded by bunds with a minimum capacity of 110% of the tank's contents. Bund bases and sides will be impermeable. All pipework connections etc. will be located within the bunded area. Absorbent material will be used to treat any spillage that may arise.	5	6
Overfilling of vessels	3	15	45	Process tanks will be bunded (see above). The volume of liquid in these tanks will be recorded. The level will be checked before deliveries are made, to ensure sufficient capacity within the tank. Absorbent material will be used to treat liquid spillages.	5	9
Emissions from plant or equipment, e.g. due to abnormal conditions.	5	15	75	There will be strict compliance with start up, shut down and operating procedures. Maintenance of plant and equipment will be in accordance with the manufacturers' recommendations.	5	15

Table 5 - Risk Assessment Matrix						
Hazard	Probability of Hazard Occurring Without Protective Measures	Consequence of Hazard	Risk Factor (Probability Consequence)	Summary of Preventativ Measures/Controls	Mitigation Factor	Mitigated Risk Factor Risk Factor/ Mitigation Factor)
Failure of containment	1	15	15	All tanks will be fully bunded (see above). The effective capacity of the bunds will be maintained at all times. The site will have an impermeable surface. Tanks, bunds, raw materials storage containers and the surface water drainage system and sumps etc. will be inspected on a monthly basis. Any repairs will be undertaken as soon as practicable and no later than 5 working days from discovery (subject to the availability of replacement materials). Mitigation measures will be undertaken immediately, if there is a possibility of pollution or harm.	5	3
Fires	1	25	25	No raw materials including all chemicals and their associated solid and liquid process wastes will be burned within the boundaries of the site. Fire extinguishers will be located at the site. All fire extinguishers will be clearly marked and tested at appropriate intervals, to confirm their integrity. Site personnel will be made aware of their location and trained in their correct use. Explosive, flammable and oxidising raw materials will be specifically handled and stored if necessary. Implementation of Fire Action Plan will be maintained. Smoke alarms will be installed.	4	6.25
Failure to contain firewater	1	15	15	Isolation valves will be provided, on the site drainage outlet pipes, to allow containment of potentially contaminated firewater.	4	3.75
Wrong connections made in drains or other systems	1	15	15	Suitably qualified personnel will ensure that materials and plant are in accordance with approved specifications and, their installation is in accordance with the approved designs.	4	3.75
Failure of main services	1	10	10	The Factory 1 and 2 areas will incorporate process controls, to ensure plant can be operated safely at all times, including during emergency shut down in the event of a power cut. If electricity supplies are cut off for a sustained period, a backup generator will be provided.	5	2
Operator error	2	15	30	Strict compliance with the operator's Environmental Management System (EMS). Use of Technically Competent Persons, as part of the Fit and Proper Person requirement, to manage activities at the site. Health and safety and environment, accident, management training, will be provided for all employees.	4	7.5

Table 5 - Risk Assessment Matrix						
Hazard	**Probability of Hazard Occurring Without Protective Measures**	**Consequence of Hazar**	**Risk Factor (Probability x Consequence)**	**Summary of Preventative Measures/Controls**	**Mitigation Factor**	**Mitigated Risk Factor Risk Factor/ Mitigation Factor)**
Contamination from materials / process wastes handling operations, engineering works etc.	3	10	30	The raw materials at the site is not intrinsically contaminating. Materials will be deposited, stored and processed in the appropriate building, which will be fitted with roller shutter doors. These are kept closed, except to allow vehicles to enter or exit. The site will be hard-surfaced with concrete or tarmac on all operational area. Visual monitoring for contamination will be undertaken daily.	5	6
Process chemicals on adjacent highways due to activities on site	2	15	30	All internal roads will comprise a paved, impermeable surface that is fit for purpose. Internal roads, site entrance and public highway will be cleaned by mechanical sweeper, as appropriate. Raw materials will only be stored in site buildings. Raw materials handling activities are unlikely to generate contamination. Site staff will inspect the site roadways regularly and instigate remedial action if required.	5	6
Breach in site security	3	15	45	Perimeter fencing and lockable gates are installed.	4	11.25

1.9.7 All identified hazards, which could cause harm, will be subject to strict, preventative measures or control at the site, to ensure that all risks are minimised.

1.9.8 The preventative measures/controls, detailed in Table 5, must be maintained to ensure a high level of good operational practice. To achieve this, the monitoring of relevant control systems, the utilisation of collated data and the review of preventative measures will be carried out. Repairs and/or improvements will be made, where monitoring shows this to be necessary.

1.9.9 The operation of the Hard Anodising Surface Treatments Ltd Factory 1 and 2 facilities will rely on the performance of well-trained site personnel and well-maintained plant, to store and process the incoming materials including all chemicals and their associated solid and liquid process wastes streams correctly.

Monitoring of procedures and maintenance schedules will aid the risk management process, in relation to environmental controls.

General good housekeeping checks will be employed to ensure the smooth and efficient running of the site.

1.9.10 Engineered containment systems on site will be inspected and maintained, to ensure their integrity, throughout the operational life of the site.

1.9.11 It is also recognised that there is a close link between environmental risk and health and safety. It is envisaged that the environmental risk assessment, carried out here, will assist in the overall risk appraisal for the operation of the facility.

2 MITIGATION

2.1 INADEQUATE PROCEDURES

2.1.1 Without the use of protective measures, the receipt of all chemicals is predicted to occur at intervals infrequently.

2.1.2 The consequences of using inappropriate materials could be potentially harmful.

2.1.3 Procedures will ensure compliance with the materials is permitted.

Third parties will be required to provide the operator, in advance, with all necessary information/documentation to satisfy the requirements of the Environmental Protection (Duty of Care) Regulations 1991 and, the conditions of the Environmental Permit. Further information is provided in the ‘Operating procedures.

2.1.4 All chemicals will only be accepted where it is suitable.

2.1.5 Raw materials will be checked on arrival against the details given on the delivery note. If necessary, local supervision, or other suitably qualified person, will make a visual inspection of loads. All raw materials will be inspected visually, upon arrival.

2.1.6 Any damaged raw materials will be reloaded onto the delivery vehicle for off-site removal. Where this is not practical the raw materials will be removed to the quarantine area for temporary secure storage, prior to off - site removal.

2.2 RAW MATERIALS INCLUDING ALL CHEMICALS AND THEIR ASSOCIATED WASTES STORAGE

2.2.1 Without the use of protective measures, raw materials including all chemicals and their associated solid and liquid process wastes storage loss is predicted to occur at infrequent intervals only.

2.2.2 The consequences of inappropriate raw materials including all chemicals and their associated solid and liquid process wastes storage are potentially harmful.

Such an event could result in windblown raw materials including all chemicals and their associated solid and liquid process wastes and/or odorous compounds escaping the site boundary. It may also generate dust or leachate and/or attract vermin to the site.

2.2.3 Following the acceptance procedures detailed above, raw materials loads will be deposited into the dedicated raw materials reception areas.

2.2.4 The storage of raw materials including all chemicals and their associated solid and liquid process wastes in the building will minimise and control windblown litter.

2.2.5 Commissioning tests will be undertaken at the site, to ensure that plant will operate to the design specifications and to check integrity of equipment, including raw materials including all chemicals and process wastes storage and transfer plant.

2.2.6 Raw materials storage activities will be carried out on an impermeable surface, with drainage directed to a foul sewer, giving an added level of protection to soils, surface water and groundwater.

2.2.7 Regular checks of site surfacing, drainage, bunding and storage vessels and these will be repaired as necessary, to ensure that they retain their integrity.

2.3 TRANSFER OF SUBSTANCES

2.3.1 Without the use of protective measures, the inappropriate transfer of substances is predicted to occur at a frequency of intervals of >2 years.

2.3.2 The consequences of an inappropriate transfer of substances, should it occur, could be harmful. Polluting substances could drain into the site's drainage system, or run-off paved areas onto adjoining land and pollute groundwater, surface water and soils.

2.3.3 All tanks and drums used for the storage of chemicals will be suitable for the material being contained. All tanks will be either self-bunded or sited on impervious bases and surrounded by impervious walls.

The size of the bunded area for a single tank will be at least equivalent to the capacity of the tank plus 10%.

Where multiple tanks are used, the impervious, bunded compound will be at least equivalent to the capacity of the largest tank plus 10%, or 25% of the total volume of the tanks (whichever is the greater).

Each constructed bund will be fully enclosed and will fall to a sump from which liquid can be removed once its chemical constituents are identified. Each sump is sealed, to prevent migration of lost material off-site.

Drums will be kept in appropriate bunds or drip trays.

2.3.4 All pipes, bunds and other relevant infrastructure will be inspected and maintained on a regular basis.

2.3.5 The effective capacity of the bunds will be maintained at all times.

Accumulated liquid will be removed from the bunds and its composition will be confirmed, to allow for appropriate disposal at a suitably authorised facility.

2.3.6 The site will incorporate an impermeable pavement with drainage via an interceptor. A shut off valve will be available to prevent contaminated water entering surface water (e.g. following a fire). The shut off valve will be operated manually. All raw materials including all chemicals and their associated solid and liquid process wastes storage areas will drain to foul sewer.

2.3.7 An inventory will be maintained to record the substances used or produced at the site; COSHH assessments and other details will be recorded. Incompatible materials will be stored separately to prevent adverse reactions. Storage of potentially hazardous materials will be indicated on a plan. The plan will be made available to the Emergency Services when necessary (e.g. in the event of a fire).

2.4 OVERFILLING OF VESSELS

2.4.1 Without the use of protective measures, the overfilling of vessels is predicted to occur at a frequency of weekly or less.

2.4.2 The consequences of overfilling vessels, should it occur, could be harmful. Polluting substances could drain into the site's drainage system or run-off paved areas onto adjoining land and pollute groundwater, surface water and soils.

2.4.3 All tanks and containers used for the storage of diesel, plant oil and lubricants will be bunded. The effective capacity of the bunds will be maintained at all times (see 3.3.3).

2.4.4 The volume of capacity tanks will are defined by signage recorded manually.

2.4.5 Should a spillage of a polluting liquid occur; absorbent material will be used to clear the spillage. The used, absorbent material will be removed and stored in a sealed container, prior to authorised disposal.

2.4.6 The site will incorporate impermeable measures where applicable.

2.5 EMISSIONS FROM PLANT AND EQUIPMENT

2.5.1 Without the use of protective measures, the risk of potentially harmful emissions from plant or equipment occurring at the site has a predicted frequency of more than daily.

2.5.2 The consequences of such emissions from plant or equipment could be harmful. Site personnel and visitors would be at most risk, but there would also be risk to local residents, neighbouring work forces, air quality, groundwater, surface water and soils.

2.5.3 It should be noted that the Hard Anodising Factory 1 and 2 facilities will be designed and built with protective measures and process controls incorporated. The above risks and consequences are theoretical only, as they are based on no protective measures or process controls being in place.

2.5.4 All equipment will be of suitable construction for the materials contained. Equipment will be operated, inspected and maintained in accordance with the manufacturers' recommendations, in order to minimise fugitive emissions.

2.5.5 The site design incorporates a concrete pavement and engineered surface water drainage system and raw materials including all chemicals and their associated solid and liquid process wastes storage areas. Installation of pollution control measures will be subject to construction quality assurance, by suitably qualified engineers.

2.5.6 The sealed drainage system, concrete pavements, storage tanks, bunds and raw materials including all chemicals and their associated solid and liquid process wastes storage and processing areas will be inspected visually on a regular basis. Any repairs will be made as soon as practicable and, subject to the availability of replacement materials, no later than 5 working days from discovery. Mitigation measures will be undertaken immediately, if there is a risk of pollution or harm.

2.5.7 Air will be extracted from the Hard Anodising Factory 1 and 2 facilities and passed to abatement where deemed necessary, prior to discharge to atmosphere, via a stack. This abatement system will remove excess fume, odour and dust from the extracted air.

2.5.8 Routine maintenance of the Hard Anodising Factory 1 and 2 facilities, including the abatement, will be in accordance with the manufacturers' recommendations.

2.5.9 Operation of the Hard Anodising Factory 1 and 2 facilities will be subject to continuous process controls. Site management will monitor the process on a regular basis to ensure effective function of all stages of every process.

2.6 FAILURE OF CONTAINMENT

2.6.1 Without the use of protective measures, a failure of containment is predicted to occur at a frequency of annually or less.

2.6.2 The consequences of a failure of containment, should it occur, could be harmful. Polluting substances could run-off paved areas onto adjoining land or permeate beneath the site and pollute groundwater, surface water and soils.

2.6.3 All tanks and containers used for the storage of diesel, plant oil and lubricants, will be bunded. The effective capacity of the bunds will be maintained at all times. An inventory of the substances held and their hazardous properties will be kept at the site and be updated regularly. This will provide information for appropriate clean-up of any leaks or spillages.

2.6.4 Tanks, bunds, storage containers will be inspected 6 monthly.

2.6.5 In addition to the weekly, visual inspection of surfaces, gullies, interceptors and above ground pipes, a CCTV survey will be carried out at regular intervals to confirm the integrity of underground pipes.

2.6.6 If there is a potential for pollution or harm, mitigation measures will be implemented immediately, including:

- Removal of liquid from a damaged tank and transfer to a replacement tank or sealed container
- Immediate repair of any damaged bund and/or removal of any liquid contained therein
- Temporary disuse of any damaged tank or container.

2.7 FIRES

2.7.1 Without the use of protective measures, the risk of fire occurring at the site has a predicted frequency of less than annually.

2.7.2 The consequences of fire, should it occur, could be harmful, with site personnel and visitors at most risk. If a fire develops, there could also be a risk of harm to local residents and neighbouring work forces.

2.7.3 Fire extinguishers will be located at the facility. All fire extinguishers will be clearly marked and tested, at appropriate intervals, to confirm their functionality. Site personnel will be made aware of their location and trained in their correct use.

2.7.4 There will be strict compliance with pre-acceptance and acceptance procedures to ensure that explosive, highly flammable, flammable and oxidising raw materials including all chemicals and their associated solid and liquid process wastes (hazard codes H1, H2, H3a and H3b) will not be received.

2.7.5 Fire detectors and fire alarms, to the requirements of BS5839-3 and BS5839-6, will be fitted in the building.

2.7.6 Automatic water sprinkler systems will not be fitted at the Hard Anodising Factory 1 and 2 facilities.

2.7.7 No raw materials including all chemicals and their associated solid and liquid process wastes materials will be burned within the confines of the site and a fire will be regarded as an emergency. Site security systems will be in place, including CCTV, to prevent unauthorised entry (see Section 3.15).

2.7.8 A Fire Safety Strategy is set out as follows:

- Separation and / or control of hazards
- control / elimination of ignition sources
- Adequate passive fire safety measures; fire breaks and doors, plus means of escape
- Detection systems to provide an early warning of fire before initiation of flaming combustion and
- First aid, mobile fire - fighting equipment suitable for use in enclosed spaces.

2.7.9 The Fire Safety Strategy above will be reviewed by the Fire Safety Officer.

2.8 FAILURE TO CONTAIN FIREWATER

2.8.1 Without the use of protective measures, the risk resulting from the failure to contain fire water at the site has low prediction of frequency.

2.8.2 The consequences of a failure to contain firewater, should it occur, could be harmful; groundwater and surface water being most at risk; firewater run-off could also cause damage to neighbouring buildings; some contamination of soils may occur.

2.8.3 Isolation valves will be provided on the site drainage outlet pipes to allow adequate containment of potentially contaminated firewater on site.

2.9 CONNECTIONS FOR DRAINS AND OTHER SYSTEMS

2.9.1 Without the use of protective measures, the risk of faulty connections being made in drains or other systems is predicted to occur annually or less frequently.

2.9.2 The consequences of a faulty connection being made could be harmful as polluting liquids could be discharged from the drainage system onto adjoining land and pollute groundwater, surface water and soils.

2.9.3 At the development stage of the site, the installation of plant and drainage works will be subject to construction quality assurance by suitably qualified engineers. An as built drawing will be provided, which will be updated to provide an up-to-date drainage record of the site.

2.10 FAILURE OF MAIN SERVICES

2.10.1 Without the use of preventative measures or controls, the risk of failure of main services is predicted to occur annually or less frequently.

2.10.2 Failure of main services could result in some impact on air quality.

LOSS OF ELECTRICAL POWER

2.10.3 The site's electricity requirements will be derived from the National Grid.

2.10.4 In the event of a loss of electrical power, the supply of feedstock to the Hard Anodising Surface Treatments Factory 1 and 2 facilities will cease; operation of the air extraction system within the buildings will stop; no emissions to atmosphere will result, as air will not be drawn to the air abatement equipment and exhaust systems.

2.10.5 It is important to note that the design and build of the Hard Anodising Surface Treatments Limited Factory 1 and 2 facilities will include process controls to ensure safe operation at all times, including periods of emergency shutdown.

2.10.6 Contingency plans will be in place; in the event of a major shut down of the site, raw materials including all chemicals and their associated solid and liquid process wastes can be diverted to another facility; the Hard Anodising Factory 1 and 2 facilities will be designed with more than one line and backup systems will be in place.

LOSS OF WATER SUPPLY

2.10.7 Loss of mains water would not have a major impact on the raw materials including all chemicals and their associated solid and liquid process wastes treatment process.

2.11 OPERATOR ERROR

2.11.1 Without the use of preventative measures or controls, the risk of operator error, which could result in an adverse effect on the environment, is predicted to occur monthly or less frequently.

2.11.2 The consequences of operator error, should it occur, could be harm to site personnel, visitors, local residents, neighbouring workforces, groundwater, surface water, air quality and soils.

2.11.3 In order to ensure the safe operation of the Hard Anodising Surface Treatments Limited Factory 1 and 2 facilities, employees, and contractors working at the site will be required to comply with the operator's Environmental Management System.

Staff training will be provided, to ensure that staff and contractors understand their roles and responsibilities.

2.12 CONTAMINATION FROM RAW MATERIALS INCLUDING ALL CHEMICALS AND THEIR ASSOCIATED WASTES ON INTERNAL ROADS

2.12.1 Without the use of preventative measures or controls, the risk of contamination arising from the Hard Anodising Surface Treatments Limited Factory 1 and 2 facilities is predicted to occur only infrequently.

2.12.2 The consequences of a release of contamination, should it occur, could be some harm to site personnel, visitors, local residents and neighbouring workforces.

2.12.3 Chemicals and their associated solid and liquid process wastes are managed using dedicated delivery / collection vehicles, closed containers or sheeted skips will not give rise to significant dust release

2.12.4 The Hard Anodising Surface Treatments Limited Factory 1 and 2 facilities will operate LEVs, extracted air will be discharged to atmosphere via abatement where deemed necessary.

2.12.5 Any potentially contaminating raw materials dispatched from the site, will be in enclosed or sheeted vehicles.

2.12.6 The site entrance and internal roads will be paved and all chemical storage and processing areas will be on a concrete pavement.

Daily checks will be made to ensure that the site surfaces are clean. The public highway, site entrance and internal roads will, when required, be kept clean.

2.13 CONTAMINATION AND DEBRIS ON THE PUBLIC HIGHWAY

2.13.1 Without the use of preventative measures or controls, the risk of contamination from the site being deposited on the public highway, is predicted to occur only very rarely if ever.

2.13.2 The consequences of site sourced chemical losses on the highway that could be harmful to road users from an accident, resulting from the deterioration in the road surface are very limited.

2.13.3 The site entrance and internal roads are paved and all chemical storage and processing areas will be within a building and on a concrete pavement.

Vehicles will not drive over unpaved surfaces. The site entrance and internal roads will be maintained in a good condition and will be laid to fall so that surface water will not accumulate. This will minimise the potential accumulation of any contamination.

2.13.4 The public highway, site entrance and internal roads will be inspected at least daily and any contamination removed by site personnel.

2.14 BREACH OF SITE SECURITY

2.14.1 Without the use of preventative measures or controls, the risk of a breach in site security is predicted to occur at a frequency of rarely or less. The consequences of a breach in site security may be liable to cause injury to intruders or site personnel. All chemicals and their associated process wastes will be stored in a secure building, minimising access by unauthorised personnel.

2.14.2 The site will be secured by management 5 days a week.

2.14.3 The site's perimeter fencing will be inspected 6 monthly and any defects repaired as soon as practicable and in any event within 5 days of discovery.

2.14.4 Security gates will be located at the site entrance of F2. The gates will be kept closed and locked should the site be non-operational at any time. The gates will be inspected weekly and any defect repaired as soon as practicable and, in any event, within 5 days of discovery.

2.14.5 In the event of access by unauthorised persons, security measures will be reviewed and upgraded where necessary.

3 PROCEDURES FOR THE PREVENTION AND MANAGEMENT OF ACCIDENTS

3.1.1 The key core procedures for the prevention and management of accidents are defined in the site's Quality and Environmental Management Systems Manuals and outline in detail the steps required to;

a) Ensure all accidents, incidents, dangerous occurrences and emergencies are reported promptly, investigated and recorded accurately and that remedial actions are put in place where necessary; defined in EP 01 and IP 2009.

b) Ensure the company complies with, the Reporting of Incidents, Diseases and Dangerous Occurrences Regulations (RIDDOR) and, good practice with regard to the investigation of all incidents (refer to IP 2009)

3.1.2 The procedures form part of the operator's Environmental Management System, which is accredited to ISO 14001 (refer to Appendix 14).

3.1.3 Systems will be in place to communicate health and safety and environmental issues to all relevant staff and contractors, in order to minimise the risk of accidents (refer to IP 2021).

3.1.4 All staff will receive training, appropriate to their post, to help minimise accidents. Records will be kept to ensure training needs are assessed and addressed (refer to IP 2021.

3.1.5 All document Quality and Environmental Procedures within the site's Integrated Management Systems are audited on a regular basis; accidents, incidents and near misses will be investigated and the findings recorded. This information will be used to develop an improvement programme to prevent future accidents (refer to IP 2014.

3.1.6 Operating procedures include the safe shut down of the plant in an emergency.

APPENDIX 1

SITE MAP

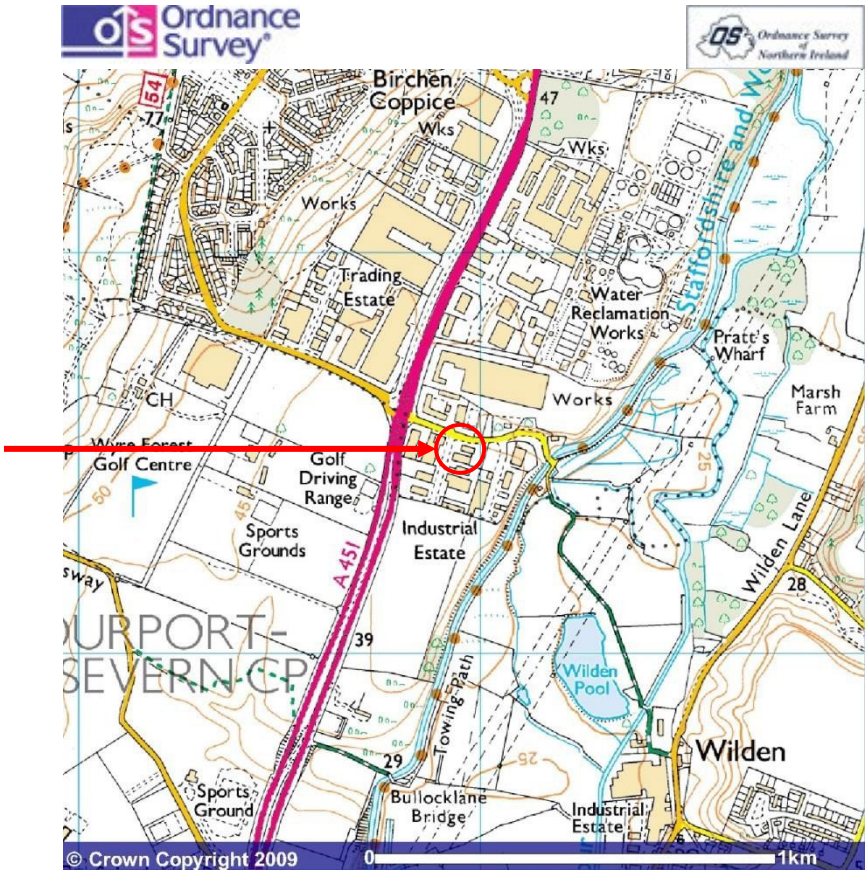


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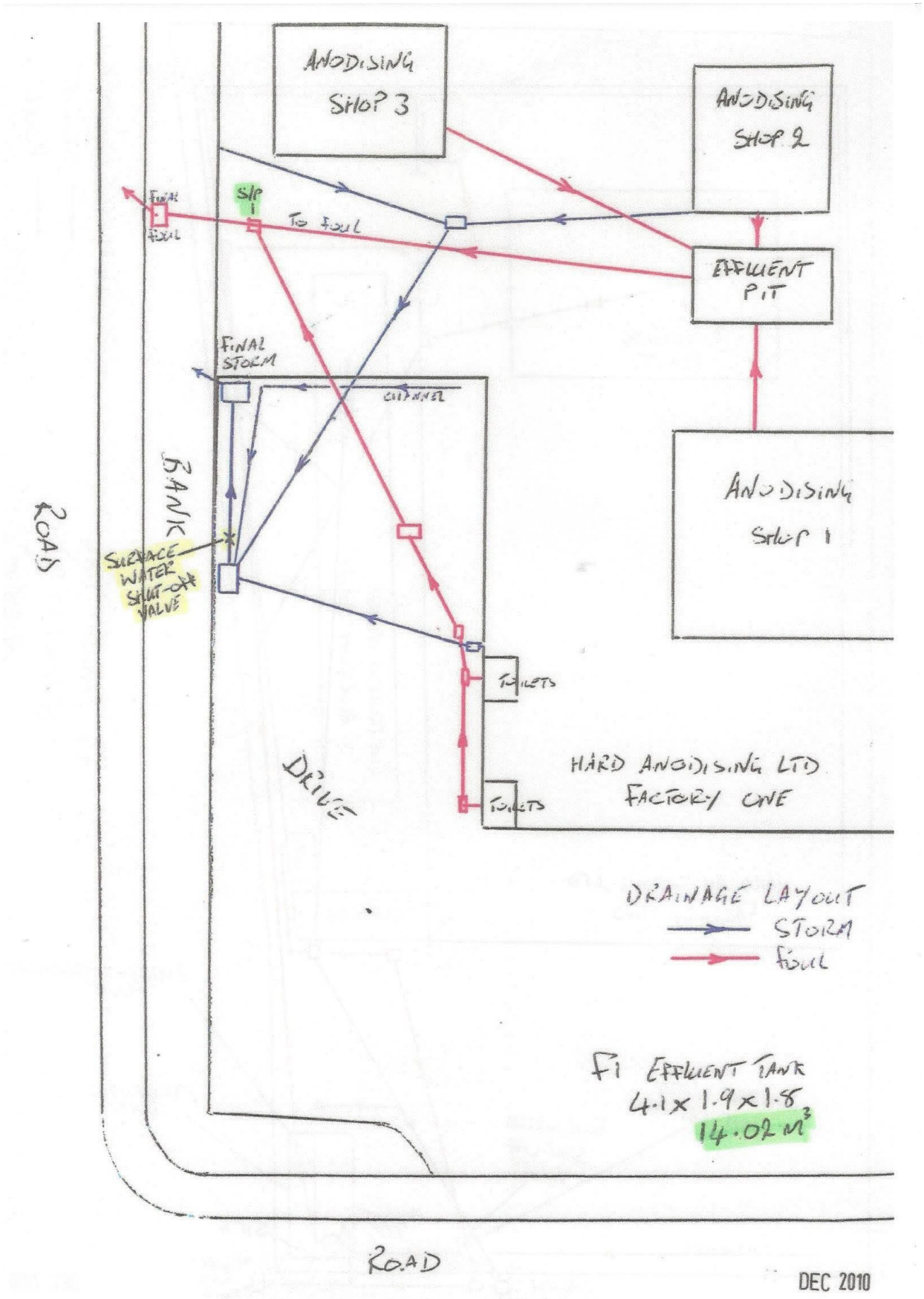
Image produced from Ordnance Survey's Get-a-map service. Image reproduced with permission of Ordnance Survey and Ordnance Survey of Northern Ireland.

APPENDIX 2

DRAINAGE PLANS


ANODISING SHOP 3
ANODISING SHOP 2
EFFLUENT PIT
ANODISING SHOP 1
FOUL
SW
To foul
FINAL STORM
CHANNEL
BANK
SURFACE WATER SHUT-OFF VALVE
TOILETS
TOILETS
DRIVE
HARD ANODISING LTD FACTORY ONE
ROAD
ROAD
DRAINAGE LAYOUT
STORM
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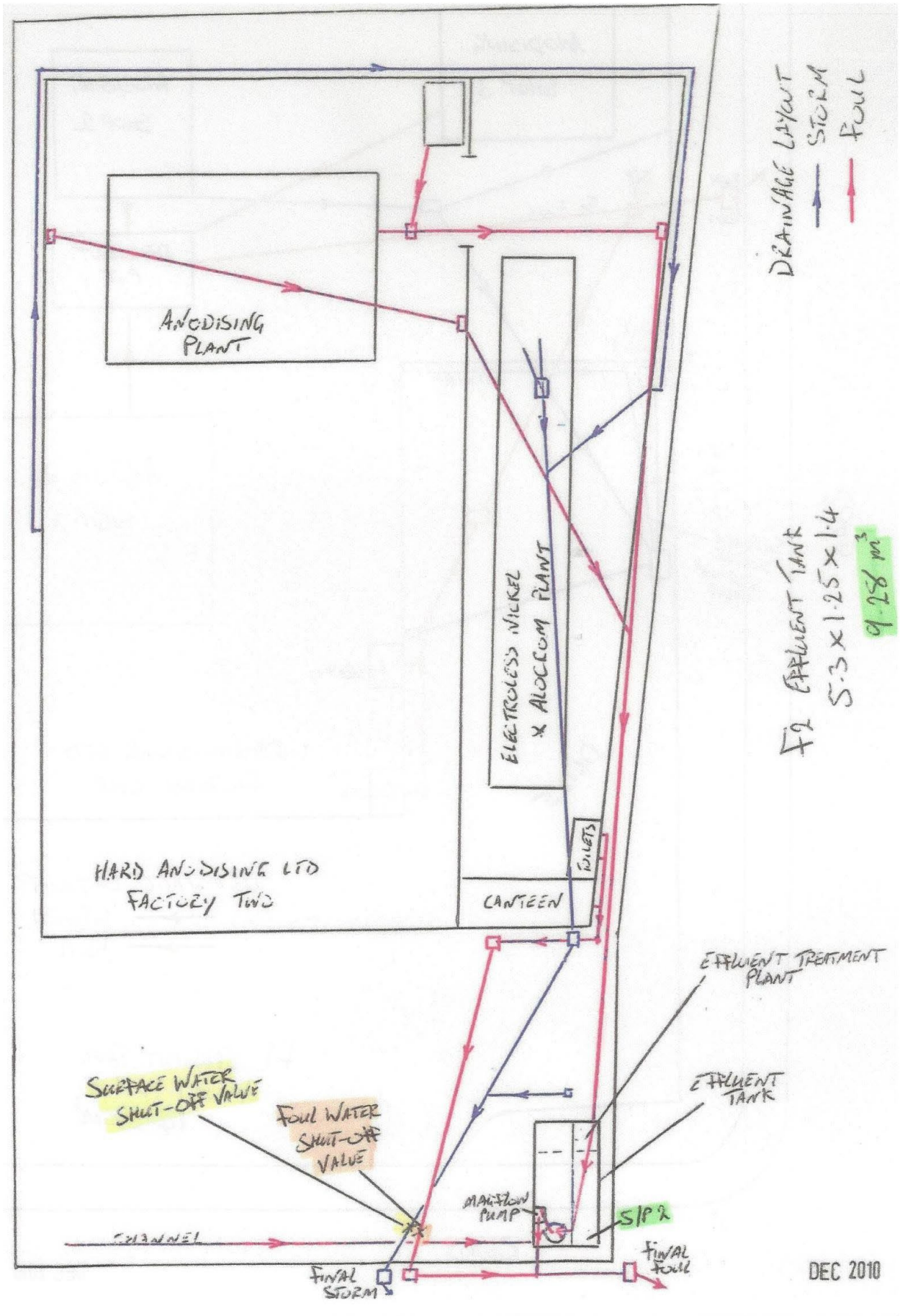
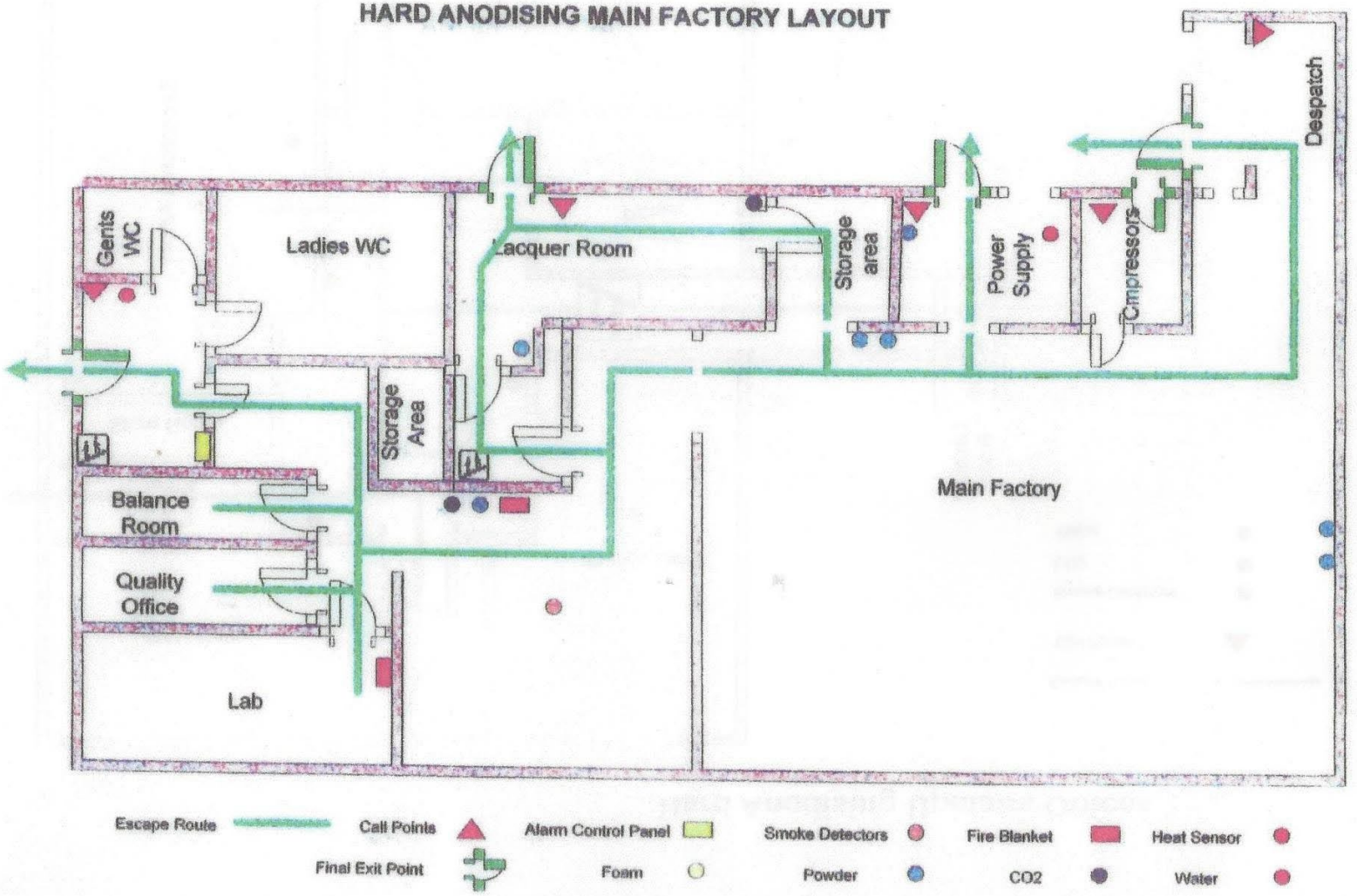
F1 EFFLUENT TANK
4.1 x 1.9 x 1.8
14.02 M3
DEC 2010


DRAINAGE LAYOUT
STORM
FOUL
ANODISING PLANT
ELECTROLESS NICKEL & ALOCROM PLANT
TOILETS
CANTEEN
HARD ANODISING LTD FACTORY TWO
EFFLUENT TANK 5·3 x 1·25 x 1·4
9·28 m³
EFFLUENT TREATMENT PLANT
EFFLUENT TANK
SURFACE WATER SHUT-OFF VALVE
FOUL WATER SHUT-OFF VALVE
MAGFLOW PUMP
SIP 2
CHANNEL
FINAL STORM
FINAL FOUL
DEC 2010

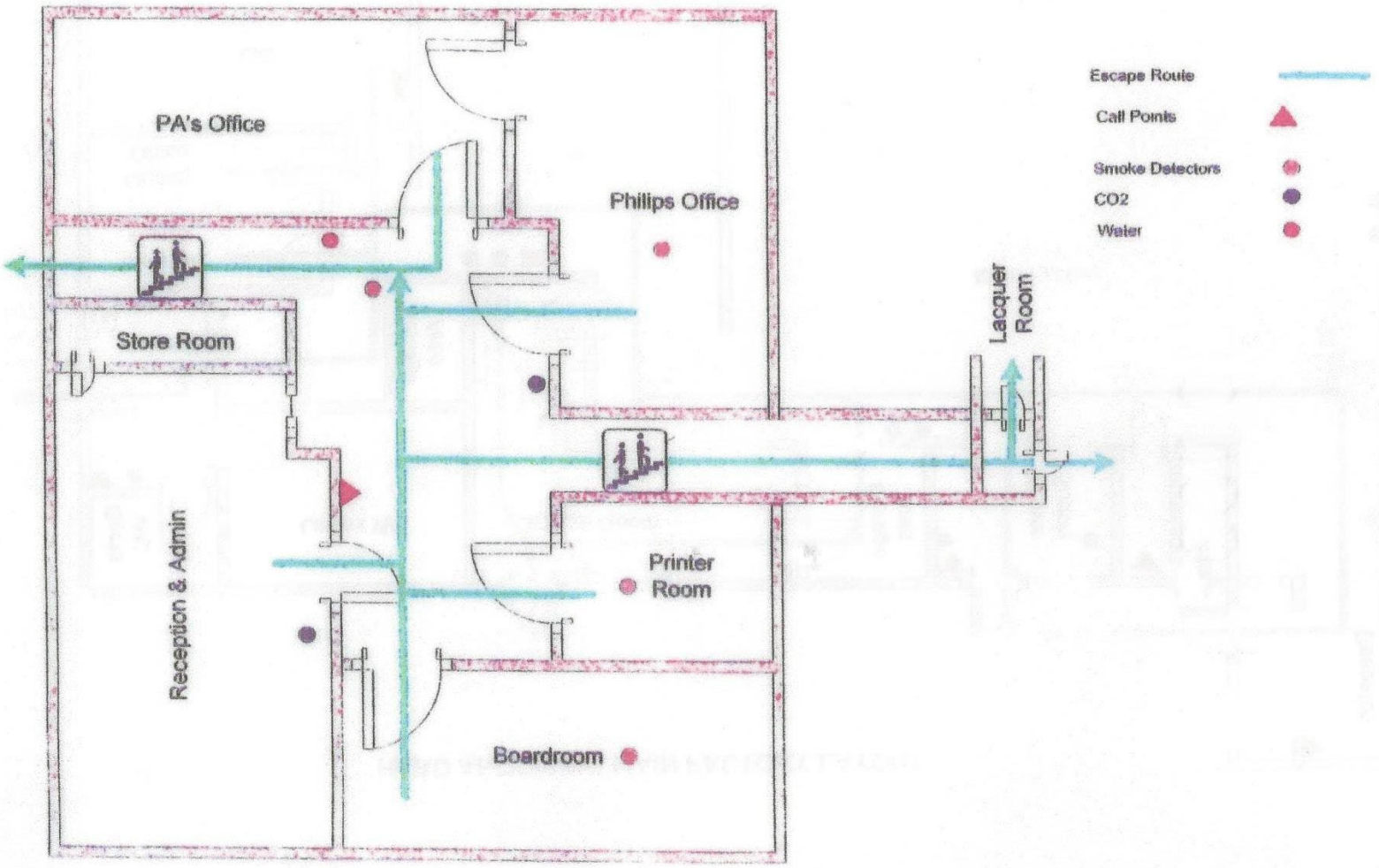
APPENDIX 3

GENERAL SITE SCHEMATICS

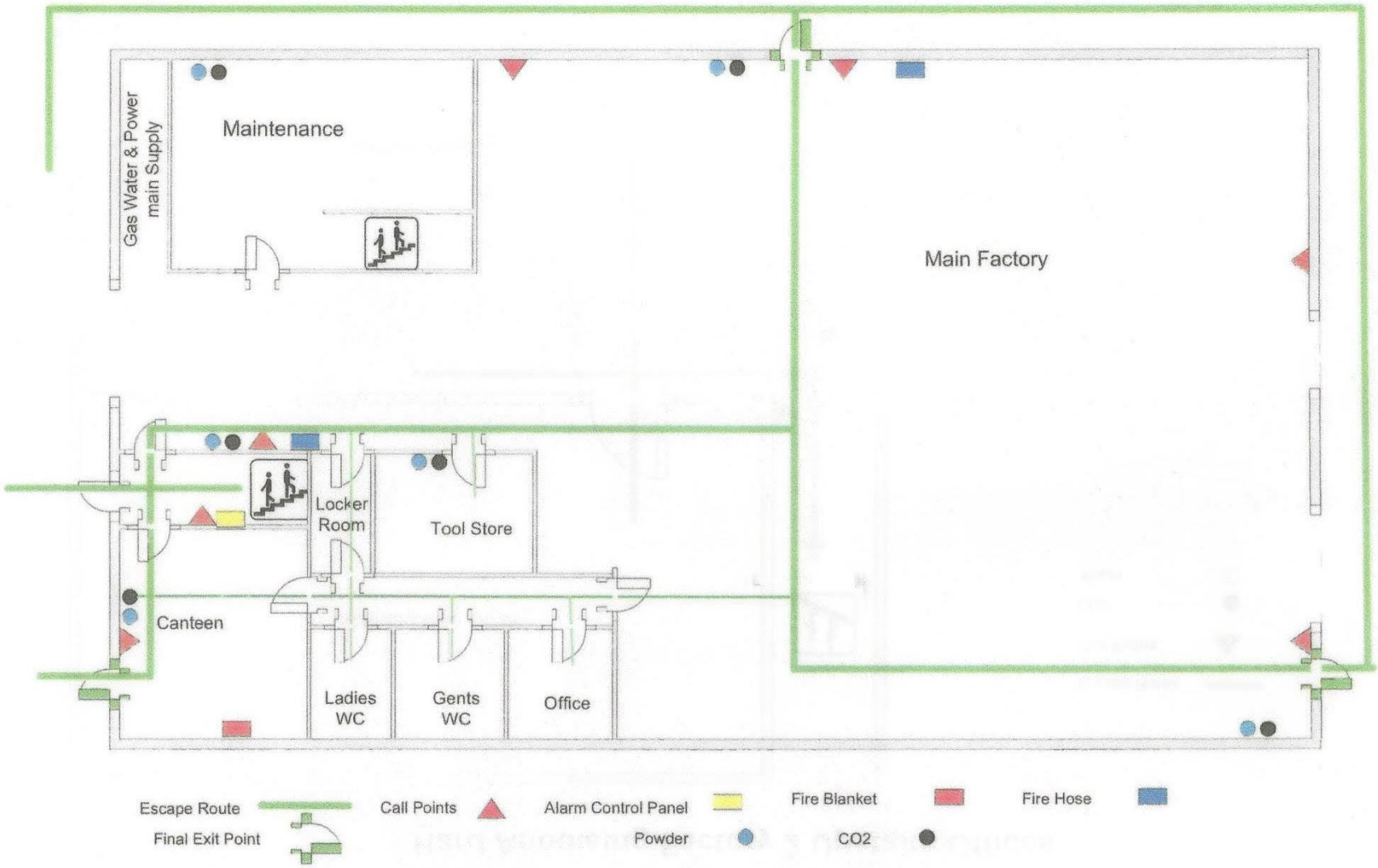
HARD ANODISING MAIN FACTORY LAYOUT



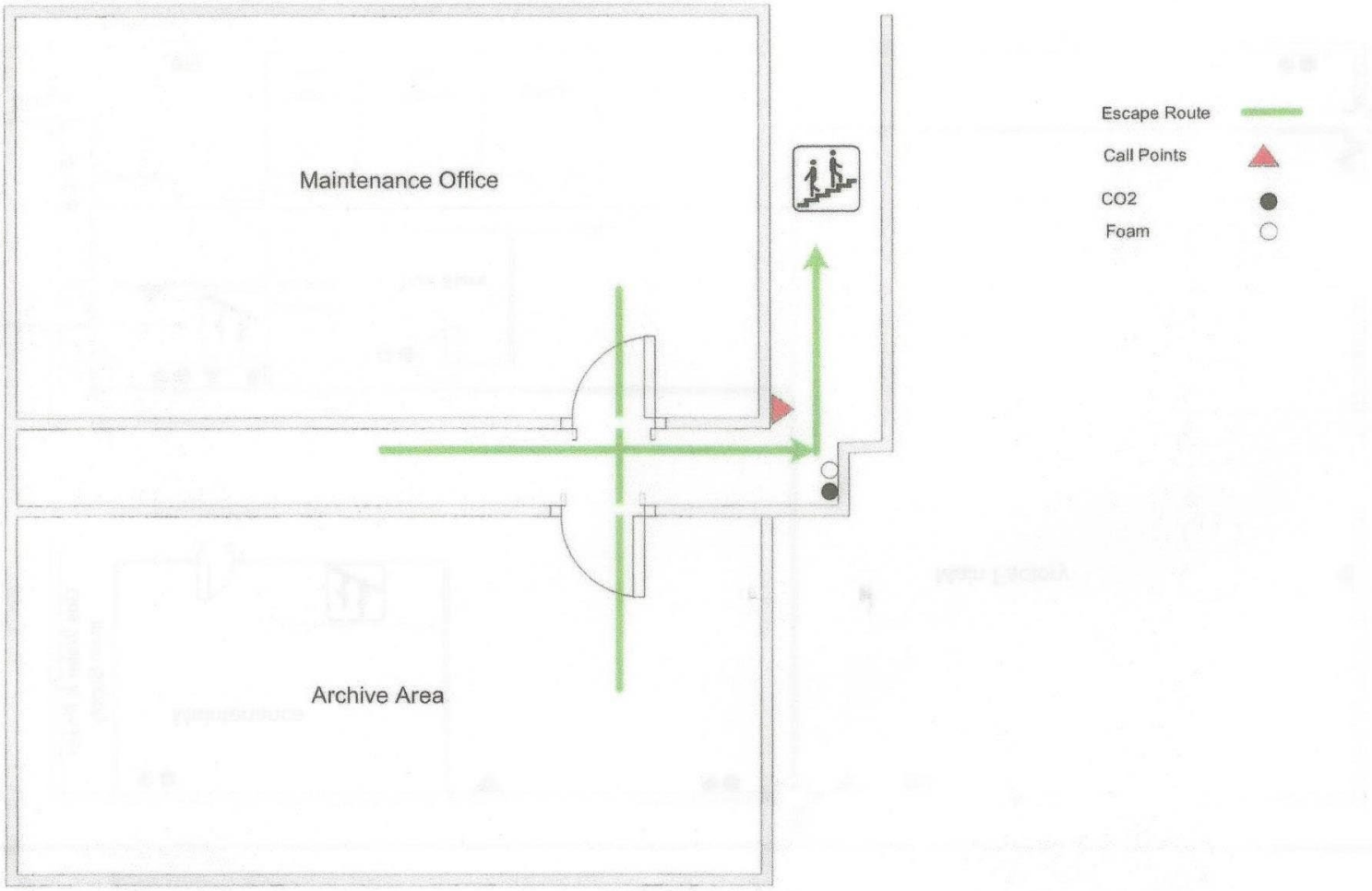
Hard Anodising Upstairs Offices



Factory 2 layout



Hard Anodising Factory 2 Upstairs Offices



APPENDIX 4

PENSTOCK VALVE PROCEDURE

Hard Anodising

1 SCOPE

This procedure enables the correct operation of the site's emergency shut off valves to prevent the loss of unauthorized releases to drainage, a statutory requirement under the site's PPC/EPR part A1 permit.

Any discontinuity in testing procedure for any reason whatsoever should be formally notified directly to the Managing Director.

The site activities warrant a Part A1 Permit under the Pollution Prevention and Control (England and Wales) Regulations 2000 by virtue of section 2.3 (surface treating metals and plastic materials) of Schedule 1 of the regulations, which requires any activity involving surface treating of metals and plastic materials using an electrolyte or chemical process where the aggregated volume of the treatment vats is more than $30m^3$ to obtain a permit to operate. The aggregated volume of treatment tanks at Hard Anodising Limited is approximately $117m^2$.

Access around the factory premises has been included within the installation boundary to address any potential likelihood of spillages of materials or wastes during collection or delivery.

The installation not only has process tanks for chemical and electrolytic surface treatment activities but also directly associated activities which have a technical connection with the surface treatment activities and which may have an effect on emissions and pollution. These include:

- Storage and handling of input chemicals and anode metals
- Water treatment
- Chemical preparation of the work to be treated
- Rinsing of the work being treated
- Drying of the treated work
- Post-treatment of the work (where necessary to complete the surface treatment)
- Fume extraction and fume abatement system
- Effluent treatment
- Handling of spent process fluids
- Handling of wastes

These activities are described in detail in Section 2.3 of the main IPPC document. Office areas are excluded from the installation. Hard Anodising Limited also operates a consent to discharge trade effluent to sewer granted by Severn Trent Water Authorities Limited. The operation comprises of the following main processes:

- Anodising
- Nickel plating
- Surface passivation and sealing

As such these processes encompass the use, storage, handling and disposal of mineral acids including sulphuric, hydrofluoric, phosphoric and hydrochloric, alkalis including sodium hydroxide and sodium carbonate and bicarbonate, in addition to aqueous sodium hypochlorite, aqueous hexavalent chromium, sodium and potassium salt solutions and nickel solutions.

The potential impacts on aquatic environments are considered such that site management operate a containment strategy to eliminate, or at least minimise any losses. All deliveries and movement of products are restricted to daytime hours only.

Hard Anodising

2 PROCEDURE

2.1 The site's shut off valves are clearly defined on site maps maintained on the Environmental Notice Boards. They form a key component of the Site Protection Management Plan and Pollution Prevention and Control initiatives.

On discovery and disclosure of a spillage of materials, employees and management will as soon as is safely possible initiated the "Spillage and Containment "procedure. This has been formally trained in and is routinely audited in its execution.

If there is any potential for loss of chemical to drainage the relevant Spill Team member will initiate the operation of the shut off valves.

The valve direction is clearly marked its open" and "closed positions". Once activated a second team member will verify that the correct position has been achieved.

The valve position will not been changed until the spillage has been completely finished to the satisfaction of the supervising manager,

The team will complete the relevant kit audit and Incident log to confirm that all relevant actions were completed as per the formal procedure.

2.2 Maintenance of the valves will be completed on a "pro – active" basis with a monthly inspection of operation.

2.3 Any maintenance repair of a shut off valve will be completed as a matter of priority and this will be formally recorded in the site's Planned maintenance Log. As per the site's permit all relevant spares will be maintained on site.

2.4 Site management will ensure alt all times that shut off valves are readily accessible to the Spill Team.

2.5 If any chemical has entered the site's drainage Spill Team members will formally contact the Environment Agency, providing as much relevant information as possible regarding the nature and amount of unauthorized chemical loss.

PROCEDURE: FREE ACCESS TO PENSTOCK VALVES

SCOPE:

This procedure has been issued to ensure that no obstructions, especially including vehicles, are left in a manner which would prevent free access to personnel in the requirement to access the site's Penstock valves in the prevention of an unauthorised release scenario.

ACTIONS:

On a continuous basis:-

i) Maintenance personnel will ensure that the area around the 2 off Penstock Valves is specifically delineated by cross hatched paintwork and designated a No Parking location under any circumstances to ensure there are no obstructions to closure.

A formal No Parking sign will also be erects to further bring this to the attention of employees and visitors.

Supervision will support this follows:-

a) Formal disclosure of this issue to all members of the workforce

b) Immediate removal of any obstruction, vehicle or otherwise, should the requirement arise

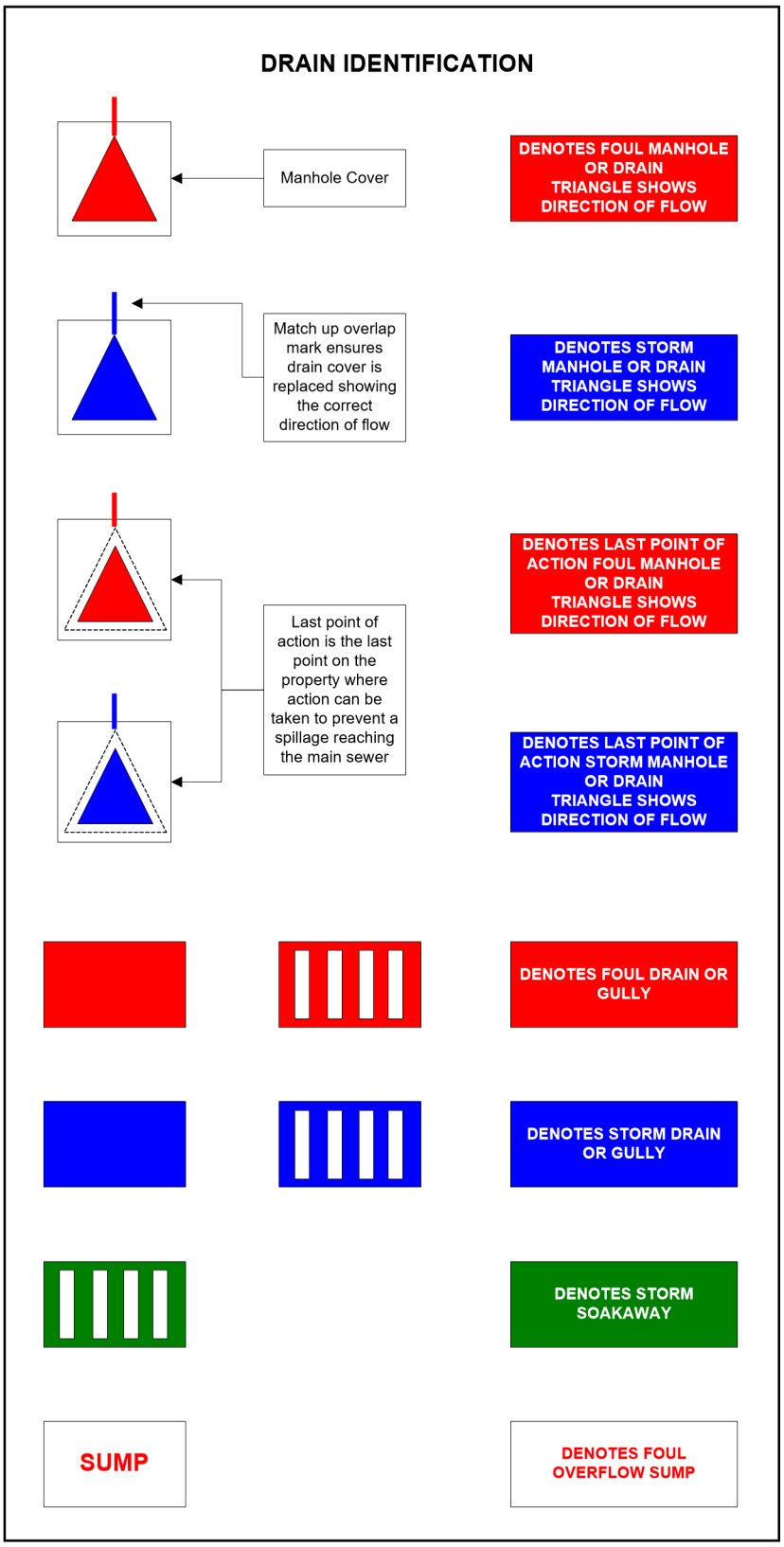
ii) Any repeat of obstruction will then be addressed by disciplinary procedures against the individual concerned.

Date of Issue:	06/2013			**Procedure Ref:**
Issue:	01			
Issued By:	CC / TG			

HARD 9514 PENSTOCK PARKING REP

APPENDIX 5

DRAIN IDENTIFICATION SHEET


DRAIN IDENTIFICATION
Manhole Cover
DENOTES FOUL MANHOLE OR DRAIN TRIANGLE SHOWS DIRECTION OF FLOW
Match up overlap mark ensures drain cover is replaced showing the correct direction of flow
DENOTES STORM MANHOLE OR DRAIN TRIANGLE SHOWS DIRECTION OF FLOW
Last point of action is the last point on the property where action can be taken to prevent a spillage reaching the main sewer
DENOTES LAST POINT OF ACTION FOUL MANHOLE OR DRAIN TRIANGLE SHOWS DIRECTION OF FLOW
DENOTES LAST POINT OF ACTION STORM MANHOLE OR DRAIN TRIANGLE SHOWS DIRECTION OF FLOW
DENOTES FOUL DRAIN OR GULLY
DENOTES STORM DRAIN OR GULLY
DENOTES STORM SOAKAWAY
SUMP
DENOTES FOUL OVERFLOW SUMP

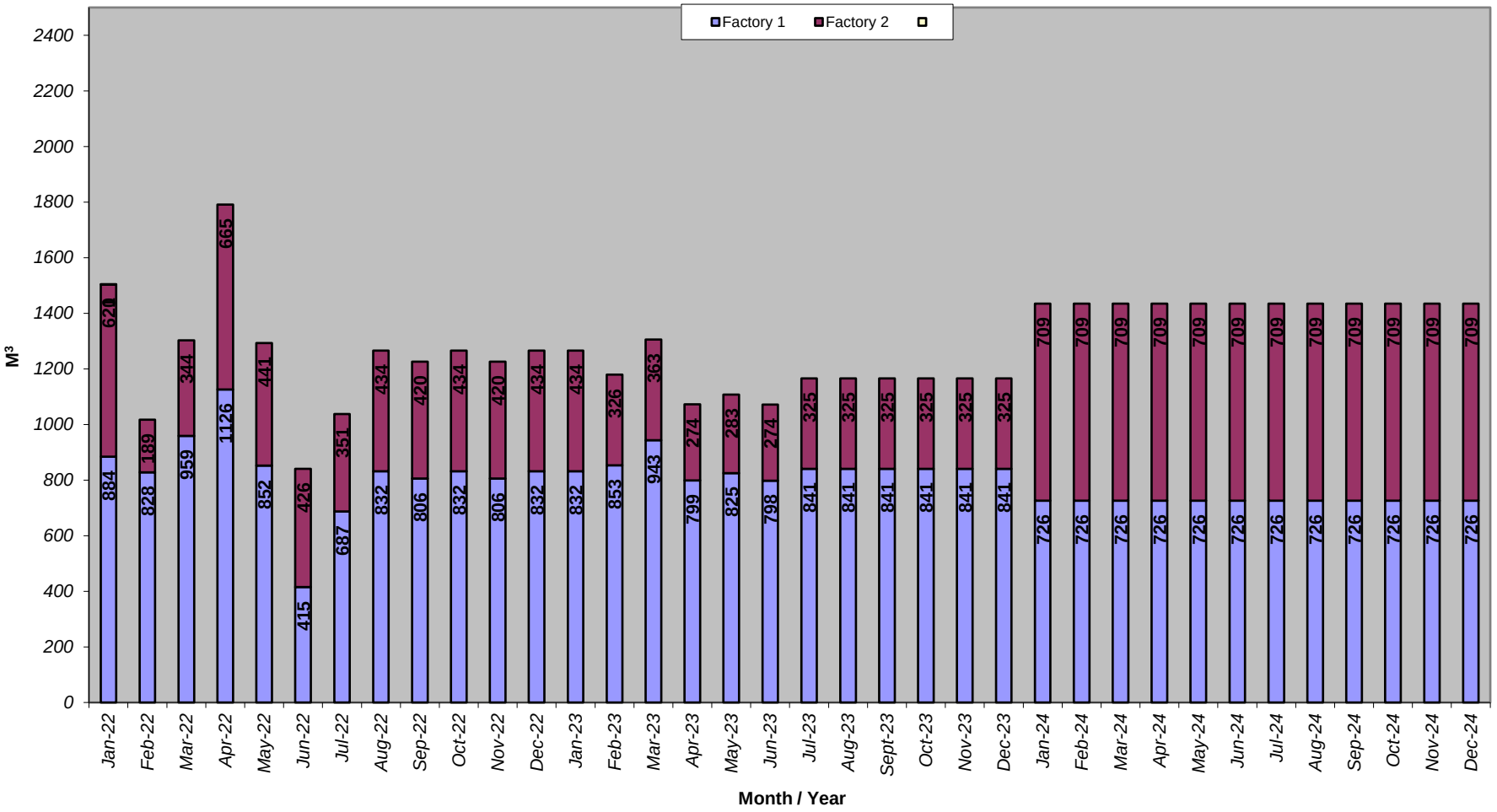
Hard Anodising Surface Treatments Ltd

Energy Efficiency

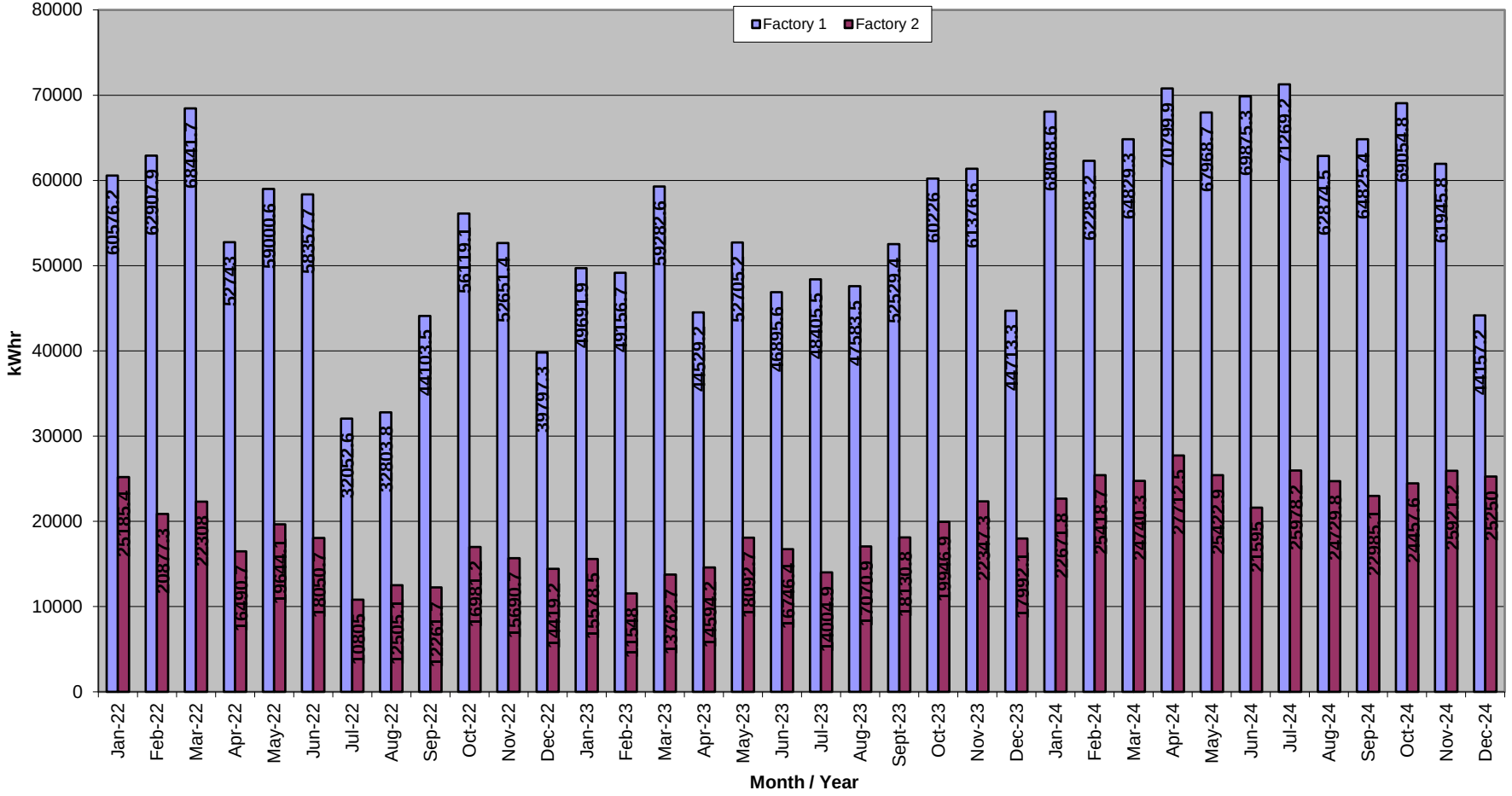
Hard Anodising Surface Treatments Ltd

Water/Gas/Electricity Usage Data Jan-22 – Dec-24

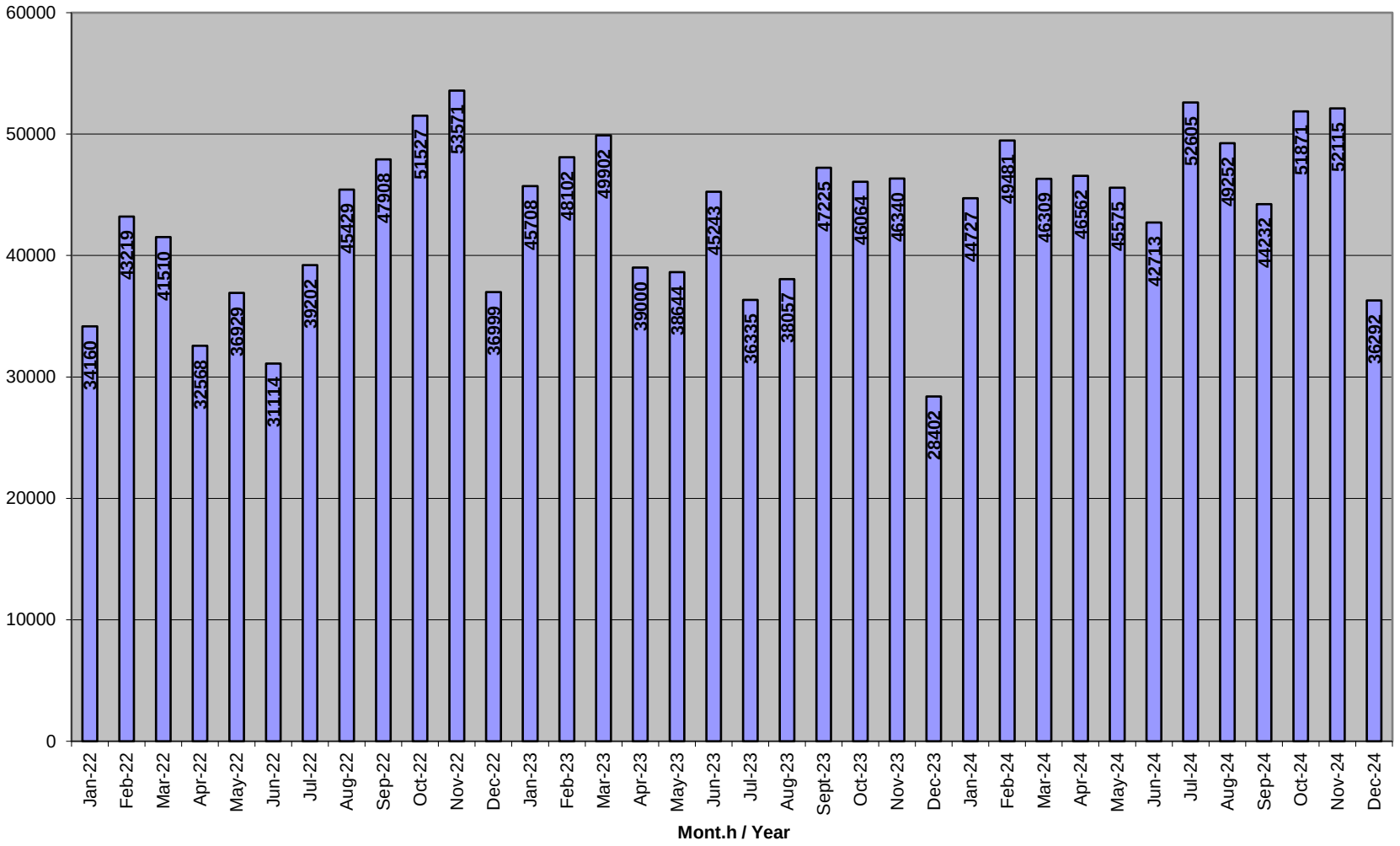
Hard Anodising Limited Water Consumption - Combined Factories



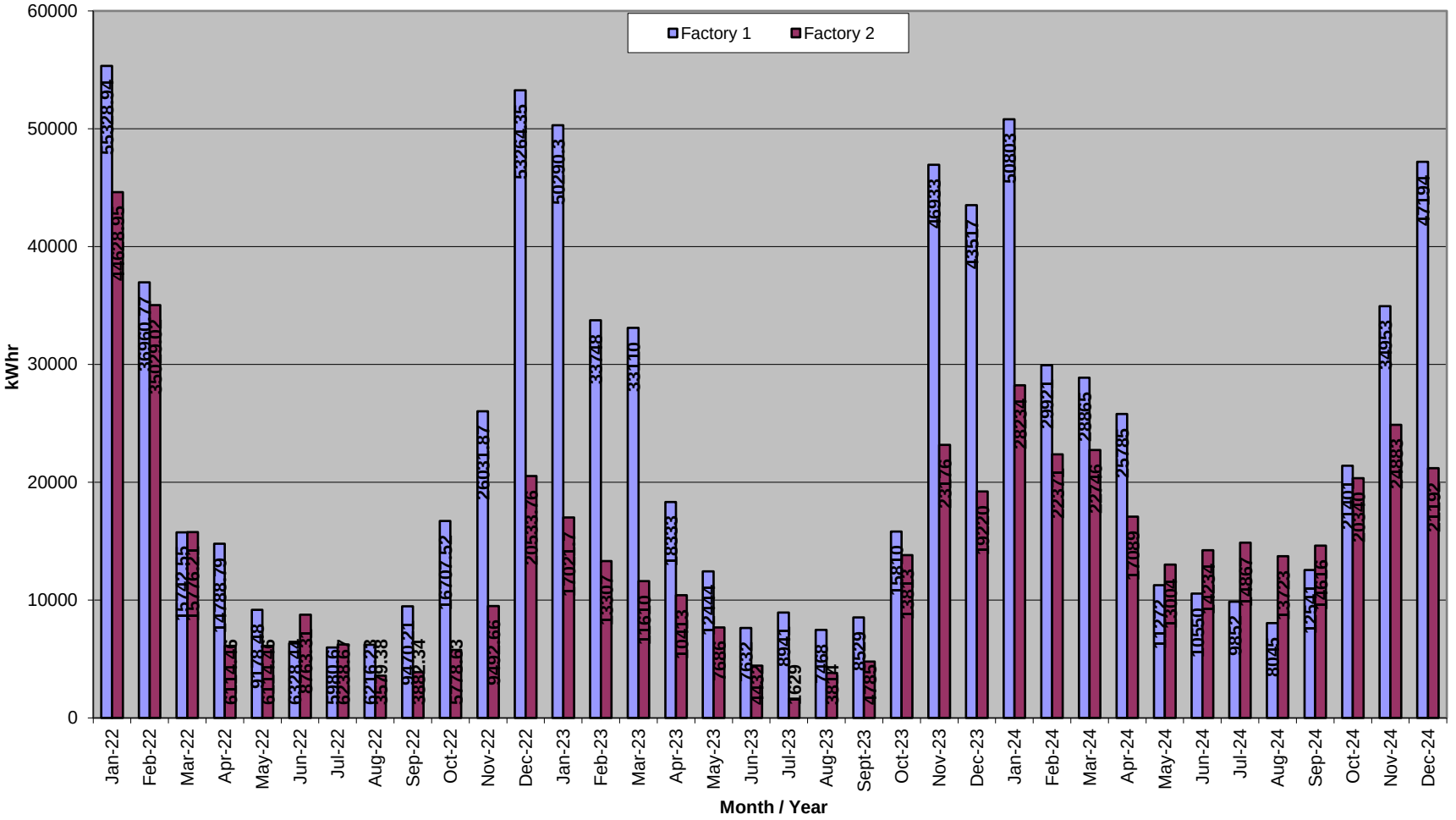
Hard Anodising STL Electricity Consumption



Hard Anodiding Limited Square Footage Production Data - Combimed Factories



Hard Anodising STL Gas Consumption



Water Supply	Factory 1	Factory 2
Jan-22	884	620
Feb-22	828	189
Mar-22	959	344
Apr-22	1126	665
May-22	852	441
Jun-22	415	426
Jul-22	687	351
Aug-22	832	434
Sep-22	806	420
Oct-22	832	434
Nov-22	806	420
Dec-22	832	434
Jan-23	832	434
Feb-23	853	326
Mar-23	943	363
Apr-23	799	274
May-23	825	283
Jun-23	798	274
Jul-23	841	325
Aug-23	841	325
Sept-23	841	325
Oct-23	841	325
Nov-23	841	325
Dec-23	841	325
Jan-24	726	709
Feb-24	726	709
Mar-24	726	709
Apr-24	726	709
May-24	726	709
Jun-24	726	709
Jul-24	726	709
Aug-24	726	709
Sep-24	726	709
Oct-24	726	709
Nov-24	726	709
Dec-24	726	709

Gas Consumption
Jan-22
Feb-22
Mar-22
Apr-22
May-22
Jun-22
Jul-22
Aug-22
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sept-23
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Nov-23
Dec-23
Jan-24
Feb-24
Mar-24
Apr-24
May-24
Jun-24
Jul-24
Aug-24
Sep-24
Oct-24
Nov-24
Dec-24

Factory 1	Factory 2	Electricty Consumption
55328.94	44628.95	**Jan-22**
36960.77	35029.02	**Feb-22**
15742.55	15776.21	**Mar-22**
14788.79	6114.46	**Apr-22**
9178.48	6114.46	**May-22**
6328.44	8763.31	**Jun-22**
5980.6	6238.67	**Jul-22**
6216.23	3579.38	**Aug-22**
9470.21	3882.34	**Sep-22**
16707.52	5778.63	**Oct-22**
26031.87	9492.66	**Nov-22**
53264.35	20533.76	**Dec-22**
50290.3	17021.7	**Jan-23**
33748	13307	**Feb-23**
33110	11610	**Mar-23**
18333	10413	**Apr-23**
12444	7686	**May-23**
7632	4432	**Jun-23**
8941	1629	**Jul-23**
7468	3814	**Aug-23**
8529	4785	**Sept-23**
15810	13813	**Oct-23**
46933	23176	**Nov-23**
43517	19220	**Dec-23**
50803	28234	**Jan-24**
29921	22371	**Feb-24**
28865	22746	**Mar-24**
25785	17089	**Apr-24**
11272	13004	**May-24**
10550	14234	**Jun-24**
9852	14867	**Jul-24**
8045	13723	**Aug-24**
12541	14616	**Sep-24**
21401	20340	**Oct-24**
34953	24883	**Nov-24**
47194	21192	**Dec-24**

Factory 1	Factory 2
60576.2	25185.4
62907.9	20877.3
68441.7	22308
52743	16490.7
59000.6	19644.1
58357.7	18050.7
32052.6	10805
32803.8	12505.1
44103.5	12261.7
56119.1	16981.2
52651.4	15690.7
39797.3	14419.2
49691.9	15578.5
49156.7	11548
59282.6	13762.7
44529.2	14594.2
52705.2	18092.7
46895.6	16746.4
48405.5	14004.9
47583.5	17070.9
52529.4	18130.8
60226	19946.9
61376.6	22347.3
44713.3	17992.1
68068.6	22671.8
62283.2	25418.7
64829.3	24740.3
70799.9	27712.5
67968.7	25422.9
69875.3	21595
71269.2	25978.2
62874.5	24729.8
64825.4	22985.1
69054.8	24457.6
61945.8	25921.2
44157.2	25250

Production Data	Sq.Ft.
Jan-22	34160
Feb-22	43219
Mar-22	41510
Apr-22	32568
May-22	36929
Jun-22	31114
Jul-22	39202
Aug-22	45429
Sep-22	47908
Oct-22	51527
Nov-22	53571
Dec-22	36999
Jan-23	45708
Feb-23	48102
Mar-23	49902
Apr-23	39000
May-23	38644
Jun-23	45243
Jul-23	36335
Aug-23	38057
Sept-23	47225
Oct-23	46064
Nov-23	46340
Dec-23	28402
Jan-24	44727
Feb-24	49481
Mar-24	46309
Apr-24	46562
May-24	45575
Jun-24	42713
Jul-24	52605
Aug-24	49252
Sep-24	44232
Oct-24	51871
Nov-24	52115
Dec-24	36292

Hard Anodising Surface Treatments Ltd

Energy Efficiency and Minimisation Audit

REPORT REF - HE 23 / 6666

Energy Efficiency and Minimisation Audit

for

Hard Anodising Surface Treatments Limited

Firs Estate
Stourport Road
Kidderminster
DY11 7QN

Study Period: - November 2023

ISSUE STATUS:	HE 23 / 6666	
ISSUE: 1	CHECKED: S J LATHAM	APPROVED: T GROWCOTT
ISSUED:	14.11.2023	

SECTION	CONTENTS

HARD ANODISING SURFACE TREATMENTS LIMITED
FIRS ESTATE
STOURPORT ROAD
KIDDERMINSTER
DY11 7QN

14th. November 2023

Ftao: Mr C Connon – Quality Co-ordinator

REPORT REF - HE 23 / 6666

ENERGY EFFICIENCY AND MINIMISATIUON AUDIT

1 INTRODUCTION

Under the provisions of the site's PPC A1 permit, the minimisation of energy usage has been identified as a specific environmental target. As such it is include within the site's Environmental Management Objectives on a year-on-year continuous improvement basis.

Under PPC, Sector Guidance Note SGN 2.07 identifies specific reduction measures under Best Available Techniques.

Site management have formally identified measures for energy minimisation and reduction programmes, these are included herein.

The last audit was undertaken in 2021; site management are required to review the permit within a 4 year period.

2.1 ENERGY MINIMISATION AUDIT – BAT COMPLIANCE

Item	Provision	Reference Document	Reduction Programme Measures	Responsible person	Reduction/target	Achieved Target	Completion Status
1	Recording of Energy Consumption Month on Month Year on Year.	PPC permit BV 8938ID Target Date November 2023	Assess site status against BATs define in Energy Usage as per SGN S2 .07 Complete energy environmetrics Complete energy efficiency measures review Review energy pinch techniques	PB/CC	All mass balances completed for factory 1 and 2 - all determined by month on month, year on year environmetrics Flow diagrams completed Site objectives established with BS EN ISO 14001 EMS Pinch techniques reviewed and completed for F2	Audit report submitted on schedule	Pass
2	Minimisation of energy consumption	As above	See Energy Minimisation	PB/CC	Routine training in importance of correct energy procedures Operation of heated tanks at lowest acceptable temperatures	See site training records	Pass

Item	Provision	Reference Document	Reduction Programme Measures	Responsible person	Reduction/target	Achieved Target	Completion Status
3	Using spent cooling water (which is raised in temperature) for rinsing purposes.	Planned Maintenance Schedule	Spent cooling water recycled where possible to minimise energy usage. Factory 1 and 2 main floor water supply and circulation pipework inspected and tested on a six-month schedule Inspection record reviewed.	PB/ Maintenance	Minimal water loss	Ongoing	Yes

Item	Provision	Reference Document	Reduction Programme Measures	Responsible person	Reduction/target	Achieved Target	Completion Status
4	Automated control for DC rectifiers.	Management Meetings and Review	Refer to Factory 1 and 2 Maintenance procedures	Maintenance	Minimal energy usage	Ongoing	Yes
5	Electrolytic processes that operate under thermally stable conditions without the need for heating or cooling.	Management Meetings and Review	Refer to Factory 1 and 2 Maintenance procedures	Maintenance	Minimal energy input	Ongoing	Yes

Item	Provision	Reference Document	Reduction Programme Measures	Responsible person	Reduction/target	Achieved Target	Completion Status
6	Minimum use of fume extraction consistent with COSHH Regulations	Site Plans	Refer to annual CoSHH regulation 9.2 Statutory Inspection and Testing Reports.	PB/CC	No Incidents	See environmetric	Pass
7	Inverter speed control or flow damper for fume extraction centrifugal fans.	Site plans	Refer to Factory 1 and 2 Maintenance procedures	PB	None	Ongoing	Pass
8	Re-use of wash waters to minimise energy usage	Work instructions	Use of cascade swill systems Use of acid swills to neutralise alkaline swills	Workforce	None	Ongoing	Pass

Item	Provision	Reference Document	Reduction Programme Measures	Responsible person	Reduction/target	Achieved Target	Completion Status
9	Gas / Electricity usage	Work Instructions	Month on Month/Year on Year Environmetrics produced and displayed	PB/CC/ Maintenance	None	Yes	Pass

2.2 GENERAL ENERGY REDUCTION MEASURES

Item	Provision	Reference Document	Reduction Programme Measures	Responsible person	Reduction/target	Achieved Target	Completion Status
10	Maintain use of croffles	Work instructions	Reduce steam losses to atmosphere and reduce make up water and energy inputs	PB/Workforce	All energy / water streams identified	Yes	Pass
11	Reduction in use of cooling water and energy input	Work Instructions	Reduce heating input to equipment.	PB	Ongoing	Ongoing	Pass
12	Minimisation of energy during COVID	Work Instructions	Minimise energy inputs on operating plant during COVID conditions to be continued	PB	Internal	Ongoing	Pass
13	Climate Change Adaption	Work Instructions	Evaluation of CCA Risk Assessment documentation Consideration of increase energy inputs associated with increased heating / cooling provisions	PB	Internal	Ongoing	Pass

3 SUMMARY AND RECOMMENDATIONS

The following measures are consistent with Sector Guidance Note provisions and environmental constraints.

All of these measures are specifically encompassed by environmetrics or screen log format.

Energy Consumption data is reported year on year.

Tim Growcott B Sc (Hons) MRSC C Sci C Chem MIMF
Senior Partner

HARD 6666 ENERGY MIN AUDIT 2023 REP

APPENDIX A

INSPECTION AND MONITORING PROTOCOLS

Contents

B1 Monitoring Protocols; Inspection, Testing and Maintenance Controls

Site management have progressively implemented procedures to identify, assess and minimise environmental risks and hazards.

The site management have endeavoured to encourage environmental site improvement to minimise all site activities based on a closed loop operating system; a dedicated team has been formed, to manage site operations with regard to waste management and storage facilities.

A maintenance programme has been constructed for areas of the site, which are fully operational. Any change to site operating conditions which reflects on the testing / monitoring / inspection programmes as deemed appropriate.

The site is in due process of establishing formal documentation specifically for the recording and forward planning of critical environmental performance monitoring. This documentation will be maintained for a period of no less than 4 years.

There have been significant changes to the controls first described in the Design SPMP.

Refer to following site documentation.

RESPONSIBILITY AND AUTHORITY

Maintenance Team

The Maintenance Team is responsible to the Directors for:-

i) Maintenance of all Company equipment in safe and good working condition
ii) Installation of all equipment and monitoring its performance
iii) Re-design of equipment as directed by the Managing Director
iv) Mechanical handling development, including jigs
v) Quality, health, safety and environmental issues as directed by the Quality/Environmental/ H&S Director (as detailed in the Integrated Management System)
vi) Maintaining a safe working environment

Production Managers

The Product Managers are responsible for:-

i) Ensuring that all production work within specified area is undertaken to procedure and in a timely manner
ii) Ensuring that all equipment and processes are operating efficiently
iii) Maintaining a safe working environment
iv) Discipline of all reporting staff
v) Reporting any discrepancies to the scheduled work through correct channels
vi) Training and re-awareness training of all production staff

Production Personnel

The Production Personnel are responsible to the Production Managers for:-

i) Completion of production operations as directed by the Production Manager, to the required quality and workmanship standards in order that the requirements of the customer reflected in the supporting documentation are met, whilst complying with environmental and health and safety requirements as detailed in the Integrated Management System.
ii) Ensuring that they inspect all work they produce, and where required obtain verification from the Quality Department.

General

The responsibilities and authorities defined in the Manual are the main responsibilities for the function / personnel described, and are not meant to be an exhaustive list.
The Company employ a highly skilled workforce, and deputisation and delegation will occur when a where required, depending on skills / experience. Also through the management team we employ a multi-disciplinary approach to our activities.

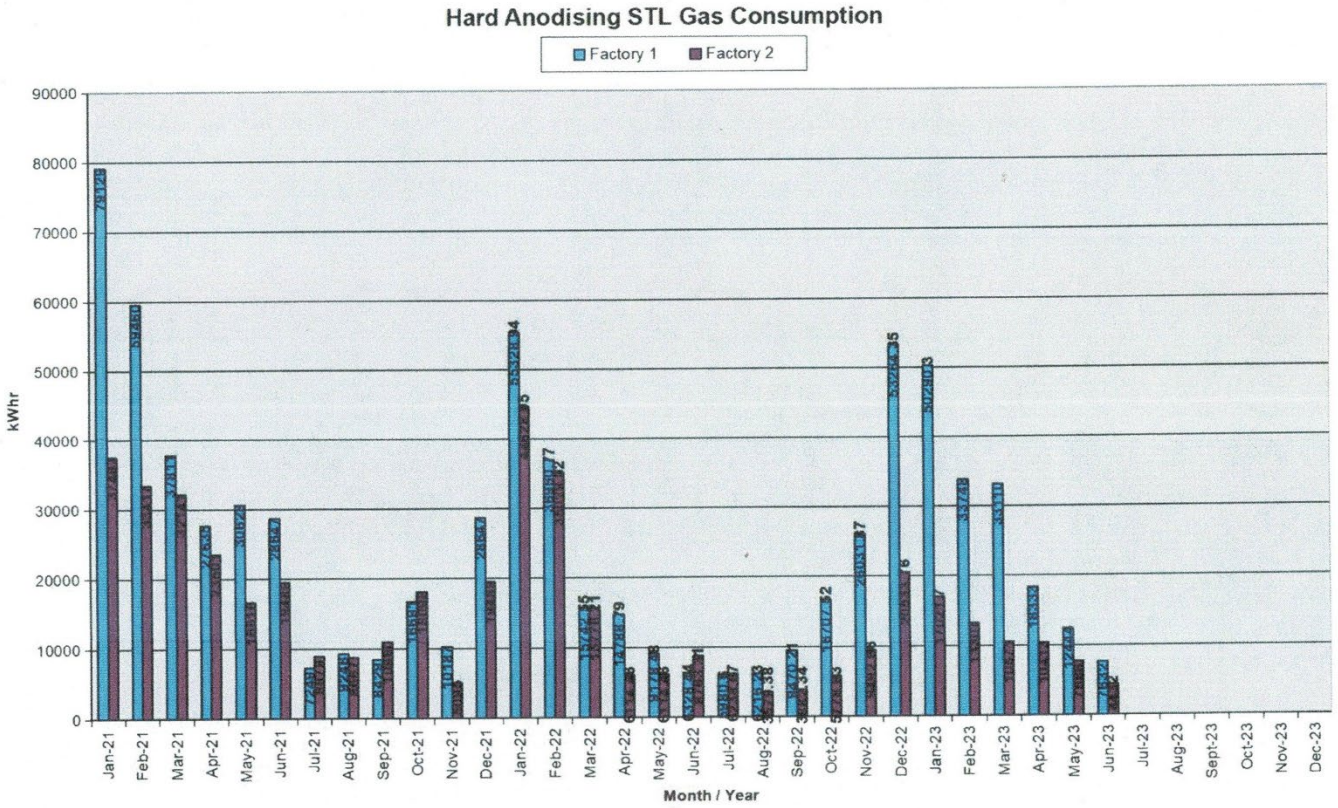
All employees are responsible for maintaining the area in which they work, in a clean and ordered manner. It is the senior managements' responsibility to promote the awareness of customer requirements throughout the Company. This will be reviewed through internal audits.
All personnel involved at any stage of the product realisation process have the authority to stop production and correct quality problems. Supervision must be notified as soon as possible.

Management Representative

The Management Representative function as detailed within the section above has been appointed by senior management to carry out those functions defined. He is authorised and has the organisational freedom to resolve matters pertaining to quality, prevent delivery of non-conforming parts and stop non-conforming processes etc.

APPENDIX B

ENERGY ENVIRONMETRICS


Hard Anodising STL Gas Consumption
Factory 1
Factory 2
kWhr
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Jan-21
Feb-21
Mar-21
Apr-21
May-21
Jun-21
Jul-21
Aug-21
Sep-21
Oct-21
Nov-21
Dec-21
Jan-22
Feb-22
Mar-22
Apr-22
May-22
Jun-22
Jul-22
Aug-22
Sep-22
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Jan-23
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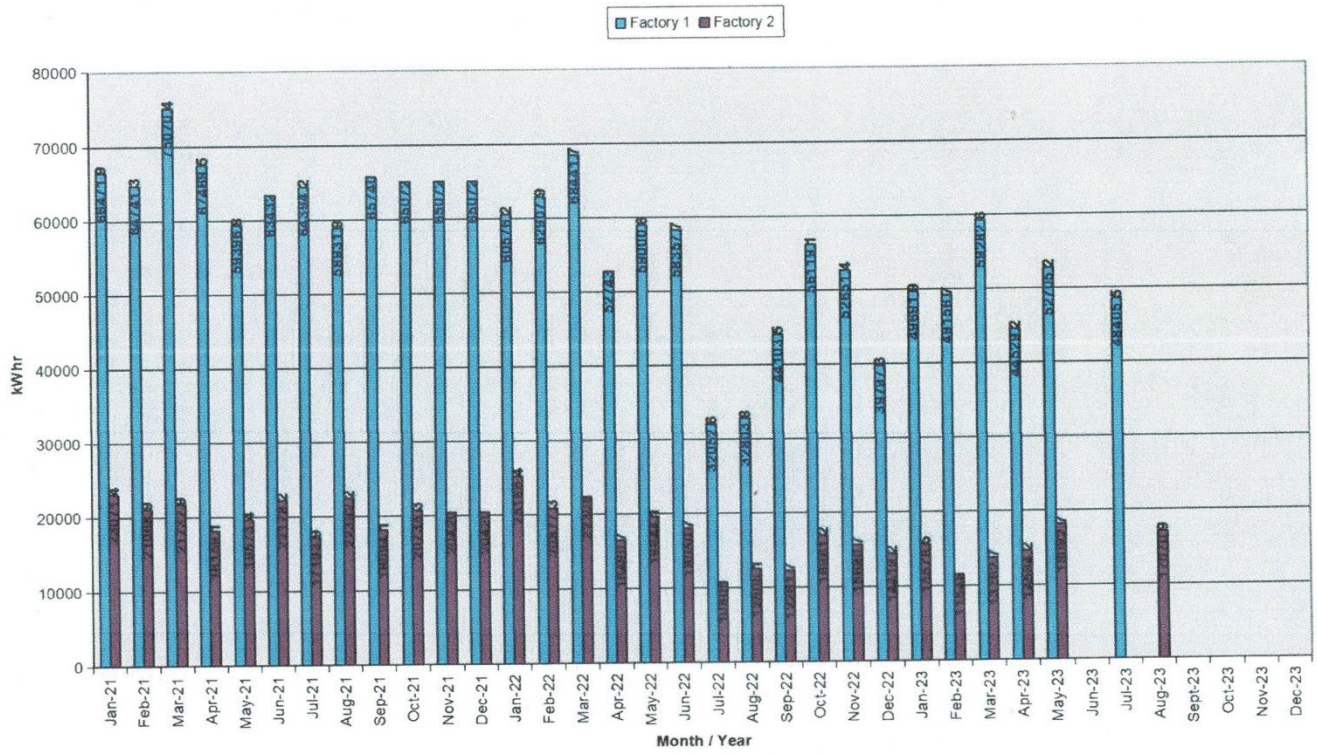
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sept-23
Oct-23
Nov-23
Dec-23
Month / Year

Hard Anodising STL Electricity Consumption



Hard Anodising Surface Treatments Ltd

Wastewater Testing Data

REPORT TO BE SENT TO:

Mr C. Connon
Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

ANALYSIS REPORT

SAMPLING POINT CODE 92282115

SAMPLE FROM: Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

DESCRIPTION: anodising

SAMPLE NUMBER: 1378561
SAMPLE DATE: 11/01/2023 SAMPLE METHOD: Spot
SAMPLE TIME: 10:01:00 SAMPLE REASON: TE Control Sample
CHARGEABLE N TAKEN BY : 285

DETERMINAND	RESULT VALUE	UNITS	CONSENT LIMITS	
Chromium (total) as Cr (mg/l)	0.12	mg/l	IM 0: 2	
Copper (total) as Cu (mg/l)	0.97	mg/l	IM 0: 1	
Lead (total) as Pb (mg/l)	0.015	mg/l	IM 0: 1	
Nickel (total) as Ni (mg/l)	4.8	mg/l	IM 0: 2	*
Zinc (total) as Zn (mg/l)	5.8	mg/l	IM 0: 2	*
Visual Quality (site test)	P			
Sampling Access (TE site test)	P			
PH	7.8	pH_unit	IM 6: 10	

SAMPLE HAS BREACHED A LIMIT

REPORT DATE: 19/01/23

ENQUIRIES REGARDING THIS REPORT SHOULD BE MADE TO: RAKESH PATEL
07500974684
rakesh.patel@severntrent.co.uk

SIGNED: DATE:

REPORT TO BE SENT TO:

Mr C. Connon
Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

ANALYSIS REPORT

SAMPLING POINT CODE 92282231

SAMPLE FROM: Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

DESCRIPTION: anodising

SAMPLE NUMBER: 1378560
SAMPLE DATE: 11/01/2023 SAMPLE METHOD: Spot
SAMPLE TIME: 10:09:00 SAMPLE REASON: TE Control Sample
CHARGEABLE N TAKEN BY : 285

DETERMINAND	RESULT VALUE	UNITS	CONSENT LIMITS
Chromium (total) as Cr (mg/l)	0.039	mg/l	IM 0: 2
Copper (total) as Cu (mg/l)	0.026	mg/l	IM 0: 1
Lead (total) as Pb (mg/l)	0.0035	mg/l	IM 0: 1
Nickel (total) as Ni (mg/l)	0.099	mg/l	IM 0: 2
Zinc (total) as Zn (mg/l)	0.13	mg/l	IM 0: 2
Visual Quality (site test)	P		
Sampling Access (TE site test)	P		
PH	7.7	pH_unit	IM 6: 10

REPORT DATE: 18/01/23

ENQUIRIES REGARDING THIS REPORT SHOULD BE MADE TO: RAKESH PATEL
07500974684
rakesh.patel@severntrent.co.uk

SIGNED: DATE:

REPORT TO BE SENT TO:

Mr C. Connon
Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

ANALYSIS REPORT

SAMPLING POINT CODE 92282115

SAMPLE FROM: Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

DESCRIPTION: anodising

SAMPLE NUMBER: 1387040
SAMPLE DATE: 28/02/2023 SAMPLE METHOD: Spot
SAMPLE TIME: 15:00:00 SAMPLE REASON: TE Control Sample
CHARGEABLE N TAKEN BY : 285

DETERMINAND	RESULT VALUE	UNITS	CONSENT LIMITS
Chromium (total) as Cr (mg/l)	0.13	mg/l	IM 0: 2
Copper (total) as Cu (mg/l)	0.033	mg/l	IM 0: 1
Lead (total) as Pb (mg/l)	0.0058	mg/l	IM 0: 1
Nickel (total) as Ni (mg/l)	0.11	mg/l	IM 0: 2
Zinc (total) as Zn (mg/l)	0.032	mg/l	IM 0: 2
Visual Quality (site test)	P		
Sampling Access (TE site test)	P		
PH	6.3	pH_unit	IM 6: 10

REPORT DATE: 09/03/23

ENQUIRIES REGARDING THIS REPORT SHOULD BE MADE TO: RAKESH PATEL
07500974684
rakesh.patel@severntrent.co.uk

SIGNED: DATE:

REPORT TO BE SENT TO:

Mr C. Connon
Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

ANALYSIS REPORT

SAMPLING POINT CODE 92282231

SAMPLE FROM: Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

DESCRIPTION: anodising

SAMPLE NUMBER: 1387041
SAMPLE DATE: 28/02/2023 SAMPLE METHOD: Spot
SAMPLE TIME: 15:05:00 SAMPLE REASON: TE Control Sample
CHARGEABLE N TAKEN BY : 285

DETERMINAND	RESULT VALUE	UNITS	CONSENT LIMITS
Chromium (total) as Cr (mg/l)	0.0079	mg/l	IM 0: 2
Copper (total) as Cu (mg/l)	0.0088	mg/l	IM 0: 1
Lead (total) as Pb (mg/l)	0.0016	mg/l	IM 0: 1
Nickel (total) as Ni (mg/l)	0.021	mg/l	IM 0: 2
Zinc (total) as Zn (mg/l)	0.033	mg/l	IM 0: 2
Visual Quality (site test)	P		
Sampling Access (TE site test)	P		
PH	6.3	pH_unit	IM 6: 10

REPORT DATE: 09/03/23

ENQUIRIES REGARDING THIS REPORT SHOULD BE MADE TO: RAKESH PATEL
07500974684
rakesh.patel@severntrent.co.uk

SIGNED: DATE:

REPORT TO BE SENT TO:

Mr C. Connon
Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

ANALYSIS REPORT

SAMPLING POINT CODE 92282115

SAMPLE FROM: Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

DESCRIPTION: anodising

SAMPLE NUMBER: 1392157
SAMPLE DATE: 30/03/2023 SAMPLE METHOD: Spot
SAMPLE TIME: 10:35:00 SAMPLE REASON: TE Control Sample
CHARGEABLE N TAKEN BY : 285

DETERMINAND	RESULT VALUE	UNITS	CONSENT LIMITS
Chromium (total) as Cr (mg/l)	0.064	mg/l	IM 0: 2
Copper (total) as Cu (mg/l)	0.093	mg/l	IM 0: 1
Lead (total) as Pb (mg/l)	0.0097	mg/l	IM 0: 1
Nickel (total) as Ni (mg/l)	0.14	mg/l	IM 0: 2
Zinc (total) as Zn (mg/l)	0.10	mg/l	IM 0: 2
Visual Quality (site test)	P		
Sampling Access (TE site test)	P		
PH	6.3	pH_unit	IM 6: 10

REPORT DATE: 10/04/23

ENQUIRIES REGARDING THIS REPORT SHOULD BE MADE TO: RAKESH PATEL
07500974684
rakesh.patel@severntrent.co.uk

SIGNED: DATE:

REPORT TO BE SENT TO:

Mr C. Connon
Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

ANALYSIS REPORT

SAMPLING POINT CODE 92282231

SAMPLE FROM: Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

DESCRIPTION: anodising

SAMPLE NUMBER: 1392158
SAMPLE DATE: 30/03/2023 SAMPLE METHOD: Spot
SAMPLE TIME: 10:41:00 SAMPLE REASON: TE Control Sample
CHARGEABLE N TAKEN BY : 285

DETERMINAND	RESULT VALUE	UNITS	CONSENT LIMITS
Chromium (total) as Cr (mg/l)	0.040	mg/l	IM 0: 2
Copper (total) as Cu (mg/l)	0.0051	mg/l	IM 0: 1
Lead (total) as Pb (mg/l)	0.0009	mg/l	IM 0: 1
Nickel (total) as Ni (mg/l)	0.035	mg/l	IM 0: 2
Zinc (total) as Zn (mg/l)	0.037	mg/l	IM 0: 2
Visual Quality (site test)	P		
Sampling Access (TE site test)	P		
PH	6.2	pH_unit	IM 6: 10

REPORT DATE: 10/04/23

ENQUIRIES REGARDING THIS REPORT SHOULD BE MADE TO: RAKESH PATEL
07500974684
rakesh.patel@severntrent.co.uk

SIGNED: DATE:

REPORT TO BE SENT TO:

Mr C. Connon
Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

ANALYSIS REPORT

SAMPLING POINT CODE 92282115

SAMPLE FROM: Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

DESCRIPTION: anodising

SAMPLE NUMBER: 1396377
SAMPLE DATE: 27/04/2023 SAMPLE METHOD: Spot
SAMPLE TIME: 11:35:00 SAMPLE REASON: TE Control Sample
CHARGEABLE N TAKEN BY : 285

DETERMINAND	RESULT VALUE	UNITS	CONSENT LIMITS	
Chromium (total) as Cr (mg/l)	0.19	mg/l	IM 0: 2	
Copper (total) as Cu (mg/l)	0.34	mg/l	IM 0: 1	
Lead (total) as Pb (mg/l)	0.023	mg/l	IM 0: 1	
Nickel (total) as Ni (mg/l)	0.092	mg/l	IM 0: 2	
Zinc (total) as Zn (mg/l)	0.100	mg/l	IM 0: 2	
Visual Quality (site test)	P			
Sampling Access (TE site test)	P			
PH	5.7	pH_unit	IM 6: 10	*

SAMPLE HAS BREACHED A LIMIT

REPORT DATE: 04/05/23

ENQUIRIES REGARDING THIS REPORT SHOULD BE MADE TO:
RAKESH PATEL
07500974684
rakesh.patel@severntrent.co.uk

SIGNED: DATE:

REPORT TO BE SENT TO:

Mr C. Connon
Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

ANALYSIS REPORT

SAMPLING POINT CODE 92282231

SAMPLE FROM: Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

DESCRIPTION: anodising

SAMPLE NUMBER: 1396376
SAMPLE DATE: 27/04/2023 SAMPLE METHOD: Spot
SAMPLE TIME: 11:39:00 SAMPLE REASON: TE Control Sample
CHARGEABLE N TAKEN BY : 285

DETERMINAND	RESULT VALUE	UNITS	CONSENT LIMITS	
Chromium (total) as Cr (mg/l)	0.022	mg/l	IM 0: 2	
Copper (total) as Cu (mg/l)	0.0040	mg/l	IM 0: 1	
Lead (total) as Pb (mg/l)	0.0005	mg/l	IM 0: 1	
Nickel (total) as Ni (mg/l)	0.25	mg/l	IM 0: 2	
Zinc (total) as Zn (mg/l)	0.025	mg/l	IM 0: 2	
PH	5.7	pH_unit	IM 6: 10	*

SAMPLE HAS BREACHED A LIMIT

REPORT DATE: 04/05/23

ENQUIRIES REGARDING THIS REPORT SHOULD BE MADE TO:
RAKESH PATEL
07500974684
rakesh.patel@severntrent.co.uk

SIGNED: DATE:

REPORT TO BE SENT TO:

Mr C. Connon
Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

ANALYSIS REPORT

SAMPLING POINT CODE 92282115

SAMPLE FROM: Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

DESCRIPTION: anodising

SAMPLE NUMBER: 1403094
SAMPLE DATE: 06/06/2023 SAMPLE METHOD: Spot
SAMPLE TIME: 15:09:00 SAMPLE REASON: TE Control Sample
CHARGEABLE N TAKEN BY : 285

DETERMINAND	RESULT VALUE	UNITS	CONSENT LIMITS
Chromium (total) as Cr (mg/l)	0.15	mg/l	IM 0: 2
Copper (total) as Cu (mg/l)	0.043	mg/l	IM 0: 1
Lead (total) as Pb (mg/l)	0.0046	mg/l	IM 0: 1
Nickel (total) as Ni (mg/l)	0.15	mg/l	IM 0: 2
Zinc (total) as Zn (mg/l)	0.068	mg/l	IM 0: 2
Visual Quality (site test)	P		
Sampling Access (TE site test)	P		
PH	6.4	pH_unit	IM 6: 10

REPORT DATE: 13/06/23

ENQUIRIES REGARDING THIS REPORT SHOULD BE MADE TO: RAKESH PATEL
07500974684
rakesh.patel@severntrent.co.uk

SIGNED: DATE:

REPORT TO BE SENT TO:

Mr C. Connon
Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

ANALYSIS REPORT

SAMPLING POINT CODE 92282231

SAMPLE FROM: Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

DESCRIPTION: anodising

SAMPLE NUMBER: 1387041
SAMPLE DATE: 28/02/2023 SAMPLE METHOD: Spot
SAMPLE TIME: 15:05:00 SAMPLE REASON: TE Control Sample
CHARGEABLE N TAKEN BY : 285

DETERMINAND	RESULT VALUE	UNITS	CONSENT LIMITS
Chromium (total) as Cr (mg/l)	0.0079	mg/l	IM 0: 2
Copper (total) as Cu (mg/l)	0.0088	mg/l	IM 0: 1
Lead (total) as Pb (mg/l)	0.0016	mg/l	IM 0: 1
Nickel (total) as Ni (mg/l)	0.021	mg/l	IM 0: 2
Zinc (total) as Zn (mg/l)	0.033	mg/l	IM 0: 2
Visual Quality (site test)	P		
Sampling Access (TE site test)	P		
PH	6.3	pH_unit	IM 6: 10

REPORT DATE: 09/03/23

ENQUIRIES REGARDING THIS REPORT SHOULD BE MADE TO: RAKESH PATEL
07500974684
rakesh.patel@severntrent.co.uk

SIGNED: DATE:

REPORT TO BE SENT TO:

Mr C. Connon
Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

ANALYSIS REPORT

SAMPLING POINT CODE 92282115

SAMPLE FROM: Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

DESCRIPTION: anodising

SAMPLE NUMBER: 1432470
SAMPLE DATE: 15/11/2023 SAMPLE METHOD: Spot
SAMPLE TIME: 12:45:00 SAMPLE REASON: TE Control Sample
CHARGEABLE N TAKEN BY : 285

DETERMINAND	RESULT VALUE	UNITS	CONSENT LIMITS
Chromium (total) as Cr (mg/l)	0.065	mg/l	IM 0: 2
Copper (total) as Cu (mg/l)	0.061	mg/l	IM 0: 1
Lead (total) as Pb (mg/l)	0.017	mg/l	IM 0: 1
Nickel (total) as Ni (mg/l)	0.19	mg/l	IM 0: 2
Zinc (total) as Zn (mg/l)	0.051	mg/l	IM 0: 2
Visual Quality (site test)	P		
Sampling Access (TE site test)	P		
PH	7.0	pH_unit	IM 6: 10

REPORT DATE: 22/11/23

ENQUIRIES REGARDING THIS REPORT SHOULD BE MADE TO: RAKESH PATEL
07500974684
rakesh.patel@severntrent.co.uk

SIGNED: DATE:

REPORT TO BE SENT TO:

Mr C. Connon
Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

ANALYSIS REPORT

SAMPLING POINT CODE 92282231

SAMPLE FROM: Hard Anodising Limited
The Firs Estate
Oldington Lane
Stourport Road Kidderminster
DY11 7QN

DESCRIPTION: anodising

SAMPLE NUMBER: 1432462
SAMPLE DATE: 15/11/2023 SAMPLE METHOD: Spot
SAMPLE TIME: 12:55:00 SAMPLE REASON: TE Control Sample
CHARGEABLE N TAKEN BY : 285

DETERMINAND	RESULT VALUE	UNITS	CONSENT LIMITS
Chromium (total) as Cr (mg/l)	0.010	mg/l	IM 0: 2
Copper (total) as Cu (mg/l)	0.010	mg/l	IM 0: 1
Lead (total) as Pb (mg/l)	0.0022	mg/l	IM 0: 1
Nickel (total) as Ni (mg/l)	0.026	mg/l	IM 0: 2
Zinc (total) as Zn (mg/l)	0.055	mg/l	IM 0: 2
Visual Quality (site test)	P		
Sampling Access (TE site test)	P		
PH	7.0	pH_unit	IM 6: 10

REPORT DATE: 22/11/23

ENQUIRIES REGARDING THIS REPORT SHOULD BE MADE TO: RAKESH PATEL
07500974684
rakesh.patel@severntrent.co.uk

SIGNED: DATE:

REPORT REF - HE 23 / 6705

Release Points S1 and S2 Water Sample Analyses

for

Hard Anodising Surface Treatments Limited

Firs Industrial Estate
Stourport Road
Kidderminster
DY11 7QN

Study Period; - 12th. December 2023

ISSUE STATUS		HE 23 / 6705	
ISSUE	01	CHECKED: T GROWCOTT	APPROVED: T GROWCOTT
ISSUED		27.12.2023	

Halcyon Environmental

SECTION	CONTENTS

HARD ANODISING SURFACE TREATMENTS LIMITED
FIRS INDUSTRIAL ESTATE
STOURPORT ROAD
KIDDERMINSTER
DY11 7QN

27th December 2023

FAO: Mr C Connon – Quality Co - ordinator

REPORT REF - HE 23 / 6705

RELEASE POINTS S1 AND S2 WATER SAMPLE ANALYSES

1 INTRODUCTION

Under the provisions of the Hard Anodising Surface Treatments Limited IPPC A1 permit (ref. No. BV 89381D), as per table 2.2.8 *Emission limits and monitoring frequency to sewer,* release points S1 and S2 require formal analysis to confirm that releases meet the limits defined within the permit.

The permit details BS EN ISO 17294 -2.2003 as the monitoring method. A formal deviation has been sought by site personnel in respect of this method as they have been unable to source the samples to any laboratory capable of meeting the specification. As such the test procedures used to determine the results reported herein are included in this report.

The S1 and S2 release locations at the Hard Anodising Limited premises was sampled by site personnel on 12th December 2023 and submitted to Halcyon and subsequently analysed by a third-party laboratory under the direction of the author.

The sample was submitted as specified by the laboratory's protocols.

Receipt of this report should be included in the site's BS EN ISO 14001 Environmental Management System, as a reported analysis of process sourced releases. The samples were defined as follows for analytical purposes; -

Sample Reference HE 23 / 6705	Site Location
Release Point S1	Factory 1: 12.30 12.12.2023
Release Point S2	Factory 2: 12.55 12.12.2023

The sample was transported in accordance with Halcyon Test procedure HALC.WATERTEST.02. The sample bottle was filled "brimful", wrapped in silver foil and transported in a cool box to the test laboratory.

Water sampling is undertaken using a standardised sampling procedure. This encompasses the use of a purpose made water-dipping device. Essentially a weighted stainless steel tube is dip immersed into the drain/stream/tank using various extension rods to obtain the relevant depth.

Dipping tubes come in a range of sizes and shapes and the tester selects suitable one for testing.

The sampling procedure has been established to provide a valid sample from the test point; often sampling may take place over hours or even days to reflect the prevailing conditions.

The sample, usually 20 – 250 mls is then transferred immediately to a sample bottle. These are purpose supplied from a bone fide supplier (Socotec). Any test location that may have a legal compliance issue will be sampled in duplicate and the second sample will be retained by Halcyon for any subsequent testing requirement. To obtain a 1000 mls samples 4 or 5 separate dips are aggregated. Importantly the sample bottle is always “brim filled”, cap sealed, wrapped in silver foil (to keep out light) and transferred to a cool box for transportation and subsequent analysis. The tester formally records the test location, time of sampling, any deviations, time of sampling and prevailing climactic conditions where deemed necessary. Any evidence of readily identified oil films, chemical sedimentation or separation is also recorded in the same manner.

Any sampling which is supporting a Consent to Discharge Trade Effluent issue will have its temperature recorded at the time of sampling. Colour and turbidity initially are assessed at the time of sampling whereas COD and BOD must be tested at the time set within the relevant British Standard.

The testing suite may encompass the determination of dissolved metals, pH, suspended solids, dispersed oils etc; all of these to be undertaken in accordance with currently approved methodologies by trained and competent personnel. To ensure that the dip tube does not become contaminated, after a sample has been taken it is washed in acetone or Decon 90 solution (to remove any oils, greases, diesel fuels etc.), then thrice rinsed in de ionised water. The dip tube is thoroughly dried for the next sampling takes place.

Where a sampling location has defined release limits, these will be obtained normally for inclusion within the generated test report along with a statement of compliance status. The tester will normally wear rubber gloves and goggles when sampling.

2 ANALYSIS RESULTS

The results of the sample analyses were reported as follows -

Analyte	Units	HE 23 / 6705/S1	HE 23 / 6705/S2	Maximum permitted release limit
pH	-	8.2	8.5	6 – 9
Suspended Solids	mg/l	9	8	-
Total Cadmium	mg/l	< 0.02	<0.02	-
Total Chromium	mg/l	0.52	0.20	1
Total Copper	mg/l	0.19	0.09	1
Total Cyanide	mg/l	< 0.1	<0.1	-
Total Nickel	mg/l	<0.1	<0.1	1
Total Mercury	mg/l	< 0.004	<0.004	-
Total Lead	mg/l	< 0.02	<0.02	1
Total Zinc	mg/l	< 0.5	<0.5	2

* denotes a release above the permit limits.

3 FURTHER ACTIONS

The results reported in section 2 need to be entered onto Environment Agency Reporting Form S1 (23.02.05) and sent to the local Environment Agency Office, this to meet the provisions of Schedule 3 of the installation permit.

A copy of this report should be retained for a period of not less than 12 months.

Tim Growcott BSc (Hons) MRSC C Sci C Chem MIMF
Senior Partner

HARD 6574 WATER 2023 REP

REPORT REF - HE 24 / 6864

Release Points S1 and S2 Water Sample Analyses

for

Hard Anodising Surface Treatments Limited

Firs Industrial Estate
Stourport Road
Kidderminster
DY11 7QN

Study Period; - 20th March 2024

ISSUE STATUS		HE 24 / 6864	
ISSUE	01	CHECKED: T GROWCOTT	APPROVED: T GROWCOTT
ISSUED		30.03.2024	

Halcyon Environmental

SECTION	CONTENTS

HARD ANODISING SURFACE TREATMENTS LIMITED
FIRS INDUSTRIAL ESTATE
STOURPORT ROAD
KIDDERMINSTER
DY11 7QN

30th March 2024

FAO: Mr C Connon – Quality Co - ordinator

REPORT REF - HE 24 / 6864

RELEASE POINTS S1 AND S2 WATER SAMPLE ANALYSES

1 INTRODUCTION

Under the provisions of the Hard Anodising Surface Treatments Limited IPPC A1 permit (ref. No. BV 89381D), as per table 2.2.8 *Emission limits and monitoring frequency to sewer,* release points S1 and S2 require formal analysis to confirm that releases meet the limits defined within the permit.

The permit details BS EN ISO 17294 -2.2003 as the monitoring method. A formal deviation has been sought by site personnel in respect of this method as they have been unable to source the samples to any laboratory capable of meeting the specification. As such the test procedures used to determine the results reported herein are included in this report.

The S1 and S2 release locations at the Hard Anodising Limited premises was sampled by site personnel on 20th March 2024 and submitted to Halcyon and subsequently analysed by a third-party laboratory under the direction of the author.

The sample was submitted as specified by the laboratory's protocols.

Receipt of this report should be included in the site's BS EN ISO 14001 Environmental Management System, as a reported analysis of process sourced releases. The samples were defined as follows for analytical purposes; -

Sample Reference HE 24 / 6864	Site Location
Release Point S1	Factory 1: 08.45
Release Point S2	Factory 2: 08.34

The sample was transported in accordance with Halcyon Test procedure HALC.WATERTEST.02. The sample bottle was filled "brimful", wrapped in silver foil and transported in a cool box to the test laboratory.

Water sampling is undertaken using a standardised sampling procedure. This encompasses the use of a purpose made water-dipping device. Essentially a weighted stainless steel tube is dip immersed into the drain/stream/tank using various extension rods to obtain the relevant depth.

Dipping tubes come in a range of sizes and shapes and the tester selects suitable one for testing.

The sampling procedure has been established to provide a valid sample from the test point; often sampling may take place over hours or even days to reflect the prevailing conditions.

The sample, usually 20 – 250 mls is then transferred immediately to a sample bottle. These are purpose supplied from a bone fide supplier (Socotec). Any test location that may have a legal compliance issue will be sampled in duplicate and the second sample will be retained by Halcyon for any subsequent testing requirement. To obtain a 1000 mls samples 4 or 5 separate dips are aggregated. Importantly the sample bottle is always “brim filled”, cap sealed, wrapped in silver foil (to keep out light) and transferred to a cool box for transportation and subsequent analysis. The tester formally records the test location, time of sampling, any deviations, time of sampling and prevailing climactic conditions where deemed necessary. Any evidence of readily identified oil films, chemical sedimentation or separation is also recorded in the same manner.

Any sampling which is supporting a Consent to Discharge Trade Effluent issue will have its temperature recorded at the time of sampling. Colour and turbidity initially are assessed at the time of sampling whereas COD and BOD must be tested at the time set within the relevant British Standard.

The testing suite may encompass the determination of dissolved metals, pH, suspended solids, dispersed oils etc; all of these to be undertaken in accordance with currently approved methodologies by trained and competent personnel. To ensure that the dip tube does not become contaminated, after a sample has been taken it is washed in acetone or Decon 90 solution (to remove any oils, greases, diesel fuels etc.), then thrice rinsed in de ionised water. The dip tube is thoroughly dried for the next sampling takes place.

Where a sampling location has defined release limits, these will be obtained normally for inclusion within the generated test report along with a statement of compliance status. The tester will normally wear rubber gloves and goggles when sampling.

2 ANALYSIS RESULTS

The results of the sample analyses were reported as follows -

Analyte	Units	HE 24 / 6864/S1	HE 24 / 6864/S2	Maximum permitted release limit
pH	-	8.2	8.3	6 – 9
Suspended Solids	mg/l	10	14	-
Total Cadmium	mg/l	< 0.02	<0.02	-
Total Chromium	mg/l	0.39	0.17	1
Total Copper	mg/l	0.10	0.12	1
Total Cyanide	mg/l	< 0.1	<0.1	-
Total Nickel	mg/l	<0.1	<0.1	1
Total Mercury	mg/l	< 0.004	<0.004	-
Total Lead	mg/l	< 0.02	<0.02	1
Total Zinc	mg/l	< 0.5	<0.5	2

* denotes a release above the permit limits.

3 FURTHER ACTIONS

The results reported in section 2 need to be entered onto Environment Agency Reporting Form S1 (23.02.05) and sent to the local Environment Agency Office, this to meet the provisions of Schedule 3 of the installation permit.

A copy of this report should be retained for a period of not less than 12 months.

Tim Growcott BSc (Hons) MRSC C Sci C Chem MIMF
Senior Partner

HARD 6864 WATER 2024 REP

REPORT REF - HE 24 / 6977

Release Points S1 and S2 Water Sample Analyses

for

Hard Anodising Surface Treatments Limited

Firs Industrial Estate
Stourport Road
Kidderminster
DY11 7QN

Study Period; - 5th June 2024

ISSUE STATUS		HE 24 / 6977	
ISSUE	01	CHECKED: T GROWCOTT	APPROVED: T GROWCOTT
ISSUED		10.06.2024	

Halcyon Environmental

SECTION	CONTENTS

HARD ANODISING SURFACE TREATMENTS LIMITED
FIRS INDUSTRIAL ESTATE
STOURPORT ROAD
KIDDERMINSTER
DY11 7QN

10th June 2024

FAO: Mr C Connon – Quality Co - ordinator

REPORT REF - HE 24 / 6977

RELEASE POINTS S1 AND S2 WATER SAMPLE ANALYSES

1 INTRODUCTION

Under the provisions of the Hard Anodising Surface Treatments Limited IPPC A1 permit (ref. No. BV 89381D), as per table 2.2.8 *Emission limits and monitoring frequency to sewer,* release points S1 and S2 require formal analysis to confirm that releases meet the limits defined within the permit.

The permit details BS EN ISO 17294 -2.2003 as the monitoring method. A formal deviation has been sought by site personnel in respect of this method as they have been unable to source the samples to any laboratory capable of meeting the specification. As such the test procedures used to determine the results reported herein are included in this report.

The S1 and S2 release locations at the Hard Anodising Limited premises was sampled by site personnel on 5th June 2024 and submitted to Halcyon and subsequently analysed by a third-party laboratory under the direction of the author.

The sample was submitted as specified by the laboratory's protocols.

Receipt of this report should be included in the site's BS EN ISO 14001 Environmental Management System, as a reported analysis of process sourced releases. The samples were defined as follows for analytical purposes; -

Sample Reference HE 24 / 6977	Site Location
Release Point S1	Factory 1: 10.35
Release Point S2	Factory 2: 10.40

The sample was transported in accordance with Halcyon Test procedure HALC.WATERTEST.02. The sample bottle was filled "brimful", wrapped in silver foil and transported in a cool box to the test laboratory.

Water sampling is undertaken using a standardised sampling procedure. This encompasses the use of a purpose made water-dipping device. Essentially a weighted stainless steel tube is dip immersed into the drain/stream/tank using various extension rods to obtain the relevant depth.

Dipping tubes come in a range of sizes and shapes and the tester selects suitable one for testing.

The sampling procedure has been established to provide a valid sample from the test point; often sampling may take place over hours or even days to reflect the prevailing conditions.

The sample, usually 20 – 250 mls is then transferred immediately to a sample bottle. These are purpose supplied from a bone fide supplier (Socotec). Any test location that may have a legal compliance issue will be sampled in duplicate and the second sample will be retained by Halcyon for any subsequent testing requirement. To obtain a 1000 mls samples 4 or 5 separate dips are aggregated. Importantly the sample bottle is always “brim filled”, cap sealed, wrapped in silver foil (to keep out light) and transferred to a cool box for transportation and subsequent analysis. The tester formally records the test location, time of sampling, any deviations, time of sampling and prevailing climactic conditions where deemed necessary. Any evidence of readily identified oil films, chemical sedimentation or separation is also recorded in the same manner.

Any sampling which is supporting a Consent to Discharge Trade Effluent issue will have its temperature recorded at the time of sampling. Colour and turbidity initially are assessed at the time of sampling whereas COD and BOD must be tested at the time set within the relevant British Standard.

The testing suite may encompass the determination of dissolved metals, pH, suspended solids, dispersed oils etc; all of these to be undertaken in accordance with currently approved methodologies by trained and competent personnel. To ensure that the dip tube does not become contaminated, after a sample has been taken it is washed in acetone or Decon 90 solution (to remove any oils, greases, diesel fuels etc.), then thrice rinsed in de ionised water. The dip tube is thoroughly dried for the next sampling takes place.

Where a sampling location has defined release limits, these will be obtained normally for inclusion within the generated test report along with a statement of compliance status. The tester will normally wear rubber gloves and goggles when sampling.

2 ANALYSIS RESULTS

The results of the sample analyses were reported as follows -

Analyte	Units	HE 24 / 6977/S1	HE 24 / 6977/S2	Maximum permitted release limit
pH	-	8.6	8.4	6 – 9
Suspended Solids	mg/l	8	11	-
Total Cadmium	mg/l	0.000004	0.00001	-
Total Chromium	mg/l	0.41	0.18	1
Total Copper	mg/l	0.16	0.08	1
Total Cyanide	mg/l	0.00004	0.0001	-
Total Nickel	mg/l	0.0004	0.002	1
Total Mercury	mg/l	0.0001	0.0001	-
Total Lead	mg/l	0.000002	0.000001	1
Total Zinc	mg/l	0.003	0.0006	2

* denotes a release above the permit limits.

3 FURTHER ACTIONS

The results reported in section 2 need to be entered onto Environment Agency Reporting Form S1 (23.02.05) and sent to the local Environment Agency Office, this to meet the provisions of Schedule 3 of the installation permit.

A copy of this report should be retained for a period of not less than 12 months.

Tim Growcott BSc (Hons) MRSC C Sci C Chem MIMF
Senior Partner

HARD 6977 WATER 2024 REP

REPORT REF - HE 24 / 7104

Release Points S1 and S2 Water Sample Analyses

for

Hard Anodising Surface Treatments Limited

Firs Industrial Estate
Stourport Road
Kidderminster
DY11 7QN

Study Period; - 9th September 2024

ISSUE STATUS		HE 24 / 7104	
ISSUE	01	CHECKED: T GROWCOTT	APPROVED: T GROWCOTT
ISSUED		18.09.2024	

SECTION	CONTENTS

HARD ANODISING SURFACE TREATMENTS LIMITED
FIRS INDUSTRIAL ESTATE
STOURPORT ROAD
KIDDERMINSTER
DY11 7QN

18th September 2024

FAO: Mr C Connon – Quality Co - ordinator

REPORT REF - HE 24 / 7104

RELEASE POINTS S1 AND S2 WATER SAMPLE ANALYSES

1 INTRODUCTION

Under the provisions of the Hard Anodising Surface Treatments Limited IPPC A1 permit (ref. No. BV 89381D), as per table 2.2.8 *Emission limits and monitoring frequency to sewer,* release points S1 and S2 require formal analysis to confirm that releases meet the limits defined within the permit.

The permit details BS EN ISO 17294 -2.2003 as the monitoring method. A formal deviation has been sought by site personnel in respect of this method as they have been unable to source the samples to any laboratory capable of meeting the specification. As such the test procedures used to determine the results reported herein are included in this report.

The S1 and S2 release locations at the Hard Anodising Limited premises was sampled by site personnel on 9th. September 2024 and submitted to Halcyon and subsequently analysed by a third-party laboratory under the direction of the author.

The sample was submitted as specified by the laboratory's protocols.

Receipt of this report should be included in the site's BS EN ISO 14001 Environmental Management System, as a reported analysis of process sourced releases. The samples were defined as follows for analytical purposes; -

Sample Reference HE 24 / 7104	Site Location
Release Point S1	Factory 1: 09.35
Release Point S2	Factory 2: 09.40

The sample was transported in accordance with Halcyon Test procedure HALC.WATERTEST.02. The sample bottle was filled "brimful", wrapped in silver foil and transported in a cool box to the test laboratory.

Water sampling is undertaken using a standardised sampling procedure. This encompasses the use of a purpose made water-dipping device. Essentially a weighted stainless steel tube is dip immersed into the drain/stream/tank using various extension rods to obtain the relevant depth.

Dipping tubes come in a range of sizes and shapes and the tester selects suitable one for testing.

The sampling procedure has been established to provide a valid sample from the test point; often sampling may take place over hours or even days to reflect the prevailing conditions.

The sample, usually 20 – 250 mls is then transferred immediately to a sample bottle. These are purpose supplied from a bone fide supplier (Socotec). Any test location that may have a legal compliance issue will be sampled in duplicate and the second sample will be retained by Halcyon for any subsequent testing requirement. To obtain a 1000 mls samples 4 or 5 separate dips are aggregated. Importantly the sample bottle is always “brim filled”, cap sealed, wrapped in silver foil (to keep out light) and transferred to a cool box for transportation and subsequent analysis. The tester formally records the test location, time of sampling, any deviations, time of sampling and prevailing climactic conditions where deemed necessary. Any evidence of readily identified oil films, chemical sedimentation or separation is also recorded in the same manner.

Any sampling which is supporting a Consent to Discharge Trade Effluent issue will have its temperature recorded at the time of sampling. Colour and turbidity initially are assessed at the time of sampling whereas COD and BOD must be tested at the time set within the relevant British Standard.

The testing suite may encompass the determination of dissolved metals, pH, suspended solids, dispersed oils etc; all of these to be undertaken in accordance with currently approved methodologies by trained and competent personnel. To ensure that the dip tube does not become contaminated, after a sample has been taken it is washed in acetone or Decon 90 solution (to remove any oils, greases, diesel fuels etc.), then thrice rinsed in de ionised water. The dip tube is thoroughly dried for the next sampling takes place.

Where a sampling location has defined release limits, these will be obtained normally for inclusion within the generated test report along with a statement of compliance status. The tester will normally wear rubber gloves and goggles when sampling.

2 ANALYSIS RESULTS

The results of the sample analyses were reported as follows -

Analyte	Units	HE 24 / 7104/S1	HE 24 / 7104/S2	Maximum permitted release limit
pH	-	8.6	8.5	6 – 9
Suspended Solids	mg/l	5	9	-
Total Cadmium	mg/l	0.000004	0.00001	-
Total Chromium	mg/l	0.37	0.12	1
Total Copper	mg/l	0.16	0.08	1
Total Cyanide	mg/l	0.00001	0.0001	-
Total Nickel	mg/l	0.0002	0.002	1
Total Mercury	mg/l	0.0001	0.0001	-
Total Lead	mg/l	0.000002	0.000001	1
Total Zinc	mg/l	0.003	0.0012	2

* denotes a release above the permit limits.

3 FURTHER ACTIONS

The results reported in section 2 need to be entered onto Environment Agency Reporting Form S1 (23.02.05) and sent to the local Environment Agency Office, this to meet the provisions of Schedule 3 of the installation permit.

A copy of this report should be retained for a period of not less than 12 months.

Tim Growcott BSc (Hons) MRSC C Sci C Chem MIMF
Senior Partner

HARD 7104 WATER 2024 REP

REPORT REF - HE 24 / 7242

Release Points S1 and S2 Water Sample Analyses

for

Hard Anodising Surface Treatments Limited

Firs Industrial Estate
Stourport Road
Kidderminster
DY11 7QN

Study Period; -10th December 2024

ISSUE STATUS		HE 24 / 7242	
ISSUE	01	CHECKED: S J LATHAM	APPROVED: T GROWCOTT
ISSUED		30.12.2024	

SECTION	CONTENTS

HARD ANODISING SURFACE TREATMENTS LIMITED
FIRS INDUSTRIAL ESTATE
STOURPORT ROAD
KIDDERMINSTER
DY11 7QN

30th. December 2024

FAO: Mr C Connon – Quality Co - ordinator

REPORT REF - HE 24 / 7242

RELEASE POINTS S1 AND S2 WATER SAMPLE ANALYSES

1 INTRODUCTION

Under the provisions of the Hard Anodising Surface Treatments Limited IPPC A1 permit (ref. No. BV 89381D), as per table 2.2.8 *Emission limits and monitoring frequency to sewer,* release points S1 and S2 require formal analysis to confirm that releases meet the limits defined within the permit.

The permit details BS EN ISO 17294 -2.2003 as the monitoring method. A formal deviation has been sought by site personnel in respect of this method as they have been unable to source the samples to any laboratory capable of meeting the specification. As such the test procedures used to determine the results reported herein are included in this report.

The S1 and S2 release locations at the Hard Anodising Limited premises was sampled by site personnel on 10th. December 2024 and submitted to Halcyon and subsequently analysed.

The sample was submitted as specified by the laboratory's protocols.

Receipt of this report should be included in the site's BS EN ISO 14001 Environmental Management System, as a reported analysis of process sourced releases. The samples were defined as follows for analytical purposes; -

Sample Reference HE 24 / 7242	Site Location
Release Point S1	Factory 1: 08.35
Release Point S2	Factory 2: 08.20

The sample was transported in accordance with Halcyon Test procedure HALC.WATERTEST.02. The sample bottle was filled "brimful", wrapped in silver foil and transported in a cool box to the test laboratory.

Water sampling is undertaken using a standardised sampling procedure. This encompasses the use of a purpose made water-dipping device. Essentially a weighted stainless steel tube is dip immersed into the drain/stream/tank using various extension rods to obtain the relevant depth.

Dipping tubes come in a range of sizes and shapes and the tester selects suitable one for testing.

The sampling procedure has been established to provide a valid sample from the test point; often sampling may take place over hours or even days to reflect the prevailing conditions.

The sample, usually 20 – 250 mls is then transferred immediately to a sample bottle. These are purpose supplied from a bone fide supplier (Socotec). Any test location that may have a legal compliance issue will be sampled in duplicate and the second sample will be retained by Halcyon for any subsequent testing requirement. To obtain a 1000 mls samples 4 or 5 separate dips are aggregated. Importantly the sample bottle is always “brim filled”, cap sealed, wrapped in silver foil (to keep out light) and transferred to a cool box for transportation and subsequent analysis. The tester formally records the test location, time of sampling, any deviations, time of sampling and prevailing climactic conditions where deemed necessary. Any evidence of readily identified oil films, chemical sedimentation or separation is also recorded in the same manner.

Any sampling which is supporting a Consent to Discharge Trade Effluent issue will have its temperature recorded at the time of sampling. Colour and turbidity initially are assessed at the time of sampling whereas COD and BOD must be tested at the time set within the relevant British Standard.

The testing suite may encompass the determination of dissolved metals, pH, suspended solids, dispersed oils etc; all of these to be undertaken in accordance with currently approved methodologies by trained and competent personnel. To ensure that the dip tube does not become contaminated, after a sample has been taken it is washed in acetone or Decon 90 solution (to remove any oils, greases, diesel fuels etc.), then thrice rinsed in de ionised water. The dip tube is thoroughly dried before the next sampling takes place.

Where a sampling location has defined release limits, these will be obtained normally for inclusion within the generated test report along with a statement of compliance status. The tester will normally wear rubber gloves and goggles when sampling.

2 ANALYSIS RESULTS

The results of the sample analyses were reported as follows -

Analyte	Units	HE 24 / 7242/S1	HE 24 / 7242/S2	Maximum permitted release limit
pH	-	8.3	8.6	6 – 9
Suspended Solids	mg/l	8	5	-
Total Cadmium	mg/l	0.000004	0.00001	-
Total Chromium	mg/l	0.44	0.10	1
Total Copper	mg/l	0.20	0.06	1
Total Cyanide	mg/l	0.00001	0.0001	-
Total Nickel	mg/l	0.0002	0.002	1
Total Mercury	mg/l	0.0001	0.0001	-
Total Lead	mg/l	0.000001	0.000001	1
Total Zinc	mg/l	0.0024	0.0005	2

* denotes a release above the permit limits.

3 FURTHER ACTIONS

The results reported in section 2 need to be entered onto Environment Agency Reporting Form S1 (23.02.05) and sent to the local Environment Agency Office, this to meet the provisions of Schedule 3 of the installation permit.

A copy of this report should be retained for a period of not less than 12 months.

Tim Growcott BSc (Hons) MRSC C Sci C Chem MIMF
Senior Partner

HARD 7242 WATER 2024 REP

The sampling procedure has been established to provide a valid sample from the test point; often sampling may take place over hours or even days to reflect the prevailing conditions.

The sample, usually 20 – 250 mls is then transferred immediately to a sample bottle. These are purpose supplied from a bone fide supplier (Socotec). Any test location that may have a legal compliance issue will be sampled in duplicate and the second sample will be retained by Halcyon for any subsequent testing requirement. To obtain a 1000 mls samples 4 or 5 separate dips are aggregated. Importantly the sample bottle is always "brim filled", cap sealed, wrapped in silver foil (to keep out light) and transferred to a cool box for transportation and subsequent analysis. The tester formally records the test location, time of sampling, any deviations, time of sampling and prevailing climactic conditions where deemed necessary. Any evidence of readily identified oil films, chemical sedimentation or separation is also recorded in the same manner.

Any sampling which is supporting a Consent to Discharge Trade Effluent issue will have its temperature recorded at the time of sampling. Colour and turbidity initially are assessed at the time of sampling whereas COD and BOD must be tested at the time set within the relevant British Standard.

The testing suite may encompass the determination of dissolved metals, pH, suspended solids, dispersed oils etc; all of these to be undertaken in accordance with currently approved methodologies by trained and competent personnel. To ensure that the dip tube does not become contaminated, after a sample has been taken it is washed in acetone or Decon 90 solution (to remove any oils, greases, diesel fuels etc.), then thrice rinsed in de ionised water. The dip tube is thoroughly dried before the next sampling takes place.

Where a sampling location has defined release limits, these will be obtained normally for inclusion within the generated test report along with a statement of compliance status. The tester will normally wear rubber gloves and goggles when sampling.

2 ANALYSIS RESULTS

The results of the sample analyses were reported as follows -

Analyte	Units	HE 25 / 7360/S1	HE 25 / 7360/S2	Maximum permitted release limit
pH	-	8.6	7.8	6 – 9
Suspended Solids	mg/l	11	8	-
Total Cadmium	mg/l	0.000004	0.00001	-
Total Chromium	mg/l	0.41	0.11	1
Total Copper	mg/l	0.29	0.04	1
Total Cyanide	mg/l	0.00001	0.0001	-
Total Nickel	mg/l	0.0002	0.002	1
Total Mercury	mg/l	0.0001	0.0001	-
Total Lead	mg/l	0.000001	0.000001	1
Total Zinc	mg/l	0.0016	0.0004	2

The sampling procedure has been established to provide a valid sample from the test point; often sampling may take place over hours or even days to reflect the prevailing conditions.

The sample, usually 20 – 250 mls is then transferred immediately to a sample bottle. These are purpose supplied from a bone fide supplier (Socotec). Any test location that may have a legal compliance issue will be sampled in duplicate and the second sample will be retained by Halcyon for any subsequent testing requirement. To obtain a 1000 mls samples 4 or 5 separate dips are aggregated. Importantly the sample bottle is always "brim filled", cap sealed, wrapped in silver foil (to keep out light) and transferred to a cool box for transportation and subsequent analysis. The tester formally records the test location, time of sampling, any deviations, time of sampling and prevailing climactic conditions where deemed necessary. Any evidence of readily identified oil films, chemical sedimentation or separation is also recorded in the same manner.

Any sampling which is supporting a Consent to Discharge Trade Effluent issue will have its temperature recorded at the time of sampling. Colour and turbidity initially are assessed at the time of sampling whereas COD and BOD must be tested at the time set within the relevant British Standard.

The testing suite may encompass the determination of dissolved metals, pH, suspended solids, dispersed oils etc; all of these to be undertaken in accordance with currently approved methodologies by trained and competent personnel. To ensure that the dip tube does not become contaminated, after a sample has been taken it is washed in acetone or Decon 90 solution (to remove any oils, greases, diesel fuels etc.), then thrice rinsed in de ionised water. The dip tube is thoroughly dried before the next sampling takes place.

Where a sampling location has defined release limits, these will be obtained normally for inclusion within the generated test report along with a statement of compliance status. The tester will normally wear rubber gloves and goggles when sampling.

2 ANALYSIS RESULTS

The results of the sample analyses were reported as follows -

Analyte	Units	HE 25 / 7360/S1	HE 25 / 7360/S2	Maximum permitted release limit
pH	-	8.5	8.4	6 – 9
Suspended Solids	mg/l	10	6	-
Total Cadmium	mg/l	0.000004	0.000002	-
Total Chromium	mg/l	0.20	0.10	1
Total Copper	mg/l	0.09	0.03	1
Total Cyanide	mg/l	0.00001	0.0001	-
Total Nickel	mg/l	0.0002	0.002	1
Total Mercury	mg/l	0.0001	0.0001	-
Total Lead	mg/l	0.000001	0.000001	1
Total Zinc	mg/l	0.0011	0.0003	2

The sampling procedure has been established to provide a valid sample from the test point; often sampling may take place over hours or even days to reflect the prevailing conditions.

The sample, usually 20 – 250 mls is then transferred immediately to a sample bottle. These are purpose supplied from a bone fide supplier (Socotec). Any test location that may have a legal compliance issue will be sampled in duplicate and the second sample will be retained by Halcyon for any subsequent testing requirement. To obtain a 1000 mls samples 4 or 5 separate dips are aggregated. Importantly the sample bottle is always "brim filled", cap sealed, wrapped in silver foil (to keep out light) and transferred to a cool box for transportation and subsequent analysis. The tester formally records the test location, time of sampling, any deviations, time of sampling and prevailing climactic conditions where deemed necessary. Any evidence of readily identified oil films, chemical sedimentation or separation is also recorded in the same manner.

Any sampling which is supporting a Consent to Discharge Trade Effluent issue will have its temperature recorded at the time of sampling. Colour and turbidity initially are assessed at the time of sampling whereas COD and BOD must be tested at the time set within the relevant British Standard.

The testing suite may encompass the determination of dissolved metals, pH, suspended solids, dispersed oils etc; all of these to be undertaken in accordance with currently approved methodologies by trained and competent personnel. To ensure that the dip tube does not become contaminated, after a sample has been taken it is washed in acetone or Decon 90 solution (to remove any oils, greases, diesel fuels etc.), then thrice rinsed in de ionised water. The dip tube is thoroughly dried before the next sampling takes place.

Where a sampling location has defined release limits, these will be obtained normally for inclusion within the generated test report along with a statement of compliance status. The tester will normally wear rubber gloves and goggles when sampling.

2 ANALYSIS RESULTS

The results of the sample analyses were reported as follows -

Analyte	Units	HE 25 / 7605/S1	HE 25 / 7605/S2	Maximum permitted release limit
pH	-	8.6	8.5	6 – 9
Suspended Solids	mg/l	6	8	-
Total Cadmium	mg/l	0.000003	0.000002	-
Total Chromium	mg/l	0.16	0.10	1
Total Copper	mg/l	0.08	0.02	1
Total Cyanide	mg/l	0.00001	0.0001	-
Total Nickel	mg/l	0.0001	0.0001	1
Total Mercury	mg/l	0.0001	0.0001	-
Total Lead	mg/l	0.000001	0.000001	1
Total Zinc	mg/l	0.0011	0.0003	2

The sampling procedure has been established to provide a valid sample from the test point; often sampling may take place over hours or even days to reflect the prevailing conditions.

The sample, usually 20 – 250 mls is then transferred immediately to a sample bottle. These are purpose supplied from a bone fide supplier (Socotec). Any test location that may have a legal compliance issue will be sampled in duplicate and the second sample will be retained by Halcyon for any subsequent testing requirement. To obtain a 1000 mls samples 4 or 5 separate dips are aggregated. Importantly the sample bottle is always "brim filled", cap sealed, wrapped in silver foil (to keep out light) and transferred to a cool box for transportation and subsequent analysis. The tester formally records the test location, time of sampling, any deviations, time of sampling and prevailing climactic conditions where deemed necessary. Any evidence of readily identified oil films, chemical sedimentation or separation is also recorded in the same manner.

Any sampling which is supporting a Consent to Discharge Trade Effluent issue will have its temperature recorded at the time of sampling. Colour and turbidity initially are assessed at the time of sampling whereas COD and BOD must be tested at the time set within the relevant British Standard.

The testing suite may encompass the determination of dissolved metals, pH, suspended solids, dispersed oils etc; all of these to be undertaken in accordance with currently approved methodologies by trained and competent personnel. To ensure that the dip tube does not become contaminated, after a sample has been taken it is washed in acetone or Decon 90 solution (to remove any oils, greases, diesel fuels etc.), then thrice rinsed in de ionised water. The dip tube is thoroughly dried before the next sampling takes place.

Where a sampling location has defined release limits, these will be obtained normally for inclusion within the generated test report along with a statement of compliance status. The tester will normally wear rubber gloves and goggles when sampling.

2 ANALYSIS RESULTS

The results of the sample analyses were reported as follows -

Analyte	Units	HE 25 / 7741/S1	HE 25 / 7741/S2	Maximum permitted release limit
pH	-	8.7	8.6	6 – 9
Suspended Solids	mg/l	4	6	-
Total Cadmium	mg/l	0.000003	0.000002	-
Total Chromium	mg/l	0.19	0.10	1
Total Copper	mg/l	0.09	0.05	1
Total Cyanide	mg/l	0.00001	0.0001	-
Total Nickel	mg/l	0.0001	0.0001	1
Total Mercury	mg/l	0.0001	0.0001	-
Total Lead	mg/l	0.000001	0.000001	1
Total Zinc	mg/l	0.0010	0.0004	2

REPORT TO BE SENT TO:

Philip Bayliss
Hard Anodising Surface Treatments Limited
Factory 1; Firs Industrial Est
Kidderminster
Worcestershire
DY11 7QN

ANALYSIS REPORT

SAMPLING POINT CODE 9990134

SAMPLE FROM: Hard Anodising Surface Treatments Limited
Factory 1; Firs Industrial Est
Kidderminster
Worcestershire
DY11 7QN

DESCRIPTION: Anodising

SAMPLE NUMBER: 2001427
SAMPLE DATE: 03/02/2026 SAMPLE METHOD: Spot
SAMPLE TIME: 11:35:00 SAMPLE REASON: TE Control Sample
CHARGEABLE N TAKEN BY : 285

DETERMINAND	RESULT VALUE	UNITS	CONSENT LIMITS
CHROMIUM (TOTAL) AS CR (MG/L)	0.249	mg/l	IM 0: 2
Copper (total) as Cu (mg/l)	0.0278	mg/l	IM 0: 1
Lead (total) as Pb (mg/l)	0.00380	mg/l	IM 0: 1
Nickel (total) as Ni (mg/l)	0.778	mg/l	IM 0: 2
Zinc (total) as Zn (mg/l)	0.0195	mg/l	IM 0: 2
Sampling Access (TE site test)	P		
PH	8.9	pH_unit	IM 6: 10

REPORT DATE: 17/02/26

ENQUIRIES REGARDING THIS REPORT SHOULD BE MADE TO: RAKESH PATEL
07500974684
rakesh.patel@severntrent.co.uk

SIGNED: DATE:

REPORT TO BE SENT TO:

Philip Bayliss
Hard Anodising Surface Treatments Limited
Factory 2; Firs Industrial Est
Kidderminster
Worcestershire
DY11 7QN

ANALYSIS REPORT

SAMPLING POINT CODE 9990135

SAMPLE FROM: Hard Anodising Surface Treatments Limited
Factory 2; Firs Industrial Est
Kidderminster
Worcestershire
DY11 7QN

DESCRIPTION: Anodising

SAMPLE NUMBER: 2001424
SAMPLE DATE: 03/02/2026 SAMPLE METHOD: Spot
SAMPLE TIME: 11:29:00 SAMPLE REASON: TE Control Sample
CHARGEABLE N TAKEN BY : 285

DETERMINAND	RESULT VALUE	UNITS	CONSENT LIMITS
CHROMIUM (TOTAL) AS CR (MG/L)	0.0512	mg/l	IM 0: 2
Copper (total) as Cu (mg/l)	0.0024	mg/l	IM 0: 1
Lead (total) as Pb (mg/l)	0.00052	mg/l	IM 0: 1
Nickel (total) as Ni (mg/l)	0.0499	mg/l	IM 0: 2
Zinc (total) as Zn (mg/l)	0.0242	mg/l	IM 0: 2
Sampling Access (TE site test)	P		
PH	8.8	pH_unit	IM 6: 10

REPORT DATE: 16/02/26

ENQUIRIES REGARDING THIS REPORT SHOULD BE MADE TO: RAKESH PATEL
07500974684
rakesh.patel@severntrent.co.uk

SIGNED: DATE:

Hard Anodising Surface Treatments Ltd

Point Source Emissions to Air

Emission Points to Air Location Table

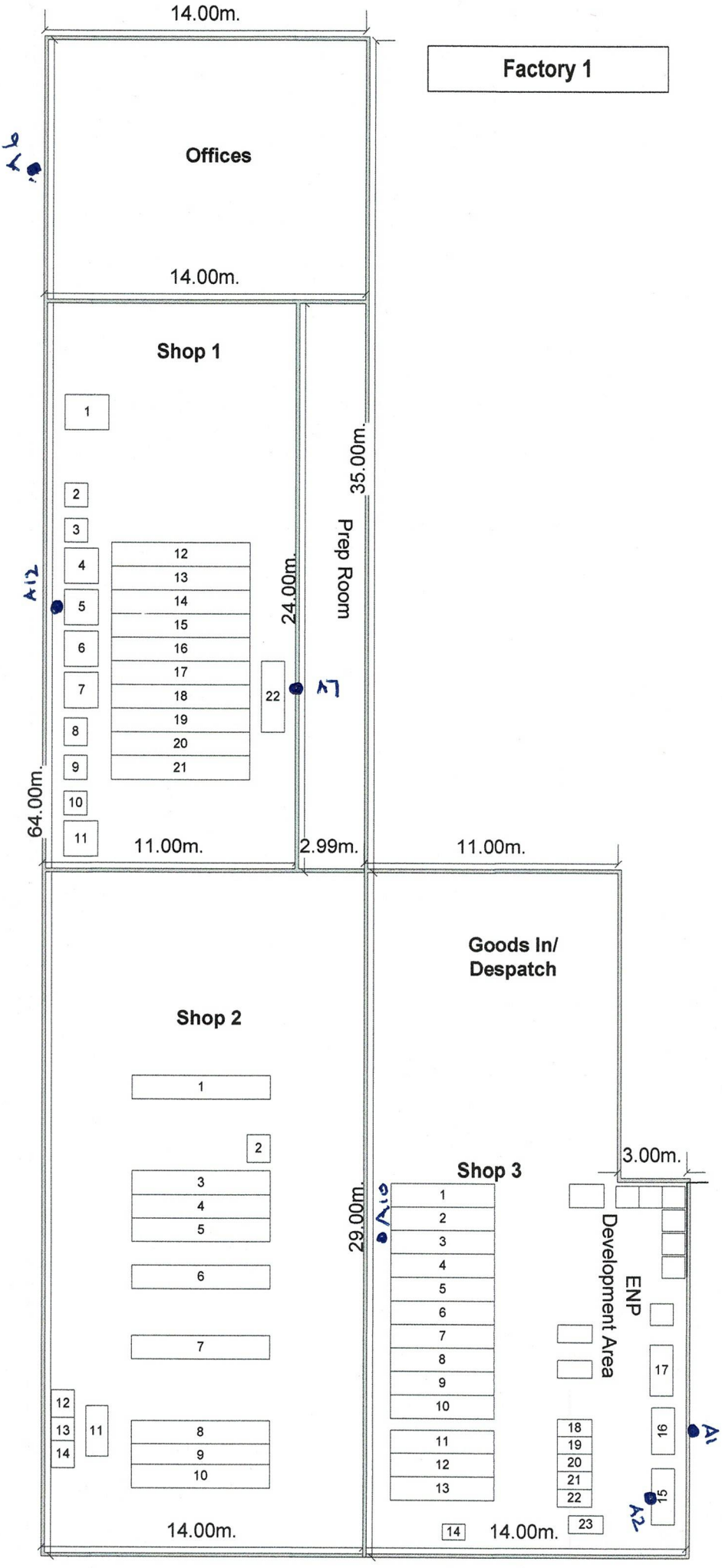
EMISSION POINTS TO AIR

March 2024

EMISSION POINT	LEV SOURCE	LOCATION
A1	Nitric Acid – via stack	Factory 1 – Shop 3
A2	Chromic Acid – via stack	Factory 1 – Shop 3
A3	Vapour Degreasing Unit – via ducting **REMOVED**	Factory 1 – Shop 1
A4	Vapour Degreasing Heater – via stack **REMOVED**	Factory 1 – Shop 1
A5	Lacquering Table – via ducting **REMOVED**	Factory 1 – Jigging/ Preparation Room
A6	Lab Fume Cupboard – via stack	Factory 1 - Laboratory
A7	Anodising Vat 2 – via stack	Factory 1 – Shop 1
A8	Wall Extraction Fan (Cupboard)	Factory 1 – Lacquer Room
A9	Anodising Vats 9 & 12 – via stack	Factory 2
A10	ENP Vats 15/16 – via stack	Factory 1 – Shop 3
A11	Maintenance Area – via stack	Factory 2
A12	Dichromate Seal – via stack	Factory 1 – Shop 1
A 13	Dichromate Seal – via stack	Factory 2
A14	Roof Fan (Dichromate Seal)	Factory 2
A15	Roof Fan	Factory 1 – Shop 1
A16	Wall Fan (De-Lacquer Vat)	Factory 1 – Shop 1
A17	Roof Fan	Factory 1 – Shop 3
A18	Wall Fan (connected via plug-top)	Factory 1 – Shop 2
A19	Wall Extraction Fan	Factory 1 – Lacquer Room
A20	Wall Extraction Fan	Factory 1 – Lacquer Room
A21	Lacquering Table – via ducting	Factory 1 – Lacquer Room

Hard Anodising Surface Treatments Ltd

Stack Location Plan



Shop 1

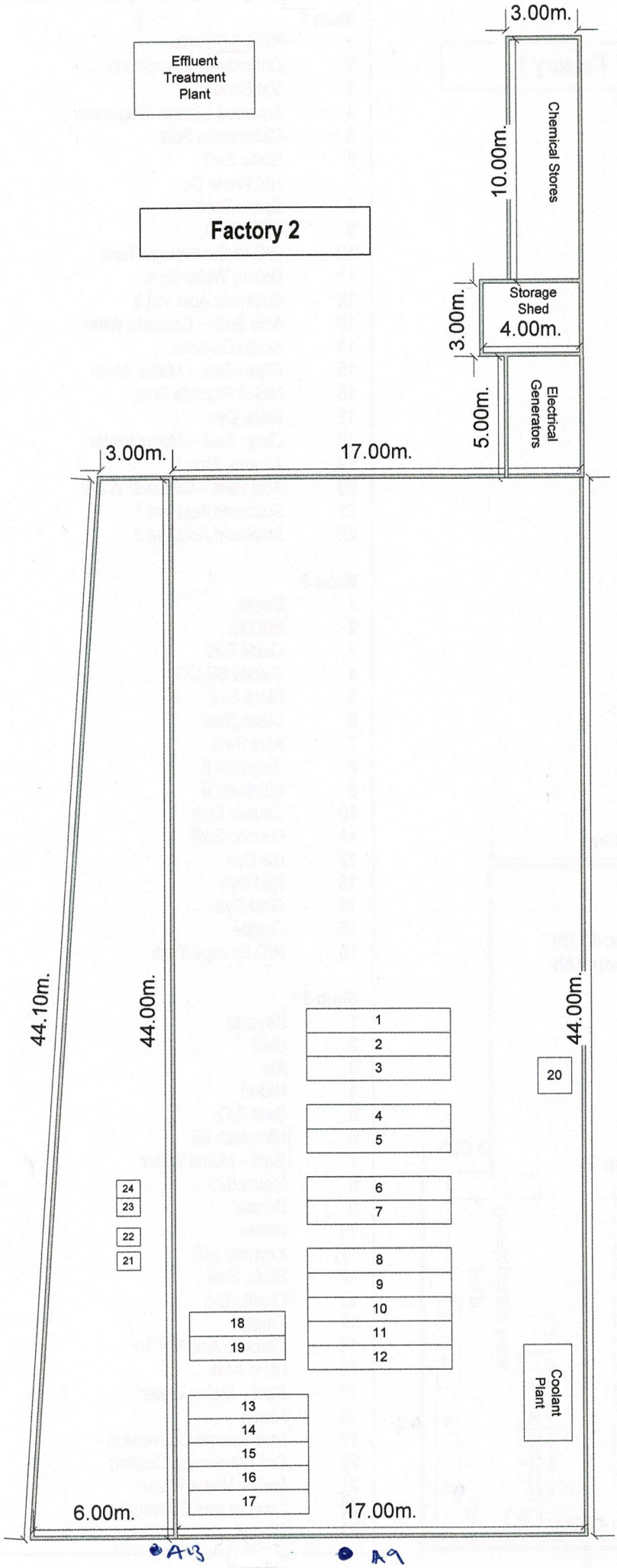
1	KEM-SOL Wax
2	Chromium / Phosphoric
3	Vat Bund
4	Aqueous Cleaner/Degreaser
5	Dichromate Seal
6	Static Swill
7	Hot Water Dip
8	Spare Tank
9	PTFE/PFA
10	R/O Water Storage Tank
11	Boiling Water Seal
12	Sulphuric Acid Vat 3
13	Acid Swill – Cascade Water
14	Acidic De-smut
15	Clean Swill – Mains Water
16	Nickel Fluoride Seal
17	Black Dye
18	Clean Swill – Mains Water
19	Alkaline Etch
20	Acid Swill – Cascade Water
21	Sulphuric Acid Vat 1
22	Sulphuric Acid Vat 2

Shop 2

1	Empty
2	Hot Dip
3	Oxide D30
4	Oxidite SE CO
5	Black Dye
6	Clean Swill
7	Acid Swill
8	Sulphuric 5
9	Sulphuric 6
10	Caustic Etch
11	Caustic Swill
12	Ble Dye
13	Red Dye
14	Gold Dye
15	Oxidite
16	R/O Storage Tank

Shop 3

1	Keycote
2	Swill
3	Alu
4	Nickel
5	Swill R/O
6	Microtech 66
7	Swill – Mains Water
8	Metex 629
9	Bondal
10	Metex
11	Keynote 245
12	Static Swill
13	Oxidite C-8
14	Empty
15	Chromic Acid Vat 10
16	Nitric Acid
17	Swill – Mains Water
18	Nickel
19	Non-chrome Conversion
20	Cr6 Conversion Coating
21	Swill – Mains Water
22	Non-chrome Conversion
23	Empty



1	Spare Tank
2	Spare Tank
3	Oxidite SE CO
4	Swill – Mains Water
5	Cr3 Conversion/passivation
6	Clean Swill – Mains Water
7	Iridite TCP III
8	Sulphuric Acid Vat 12
9	Acid Swill
10	Sulphuric Acid V12
11	Sulphuric Acit V9
12	Oxidite C8
13	Hot Water Dip
14	Swill 3
15	Dichromate Swill – Cascade Water
16	Dichromate Swill – Cascade Water
17	Sodium Dichromate
18	Dichromate Swill
19	PTFE
20	R/O
21	Hot Water
22	PTFE
23	Masco 425 DMY

Stack Heights & Photographs

STACK HEIGHT AND HEIGHTS ABOVE ROOF APEX

Stack Ref	Height Above Roof Apex (m)	Stack Height (m)
A1	0	6
A2	3	9
A6	0	5
A7	0	8
A8	0	8
A9	3	9
A10	2	8
A11	0	7
A12	0	7
A13	2	8
A14	0	N/A
A15	0	N/A
A16	0	N/A
A17	0	N/A
A18	0	N/A
A19	0	N/A
A20	0	N/A
A21	0	N/A

Building Height Factory 1 = 6m

Building Height Factory 2 = 6m

PHOTOGRAPH 1 - A1

PHOTOGRAPH 2 - A2

PHOTOGRAPH 3 - A6

PHOTOGRAPH 4 - A7

PHOTOGRAPH 5 – A9

PHOTOGRAPH 6 - A12

PHOTOGRAPH 7 - A13

PHOTOGRAPH 8 - A16

PHOTOGRAPH 9 - A19

PHOTOGRAPH 10 - A20

Hard Anodising Surface Treatments Ltd

Element Air Emissions Test Reports

Element, Unit C6, Emery Court, The Embankment Business Park, Heaton Mersey, Stockport, SK4 3GL
Your Element Contact: Richard Carter (+44(0)7585 894 426)
E: richard.carter@element.com

Stack Emissions Testing Report Commissioned by
Envirosolution Ltd

Installation Name & Address
Hard Anodising Surface Treatments Ltd
Firs Estate
Stourport Road
Kidderminster
DY11 7QN

Stack Reference
A1 Nitric Acid

Dates of the Monitoring Campaign
6th January 2026

Job Reference Number
EMT15043

Report Written by
Ewan Price Team Leader MCERTS Level 2 Team Leader TE1 TE2 TE3 TE4

Report Approved by
Tracy Dodds Key Account Manager MCERTS Level 2 MM 03 414 TE1 TE2 TE3 TE4

Report Date
2nd February 2026

Version
Version 1

Signature of Report Approver


CONTENTS

Opinions and interpretations expressed herein are outside the scope of Element's ISO 17025 accreditation.

MONITORING OBJECTIVES

Hard Anodising Surface Treatments Ltd, Kidderminster
A1 Nitric Acid
6th January 2026

Overall Aim of the Monitoring Campaign

Element were commissioned by Envirosolution Ltd to carry out stack emissions testing for Hard Anodising Surface Treatments Ltd on the A1 Nitric Acid at Kidderminster.

The aim of the monitoring campaign was to perform testing, as requested by the customer, for a number of prescribed pollutants. There are no emission limits set for any of the pollutants at this time.

Special Requirements

There were no special requirements.

Target Parameters

Total Particulate Matter, Sulphur Dioxide, Nickel, Total VOCs (as Carbon), Oxides of Nitrogen (as NO_2)

Executive Summary

MONITORING RESULTS

Hard Anodising Surface Treatments Ltd, Kidderminster

A1 Nitric Acid

6th January 2026

where MU = Measurement Uncertainty associated with the Result

	Concentration				Mass Emission			
Parameter	**Units**	**Result**	**MU +/-**	**Limit**	**Units**	**Result**	**MU +/-**	**Limit**
Total Particulate Matter [1]	mg/m³	0.99	0.42	-	g/hr	0.41	0.18	-
Sulphur Dioxide [1]	mg/m³	0.049	0.0035	-	g/hr	0.020	0.0022	-
Nickel [1]	mg/m³	0.0042	0.0007	-	g/hr	0.0017	0.00033	-
Total VOCs (as Carbon) [1]	mg/m³	2.9	0.44	-	g/hr	1.2	0.21	-
Oxides of Nitrogen (as NO_2) [1]	mg/m³	3.8	1.7	-	g/hr	1.6	0.71	-
Water Vapour	% v/v	0.79	0.041					
Stack Gas Temperature	°C	13.3						
Stack Gas Velocity	m/s	6.7	0.48					
Volumetric Flow Rate (ACTUAL)	m³/hr	428	36.3					
Volumetric Flow Rate (REF) [1]	m³/hr	409	34.7					

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM AN AVERAGE OF ALL OF THE ISOKINETIC RUNS.

[1] Reference Conditions (REF) are: 273K, 101.3kPa, without correction for water vapour content.

MONITORING DATE(S) & TIMES

Hard Anodising Surface Treatments Ltd, Kidderminster
A1 Nitric Acid
6th January 2026

Parameter		Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins
Total Particulate Matter	R1	mg/m³	1.0	g/hr	0.41	06/01/2026	13:40 - 14:40	60
Sulphur Dioxide	R1	mg/m³	0.049	g/hr	0.020	06/01/2026	13:40 - 14:40	60
Nickel	R1	mg/m³	0.0042	g/hr	0.0017	06/01/2026	14:46 - 15:46	60
Total VOCs (as Carbon)	R1	mg/m³	2.9	g/hr	1.2	06/01/2026	13:40 - 14:40	60
Oxides of Nitrogen (as NO_2)	R1	mg/m³	3.8	g/hr	1.6	06/01/2026	13:40 -14:40	60
Velocity Traverse	R1					06/01/2026	13:22 - 13:27	

All results are expressed at the respective reference conditions.

PROCESS DETAILS

Hard Anodising Surface Treatments Ltd, Kidderminster

A1 Nitric Acid

6th January 2026

Standard Operating Conditions

Parameter	Value
Process Status	Normal Operation
Capacity (of 100%) and Tonnes / Hour	100%
Continuous or Batch Process	Batch
Feedstock (if applicable)	Jig Cleaning
Abatement System	N/A
Abatement System Running Status	N/A
Fuel	N/A - Electric Heating
Plume Appearance	Vapour Plume Visable

MONITORING & ANALYTICAL METHODS

Hard Anodising Surface Treatments Ltd, Kidderminster

A1 Nitric Acid

6th January 2026

	Monitoring				Analysis					
Parameter	**Standard**	**Technical Procedure**	**Sampling Status**	**Testing Lab**	**Analytical Procedure**	**Analytical Technique**	**Analysis Status**	**Analysis Lab**	**Overall Status**	**LOD (Average)**
Total Particulate Matter	EN 13284-1	MD 001	MCERTS	EET	MD 103	Gravimetric	MCERTS	EET	MCERTS	0.2 mg/m³
Sulphur Dioxide	EN 14791	MD 009	MCERTS	EET	MD 101	IC	MCERTS	EET	MCERTS	0.016 mg/m³
Nickel	EN 14385	MD 006	MCERTS	EET	MD 107	ICP-MS	MCERTS	EET	MCERTS	0.001 mg/m³
Water Vapour	EN 14790	MD 005	MCERTS	EET	MD 005	Gravimetric	MCERTS	EET	MCERTS	0.10 % v/v
Total VOCs (as Carbon)	EN 12619:2013	MD 020	MCERTS	EET	Flame Ionisation Detection by Sick 3006				MCERTS	0.32 mg/m³
Oxides of Nitrogen (as NO_2)	EN 14792	MD 039	MCERTS	EET	Chemiluminescence by Horiba PG-350E				MCERTS	0.41 mg/m³
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041	MCERTS	EET	Pitot Tube and Thermocouple				MCERTS	1.2 m/s

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

Element (Stockport Lab - EET)	ISO 17025 Accreditation Number: UKAS 4279

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
Sulphur Dioxide	Run 1	The absorption efficiency was less than the required 95%. [50 - 75%]
Nickel	Run 1	The absorption efficiency was less than the required 90%. [50 - 75%]

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.15
Width	m	-
Area	m^2	0.02
Port Depth	cm	10
Orientation of Duct	-	Vertical
Number of Ports	-	1
Sample Port Size	-	4" BSP

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	Temporary
Inside / Outside	Outside

Platform Details

EA Technical Guidance Note M1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	Yes
Platform has vertical base boards (approx. 0.25m high)	Yes
Platform has chains / self closing gates at top of ladders	Yes
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations.

EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

Sampling Plane Validation Criteria (from EN 15259)

Criteria in EN 15259	Units	Traverse 1	Required	Compliant
Lowest Differential Pressure	Pa	43.2	> 5 Pa	Yes
Mean Velocity	m/s	7.02	-	-
Lowest Gas Velocity	m/s	7.02	-	-
Highest Gas Velocity	m/s	7.02	-	-
Ratio of Above	: 1	1.00	< 3 : 1	Yes
Maximum Angle of Swirl	°	4.00	< 15°	Yes
No Local Negative Flow	-	Yes	-	Yes

Executive Summary

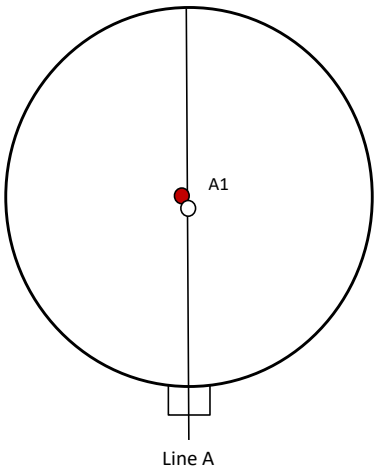
(Page 7 of 7)

PLANT PHOTOS

Photo 1

Photo 2

SAMPLE POINTS



where
- ○ = isokinetic point sampled at
- ● = isokinetic point not sampled at
- ● = combustion gases sample point
- ● = non-isokinetic sample point

APPENDIX CONTENTS

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Ewan Price	MCERTS Level 2	MM 21 1654	TE1 TE2 TE3 TE4
Trainee	Greg Stretton	MCERTS Trainee	MM 24 1853	N/A

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	CAT 7.122
Control Box DGM (2)	-
Box Thermocouples (1)	CAT 3.136
Box Thermocouples (2)	-
Umbilical (1)	CAT 3.136
Umbilical (2)	-
Oven Box (1)	CAT 12.106
Oven Box (2)	-
Heated Probe (1)	CAT 5.10
Heated Probe (2)	-
Heated Probe (3)	-
S-Pitot (1)	CAT 21P.193
S-Pitot (2)	CAT 21S.76
L-Pitot	-
Site Balance	CAT 17.92
500g / 1Kg Check Weights	CAT 17.92
Last Impinger Arm	-
Callipers	-
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-350E	CAT 39.29
Horiba PG-250 SRM	-
Servomex 5200 MP	-
Ankersmid AOX210	-
ABB AO2020-URAS26	-
Testo 350 XL	-
M&C PSS5	CAT 4.1961
ProtIR 204M	-
Gasmet Sampling System	-
Sick 3006	CAT 8.10
M&C PSS	CAT 12.112
Mass Flow Controller (1)	CAT 6.19
Mass Flow Controller (2)	CAT 6.20
Mass View (1)	-
Mass View (2)	-
Hioki 5043 (V)	CAT 11.117
Hioki 5043 (V)	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	CAT 3.230
Digital Manometer (2)	-
Digital Temperature Meter	CAT 3.230
Stopwatch	CAT 14.53
Barometer	-
Stack Thermocouple (1)	CAT 4.1461
Stack Thermocouple (2)	CAT A009112
Stack Thermocouple (3)	-
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	CAT 20.274
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	CAT 1.18, 1.18a, 1.18b
Tape Measure	CAT 16.69

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Total Particulate Matter	EN 13284-1	MD 001
Sulphur Dioxide	EN 14791	MD 009
Nickel	EN 14385	MD 006
Water Vapour	EN 14790	MD 005
Total VOCs (as Carbon)	EN 12619:2013	MD 020
Oxides of Nitrogen (as NO_2)	EN 14792	MD 039
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041

PRELIMINARY STACK SURVEY: CALCULATIONS

General Stack Details

Stack Details (from Traverse)	Units	Value
Stack Diameter / Depth, D	m	0.15
Stack Width, W	m	-
Stack Area, A	m^2	0.02
Average Stack Gas Temperature, T_a	°C	14.0
Average Stack Gas Pressure	Pa	43.2
Average Stack Static Pressure, P_{static}	kPa	0.052
Average Barometric Pressure, P_b	kPa	101.7
Average Pitot Tube Calibration Coefficient, C_p	-	0.84

Stack Gas Composition & Molecular Weights

Component	Conc ppm	Conc Dry % v/v	Conc Wet % v/v	Volume Fraction r	Molar Mass M	Density kg/m³ p	Conc kg/m³ p_i
CO_2 (Estimated)	-	0.06	0.06	0.0006	44.01	1.9635	0.00118
O_2 (Estimated)	-	20.80	20.64	0.2080	32.00	1.4277	0.29696
N_2	-	79.14	78.52	0.7914	28.01	1.2498	0.98913
Moisture (H_2O)	-	-	0.79	0.0079	18.02	0.8037	0.00634

Where: $p = M / 22.41$

$p_i = r \times p$

Calculation of Stack Gas Densities

Determinand	Units	Result
Dry Density (STP), P_{STD}	kg/m³	1.287
Wet Density (STP), P_{STW}	kg/m³	1.283
Dry Density (Actual), P_{Actual}	kg/m³	1.230
Average Wet Density (Actual), $P_{ActualW}$	kg/m³	1.226

Where: P_{STD} = sum of component concentrations, kg/m³ (not including water vapour)

P_{STW} = sum of all wet concentrations / 100 x density, kg/m³ (including water vapour)

$P_{Actual} = P_{STD} \times (T_{STP} / (P_{STP})) \times ((P_{static} + P_b) / T_a)$

$P_{ActualW}$ (at each sampling point) $= P_{STW} \times (T_s / P_s) \times (P_a / T_a)$

Calculation of Stack Gas Volumetric Flowrate, Q

Duct gas flow conditions	Units	Actual	REF [1]
Temperature	°C	14.0	0.0
Total Pressure	kPa	101.8	101.3
Moisture	%	0.79	0.79

Gas Volumetric Flowrate (from Traverse)	Units	Result
Gas Volumetric Flowrate (Actual)	m³/hr	447
Gas Volumetric Flowrate (STP, Wet)	m³/hr	427
Gas Volumetric Flowrate (STP, Dry)	m³/hr	423
Gas Volumetric Flowrate REF [1]	m³/hr	427

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID)

(1 of 1)

Parameter	Units	Value
Date of Survey	-	06/01/2026
Time of Survey	-	13:22 - 13:27
Atmospheric Pressure	kPa	101.7
Average Stack Static Pressure	Pa	52
Result of Pitot Stagnation Test	-	Pass
Are Water Droplets Present?	-	No
Device Used	S-Type Pitot with KIMO MP 210 (500Pa)	

Parameter	Units	Value
Initial Pitot Leak Check	-	Pass
Final Pitot Leak Check	-	Pass
Orientation of Duct	-	Vertical
Pitot Tube, C_p	-	0.84
Number of Lines Available	-	1
Number of Lines Used	-	1

Sampling Line A

Traverse Point	Depth m	ΔP Pa	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °
STATIC (Units: Pa)		*52.1*				
Mean		**43.2**	**14.0**	**1.226**	**7.02**	
1	0.08	43.2	14.0	1.226	7.02	4.0

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID) - MEASUREMENT UNCERTAINTY

(1 of 1)

Performance characteristics (Uncertainty Components)	Uncertainty	Value	Units
Standard Uncertainty on the coefficient of the Pitot Tube	u(k)	0.005	-
Standard Uncertainty associated with the mean local dynamic pressures	u(Δpi)	1.150	Pa
- Resolution	u(res)	0.00087	
- Calibration	u(cal)	0.194	
- Drift	u(drift)	0.083	
- Lack of Fit	u(fit)	0.044	
- Overall corrections to dynamic measurements	u(Cf)	0.323	
Standard uncertainty associated with the molar mass of the gas	u(M)	0.00003	-
- $\varphi O_2,w$	-	20.636	
- $\varphi CO_2,w$	-	0.060	
- Oxygen, dry	u(ϕO_2,d)	0.637	
- Carbon Dioxide, dry	u(ϕCO_2,d)	0.002	
- Water Vapour	u(ϕH_2O)	0.040	
- Oxygen, wet	u(ϕO_2,w)	0.632	
- Carbon Dioxide, wet	u(ϕCO_2,w)	0.002	
Standard uncertainty associated with the stack temperature	u(Tc)	1.464	K
Standard uncertainty associated with the absolute pressure in the duct	u(pc)	175.696	Pa
- Atmospheric Pressure	u(patm)	175.692	
- Static Pressure	u(pstat)	1.150	
Standard uncertainty associated with the density in the duct	u(ρ)	0.00669	-
Standard uncertainty associated with the local velocities	u(vi)	0.257	Pa
Standard uncertainty associated with the mean velocity	u(v)	0.257	m/s
Standard uncertainty associated with the mean velocity (95% Confidence)	Uc(v)	0.504	m/s
Standard uncertainty associated with the mean velocity (95% Confidence), relative	Uc,rel(v)	7.18	%
Standard uncertainty associated with the volume flow rate (95% Confidence)	Uc(qV,w)	37.9	m^3/hr
- $u^2(a)/a^2$	-	0.00053	
- $u^2(qV,w)/q^2V,w$	-	0.00187	
- $u^2(qV,w)$	-	374	
- $u(qV,w)$	-	19.3	
Standard uncertainty associated with the volume flow rate (95% Confidence), relative	Uc,rel(qV,w)	8.49	%

TOTAL PARTICULATE MATTER: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster

A1 Nitric Acid

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.99		0.99
Uncertainty	±mg/m³	0.42		0.42
Mass Emission	g/hr	0.41		0.41
Uncertainty	±g/hr	0.18		0.18

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.61		0.61
Uncertainty	±% v/v	0.033		0.033

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.20		0.20

NOTE: Where the Balance Uncertainty / Limit of Detection is higher than the Blank concentration, the Balance Uncertainty / Limit of Detection concentration has been reported.

General Sampling Information

Parameter	Value	
Standard	EN 13284-1	
Technical Procedure	MD 001	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL PARTICULATE MATTER: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	762.8
Stack static pressure, P_{static}	mmH_2O	5.3
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	763.2
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	1.8
Total mass collected in impingers (silica trap)	g	4.0
Total mass of liquid collected, V_{lc}	g	5.8
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0072
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.1944
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	5.2
Average pressure drop across orifice, ΔH	mmH_2O	37.6
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.1702
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0061
B_{wo} as a percentage	% v/v	0.61
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.61
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.1774
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.78
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	4.02
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.00
Average stack gas temperature, T_s	°C	13.3
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	6.71
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.02
$Q_a = (60)(A_s)(V_s)$	m^3/min	7.1
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	6.8
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	6.8
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	7.99
Nozzle area, A_n	mm^2	50.10
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	101.7

TOTAL PARTICULATE MATTER: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	13:40 - 14:40
Sampling Dates	-	06/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.1774
Filter I.D. Number	-	47-114083
Start Filter Mass	g	0.14574
End Filter Mass	g	0.14632
Total Mass on Filter	g	0.00058
Probe Rinse I.D. Number	-	PR-47-114083
Start Probe Rinse Mass	g	2.84927
End Probe Rinse Mass	g	2.84987
Total Mass in Probe Rinse	g	0.00059
Total Mass Collected	mg	1.17
Calculated Concentration	mg/m^3	0.99
Balance Uncertainty / LOD	mg/m^3	0.20

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	06/01/2026
Average Volume Sampled (REF)	m^3	1.1774
Filter I.D. Number	-	47-125412
Start Filter Mass	g	0.14421
End Filter Mass	g	0.14423
Total Mass on Filter	g	0.00002
Probe Rinse I.D. Number	-	PR-47-125412
Start Probe Rinse Mass	g	2.61657
End Probe Rinse Mass	g	2.61672
Total Mass in Probe Rinse	g	0.00016
Total Mass Collected	mg	0.18
Calculated Concentration	mg/m^3	0.15
Balance Uncertainty / LOD	mg/m^3	0.20

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	19.7
Pre-Sampling Leak Rate	l/min	0.16
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.4
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	101.7
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Weighing Uncertainty Criteria	Units	Run 1
Overall Weighing Uncertainty	± mg	0.33
Overall Weighing Uncertainty	± mg/m³	0.28
ELV [Daily ELV for IED]	mg/m³	N/A
Allowable Weighing Uncertainty	mg/m³	N/A
Weighing Uncertainty Acceptable	-	N/A

Filter Temperatures	Units	Run 1
Pre-Conditioning Temperature	°C	180
Post-Conditioning Temperature	°C	160
Maximum Filter Temperature	°C	14

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.35
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Acetone / Water Rinse Blank	Units	Blank
Acetone / Water Rinse Value	mg/l	2.7
Allowable Blank	mg/l	10
Blank Acceptable	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
There are no deviations associated with the sampling employed.	wx	

TOTAL PARTICULATE MATTER: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.1944	uV_m	m^3	0.0239
Sampled Gas Temperature	T_m	278.2	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.8	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	0.81	uL	%	-
Mass of Particulate	m	1.17	um	mg	0.23
Uncollected Mass	UCM	0.18	uUCM	mg	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.72	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.81	≤2%
Mass of Particulate	%	-	-
Uncollected Mass	%	-	-

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.1702	0.85
Leak	L	mg/m^3	0.005	1.00
Mass of Particulate	L_r	mg	1.170	0.85
Uncollected Mass	UCM	mg	0.10	0.85

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.024
Leak	mg/m^3	0.0047
Mass of Particulate	mg/m^3	0.1953
Uncollected Mass	mg/m^3	0.0883

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.22
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.42
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.42
Reported Uncertainty	mg/m^3	0.42
Expanded uncertainty (95% confidence), without Oxygen Correction	%	42.6
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	42.6
Reported Uncertainty	%	42.6
Reported Uncertainty as % of ELV	%	N/A

SULPHUR DIOXIDE: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A1 Nitric Acid

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.049		0.049
Uncertainty	±mg/m³	0.0035		0.0035
Mass Emission	g/hr	0.020		0.020
Uncertainty	±g/hr	0.0022		0.0022

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.61		0.61
Uncertainty	±% v/v	0.033		0.033

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	< 0.014		< 0.014

General Sampling Information

Parameter	Value	
Standard	EN 14791	
Technical Procedure	MD 009	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 101	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	08/01/2026	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Impinger Material	Polyethylene	
Absorption Solution	0.3% Hydrogen Peroxide	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

SULPHUR DIOXIDE: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	762.8
Stack static pressure, P_{static}	mmH_2O	5.3
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	763.2
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	1.8
Total mass collected in impingers (silica trap)	g	4.0
Total mass of liquid collected, V_{lc}	g	5.8
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0072
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.1944
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	5.2
Average pressure drop across orifice, ΔH	mmH_2O	37.6
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.1702
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0061
B_{wo} as a percentage	% v/v	0.61
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.61
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.1774
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.78
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	4.02
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.00
Average stack gas temperature, T_s	°C	13.3
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	6.71
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.02
$Q_a = (60)(A_s)(V_s)$	m^3/min	7.1
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	6.8
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	6.8
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	7.99
Nozzle area, A_n	mm^2	50.10
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	101.7

SULPHUR DIOXIDE: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	13:40 - 14:40
Sampling Dates	-	06/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.1774
Laboratory Result for Front Impingers	µg/ml	0.13
Laboratory Result for Back Impinger	µg/ml	0.18
Volume in Front Impingers	ml	251.8
Volume in Back Impinger	ml	135.7
Mass in Front Impingers	µg	32.7
Mass in Back Impinger	µg	24.4
Total Mass Collected	µg	57.2
Calculated Concentration	mg/m^3	0.05

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	06/01/2026
Average Volume Sampled (REF)	m^3	1.1774
Laboratory Result for Impingers	µg/ml	< 0.05
Volume in Impingers	ml	318.8
Total Mass Collected	µg	< 15.9
Calculated Concentration	mg/m^3	< 0.01

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	19.7
Pre-Sampling Leak Rate	l/min	0.16
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	57.3
Allowable Absorption Efficiency	%	95
Absorption Efficiency Acceptable	-	No

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.4
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	101.7
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	14

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.35
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
The absorption efficiency was less than the required 95%. [50 - 75%]	x	

SULPHUR DIOXIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.1944	uV_m	m^3	0.0239
Sampled Gas Temperature	T_m	278.2	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.8	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	0.81	uL	%	-
Laboratory Result	L_r	0.90	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.72	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.81	≤2%
Laboratory Result	%	0.90	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.1702	0.04
Leak	L	mg/m^3	0.000	1.00
Laboratory Result	L_r	mg/m^3	0.000	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.001
Leak	mg/m^3	0.0002
Laboratory Result	mg/m^3	0.0004

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.0013
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.0025
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.0035
Reported Uncertainty	mg/m^3	0.0035
Expanded uncertainty (95% confidence), without Oxygen Correction	%	5.2
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	7.2
Reported Uncertainty	%	7.2
Reported Uncertainty as % of ELV	%	N/A

NICKEL: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A1 Nitric Acid

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.0042		0.0042
Uncertainty	±mg/m³	0.00073		0.00073
Mass Emission	g/hr	0.0017		0.0017
Uncertainty	±g/hr	0.00033		0.00033

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.96		0.96
Uncertainty	±% v/v	0.050		0.050

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.0006		0.0006

General Sampling Information

Parameter	Value	
Standard	EN 14385	
Technical Procedure	MD 006	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 107	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	15/01/2026	
Probe Material	Titanium	
Filter Housing Material	Borosilicate Glass	
Impinger Material	Borosilicate Glass	
Absorption Solution	Nitric Peroxide	
Positioning of Filter	Out Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

NICKEL: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	762.8
Stack static pressure, P_{static}	mmH_2O	5.3
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	763.2
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	6.6
Total mass collected in impingers (silica trap)	g	2.6
Total mass of liquid collected, V_{lc}	g	9.2
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0115
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.2144
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	7.8
Average pressure drop across orifice, ΔH	mmH_2O	38.7
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.1788
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0096
B_{wo} as a percentage	% v/v	0.96
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.96
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.1902
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.74
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	4.07
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.02
Average stack gas temperature, T_s	°C	13.5
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	6.75
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.02
$Q_a = (60)(A_s)(V_s)$	m^3/min	7.2
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	6.9
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	6.8
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	8.01
Nozzle area, A_n	mm^2	50.35
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	101.6

NICKEL: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	14:46 - 15:46
Sampling Dates	-	06/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.1902
Mass on Filter / in Rinse	µg	0.79
Mass in Front Impingers	µg	2.21
Mass in Back Impinger	µg	1.95
Total Mass Collected	µg	4.94
Calculated Concentration	mg/m^3	0.0042
Reported Concentration	mg/m^3	0.0042

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	06/01/2026
Average Volume Sampled (REF)	m^3	1.1902
Mass on Filter / in Rinse	µg	< 0.60
Mass in Front Impingers	µg	0.08
Mass in Back Impinger	µg	< 0.03
Total Mass Collected	µg	0.70
Calculated Concentration	mg/m^3	0.0006
Reported Concentration	mg/m^3	0.0006

NICKEL: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	20.1
Pre-Sampling Leak Rate	l/min	0.17
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	60.6
Allowable Absorption Efficiency	%	90
Absorption Efficiency Acceptable	-	No

Detection Limit	Units	Run 1
Detection Limit	µg/m³	0.6
Allowable Detection Limit	µg/m³	5
Detection Limit Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.2
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	101.6
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	180

Impingers Exit Temperature	Units	Run 1
Maximum Temperature Recorded	°C	8
Maximum Allowable Temperature	°C	30
Exit Temperature Acceptable	-	Yes

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

NICKEL: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.28
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
The absorption efficiency was less than the required 90%. [50 - 75%]	x	

NICKEL: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.2144	uV_m	m³	0.0243
Sampled Gas Temperature	T_m	280.8	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.8	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.0	uH_m	% v/v	1.00
Leak	L	0.85	uL	%	-
Laboratory Result	L_r	5.90	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.71	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.85	≤2%
Laboratory Result	%	5.90	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m³	1.1788	0.0035
Leak	L	mg/m³	0.0000	1.00
Laboratory Result	L_r	mg/m³	0.0002	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m³	0.0001
Leak	mg/m³	0.0000
Laboratory Result	mg/m³	0.0002

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	%	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m³	0.0003
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m³	0.0005
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m³	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m³	0.0007
Reported Uncertainty	mg/m³	0.0007
Expanded uncertainty (95% confidence), without Oxygen Correction	%	12.6
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	17.6
Reported Uncertainty	%	17.6
Reported Uncertainty as % of ELV	%	N/A

TOTAL VOCs (as CARBON): RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster

A1 Nitric Acid

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	2.9		2.9
Uncertainty	±mg/m³	0.44		0.44
Mass Emission	g/hr	1.2		1.2
Uncertainty	±g/hr	0.21		0.21

General Sampling Information

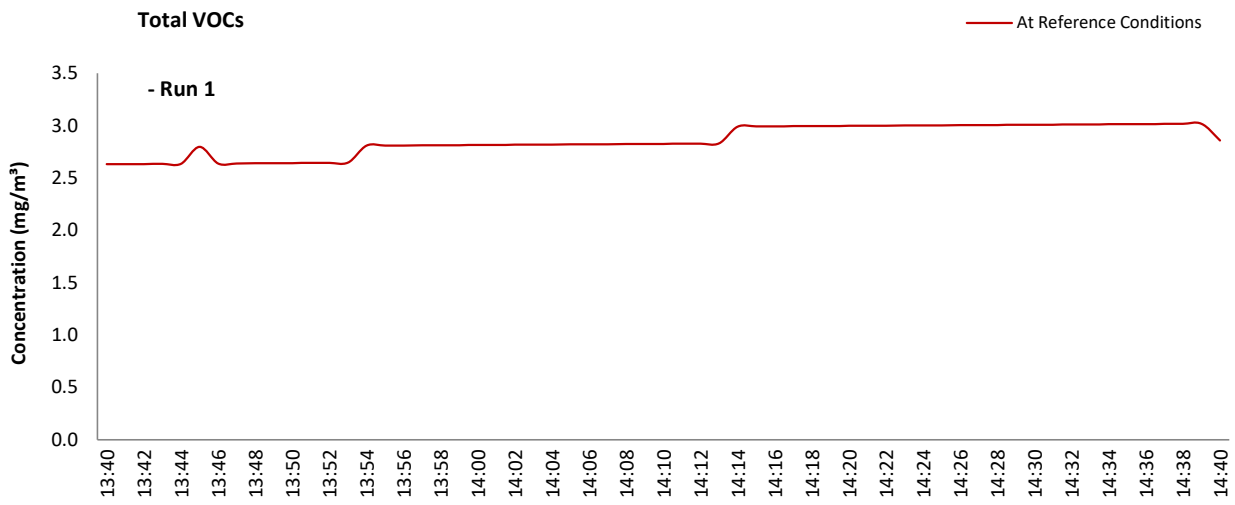
Parameter	Value	
Standard	EN 12619:2013	
Technical Procedure	MD 020	
Probe Material	Titanium	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Propane In Synthetic Air (5 Grade)	
Span Gas Reference Number	1.0623	
Span Gas Expiry Date	07/01/2029	
Span Gas Start Pressure (bar)	45	
Gas Cylinder Concentration (ppm)	80.5	
Span Gas Set Point (ppm)	80.50	
Span Gas Uncertainty (%)	2	
Zero Gas Type	Synthetic Air (5 Grade)	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL VOCs (as CARBON): DATA TREND

Graphical Trend of Data



TOTAL VOCs (as CARBON): SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	13:40 - 14:40
Sampling Dates	-	06/01/2026
Instrument Range	ppm	100
Span Gas Value	ppm	80.5

Quality Assurance

	Zero Drift	Units	Run 1
CAL 1	Zero Down Sampling Line (Pre)	ppm	0.00
CAL 1	Zero Down Sampling Line (Post)	ppm	-0.10
CAL 1	Zero Drift	ppm	-0.10
CAL 1	Zero Drift	%	-0.13
CAL 1	Drift Correction Applied	2-5%	No
	Allowable Zero Drift	± ppm	4.03
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span Down Sampling Line (Pre)	ppm	79.70
CAL 1	Span Down Sampling Line (Post)	ppm	80.90
CAL 1	Span Drift	ppm	1.20
CAL 1	Span Drift	%	1.51
CAL 1	Drift Correction Applied	2-5%	No
	Allowable Span Drift	± ppm	4.03
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	1 - 4

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
There are no deviations associated with the sampling employed.	x	

TOTAL VOCs (as CARBON): MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	-		mg/m³ (REF)
Allowable MU	15.0		%
Measured concentration	2.88		mg/m³ (STP, dry)
Range Used	100.0		ppm
Range Used [A]	160.6		mg/m³
Cal gas conc.	80.5		ppm
Conversion	1.61		ppm to mg/m³
MCERTS Range [B]	15.0		mg/m³
Lower of [A] or [B]	15.0		mg/m³
Cal gas conc.	129.3		mg/m³

Performance characteristics	RUN 1		Units
Response time	45		seconds
Number of readings in measurement	60		-
Repeatability at zero	2.00		% full scale
Repeatability at span level	0.00		% full scale
Deviation from linearity	0.07		% of value
Zero drift	-0.13		% full scale
Span drift	1.51		% full scale
Volume or pressure flow dependence	1.60		% of full scale
Atmospheric pressure dependence	0.30		% of value/kPa
Ambient temperature dependence	1.40		% full scale/10K
Combined interference	0.45		% range
Dependence on voltage	0.50		% full scale/10V
Losses in the line (leak)	1.37		% of value
Uncertainty of calibration gas	2.00		% of value

Performance characteristic	RUN 1		Units
Standard deviation of repeatability at zero	use rep at span		mg/m³
Standard deviation of repeatability at span level	0.00		mg/m³
Lack of fit	0.01		mg/m³
Drift	-0.07		mg/m³
Volume or pressure flow dependence	0.00		mg/m³
Atmospheric pressure dependence	0.01		mg/m³
Ambient temperature dependence	0.20		mg/m³
Combined interference (from MCERTS Certificate)	0.04		mg/m³
Dependence on voltage	0.06		mg/m³
Losses in the line (leak)	0.02		mg/m³
Uncertainty of calibration gas	0.03		mg/m³

			RUN 1		Units
Measurement uncertainty		**Result**	2.88		mg/m³
Combined uncertainty			0.23		mg/m³
Expanded uncertainty	k =	1.96	0.45		mg/m³
Uncertainty corrected to std conds. (O_2)			0.45		mg/m³ (REF)

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	15.55		% of Value
Expanded uncertainty (no O_2) - at 95% Confidence	N/A		% at ELV
Overall Allowable uncertainty (no O_2) - at 95% Confidence	N/A		% at ELV
Result of Compliance with Uncertainty Requirement	**N/A**		-

	RUN 1		Units
Expanded uncertainty (with O_2) - at 95% Confidence	N/A		% of Value
Expanded uncertainty (with O_2) - at 95% Confidence	N/A		% at ELV
Overall Allowable uncertainty (with O_2) - at 95% Confidence	N/A		% at ELV
Result of Compliance with Uncertainty Requirement	**N/A**		-

Requirement for SRM is that Uncertainty should be <15% of the value at the ELV, on a dry gas basis, or if O_2 correction is applied less than 15% + the uncertainty associated with the O_2 correction (using sqrt of sum squares to add uncertainty components).

OXIDES OF NITROGEN (as NO_2): RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster

A1 Nitric Acid

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	3.8		3.8
Uncertainty	±mg/m³	1.7		1.7
Mass Emission	g/hr	1.6		1.6
Uncertainty	±g/hr	0.71		0.71

General Sampling Information

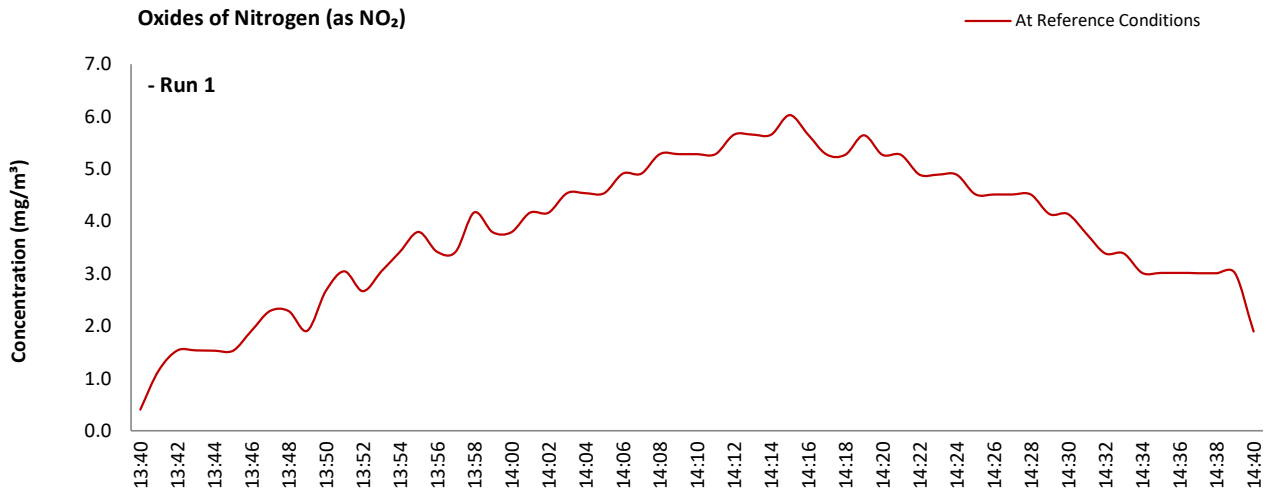
Parameter	Value	
Standard	EN 14792	
Technical Procedure	MD 039	
Probe Material	Titanium	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Date & Result of Last Converter Check	11/09/2025 - 97.6%	
Span Gas Type	Nitrogen Monoxide	
Span Gas Reference Number	12.0733	
Span Gas Expiry Date	07/04/2027	
Span Gas Start Pressure (bar)	80	
Gas Cylinder Concentration (ppm)	417.3	NOTE: Dilution performed to achieve correct span value
Span Gas Uncertainty (%)	2	
Zero Gas Type	Nitrogen (5 Grade)	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

OXIDES OF NITROGEN (as NO_2): DATA TREND

Graphical Trend of Data



OXIDES OF NITROGEN (as NO_2): SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	13:40 -14:40
Sampling Dates	-	06/01/2026
Instrument Range	ppm	500
Span Gas Value	ppm	417.3

Quality Assurance

Conditioning Unit Temperature	Units	Run 1
Average Temperature	°C	3.0
Allowable Temperature	< °C	4.0
Temperature Acceptable	-	Yes

	Zero Drift	Units	Run 1
CAL 1	Zero at Analyser (Pre)	ppm	0.00
CAL 1	Zero at Analyser (Post)	ppm	-0.02
CAL 1	Zero Drift	ppm	-0.02
CAL 1	Zero Drift	%	0.00
CAL 1	Drift Correction Applied	2-5%	No
	Allowable Zero Drift	± %	5.00
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span at Analyser (Pre)	ppm	417.30
CAL 1	Span at Analyser (Post)	ppm	436.60
CAL 1	Span Drift	ppm	19.30
CAL 1	Zero Adj. Span Drift	%	4.63
CAL 1	Drift Correction Applied	2-5%	Yes
	Allowable Span Drift	± %	5.00
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	1 - 4

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
There are no deviations associated with the sampling employed.	x	

OXIDES OF NITROGEN (as NO_2): MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	-		mg/m³ (REF)
Allowable MU	10.0		%
Measured concentration	3.85		mg/m³ (STP, dry)
Ratio NO / NO_2	5		%
Range Used	500.0		ppm
Range Used [A]	1026.1		mg/m³
Cal gas conc.	417.3		ppm
Conversion	2.05		ppm to mg/m³
MCERTS Range [B]	205.0		mg/m³
Lower of [A] or [B]	205.0		mg/m³
Cal gas conc.	856.4		mg/m³

Performance characteristics	RUN 1		Units
Response time	31		seconds
Number of readings in measurement	60		-
Repeatability at zero	0.00		% full scale
Repeatability at span level	0.10		% full scale
Deviation from linearity	0.39		% of value
Zero drift	0.00		% full scale
Span drift	0.00		% full scale
Volume or pressure flow dependence	0.10		% of full scale
Atmospheric pressure dependence	0.10		% of value/kPa
Ambient temperature dependence	0.04		% full scale/10K
Combined interference	0.63		% range
Dependence on voltage	-0.23		% full scale/10V
Converter efficiency	97.6		%
Losses in the line (leak)	0.41		% of value
Uncertainty of calibration gas blending	1.40		% of value
Uncertainty of calibration gas	2.00		% of value

Performance characteristic	RUN 1		Units
Standard deviation of repeatability at zero	use rep at span		mg/m³
Standard deviation of repeatability at span level	0.01		mg/m³
Lack of fit	0.46		mg/m³
Drift	-0.02		mg/m³
Volume or pressure flow dependence	0.00		mg/m³
Atmospheric pressure dependence	0.06		mg/m³
Ambient temperature dependence	0.01		mg/m³
Combined interference (from MCERTS Certificate)	0.75		mg/m³
Dependence on voltage	-0.03		mg/m³
Converter efficiency	0.00		mg/m³
Losses in the line (leak)	0.01		mg/m³
Uncertainty of calibration gas blending	0.03		mg/m³
Uncertainty of calibration gas	0.04		mg/m³

			RUN 1		Units
Measurement uncertainty		**Result**	3.85		mg/m³
Combined uncertainty			0.88		mg/m³
Expanded uncertainty	k =	1.96	1.73		mg/m³
Uncertainty corrected to std conds. (O_2)			1.73		mg/m³ (REF)

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	44.84		% of Value
Expanded uncertainty (no O_2) - at 95% Confidence	N/A		% at ELV
Overall Allowable uncertainty (no O_2) - at 95% Confidence	N/A		% at ELV
Result of Compliance with Uncertainty Requirement	**N/A**		-

	RUN 1		Units
Expanded uncertainty (with O_2) - at 95% Confidence	N/A		% of Value
Expanded uncertainty (with O_2) - at 95% Confidence	N/A		% at ELV
Overall Allowable uncertainty (with O_2) - at 95% Confidence	N/A		% at ELV
Result of Compliance with Uncertainty Requirement	**N/A**		-

Requirement for SRM is that Uncertainty should be <10% of the value at the ELV, on a dry gas basis, or if O_2 correction is applied less than 10% + the uncertainty associated with the O_2 correction (using sqrt of sum squares to add uncertainty components).

VERSION HISTORY

Version Number	Record of changes made within this version of the document
V1	The original document issued to the client

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Stack Emissions Testing Report Commissioned by
Envirosolution Ltd

Installation Name & Address
Hard Anodising Surface Treatments Ltd
Firs Estate
Stourport Road
Kidderminster
DY11 7QN

Stack Reference
A2 Chromic Acid Factory 1 Shop 3

Dates of the Monitoring Campaign
5th January 2026

Job Reference Number
EMT15043

Report Written by
Ewan Price Team Leader MCERTS Level 2 Team Leader TE1 TE2 TE3 TE4

Report Approved by
Tracy Dodds Key Account Manager MCERTS Level 2 MM 03 414 TE1 TE2 TE3 TE4

Report Date
2nd February 2026

Version
Version 1

Signature of Report Approver


CONTENTS

Opinions and interpretations expressed herein are outside the scope of Element's ISO 17025 accreditation.

Executive Summary

MONITORING OBJECTIVES

Hard Anodising Surface Treatments Ltd, Kidderminster
A2 Chromic Acid Factory 1 Shop 3
5th January 2026

Overall Aim of the Monitoring Campaign

Element were commissioned by Envirosolution Ltd to carry out stack emissions testing for Hard Anodising Surface Treatments Ltd on the A2 Chromic Acid Factory 1 Shop 3 at Kidderminster.

The aim of the monitoring campaign was to perform testing, as requested by the customer, for a number of prescribed pollutants. There are no emission limits set for any of the pollutants at this time.

Special Requirements

There were no special requirements.

Target Parameters

Total Particulate Matter, Sulphur Dioxide, Chromium

Executive Summary

MONITORING RESULTS

Hard Anodising Surface Treatments Ltd, Kidderminster

A2 Chromic Acid Factory 1 Shop 3

5th January 2026

where MU = Measurement Uncertainty associated with the Result

	Concentration				Mass Emission			
Parameter	**Units**	**Result**	**MU +/-**	**Limit**	**Units**	**Result**	**MU +/-**	**Limit**
Total Particulate Matter [1]	mg/m³	0.94	0.58	-	g/hr	1.6	1.0	-
Sulphur Dioxide [1]	mg/m³	0.043	0.0033	-	g/hr	0.073	0.0073	-
Chromium [1]	mg/m³	0.029	0.0046	-	g/hr	0.049	0.0084	-
Water Vapour	% v/v	0.22	0.018					
Stack Gas Temperature	°C	16.3						
Stack Gas Velocity	m/s	6.2	0.28					
Volumetric Flow Rate (ACTUAL)	m³/hr	1788	114					
Volumetric Flow Rate (REF) [1]	m³/hr	1691	108					

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM AN AVERAGE OF ALL OF THE ISOKINETIC RUNS.

[1] Reference Conditions (REF) are: 273K, 101.3kPa, without correction for water vapour content.

Executive Summary

MONITORING DATE(S) & TIMES

Hard Anodising Surface Treatments Ltd, Kidderminster
A2 Chromic Acid Factory 1 Shop 3
5th January 2026

Parameter		Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins
Total Particulate Matter	R1	mg/m³	0.94	g/hr	1.6	05/01/2026	17:58 - 18:58	60
Sulphur Dioxide	R1	mg/m³	0.043	g/hr	0.073	05/01/2026	17:58 - 18:58	60
Chromium	R1	mg/m³	0.029	g/hr	0.049	05/01/2026	16:52 - 17:52	60
Velocity Traverse	R1					05/01/2026	16:44 - 16:47	

All results are expressed at the respective reference conditions.

PROCESS DETAILS

Hard Anodising Surface Treatments Ltd, Kidderminster

A2 Chromic Acid Factory 1 Shop 3

5th January 2026

Standard Operating Conditions

Parameter	Value
Process Status	Normal Operation
Capacity (of 100%) and Tonnes / Hour	100%
Continuous or Batch Process	Batch
Feedstock (if applicable)	Aluminium Parts
Abatement System	N/A
Abatement System Running Status	N/A
Fuel	N/A - Electric Heating
Plume Appearance	None Visable

Executive Summary

MONITORING & ANALYTICAL METHODS

Hard Anodising Surface Treatments Ltd, Kidderminster
A2 Chromic Acid Factory 1 Shop 3
5th January 2026

	Monitoring				Analysis					
Parameter	**Standard**	**Technical Procedure**	**Sampling Status**	**Testing Lab**	**Analytical Procedure**	**Analytical Technique**	**Analysis Status**	**Analysis Lab**	**Overall Status**	**LOD (Average)**
Total Particulate Matter	EN 13284-1	MD 001	MCERTS	EET	MD 103	Gravimetric	MCERTS	EET	MCERTS	0.21 mg/m³
Sulphur Dioxide	EN 14791	MD 009	MCERTS	EET	MD 101	IC	MCERTS	EET	MCERTS	0.016 mg/m³
Chromium	EN 14385	MD 006	MCERTS	EET	MD 107	ICP-MS	MCERTS	EET	MCERTS	0.001 mg/m³
Water Vapour	EN 14790	MD 005	MCERTS	EET	MD 005	Gravimetric	MCERTS	EET	MCERTS	0.10 % v/v
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041	MCERTS	EET	Pitot Tube and Thermocouple				MCERTS	1.2 m/s

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

Element (Stockport Lab - EET)	ISO 17025 Accreditation Number: UKAS 4279

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
Sulphur Dioxide	Run 1	The absorption efficiency was less than the required 95%. [50 - 75%]

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.32
Width	m	-
Area	m^2	0.08
Port Depth	cm	10
Orientation of Duct	-	Angled
Number of Ports	-	2
Sample Port Size	-	4" BSP

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	Temporary
Inside / Outside	Inside

Platform Details

EA Technical Guidance Note M1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	Yes
Platform has vertical base boards (approx. 0.25m high)	Yes
Platform has chains / self closing gates at top of ladders	Yes
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations.

EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

Sampling Plane Validation Criteria (from EN 15259)

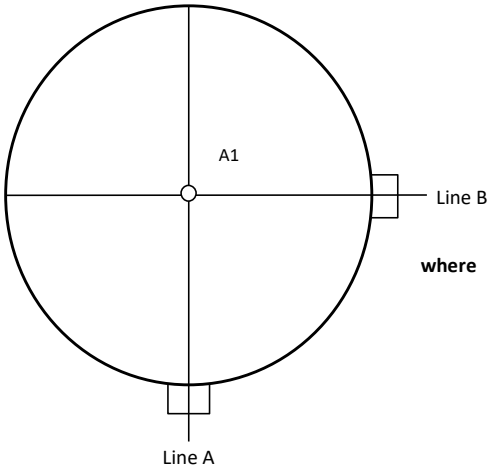
Criteria in EN 15259	Units	Traverse 1	Required	Compliant
Lowest Differential Pressure	Pa	34.2	> 5 Pa	Yes
Mean Velocity	m/s	6.27	-	-
Lowest Gas Velocity	m/s	6.27	-	-
Highest Gas Velocity	m/s	6.27	-	-
Ratio of Above	: 1	1.00	< 3 : 1	Yes
Maximum Angle of Swirl	°	7.00	< 15°	Yes
No Local Negative Flow	-	Yes	-	Yes

Executive Summary

PLANT PHOTOS

Photo 1

SAMPLE POINTS



where
- ○ = isokinetic point sampled at
- ● = isokinetic point not sampled at
- = combustion gases sample point
- = non-isokinetic sample point

APPENDIX CONTENTS

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Ewan Price	MCERTS Level 2	MM 21 1654	TE1 TE2 TE3 TE4
Trainee	Greg Stretton	MCERTS Trainee	MM 24 1853	N/A

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	CAT 7.122
Control Box DGM (2)	-
Box Thermocouples (1)	CAT 3.136
Box Thermocouples (2)	-
Umbilical (1)	CAT 3.136
Umbilical (2)	-
Oven Box (1)	CAT 12.106
Oven Box (2)	-
Heated Probe (1)	CAT 5.10
Heated Probe (2)	-
Heated Probe (3)	-
S-Pitot (1)	CAT 21P.193
S-Pitot (2)	-
L-Pitot	-
Site Balance	CAT 17.92
500g / 1Kg Check Weights	CAT 17.92
Last Impinger Arm	-
Callipers	-
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-250	-
Horiba PG-250	-
Servomex 4900	-
Eco Physics CLD 822Mh	-
ABB AO2020-URAS26	-
Testo 350 XL	-
MAK10 Cooler	-
Gasmet DX4000	-
Gasmet Sampling System	-
Sick 3006	-
Ankersmid APP100	-
Mass Flow Controller (1)	-
Mass Flow Controller (2)	-
Mass View (1)	-
Mass View (2)	-
Easylogger EN-EL-12 Bit	-
Hioki 5043 (V)	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	CAT 3.230
Digital Manometer (2)	-
Digital Temperature Meter	CAT 3.230
Stopwatch	CAT 14.53
Barometer	-
Stack Thermocouple (1)	CAT 4.1461
Stack Thermocouple (2)	-
Stack Thermocouple (3)	-
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	-
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	CAT 1.18, 1.18a, 1.18b
Tape Measure	CAT 16.69

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Total Particulate Matter	EN 13284-1	MD 001
Sulphur Dioxide	EN 14791	MD 009
Chromium	EN 14385	MD 006
Water Vapour	EN 14790	MD 005
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041

PRELIMINARY STACK SURVEY: CALCULATIONS

General Stack Details

Stack Details (from Traverse)	Units	Value
Stack Diameter / Depth, D	m	0.32
Stack Width, W	m	-
Stack Area, A	m^2	0.08
Average Stack Gas Temperature, T_a	°C	16.3
Average Stack Gas Pressure	Pa	34.2
Average Stack Static Pressure, P_{static}	kPa	0.023
Average Barometric Pressure, P_b	kPa	101.5
Average Pitot Tube Calibration Coefficient, C_p	-	0.84

Stack Gas Composition & Molecular Weights

Component	Conc ppm	Conc Dry % v/v	Conc Wet % v/v	Volume Fraction r	Molar Mass M	Density kg/m³ p	Conc kg/m³ p_i
CO_2 (Estimated)	-	0.06	0.06	0.0006	44.01	1.9635	0.00118
O_2 (Estimated)	-	20.80	20.75	0.2080	32.00	1.4277	0.29696
N_2	-	79.14	78.96	0.7914	28.01	1.2498	0.98913
Moisture (H_2O)	-	-	0.22	0.0022	18.02	0.8037	0.00179

Where: p = M / 22.41

p_i = r x p

Calculation of Stack Gas Densities

Determinand	Units	Result
Dry Density (STP), P_{STD}	kg/m³	1.287
Wet Density (STP), P_{STW}	kg/m³	1.286
Dry Density (Actual), P_{Actual}	kg/m³	1.217
Average Wet Density (Actual), $P_{ActualW}$	kg/m³	1.216

Where: P_{STD} = sum of component concentrations, kg/m³ (not including water vapour)

P_{STW} = sum of all wet concentrations / 100 x density, kg/m³ (including water vapour)

$P_{Actual} = P_{STD} \times (T_{STP} / (P_{STP})) \times ((P_{static} + P_b) / T_a)$

$P_{ActualW}$ (at each sampling point) $= P_{STW} \times (T_s / P_s) \times (P_a / T_a)$

Calculation of Stack Gas Volumetric Flowrate, Q

Duct gas flow conditions	Units	Actual	REF [1]
Temperature	°C	16.3	0.0
Total Pressure	kPa	101.5	101.3
Moisture	%	0.22	0.22

Gas Volumetric Flowrate (from Traverse)	Units	Result
Gas Volumetric Flowrate (Actual)	m³/hr	1816
Gas Volumetric Flowrate (STP, Wet)	m³/hr	1717
Gas Volumetric Flowrate (STP, Dry)	m³/hr	1713
Gas Volumetric Flowrate REF [1]	m³/hr	1717

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID)

(1 of 1)

Parameter	Units	Value
Date of Survey	-	05/01/2026
Time of Survey	-	16:44 - 16:47
Atmospheric Pressure	kPa	101.5
Average Stack Static Pressure	Pa	23
Result of Pitot Stagnation Test	-	Pass
Are Water Droplets Present?	-	No
Device Used	S-Type Pitot with KIMO MP 210 (500Pa)	

Parameter	Units	Value
Initial Pitot Leak Check	-	Pass
Final Pitot Leak Check	-	Pass
Orientation of Duct	-	Angled
Pitot Tube, C_p	-	0.84
Number of Lines Available	-	2
Number of Lines Used	-	1

		Sampling Line A					Sampling Line B				
Traverse Point	Depth m	ΔP Pa	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °	ΔP	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °
STATIC (Units: Pa)		*22.5*									
Mean		**34.2**	**16.3**	**1.216**	**6.27**						
1	0.16	34.2	16.3	1.216	6.27	7.0					

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID) - MEASUREMENT UNCERTAINTY

(1 of 1)

Performance characteristics (Uncertainty Components)	Uncertainty	Value	Units
Standard Uncertainty on the coefficient of the Pitot Tube	u(k)	0.005	-
Standard Uncertainty associated with the mean local dynamic pressures	u(Δpi)	1.111	Pa
- Resolution	u(res)	0.00087	
- Calibration	u(cal)	0.122	
- Drift	u(drift)	0.083	
- Lack of Fit	u(fit)	0.028	
- Overall corrections to dynamic measurements	u(Cf)	0.234	
Standard uncertainty associated with the molar mass of the gas	u(M)	0.00003	-
- $\varphi O_2,w$	-	20.754	
- $\varphi CO_2,w$	-	0.060	
- Oxygen, dry	u(ϕO_2,d)	0.637	
- Carbon Dioxide, dry	u(ϕCO_2,d)	0.002	
- Water Vapour	u(ϕH_2O)	0.011	
- Oxygen, wet	u(ϕO_2,w)	0.635	
- Carbon Dioxide, wet	u(ϕCO_2,w)	0.002	
Standard uncertainty associated with the stack temperature	u(Tc)	1.476	K
Standard uncertainty associated with the absolute pressure in the duct	u(pc)	175.696	Pa
- Atmospheric Pressure	u(patm)	175.692	
- Static Pressure	u(pstat)	1.111	
Standard uncertainty associated with the density in the duct	u(ρ)	0.00664	-
Standard uncertainty associated with the local velocities	u(vi)	0.144	Pa
Standard uncertainty associated with the mean velocity	u(v)	0.144	m/s
Standard uncertainty associated with the mean velocity (95% Confidence)	Uc(v)	0.282	m/s
Standard uncertainty associated with the mean velocity (95% Confidence), relative	Uc,rel(v)	4.49	%
Standard uncertainty associated with the volume flow rate (95% Confidence)	Uc(qV,w)	115.8	m^3/hr
- $u^2(a)/a^2$	-	0.00053	
- $u^2(qV,w)/q^2V,w$	-	0.00106	
- $u^2(qV,w)$	-	3490	
- $u(qV,w)$	-	59.1	
Standard uncertainty associated with the volume flow rate (95% Confidence), relative	Uc,rel(qV,w)	6.38	%

TOTAL PARTICULATE MATTER: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster

A2 Chromic Acid Factory 1 Shop 3

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.94		0.94
Uncertainty	±mg/m³	0.58		0.58
Mass Emission	g/hr	1.6		1.6
Uncertainty	±g/hr	1.0		1.0

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.16		0.16
Uncertainty	±% v/v	0.016		0.016

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.21		0.21

NOTE: Where the Balance Uncertainty / Limit of Detection is higher than the Blank concentration, the Balance Uncertainty / Limit of Detection concentration has been reported.

General Sampling Information

Parameter	Value	
Standard	EN 13284-1	
Technical Procedure	MD 001	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL PARTICULATE MATTER: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	761.3
Stack static pressure, P_{static}	mmH_2O	2.3
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	761.5
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	-5.9
Total mass collected in impingers (silica trap)	g	7.3
Total mass of liquid collected, V_{lc}	g	1.4
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0017
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.1708
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	17.0
Average pressure drop across orifice, ΔH	mmH_2O	31.3
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0976
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0016
B_{wo} as a percentage	% v/v	0.16
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.16
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0993
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.82
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	3.22
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	1.79
Average stack gas temperature, T_s	°C	17.3
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	6.04
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	29.2
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	27.5
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	27.4
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	8.01
Nozzle area, A_n	mm^2	50.39
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	106.4

TOTAL PARTICULATE MATTER: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	17:58 - 18:58
Sampling Dates	-	05/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.0993
Filter I.D. Number	-	47-124775
Start Filter Mass	g	0.14720
End Filter Mass	g	0.14781
Total Mass on Filter	g	0.00061
Probe Rinse I.D. Number	-	PR-47-124775
Start Probe Rinse Mass	g	2.83661
End Probe Rinse Mass	g	2.83703
Total Mass in Probe Rinse	g	0.00042
Total Mass Collected	mg	1.03
Calculated Concentration	mg/m^3	0.94
Balance Uncertainty / LOD	mg/m^3	0.21

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	05/01/2026
Average Volume Sampled (REF)	m^3	1.0993
Filter I.D. Number	-	47-121176
Start Filter Mass	g	0.14233
End Filter Mass	g	0.14198
Total Mass on Filter	g	-0.00035
Probe Rinse I.D. Number	-	PR-47-121176
Start Probe Rinse Mass	g	2.85019
End Probe Rinse Mass	g	2.85014
Total Mass in Probe Rinse	g	-0.00005
Total Mass Collected	mg	-0.40
Calculated Concentration	mg/m^3	-0.36
Balance Uncertainty / LOD	mg/m^3	0.21

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	19.3
Pre-Sampling Leak Rate	l/min	0.24
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	9.9
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	106.4
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Weighing Uncertainty Criteria	Units	Run 1
Overall Weighing Uncertainty	± mg	0.33
Overall Weighing Uncertainty	± mg/m³	0.30
ELV [Daily ELV for IED]	mg/m³	N/A
Allowable Weighing Uncertainty	mg/m³	N/A
Weighing Uncertainty Acceptable	-	N/A

Filter Temperatures	Units	Run 1
Pre-Conditioning Temperature	°C	180
Post-Conditioning Temperature	°C	160
Maximum Filter Temperature	°C	18

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.31
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Acetone / Water Rinse Blank	Units	Blank
Acetone / Water Rinse Value	mg/l	2.7
Allowable Blank	mg/l	10
Blank Acceptable	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1
There are no deviations associated with the sampling employed.	wx

TOTAL PARTICULATE MATTER: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.1708	uV_m	m^3	0.0234
Sampled Gas Temperature	T_m	290.0	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.5	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	1.24	uL	%	-
Mass of Particulate	m	1.03	um	mg	0.23
Uncollected Mass	UCM	-0.40	uUCM	mg	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.69	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	1.24	≤2%
Mass of Particulate	%	-	-
Uncollected Mass	%	-	-

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.0976	0.85
Leak	L	mg/m^3	0.007	1.00
Mass of Particulate	L_r	mg	1.030	0.91
Uncollected Mass	UCM	mg	-0.23	0.91

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.023
Leak	mg/m^3	0.0067
Mass of Particulate	mg/m^3	0.2092
Uncollected Mass	mg/m^3	-0.2101

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.30
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.58
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.58
Reported Uncertainty	mg/m^3	0.58
Expanded uncertainty (95% confidence), without Oxygen Correction	%	62.2
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	62.2
Reported Uncertainty	%	62.2
Reported Uncertainty as % of ELV	%	N/A

SULPHUR DIOXIDE: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A2 Chromic Acid Factory 1 Shop 3

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.043		0.043
Uncertainty	±mg/m³	0.0033		0.0033
Mass Emission	g/hr	0.073		0.073
Uncertainty	±g/hr	0.0073		0.0073

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.16		0.16
Uncertainty	±% v/v	0.016		0.016

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.020		0.020

General Sampling Information

Parameter	Value	
Standard	EN 14791	
Technical Procedure	MD 009	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 101	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	08/01/2025	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Impinger Material	Polyethylene	
Absorption Solution	0.3% Hydrogen Peroxide	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

SULPHUR DIOXIDE: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	761.3
Stack static pressure, P_{static}	mmH_2O	2.3
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	761.5
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	-5.9
Total mass collected in impingers (silica trap)	g	7.3
Total mass of liquid collected, V_{lc}	g	1.4
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0017
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.1708
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	17.0
Average pressure drop across orifice, ΔH	mmH_2O	31.3
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0976
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0016
B_{wo} as a percentage	% v/v	0.16
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.16
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0993
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.82
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	3.22
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	1.79
Average stack gas temperature, T_s	°C	17.3
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	6.04
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	29.2
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	27.5
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	27.4
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	8.01
Nozzle area, A_n	mm^2	50.39
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	106.4

SULPHUR DIOXIDE: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	17:58 - 18:58
Sampling Dates	-	05/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.0993
Laboratory Result for Front Impingers	µg/ml	0.16
Laboratory Result for Back Impinger	µg/ml	0.09
Volume in Front Impingers	ml	230.6
Volume in Back Impinger	ml	120.1
Mass in Front Impingers	µg	36.9
Mass in Back Impinger	µg	10.8
Total Mass Collected	µg	47.7
Calculated Concentration	mg/m^3	0.04

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	05/01/2026
Average Volume Sampled (REF)	m^3	1.0993
Laboratory Result for Impingers	µg/ml	0.07
Volume in Impingers	ml	309.3
Total Mass Collected	µg	21.7
Calculated Concentration	mg/m^3	0.02

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	19.3
Pre-Sampling Leak Rate	l/min	0.24
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	77.3
Allowable Absorption Efficiency	%	95
Absorption Efficiency Acceptable	-	No

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	9.9
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	106.4
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	18

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.31
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
The absorption efficiency was less than the required 95%. [50 - 75%]	x	

SULPHUR DIOXIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.1708	uV_m	m^3	0.0234
Sampled Gas Temperature	T_m	290.0	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.5	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	1.24	uL	%	-
Laboratory Result	L_r	0.90	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.69	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	1.24	≤2%
Laboratory Result	%	0.90	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.0976	0.04
Leak	L	mg/m^3	0.000	1.00
Laboratory Result	L_r	mg/m^3	0.000	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.001
Leak	mg/m^3	0.0003
Laboratory Result	mg/m^3	0.0004

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.0012
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.0023
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.0033
Reported Uncertainty	mg/m^3	0.0033
Expanded uncertainty (95% confidence), without Oxygen Correction	%	5.4
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	7.6
Reported Uncertainty	%	7.6
Reported Uncertainty as % of ELV	%	N/A

CHROMIUM: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A2 Chromic Acid Factory 1 Shop 3

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.029		0.029
Uncertainty	±mg/m³	0.0046		0.0046
Mass Emission	g/hr	0.049		0.049
Uncertainty	±g/hr	0.0084		0.0084

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.29		0.29
Uncertainty	±% v/v	0.020		0.020

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.00056		0.00056

General Sampling Information

Parameter	Value	
Standard	EN 14385	
Technical Procedure	MD 006	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 107	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	16/01/2025	
Probe Material	Titanium	
Filter Housing Material	Borosilicate Glass	
Impinger Material	Borosilicate Glass	
Absorption Solution	Nitric Peroxide	
Positioning of Filter	Out Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

CHROMIUM: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	761.3
Stack static pressure, P_{static}	mmH_2O	2.3
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	761.5
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	0.7
Total mass collected in impingers (silica trap)	g	1.9
Total mass of liquid collected, V_{lc}	g	2.6
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0032
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.2076
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	17.6
Average pressure drop across orifice, ΔH	mmH_2O	36.2
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.1300
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0029
B_{wo} as a percentage	% v/v	0.29
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.29
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.1332
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.81
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	3.68
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	1.92
Average stack gas temperature, T_s	°C	14.3
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	6.44
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	31.1
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	29.6
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	29.5
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	8.01
Nozzle area, A_n	mm^2	50.35
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	102.0

CHROMIUM: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	16:52 - 17:52
Sampling Dates	-	05/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.1332
Mass on Filter / in Rinse	µg	31.84
Mass in Front Impingers	µg	0.42
Mass in Back Impinger	µg	0.52
Total Mass Collected	µg	32.78
Calculated Concentration	mg/m^3	0.0289
Reported Concentration	mg/m^3	0.0289

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	05/01/2026
Average Volume Sampled (REF)	m^3	1.1332
Mass on Filter / in Rinse	µg	< 0.60
Mass in Front Impingers	µg	< 0.02
Mass in Back Impinger	µg	0.01
Total Mass Collected	µg	0.63
Calculated Concentration	mg/m^3	0.0006
Reported Concentration	mg/m^3	0.0006

CHROMIUM: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	19.9
Pre-Sampling Leak Rate	l/min	0.23
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	98.4
Allowable Absorption Efficiency	%	90
Absorption Efficiency Acceptable	-	Yes

Detection Limit	Units	Run 1
Detection Limit	µg/m³	0.6
Allowable Detection Limit	µg/m³	5
Detection Limit Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	6.9
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	102.0
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	180

Impingers Exit Temperature	Units	Run 1
Maximum Temperature Recorded	°C	9
Maximum Allowable Temperature	°C	30
Exit Temperature Acceptable	-	Yes

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

CHROMIUM: QUALITY ASSURANCE

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.18
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
There are no deviations associated with the sampling employed.	wx	

CHROMIUM: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.2076	uV_m	m^3	0.0242
Sampled Gas Temperature	T_m	290.6	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.5	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.0	uH_m	% v/v	1.00
Leak	L	1.15	uL	%	-
Laboratory Result	L_r	7.70	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.69	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	1.15	≤2%
Laboratory Result	%	7.70	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.1300	0.03
Leak	L	mg/m^3	0.0002	1.00
Laboratory Result	L_r	mg/m^3	0.0022	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.0007
Leak	mg/m^3	0.0002
Laboratory Result	mg/m^3	0.0022

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	%	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.0024
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.0046
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.0046
Reported Uncertainty	mg/m^3	0.0046
Expanded uncertainty (95% confidence), without Oxygen Correction	%	15.9
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	15.9
Reported Uncertainty	%	15.9
Reported Uncertainty as % of ELV	%	N/A

VERSION HISTORY

Version Number	Record of changes made within this version of the document
V1	The original document issued to the client

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Stack Emissions Testing Report Commissioned by
Envirosolution Ltd

Installation Name & Address
Hard Anodising Surface Treatments Ltd
Firs Estate
Stourport Road
Kidderminster
DY11 7QN

Stack Reference
A6 Lab Fume Extraction

Dates of the Monitoring Campaign
5th January 2026

Job Reference Number
EMT15043

Report Written by
Ewan Price Team Leader MCERTS Level 2 Team Leader TE1 TE2 TE3 TE4

Report Approved by
Tracy Dodds Key Account Manager MCERTS Level 2 MM 03 414 TE1 TE2 TE3 TE4

Report Date
2nd February 2026

Version
Version 1

Signature of Report Approver


CONTENTS

Opinions and interpretations expressed herein are outside the scope of Element's ISO 17025 accreditation.

MONITORING OBJECTIVES

Hard Anodising Surface Treatments Ltd, Kidderminster
A6 Lab Fume Extraction
5th January 2026

Overall Aim of the Monitoring Campaign

Element were commissioned by Envirosolution Ltd to carry out stack emissions testing for Hard Anodising Surface Treatments Ltd on the A6 Lab Fume Extraction at Kidderminster.

The aim of the monitoring campaign was to perform testing, as requested by the customer, for a number of prescribed pollutants. There are no emission limits set for any of the pollutants at this time.

Special Requirements

There were no special requirements.

Target Parameters

Total Particulate Matter, Sulphur Dioxide

MONITORING RESULTS

Hard Anodising Surface Treatments Ltd, Kidderminster

A6 Lab Fume Extraction

5th January 2026

where MU = Measurement Uncertainty associated with the Result

	Concentration				Mass Emission			
Parameter	**Units**	**Result**	**MU +/-**	**Limit**	**Units**	**Result**	**MU +/-**	**Limit**
Total Particulate Matter [1]	mg/m³	0.82	0.42	-	g/hr	0.33	0.17	-
Sulphur Dioxide [1]	mg/m³	0.11	0.0085	-	g/hr	0.046	0.0052	-
Water Vapour	% v/v	0.95	0.050					
Stack Gas Temperature	°C	20.8						
Stack Gas Velocity	m/s	5.3	0.38					
Volumetric Flow Rate (ACTUAL)	m³/hr	430	36.6					
Volumetric Flow Rate (REF) [1]	m³/hr	400	34.0					

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM AN AVERAGE OF ALL OF THE ISOKINETIC RUNS.

[1] Reference Conditions (REF) are: 273K, 101.3kPa, without correction for water vapour content.

Executive Summary

(Page 3 of 7)

MONITORING DATE(S) & TIMES

Hard Anodising Surface Treatments Ltd, Kidderminster

A6 Lab Fume Extraction

5th January 2026

Parameter		Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins
Total Particulate Matter	R1	mg/m³	0.82	g/hr	0.33	05/01/2026	12:51 - 13:51	60
Sulphur Dioxide	R1	mg/m³	0.11	g/hr	0.046	05/01/2026	12:51 - 13:51	60
Velocity Traverse	R1					05/01/2026	12:44 - 12:48	

All results are expressed at the respective reference conditions.

PROCESS DETAILS

Hard Anodising Surface Treatments Ltd, Kidderminster
A6 Lab Fume Extraction
5th January 2026

Standard Operating Conditions

Parameter	Value
Process Status	Normal Operation
Capacity (of 100%) and Tonnes / Hour	100%
Continuous or Batch Process	Batch
Feedstock (if applicable)	Acids & Aluminium parts
Abatement System	N/A
Abatement System Running Status	N/A
Fuel	N/A
Plume Appearance	None Visable

Executive Summary

(Page 5 of 7)

MONITORING & ANALYTICAL METHODS

Hard Anodising Surface Treatments Ltd, Kidderminster
A6 Lab Fume Extraction
5th January 2026

	Monitoring				Analysis					
Parameter	**Standard**	**Technical Procedure**	**Sampling Status**	**Testing Lab**	**Analytical Procedure**	**Analytical Technique**	**Analysis Status**	**Analysis Lab**	**Overall Status**	**LOD (Average)**
Total Particulate Matter	EN 13284-1	MD 001	MCERTS	EET	MD 103	Gravimetric	MCERTS	EET	MCERTS	0.21 mg/m³
Sulphur Dioxide	EN 14791	MD 009	MCERTS	EET	MD 101	IC	MCERTS	EET	MCERTS	0.016 mg/m³
Water Vapour	EN 14790	MD 005	MCERTS	EET	MD 005	Gravimetric	MCERTS	EET	MCERTS	0.10 % v/v
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041	MCERTS	EET	Pitot Tube and Thermocouple				MCERTS	1.2 m/s

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

Element (Stockport Lab - EET)	ISO 17025 Accreditation Number: UKAS 4279

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
Sulphur Dioxide	Run 1	The absorption efficiency was less than the required 95%. [50 - 75%]

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.17
Width	m	-
Area	m^2	0.02
Port Depth	cm	5
Orientation of Duct	-	Vertical
Number of Ports	-	2
Sample Port Size	-	4" BSP

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	Temporary
Inside / Outside	Inside

Platform Details

EA Technical Guidance Note M1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	Yes
Platform has vertical base boards (approx. 0.25m high)	Yes
Platform has chains / self closing gates at top of ladders	Yes
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations.

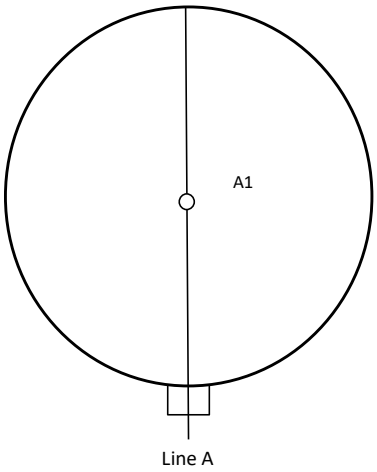
EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

Sampling Plane Validation Criteria (from EN 15259)

Criteria in EN 15259	Units	Traverse 1	Required	Compliant
Lowest Differential Pressure	Pa	25.7	> 5 Pa	Yes
Mean Velocity	m/s	5.45	-	-
Lowest Gas Velocity	m/s	5.45	-	-
Highest Gas Velocity	m/s	5.45	-	-
Ratio of Above	: 1	1.00	< 3 : 1	Yes
Maximum Angle of Swirl	°	6.00	< 15°	Yes
No Local Negative Flow	-	Yes	-	Yes

SAMPLE POINTS



where ○ = isokinetic point sampled at
● = isokinetic point not sampled at
● = combustion gases sample point
● = non-isokinetic sample point

APPENDIX CONTENTS

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Ewan Price	MCERTS Level 2	MM 21 1654	TE1 TE2 TE3 TE4
Trainee	Greg Stretton	MCERTS Trainee	MM 24 1853	N/A

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	CAT 7.122
Control Box DGM (2)	-
Box Thermocouples (1)	CAT 3.136
Box Thermocouples (2)	-
Umbilical (1)	CAT 3.136
Umbilical (2)	-
Oven Box (1)	-
Oven Box (2)	-
Heated Probe (1)	CAT 5.10
Heated Probe (2)	-
Heated Probe (3)	-
S-Pitot (1)	CAT 21P.193
S-Pitot (2)	-
L-Pitot	-
Site Balance	CAT 17.92
500g / 1Kg Check Weights	CAT 17.92
Last Impinger Arm	-
Callipers	-
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-250	-
Horiba PG-250	-
Servomex 4900	-
Eco Physics CLD 822Mh	-
ABB AO2020-URAS26	-
Testo 350 XL	-
JCT JCC P1 Cooler	-
Gasmet DX4000	-
Gasmet Sampling System	-
Signal 3000HM	-
Ankersmid APP100	-
Mass Flow Controller (1)	-
Mass Flow Controller (2)	-
Mass View (1)	-
Mass View (2)	-
Hioki 5043 (V)	-
Easylogger EN-EL-12 Bit	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	CAT 3.230
Digital Manometer (2)	-
Digital Temperature Meter	CAT 3.230
Stopwatch	CAT 14.53
Barometer	-
Stack Thermocouple (1)	CAT 4.1461
Stack Thermocouple (2)	-
Stack Thermocouple (3)	-
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	-
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	CAT 1.18, 1.18a, 1.18b
Tape Measure	CAT 16.69

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Total Particulate Matter	EN 13284-1	MD 001
Sulphur Dioxide	EN 14791	MD 009
Water Vapour	EN 14790	MD 005
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041

PRELIMINARY STACK SURVEY: CALCULATIONS

General Stack Details

Stack Details (from Traverse)	Units	Value
Stack Diameter / Depth, D	m	0.17
Stack Width, W	m	-
Stack Area, A	m^2	0.02
Average Stack Gas Temperature, T_a	°C	17.0
Average Stack Gas Pressure	Pa	25.7
Average Stack Static Pressure, P_{static}	kPa	0.100
Average Barometric Pressure, P_b	kPa	101.5
Average Pitot Tube Calibration Coefficient, C_p	-	0.84

Stack Gas Composition & Molecular Weights

Component	Conc ppm	Conc Dry % v/v	Conc Wet % v/v	Volume Fraction r	Molar Mass M	Density kg/m³ p	Conc kg/m³ p_i
CO_2 (Estimated)	-	0.06	0.06	0.0006	44.01	1.9635	0.00118
O_2 (Estimated)	-	20.80	20.60	0.2080	32.00	1.4277	0.29696
N_2	-	79.14	78.39	0.7914	28.01	1.2498	0.98913
Moisture (H_2O)	-	-	0.95	0.0095	18.02	0.8037	0.00761

Where: p = M / 22.41

p_i = r x p

Calculation of Stack Gas Densities

Determinand	Units	Result
Dry Density (STP), P_{STD}	kg/m³	1.287
Wet Density (STP), P_{STW}	kg/m³	1.283
Dry Density (Actual), P_{Actual}	kg/m³	1.215
Average Wet Density (Actual), $P_{ActualW}$	kg/m³	1.211

Where: P_{STD} = sum of component concentrations, kg/m³ (not including water vapour)

P_{STW} = sum of all wet concentrations / 100 x density, kg/m³ (including water vapour)

$P_{Actual} = P_{STD} \times (T_{STP} / (P_{STP})) \times ((P_{static} + P_b) / T_a)$

$P_{ActualW}$ (at each sampling point) $= P_{STW} \times (T_s / P_s) \times (P_a / T_a)$

Calculation of Stack Gas Volumetric Flowrate, Q

Duct gas flow conditions	Units	Actual	REF [1]
Temperature	°C	17.0	0.0
Total Pressure	kPa	101.6	101.3
Moisture	%	0.95	0.95

Gas Volumetric Flowrate (from Traverse)	Units	Result
Gas Volumetric Flowrate (Actual)	m³/hr	445
Gas Volumetric Flowrate (STP, Wet)	m³/hr	420
Gas Volumetric Flowrate (STP, Dry)	m³/hr	416
Gas Volumetric Flowrate REF [1]	m³/hr	420

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID)

(1 of 1)

Parameter	Units	Value
Date of Survey	-	05/01/2026
Time of Survey	-	12:44 - 12:48
Atmospheric Pressure	kPa	101.5
Average Stack Static Pressure	Pa	100
Result of Pitot Stagnation Test	-	Pass
Are Water Droplets Present?	-	No
Device Used	S-Type Pitot with KIMO MP 210 (500Pa)	

Parameter	Units	Value
Initial Pitot Leak Check	-	Pass
Final Pitot Leak Check	-	Pass
Orientation of Duct	-	Vertical
Pitot Tube, C_p	-	0.84
Number of Lines Available	-	1
Number of Lines Used	-	1

Sampling Line A

Traverse Point	Depth m	ΔP Pa	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °
STATIC (Units: Pa)		*99.7*				
Mean		**25.7**	**17.0**	**1.211**	**5.45**	
1	0.09	25.7	17.0	1.211	5.45	6.0

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID) - MEASUREMENT UNCERTAINTY

(1 of 1)

Performance characteristics (Uncertainty Components)	Uncertainty	Value	Units
Standard Uncertainty on the coefficient of the Pitot Tube	u(k)	0.005	-
Standard Uncertainty associated with the mean local dynamic pressures	u(Δpi)	1.081	Pa
- Resolution	u(res)	0.00087	
- Calibration	u(cal)	0.069	
- Drift	u(drift)	0.083	
- Lack of Fit	u(fit)	0.016	
- Overall corrections to dynamic measurements	u(Cf)	0.169	
Standard uncertainty associated with the molar mass of the gas	u(M)	0.00003	-
- $\varphi O_2,w$	-	20.603	
- $\varphi CO_2,w$	-	0.059	
- Oxygen, dry	u(ϕO_2,d)	0.637	
- Carbon Dioxide, dry	u(ϕCO_2,d)	0.002	
- Water Vapour	u(ϕH_2O)	0.048	
- Oxygen, wet	u(ϕO_2,w)	0.631	
- Carbon Dioxide, wet	u(ϕCO_2,w)	0.002	
Standard uncertainty associated with the stack temperature	u(Tc)	1.480	K
Standard uncertainty associated with the absolute pressure in the duct	u(pc)	175.695	Pa
- Atmospheric Pressure	u(patm)	175.692	
- Static Pressure	u(pstat)	1.081	
Standard uncertainty associated with the density in the duct	u(ρ)	0.00661	-
Standard uncertainty associated with the local velocities	u(vi)	0.200	Pa
Standard uncertainty associated with the mean velocity	u(v)	0.200	m/s
Standard uncertainty associated with the mean velocity (95% Confidence)	Uc(v)	0.392	m/s
Standard uncertainty associated with the mean velocity (95% Confidence), relative	Uc,rel(v)	7.20	%
Standard uncertainty associated with the volume flow rate (95% Confidence)	Uc(qV,w)	37.9	m^3/hr
- $u^2(a)/a^2$	-	0.00053	
- $u^2(qV,w)/q^2V,w$	-	0.00188	
- $u^2(qV,w)$	-	373	
- $u(qV,w)$	-	19.3	
Standard uncertainty associated with the volume flow rate (95% Confidence), relative	Uc,rel(qV,w)	8.51	%

TOTAL PARTICULATE MATTER: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A6 Lab Fume Extraction

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.82		0.82
Uncertainty	±mg/m³	0.42		0.42
Mass Emission	g/hr	0.33		0.33
Uncertainty	±g/hr	0.17		0.17

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.95		0.95
Uncertainty	±% v/v	0.050		0.050

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.21		0.21

NOTE: Where the Balance Uncertainty / Limit of Detection is higher than the Blank concentration, the Balance Uncertainty / Limit of Detection concentration has been reported.

General Sampling Information

Parameter	Value	
Standard	EN 13284-1	
Technical Procedure	MD 001	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL PARTICULATE MATTER: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	761.3
Stack static pressure, P_{static}	mmH_2O	6.7
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	761.8
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	-0.9
Total mass collected in impingers (silica trap)	g	9.2
Total mass of liquid collected, V_{lc}	g	8.3
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0103
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.1520
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	16.5
Average pressure drop across orifice, ΔH	mmH_2O	36.7
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0822
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0095
B_{wo} as a percentage	% v/v	0.95
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.95
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0926
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.74
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	2.40
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	1.55
Average stack gas temperature, T_s	°C	20.8
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	5.26
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.02
$Q_a = (60)(A_s)(V_s)$	m^3/min	7.2
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	6.7
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	6.6
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	9.00
Nozzle area, A_n	mm^2	63.62
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	97.4

TOTAL PARTICULATE MATTER: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	12:51 - 13:51
Sampling Dates	-	05/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.0926
Filter I.D. Number	-	47-125258
Start Filter Mass	g	0.14348
End Filter Mass	g	0.14387
Total Mass on Filter	g	0.00039
Probe Rinse I.D. Number	-	PR-47-125258
Start Probe Rinse Mass	g	2.88372
End Probe Rinse Mass	g	2.88423
Total Mass in Probe Rinse	g	0.00051
Total Mass Collected	mg	0.90
Calculated Concentration	mg/m^3	0.82
Balance Uncertainty / LOD	mg/m^3	0.21

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	05/01/2026
Average Volume Sampled (REF)	m^3	1.0926
Filter I.D. Number	-	47-125416
Start Filter Mass	g	0.14221
End Filter Mass	g	0.14221
Total Mass on Filter	g	0.00000
Probe Rinse I.D. Number	-	PR-47-125416
Start Probe Rinse Mass	g	2.84283
End Probe Rinse Mass	g	2.84281
Total Mass in Probe Rinse	g	-0.00002
Total Mass Collected	mg	-0.02
Calculated Concentration	mg/m^3	-0.02
Balance Uncertainty / LOD	mg/m^3	0.21

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	19.0
Pre-Sampling Leak Rate	l/min	0.15
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.3
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	97.4
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Weighing Uncertainty Criteria	Units	Run 1
Overall Weighing Uncertainty	± mg	0.33
Overall Weighing Uncertainty	± mg/m³	0.30
ELV [Daily ELV for IED]	mg/m³	N/A
Allowable Weighing Uncertainty	mg/m³	N/A
Weighing Uncertainty Acceptable	-	N/A

Filter Temperatures	Units	Run 1
Pre-Conditioning Temperature	°C	180
Post-Conditioning Temperature	°C	160
Maximum Filter Temperature	°C	22

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.12
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Acetone / Water Rinse Blank	Units	Blank
Acetone / Water Rinse Value	mg/l	2.7
Allowable Blank	mg/l	10
Blank Acceptable	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1
There are no deviations associated with the sampling employed.	wx

TOTAL PARTICULATE MATTER: MEASUREMENT UNCERTAINTY CALCULATIONS

		Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**		**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.1520		uV_m	m^3	0.0230
Sampled Gas Temperature	T_m	289.5		uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.6		$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00		uH_m	% v/v	1.00
Leak	L	0.79		uL	%	-
Mass of Particulate	m	0.90		um	mg	0.23
Uncollected Mass	UCM	-0.02		uUCM	mg	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.69	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.79	≤2%
Mass of Particulate	%	-	-
Uncollected Mass	%	-	-

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.0822	0.76
Leak	L	mg/m^3	0.004	1.00
Mass of Particulate	L_r	mg	0.900	0.92
Uncollected Mass	UCM	mg	-0.01	0.92

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.021
Leak	mg/m^3	0.0037
Mass of Particulate	mg/m^3	0.2105
Uncollected Mass	mg/m^3	-0.0106

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.21
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.42
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.42
Reported Uncertainty	mg/m^3	0.42
Expanded uncertainty (95% confidence), without Oxygen Correction	%	50.4
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	50.4
Reported Uncertainty	%	50.4
Reported Uncertainty as % of ELV	%	N/A

SULPHUR DIOXIDE: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A6 Lab Fume Extraction

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.11		0.11
Uncertainty	±mg/m³	0.0085		0.0085
Mass Emission	g/hr	0.046		0.046
Uncertainty	±g/hr	0.0052		0.0052

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.95		0.95
Uncertainty	±% v/v	0.050		0.050

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.017		0.017

General Sampling Information

Parameter	Value	
Standard	EN 14791	
Technical Procedure	MD 009	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 101	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	08/01/2025	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Impinger Material	Polyethylene	
Absorption Solution	0.3% Hydrogen Peroxide	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

SULPHUR DIOXIDE: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	761.3
Stack static pressure, P_{static}	mmH_2O	6.7
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	761.8
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	-0.9
Total mass collected in impingers (silica trap)	g	9.2
Total mass of liquid collected, V_{lc}	g	8.3
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0103
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.1520
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	16.5
Average pressure drop across orifice, ΔH	mmH_2O	36.7
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0822
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0095
B_{wo} as a percentage	% v/v	0.95
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.95
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0926
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.74
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	2.40
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	1.55
Average stack gas temperature, T_s	°C	20.8
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	5.26
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.02
$Q_a = (60)(A_s)(V_s)$	m^3/min	7.2
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	6.7
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	6.6
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	9.00
Nozzle area, A_n	mm^2	63.62
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	97.4

SULPHUR DIOXIDE: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	12:51 - 13:51
Sampling Dates	-	05/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.0926
Laboratory Result for Front Impingers	µg/ml	0.37
Laboratory Result for Back Impinger	µg/ml	0.32
Volume in Front Impingers	ml	229.9
Volume in Back Impinger	ml	125.3
Mass in Front Impingers	µg	85.1
Mass in Back Impinger	µg	40.1
Total Mass Collected	µg	125.2
Calculated Concentration	mg/m^3	0.11

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	05/01/2026
Average Volume Sampled (REF)	m^3	1.0926
Laboratory Result for Impingers	µg/ml	0.06
Volume in Impingers	ml	315.8
Total Mass Collected	µg	18.9
Calculated Concentration	mg/m^3	0.02

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	19.0
Pre-Sampling Leak Rate	l/min	0.15
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	68.0
Allowable Absorption Efficiency	%	95
Absorption Efficiency Acceptable	-	No

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.3
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	97.4
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	22

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.12
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
The absorption efficiency was less than the required 95%. [50 - 75%]	x	

SULPHUR DIOXIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.1520	uV_m	m^3	0.0230
Sampled Gas Temperature	T_m	289.5	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.6	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	0.79	uL	%	-
Laboratory Result	L_r	0.90	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.69	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.79	≤2%
Laboratory Result	%	0.90	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.0822	0.11
Leak	L	mg/m^3	0.001	1.00
Laboratory Result	L_r	mg/m^3	0.001	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.003
Leak	mg/m^3	0.0005
Laboratory Result	mg/m^3	0.0010

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.00
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.01
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.01
Reported Uncertainty	mg/m^3	0.01
Expanded uncertainty (95% confidence), without Oxygen Correction	%	5.3
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	7.4
Reported Uncertainty	%	7.4
Reported Uncertainty as % of ELV	%	N/A

VERSION HISTORY

Version Number	Record of changes made within this version of the document
V1	The original document issued to the client

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Stack Emissions Testing Report Commissioned by
Envirosolution Ltd

Installation Name & Address
Hard Anodising Surface Treatments Ltd
Firs Estate
Stourport Road
Kidderminster
DY11 7QN

Stack Reference
A7 Anodising VAT 2 Fcatory 1 shop 1

Dates of the Monitoring Campaign
5th January 2026

Job Reference Number
EMT15043

Report Written by
Ewan Price Team Leader MCERTS Level 2 Team Leader TE1 TE2 TE3 TE4

Report Approved by
Tracy Dodds Key Account Manager MCERTS Level 2 MM 03 414 TE1 TE2 TE3 TE4

Report Date
2nd February 2026

Version
Version 1

Signature of Report Approver


CONTENTS

Opinions and interpretations expressed herein are outside the scope of Element's ISO 17025 accreditation.

Executive Summary

MONITORING OBJECTIVES

Hard Anodising Surface Treatments Ltd, Kidderminster
A7 Anodising VAT 2 Fcatory 1 shop 1
5th January 2026

Overall Aim of the Monitoring Campaign

Element were commissioned by Envirosolution Ltd to carry out stack emissions testing for Hard Anodising Surface Treatments Ltd on the A7 Anodising VAT 2 Fcatory 1 shop 1 at Kidderminster.

The aim of the monitoring campaign was to perform testing, as requested by the customer, for a number of prescribed pollutants. There are no emission limits set for any of the pollutants at this time.

Special Requirements

There were no special requirements.

Target Parameters

Total Particulate Matter, Sulphur Dioxide

Executive Summary

MONITORING RESULTS

Hard Anodising Surface Treatments Ltd, Kidderminster

A7 Anodising VAT 2 Fcatory 1 shop 1

5th January 2026

where MU = Measurement Uncertainty associated with the Result

	Concentration				Mass Emission			
Parameter	**Units**	**Result**	**MU +/-**	**Limit**	**Units**	**Result**	**MU +/-**	**Limit**
Total Particulate Matter [1]	mg/m³	1.0	0.43	-	g/hr	1.3	0.56	-
Sulphur Dioxide [1]	mg/m³	0.24	0.014	-	g/hr	0.30	0.028	-
Water Vapour	% v/v	0.75	0.040					
Stack Gas Temperature	°C	13.8						
Stack Gas Velocity	m/s	4.6	0.26					
Volumetric Flow Rate (ACTUAL)	m³/hr	1332	96.8					
Volumetric Flow Rate (REF) [1]	m³/hr	1271	92.4					

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM AN AVERAGE OF ALL OF THE ISOKINETIC RUNS.

[1] Reference Conditions (REF) are: 273K, 101.3kPa, without correction for water vapour content.

MONITORING DATE(S) & TIMES

Hard Anodising Surface Treatments Ltd, Kidderminster
A7 Anodising VAT 2 Fcatory 1 shop 1
5th January 2026

Parameter		Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins
Total Particulate Matter	R1	mg/m³	1.0	g/hr	1.3	05/01/2026	10:56 - 11:56	60
Sulphur Dioxide	R1	mg/m³	0.24	g/hr	0.30	05/01/2026	10:56 - 11:56	60
Velocity Traverse	R1					05/01/2026	10:45 - 10:50	

All results are expressed at the respective reference conditions.

PROCESS DETAILS

Hard Anodising Surface Treatments Ltd, Kidderminster
A7 Anodising VAT 2 Fcatory 1 shop 1
5th January 2026

Standard Operating Conditions

Parameter	Value
Process Status	Normal Operation
Capacity (of 100%) and Tonnes / Hour	100%
Continuous or Batch Process	Batch
Feedstock (if applicable)	Aluminium Parts
Abatement System	N/A
Abatement System Running Status	N/A
Fuel	N/A - Electric Heating
Plume Appearance	None Visable

Executive Summary

MONITORING & ANALYTICAL METHODS

Hard Anodising Surface Treatments Ltd, Kidderminster
A7 Anodising VAT 2 Fcatory 1 shop 1
5th January 2026

	Monitoring				Analysis					
Parameter	**Standard**	**Technical Procedure**	**Sampling Status**	**Testing Lab**	**Analytical Procedure**	**Analytical Technique**	**Analysis Status**	**Analysis Lab**	**Overall Status**	**LOD (Average)**
Total Particulate Matter	EN 13284-1	MD 001	MCERTS	EET	MD 103	Gravimetric	MCERTS	EET	MCERTS	0.22 mg/m³
Sulphur Dioxide	EN 14791	MD 009	MCERTS	EET	MD 101	IC	MCERTS	EET	MCERTS	0.018 mg/m³
Water Vapour	EN 14790	MD 005	MCERTS	EET	MD 005	Gravimetric	MCERTS	EET	MCERTS	0.10 % v/v
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041	MCERTS	EET	Pitot Tube and Thermocouple				MCERTS	1.2 m/s

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

Element (Stockport Lab - EET)	ISO 17025 Accreditation Number: UKAS 4279

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
Sulphur Dioxide	Run 1	The absorption efficiency was less than the required 95%. [90 - 95%]

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.32
Width	m	-
Area	m^2	0.08
Port Depth	cm	5
Orientation of Duct	-	Vertical
Number of Ports	-	2
Sample Port Size	-	4" BSP

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	Temporary
Inside / Outside	Inside

Platform Details

EA Technical Guidance Note M1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	Yes
Platform has vertical base boards (approx. 0.25m high)	Yes
Platform has chains / self closing gates at top of ladders	Yes
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations.

EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

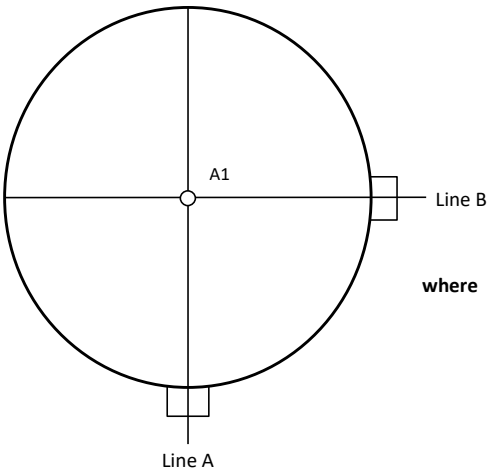
Sampling Plane Validation Criteria (from EN 15259)

Criteria in EN 15259	Units	Traverse 1	Required	Compliant
Lowest Differential Pressure	Pa	22.1	> 5 Pa	Yes
Mean Velocity	m/s	5.01	-	-
Lowest Gas Velocity	m/s	5.01	-	-
Highest Gas Velocity	m/s	5.01	-	-
Ratio of Above	: 1	1.00	< 3 : 1	Yes
Maximum Angle of Swirl	°	4.00	< 15°	Yes
No Local Negative Flow	-	Yes	-	Yes

PLANT PHOTOS

Photo 1

SAMPLE POINTS



where ○ = isokinetic point sampled at
● = isokinetic point not sampled at
● = combustion gases sample point
● = non-isokinetic sample point

APPENDIX CONTENTS

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Ewan Price	MCERTS Level 2	MM 21 1654	TE1 TE2 TE3 TE4
Trainee	Greg Stretton	MCERTS Trainee	MM 24 1853	N/A

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	CAT 7.122
Control Box DGM (2)	-
Box Thermocouples (1)	CAT 3.136
Box Thermocouples (2)	-
Umbilical (1)	CAT 3.136
Umbilical (2)	-
Oven Box (1)	-
Oven Box (2)	-
Heated Probe (1)	CAT 5.10
Heated Probe (2)	-
Heated Probe (3)	-
S-Pitot (1)	CAT 21P.193
S-Pitot (2)	-
L-Pitot	-
Site Balance	CAT 17.92
500g / 1Kg Check Weights	CAT 17.92
Last Impinger Arm	-
Callipers	-
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-250	-
Horiba PG-250 SRM	-
Servomex 4900	-
Ankersmid AOX210	-
ABB AO2020-URAS26	-
Testo 350 XL	-
MAK10 Cooler	-
MKS MG2030	-
Gasmet Sampling System	-
Sick 3006	-
Ankersmid APP100	-
Mass Flow Controller (1)	-
Mass Flow Controller (2)	-
Mass View (1)	-
Mass View (2)	-
Squirrel 2020	-
Easylogger EN-EL-12 Bit	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	CAT 3.230
Digital Manometer (2)	-
Digital Temperature Meter	CAT 3.230
Stopwatch	CAT 14.53
Barometer	-
Stack Thermocouple (1)	CAT 4.1461
Stack Thermocouple (2)	-
Stack Thermocouple (3)	-
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	-
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	CAT 1.18, 1.18a, 1.18b
Tape Measure	CAT 16.69

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Total Particulate Matter	EN 13284-1	MD 001
Sulphur Dioxide	EN 14791	MD 009
Water Vapour	EN 14790	MD 005
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041

PRELIMINARY STACK SURVEY: CALCULATIONS

General Stack Details

Stack Details (from Traverse)	Units	Value
Stack Diameter / Depth, D	m	0.32
Stack Width, W	m	-
Stack Area, A	m^2	0.08
Average Stack Gas Temperature, T_a	°C	12.0
Average Stack Gas Pressure	Pa	22.1
Average Stack Static Pressure, P_{static}	kPa	0.100
Average Barometric Pressure, P_b	kPa	101.5
Average Pitot Tube Calibration Coefficient, C_p	-	0.84

Stack Gas Composition & Molecular Weights

Component	Conc ppm	Conc Dry % v/v	Conc Wet % v/v	Volume Fraction r	Molar Mass M	Density kg/m³ p	Conc kg/m³ p_i
CO_2 (Estimated)	-	0.06	0.06	0.0006	44.01	1.9635	0.00118
O_2 (Estimated)	-	20.80	20.64	0.2080	32.00	1.4277	0.29696
N_2	-	79.14	78.55	0.7914	28.01	1.2498	0.98913
Moisture (H_2O)	-	-	0.75	0.0075	18.02	0.8037	0.00600

Where: p = M / 22.41

p_i = r x p

Calculation of Stack Gas Densities

Determinand	Units	Result
Dry Density (STP), P_{STD}	kg/m³	1.287
Wet Density (STP), P_{STW}	kg/m³	1.284
Dry Density (Actual), P_{Actual}	kg/m³	1.237
Average Wet Density (Actual), $P_{ActualW}$	kg/m³	1.233

Where: P_{STD} = sum of component concentrations, kg/m³ (not including water vapour)

P_{STW} = sum of all wet concentrations / 100 x density, kg/m³ (including water vapour)

$P_{Actual} = P_{STD} \times (T_{STP} / (P_{STP})) \times ((P_{static} + P_b) / T_a)$

$P_{ActualW}$ (at each sampling point) $= P_{STW} \times (T_s / P_s) \times (P_a / T_a)$

Calculation of Stack Gas Volumetric Flowrate, Q

Duct gas flow conditions	Units	Actual	REF [1]
Temperature	°C	12.0	0.0
Total Pressure	kPa	101.6	101.3
Moisture	%	0.75	0.75

Gas Volumetric Flowrate (from Traverse)	Units	Result
Gas Volumetric Flowrate (Actual)	m³/hr	1450
Gas Volumetric Flowrate (STP, Wet)	m³/hr	1393
Gas Volumetric Flowrate (STP, Dry)	m³/hr	1382
Gas Volumetric Flowrate REF [1]	m³/hr	1393

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID)

(1 of 1)

Parameter	Units	Value
Date of Survey	-	05/01/2026
Time of Survey	-	10:45 - 10:50
Atmospheric Pressure	kPa	101.5
Average Stack Static Pressure	Pa	100
Result of Pitot Stagnation Test	-	Pass
Are Water Droplets Present?	-	No
Device Used	S-Type Pitot with KIMO MP 210 (500Pa)	

Parameter	Units	Value
Initial Pitot Leak Check	-	Pass
Final Pitot Leak Check	-	Pass
Orientation of Duct	-	Vertical
Pitot Tube, C_p	-	0.84
Number of Lines Available	-	1
Number of Lines Used	-	1

Sampling Line A

Traverse Point	Depth m	ΔP Pa	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °
STATIC (Units: Pa)		*99.7*				
Mean		**22.1**	**12.0**	**1.233**	**5.01**	
1	0.16	22.1	12.0	1.233	5.01	4.0

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID) - MEASUREMENT UNCERTAINTY

(1 of 1)

Performance characteristics (Uncertainty Components)	Uncertainty	Value	Units
Standard Uncertainty on the coefficient of the Pitot Tube	u(k)	0.005	-
Standard Uncertainty associated with the mean local dynamic pressures	u(Δpi)	1.065	Pa
- Resolution	u(res)	0.00087	
- Calibration	u(cal)	0.051	
- Drift	u(drift)	0.083	
- Lack of Fit	u(fit)	0.000	
- Overall corrections to dynamic measurements	u(Cf)	0.135	
Standard uncertainty associated with the molar mass of the gas	u(M)	0.00003	-
- $\varphi O_2,w$	-	20.645	
- $\varphi CO_2,w$	-	0.060	
- Oxygen, dry	u(ϕO_2,d)	0.637	
- Carbon Dioxide, dry	u(ϕCO_2,d)	0.002	
- Water Vapour	u(ϕH_2O)	0.038	
- Oxygen, wet	u(ϕO_2,w)	0.632	
- Carbon Dioxide, wet	u(ϕCO_2,w)	0.002	
Standard uncertainty associated with the stack temperature	u(Tc)	1.454	K
Standard uncertainty associated with the absolute pressure in the duct	u(pc)	175.695	Pa
- Atmospheric Pressure	u(patm)	175.692	
- Static Pressure	u(pstat)	1.065	
Standard uncertainty associated with the density in the duct	u(ρ)	0.00673	-
Standard uncertainty associated with the local velocities	u(vi)	0.145	Pa
Standard uncertainty associated with the mean velocity	u(v)	0.145	m/s
Standard uncertainty associated with the mean velocity (95% Confidence)	Uc(v)	0.285	m/s
Standard uncertainty associated with the mean velocity (95% Confidence), relative	Uc,rel(v)	5.69	%
Standard uncertainty associated with the volume flow rate (95% Confidence)	Uc(qV,w)	105.4	m^3/hr
- $u^2(a)/a^2$	-	0.00053	
- $u^2(qV,w)/q^2V,w$	-	0.00138	
- $u^2(qV,w)$	-	2892	
- $u(qV,w)$	-	53.8	
Standard uncertainty associated with the volume flow rate (95% Confidence), relative	Uc,rel(qV,w)	7.27	%

TOTAL PARTICULATE MATTER: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A7 Anodising VAT 2 Fcatory 1 shop 1

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	1.0		1.0
Uncertainty	±mg/m³	0.43		0.43
Mass Emission	g/hr	1.3		1.3
Uncertainty	±g/hr	0.56		0.56

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.75		0.75
Uncertainty	±% v/v	0.040		0.040

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.22		0.22

NOTE: Where the Balance Uncertainty / Limit of Detection is higher than the Blank concentration, the Balance Uncertainty / Limit of Detection concentration has been reported.

General Sampling Information

Parameter	Value	
Standard	EN 13284-1	
Technical Procedure	MD 001	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL PARTICULATE MATTER: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	761.3
Stack static pressure, P_{static}	mmH_2O	10.2
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	762.1
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	-1.5
Total mass collected in impingers (silica trap)	g	7.8
Total mass of liquid collected, V_{lc}	g	6.3
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0078
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.0820
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	8.8
Average pressure drop across orifice, ΔH	mmH_2O	28.5
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0433
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0075
B_{wo} as a percentage	% v/v	0.75
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.75
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0511
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.76
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	1.88
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	1.37
Average stack gas temperature, T_s	°C	13.8
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	4.60
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	22.2
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	21.2
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	21.0
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	8.98
Nozzle area, A_n	mm^2	63.38
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	104.9

TOTAL PARTICULATE MATTER: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	10:56 - 11:56
Sampling Dates	-	05/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.0511
Filter I.D. Number	-	47-125260
Start Filter Mass	g	0.14245
End Filter Mass	g	0.14310
Total Mass on Filter	g	0.00065
Probe Rinse I.D. Number	-	PR-47-125260
Start Probe Rinse Mass	g	2.83421
End Probe Rinse Mass	g	2.83464
Total Mass in Probe Rinse	g	0.00044
Total Mass Collected	mg	1.09
Calculated Concentration	mg/m^3	1.04
Balance Uncertainty / LOD	mg/m^3	0.22

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	05/01/2026
Average Volume Sampled (REF)	m^3	1.0511
Filter I.D. Number	-	47-125261
Start Filter Mass	g	0.14377
End Filter Mass	g	0.14372
Total Mass on Filter	g	-0.00005
Probe Rinse I.D. Number	-	PR-47-125261
Start Probe Rinse Mass	g	3.00440
End Probe Rinse Mass	g	3.00447
Total Mass in Probe Rinse	g	0.00007
Total Mass Collected	mg	0.02
Calculated Concentration	mg/m^3	0.02
Balance Uncertainty / LOD	mg/m^3	0.22

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	17.9
Pre-Sampling Leak Rate	l/min	0.15
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.3
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	104.9
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Weighing Uncertainty Criteria	Units	Run 1
Overall Weighing Uncertainty	± mg	0.33
Overall Weighing Uncertainty	± mg/m³	0.31
ELV [Daily ELV for IED]	mg/m³	N/A
Allowable Weighing Uncertainty	mg/m³	N/A
Weighing Uncertainty Acceptable	-	N/A

Filter Temperatures	Units	Run 1
Pre-Conditioning Temperature	°C	180
Post-Conditioning Temperature	°C	160
Maximum Filter Temperature	°C	14

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.12
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Acetone / Water Rinse Blank	Units	Blank
Acetone / Water Rinse Value	mg/l	2.7
Allowable Blank	mg/l	10
Blank Acceptable	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1
There are no deviations associated with the sampling employed.	wx

TOTAL PARTICULATE MATTER: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.0820	uV_m	m^3	0.0216
Sampled Gas Temperature	T_m	281.8	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.6	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	0.84	uL	%	-
Mass of Particulate	m	1.09	um	mg	0.23
Uncollected Mass	UCM	0.02	uUCM	mg	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.71	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.84	≤2%
Mass of Particulate	%	-	-
Uncollected Mass	%	-	-

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.0433	0.99
Leak	L	mg/m^3	0.005	1.00
Mass of Particulate	L_r	mg	1.090	0.95
Uncollected Mass	UCM	mg	0.01	0.95

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.026
Leak	mg/m^3	0.0050
Mass of Particulate	mg/m^3	0.2188
Uncollected Mass	mg/m^3	0.0110

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.22
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.43
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.43
Reported Uncertainty	mg/m^3	0.43
Expanded uncertainty (95% confidence), without Oxygen Correction	%	41.7
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	41.7
Reported Uncertainty	%	41.7
Reported Uncertainty as % of ELV	%	N/A

SULPHUR DIOXIDE: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A7 Anodising VAT 2 Fcatory 1 shop 1

Sample Runs

Parameter	Units	Run 1	Mean
Concentration	mg/m³	0.24	0.24
Uncertainty	±mg/m³	0.014	0.014
Mass Emission	g/hr	0.30	0.30
Uncertainty	±g/hr	0.028	0.028

Parameter	Units	Run 1	Mean
Water Vapour	% v/v	0.75	0.75
Uncertainty	±% v/v	0.040	0.040

Blank Runs

Parameter	Units	Blank 1	Maximum
Concentration	mg/m³	0.018	0.018

General Sampling Information

Parameter	Value	
Standard	EN 14791	
Technical Procedure	MD 009	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 101	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	08/01/2025	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Impinger Material	Polyethylene	
Absorption Solution	0.3% Hydrogen Peroxide	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

SULPHUR DIOXIDE: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	761.3
Stack static pressure, P_{static}	mmH_2O	10.2
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	762.1
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	-1.5
Total mass collected in impingers (silica trap)	g	7.8
Total mass of liquid collected, V_{lc}	g	6.3
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0078
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.0820
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	8.8
Average pressure drop across orifice, ΔH	mmH_2O	28.5
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0433
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0075
B_{wo} as a percentage	% v/v	0.75
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.75
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0511
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.76
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	1.88
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	1.37
Average stack gas temperature, T_s	°C	13.8
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	4.60
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	22.2
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	21.2
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	21.0
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	8.98
Nozzle area, A_n	mm^2	63.38
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	104.9

SULPHUR DIOXIDE: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	10:56 - 11:56
Sampling Dates	-	05/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.0511
Laboratory Result for Front Impingers	µg/ml	0.89
Laboratory Result for Back Impinger	µg/ml	0.15
Volume in Front Impingers	ml	262.1
Volume in Back Impinger	ml	125.3
Mass in Front Impingers	µg	233.3
Mass in Back Impinger	µg	18.8
Total Mass Collected	µg	252.1
Calculated Concentration	mg/m^3	0.24

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	05/01/2026
Average Volume Sampled (REF)	m^3	1.0511
Laboratory Result for Impingers	µg/ml	0.06
Volume in Impingers	ml	319.0
Total Mass Collected	µg	19.1
Calculated Concentration	mg/m^3	0.02

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	17.9
Pre-Sampling Leak Rate	l/min	0.15
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	92.5
Allowable Absorption Efficiency	%	95
Absorption Efficiency Acceptable	-	No

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.3
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	104.9
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	14

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.12
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
The absorption efficiency was less than the required 95%. [90 - 95%]	x	

SULPHUR DIOXIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.0820	uV_m	m^3	0.0216
Sampled Gas Temperature	T_m	281.8	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.6	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	0.84	uL	%	-
Laboratory Result	L_r	0.90	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.71	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.84	≤2%
Laboratory Result	%	0.90	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.0433	0.23
Leak	L	mg/m^3	0.001	1.00
Laboratory Result	L_r	mg/m^3	0.002	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.006
Leak	mg/m^3	0.0012
Laboratory Result	mg/m^3	0.0022

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.01
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.01
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.01
Reported Uncertainty	mg/m^3	0.01
Expanded uncertainty (95% confidence), without Oxygen Correction	%	5.2
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	5.7
Reported Uncertainty	%	5.7
Reported Uncertainty as % of ELV	%	N/A

VERSION HISTORY

Version Number	Record of changes made within this version of the document
V1	The original document issued to the client

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Stack Emissions Testing Report Commissioned by
Envirosolution Ltd

Installation Name & Address
Hard Anodising Surface Treatments Ltd
Firs Estate
Stourport Road
Kidderminster
DY11 7QN

Stack Reference
A9 Anodising VATs 9 & 12

Dates of the Monitoring Campaign
6th January 2026

Job Reference Number
EMT15043

Report Written by
Ewan Price Team Leader MCERTS Level 2 Team Leader TE1 TE2 TE3 TE4

Report Approved by
Tracy Dodds Key Account Manager MCERTS Level 2 MM 03 414 TE1 TE2 TE3 TE4

Report Date
2nd February 2026

Version
Version 1

Signature of Report Approver


CONTENTS

Opinions and interpretations expressed herein are outside the scope of Element's ISO 17025 accreditation.

MONITORING OBJECTIVES

Hard Anodising Surface Treatments Ltd, Kidderminster
A9 Anodising VATs 9 & 12
6th January 2026

Overall Aim of the Monitoring Campaign

Element were commissioned by Envirosolution Ltd to carry out stack emissions testing for Hard Anodising Surface Treatments Ltd on the A9 Anodising VATs 9 & 12 at Kidderminster.

The aim of the monitoring campaign was to perform testing, as requested by the customer, for a number of prescribed pollutants. There are no emission limits set for any of the pollutants at this time.

Special Requirements

There were no special requirements.

Target Parameters

Total Particulate Matter, Sulphur Dioxide

Executive Summary

MONITORING RESULTS

Hard Anodising Surface Treatments Ltd, Kidderminster
A9 Anodising VATs 9 & 12
6th January 2026

where MU = Measurement Uncertainty associated with the Result

	Concentration				Mass Emission			
Parameter	**Units**	**Result**	**MU +/-**	**Limit**	**Units**	**Result**	**MU +/-**	**Limit**
Total Particulate Matter [1]	mg/m³	1.8	0.38	-	g/hr	13.9	3.1	-
Sulphur Dioxide [1]	mg/m³	0.073	0.0053	-	g/hr	0.56	0.059	-
Water Vapour	% v/v	0.32	0.019					
Stack Gas Temperature	°C	14.3						
Stack Gas Velocity	m/s	3.9	0.24					
Volumetric Flow Rate (ACTUAL)	m³/hr	7997	605					
Volumetric Flow Rate (REF) [1]	m³/hr	7631	578					

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM THE PRELIMINARY VELOCITY TRAVERSE.

[1] Reference Conditions (REF) are: 273K, 101.3kPa, without correction for water vapour content.

Executive Summary

(Page 3 of 7)

MONITORING DATE(S) & TIMES

Hard Anodising Surface Treatments Ltd, Kidderminster
A9 Anodising VATs 9 & 12
6th January 2026

Parameter		Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins
Total Particulate Matter	R1	mg/m³	1.8	g/hr	13.9	06/01/2026	08:06 - 09:06	60
Sulphur Dioxide	R1	mg/m³	0.073	g/hr	0.56	06/01/2026	08:06 - 09:06	60
Velocity Traverse	R1					06/01/2026	07:54 - 08:01	

All results are expressed at the respective reference conditions.

PROCESS DETAILS

Hard Anodising Surface Treatments Ltd, Kidderminster
A9 Anodising VATs 9 & 12
6th January 2026

Standard Operating Conditions

Parameter	Value
Process Status	Normal Operation
Capacity (of 100%) and Tonnes / Hour	100%
Continuous or Batch Process	Batch
Feedstock (if applicable)	Aluminium Parts
Abatement System	N/A
Abatement System Running Status	N/A
Fuel	N/A - Electric Heating
Plume Appearance	None Visable

MONITORING & ANALYTICAL METHODS

Hard Anodising Surface Treatments Ltd, Kidderminster
A9 Anodising VATs 9 & 12
6th January 2026

	Monitoring				Analysis					
Parameter	**Standard**	**Technical Procedure**	**Sampling Status**	**Testing Lab**	**Analytical Procedure**	**Analytical Technique**	**Analysis Status**	**Analysis Lab**	**Overall Status**	**LOD (Average)**
Total Particulate Matter	EN 13284-1	MD 001	MCERTS	EET	MD 103	Gravimetric	MCERTS	EET	MCERTS	0.17 mg/m³
Sulphur Dioxide	EN 14791	MD 009	MCERTS	EET	MD 101	IC	MCERTS	EET	MCERTS	0.012 mg/m³
Water Vapour	EN 14790	MD 005	MCERTS	EET	MD 005	Gravimetric	MCERTS	EET	MCERTS	0.10 % v/v
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041	MCERTS	EET	Pitot Tube and Thermocouple				MCERTS	1.8 m/s

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

Element (Stockport Lab - EET)	ISO 17025 Accreditation Number: UKAS 4279

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
Sulphur Dioxide	Run 1	The absorption efficiency was less than the required 95%. [50 - 75%]

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.85
Width	m	-
Area	m^2	0.57
Port Depth	cm	10
Orientation of Duct	-	Vertical
Number of Ports	-	2
Sample Port Size	-	4" BSP

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	Temporary
Inside / Outside	Inside

Platform Details

EA Technical Guidance Note M1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	Yes
Platform has vertical base boards (approx. 0.25m high)	Yes
Platform has chains / self closing gates at top of ladders	Yes
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations.

EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

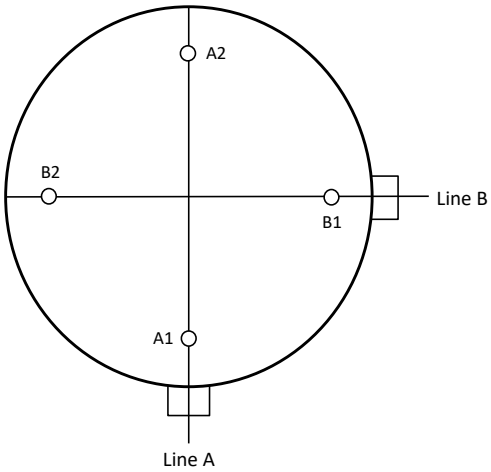
Sampling Plane Validation Criteria (from EN 15259)

Criteria in EN 15259	Units	Traverse 1	Required	Compliant
Lowest Differential Pressure	Pa	12.3	> 5 Pa	Yes
Mean Velocity	m/s	3.91	-	-
Lowest Gas Velocity	m/s	3.74	-	-
Highest Gas Velocity	m/s	4.02	-	-
Ratio of Above	: 1	1.07	< 3 : 1	Yes
Maximum Angle of Swirl	°	9.00	< 15°	Yes
No Local Negative Flow	-	Yes	-	Yes

PLANT PHOTOS

Photo 1

SAMPLE POINTS



where
- ○ = isokinetic point sampled at
- ● = isokinetic point not sampled at
- ● = combustion gases sample point
- ● = non-isokinetic sample point

APPENDIX CONTENTS

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Ewan Price	MCERTS Level 2	MM 21 1654	TE1 TE2 TE3 TE4
Trainee	Greg Stretton	MCERTS Trainee	MM 24 1853	N/A

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	CAT 7.122
Control Box DGM (2)	-
Box Thermocouples (1)	CAT 3.136
Box Thermocouples (2)	-
Umbilical (1)	CAT 3.136
Umbilical (2)	-
Oven Box (1)	-
Oven Box (2)	-
Heated Probe (1)	CAT 5.10
Heated Probe (2)	-
Heated Probe (3)	-
S-Pitot (1)	CAT 21P.193
S-Pitot (2)	-
L-Pitot	-
Site Balance	CAT 17.92
500g / 1Kg Check Weights	CAT 17.92
Last Impinger Arm	-
Callipers	-
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-250	-
Horiba PG-250	-
Servomex 5200 MP	-
Eco Physics CLD 822Mh	-
ABB AO2020-URAS26	-
Testo 350 XL	-
JCT JCC P1 Cooler	-
Gasmet DX4000	-
Gasmet Sampling System	-
Sick 3006	-
M&C PSS	-
Mass Flow Controller (1)	-
Mass Flow Controller (2)	-
Mass View (1)	-
Mass View (2)	-
Hioki 5043 (V)	-
Easylogger EN-EL-12 Bit	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	-
Digital Manometer (2)	-
Digital Temperature Meter	-
Stopwatch	CAT 14.53
Barometer	-
Stack Thermocouple (1)	CAT 4.1461
Stack Thermocouple (2)	-
Stack Thermocouple (3)	-
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	-
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	CAT 1.18, 1.18a, 1.18b
Tape Measure	CAT 16.69

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Total Particulate Matter	EN 13284-1	MD 001
Sulphur Dioxide	EN 14791	MD 009
Water Vapour	EN 14790	MD 005
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041

PRELIMINARY STACK SURVEY: CALCULATIONS

General Stack Details

Stack Details (from Traverse)	Units	Value
Stack Diameter / Depth, D	m	0.85
Stack Width, W	m	-
Stack Area, A	m^2	0.57
Average Stack Gas Temperature, T_a	°C	14.3
Average Stack Gas Pressure	Pa	13.5
Average Stack Static Pressure, P_{static}	kPa	0.019
Average Barometric Pressure, P_b	kPa	101.7
Average Pitot Tube Calibration Coefficient, C_p	-	0.84

Stack Gas Composition & Molecular Weights

Component	Conc ppm	Conc Dry % v/v	Conc Wet % v/v	Volume Fraction r	Molar Mass M	Density kg/m³ p	Conc kg/m³ p_i
CO_2 (Estimated)	-	0.06	0.06	0.0006	44.01	1.9635	0.00118
O_2 (Estimated)	-	20.80	20.73	0.2080	32.00	1.4277	0.29696
N_2	-	79.14	78.89	0.7914	28.01	1.2498	0.98913
Moisture (H_2O)	-	-	0.32	0.0032	18.02	0.8037	0.00256

Where: p = M / 22.41

p_i = r x p

Calculation of Stack Gas Densities

Determinand	Units	Result
Dry Density (STP), P_{STD}	kg/m³	1.287
Wet Density (STP), P_{STW}	kg/m³	1.286
Dry Density (Actual), P_{Actual}	kg/m³	1.228
Average Wet Density (Actual), $P_{ActualW}$	kg/m³	1.227

Where: P_{STD} = sum of component concentrations, kg/m³ (not including water vapour)

P_{STW} = sum of all wet concentrations / 100 x density, kg/m³ (including water vapour)

$P_{Actual} = P_{STD} \times (T_{STP} / (P_{STP})) \times ((P_{static} + P_b) / T_a)$

$P_{ActualW}$ (at each sampling point) $= P_{STW} \times (T_s / P_s) \times (P_a / T_a)$

Calculation of Stack Gas Volumetric Flowrate, Q

Duct gas flow conditions	Units	Actual	REF [1]
Temperature	°C	14.3	0.0
Total Pressure	kPa	101.7	101.3
Moisture	%	0.32	0.32

Gas Volumetric Flowrate (from Traverse)	Units	Result
Gas Volumetric Flowrate (Actual)	m³/hr	7997
Gas Volumetric Flowrate (STP, Wet)	m³/hr	7631
Gas Volumetric Flowrate (STP, Dry)	m³/hr	7607
Gas Volumetric Flowrate REF [1]	m³/hr	7631

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID)

(1 of 1)

Parameter	Units	Value
Date of Survey	-	06/01/2026
Time of Survey	-	07:54 - 08:01
Atmospheric Pressure	kPa	101.7
Average Stack Static Pressure	Pa	19
Result of Pitot Stagnation Test	-	Pass
Are Water Droplets Present?	-	No
Device Used	S-Type Pitot with Liquid Incline Manometer	

Parameter	Units	Value
Initial Pitot Leak Check	-	Pass
Final Pitot Leak Check	-	Pass
Orientation of Duct	-	Vertical
Pitot Tube, C_p	-	0.84
Number of Lines Available	-	2
Number of Lines Used	-	2

		Sampling Line A					Sampling Line B				
Traverse Point	Depth m	ΔP Pa	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °	ΔP Pa	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °
STATIC (Units: Pa)		*17.8*					*19.4*				
Mean		**13.0**	**14.3**	**1.227**	**3.84**		**14.0**	**14.3**	**1.227**	**3.99**	
1	0.12	12.3	14.2	1.227	3.74	8.0	14.2	14.3	1.227	4.02	9.0
2	0.73	13.6	14.3	1.227	3.94	9.0	13.7	14.3	1.227	3.95	9.0

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID) - MEASUREMENT UNCERTAINTY

(1 of 1)

Performance characteristics (Uncertainty Components)	Uncertainty	Value	Units
Standard Uncertainty on the coefficient of the Pitot Tube	u(k)	0.005	-
Standard Uncertainty associated with the mean local dynamic pressures	u(Δpi)	1.624	Pa
- Resolution	u(res)	0.52154	
- Calibration	u(cal)	0.019	
- Drift	u(drift)	1.096	
- Lack of Fit	u(fit)	0.002	
- Overall corrections to dynamic measurements	u(Cf)	1.638	
Standard uncertainty associated with the molar mass of the gas	u(M)	0.00003	-
- $\varphi O_2,w$	-	20.734	
- $\varphi CO_2,w$	-	0.060	
- Oxygen, dry	u(ϕO_2,d)	0.637	
- Carbon Dioxide, dry	u(ϕCO_2,d)	0.002	
- Water Vapour	u(ϕH_2O)	0.016	
- Oxygen, wet	u(ϕO_2,w)	0.635	
- Carbon Dioxide, wet	u(ϕCO_2,w)	0.002	
Standard uncertainty associated with the stack temperature	u(Tc)	1.466	K
Standard uncertainty associated with the absolute pressure in the duct	u(pc)	175.696	Pa
- Atmospheric Pressure	u(patm)	175.692	
- Static Pressure	u(pstat)	1.148	
Standard uncertainty associated with the density in the duct	u(ρ)	0.00670	-
Standard uncertainty associated with the local velocities	u(vi)	0.238	Pa
Standard uncertainty associated with the mean velocity	u(v)	0.121	m/s
Standard uncertainty associated with the mean velocity (95% Confidence)	Uc(v)	0.238	m/s
Standard uncertainty associated with the mean velocity (95% Confidence), relative	Uc,rel(v)	6.07	%
Standard uncertainty associated with the volume flow rate (95% Confidence)	Uc(qV,w)	605.3	m^3/hr
- $u^2(a)/a^2$	-	0.00053	
- $u^2(qV,w)/q^2V,w$	-	0.00149	
- $u^2(qV,w)$	-	95384	
- $u(qV,w)$	-	308.8	
Standard uncertainty associated with the volume flow rate (95% Confidence), relative	Uc,rel(qV,w)	7.57	%

TOTAL PARTICULATE MATTER: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A9 Anodising VATs 9 & 12

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	1.8		1.8
Uncertainty	±mg/m³	0.38		0.38
Mass Emission	g/hr	13.9		13.9
Uncertainty	±g/hr	3.1		3.1

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.32		0.32
Uncertainty	±% v/v	0.019		0.019

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.17		0.17

NOTE: Where the Balance Uncertainty / Limit of Detection is higher than the Blank concentration, the Balance Uncertainty / Limit of Detection concentration has been reported.

General Sampling Information

Parameter	Value	
Standard	EN 13284-1	
Technical Procedure	MD 001	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	2 / 2	FORMAT: Number Used / Number Required
Number of Sampling Points Used	4 / 4	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL PARTICULATE MATTER: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	761.3
Stack static pressure, P_{static}	mmH_2O	1.8
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	761.4
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	-5.1
Total mass collected in impingers (silica trap)	g	8.5
Total mass of liquid collected, V_{lc}	g	3.4
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0042
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.3678
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	8.4
Average pressure drop across orifice, ΔH	mmH_2O	46.4
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.3233
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0032
B_{wo} as a percentage	% v/v	0.32
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.32
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.3275
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.81
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	0.97
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	0.98
Average stack gas temperature, T_s	°C	14.0
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	3.30
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.57
$Q_a = (60)(A_s)(V_s)$	m^3/min	112.2
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	106.9
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	106.6
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	12.00
Nozzle area, A_n	mm^2	113.03
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	103.9

TOTAL PARTICULATE MATTER: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	08:06 - 09:06
Sampling Dates	-	06/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.3275
Filter I.D. Number	-	47-124739
Start Filter Mass	g	0.14666
End Filter Mass	g	0.14713
Total Mass on Filter	g	0.00047
Probe Rinse I.D. Number	-	PR-47-124739
Start Probe Rinse Mass	g	2.81547
End Probe Rinse Mass	g	2.81742
Total Mass in Probe Rinse	g	0.00195
Total Mass Collected	mg	2.42
Calculated Concentration	mg/m^3	1.82
Balance Uncertainty / LOD	mg/m^3	0.17

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	06/01/2026
Average Volume Sampled (REF)	m^3	1.3275
Filter I.D. Number	-	47-125278
Start Filter Mass	g	0.14053
End Filter Mass	g	0.14032
Total Mass on Filter	g	-0.00021
Probe Rinse I.D. Number	-	PR-47-125278
Start Probe Rinse Mass	g	2.77723
End Probe Rinse Mass	g	2.77727
Total Mass in Probe Rinse	g	0.00004
Total Mass Collected	mg	-0.17
Calculated Concentration	mg/m^3	-0.13
Balance Uncertainty / LOD	mg/m^3	0.17

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	22.6
Pre-Sampling Leak Rate	l/min	0.15
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	6.1
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	103.9
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Weighing Uncertainty Criteria	Units	Run 1
Overall Weighing Uncertainty	± mg	0.33
Overall Weighing Uncertainty	± mg/m³	0.25
ELV [Daily ELV for IED]	mg/m³	N/A
Allowable Weighing Uncertainty	mg/m³	N/A
Weighing Uncertainty Acceptable	-	N/A

Filter Temperatures	Units	Run 1
Pre-Conditioning Temperature	°C	180
Post-Conditioning Temperature	°C	160
Maximum Filter Temperature	°C	14

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.14
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Acetone / Water Rinse Blank	Units	Blank
Acetone / Water Rinse Value	mg/l	2.7
Allowable Blank	mg/l	10
Blank Acceptable	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1
There are no deviations associated with the sampling employed.	wx

TOTAL PARTICULATE MATTER: MEASUREMENT UNCERTAINTY CALCULATIONS

		Value			Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**		**Symbol**	**Units**	**Run 1**	
Sampled Volume (Actual)	V_m	1.3678		uV_m	m^3	0.0274	
Sampled Gas Temperature	T_m	281.4		uT_m	K	2.00	
Sampled Gas Pressure	ρ_m	101.5		$u\rho_m$	kPa	0.50	
Sampled Gas Humidity	H_m	0.00		uH_m	% v/v	1.00	
Leak	L	0.66		uL	%	-	
Mass of Particulate	m	2.42		um	mg	0.23	
Uncollected Mass	UCM	-0.17		uUCM	mg	-	

	Uncertainty as a Percentage			
Measured Quantities	**Units**	**Run 1**		**Requirement of Standard**
Sampled Volume (Actual)	%	2.00		≤2%
Sampled Gas Temperature	%	0.71		≤1%
Sampled Gas Pressure	%	0.49		≤1%
Sampled Gas Humidity	%	1.00		≤1%
Leak	%	0.66		≤2%
Mass of Particulate	%	-		-
Uncollected Mass	%	-		-

	Uncertainty in Measurement Units				Sensitivity Coefficient	
Measured Quantities	**Symbol**	**Units**	**Run 1**		**Run 1**	
Sampled Volume (STP)	V_m	m^3	1.3233		1.38	
Leak	L	mg/m^3	0.007		1.00	
Mass of Particulate	L_r	mg	2.420		0.75	
Uncollected Mass	UCM	mg	-0.10		0.75	

	Uncertainty in Result		
Measured Quantities	**Units**	**Run 1**	
Sampled Volume (STP)	mg/m^3	0.045	
Leak	mg/m^3	0.0070	
Mass of Particulate	mg/m^3	0.1733	
Uncollected Mass	mg/m^3	-0.0739	

	Oxygen Correction Part of MU Budget		
Measured Quantities	**Units**	**Run 1**	
O_2 Correction Factor	-	N/A	
Stack Gas O_2 Content	% v/v	N/A	
MU for O_2 Correction	-	N/A	
Overall MU For O_2 Measurement	%	N/A	

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.19
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.38
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.38
Reported Uncertainty	mg/m^3	0.38
Expanded uncertainty (95% confidence), without Oxygen Correction	%	20.8
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	20.8
Reported Uncertainty	%	20.8
Reported Uncertainty as % of ELV	%	N/A

SULPHUR DIOXIDE: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A9 Anodising VATs 9 & 12

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.073		0.073
Uncertainty	±mg/m³	0.0053		0.0053
Mass Emission	g/hr	0.56		0.56
Uncertainty	±g/hr	0.059		0.059

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.32		0.32
Uncertainty	±% v/v	0.019		0.019

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.023		0.023

General Sampling Information

Parameter	Value	
Standard	EN 14791	
Technical Procedure	MD 009	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 101	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	08/01/2025	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Impinger Material	Polyethylene	
Absorption Solution	0.3% Hydrogen Peroxide	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	2 / 2	FORMAT: Number Used / Number Required
Number of Sampling Points Used	4 / 4	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

SULPHUR DIOXIDE: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	761.3
Stack static pressure, P_{static}	mmH_2O	1.8
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	761.4
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	-5.1
Total mass collected in impingers (silica trap)	g	8.5
Total mass of liquid collected, V_{lc}	g	3.4
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0042
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.3678
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	8.4
Average pressure drop across orifice, ΔH	mmH_2O	46.4
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.3233
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0032
B_{wo} as a percentage	% v/v	0.32
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.32
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.3275
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.81
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	0.97
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	0.98
Average stack gas temperature, T_s	°C	14.0
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	3.30
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.57
$Q_a = (60)(A_s)(V_s)$	m^3/min	112.2
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	106.9
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	106.6
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	12.00
Nozzle area, A_n	mm^2	113.03
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	103.9

SULPHUR DIOXIDE: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	08:06 - 09:06
Sampling Dates	-	06/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.3275
Laboratory Result for Front Impingers	µg/ml	0.36
Laboratory Result for Back Impinger	µg/ml	0.22
Volume in Front Impingers	ml	201.0
Volume in Back Impinger	ml	112.5
Mass in Front Impingers	µg	72.4
Mass in Back Impinger	µg	24.8
Total Mass Collected	µg	97.1
Calculated Concentration	mg/m^3	0.07

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	06/01/2026
Average Volume Sampled (REF)	m^3	1.3275
Laboratory Result for Impingers	µg/ml	0.10
Volume in Impingers	ml	308.7
Total Mass Collected	µg	30.9
Calculated Concentration	mg/m^3	0.02

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	22.6
Pre-Sampling Leak Rate	l/min	0.15
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	74.5
Allowable Absorption Efficiency	%	95
Absorption Efficiency Acceptable	-	No

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	6.1
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	103.9
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	14

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.14
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
The absorption efficiency was less than the required 95%. [50 - 75%]	x	

SULPHUR DIOXIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.3678	uV_m	m^3	0.0274
Sampled Gas Temperature	T_m	281.4	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.5	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	0.66	uL	%	-
Laboratory Result	L_r	0.90	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.71	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.66	≤2%
Laboratory Result	%	0.90	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.3233	0.06
Leak	L	mg/m^3	0.000	1.00
Laboratory Result	L_r	mg/m^3	0.001	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.002
Leak	mg/m^3	0.0003
Laboratory Result	mg/m^3	0.0007

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.002
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.004
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.005
Reported Uncertainty	mg/m^3	0.005
Expanded uncertainty (95% confidence), without Oxygen Correction	%	5.2
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	7.2
Reported Uncertainty	%	7.2
Reported Uncertainty as % of ELV	%	N/A

VERSION HISTORY

Version Number	Record of changes made within this version of the document
V1	The original document issued to the client

Element, Unit C6, Emery Court, The Embankment Business Park, Heaton Mersey, Stockport, SK4 3GL
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Stack Emissions Testing Report Commissioned by
Envirosolution Ltd

Installation Name & Address
Hard Anodising Surface Treatments Ltd
Firs Estate
Stourport Road
Kidderminster
DY11 7QN

Stack Reference
A10 ENP VATs 15 & 16 Factory 1 Shop 3

Dates of the Monitoring Campaign
5th January 2026

Job Reference Number
EMT15043

Report Written by
Ewan Price Team Leader MCERTS Level 2 Team Leader TE1 TE2 TE3 TE4

Report Approved by
Tracy Dodds Key Account Manager MCERTS Level 2 MM 03 414 TE1 TE2 TE3 TE4

Report Date
2nd February 2026

Version
Version 1

Signature of Report Approver


CONTENTS

Opinions and interpretations expressed herein are outside the scope of Element's ISO 17025 accreditation.

MONITORING OBJECTIVES

Hard Anodising Surface Treatments Ltd, Kidderminster
A10 ENP VATs 15 & 16 Factory 1 Shop 3
5th January 2026

Overall Aim of the Monitoring Campaign

Element were commissioned by Envirosolution Ltd to carry out stack emissions testing for Hard Anodising Surface Treatments Ltd on the A10 ENP VATs 15 & 16 Factory 1 Shop 3 at Kidderminster.

The aim of the monitoring campaign was to perform testing, as requested by the customer, for a number of prescribed pollutants. There are no emission limits set for any of the pollutants at this time.

Special Requirements

There were no special requirements.

Target Parameters

Total Particulate Matter, Sulphur Dioxide, Nickel

Executive Summary

(Page 2 of 7)

MONITORING RESULTS

Hard Anodising Surface Treatments Ltd, Kidderminster

A10 ENP VATs 15 & 16 Factory 1 Shop 3

5th January 2026

where MU = Measurement Uncertainty associated with the Result

	Concentration				Mass Emission			
Parameter	**Units**	**Result**	**MU +/-**	**Limit**	**Units**	**Result**	**MU +/-**	**Limit**
Total Particulate Matter [1]	mg/m³	11.2	0.72	-	g/hr	45.5	4.0	-
Sulphur Dioxide [1]	mg/m³	0.14	0.0086	-	g/hr	0.55	0.048	-
Nickel [1]	mg/m³	0.0015	0.0002	-	g/hr	0.0060	0.0008	-
Water Vapour	% v/v	1.2	0.064					
Stack Gas Temperature	°C	20.4						
Stack Gas Velocity	m/s	16.0	0.60					
Volumetric Flow Rate (ACTUAL)	m³/hr	4344	256					
Volumetric Flow Rate (REF) [1]	m³/hr	4053	239					

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM AN AVERAGE OF ALL OF THE ISOKINETIC RUNS.

[1] Reference Conditions (REF) are: 273K, 101.3kPa, without correction for water vapour content.

Executive Summary

MONITORING DATE(S) & TIMES

Hard Anodising Surface Treatments Ltd, Kidderminster
A10 ENP VATs 15 & 16 Factory 1 Shop 3
5th January 2026

Parameter		Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins
Total Particulate Matter	R1	mg/m³	11.2	g/hr	45.5	05/01/2026	15:35 - 16:36	60
Sulphur Dioxide	R1	mg/m³	0.14	g/hr	0.55	05/01/2026	15:35 - 16:36	60
Nickel	R1	mg/m³	0.0015	g/hr	0.0060	05/01/2026	14:30 - 15:30	60
Velocity Traverse	R1					05/01/2026	14:21 - 14:23	

All results are expressed at the respective reference conditions.

PROCESS DETAILS

Hard Anodising Surface Treatments Ltd, Kidderminster
A10 ENP VATs 15 & 16 Factory 1 Shop 3
5th January 2026

Standard Operating Conditions

Parameter	Value
Process Status	Normal Operation
Capacity (of 100%) and Tonnes / Hour	100%
Continuous or Batch Process	Batch
Feedstock (if applicable)	Aluminium Parts
Abatement System	N/A
Abatement System Running Status	N/A
Fuel	N/A - Electric Heating
Plume Appearance	None Visable

Executive Summary

MONITORING & ANALYTICAL METHODS

Hard Anodising Surface Treatments Ltd, Kidderminster
A10 ENP VATs 15 & 16 Factory 1 Shop 3
5th January 2026

	Monitoring				Analysis					
Parameter	**Standard**	**Technical Procedure**	**Sampling Status**	**Testing Lab**	**Analytical Procedure**	**Analytical Technique**	**Analysis Status**	**Analysis Lab**	**Overall Status**	**LOD (Average)**
Total Particulate Matter	EN 13284-1	MD 001	MCERTS	EET	MD 103	Gravimetric	MCERTS	EET	MCERTS	0.23 mg/m³
Sulphur Dioxide	EN 14791	MD 009	MCERTS	EET	MD 101	IC	MCERTS	EET	MCERTS	0.019 mg/m³
Nickel	EN 14385	MD 006	MCERTS	EET	MD 107	ICP-MS	MCERTS	EET	MCERTS	0.001 mg/m³
Water Vapour	EN 14790	MD 005	MCERTS	EET	MD 005	Gravimetric	MCERTS	EET	MCERTS	0.10 % v/v
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041	MCERTS	EET	Pitot Tube and Thermocouple				MCERTS	1.2 m/s

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

Element (Stockport Lab - EET)	ISO 17025 Accreditation Number: UKAS 4279

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
Sulphur Dioxide	Run 1	The absorption efficiency was less than the required 95%. [75 - 90%]

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.31
Width	m	-
Area	m^2	0.08
Port Depth	cm	6
Orientation of Duct	-	Vertical
Number of Ports	-	2
Sample Port Size	-	4" BSP

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	On Ground
Inside / Outside	Inside

Platform Details

EA Technical Guidance Note M1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	N/A
Platform has vertical base boards (approx. 0.25m high)	N/A
Platform has chains / self closing gates at top of ladders	N/A
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations.

EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

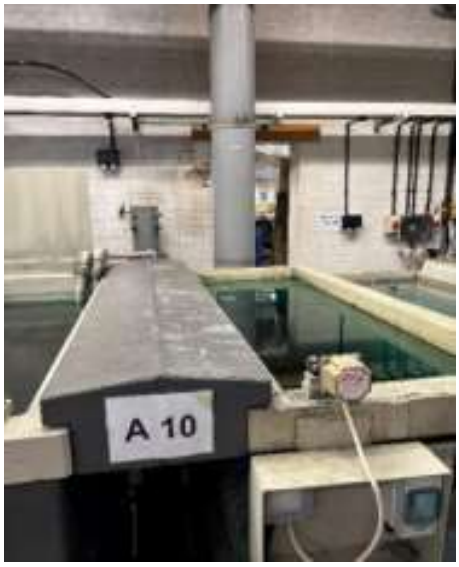
Sampling Plane Validation Criteria (from EN 15259)

Criteria in EN 15259	Units	Traverse 1	Required	Compliant
Lowest Differential Pressure	Pa	214.3	> 5 Pa	Yes
Mean Velocity	m/s	15.91	-	-
Lowest Gas Velocity	m/s	15.91	-	-
Highest Gas Velocity	m/s	15.91	-	-
Ratio of Above	: 1	1.00	< 3 : 1	Yes
Maximum Angle of Swirl	°	4.00	< 15°	Yes
No Local Negative Flow	-	Yes	-	Yes

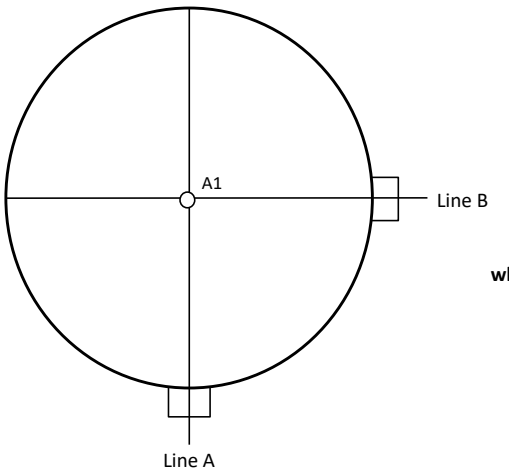
Executive Summary

PLANT PHOTOS

Photo 1



SAMPLE POINTS



where ○ = isokinetic point sampled at
● = isokinetic point not sampled at
● = combustion gases sample point
● = non-isokinetic sample point

APPENDIX CONTENTS

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Ewan Price	MCERTS Level 2	MM 21 1654	TE1 TE2 TE3 TE4
Trainee	Greg Stretton	MCERTS Trainee	MM 24 1853	N/A

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	CAT 7.122
Control Box DGM (2)	-
Box Thermocouples (1)	CAT 3.136
Box Thermocouples (2)	-
Umbilical (1)	CAT 3.136
Umbilical (2)	-
Oven Box (1)	CAT 12.106
Oven Box (2)	-
Heated Probe (1)	CAT 5.10
Heated Probe (2)	-
Heated Probe (3)	-
S-Pitot (1)	CAT 21P.193
S-Pitot (2)	-
L-Pitot	-
Site Balance	CAT 17.92
500g / 1Kg Check Weights	CAT 17.92
Last Impinger Arm	-
Callipers	-
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-250	-
Horiba PG-350E	-
Servomex 5200 MP	-
Eco Physics CLD 822Mh	-
ABB AO2020-URAS26	-
Testo 350 XL	-
JCT JCC P1 Cooler	-
Gasmet DX4000	-
Gasmet Sampling System	-
Sick 3006	-
Ankersmid APP100	-
Mass Flow Controller (1)	-
Mass Flow Controller (2)	-
Mass View (1)	-
Mass View (2)	-
Hioki 5043 (V)	-
Hioki 5043 (V)	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	CAT 3.230
Digital Manometer (2)	-
Digital Temperature Meter	CAT 3.230
Stopwatch	CAT 14.53
Barometer	-
Stack Thermocouple (1)	CAT 4.1461
Stack Thermocouple (2)	-
Stack Thermocouple (3)	-
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	-
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	CAT 1.18, 1.18a, 1.18b
Tape Measure	CAT 16.69

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Total Particulate Matter	EN 13284-1	MD 001
Sulphur Dioxide	EN 14791	MD 009
Nickel	EN 14385	MD 006
Water Vapour	EN 14790	MD 005
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041

PRELIMINARY STACK SURVEY: CALCULATIONS

General Stack Details

Stack Details (from Traverse)	Units	Value
Stack Diameter / Depth, D	m	0.31
Stack Width, W	m	-
Stack Area, A	m^2	0.08
Average Stack Gas Temperature, T_a	°C	22.1
Average Stack Gas Pressure	Pa	214.3
Average Stack Static Pressure, P_{static}	kPa	-0.332
Average Barometric Pressure, P_b	kPa	101.5
Average Pitot Tube Calibration Coefficient, C_p	-	0.84

Stack Gas Composition & Molecular Weights

Component	Conc ppm	Conc Dry % v/v	Conc Wet % v/v	Volume Fraction r	Molar Mass M	Density kg/m³ p	Conc kg/m³ p_i
CO_2 (Estimated)	-	0.06	0.06	0.0006	44.01	1.9635	0.00118
O_2 (Estimated)	-	20.80	20.55	0.2080	32.00	1.4277	0.29696
N_2	-	79.14	78.18	0.7914	28.01	1.2498	0.98913
Moisture (H_2O)	-	-	1.22	0.0122	18.02	0.8037	0.00979

Where: p = M / 22.41

p_i = r x p

Calculation of Stack Gas Densities

Determinand	Units	Result
Dry Density (STP), P_{STD}	kg/m³	1.287
Wet Density (STP), P_{STW}	kg/m³	1.281
Dry Density (Actual), P_{Actual}	kg/m³	1.189
Average Wet Density (Actual), $P_{ActualW}$	kg/m³	1.184

Where: P_{STD} = sum of component concentrations, kg/m³ (not including water vapour)

P_{STW} = sum of all wet concentrations / 100 x density, kg/m³ (including water vapour)

$P_{Actual} = P_{STD} \times (T_{STP} / (P_{STP})) \times ((P_{static} + P_b) / T_a)$

$P_{ActualW}$ (at each sampling point) $= P_{STW} \times (T_s / P_s) \times (P_a / T_a)$

Calculation of Stack Gas Volumetric Flowrate, Q

Duct gas flow conditions	Units	Actual	REF [1]
Temperature	°C	22.1	0.0
Total Pressure	kPa	101.2	101.3
Moisture	%	1.22	1.22

Gas Volumetric Flowrate (from Traverse)	Units	Result
Gas Volumetric Flowrate (Actual)	m³/hr	4324
Gas Volumetric Flowrate (STP, Wet)	m³/hr	3995
Gas Volumetric Flowrate (STP, Dry)	m³/hr	3946
Gas Volumetric Flowrate REF [1]	m³/hr	3995

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID)

(1 of 1)

Parameter	Units	Value
Date of Survey	-	05/01/2026
Time of Survey	-	14:21 - 14:23
Atmospheric Pressure	kPa	101.5
Average Stack Static Pressure	Pa	-332
Result of Pitot Stagnation Test	-	Pass
Are Water Droplets Present?	-	No
Device Used	S-Type Pitot with KIMO MP 210 (500Pa)	

Parameter	Units	Value
Initial Pitot Leak Check	-	Pass
Final Pitot Leak Check	-	Pass
Orientation of Duct	-	Vertical
Pitot Tube, C_p	-	0.84
Number of Lines Available	-	1
Number of Lines Used	-	1

Sampling Line A

Traverse Point	Depth m	ΔP Pa	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °
STATIC (Units: Pa)		*-331.8*				
Mean		**214.3**	**22.1**	**1.184**	**15.91**	
1	0.16	214.3	22.1	1.184	15.91	4.0

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID) - MEASUREMENT UNCERTAINTY

(1 of 1)

Performance characteristics (Uncertainty Components)	Uncertainty	Value	Units
Standard Uncertainty on the coefficient of the Pitot Tube	u(k)	0.005	-
Standard Uncertainty associated with the mean local dynamic pressures	u(Δpi)	4.138	Pa
- Resolution	u(res)	0.00087	
- Calibration	u(cal)	4.782	
- Drift	u(drift)	0.083	
- Lack of Fit	u(fit)	11.257	
- Overall corrections to dynamic measurements	u(Cf)	16.123	
Standard uncertainty associated with the molar mass of the gas	u(M)	0.00003	-
- $\varphi O_2,w$	-	20.547	
- $\varphi CO_2,w$	-	0.059	
- Oxygen, dry	u(ϕO_2,d)	0.637	
- Carbon Dioxide, dry	u(ϕCO_2,d)	0.002	
- Water Vapour	u(ϕH_2O)	0.062	
- Oxygen, wet	u(ϕO_2,w)	0.629	
- Carbon Dioxide, wet	u(ϕCO_2,w)	0.002	
Standard uncertainty associated with the stack temperature	u(Tc)	1.506	K
Standard uncertainty associated with the absolute pressure in the duct	u(pc)	175.741	Pa
- Atmospheric Pressure	u(patm)	175.692	
- Static Pressure	u(pstat)	4.138	
Standard uncertainty associated with the density in the duct	u(ρ)	0.00647	-
Standard uncertainty associated with the local velocities	u(vi)	0.307	Pa
Standard uncertainty associated with the mean velocity	u(v)	0.307	m/s
Standard uncertainty associated with the mean velocity (95% Confidence)	Uc(v)	0.601	m/s
Standard uncertainty associated with the mean velocity (95% Confidence), relative	Uc,rel(v)	3.78	%
Standard uncertainty associated with the volume flow rate (95% Confidence)	Uc(qV,w)	254.9	m^3/hr
- $u^2(a)/a^2$	-	0.00053	
- $u^2(qV,w)/q^2V,w$	-	0.00090	
- $u^2(qV,w)$	-	16917	
- $u(qV,w)$	-	130.1	
Standard uncertainty associated with the volume flow rate (95% Confidence), relative	Uc,rel(qV,w)	5.90	%

TOTAL PARTICULATE MATTER: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A10 ENP VATs 15 & 16 Factory 1 Shop 3

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	11.2		11.2
Uncertainty	±mg/m³	0.72		0.72
Mass Emission	g/hr	45.5		45.5
Uncertainty	±g/hr	4.0		4.0

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.90		0.90
Uncertainty	±% v/v	0.048		0.048

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.23		0.23

NOTE: Where the Balance Uncertainty / Limit of Detection is higher than the Blank concentration, the Balance Uncertainty / Limit of Detection concentration has been reported.

General Sampling Information

Parameter	Value	
Standard	EN 13284-1	
Technical Procedure	MD 001	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL PARTICULATE MATTER: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	761.3
Stack static pressure, P_{static}	mmH_2O	10.2
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	762.1
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	-0.8
Total mass collected in impingers (silica trap)	g	8.1
Total mass of liquid collected, V_{lc}	g	7.3
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0091
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.0721
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	18.1
Average pressure drop across orifice, ΔH	mmH_2O	32.0
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0012
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0090
B_{wo} as a percentage	% v/v	0.90
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.90
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0103
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.74
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	21.80
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	4.67
Average stack gas temperature, T_s	°C	20.1
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	15.83
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	71.7
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	66.9
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	66.3
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	5.00
Nozzle area, A_n	mm^2	19.63
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	96.7

TOTAL PARTICULATE MATTER: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	15:35 - 16:36
Sampling Dates	-	05/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.0103
Filter I.D. Number	-	47-125262
Start Filter Mass	g	0.14170
End Filter Mass	g	0.14198
Total Mass on Filter	g	0.00028
Probe Rinse I.D. Number	-	PR-47-125262
Start Probe Rinse Mass	g	2.81128
End Probe Rinse Mass	g	2.82234
Total Mass in Probe Rinse	g	0.01106
Total Mass Collected	mg	11.34
Calculated Concentration	mg/m^3	11.22
Balance Uncertainty / LOD	mg/m^3	0.23

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	05/01/2026
Average Volume Sampled (REF)	m^3	1.0103
Filter I.D. Number	-	47-125415
Start Filter Mass	g	0.14277
End Filter Mass	g	0.14276
Total Mass on Filter	g	-0.00001
Probe Rinse I.D. Number	-	PR-47-125415
Start Probe Rinse Mass	g	2.75918
End Probe Rinse Mass	g	2.75911
Total Mass in Probe Rinse	g	-0.00007
Total Mass Collected	mg	-0.08
Calculated Concentration	mg/m^3	-0.08
Balance Uncertainty / LOD	mg/m^3	0.23

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	17.7
Pre-Sampling Leak Rate	l/min	0.15
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.4
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	96.7
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Weighing Uncertainty Criteria	Units	Run 1
Overall Weighing Uncertainty	± mg	0.33
Overall Weighing Uncertainty	± mg/m³	0.32
ELV [Daily ELV for IED]	mg/m³	N/A
Allowable Weighing Uncertainty	mg/m³	N/A
Weighing Uncertainty Acceptable	-	N/A

Filter Temperatures	Units	Run 1
Pre-Conditioning Temperature	°C	180
Post-Conditioning Temperature	°C	160
Maximum Filter Temperature	°C	21

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.12
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Acetone / Water Rinse Blank	Units	Blank
Acetone / Water Rinse Value	mg/l	2.7
Allowable Blank	mg/l	10
Blank Acceptable	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
There are no deviations associated with the sampling employed.	wx	

TOTAL PARTICULATE MATTER: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.0721	uV_m	m^3	0.0214
Sampled Gas Temperature	T_m	291.1	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.6	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	0.85	uL	%	-
Mass of Particulate	m	11.34	um	mg	0.23
Uncollected Mass	UCM	-0.08	uUCM	mg	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.69	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.85	≤2%
Mass of Particulate	%	-	-
Uncollected Mass	%	-	-

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.0012	11.21
Leak	L	mg/m^3	0.055	1.00
Mass of Particulate	L_r	mg	11.340	0.99
Uncollected Mass	UCM	mg	-0.05	0.99

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.282
Leak	mg/m^3	0.0549
Mass of Particulate	mg/m^3	0.2276
Uncollected Mass	mg/m^3	-0.0457

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.37
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.72
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.72
Reported Uncertainty	mg/m^3	0.72
Expanded uncertainty (95% confidence), without Oxygen Correction	%	6.4
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	6.4
Reported Uncertainty	%	6.4
Reported Uncertainty as % of ELV	%	N/A

SULPHUR DIOXIDE: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A10 ENP VATs 15 & 16 Factory 1 Shop 3

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.14		0.14
Uncertainty	±mg/m³	0.0086		0.0086
Mass Emission	g/hr	0.55		0.55
Uncertainty	±g/hr	0.048		0.048

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.90		0.90
Uncertainty	±% v/v	0.048		0.048

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	< 0.016		< 0.016

General Sampling Information

Parameter	Value	
Standard	EN 14791	
Technical Procedure	MD 009	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 101	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	08/01/2025	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Impinger Material	Polyethylene	
Absorption Solution	0.3% Hydrogen Peroxide	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

SULPHUR DIOXIDE: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	761.3
Stack static pressure, P_{static}	mmH_2O	10.2
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	762.1
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	-0.8
Total mass collected in impingers (silica trap)	g	8.1
Total mass of liquid collected, V_{lc}	g	7.3
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0091
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.0721
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	18.1
Average pressure drop across orifice, ΔH	mmH_2O	32.0
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0012
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0090
B_{wo} as a percentage	% v/v	0.90
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.90
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0103
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.74
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	21.80
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	4.67
Average stack gas temperature, T_s	°C	20.1
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	15.83
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	71.7
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	66.9
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	66.3
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	5.00
Nozzle area, A_n	mm^2	19.63
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	96.7

SULPHUR DIOXIDE: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	15:35 - 16:36
Sampling Dates	-	05/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.0103
Laboratory Result for Front Impingers	µg/ml	0.45
Laboratory Result for Back Impinger	µg/ml	0.18
Volume in Front Impingers	ml	254.0
Volume in Back Impinger	ml	125.6
Mass in Front Impingers	µg	114.3
Mass in Back Impinger	µg	22.6
Total Mass Collected	µg	136.9
Calculated Concentration	mg/m^3	0.14

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	05/01/2026
Average Volume Sampled (REF)	m^3	1.0103
Laboratory Result for Impingers	µg/ml	< 0.05
Volume in Impingers	ml	313.3
Total Mass Collected	µg	< 15.7
Calculated Concentration	mg/m^3	< 0.02

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	17.7
Pre-Sampling Leak Rate	l/min	0.15
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	83.5
Allowable Absorption Efficiency	%	95
Absorption Efficiency Acceptable	-	No

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.4
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	96.7
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	21

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.12
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
The absorption efficiency was less than the required 95%. [75 - 90%]	x	

SULPHUR DIOXIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.0721	uV_m	m^3	0.0214
Sampled Gas Temperature	T_m	291.1	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.6	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	0.85	uL	%	-
Laboratory Result	L_r	0.90	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.69	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.85	≤2%
Laboratory Result	%	0.90	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.0012	0.14
Leak	L	mg/m^3	0.001	1.00
Laboratory Result	L_r	mg/m^3	0.001	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.003
Leak	mg/m^3	0.0007
Laboratory Result	mg/m^3	0.0012

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.004
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.007
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.009
Reported Uncertainty	mg/m^3	0.009
Expanded uncertainty (95% confidence), without Oxygen Correction	%	5.3
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	6.4
Reported Uncertainty	%	6.4
Reported Uncertainty as % of ELV	%	N/A

NICKEL: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A10 ENP VATs 15 & 16 Factory 1 Shop 3

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.0015		0.0015
Uncertainty	±mg/m³	0.00018		0.00018
Mass Emission	g/hr	0.0060		0.0060
Uncertainty	±g/hr	0.00084		0.00084

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	1.5		1.5
Uncertainty	±% v/v	0.080		0.080

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.00065		0.00065

General Sampling Information

Parameter	Value	
Standard	EN 14385	
Technical Procedure	MD 006	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 107	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	16/01/2026	
Probe Material	Titanium	
Filter Housing Material	Borosilicate Glass	
Impinger Material	Borosilicate Glass	
Absorption Solution	Nitric Peroxide	
Positioning of Filter	Out Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

NICKEL: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	761.3
Stack static pressure, P_{static}	mmH_2O	10.2
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	762.1
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	10.0
Total mass collected in impingers (silica trap)	g	3.4
Total mass of liquid collected, V_{lc}	g	13.4
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0167
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.1412
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	16.9
Average pressure drop across orifice, ΔH	mmH_2O	33.8
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0702
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0154
B_{wo} as a percentage	% v/v	1.54
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	1.54
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0869
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.68
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	23.02
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	4.80
Average stack gas temperature, T_s	°C	21.0
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	16.31
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	73.9
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	68.8
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	67.7
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	5.01
Nozzle area, A_n	mm^2	19.69
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	101.0

NICKEL: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	14:30 - 15:30
Sampling Dates	-	05/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.0869
Mass on Filter / in Rinse	µg	1.26
Mass in Front Impingers	µg	0.26
Mass in Back Impinger	µg	0.06
Total Mass Collected	µg	1.58
Calculated Concentration	mg/m^3	0.0015
Reported Concentration	mg/m^3	0.0015

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	05/01/2026
Average Volume Sampled (REF)	m^3	1.0869
Mass on Filter / in Rinse	µg	< 0.60
Mass in Front Impingers	µg	0.08
Mass in Back Impinger	µg	< 0.02
Total Mass Collected	µg	0.70
Calculated Concentration	mg/m^3	0.0006
Reported Concentration	mg/m^3	0.0006

NICKEL: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	18.8
Pre-Sampling Leak Rate	l/min	0.19
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	96.4
Allowable Absorption Efficiency	%	90
Absorption Efficiency Acceptable	-	Yes

Detection Limit	Units	Run 1
Detection Limit	µg/m³	0.6
Allowable Detection Limit	µg/m³	5
Detection Limit Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.2
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	101.0
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	180

Impingers Exit Temperature	Units	Run 1
Maximum Temperature Recorded	°C	7
Maximum Allowable Temperature	°C	30
Exit Temperature Acceptable	-	Yes

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

NICKEL: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.22
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1
There are no deviations associated with the sampling employed.	wx

NICKEL: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.1412	uV_m	m³	0.0228
Sampled Gas Temperature	T_m	289.9	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.6	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.0	uH_m	% v/v	1.00
Leak	L	1.01	uL	%	-
Laboratory Result	L_r	5.90	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.69	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	1.01	≤2%
Laboratory Result	%	5.90	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m³	1.0702	0.0014
Leak	L	mg/m³	0.0000	1.00
Laboratory Result	L_r	mg/m³	0.0001	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m³	0.0000
Leak	mg/m³	0.0000
Laboratory Result	mg/m³	0.0001

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	%	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m³	0.0001
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m³	0.0002
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m³	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m³	0.0002
Reported Uncertainty	mg/m³	0.0002
Expanded uncertainty (95% confidence), without Oxygen Correction	%	12.6
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	12.6
Reported Uncertainty	%	12.6
Reported Uncertainty as % of ELV	%	N/A

VERSION HISTORY

Version Number	Record of changes made within this version of the document
V1	The original document issued to the client

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Stack Emissions Testing Report Commissioned by
Envirosolution Ltd

Installation Name & Address
Hard Anodising Surface Treatments Ltd
Firs Estate
Stourport Road
Kidderminster
DY11 7QN

Stack Reference
A12 Dichromate Seal Factory Shop 1

Dates of the Monitoring Campaign
6th January 2026

Job Reference Number
EMT15043

Report Written by
Ewan Price Team Leader MCERTS Level 2 Team Leader TE1 TE2 TE3 TE4

Report Approved by
Tracy Dodds Key Account Manager MCERTS Level 2 MM 03 414 TE1 TE2 TE3 TE4

Report Date
2nd February 2026

Version
Version 1

Signature of Report Approver


CONTENTS

Opinions and interpretations expressed herein are outside the scope of Element's ISO 17025 accreditation.

MONITORING OBJECTIVES

Hard Anodising Surface Treatments Ltd, Kidderminster
A12 Dichromate Seal Factory Shop 1
6th January 2026

Overall Aim of the Monitoring Campaign

Element were commissioned by Envirosolution Ltd to carry out stack emissions testing for Hard Anodising Surface Treatments Ltd on the A12 Dichromate Seal Factory Shop 1 at Kidderminster.

The aim of the monitoring campaign was to perform testing, as requested by the customer, for a number of prescribed pollutants. There are no emission limits set for any of the pollutants at this time.

Special Requirements

There were no special requirements.

Target Parameters

Total Particulate Matter, Sulphur Dioxide, Chromium

Executive Summary

MONITORING RESULTS

Hard Anodising Surface Treatments Ltd, Kidderminster

A12 Dichromate Seal Factory Shop 1

6th January 2026

where MU = Measurement Uncertainty associated with the Result

	Concentration				Mass Emission			
Parameter	**Units**	**Result**	**MU +/-**	**Limit**	**Units**	**Result**	**MU +/-**	**Limit**
Total Particulate Matter [1]	mg/m³	9.7	0.67	-	g/hr	19.1	1.7	-
Sulphur Dioxide [1]	mg/m³	0.12	0.0075	-	g/hr	0.23	0.020	-
Chromium [1]	mg/m³	0.030	0.0047	-	g/hr	0.059	0.010	-
Water Vapour	% v/v	0.47	0.027					
Stack Gas Temperature	°C	27.4						
Stack Gas Velocity	m/s	7.5	0.29					
Volumetric Flow Rate (ACTUAL)	m³/hr	2161	129					
Volumetric Flow Rate (REF) [1]	m³/hr	1972	118					

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM AN AVERAGE OF ALL OF THE ISOKINETIC RUNS.

[1] Reference Conditions (REF) are: 273K, 101.3kPa, without correction for water vapour content.

Executive Summary

MONITORING DATE(S) & TIMES

Hard Anodising Surface Treatments Ltd, Kidderminster
A12 Dichromate Seal Factory Shop 1
6th January 2026

Parameter		Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins
Total Particulate Matter	R1	mg/m³	9.7	g/hr	19.1	06/01/2026	10:00 - 11:00	60
Sulphur Dioxide	R1	mg/m³	0.12	g/hr	0.23	06/01/2026	10:00 - 11:00	60
Chromium	R1	mg/m³	0.030	g/hr	0.059	06/01/2026	11:06 - 12:06	60
Velocity Traverse	R1					06/01/2026	09:49 - 09:53	

All results are expressed at the respective reference conditions.

PROCESS DETAILS

Hard Anodising Surface Treatments Ltd, Kidderminster

A12 Dichromate Seal Factory Shop 1

6th January 2026

Standard Operating Conditions

Parameter	Value
Process Status	Normal Operation
Capacity (of 100%) and Tonnes / Hour	100%
Continuous or Batch Process	Batch
Feedstock (if applicable)	Aluminium Parts
Abatement System	N/A
Abatement System Running Status	N/A
Fuel	N/A - Electric Heating
Plume Appearance	Vapour Plume Visable

Executive Summary

MONITORING & ANALYTICAL METHODS

Hard Anodising Surface Treatments Ltd, Kidderminster
A12 Dichromate Seal Factory Shop 1
6th January 2026

	Monitoring				Analysis					
Parameter	**Standard**	**Technical Procedure**	**Sampling Status**	**Testing Lab**	**Analytical Procedure**	**Analytical Technique**	**Analysis Status**	**Analysis Lab**	**Overall Status**	**LOD (Average)**
Total Particulate Matter	EN 13284-1	MD 001	MCERTS	EET	MD 103	Gravimetric	MCERTS	EET	MCERTS	0.22 mg/m³
Sulphur Dioxide	EN 14791	MD 009	MCERTS	EET	MD 101	IC	MCERTS	EET	MCERTS	0.016 mg/m³
Chromium	EN 14385	MD 006	MCERTS	EET	MD 107	ICP-MS	MCERTS	EET	MCERTS	0 mg/m³
Water Vapour	EN 14790	MD 005	MCERTS	EET	MD 005	Gravimetric	MCERTS	EET	MCERTS	0.10 % v/v
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041	MCERTS	EET	Pitot Tube and Thermocouple				MCERTS	1.2 m/s

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

Element (Stockport Lab - EET)	ISO 17025 Accreditation Number: UKAS 4279

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
Sulphur Dioxide	Run 1	The absorption efficiency was less than the required 95%. [75 - 90%]

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.32
Width	m	-
Area	m^2	0.08
Port Depth	cm	10
Orientation of Duct	-	Vertical
Number of Ports	-	2
Sample Port Size	-	4" BSP

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	Temporary
Inside / Outside	Outside

Platform Details

EA Technical Guidance Note M1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	Yes
Platform has vertical base boards (approx. 0.25m high)	Yes
Platform has chains / self closing gates at top of ladders	Yes
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations.

EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

Sampling Plane Validation Criteria (from EN 15259)

Criteria in EN 15259	Units	Traverse 1	Required	Compliant
Lowest Differential Pressure	Pa	50.5	> 5 Pa	Yes
Mean Velocity	m/s	7.76	-	-
Lowest Gas Velocity	m/s	7.76	-	-
Highest Gas Velocity	m/s	7.76	-	-
Ratio of Above	: 1	1.00	< 3 : 1	Yes
Maximum Angle of Swirl	°	6.00	< 15°	Yes
No Local Negative Flow	-	Yes	-	Yes

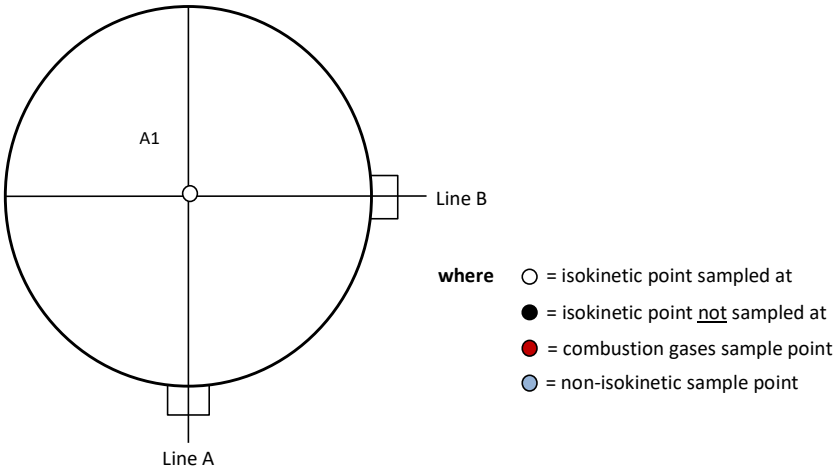
Executive Summary

(Page 7 of 7)

PLANT PHOTOS

Photo 1

SAMPLE POINTS



APPENDIX CONTENTS

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Ewan Price	MCERTS Level 2	MM 21 1654	TE1 TE2 TE3 TE4
Trainee	Greg Stretton	MCERTS Trainee	MM 24 1853	N/A

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	CAT 7.122
Control Box DGM (2)	-
Box Thermocouples (1)	CAT 3.136
Box Thermocouples (2)	-
Umbilical (1)	CAT 3.136
Umbilical (2)	-
Oven Box (1)	CAT 12.106
Oven Box (2)	-
Heated Probe (1)	CAT 5.10
Heated Probe (2)	-
Heated Probe (3)	-
S-Pitot (1)	CAT 21P.193
S-Pitot (2)	-
L-Pitot	-
Site Balance	CAT 17.92
500g / 1Kg Check Weights	CAT 17.92
Last Impinger Arm	-
Callipers	-
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-250 SRM	-
Horiba PG-250 SRM	-
Servomex 5200 MP	-
Ankersmid AOX210	-
ABB AO2020-URAS26	-
Testo 350 XL	-
MAK10 Cooler	-
Gasmet DX4000	-
Gasmet Sampling System	-
Signal 3000HM	-
Ankersmid APP100	-
Mass Flow Controller (1)	-
Mass Flow Controller (2)	-
Mass View (1)	-
Mass View (2)	-
Hioki 5043 (V)	-
Hioki 5043 (V)	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	CAT 3.230
Digital Manometer (2)	-
Digital Temperature Meter	CAT 3.230
Stopwatch	CAT 14.53
Barometer	-
Stack Thermocouple (1)	CAT 4.1461
Stack Thermocouple (2)	-
Stack Thermocouple (3)	-
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	-
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	CAT 1.18, 1.18a, 1.18b
Tape Measure	CAT 16.69

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Total Particulate Matter	EN 13284-1	MD 001
Sulphur Dioxide	EN 14791	MD 009
Chromium	EN 14385	MD 006
Water Vapour	EN 14790	MD 005
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041

PRELIMINARY STACK SURVEY: CALCULATIONS

General Stack Details

Stack Details (from Traverse)	Units	Value
Stack Diameter / Depth, D	m	0.32
Stack Width, W	m	-
Stack Area, A	m^2	0.08
Average Stack Gas Temperature, T_a	°C	27.3
Average Stack Gas Pressure	Pa	50.5
Average Stack Static Pressure, P_{static}	kPa	0.066
Average Barometric Pressure, P_b	kPa	101.7
Average Pitot Tube Calibration Coefficient, C_p	-	0.84

Stack Gas Composition & Molecular Weights

Component	Conc ppm	Conc Dry % v/v	Conc Wet % v/v	Volume Fraction r	Molar Mass M	Density kg/m³ p	Conc kg/m³ p_i
CO_2 (Estimated)	-	0.06	0.06	0.0006	44.01	1.9635	0.00118
O_2 (Estimated)	-	20.80	20.70	0.2080	32.00	1.4277	0.29696
N_2	-	79.14	78.77	0.7914	28.01	1.2498	0.98913
Moisture (H_2O)	-	-	0.47	0.0047	18.02	0.8037	0.00379

Where: $p = M / 22.41$

$p_i = r \times p$

Calculation of Stack Gas Densities

Determinand	Units	Result
Dry Density (STP), P_{STD}	kg/m³	1.287
Wet Density (STP), P_{STW}	kg/m³	1.285
Dry Density (Actual), P_{Actual}	kg/m³	1.176
Average Wet Density (Actual), $P_{ActualW}$	kg/m³	1.174

Where: P_{STD} = sum of component concentrations, kg/m³ (not including water vapour)

P_{STW} = sum of all wet concentrations / 100 x density, kg/m³ (including water vapour)

$P_{Actual} = P_{STD} \times (T_{STP} / (P_{STP})) \times ((P_{static} + P_b) / T_a)$

$P_{ActualW}$ (at each sampling point) $= P_{STW} \times (T_s / P_s) \times (P_a / T_a)$

Calculation of Stack Gas Volumetric Flowrate, Q

Duct gas flow conditions	Units	Actual	REF [1]
Temperature	°C	27.3	0.0
Total Pressure	kPa	101.8	101.3
Moisture	%	0.47	0.47

Gas Volumetric Flowrate (from Traverse)	Units	Result
Gas Volumetric Flowrate (Actual)	m³/hr	2246
Gas Volumetric Flowrate (STP, Wet)	m³/hr	2052
Gas Volumetric Flowrate (STP, Dry)	m³/hr	2042
Gas Volumetric Flowrate REF [1]	m³/hr	2052

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID)

(1 of 1)

Parameter	Units	Value
Date of Survey	-	06/01/2026
Time of Survey	-	09:49 - 09:53
Atmospheric Pressure	kPa	101.7
Average Stack Static Pressure	Pa	66
Result of Pitot Stagnation Test	-	Pass
Are Water Droplets Present?	-	No
Device Used	S-Type Pitot with KIMO MP 210 (500Pa)	

Parameter	Units	Value
Initial Pitot Leak Check	-	Pass
Final Pitot Leak Check	-	Pass
Orientation of Duct	-	Vertical
Pitot Tube, C_p	-	0.84
Number of Lines Available	-	2
Number of Lines Used	-	1

		Sampling Line A					Sampling Line B				
Traverse Point	Depth m	ΔP Pa	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °	ΔP	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °
STATIC (Units: Pa)		*66.3*									
Mean		**50.5**	**27.3**	**1.174**	**7.76**						
1	0.16	50.5	27.3	1.174	7.76	6.0					

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID) - MEASUREMENT UNCERTAINTY

(1 of 1)

Performance characteristics (Uncertainty Components)	Uncertainty	Value	Units
Standard Uncertainty on the coefficient of the Pitot Tube	u(k)	0.005	-
Standard Uncertainty associated with the mean local dynamic pressures	u(Δpi)	1.187	Pa
- Resolution	u(res)	0.00087	
- Calibration	u(cal)	0.266	
- Drift	u(drift)	0.083	
- Lack of Fit	u(fit)	0.060	
- Overall corrections to dynamic measurements	u(Cf)	0.410	
Standard uncertainty associated with the molar mass of the gas	u(M)	0.00003	-
- $\varphi O_2,w$	-	20.702	
- $\varphi CO_2,w$	-	0.060	
- Oxygen, dry	u(ϕO_2,d)	0.637	
- Carbon Dioxide, dry	u(ϕCO_2,d)	0.002	
- Water Vapour	u(ϕH_2O)	0.024	
- Oxygen, wet	u(ϕO_2,w)	0.634	
- Carbon Dioxide, wet	u(ϕCO_2,w)	0.002	
Standard uncertainty associated with the stack temperature	u(Tc)	1.532	K
Standard uncertainty associated with the absolute pressure in the duct	u(pc)	175.696	Pa
- Atmospheric Pressure	u(patm)	175.692	
- Static Pressure	u(pstat)	1.187	
Standard uncertainty associated with the density in the duct	u(ρ)	0.00641	-
Standard uncertainty associated with the local velocities	u(vi)	0.155	Pa
Standard uncertainty associated with the mean velocity	u(v)	0.155	m/s
Standard uncertainty associated with the mean velocity (95% Confidence)	Uc(v)	0.304	m/s
Standard uncertainty associated with the mean velocity (95% Confidence), relative	Uc,rel(v)	3.92	%
Standard uncertainty associated with the volume flow rate (95% Confidence)	Uc(qV,w)	134.5	m^3/hr
- $u^2(a)/a^2$	-	0.00053	
- $u^2(qV,w)/q^2V,w$	-	0.00093	
- $u^2(qV,w)$	-	4709	
- $u(qV,w)$	-	68.6	
Standard uncertainty associated with the volume flow rate (95% Confidence), relative	Uc,rel(qV,w)	5.99	%

TOTAL PARTICULATE MATTER: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A12 Dichromate Seal Factory Shop 1

Sample Runs

Parameter	Units	Run 1	Mean
Concentration	mg/m³	9.7	9.7
Uncertainty	±mg/m³	0.67	0.67
Mass Emission	g/hr	19.1	19.1
Uncertainty	±g/hr	1.7	1.7

Parameter	Units	Run 1	Mean
Water Vapour	% v/v	0.49	0.49
Uncertainty	±% v/v	0.029	0.029

Blank Runs

Parameter	Units	Blank 1	Maximum
Concentration	mg/m³	0.22	0.22

NOTE: Where the Balance Uncertainty / Limit of Detection is higher than the Blank concentration, the Balance Uncertainty / Limit of Detection concentration has been reported.

General Sampling Information

Parameter	Value	
Standard	EN 13284-1	
Technical Procedure	MD 001	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL PARTICULATE MATTER: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	762.8
Stack static pressure, P_{static}	mmH_2O	6.8
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	763.3
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	1.4
Total mass collected in impingers (silica trap)	g	2.6
Total mass of liquid collected, V_{lc}	g	4.0
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0050
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.0375
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	4.3
Average pressure drop across orifice, ΔH	mmH_2O	24.6
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0182
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0049
B_{wo} as a percentage	% v/v	0.49
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.49
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0232
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.79
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	4.77
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.18
Average stack gas temperature, T_s	°C	27.2
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	7.48
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	36.1
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	33.0
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	32.8
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	7.00
Nozzle area, A_n	mm^2	38.48
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	108.1

TOTAL PARTICULATE MATTER: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	10:00 - 11:00
Sampling Dates	-	06/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.0232
Filter I.D. Number	-	47-124848
Start Filter Mass	g	0.14515
End Filter Mass	g	0.15377
Total Mass on Filter	g	0.00862
Probe Rinse I.D. Number	-	PR-47-124848
Start Probe Rinse Mass	g	2.77092
End Probe Rinse Mass	g	2.77220
Total Mass in Probe Rinse	g	0.00128
Total Mass Collected	mg	9.90
Calculated Concentration	mg/m^3	9.68
Balance Uncertainty / LOD	mg/m^3	0.22

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	06/01/2026
Average Volume Sampled (REF)	m^3	1.0232
Filter I.D. Number	-	47-125259
Start Filter Mass	g	0.14342
End Filter Mass	g	0.14340
Total Mass on Filter	g	-0.00002
Probe Rinse I.D. Number	-	PR-47-125259
Start Probe Rinse Mass	g	2.95294
End Probe Rinse Mass	g	2.95308
Total Mass in Probe Rinse	g	0.00014
Total Mass Collected	mg	0.12
Calculated Concentration	mg/m^3	0.12
Balance Uncertainty / LOD	mg/m^3	0.22

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	17.1
Pre-Sampling Leak Rate	l/min	0.24
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.9
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	108.1
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Weighing Uncertainty Criteria	Units	Run 1
Overall Weighing Uncertainty	± mg	0.33
Overall Weighing Uncertainty	± mg/m³	0.32
ELV [Daily ELV for IED]	mg/m³	N/A
Allowable Weighing Uncertainty	mg/m³	N/A
Weighing Uncertainty Acceptable	-	N/A

Filter Temperatures	Units	Run 1
Pre-Conditioning Temperature	°C	180
Post-Conditioning Temperature	°C	160
Maximum Filter Temperature	°C	28

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.23
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Acetone / Water Rinse Blank	Units	Blank
Acetone / Water Rinse Value	mg/l	2.7
Allowable Blank	mg/l	10
Blank Acceptable	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
There are no deviations associated with the sampling employed.	wx	

TOTAL PARTICULATE MATTER: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.0375	uV_m	m^3	0.0208
Sampled Gas Temperature	T_m	277.3	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.8	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	1.40	uL	%	-
Mass of Particulate	m	9.90	um	mg	0.23
Uncollected Mass	UCM	0.12	uUCM	mg	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.72	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	1.40	≤2%
Mass of Particulate	%	-	-
Uncollected Mass	%	-	-

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.0182	9.50
Leak	L	mg/m^3	0.078	1.00
Mass of Particulate	L_r	mg	9.900	0.98
Uncollected Mass	UCM	mg	0.07	0.98

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.235
Leak	mg/m^3	0.0782
Mass of Particulate	mg/m^3	0.2248
Uncollected Mass	mg/m^3	0.0677

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.34
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.67
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.67
Reported Uncertainty	mg/m^3	0.67
Expanded uncertainty (95% confidence), without Oxygen Correction	%	6.9
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	6.9
Reported Uncertainty	%	6.9
Reported Uncertainty as % of ELV	%	N/A

SULPHUR DIOXIDE: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A12 Dichromate Seal Factory Shop 1

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.12		0.12
Uncertainty	±mg/m³	0.0075		0.0075
Mass Emission	g/hr	0.23		0.23
Uncertainty	±g/hr	0.020		0.020

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.49		0.49
Uncertainty	±% v/v	0.029		0.029

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	< 0.015		< 0.015

General Sampling Information

Parameter	Value	
Standard	EN 14791	
Technical Procedure	MD 009	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 101	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	08/01/2025	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Impinger Material	Polyethylene	
Absorption Solution	0.3% Hydrogen Peroxide	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

SULPHUR DIOXIDE: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	762.8
Stack static pressure, P_{static}	mmH_2O	6.8
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	763.3
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	1.4
Total mass collected in impingers (silica trap)	g	2.6
Total mass of liquid collected, V_{lc}	g	4.0
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0050
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.0375
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	4.3
Average pressure drop across orifice, ΔH	mmH_2O	24.6
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.0182
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0049
B_{wo} as a percentage	% v/v	0.49
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.49
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.0232
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.79
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	4.77
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.18
Average stack gas temperature, T_s	°C	27.2
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	7.48
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	36.1
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	33.0
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	32.8
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	7.00
Nozzle area, A_n	mm^2	38.48
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	108.1

SULPHUR DIOXIDE: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	10:00 - 11:00
Sampling Dates	-	06/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.0232
Laboratory Result for Front Impingers	µg/ml	0.45
Laboratory Result for Back Impinger	µg/ml	0.18
Volume in Front Impingers	ml	219.7
Volume in Back Impinger	ml	114.1
Mass in Front Impingers	µg	98.9
Mass in Back Impinger	µg	20.5
Total Mass Collected	µg	119.4
Calculated Concentration	mg/m^3	0.12

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	06/01/2026
Average Volume Sampled (REF)	m^3	1.0232
Laboratory Result for Impingers	µg/ml	< 0.05
Volume in Impingers	ml	308.6
Total Mass Collected	µg	< 15.4
Calculated Concentration	mg/m^3	< 0.02

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	17.1
Pre-Sampling Leak Rate	l/min	0.24
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	82.8
Allowable Absorption Efficiency	%	95
Absorption Efficiency Acceptable	-	No

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.9
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	108.1
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	28

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.23
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
The absorption efficiency was less than the required 95%. [75 - 90%]	x	

SULPHUR DIOXIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.0375	uV_m	m^3	0.0208
Sampled Gas Temperature	T_m	277.3	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.8	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	1.40	uL	%	-
Laboratory Result	L_r	0.90	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.72	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	1.40	≤2%
Laboratory Result	%	0.90	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.0182	0.11
Leak	L	mg/m^3	0.001	1.00
Laboratory Result	L_r	mg/m^3	0.001	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.003
Leak	mg/m^3	0.0009
Laboratory Result	mg/m^3	0.0011

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.003
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.01
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.01
Reported Uncertainty	mg/m^3	0.01
Expanded uncertainty (95% confidence), without Oxygen Correction	%	5.3
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	6.4
Reported Uncertainty	%	6.4
Reported Uncertainty as % of ELV	%	N/A

CHROMIUM: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A12 Dichromate Seal Factory Shop 1

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.030		0.030
Uncertainty	±mg/m³	0.0047		0.0047
Mass Emission	g/hr	0.059		0.059
Uncertainty	±g/hr	0.010		0.010

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.46		0.46
Uncertainty	±% v/v	0.026		0.026

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	< 0.00054		< 0.00054

General Sampling Information

Parameter	Value	
Standard	EN 14385	
Technical Procedure	MD 006	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 107	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	16/01/2026	
Probe Material	Titanium	
Filter Housing Material	Borosilicate Glass	
Impinger Material	Borosilicate Glass	
Absorption Solution	Nitric Peroxide	
Positioning of Filter	Out Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

CHROMIUM: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	762.8
Stack static pressure, P_{static}	mmH_2O	6.8
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	763.3
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	2.8
Total mass collected in impingers (silica trap)	g	1.5
Total mass of liquid collected, V_{lc}	g	4.3
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0054
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.1916
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	4.9
Average pressure drop across orifice, ΔH	mmH_2O	41.3
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.1689
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0046
B_{wo} as a percentage	% v/v	0.46
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.46
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.1742
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.79
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	4.70
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.17
Average stack gas temperature, T_s	°C	27.8
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	7.43
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	35.9
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	32.7
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	32.5
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	8.00
Nozzle area, A_n	mm^2	50.22
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	95.9

CHROMIUM: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	11:06 - 12:06
Sampling Dates	-	06/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.1742
Mass on Filter / in Rinse	µg	33.12
Mass in Front Impingers	µg	1.38
Mass in Back Impinger	µg	0.62
Total Mass Collected	µg	35.11
Calculated Concentration	mg/m^3	0.0299
Reported Concentration	mg/m^3	0.0299

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	06/01/2026
Average Volume Sampled (REF)	m^3	1.1742
Mass on Filter / in Rinse	µg	< 0.60
Mass in Front Impingers	µg	< 0.02
Mass in Back Impinger	µg	< 0.01
Total Mass Collected	µg	< 0.63
Calculated Concentration	mg/m^3	< 0.0005
Reported Concentration	mg/m^3	< 0.0005

CHROMIUM: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	19.7
Pre-Sampling Leak Rate	l/min	0.15
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	98.2
Allowable Absorption Efficiency	%	90
Absorption Efficiency Acceptable	-	Yes

Detection Limit	Units	Run 1
Detection Limit	µg/m³	0.3
Allowable Detection Limit	µg/m³	5
Detection Limit Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.6
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	95.9
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	180

Impingers Exit Temperature	Units	Run 1
Maximum Temperature Recorded	°C	5
Maximum Allowable Temperature	°C	30
Exit Temperature Acceptable	-	Yes

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

CHROMIUM: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.22
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
There are no deviations associated with the sampling employed.	wx	

CHROMIUM: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.1916	uV_m	m^3	0.0238
Sampled Gas Temperature	T_m	277.9	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.8	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.0	uH_m	% v/v	1.00
Leak	L	0.76	uL	%	-
Laboratory Result	L_r	7.70	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.72	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.76	≤2%
Laboratory Result	%	7.70	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.1689	0.03
Leak	L	mg/m^3	0.0001	1.00
Laboratory Result	L_r	mg/m^3	0.0023	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.0007
Leak	mg/m^3	0.0001
Laboratory Result	mg/m^3	0.0023

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	%	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.0024
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.0047
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.0047
Reported Uncertainty	mg/m^3	0.0047
Expanded uncertainty (95% confidence), without Oxygen Correction	%	15.9
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	15.9
Reported Uncertainty	%	15.9
Reported Uncertainty as % of ELV	%	N/A

VERSION HISTORY

Version Number	Record of changes made within this version of the document
V1	The original document issued to the client

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Stack Emissions Testing Report Commissioned by
Envirosolution Ltd

Installation Name & Address
Hard Anodising Surface Treatments Ltd
Firs Estate
Stourport Road
Kidderminster
DY11 7QN

Stack Reference
A13 Dichromate Seal Factory 2

Dates of the Monitoring Campaign
6th January 2026

Job Reference Number
EMT15043

Report Written by
Ewan Price Team Leader MCERTS Level 2 Team Leader TE1 TE2 TE3 TE4

Report Approved by
Tracy Dodds Key Account Manager MCERTS Level 2 MM 03 414 TE1 TE2 TE3 TE4

Report Date
2nd February 2026

Version
Version 1

Signature of Report Approver


CONTENTS

Opinions and interpretations expressed herein are outside the scope of Element's ISO 17025 accreditation.

MONITORING OBJECTIVES

Hard Anodising Surface Treatments Ltd, Kidderminster
A13 Dichromate Seal Factory 2
6th January 2026

Overall Aim of the Monitoring Campaign

Element were commissioned by Envirosolution Ltd to carry out stack emissions testing for Hard Anodising Surface Treatments Ltd on the A13 Dichromate Seal Factory 2 at Kidderminster.

The aim of the monitoring campaign was to perform testing, as requested by the customer, for a number of prescribed pollutants. There are no emission limits set for any of the pollutants at this time.

Special Requirements

There were no special requirements.

Target Parameters

Total Particulate Matter, Sulphur Dioxide, Chromium

Executive Summary

MONITORING RESULTS

Hard Anodising Surface Treatments Ltd, Kidderminster

A13 Dichromate Seal Factory 2

6th January 2026

where MU = Measurement Uncertainty associated with the Result

		Concentration				Mass Emission			
Parameter		**Units**	**Result**	**MU +/-**	**Limit**	**Units**	**Result**	**MU +/-**	**Limit**
Total Particulate Matter	[1]	mg/m³	0.60	0.37	-	g/hr	1.2	0.75	-
Sulphur Dioxide	[1]	mg/m³	0.17	0.0088	-	g/hr	0.34	0.027	-
Chromium	[1]	mg/m³	0.0041	0.00129	-	g/hr	0.0082	0.0026	-
Water Vapour		% v/v	1.9	0.093					
Stack Gas Temperature		°C	20.1						
Stack Gas Velocity		m/s	7.4	0.29					
Volumetric Flow Rate (ACTUAL)		m³/hr	2152	128					
Volumetric Flow Rate (REF)	[1]	m³/hr	2013	120					

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM AN AVERAGE OF ALL OF THE ISOKINETIC RUNS.

[1] Reference Conditions (REF) are: 273K, 101.3kPa, without correction for water vapour content.

MONITORING DATE(S) & TIMES

Hard Anodising Surface Treatments Ltd, Kidderminster

A13 Dichromate Seal Factory 2

6th January 2026

Parameter		Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins
Total Particulate Matter	R1	mg/m³	0.60	g/hr	1.2	06/01/2026	16:48 - 17:48	60
Sulphur Dioxide	R1	mg/m³	0.17	g/hr	0.34	06/01/2026	16:48 - 17:48	60
Chromium	R1	mg/m³	0.0041	g/hr	0.0082	06/01/2026	17:52 - 18:52	60
Velocity Traverse	R1					06/01/2026	16:33 - 16:37	

All results are expressed at the respective reference conditions.

PROCESS DETAILS

Hard Anodising Surface Treatments Ltd, Kidderminster
A13 Dichromate Seal Factory 2
6th January 2026

Standard Operating Conditions

Parameter	Value
Process Status	Normal Operation
Capacity (of 100%) and Tonnes / Hour	100%
Continuous or Batch Process	Batch
Feedstock (if applicable)	Aluminium Parts
Abatement System	N/A
Abatement System Running Status	N/A
Fuel	N/A - Electric Heating
Plume Appearance	Vapour Plume Visable

Executive Summary

MONITORING & ANALYTICAL METHODS

Hard Anodising Surface Treatments Ltd, Kidderminster
A13 Dichromate Seal Factory 2
6th January 2026

	Monitoring				Analysis					
Parameter	**Standard**	**Technical Procedure**	**Sampling Status**	**Testing Lab**	**Analytical Procedure**	**Analytical Technique**	**Analysis Status**	**Analysis Lab**	**Overall Status**	**LOD (Average)**
Total Particulate Matter	EN 13284-1	MD 001	MCERTS	EET	MD 103	Gravimetric	MCERTS	EET	MCERTS	0.18 mg/m³
Sulphur Dioxide	EN 14791	MD 009	MCERTS	EET	MD 101	IC	MCERTS	EET	MCERTS	0.016 mg/m³
Chromium	EN 14385	MD 006	MCERTS	EET	MD 107	ICP-MS	MCERTS	EET	MCERTS	0 mg/m³
Water Vapour	EN 14790	MD 005	MCERTS	EET	MD 005	Gravimetric	MCERTS	EET	MCERTS	0.10 % v/v
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041	MCERTS	EET	Pitot Tube and Thermocouple				MCERTS	1.2 m/s

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

Element (Stockport Lab - EET)	ISO 17025 Accreditation Number: UKAS 4279

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
Sulphur Dioxide	Run 1	The absorption efficiency was less than the required 95%. [90 - 95%]
Chromium	Run 1	The absorption efficiency was less than the required 90%. [< 50%]

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.32
Width	m	-
Area	m^2	0.08
Port Depth	cm	10
Orientation of Duct	-	Vertical
Number of Ports	-	2
Sample Port Size	-	4" BSP

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	Temporary
Inside / Outside	Outside

Platform Details

EA Technical Guidance Note M1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	Yes
Platform has vertical base boards (approx. 0.25m high)	Yes
Platform has chains / self closing gates at top of ladders	Yes
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations.

EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

Sampling Plane Validation Criteria (from EN 15259)

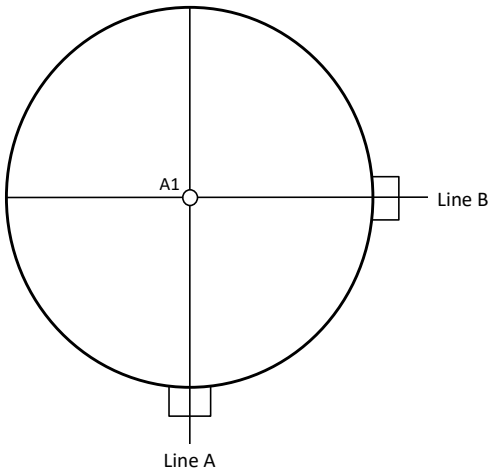
Criteria in EN 15259	Units	Traverse 1	Required	Compliant
Lowest Differential Pressure	Pa	51.9	> 5 Pa	Yes
Mean Velocity	m/s	7.79	-	-
Lowest Gas Velocity	m/s	7.79	-	-
Highest Gas Velocity	m/s	7.79	-	-
Ratio of Above	: 1	1.00	< 3 : 1	Yes
Maximum Angle of Swirl	°	7.00	< 15°	Yes
No Local Negative Flow	-	Yes	-	Yes

Executive Summary

PLANT PHOTOS

Photo 1

SAMPLE POINTS



where ○ = isokinetic point sampled at
● = isokinetic point not sampled at
● = combustion gases sample point
● = non-isokinetic sample point

APPENDIX CONTENTS

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Ewan Price	MCERTS Level 2	MM 21 1654	TE1 TE2 TE3 TE4
Trainee	Greg Stretton	MCERTS Trainee	MM 24 1853	N/A

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	CAT 7.122
Control Box DGM (2)	-
Box Thermocouples (1)	CAT 3.136
Box Thermocouples (2)	-
Umbilical (1)	CAT 3.136
Umbilical (2)	-
Oven Box (1)	CAT 12.106
Oven Box (2)	-
Heated Probe (1)	CAT 5.10
Heated Probe (2)	-
Heated Probe (3)	-
S-Pitot (1)	CAT 21P.193
S-Pitot (2)	-
L-Pitot	-
Site Balance	CAT 17.92
500g / 1Kg Check Weights	CAT 17.92
Last Impinger Arm	-
Callipers	-
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-250 SRM	-
Horiba PG-250 SRM	-
Servomex 5200 MP	-
Ankersmid AOX210	-
ABB AO2020-URAS26	-
Testo 350 XL	-
JCT JCC P1 Cooler	-
ProtIR 204M	-
Gasmet Sampling System	-
Sick 3006	-
Ankersmid APP100	-
Mass Flow Controller (1)	-
Mass Flow Controller (2)	-
Mass View (1)	-
Mass View (2)	-
Easylogger EN-EL-12 Bit	-
Hioki 5043 (V)	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	CAT 3.230
Digital Manometer (2)	-
Digital Temperature Meter	CAT 3.230
Stopwatch	CAT 14.53
Barometer	-
Stack Thermocouple (1)	CAT 4.1461
Stack Thermocouple (2)	-
Stack Thermocouple (3)	-
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	-
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	CAT 1.18, 1.18a, 1.18b
Tape Measure	CAT 16.69

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Total Particulate Matter	EN 13284-1	MD 001
Sulphur Dioxide	EN 14791	MD 009
Chromium	EN 14385	MD 006
Water Vapour	EN 14790	MD 005
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	MD 041

PRELIMINARY STACK SURVEY: CALCULATIONS

General Stack Details

Stack Details (from Traverse)	Units	Value
Stack Diameter / Depth, D	m	0.32
Stack Width, W	m	-
Stack Area, A	m^2	0.08
Average Stack Gas Temperature, T_a	°C	20.3
Average Stack Gas Pressure	Pa	51.9
Average Stack Static Pressure, P_{static}	kPa	0.036
Average Barometric Pressure, P_b	kPa	101.7
Average Pitot Tube Calibration Coefficient, C_p	-	0.84

Stack Gas Composition & Molecular Weights

Component	Conc ppm	Conc Dry % v/v	Conc Wet % v/v	Volume Fraction r	Molar Mass M	Density kg/m³ p	Conc kg/m³ p_i
CO_2 (Estimated)	-	0.06	0.06	0.0006	44.01	1.9635	0.00118
O_2 (Estimated)	-	20.80	20.41	0.2080	32.00	1.4277	0.29696
N_2	-	79.14	77.67	0.7914	28.01	1.2498	0.98913
Moisture (H_2O)	-	-	1.85	0.0185	18.02	0.8037	0.01489

Where: p = M / 22.41

p_i = r x p

Calculation of Stack Gas Densities

Determinand	Units	Result
Dry Density (STP), P_{STD}	kg/m³	1.287
Wet Density (STP), P_{STW}	kg/m³	1.278
Dry Density (Actual), P_{Actual}	kg/m³	1.203
Average Wet Density (Actual), $P_{ActualW}$	kg/m³	1.195

Where: P_{STD} = sum of component concentrations, kg/m³ (not including water vapour)

P_{STW} = sum of all wet concentrations / 100 x density, kg/m³ (including water vapour)

$P_{Actual} = P_{STD} \times (T_{STP} / (P_{STP})) \times ((P_{static} + P_b) / T_a)$

$P_{ActualW}$ (at each sampling point) $= P_{STW} \times (T_s / P_s) \times (P_a / T_a)$

Calculation of Stack Gas Volumetric Flowrate, Q

Duct gas flow conditions	Units	Actual	REF [1]
Temperature	°C	20.3	0.0
Total Pressure	kPa	101.7	101.3
Moisture	%	1.85	1.85

Gas Volumetric Flowrate (from Traverse)	Units	Result
Gas Volumetric Flowrate (Actual)	m³/hr	2257
Gas Volumetric Flowrate (STP, Wet)	m³/hr	2110
Gas Volumetric Flowrate (STP, Dry)	m³/hr	2071
Gas Volumetric Flowrate REF [1]	m³/hr	2110

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID)

(1 of 1)

Parameter	Units	Value
Date of Survey	-	06/01/2026
Time of Survey	-	16:33 - 16:37
Atmospheric Pressure	kPa	101.7
Average Stack Static Pressure	Pa	36
Result of Pitot Stagnation Test	-	Pass
Are Water Droplets Present?	-	No
Device Used	S-Type Pitot with KIMO MP 210 (500Pa)	

Parameter	Units	Value
Initial Pitot Leak Check	-	Pass
Final Pitot Leak Check	-	Pass
Orientation of Duct	-	Vertical
Pitot Tube, C_p	-	0.84
Number of Lines Available	-	2
Number of Lines Used	-	1

		Sampling Line A					Sampling Line B				
Traverse Point	Depth m	ΔP Pa	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °	ΔP	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °
STATIC (Units: Pa)		*35.8*									
Mean		**51.9**	**20.3**	**1.195**	**7.79**						
1	0.16	51.9	20.3	1.195	7.79	7.0					

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID) - MEASUREMENT UNCERTAINTY

(1 of 1)

Performance characteristics (Uncertainty Components)	Uncertainty	Value	Units
Standard Uncertainty on the coefficient of the Pitot Tube	u(k)	0.005	-
Standard Uncertainty associated with the mean local dynamic pressures	u(Δpi)	1.195	Pa
- Resolution	u(res)	0.00087	
- Calibration	u(cal)	0.280	
- Drift	u(drift)	0.083	
- Lack of Fit	u(fit)	0.064	
- Overall corrections to dynamic measurements	u(Cf)	0.428	
Standard uncertainty associated with the molar mass of the gas	u(M)	0.00003	-
- $\varphi O_2,w$	-	20.415	
- $\varphi CO_2,w$	-	0.059	
- Oxygen, dry	u(ϕO_2,d)	0.637	
- Carbon Dioxide, dry	u(ϕCO_2,d)	0.002	
- Water Vapour	u(ϕH_2O)	0.095	
- Oxygen, wet	u(ϕO_2,w)	0.625	
- Carbon Dioxide, wet	u(ϕCO_2,w)	0.002	
Standard uncertainty associated with the stack temperature	u(Tc)	1.496	K
Standard uncertainty associated with the absolute pressure in the duct	u(pc)	175.696	Pa
- Atmospheric Pressure	u(patm)	175.692	
- Static Pressure	u(pstat)	1.195	
Standard uncertainty associated with the density in the duct	u(ρ)	0.00653	-
Standard uncertainty associated with the local velocities	u(vi)	0.155	Pa
Standard uncertainty associated with the mean velocity	u(v)	0.155	m/s
Standard uncertainty associated with the mean velocity (95% Confidence)	Uc(v)	0.303	m/s
Standard uncertainty associated with the mean velocity (95% Confidence), relative	Uc,rel(v)	3.89	%
Standard uncertainty associated with the volume flow rate (95% Confidence)	Uc(qV,w)	134.7	m^3/hr
- $u^2(a)/a^2$	-	0.00053	
- $u^2(qV,w)/q^2V,w$	-	0.00093	
- $u^2(qV,w)$	-	4724	
- u(qV,w)	-	68.7	
Standard uncertainty associated with the volume flow rate (95% Confidence), relative	Uc,rel(qV,w)	5.97	%

TOTAL PARTICULATE MATTER: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster

A13 Dichromate Seal Factory 2

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.60		0.60
Uncertainty	±mg/m³	0.37		0.37
Mass Emission	g/hr	1.2		1.2
Uncertainty	±g/hr	0.75		0.75

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	2.4		2.4
Uncertainty	±% v/v	0.12		0.12

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	0.18		0.18

NOTE: Where the Balance Uncertainty / Limit of Detection is higher than the Blank concentration, the Balance Uncertainty / Limit of Detection concentration has been reported.

General Sampling Information

Parameter	Value	
Standard	EN 13284-1	
Technical Procedure	MD 001	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL PARTICULATE MATTER: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	762.8
Stack static pressure, P_{static}	mmH_2O	3.7
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	763.1
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	16.2
Total mass collected in impingers (silica trap)	g	8.5
Total mass of liquid collected, V_{lc}	g	24.7
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0308
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.2551
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	6.3
Average pressure drop across orifice, ΔH	mmH_2O	44.5
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.2255
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0245
B_{wo} as a percentage	% v/v	2.45
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	2.45
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.2563
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.58
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	4.80
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.19
Average stack gas temperature, T_s	°C	20.2
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	7.44
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	35.9
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	33.6
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	32.8
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	8.01
Nozzle area, A_n	mm^2	50.39
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	99.5

TOTAL PARTICULATE MATTER: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	16:48 - 17:48
Sampling Dates	-	06/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.2563
Filter I.D. Number	-	47-123920
Start Filter Mass	g	0.14031
End Filter Mass	g	0.14073
Total Mass on Filter	g	0.00042
Probe Rinse I.D. Number	-	PR-47-123920
Start Probe Rinse Mass	g	2.90403
End Probe Rinse Mass	g	2.90436
Total Mass in Probe Rinse	g	0.00033
Total Mass Collected	mg	0.75
Calculated Concentration	mg/m^3	0.60
Balance Uncertainty / LOD	mg/m^3	0.18

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	06/01/2026
Average Volume Sampled (REF)	m^3	1.2563
Filter I.D. Number	-	47-125277
Start Filter Mass	g	0.14252
End Filter Mass	g	0.14229
Total Mass on Filter	g	-0.00023
Probe Rinse I.D. Number	-	PR-47-125277
Start Probe Rinse Mass	g	2.73070
End Probe Rinse Mass	g	2.73082
Total Mass in Probe Rinse	g	0.00012
Total Mass Collected	mg	-0.11
Calculated Concentration	mg/m^3	-0.09
Balance Uncertainty / LOD	mg/m^3	0.18

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	20.7
Pre-Sampling Leak Rate	l/min	0.17
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.0
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	99.5
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Weighing Uncertainty Criteria	Units	Run 1
Overall Weighing Uncertainty	± mg	0.33
Overall Weighing Uncertainty	± mg/m³	0.26
ELV [Daily ELV for IED]	mg/m³	N/A
Allowable Weighing Uncertainty	mg/m³	N/A
Weighing Uncertainty Acceptable	-	N/A

Filter Temperatures	Units	Run 1
Pre-Conditioning Temperature	°C	180
Post-Conditioning Temperature	°C	160
Maximum Filter Temperature	°C	21

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.27
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Acetone / Water Rinse Blank	Units	Blank
Acetone / Water Rinse Value	mg/l	2.7
Allowable Blank	mg/l	10
Blank Acceptable	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
There are no deviations associated with the sampling employed.	wx	

TOTAL PARTICULATE MATTER: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.2551	uV_m	m^3	0.0251
Sampled Gas Temperature	T_m	279.3	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.7	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	0.82	uL	%	-
Mass of Particulate	m	0.75	um	mg	0.23
Uncollected Mass	UCM	-0.11	uUCM	mg	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.72	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.82	≤2%
Mass of Particulate	%	-	-
Uncollected Mass	%	-	-

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.2255	0.49
Leak	L	mg/m^3	0.003	1.00
Mass of Particulate	L_r	mg	0.750	0.80
Uncollected Mass	UCM	mg	-0.06	0.80

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.015
Leak	mg/m^3	0.0028
Mass of Particulate	mg/m^3	0.1831
Uncollected Mass	mg/m^3	-0.0506

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.19
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.37
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.37
Reported Uncertainty	mg/m^3	0.37
Expanded uncertainty (95% confidence), without Oxygen Correction	%	62.5
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	62.5
Reported Uncertainty	%	62.5
Reported Uncertainty as % of ELV	%	N/A

SULPHUR DIOXIDE: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A13 Dichromate Seal Factory 2

Sample Runs

Parameter	Units	Run 1	Mean
Concentration	mg/m³	0.17	0.17
Uncertainty	±mg/m³	0.0088	0.0088
Mass Emission	g/hr	0.34	0.34
Uncertainty	±g/hr	0.027	0.027

Parameter	Units	Run 1	Mean
Water Vapour	% v/v	2.4	2.4
Uncertainty	±% v/v	0.12	0.12

Blank Runs

Parameter	Units	Blank 1	Maximum
Concentration	mg/m³	< 0.012	< 0.012

General Sampling Information

Parameter	Value	
Standard	EN 14791	
Technical Procedure	MD 009	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 101	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	08/01/2025	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Impinger Material	Polyethylene	
Absorption Solution	0.3% Hydrogen Peroxide	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

SULPHUR DIOXIDE: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	762.8
Stack static pressure, P_{static}	mmH_2O	3.7
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	763.1
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	16.2
Total mass collected in impingers (silica trap)	g	8.5
Total mass of liquid collected, V_{lc}	g	24.7
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0308
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.2551
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	6.3
Average pressure drop across orifice, ΔH	mmH_2O	44.5
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.2255
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0245
B_{wo} as a percentage	% v/v	2.45
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	2.45
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.2563
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.58
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	4.80
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.19
Average stack gas temperature, T_s	°C	20.2
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	7.44
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	35.9
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	33.6
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	32.8
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	8.01
Nozzle area, A_n	mm^2	50.39
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	99.5

SULPHUR DIOXIDE: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	16:48 - 17:48
Sampling Dates	-	06/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.2563
Laboratory Result for Front Impingers	µg/ml	0.69
Laboratory Result for Back Impinger	µg/ml	0.15
Volume in Front Impingers	ml	279.4
Volume in Back Impinger	ml	131.4
Mass in Front Impingers	µg	192.8
Mass in Back Impinger	µg	19.7
Total Mass Collected	µg	212.5
Calculated Concentration	mg/m^3	0.17

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	06/01/2026
Average Volume Sampled (REF)	m^3	1.2563
Laboratory Result for Impingers	µg/ml	< 0.05
Volume in Impingers	ml	309.7
Total Mass Collected	µg	< 15.5
Calculated Concentration	mg/m^3	< 0.01

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	20.7
Pre-Sampling Leak Rate	l/min	0.17
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	90.7
Allowable Absorption Efficiency	%	95
Absorption Efficiency Acceptable	-	No

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.0
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	99.5
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	21

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

SULPHUR DIOXIDE: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.27
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
The absorption efficiency was less than the required 95%. [90 - 95%]	x	

SULPHUR DIOXIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.2551	uV_m	m^3	0.0251
Sampled Gas Temperature	T_m	279.3	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.7	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.00	uH_m	% v/v	1.00
Leak	L	0.82	uL	%	-
Laboratory Result	L_r	0.90	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.72	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.82	≤2%
Laboratory Result	%	0.90	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.2255	0.14
Leak	L	mg/m^3	0.001	1.00
Laboratory Result	L_r	mg/m^3	0.002	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.004
Leak	mg/m^3	0.0008
Laboratory Result	mg/m^3	0.0015

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.004
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.009
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.009
Reported Uncertainty	mg/m^3	0.009
Expanded uncertainty (95% confidence), without Oxygen Correction	%	5.2
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	5.2
Reported Uncertainty	%	5.2
Reported Uncertainty as % of ELV	%	N/A

CHROMIUM: RESULTS SUMMARY

Hard Anodising Surface Treatments Ltd, Kidderminster
A13 Dichromate Seal Factory 2

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	0.0041		0.0041
Uncertainty	±mg/m³	0.00129		0.00129
Mass Emission	g/hr	0.0082		0.0082
Uncertainty	±g/hr	0.0026		0.0026

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	1.3		1.3
Uncertainty	±% v/v	0.063		0.063

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	< 0.00047		< 0.00047

General Sampling Information

Parameter	Value	
Standard	EN 14385	
Technical Procedure	MD 006	
Name of Analytical Laboratory	EET	
Analytical Laboratory's Procedure	MD 107	
ISO 17025 Accredited Analysis?	MCERTS	
Date of Sample Analysis	16/01/2025	
Probe Material	Titanium	
Filter Housing Material	Borosilicate Glass	
Impinger Material	Borosilicate Glass	
Absorption Solution	Nitric Peroxide	
Positioning of Filter	Out Stack	
Filter Size and Material	47mm Quartz Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

CHROMIUM: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	762.8
Stack static pressure, P_{static}	mmH_2O	3.7
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	763.1
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	10.8
Total mass collected in impingers (silica trap)	g	2.7
Total mass of liquid collected, V_{lc}	g	13.5
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0168
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	1.3601
Gas meter correction factor, Y_d	-	0.9910
Average dry gas meter temperature, T_m	°C	7.3
Average pressure drop across orifice, ΔH	mmH_2O	44.6
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	1.3231
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0126
B_{wo} as a percentage	% v/v	1.26
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	1.26
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	1.3399
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.71
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	4.78
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	2.19
Average stack gas temperature, T_s	°C	20.0
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	7.41
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	35.8
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	33.5
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	33.0
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	8.01
Nozzle area, A_n	mm^2	50.43
Total sampling time, q	min	60
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	106.4

CHROMIUM: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	17:52 - 18:52
Sampling Dates	-	06/01/2026
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	1.3399
Mass on Filter / in Rinse	µg	< 0.60
Mass in Front Impingers	µg	1.64
Mass in Back Impinger	µg	3.23
Total Mass Collected	µg	5.47
Calculated Concentration	mg/m^3	0.0041
Reported Concentration	mg/m^3	0.0041

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	06/01/2026
Average Volume Sampled (REF)	m^3	1.3399
Mass on Filter / in Rinse	µg	< 0.60
Mass in Front Impingers	µg	< 0.02
Mass in Back Impinger	µg	< 0.01
Total Mass Collected	µg	< 0.63
Calculated Concentration	mg/m^3	< 0.0005
Reported Concentration	mg/m^3	< 0.0005

CHROMIUM: QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	22.5
Pre-Sampling Leak Rate	l/min	0.15
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Absorption Efficiency	Units	Run 1
Absorption Efficiency	%	41.0
Allowable Absorption Efficiency	%	90
Absorption Efficiency Acceptable	-	No

Detection Limit	Units	Run 1
Detection Limit	µg/m³	0.5
Allowable Detection Limit	µg/m³	5
Detection Limit Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	5.0
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	106.4
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Filter Temperatures	Units	Run 1
Maximum Filter Temperature	°C	180

Impingers Exit Temperature	Units	Run 1
Maximum Temperature Recorded	°C	9
Maximum Allowable Temperature	°C	30
Exit Temperature Acceptable	-	Yes

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

CHROMIUM: QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	20.0
Pre-Sampling Leak Rate	l/min	0.34
Post-Sampling Leak Rate	l/min	N/A
Allowable Leak Rate	l/min	0.40
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	N/A
Blank Acceptable	-	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
The absorption efficiency was less than the required 90%. [< 50%]	x	

CHROMIUM: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	1.3601	uV_m	m^3	0.0272
Sampled Gas Temperature	T_m	280.3	uT_m	K	2.00
Sampled Gas Pressure	ρ_m	101.7	$u\rho_m$	kPa	0.50
Sampled Gas Humidity	H_m	0.0	uH_m	% v/v	1.00
Leak	L	0.67	uL	%	-
Laboratory Result	L_r	7.70	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.71	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.67	≤2%
Laboratory Result	%	7.70	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	1.3231	0.0031
Leak	L	mg/m^3	0.0000	1.00
Laboratory Result	L_r	mg/m^3	0.0003	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.0001
Leak	mg/m^3	0.0000
Laboratory Result	mg/m^3	0.0003

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	%	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.0003
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.0006
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.0013
Reported Uncertainty	mg/m^3	0.0013
Expanded uncertainty (95% confidence), without Oxygen Correction	%	15.9
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	31.7
Reported Uncertainty	%	31.7
Reported Uncertainty as % of ELV	%	N/A

VERSION HISTORY

Version Number	Record of changes made within this version of the document
V1	The original document issued to the client

Hard Anodising Surface Treatments Ltd

Stack Data

Stack Ref	Release Point	Stack Dia m	Mean Efflux Velocity m/sec	Cross Sectional Area m^2	Volumetric Flow m^3/sec	Volumetric Flow m^3/hour
A1	S	0.15	10.9	0.01767	0.1926	693
A2	S	0.32	11.7			
A6	S	0.30	5.2	0.07068	0.3675	1323
A7	S	0.32	9.4	0.0804	0.7559	3600
A8	WMF	0.30	9.7			
A9	S	0.85	15.2	0.5674	8.625	31050
A10	S	0.30	9.1	0.0768	0.6432	2315
A11	S	0.22	9.5			
A12	S	0.32	9.4			
A13	S	0.20	9.1			
A14	RF					
A15	RF					
A16	WMF	0.22				
A17	RF	0.50				
A18	WMF	0.30				
A19	WMF	0.22				
A20	WMF	0.22				
A21	WMF	0.22				

All releases are at ambient temperature

S = Stack WMF = Wall Mounted Fan RF = Roof Fan

Other

Hard Anodising Surface Treatments Ltd

Site Protection and Monitoring Programme Review

HE 24 / 6966

Pollution Prevention and Control (PPC)
and Environmental Permitting (EP) Regulations

Site Protection and Monitoring Programme Review

Hard Anodising Surface Treatment Surface Treatment Limited

Firs Industrial Estate
Stourport Road
Kidderminster
DY11 7QN

June 2024

CONTENTS

SUMMARY

This document represents the first review of the Site Protection and Monitoring Programme (SPMP) for Hard Anodising Surface Treatment, submitted to the Environment Agency in pursuance of Condition 2.10.9 of the Permit No. BV8938 ID (the "Permit") authorising the operation of Hard Anodising Surface Treatment (the "Installation").

The scope of this monitoring is detailed within the SPMP submitted in April 2020 in pursuance of Condition 4.1.7 of the above-mentioned Permit. This document should be read in conjunction with both documents,

The original monitoring programme for the site is presented in Section 3 of the Design SPMP.

1 INTRODUCTION

This report was undertaken by site management supported by Halcyon Environmental personnel and completed in February 2018.

1.1 Site Location

The installation is located at Firs Estate, Stourport Road, Kidderminster, DY11 7QN approximately 3 km SW of Kidderminster in an area of surrounding Industrial Premises. Hard Anodising Surface Treatment Limited is located on a two site, as Factory 1 and Factory 2. The sites are accessed from Stourport Road, which is the main road serving the industrial estate.

The centre of the site is at National Grid Reference SO 819 734. The site covers an area of 2 acres and can be seen in Appendix A1.

Approx. 400 m to the rear of the properties is the Staffs & Worcester Canal. A further 300 m beyond that lies a small lake and a further 200 m beyond that lies the R Stour. The R Stour eventually merges with the R. Severn as does the Staffs & Worcester Canal.

The site activities warrant a Part A1 Permit under the Pollution Prevention and Control (England and Wales) Regulations 2000 by virtue of section 2.3 (surface treating metals and plastic materials) of Schedule 1 of the regulations, which requires any activity involving surface treating of metals and plastic materials using an electrolyte or chemical process where the aggregated volume of the treatment vats is more than $30m^3$ to obtain a permit to operate. The aggregated volume of treatment tanks at Hard Anodising Surface Treatment Limited is > $30m^3$.

Access around the factory premises has been included within the installation boundary to address any potential likelihood of spillages of materials or wastes during collection or delivery.

The installation not only the process tanks for chemical and electrolytic surface treatment activities but also directly associated activities which have a technical connection with the surface treatment activities, and which may have an effect on emissions and pollution. These include:

- Storage and handling of input chemicals and anode metals
- Water treatment
- Chemical preparation of the work to be treated
- Rinsing of the work being treated
- Drying of the treated work
- Post-treatment of the work (where necessary to complete the surface treatment)
- Fume extraction and fume abatement system
- Effluent treatment
- Handling of spent process fluids
- Handling of wastes

The operation comprises of the following main processes:

- Anodising
- Nickel plating
- Surface passivation and sealing

As such these processes encompass the use, storage, handling and disposal of mineral acids including sulphuric, hydrofluoric, phosphoric and hydrochloric, alkalis including sodium hydroxide and sodium carbonate and bicarbonate, in addition to aqueous sodium hypochlorite, aqueous hexavalent chromium, sodium and potassium salt solutions and nickel solutions. The potential impacts on aquatic environments are considered such that site management operate a containment strategy to eliminate, or at least minimise any losses. All deliveries and movement of products are restricted to daytime hours only. Wastes are treated in the site's dedicated 2 off effluent treatment systems.

The process encompasses sequential processing of components and parts through dedicated, purpose-built plants. The plant encompasses double and single skinned tanks which contain specific solutions (hot and cold) of process chemicals. The process operator passes the work in a defined series of operation for specific periods of time. By completing the sequence in the order chemical processes are used to clean, rinse, etch, de-smut, anodise and colour as the work is being processed. Acid Stripping is undertaken using an immersion process.

Hard Anodising Surface Treatment Limited also operates a consent to discharge trade effluent to sewer granted by Severn Trent Water Authority.Hard Anodising Surface Treatment Limited currently employs approx. 30 people on a full-time basis.

The following table defines the positive and negative aspects of the current SPMP management initiatives; -

2 MONITORING PROGRAMME

2.1 Objectives of the Monitoring Programme

No reported objective changes; site is now addressing.

2.2 Monitoring Programme

The monitoring programme initiatives undertaken in year 2023/24 are summarised below.

Item	Action	Outcome
1	Reduction in Hexavalent Chromium Usage	SEA CTAC application process ongoing
2	Factory 1 re-planned following F2 fire	Completed
3	Factory 2 rebuilt following fire	Completed.
4	Repair/refurbishment of tanks and bunds	Continuous and ongoing
5	Repair/refurbishment of all main slab areas	Shop 1 continuous and on-going
6	Commission of new drain (Factory 2) to prevent any unauthorised releases to roadway	Installed

Item	Action	Outcome
7	Predicted installation of M Certs Mag Flow unit (Factory 2)	Delayed installation due to current economic situation
8	Refurbishment of main laboratory and upgrade of monitoring equipment	Completed
9	Implementation of Preventative Maintenance System Site wide	Installed and reviewed 2017
10	Enhance issue of work instruction and risk assessments	Continuous improvement Programme
11	Enhanced levels of Training and Awareness	Continuous Improvement Programme
12	Elevation of Effluent Pit to above ground status	Development upon F2 refurb and M-CERTS system completed
13	Expansion of bunding capability site wide	On going
14	Concreting of waste storage area (Factory 1)	On going
15	Enhanced bunding of all site areas Site wide	On going
16	Implementation of Environmetrics to assess water consumption and accidents, incidents and any other issue	Continuous and ongoing
17	Disclosure of environmental issues site wide	Continuous and ongoing
18	No prosecutions	Zero Environmental prosecutions
19	S1/S2 water sampling and reporting maintained on schedule	100% passed tests 0% failed tests Quarterly samples
20	STWA water sampling and reporting maintained on schedule	See site log
21	Awareness of Spills Implementation of supportive poster campaign	Implemented and continuously displayed on notice boards
22	Accreditation to BS EN ISO 14001	2019 via ICS continues
23	Emergency shut off valves F1 / F2	Implemented and on going
24	Awareness of REACH and its implications for trivalent and hexavalent Chromium including Sunset Dates	Implemented and on going
25	Installation o5 Second MCERTS Flow Meter	Implemented and on going

2.3 Infrastructure Monitoring Programme

2.3.1 Location

The major risks to land pollution from hazardous materials used by Hard Anodising Surface Treatment Limited during normal and abnormal conditions are:

- Hazardous liquid spillage and entry into groundwater or surface water during delivery of chemicals, storage or handling / movement around the site
- Escape of hazardous waste materials to groundwater or surface water during storage or collection for off-site disposal
- Release of hazardous materials to sewer above trade effluent consent limits from failure of the effluent treatment plant

The major risk to land pollution during an emergency scenario would be:

- Damage to tanks in the effluent treatment plant causing loss of containment.

2.3.2 Personnel Issues

Personnel responsibilities for the inspection, testing and maintenance of pollution prevention infrastructure are to be trained to an appropriate level to ensure compliance with the Programme. Roles and responsibilities for undertaking the Programme (including reporting) and ensuring adequate competence of staff is continued as per the original SPMP.

2.4 Assessment and Reporting Procedures

2.4.1 Assessment Procedure

The list of preventative maintenance checks carried out in each area of the factory is shown in Appendix C. This form identified 3 levels of response:

- Repair immediately
- Repair within 1 week
- Repair within 1 month

The following table of criteria defines how the different levels of response are applied for preventative maintenance issues associated with the potential for land contamination.

Criteria for Different Levels of Response for Preventative Maintenance Issues Associated with Potential Land Contamination Issues Table 1

Response Level	Criterion
Repair Immediately	Serious damage to hard standing, factory floor, bunds, tanks, pipework etc likely to lead to immediate loss of primary, secondary or tertiary containment
Repair within 1 week	Minor damage to hard standing, factory floor, bunds, tanks, pipework etc likely to lead to potential loss of primary, secondary or tertiary containment
Repair within 1 month	Minor damage to hard standing, factory floor, bunds, tanks, pipework etc which could develop into more serious damage which could lead to potential loss of primary, secondary or tertiary containment

2.4.2 Reporting Procedure

Summaries of the monitoring data will be sent to the Agency every 2 years along with the results of the data assessment, and any recommendations for amendments to the monitoring programme.

The list of quarterly preventative maintenance checks carried out in each area of the factory is shown in Appendix C.

This checklist is supplemented by digital photographs to provide a formal, auditable record of visual preventative maintenance inspections carried out each quarter.

As well as meeting Environment Agency annual reporting requirements, these records are stored on site by the Environment Team for the life of the permit in order to provide Hard Anodising Surface Treatment Limited with data to aid in the process of surrendering the permit.

Summaries of these maintenance inspections will be sent to the Environment Agency every 2 years along with any recommendations for amendments to the Monitoring Programme. Copies of these reports are stored on site by the Environment Team for the life of the permit.

EMS emergency plans detail the responsibilities and reporting requirements should the infrastructure testing and inspection programme detect any loss of containment and / or pollution of ground or groundwater.

The formats for standard and emergency reporting procedures are shown in Appendix B3.

Emergency Response Actions

The emergency response actions for the site are as follows:

- The Environmental Representative or, in his absence a senior member of staff, will be notified and will decide upon the action to be taken. The Environmental Representative will notify the Authorities where appropriate.

- All spillages within the main process area and site bunded area will be directed to the effluent treatment plant. If the materials and / or quantities involved are deemed sufficient to cause an overloading of the effluent treatment system, then all water supplies to the site will be switched off and the settlement tanks will be closed to effectively eliminate the possibility of any escape of materials from the site.

- The Environmental Representative will then arrange for the spillage materials to be treated through effluent treatment plant, if possible, or pumped out of the site bunded area to a tanker for off-site disposal.

- In the event of a leak, further leakages will be stopped and leaked substances prevented from migrating via site service corridors or other conduits (eg. drains and ducts). Spilled material will be prevented from escaping from the site by collection within the site bunded areas.

- All spill incidents will be documented, including the actions taken and final outcome. Incident reports will be reviewed at management review meetings to decide whether changes to operations are required.

Materials contaminated with the leaked substances will be handled carefully and properly disposed of in accordance with the Duty of Care Regulations.

Waste will be collected and deposited in polythene bags (and / or lidded UN drums, IBCs or bulk tanker), clearly identified and labelled with the contents, and disposed of via approved Waste Contractors.

The formats for standard and emergency reporting procedures remain as per the original SPMP.

Incident Reporting Procedure

Depending on the specific circumstances of the incident, a number of the emergency and regulatory authorities will be contacted.

Two reporting levels will be considered for the reporting of incidents:

Level 1: Life and Property Incidents: Potentially Polluting Incidents

The first level of reporting will be concerned with personal safety as first priority and significant property damage. Those parties to be informed will be involved in dealing with injured people and preventing fire and explosion, e.g. ambulance, fire brigade and / or police.

Once the site has been made safe in terms of an immediate fore explosion risk, the Environmental Representative will initiate the reporting actions, concerned with informing those parties whose responsibility it is to protect sources from the impact of the release, e.g. the Environment Agency, Water Company and Local Authority.

These parties will be contacted once the site has been made safe.

There have been no major plant failures reported since the permits inception.

Level 2: Minor Incidents

If the incident has not resulted in any Health and Safety or off-site environmental impact, external reporting of the incident will not be necessary unless required by the EPR Permit.

The majority of minor spillages will fall into this category. However, the incident will still be responded to, investigated and reported internally in accordance with the sites Environmental Management System.

2.4.3 Recording and Data Management

The list of preventative maintenance checks carried out in each area of the factory is shown in Appendix C. This checklist is supplemented by records/digital photographs to provide a formal, auditable record of visual of preventative maintenance inspections carried out.

As well as meeting Environmental Management criteria for the life of the permit, this aspect is undertaken in order to provide management with data to aid in the process of surrendering the Permit. A plan has been compiled as per the permit.

Data recording continues to be maintained to include; -

(i) all environmental incidents, their consequences and remedial actions.

(ii) the disposal of all chemicals and process wastes from site (via consignment notes).

(iii) all planned maintenance records.

(iv) all opportunistic monitoring records.

(v) all clearance activities involving chemical processes and plant.

All records will be maintained in accordance with the archiving provisions defined in the site's EMS.

All records are reviewed on an annual basis and at the monthly meetings.

3 Other Issues

3.1 Chemical Delivery and Storage

1. All containment vessels are bone fide, purpose built.

2. All containment structure is purpose built in accordance with Engineering specifications.

3. All bunding is subject to scheduled inspection record and corrective action.

4. All bunds are visually monitored using document “Bund Contaminant Integrity Test Log”.

5. All containment and bunding losses are subject to site “Spillage & Containment” procedures as documented within its ISO14001 EMS.

6. All containment and bunding is subject to internal audit and services.

7. Bulk containment and enclosures are subject to British Standards in respect of suitable materials.

8. Spillage control kits are maintained on site.

9. All materials supplied to site require submission of appropriate material health & safety data sheets prior to commencement of supply.

10. All materials supplied to site are delivered in appropriate containers albeit 5, 10, 25, 50, 100, 1000 litre packages.

11. Dry materials eg. Hydrated Lime, are supplied in suitable bags.

12. Assessments of adequacy of containment are undertaken by competent personnel.

13. All localised spillages are subject to appropriate address by the site management and supervision.

14. Significant spillages are subject to immediate, formal notification of the Environmental Agency using the procedure defined in the site’s ISO 14001 EMS.

15. All containers of product are visually inspected / examined as part of the acceptance process. Damaged containers are rejected.

16. All 25kg dry sacks are to UN standard 5H4.

17. All 1000lt IBCs are to UN Standard 31 HA1.

18. All 25lt Polyethylene containers are to UN standard 3H1 or RH1.

19. All loading / unloading activities take place on hardstanding.

20. All procedures outlined in the site’s ISO 14001 EMS are subject to 3rd party audit on a pre-scheduled basis.

21. All FLT drivers are formally made aware of what to do in the event of an accident, incident or unauthorised release of product during delivery, storage or general transport.

These risks are minimised by locating the effluent treatment plant and all chemicals storage areas and hazardous wastes storage areas inside the site bunded area, which is described in the Application Site Report.

The effluent treatment plants are located within the sites bunded area with an effective containment. Sudden and unexpected loss of this tank would result in the already treated waste passing into the foul drainage system.

Hard Anodising Surface Treatment operates a comprehensive maintenance management system, which is described in the main EPR application document. The management system includes quarterly visual inspections of:

- All bunded areas, drainage channels to detect any signs of deterioration, leaks, spillage, or blockage. Any corrective action required is reported to and implemented by the Environmental Team.

- Equipment in all process areas, to identify equipment wear and tear which need to be addressed as part of the company's planned / predictive maintenance programme. Particular attention is paid to pipework, tanks, supports, ducting, motors, pumps and filters, and compressed air.

The list of quarterly preventative maintenance checks is carried out in each area of the factory. This checklist is supplemented by digital photographs to provide formal, auditable records of visual preventative inspections, carried out for each quarter.

Annual testing of bunded areas and drainage channels is also carried out including:

- Leak testing of bunded areas and sumps
- Detailed inspection of integrity of drainage channels

The maintenance management system is incorporated within and managed by an ISO 14001 Environmental Management System at Hard Anodising Surface Treatment. This ensures that the maintenance management system is audited at least once per year.

Any corrective action is reported to and implemented by the Environmental Team.

The results are recorded and reviewed at the annual management review meeting. The EMS also includes emergency plans which are described in section 2.8.2 of the main EPR Application document.

These will immediately be enacted should the infrastructure testing and inspection programme detect any loss of containment and / or pollution of ground or groundwater.

In addition to the skills and competencies required for each job, all staff receive formal environmental training and regular refresher training.

This is recorded on the training records held for all employees. The content of the environmental training is recorded, the training was extended so that it now includes;

- Awareness of the regulatory implications of the EPR Permit for Hard Anodising Surface Treatment management and workforce and their work activites.

- Awareness of all potential environmental effects from operation under normal and abnormal circumstances (i.e. planned maintenance, process shut-down, start-up).

- Prevention of environmental accidents and action to be taken if accidents occur.

A typical training plan is included in Appendix F2

4 REFERENCES

A copy of the site's BS EN ISO 14001 accreditation certificate is maintained on site.

British Assessment Bureau

Cer fica on is condi onal on maintaining the required performance standards throughout the cer fied period of registra on
The Bri sh Assessment Bureau, 30 Tower View, Kings Hill, Kent, ME19 4UY

The management system of Cer ficate
Number **232698** **Hard Anodising**
Surface Treatments Limited
Firs Estate, Stourport Road,

Kidderminster, DY11 7QN has been

assessed and cer fied as mee ng the

requirements of

ISO 14001:2015
for the following ac vi es

Coa ng of metals by electroly c and
chemical process Globally.

Further clarifica ons regarding the scope of this cer ficate and the applicability of requirements may be obtained by consul ng the cer fier.

Valid fromAuthorised by

Ini al Cer fica on: 11 July 2004
Latest Issue: 21 May 2023
Expiry Date: 09 May 2026 subject to annual assessments

UKAS MANAGEMENT SYSTEMS
8289

Mike Tims
Chief Execu ve Officer

5 GLOSSARY

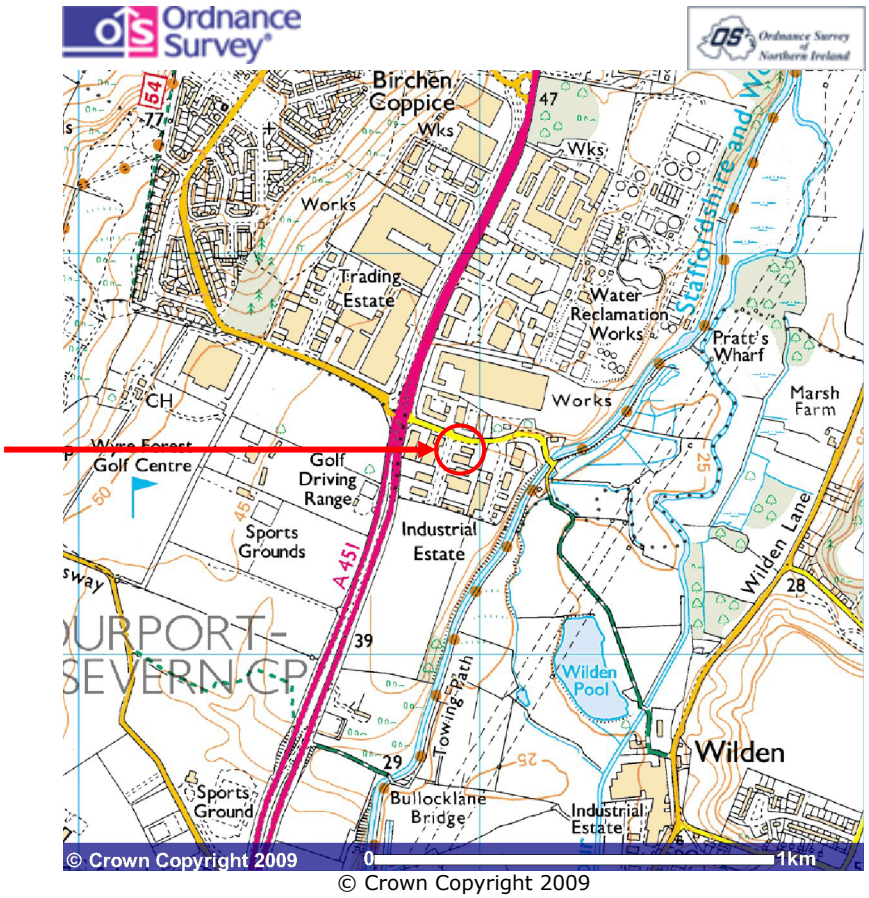
APHA	American Public Health Association
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CV-AAS	Cold Vapour Atomic Absorption Spectroscopy
DIM	Documented In-House Method
EPA	US Environmental Protection Agency
FT- IR	Fourier Transform Infra Red Spectroscopy
GC- ECD	Gas Chromatography with Electron Capture Detection
GC- FID	Gas Chromatography with Flame Ionisation Detection
GC- MS	Gas Chromatography – Mass Spectrometry
GF- AAS	Graphite Furnace Atomic Absorption Spectroscopy
HPLC- PED	High Performance Liquid Chromatography with Pulsed Electrochemical Detection
HPLC-UV	High Performance Liquid Chromatography with Ultraviolet Detection
HS-GC-FID	Headspace Gas Chromatography with Flame Ionisation Detection
HS-GC-MS	Headspace Gas Chromatography – Mass Spectrometry
IC-COND	Ion Chromatography with Conductivity Detection
IC-PED	Ion Chromatography with Pulsed Electrochemical Detection
ICP-OES	Inductively Coupled Plasma – Optical Emission Spectroscopy
ICRCL	Interdepartmental Committee on the Redevelopment of Contaminated Land
MDHS	Methods for the Determination of Hazardous Substances
Method Source	Current EcoS methodologies are based on the appropriate protocols within publications from the listed bodies
MEWAM	Methods for the Examination of Waters and Associated Materials
SVOCs	Semi-Volatile Organic Compounds
Technique	Method used for the detection of the determinant
TON	Total Oxidised Nitrogen
VOCs	Volatile Organic Compounds

APPENDIX A

FIGURES AND PLANS

A1 Ordnance Survey Map

A2 Tank Layout Diagram



www.ordnancesurvey.co.uk/**getamap**

Image produced from Ordnance Survey's Get-a-map service.
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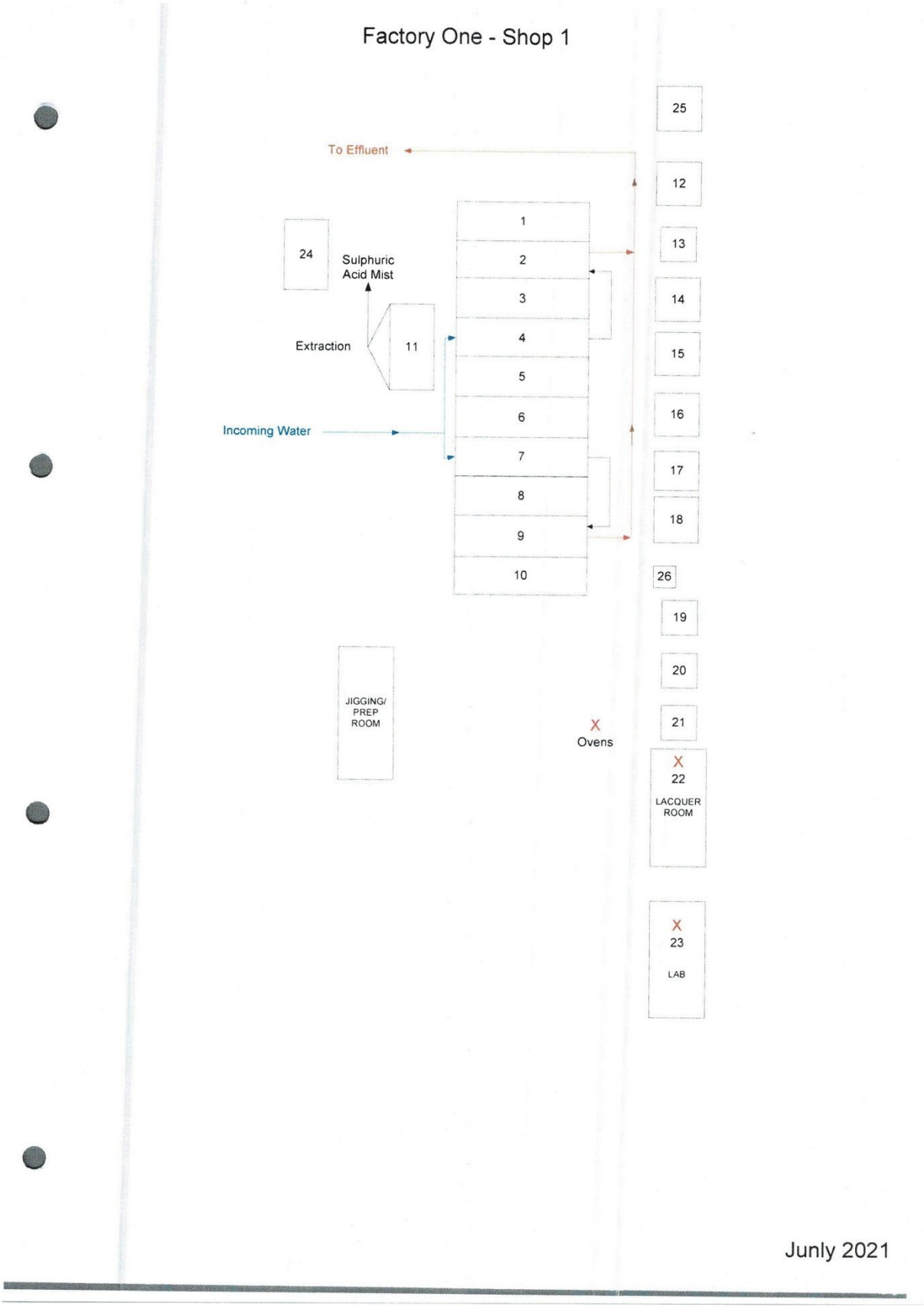
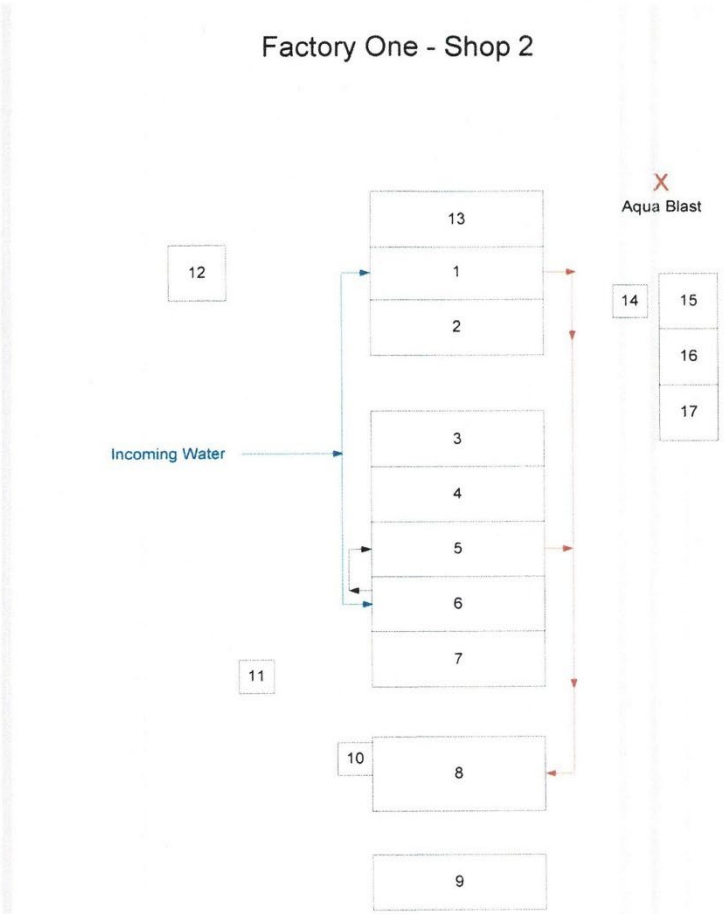
Ordnance Survey of Northern Ireland.

Site plan Index

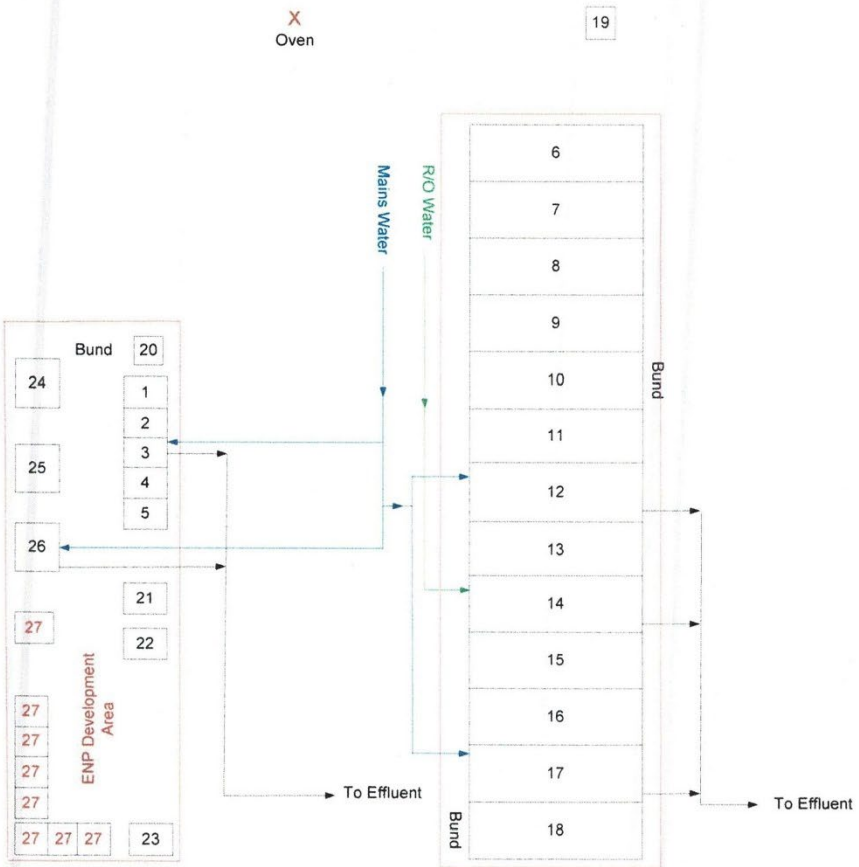
Hard Anodising Surface Treatment - Factory 1:



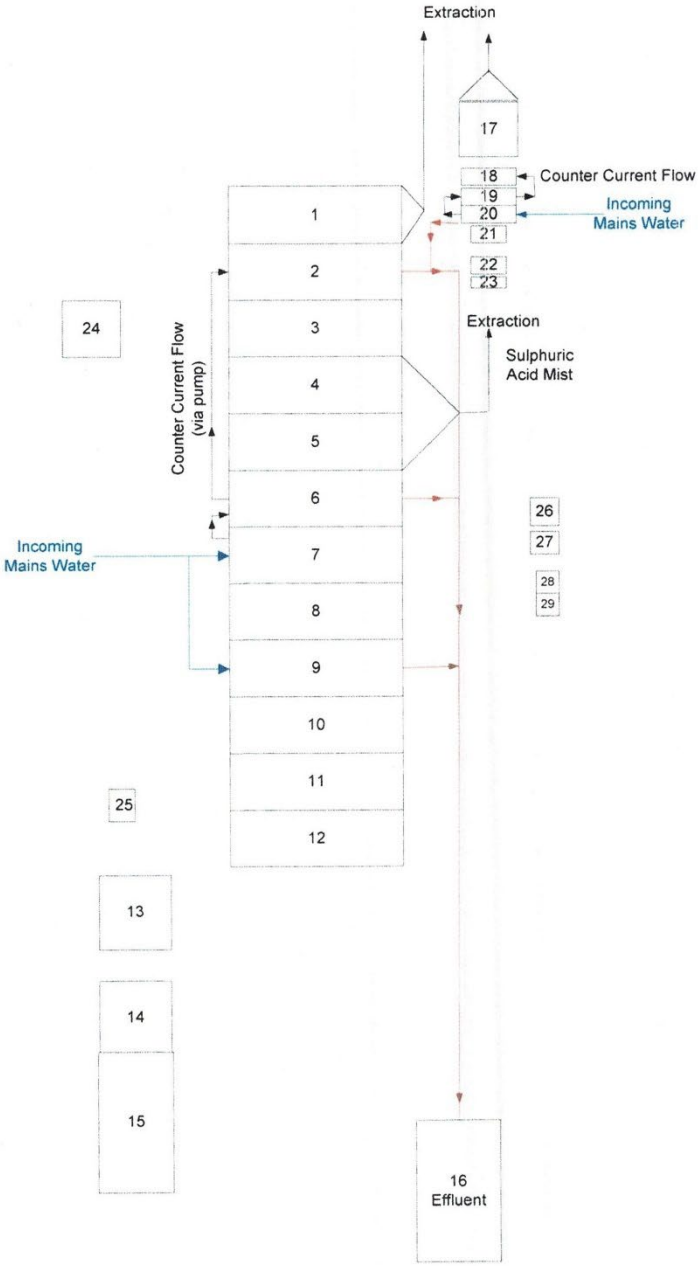
Factory 1 layout



Factory One - Shop 3



Factory Two


Extraction
17
18
19
20
21
Counter Current Flow
Incoming
Mains Water
1
2
3
4
5
6
7
8
9
10
11
12
22
23
Extraction
Sulphuric
Acid Mist
24
Counter Current Flow
(via pump)
26
27
28
29
Incoming
Mains Water
25
13
14
15
16
Effluent

APPENDIX B

INSPECTION AND MONITORING PROTOCOLS

Contents

B1 Monitoring Protocols; Inspection, Testing and Maintenance Controls

Site management have progressively implemented procedures to identify, assess and minimise environmental risks and hazards.

The site management have endeavoured to encourage environmental site improvement to minimise all site activities based on a closed loop operating system; a dedicated team has been formed, to manage site operations with regard to waste management and storage facilities.

A maintenance programme has been constructed for areas of the site, which are fully operational. Any change to site operating conditions which reflects on the testing / monitoring / inspection programmes as deemed appropriate.

The site is in due process of establishing formal documentation specifically for the recording and forward planning of critical environmental performance monitoring. This documentation will be maintained for a period of no less than 4 years.

There have been significant changes to the controls first described in the Design SPMP.

ORGANISATIONAL ROLES, RESPONSIBILITIES AND AUTHORITIES

Hard Anodising STL management have assigned the responsibility and authority for:

a) Ensuring that the integrated management system conforms to the requirements of BS EN ISO 9001, AS9100 and BS EN ISO 14001.

b) Ensuring that the processes are delivering their intended outputs;

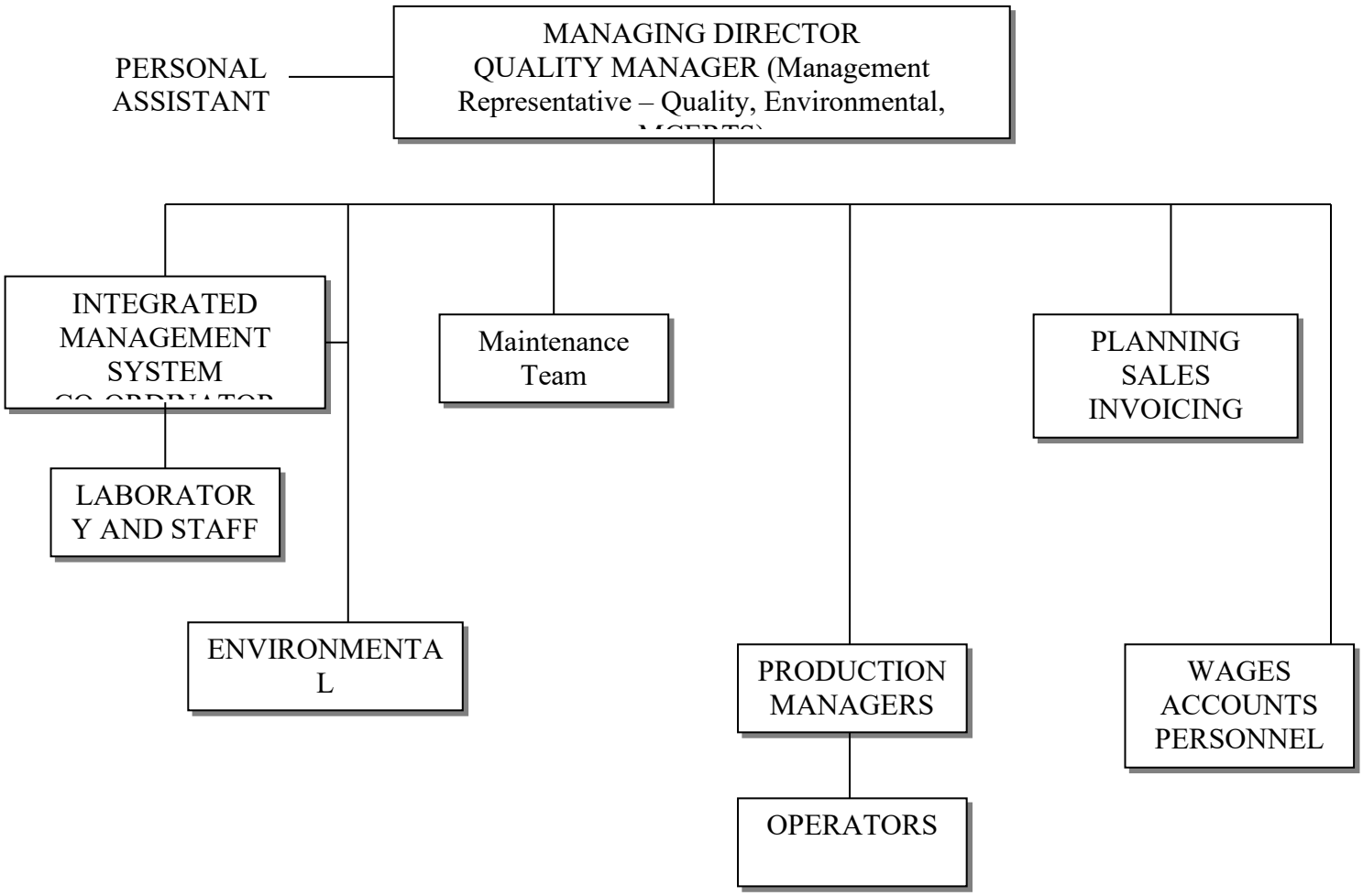
c) Reporting on the performance of the integrated management system and on opportunities for improvement, in particular to top management;

d) Ensuring the promotion of customer focus throughout the organization;

e) Ensuring that the integrity of the integrated management system is maintained when changes to the quality management system are planned and implemented.

Responsibilities and authorities are further defined within the Part 2 & 3 procedures as described within this manual.

The necessary competence for job function shall be determined and training provided as required. The company will review training to ensure the necessary competence has been achieved.



RESPONSIBILITY AND AUTHORITY

The structure as defined in the Family Tree and the responsibilities and authorities within this Manual ensure a multi-disciplinary approach to decision making, and also provides a conduit for efficient transmission of communication of information and data to relevant personnel within the Company.

Directors

The Directors hold overall authority within the Company and are responsible for all policy, setting Company targets and monitoring respective performance including the effectiveness of the systems adopted to meet quality, environmental, Health and safety and contractual requirements.
The Directors are responsible for ensuring that adequate resource is available to ensure the Company manufactures its products correctly, on time, and at a competitive price.

Managing Director

The Managing Director is responsible for:-

i) Financial performance and general well being of Company sales, order intake, cash flow etc.,
ii) Primary interface with customers
iii) Estimating and pricing
iv) Resource control and allocation within the Company and liaison with department heads on resources
v) Technical assistance with production planning
vi) Approval of process for new work and contract review
vii) Specification of plant, equipment and processes
viii) Compliance with all legislative requirements
ix) Planning and facilitating of future strategy
x) General business development including customer liaison
xi) Registered “A” stamp holder
xii) Development of new processes and procedures
xiii) Quality, health, safety and environmental matters (as detailed in the Integrated Management System Procedures)
xiv) Customer, Statutory and Regulatory requirements including Environmental and Health and Safety
xv) Promoting awareness of customer, statutory and regulatory requirements throughout the organisation
xvi) Overall responsibility for Laboratory analysis and cover in the absence of Laboratory personnel

RESPONSIBILITY AND AUTHORITY

Quality/Environmental/ H&S Manager

The Manager is responsible for:-

i) Implementation of the Integrated Management System - procedures
ii) Executive responsible for Laboratory and authorisation of Lab and testing procedures
iii) Estimating and pricing
iv) Quality health, safety and Environmental matters (as detailed in the Integrated Management System Procedures)
v) Representing the needs of the customer in internal functions in addressing ISO 9001, AS9100, IATF 16949 and ISO 14001 requirements.
vi) Transport and Company vehicles
vii) Maintenance of all facilities through the Maintenance Department
viii) Back-up provision to the Production Director when required
ix) Executive responsibility for the maintenance of the quality system
x) Company training
xi) Management of 'controlled' Company documentation
xii) Registered "A" stampholder
xiii) Ensuring the processes of the integrated management system and its associated responsibilities are established and maintained to meet the requirements of ISO 9001, AS 9100. TS 16949 and ISO 14001
xiv) Provision and maintenance of integrated system procedures, at the correct issue at all application locations throughout the Company
xv) Promoting awareness of customer requirements throughout the organisation
xvi) The waste flow monitoring arrangements and liaison with Sira and the Environment Agency on such matters.This includes:-
    a) Ensuring that management system procedures are established, implemented and maintained with regards to all flow monitoring activities.
    b) Reporting to senior management, and liaising with Sira and the Environment Agency on performance of the flow monitoring arrangements, including the management system and the need for improvement.
    c) Ensuring the requirements of the management system in relation to meeting the performance targets are understood and appropriate training has been received by all relevant personnel.

Integrated Management System Co-Ordinator

The Co-Ordinator is responsible to the Quality/Environmental/ H&S Manager

i) Reporting to the Management through internal auditing, customer liaison etc., on the effectiveness of the integrated management system
ii) Review and assessment of the integrated management system through a series of planned and systematic internal audits
iii) The competence and efficiency of all staff carrying out quality related activities, with the provision of training where required
iv) Assessment and monitoring of sub-contractors / suppliers
v) Ensuring that all documentation providing traceability and history of product / service, and the effective working of the integrated management system is maintained in a systematic manner, which will prevent deterioration and provide easy retrieval
vi) Ensuring adequate verification resource
vii) Control of non-conforming products / services, environmental and health and safety incidents and corrective action. Reporting and maintaining records.
viii Calibration system
ix) Registered "A" stampholder.
x) Quality, Health & Safety and Environmental matters, including waste flow monitoring activities as directed by the Director (as detailed in the integrated management system procedures).
xi) Maintenance of legislation register and co-ordinating compliance reviews
xii) Environmental Aspects and Impacts

In the absence of the Co-Ordinator the Manager will take responsibility for the above.

RESPONSIBILITY AND AUTHORITY

Note: "A" Stampholders are authorised to approve all procedures relating to production, quality control, receipt and despatch of work.

Laboratory Manager

The Laboratory Manager is responsible to the Directors for:-

i) Routine analysis through automotive and/or manual titration, of vat makeup solutions & conditions ensuring chemical concentrations & vat additions are with specified parameters
ii) Control and make-up of new vat solutions
iii) Input & maintenance of all lab records, providing history, traceability and easy retrieval in a manner which will prevent deterioration
iv) Control of chemical provisions through regular stock checks and reporting results to the Quality Director
v) Calibration of lab and test equipment
vi) Preparation and testing of processed parts and test pieces for both destructive and non-destructive testing.
vii) Collation of chemical and mechanical test results for trend analysis
viii) Reporting to Management through monthly meetings and liaison with Management/Quality Personnel on lab and quality issues
ix) Quality, health, safety and environmental issues as directed by the Quality Director (as detailed in the Integrated Management System Procedures)
x) Development of laboratory procedures and solution analysis methods

Sales Department

The Sales Department are responsible to the Directors for:

i) Order input onto the Production Database
ii) Generation of works orders
iii) Invoicing
iv) Credit control
v) Update of masters of works orders
vi) Generation of C of C's and despatch notes
vii) Customer liaison
viii) Filing and record keeping
ix) Compliance with the Company's Integrated Management System, including quality, environmental and health and safety requirements as applicable to their job function

Wages and Accounts

Wages and Accounts are responsible to the Directors for:

i) Processing and payment of wages into employee's bank accounts
ii) Accounts activities
iii) Payment of invoices from suppliers etc.,
iv) Filing and record keeping
v) Compliance with the Company's Integrated Management System, including quality, environmental and health and safety requirements as applicable to their job function

RESPONSIBILITY AND AUTHORITY

Maintenance Team

The Maintenance Team is responsible to the Directors for:-

i) Maintenance of all Company equipment in safe and good working condition
ii) Installation of all equipment and monitoring its performance
iii) Re-design of equipment as directed by the Managing Director
iv) Mechanical handling development, including jigs
v) Quality, health, safety and environmental issues as directed by the Quality/Environmental/ H&S Director (as detailed in the Integrated Management System)
vi) Maintaining a safe working environment

Production Managers

The Product Managers are responsible for:-

i) Ensuring that all production work within specified area is undertaken to procedure and in a timely manner
ii) Ensuring that all equipment and processes are operating efficiently
iii) Maintaining a safe working environment
iv) Discipline of all reporting staff
v) Reporting any discrepancies to the scheduled work through correct channels
vi) Training and re-awareness training of all production staff

Production Personnel

The Production Personnel are responsible to the Production Managers for:-

i) Completion of production operations as directed by the Production Manager, to the required quality and workmanship standards in order that the requirements of the customer reflected in the supporting documentation are met, whilst complying with environmental and health and safety requirements as detailed in the Integrated Management System.
ii) Ensuring that they inspect all work they produce, and where required obtain verification from the Quality Department.

General

The responsibilities and authorities defined in the Manual are the main responsibilities for the function / personnel described, and are not meant to be an exhaustive list.
The Company employ a highly skilled workforce, and deputisation and delegation will occur when a where required, depending on skills / experience. Also through the management team we employ a multi-disciplinary approach to our activities.

All employees are responsible for maintaining the area in which they work, in a clean and ordered manner.
It is the senior managements' responsibility to promote the awareness of customer requirements throughout the Company. This will be reviewed through internal audits.
All personnel involved at any stage of the product realisation process have the authority to stop production and correct quality problems. Supervision must be notified as soon as possible.

Management Representative

The Management Representative function as detailed within the section above has been appointed by senior management to carry out those functions defined. He is authorised and has the organisational freedom to resolve matters pertaining to quality, prevent delivery of non-conforming parts and stop non-conforming processes etc.

PLANNED MAINTENANCE

Page	Description	Schedule	Date of Test	Date of Next Test
1	Index			
2	**F1** Refrigerator Plant (RP2)	Monthly	--	--
3	**F2** Refrigerator Plant (RP5)	Monthly	--	--
4	**F1** Refrigerator Plant (RP7)	Monthly	--	--
5	**F1** Refrigerator Plant (RP8)	Monthly	--	--
6	**F1** Effluent Treatment Plant	Monthly	--	--
7	**F2** Effluent Treatment Plant and MCERT Magflow Meter	Monthly	--	--
8	**F2** Nickel Seal (low-temp) Tank – Heating System	Monthly	--	--
9	**F2** Passivation/Seal Tank – Heating System	Monthly	--	--
10	**F1** Surface Water/Effluent Shut-off Valves	Monthly	--	--
11	**F2** Surface Water/Effluent Shut-off Valves	Monthly	--	--
12	**No.1** Submersible Transfer Pump	Monthly	--	--
13	**No.2** Submersible Transfer Pump	Monthly	--	--
14	**No.3** Submersible Transfer Pump	Monthly	--	--
15	**No.1** Carboy Transfer Pump	Monthly	--	--
16	**No.2** Carboy Transfer Pump	Monthly	--	--
17	**No.3** Carboy Transfer Pump	Monthly	--	--
18	**No.4** Carboy Transfer Pump	Monthly	--	--
19	**No.5** Carboy Transfer Pump	Monthly	--	--
20	**No.6** Carboy Transfer Pump	Monthly	--	--
21	**No.7** Carboy Transfer Pump	Monthly	--	--
22	**F1** Branson Degreaser Unit	Monthly	--	--
23	**No.4** Submersible Transfer Pump	Monthly	--	--
24	**No.5** Submersible Transfer Pump	Monthly	--	--
25	Carrier Refrigerator Plant **No.9**	Monthly	--	--
26	ICS Gallaxy Refrigerator Plant **No.10**	Monthly	--	--

Page	Description	Schedule	Date of Test	Date of Next Test
1&2	Index			
3	**F1/S3** Nitric Acid Etch LEV (A1)	6 Monthly	June	Dec
4	**F1/S3** Chromic Acid Anodising LEV (A2)	6 Monthly	June	Dec
5	**F1/S1** Hot Seal Tank No2 Combustion Fume LEV	6 Monthly	June	Dec
6	**F1/S1** Lacquer Extraction Table No.1 LEV (A5)	6 Monthly	June	Dec
7	**F1/S1** Lacquer (Room) Extraction Table No.2 LEV	6 Monthly	June	Dec
8	**F1/S1** Vat 2 Sulphuric Acid LEV (A7)	6 Monthly	June	Dec
9	**F1/S1** Lacquer Room Extraction Cupboard (A8)	6 Monthly	June	Dec
10	**F2** Anodising Line LEV (A9)	6 Monthly	June	Dec
11	**F1** Effluent Treatment Plant – Pipework and Valves	6 Monthly	June	Dec
12	**F2** Effluent Treatment Plant – Pipework and Valves	6 Monthly	June	Dec
13	**Factory 1** – Main Floor – Pipework and Valves	6 Monthly	June	Dec
14	**Factory 2** – Main Floor – Pipework and Valves	6 Monthly	June	Dec
15	**Factory 1** – Release to Drain – Pipework and Valves	6 Monthly	June	Dec
16	**Factory 2** – Release to Drain – Pipework and Valves	6 Monthly	June	Dec
17	**F1** Effluent Treatment Plant – Electrodes & Displays	6 Monthly	June	Dec
18	**F2** Effluent Treatment Plant – Electrodes & Displays	6 Monthly	June	Dec
19	**F2** Aqueous Degreaser	6 Monthly	June	Dec
20	**F1/S1** Dichromate Seal Tank LEV (A12)	6 Monthly	June	Dec
21	**F2** Hot Seal Combustion Fume LEV	6.Monthly	June	Dec
22	**F2** Dichromate Seal Tank LEV (A13)	6 Monthly	June	Dec
23	**F2** Hot Seal Tank Roof Extraction (A14)	6 Monthly	June	Dec
24	**F1/S1** Lacquer Stripping Tank Extraction (A16)	6 Monthly	June	Dec
25	**F1/S3** ENP Plating Line Extraction (A10)	6 Monthly	June	Dec
26	**F1/S3** ENP Roof Extraction (A17)	6 Monthly	June	Dec
27	**F1/Loading Bay** Water De-Ioniser (Ionmaster RO)	6 Monthly	June	Dec
28	**F1/Lab** Fume Extraction Cupboard (A6)	6 Monthly	June	Dec
29	**F2** Maintenance Area Extraction Unit (A11)	6 Monthly	June	Dec
30	**F1/S1** Auxiliary Roof Extraction Fan (A15)	6 Monthly	June	Dec
31	**F1/S1** Lacquer Room Wall Extraction (A19)	6 Monthly	June	Dec
32	**F1/S1** Lacquer Room Wall Extraction (A20)	6 Monthly	June	Dec
33	**F2** Bead Blaster Extraction	6 Monthly	June	Dec
34	**F2** Water De-Ioniser (Adept RO)	6 Monthly	June	Dec
35	Bund Containment Integrity Log	6 Monthly	June	Dec
36	Electroless Nickel Plating Tank 15	6 Monthly	June	Dec

Name	Job Title	Abrasion Resistance - Taber (WI 3206)	Cross Sectional Micro Hardness - Surge (WI 3216)	Spot Test Sealing (WI 3206)	Coating Thickness Test - Eddy Current (WI 3217)	Coating Thickness Test - Strip and Weigh (WI 3206)	Electrical Breakdown Potential Test (WI 3206)	ENP Coating Tests (WI 3219)	Laboratory Analyses	ENP Chemical Analyses	Salt Spray Testing	Sulphuric-Hard Anodising	Electroless Nickel Plate	Chromic Acid Anodising	Acidstrome	Jigging	Specialised Jigging	Lacquering	Vapour/Dry Blasting	Receipt of Goods (IP 2012)	In-process Inspection/Works Orders (IP 2007/2011)	Final Inspection (IP 2011)	Fork Lift Operation	Calibration (IP 2006)	Packing and Despatch (IP 2012)	Chemical Additions (IP 2012)	General Office Administration	Order Review/Booking In (IP 2002)	Sales Enquiry/Quotations	Accounts Administration - Sales/Purchases	Purchasing - Critical (IP 2003)	Purchasing - General (IP 2003)	Production Planning & Control	Quality Awareness (IP 2003)	Health and Safety Awareness	Environmental Awareness	Quality/Integrated Systems Management	Internal Auditing	Sampling Plans (Mil-STD-1916)	Maintenance	Cleaning	First Aid	Environmental Incident Response
Andrews P	Production																																												
Ashcroft T	Production		1																																										
Bennett D	Maintenance																																												
Benton B	Production	1				1																																							
Bishop A	Production																																												
Breese K	Cleaning																																												
Donohue K	Production		1				1																																						
Dprea E	Production																																												
Harper M	Production																																												
Harrington Jr	Production		1				1					3																																	
Iacono G	Production		1		1	2		2					3	3	3	3	1	3		2	3	3	2			2																		
Jeavons B	Production																2			1	2	2		1																				
Kirk A	Production															1		3		1	3			2																				
McGowan B	Production		1			1					3			1	3	2	1	2	2	3	3	2		3	2																		
Moran D	Production		1				1	1	1		2	2	2	2	2	1	1		2	2	2	T		2	2		1																
Neri J	Production															2			1	1				1																				
Pearson S	Production		1			1								3	2	1			2	2	2			3	1																		
Ricketts G	Production		1			1								2	3	3	2		2	3	3	2		3	2		2																
Vaughan A	Laboratory	2	2	2	1	2	2	1	1	2										2			2	3																		
Anwar T	Office/Management																			2							2	2	1	2	1	1	1	1	1	1						
Bayliss D	Office/Management						1			2					2	2	2	2	2	2	2	2	2	3	3	3	2	3	2	2	1	1	1	1	1						
Bayliss P	Office/Management		2	2	2		2		2	2	1	3	3	3	3	3	3	3			3	3	3			2	3	2	3	3	3	1	1	1	1						
Chapman J	Office/Management																									3	3	3		2	2	2		1	1	1						
Connon C	Office/Management	2	1		2		1	1							2					2	2	2	3	2	2	2			3	2			1	1	1	1	1	1			
Davis S	Office/Management																			2						3	3	3	3	2	2		1	1	1			1			
Horton J	Office/Management																									3			3	2	3		1	1	1			1			
TRAINING/ EVALUATION METHOD Form Nos.		WI 3206 & 2015/8																								WI 3003 & 2015/8										WI 3601/11 & 2015/8					

HARD ANODISING - SKILLS MATRIX - October 2023

2015/3 Issue 11

APPENDIX C

OTHER ISSUES

Contents

APPENDIX 1: Shut-off Valve Operation

1 SCOPE

This procedure enables the correct operation of the site's emergency shut off valves to prevent the loss of unauthorized releases to drainage, a statutory requirement under the site's PPC/EPR part A1 permit.

Any discontinuity in testing procedure for any reason whatsoever should be formally notified directly to the Managing Director.

The site activities warrant a Part A1 Permit under the Pollution Prevention and Control (England and Wales) Regulations 2000 by virtue of section 2.3 (surface treating metals and plastic materials) of Schedule 1 of the regulations, which requires any activity involving surface treating of metals and plastic materials using an electrolyte or chemical process where the aggregated volume of the treatment vats is more than $30m^3$ to obtain a permit to operate. The aggregated volume of treatment tanks at Hard Anodising Limited is approximately $117m^2$.

Access around the factory premises has been included within the installation boundary to address any potential likelihood of spillages of materials or wastes during collection or delivery.

The installation not only has process tanks for chemical and electrolytic surface treatment activities but also directly associated activities which have a technical connection with the surface treatment activities and which may have an effect on emissions and pollution. These include:

- Storage and handling of input chemicals
- Water treatment
- Chemical preparation of the work to be treated
- Rinsing of the work being treated
- Drying of the treated work
- Post-treatment of the work (where necessary to complete the surface treatment)
- Fume extraction and fume abatement system
- Effluent treatment
- Handling of spent process fluids
- Handling of wastes

These activities are described in detail in Section 2.3 of the main IPPC document. Office areas are excluded from the installation. Hard Anodising Limited also operates a consent to discharge trade effluent to sewer, granted by Severn Trent Water Authorities Limited. The operation comprises of the following main processes:

- Anodising
- Nickel plating
- Surface passivation and sealing

As such these processes encompass the use, storage, handling and disposal of mineral acids including sulphuric, phosphoric and hydrochloric, and alkalis including sodium hydroxide and sodium carbonate and bicarbonate, in addition to aqueous hexavalent chromium, sodium and potassium salt solutions and nickel solutions.

The potential impacts on aquatic environments are considered such that site management operate a containment strategy to eliminate, or at least minimise any losses. All deliveries and movement of products are restricted to daytime hours only.

APPENDIX 1: Shut-off Valve Operation

2 PROCEDURE

2.1 The site's shut off valves are clearly defined on site maps maintained in the Environmental Manual and displayed on the Environmental Notice Board. They form a key component of the Site Protection Management Plan and Pollution Prevention and Control initiatives.

- On discovery and disclosure of a spillage of materials, employees and management will as soon as is safely possible initiate the 'Spillage and Containment' procedure. Formal training for this has been carried out and is routinely updated.
- If there is any potential for loss of chemical to drainage the relevant Spill Team member will initiate the operation of the shut off valves.
- Keys for the shut-off valve access covers are located in the Spill Kit tool boxes situated in Factory One and Factory Two.
- The valve direction is clearly marked with 'open' and 'closed' positions. Once activated a second team member will verify that the correct position has been achieved.
- The valve position will not be changed until the spillage has been completely dealt with to the satisfaction of the supervising manager.
- The team will complete the relevant kit audit and Incident log to confirm that all relevant actions were completed as per the formal procedure.

2.2 Maintenance of the valves will be completed on a 'pro-active' basis with a monthly inspection of operation.

2.3 Any maintenance/repair of a shut off valve will be completed as a matter of priority and this will be formally recorded in the site's Planned Maintenance Log as per the site's permit.

2.4 Site management will ensure at all times that shut off valves are readily accessible to the Spill Team.

2.5 If any chemical has entered the site's drainage, Spill Team members will formally contact the Environment Agency, providing as much relevant information as possible regarding the nature and amount of unauthorized chemical loss.

APPENDIX 2: Chemical Storage and Bund Inspection

INTRODUCTION

The major risks to pollution from hazardous materials used by Hard Anodising Surface Treatments Limited during normal and abnormal conditions are:

- Hazardous liquid spillage and entry into groundwater or surface water during delivery of chemicals, storage or handling / movement around the site
- Escape of hazardous waste materials to groundwater or surface water during storage or collection for off-site disposal
- Release of hazardous materials to sewer above trade effluent consent limits from failure of the effluent treatment plant.

STORAGE & INSPECTION

As a consequence of the processes employed at Hard Anodising Surface Treatments, raw and used chemicals are routinely stored on site. These chemicals are mainly held on the two main storage bunds situated in the despatch area of Factory One and on the driveway of Factory Two, or within the bunded areas of the factory buildings. Additional bunded storage facility has been created on the driveway of Factory One in order to facilitate temporary, short-term storage of bulk chemicals, while moving goods around within the goods-in/despatch area. When moving chemistry around the factory, at no point shall it be left in an area that is not adequately bunded.

This procedure has been issued to ensure that there is adequate storage facility for chemicals held on site and that bunds are routinely inspected and tested to ensure their integrity and capability in terms of the prevention of unauthorised releases. Personnel responsibilities for the inspection, testing and maintenance of pollution prevention infrastructure, including bunds, to an appropriate level to ensure compliance have already been designated under the SPMP, as have roles and responsibilities including reporting and ensuring adequate competence of staff is continued as per the SPMP. Hard Anodising operates a comprehensive maintenance management system, which is described in the main EPR application document. The management system preventative maintenance checks carried out in each area of the factory includes visual inspections of:

- All bunded areas, drainage channels to detect any signs of deterioration, leaks, spillage, or blockage. Any corrective action required is reported to and implemented by the Environmental Team.

- Equipment in all process areas, to identify equipment wear and tear which need to be addressed as part of the company's planned / predictive maintenance programme. Particular attention is paid to pipework, tanks, supports, ducting, motors, pumps and filters, and compressed air.

In addition to the skills and competencies required for each job, all staff receive formal environmental training and regular refresher training. This is recorded on the training records held for all employees. The content of the environmental training includes the following:

- Awareness of the regulatory implications of the EPR Permit for Hard Anodising Surface Treatments management and workforce and their work activities.

- Awareness of all potential environmental effects from operation under normal and abnormal circumstances (i.e. planned maintenance, process shut-down, start-up).

- Prevention of environmental accidents and action to be taken if accidents occur.

Maintenance personnel will ensure that all bunds are of 100% integrity.

The preventative maintenance checks, including all bunds, carried out in each area of the factory identifies three levels of response:

- Repair immediately
- Repair within 1 week
- Repair within 1 month

The following table of criteria defines how the different levels of response are applied for preventative maintenance issues associated with the potential for land contamination.

Criteria for Different Levels of Response for Preventative Maintenance Issues Associated with Potential Land Contamination Issues Table 1

Response Level	Criterion
Repair Immediately	Serious damage to hard standing, factory floor, bunds, tanks, pipework etc. likely to lead to immediate loss of primary, secondary or tertiary containment
Repair within 1 week	Minor damage to hard standing, factory floor, bunds, tanks, pipework etc. likely to lead to potential loss of primary, secondary or tertiary containment
Repair within 1 month	Minor damage to hard standing, factory floor, bunds, tanks, pipework etc. which could develop into more serious damage which could lead to potential loss of primary, secondary or tertiary containment

The maintenance management system is incorporated within and managed by an ISO 14001 Environmental Management System at Hard Anodising.

The definitive document for the inspection and testing of bunds is *Containment of Bulk Hazardous Liquids; Supporting Guidance for Secondary and Tertiary Containment* and this has been the basis of the site's maintenance programme.

The following schedules are applied:

Process	Contents	Drop Period
Plating Swills	Water	Once Per Day
Acid Swills	Water	Once Per Day
Cleaner Swills	Water	Once Per Day
Drag Outs	Water	Once Per Day
Hot Water Swills	Water	Once Per Day

Maintenance visual but no formal record.

APPENDIX E

SPILLAGE AND CONTAINMENTS PROCEDURES

Contents

EMERGENCY PREPAREDNESS PLAN

Emergency Contact Details

- Fire, Police & Ambulance - 999
- Management Representative (P Bayliss MD) - 07850 293030
- Environment Agency 0800 807060
- Health & Safety Exec (RIDDOR) 0345 3009923
- NHS Direct - 111
- Severn Trent Water Authority 0800 7834444
- Gas 0800 111999
- Electricity 0800 404090
- Alarm Company (Autoguard Alarms Ltd) - 01384 374863
- Halcyon Environmental (Env. Consultants) - 01902 743673
- Crownford (Health & Safety Consultants) - 01685 815200

Emergency Preparedness and Response

1. Spillage Procedure

a) Upon discovery of a spillage, evaluate the incident and determine status. (Note – PPE must be worn when attending an incident).
b) Inform member of spillage team (See notice board for spill team members).
c) Assess Safety & Environmental Aspects.
d) Isolate area and determine requirements. (Isolate as much of the area as possible).
e) Contain spill with all appropriate equipment.
f) Apply drain covers and drain/gulley stop-off plugs (if appropriate). Turn off storm water and main effluent shut-off valves if appropriate.
g) Inform the Management Representative (contact relevant authorities, if required).
h) Contact Maintenance Dept - Isolate any potentially dangerous equipment/systems.
i) Clean up spillage, use appropriate absorbents. Transfer used materials to suitable containers and ensure waste is correctly marked and located for disposal.
j) Complete Incident Report Form ED 03 (located outside Quality/Lab Office) and/or inform the Environmental Representative.
k) Replenish Spill kit as required.

Where a decision is made to contain the spillage by use of the emergency services, then, the fire brigade will be informed, the water authority and Environment Agency may also require disclosure.

Spill kits are located in Factories 1 & 2 – See notice boards for precise locations.

2. Accelerated Exposure to Noxious Substances

In the event of a spillage or accidental mixing of substances that could have a potential environmental/health risk:
a) Inform the spill team immediately and evacuate all staff from the area.
b) Notify the relevant bodies as required, such as the Environment Agency, fire brigade, ambulance etc.
c) Inform neighbouring properties as required.

Any spillage should be controlled as per the above Spill Procedure.

3. Accidental Emissions to Atmosphere

Hard Anodising monitor emission levels and equipment is maintained effectively. If the monitoring shows excessive emissions:

a) Notify the Environment Agency.
b) Investigate the cause, raise incident report.
c) Take action to prevent recurrence.

4. Accidental Release of Effluent to Watercourse/Discharges Outside Consent

a) Notify Severn Trent Water Authority.
b) If required, notify the Environment Agency.
c) Contain the spillage.
d) Investigate the cause, raise incident report.
e) Take action to prevent recurrence.

5. Health Monitoring (See Health and Safety Manual)

Certain chemicals can have detrimental health effects if persons are exposed for prolonged periods. Health monitoring, therefore, may be carried out if required through approved companies.

6. On Site Accident

a) Advise a First Aider.
b) Notify Management/Health and Safety representative with immediate effect.
c) If required contact the emergency services.
d) Investigate the cause of the accident and take actions to prevent recurrence.
e) Notify bodies as required and complete relevant records, eg. RIDDOR.

7. Fire

a) Activate the nearest Alarm.
b) Attempt to tackle the fire if save to do so.
c) Call the Emergency Services (i.e. 999) if necessary.
d) Assist with the evacuation.
e) Report to the stated Assembly Point. Wait for Roll Call/Stand Down Instructions. (See emergency evacuation below).

Fire alarms, extinguishers and exits are located throughout Factories 1 & 2

The assembly point is located at the front of the car park – Factory 1.

8. Hazardous Material Storage

All material should be stored in the designated storage areas, where correct storage facilities and bunding is in place.

9. Asbestos

a) Hard Anodising management maintain an Asbestos Register, which is reviewed and updated as required.

b) Periodic inspections are carried out of areas where there is asbestos to determine damage/contamination/potential risks.

c) Any removal or modification of any asbestos material within the Company will be completed by approved contractors and Waste Transfer Notes supplied. (See Asbestos Register – HE04/4611 & Asbestos Management Plan – HE09/6711).

10. First Aid

1st aid kits/eye wash kits are located in Factory1 (shops 1 & 2) and Factory 2 (main shop).
A list of first aiders is detailed on the notice boards.

APPENDIX F

Contents

F1 Calibration forecast

This document is maintained within the 14001 EMS.

CALIBRATION/TESTING FORECAST 2024

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Elco-meter	ELCOMETER FOILS (New)							X					
I N H O U S E	ELCOMETERS	X	X	X	X	X	X	X	X	X	X	X	X
	ENP MICROMETERS	X	X	X	X	X	X	X	X	X	X	X	X
	THERMOMETERS (Glass & Lab)	X	X	X	X	X	X	X	X	X	X	X	X
	VAT TEMP CONTROLERS	X	X	X	X	X	X	X	X	X	X	X	X
	TIMERS/ VAT PROG TMR								X Prog		X Prdtn		
	AMMETERS/ VOLTMETERS						X						
	Oven SAT Carbolite DS347	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
	TABER ABRASER			X						X			
	MICROSCOPE GRATICULE							X					
	STAMP CLARITY TEST		X			X			X			X	
	PERIODIC TESTING	X	X	X	X	X	X	X	X	X	X	X	X
Lambda	Vac/DTI Gauges			X									
Avery	BALANCES/ WEIGH SCALES						X						X
RS	FLUKE MULTIMETERS						X 117						
RS	REF DIGITAL THERMOMETER				X								
Mitutoyo	HARDNESS TESTER				X								
RM&C	SAT Probe/Indicator	X			X			X			X		
RM&C	ENP OVENS	X						X					
H A L C Y O N Env	S1 & S2 Water Samples			X			X			X			X
	L.E.V. TESTING (Fume Extraction)										X		
	AIR SAMPLING (COSHH/Above Tank)			X Ab.Tk						X Ar/Per	X ETP		
	NOISE SURVEY									X			
AWE	ETP pH PROBES				X				X				X
C&W Sp Eqpt	SALT SPRAY CABINET					X							
MOHS	W/P HEALTH SREENING											X	
EVO	VAPOUR BLASTER							X					

APPENDIX G

SITE PHOTOGRAPHS

PHOTOGRAPH 1

PHOTOGRAPH 2

PHOTOGRAPH 3

PHOTOGRAPH 4

PHOTOGRAPH 5

PHOTOGRAPH 6

PHOTOGRAPH 7

PHOTOGRAPH 8

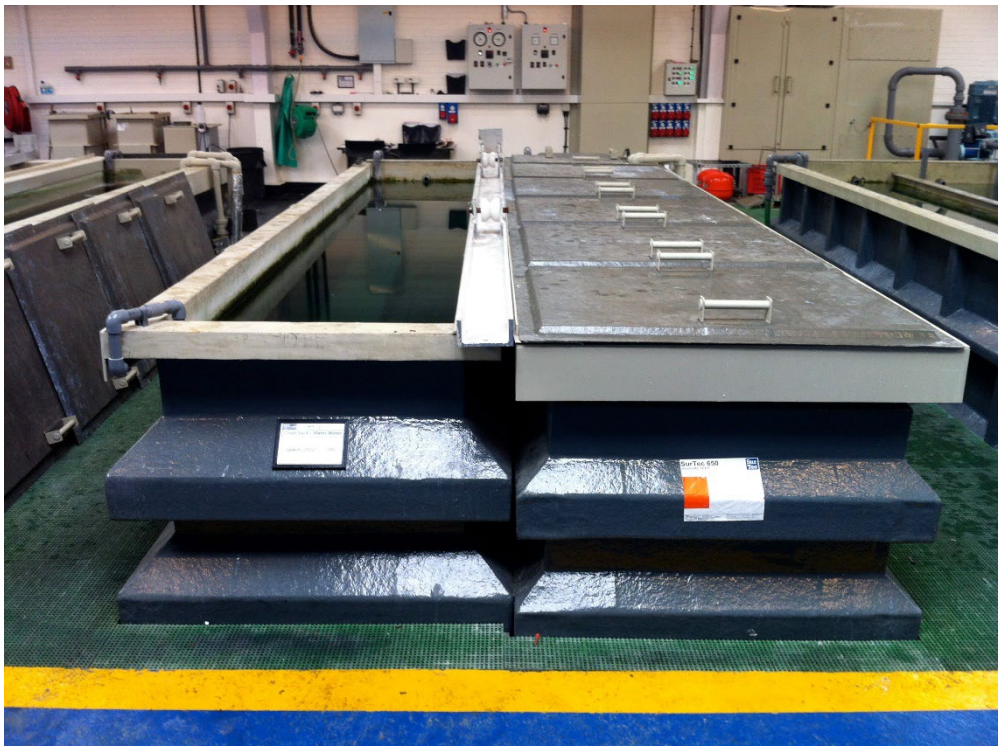
PHOTOGRAPH 9

PHOTOGRAPH 10

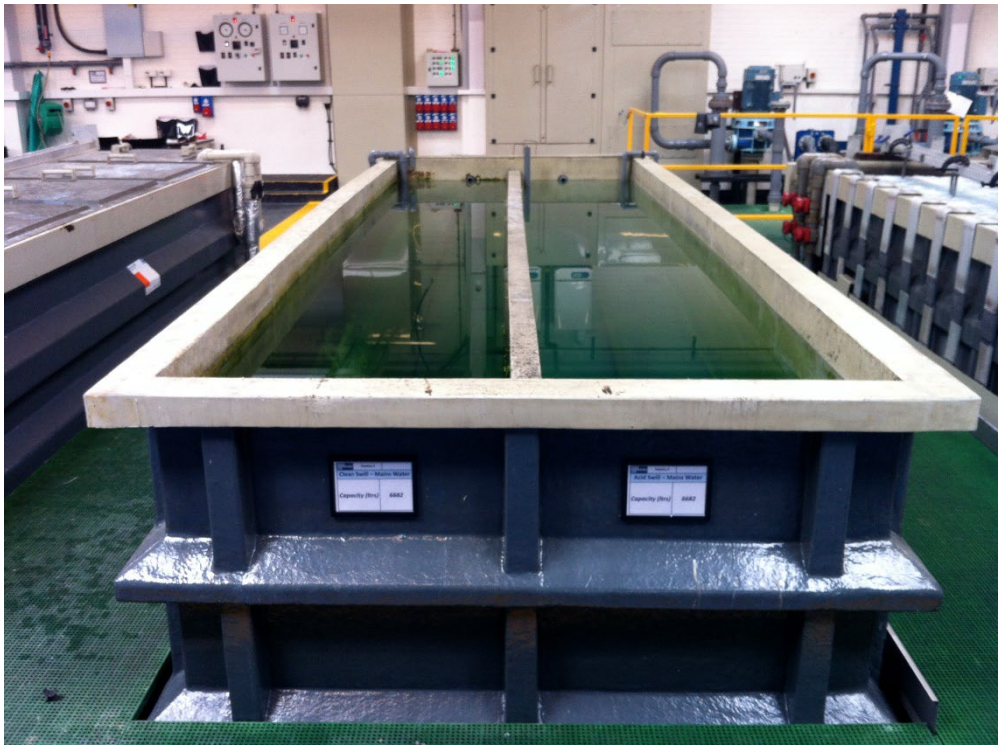
PHOTOGRAPH 11

PHOTOGRAPH 12

PHOTOGRAPH 13



PHOTOGRPH 14

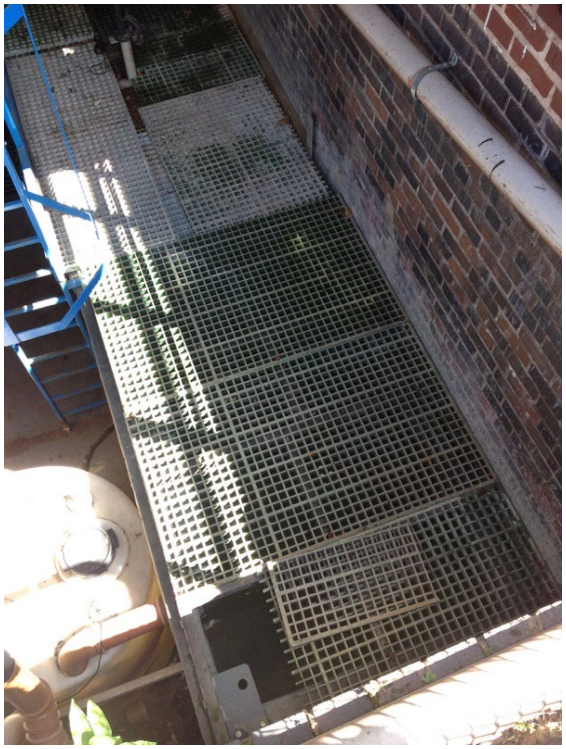


PHOTOGRAPH 15

PHOTOGRAPH 16

PHOTOGRAPH 17

PHOTOGRAPH 18



PHOTOGRAPH 19

PHOTOGRAPH 20

PHOTOGRAPH 21

PHOTOGRAPH 22

PHOTOGRAPH 23

PHOTOGRAPH 24

Hard Anodising Surface Treatments Ltd

COSHH Compliance Report 2025

HE 25 / 7361

COSHH Compliance Monitoring; -

Nitric Acid and Sulphuric Acid fume “above tank” testing

at

Hard Anodising Surface Treatments Ltd

Firs Estate
Stourport Road
Kidderminster
DY11 7QN

Study Period; - 19th February 2025

ISSUE STATUS	HE 25 / 7361	
ISSUE 01	CHECKED: T GROWCOTT	APPROVED: T GROWCOTT
ISSUED	25.02.2025	

SECTION.	CONTENTS
1	INTRODUCTION
2	LEGISLATION BACKGROUND
3	MONITORING PROCEDURES
4	PERSONAL MONITORING
5	RESULTS
6	SUMMARY AND RECOMMENDATIONS
APPENDIX 1	REFERENCE DOCUMENTS
APPENDIX 2	ACID MIST TESTING METHOD
APPENDIX 3	PHOTOGRAPHS
APPENDIX 4	STATEMENT OF COMPETENCY

HARD ANODISING SURFACE TREATMENTS LIMITED
FIRS ESTATE
STOURPORT ROAD
KIDDERMINSTER
DY11 7QN

25th February 2025

FAO: Mr C Connon – Quality Co-ordinator

REPORT REF; - HE 25 / 7361

COSHH COMPLIANCE MONITORING; -
NITRIC ACID AND SULPHURIC ACID FUME "ABOVE TANK" TESTING

1 INTRODUCTION

A survey was undertaken to determine general workplace atmospheric concentrations and specific operator exposures to nitric acid and sulphuric acid fume sourced from metal treatment activities undertaken at the Hard Anodising Surface Treatments Ltd. premises.

The monitoring and assessment, as required by the Control of Substances Hazardous to Health (CoSHH) Regulations 2005 (as per Regulation 10 schedule 4), was undertaken by Halcyon Environmental personnel on 19th February 2025.

"Above tank" monitoring of sulphuric acid mist was undertaken in compliance with statutory HSE provisions, in addition nitric acid fume was also monitored in the newly installed tank.

This study was undertaken during normal production hours, and with typical production throughput of materials. The assistance of site personnel was greatly acknowledged in the preparation of this report.

The following report describes the survey, its results and relevance to the site, with regard to workplace legislation.

Our report has been set out analyte by analyte to enable site management to determine exposures of personnel, and the risks presented by exposure to compounds hazardous to health.

It must be emphasised that all data obtained related only to the conditions and circumstances pertaining to the monitoring period.

2 LEGISLATION BACKGROUND

The CoSHH Regulations (2005) require an employer to carry out assessments in areas where an operator may exceed defined limits of exposure to workplace chemicals and compounds.

Employee's exposure to hazardous substances is well defined in document EH40 - Occupational Exposure Levels, provided by the HSE. In this document the current safe working limits for short and long term exposures to an extensive list of substances is defined in terms of a wide range of exposure scenarios.

Comparison of monitoring data with EH 40 data enables employers and employees to determine exposure levels and their significance with regard to safe working guidelines.

3 MONITORING PROCEDURES

The procedures used in this were as follows; -

(i) Sulphuric Acid – "Above Tank" Sampling

Sulphuric acid used to have an Occupational Exposure Limit of 1 mg/m^3, 8-hour TWA.

This was recently revised when the HSE issued a chemical hazard alert notice (CHAN). As such current HSE guidance for employers is that the exposure should not now exceed 0.3 mg/m , 8-hour TWA.

Monitoring was undertaken in strict accordance with the current HSE MDHS methodology.

(ii) Nitric Acid

Nitric Acid was monitored in accordance with OSHA ID –165SG. (see Appendix 2).

(iii) QA and QC procedures

All procedures were based on full compliance with standard procedures.

4 PERSONAL AND STATIC MONITORING

9 off static “above tank”, were determined as follows; -

Factory	Tank Reference	Sampling Period	Sampler
F1	Vat 1 8 - 10 % sulphuric acid	60 minutes	RFG
F1	Vat 2 14 - 16 % sulphuric acid	60 minutes	RFG
F1	Vat 3 Sulphuric Acid	60 minutes	RFG
F1	Vat 5 Sulphuric Acid	60 minutes	RFG
F1	Vat 6 Sulphuric Acid	60 minutes	RFG
F2	Vat 9 Sulphuric Acid	60 minutes	RFG

All of the sampling heads were located 300 +/- 3 mm. above tank centre.

Continuous samples were obtained from fixed, static positions with the tanks operating under normal circumstances.

Analysis was completed within 24 hours of completion of the sampling study as per MDHS protocol.

There was no evidence of “chrome misting” above the plating tanks during plating, nor of “fugitive” standing or persistent mist loses into the immediate area of the plating line.

5 MONITORING RESULTS AND ABBREVIATION INDEX

5.1 Results

The relevant data on current workplace exposure levels (WEL) is detailed in document HSE document EH 40.

Analyte	Exposure Classification	STEL (mg/m^3)	LTEL (mg/m^3)
Sulphuric Acid	WEL	-	0.05
Nitric Acid	WEL	2.6	-

The following sulphuric acid results were determined in this study.

Location	Test point	Determined LTEL result (mg/m^3)
F1	Vat 1 8 - 10 % sulphuric acid	< 0.01
F1	Vat 2 14 - 16 % sulphuric acid	< 0.01
F1	Vat 3 Sulphuric Acid	< 0.01
F1	Vat 5 Sulphuric Acid	< 0.01
F1	Vat 6 Sulphuric Acid	< 0.01
F2	Vat 9 Sulphuric Acid	< 0.01
F2	Vat 12 Sulphuric Acid	< 0.01

The following nitric acid result was determined; -

Location	Test point	Determined STEL result (mg/m^3)
F1	Nitric Acid	Withdrawn from service

5.2 Abbreviation Index

S.T.E.L. = Short-term exposure limit 15 - minute ref. period.

L.T.E.L. = Long-term exposure limit 8 - hour ref. period.

*** denotes a limit excursion result.**

6 SUMMARY AND RECOMMENDATIONS

The “above tank” hexavalent chromium and sulphuric acid mists results were well below both the current HSE action and trigger concentrations. In operating the plant I would recommend that; -

(i) the “above tank” study is scheduled for retest in 3 months time.

(iii) formal disclosure of the results determined in this study is directed to the work force via positive reporting including compliance with statutory provision.

This report should be maintained for a period of not less than 5 years as per current HSE provision.

Tim Growcott B.Sc. (Hons) MRSC C Sci C Chem MIMF M Am Chem Soc
Senior Partner

HARD 7361 ACIDS ABOVE TANK 2025 REP

APPENDIX 1 - REFERENCE DOCUMENTS

REF	Document
1	Control Of Substances Hazardous To Health Regulations. 2005
2	EH 40 Workplace Exposure Levels
3	CoSHH Employers Brief Indg 136

APPENDIX 2

ACID MIST TEST METHOD

ACID MIST IN WORKPLACE ATMOSPHERES

Method no.:	ID-165SG
Matrix:	Air
OSHA Standard:	3.0 ppm Hydrogen Bromide, HBr 2.0 ppm Nitric Acid, HNO_3 1.0 mg/m^3 Phosphoric Acid, H_3PO_4 1.0 mg/m^3 Sulphuric Acid, H_2SO_4
Collection Procedure:	A known volume of air is drawn through a silica gel tube. H_2SO_4, H_3PO_4 and other particulates are collected on the glass fibre plug while HBr and HNO_3 are collected on the silica gel sorbant.
Recommended Air Volume:	96 litres
Recommended Sampling Rate:	0.2 litres per minute
Analytical Procedure:	The glass fibre plug and the silica gel tubes are desorbed with standard eluent and analyzed by Ion Chromatography (IC).
Detection Limit:	See Section 2.3.
Precision and Accuracy:	(CV_A) = 0.035 for HBr 0.037 for HNO_3 0.066 for H_3PO_4 0.079 for H_2SO_4

Methods Development Team
Industrial Hygiene Chemistry Division
OSHA Salt Lake Technical Centre
Sandy UT 84070-6406

1. Introduction

This method describes the collection and analysis of airborne acids using Ion Chromatography. The method measures the total concentration of four airborne anions. The corresponding acids may be collected on a single sampler and determined simultaneously. Acids which can be collected and analyzed this way are HBr, H_3PO_4, HNO_3, and H_2SO_4.

1.1. History)

Prior to the use of this method, HBr was collected in 0.01 N NaOH, HNO_3 was collected in deionised (DI) water, H_2SO_4 and H_3PO_4 were collected on 0.8 micron MCEF filters, and all were analyzed by IC.

1.2. Uses

Nitric acid is a colourless liquid (depending upon purity and freshness). The acid produces fumes in moist air and has a strong choking odour. Long exposure to light causes nitric acid to become discoloured (brownish). Commercial grades are approximately 70 - 71% pure.

Physical Constants:	HBr	HNO_3	H_3PO_4	H_2SO_4
Specific Gravity:	2.71	1.50	1.003	1.84
Melting Point:	-86.9	-42.0	42.35	10.4°C
Boiling Point:	-66.8	83.0	213.	315 - 338°C
Molecular Weight:	80.92	63.02	98.00	98.08

2. Working Range and Detection Limit

2.1. The working range for a 100 litre air sample is 0.08 to 3.0 ppm for Br^-, 0.10 to 3.9 ppm for NO_3^-, and 0.25 to 10.0 mg/m^3 for PO_4^{-3}, and $SO_4^=$. This corresponds to 2.5 to 50. ug of bromide, nitrate, phosphate, and sulphate. The upper range can be extended by sample dilution.

2.2. The sensitivity at 30 umho full scale is 5 ug of analyte (Br^-, NO_3^-, PO_4^{-3}, and $SO_4^=$) per sample per mm chart deflection (based on a 10 ml sample volume).

2.3. The qualitative detection limits for PO_4^{-3}, Br^-, NO_3^-, and $SO_4^=$ were calculated using the Student's T-Test. The detection limits are as follows at a confidence level of 95%:

PO_4^{-3} = 0.25 ug

Br^- = 0.20 ug

NO_3^- = 0.125 ug

$SO_4^=$ = 0.25 ug

These detection limits were calculated based on a sample volume of 10 ml and an injection volume of 100 uL. The detection limits for each analyte were calculated in the presence of the other three analytes. The detection limit may be improved by using a larger injection volume (for auto sampler only), or by using a smaller volume than 10 ml to desorb the sample.

3. Precision and Accuracy

3.1. The average coefficient of variation (CV_A) is: 0.035 for HBr, 0.037 for HNO_3, 0.079 for H_2SO_4, and 0.066 for H_3PO_4.

4. Interferences

4.1. Large quantities of any one analyte will cause some masking of some of the other peaks.

5. Advantages and Disadvantages

5.1. The method can be automated and is quick and accurate compared to previous methods which involved titrations with nebulous endpoints.

5.2. The sampling procedure employed uses silica gel tubes as opposed to impingers which are used in other sampling methods for acid mist. Such a sampling procedure eliminates the inherent problems of using impingers.

5.3. Unlike previous methods, nitrate and bromide particulates are not an interference in this method since particulates can be captured on the glass fibre filter in the tubes and analyzed separately if necessary.

6. Sampling Procedure

6.1. Apparatus - Silica gel sorbant tubes, Supelco, Inc. ORBO-53 (or equivalent silica gel tubes which have been demonstrated to show low levels of the anions of interest), personal sampling pump with calibrated flow in line with a silica gel tube to an accuracy of ±10% at the 95% confidence limit at the recommended flow rate.

6.2. The silica gel tube is attached to a calibrated personal sampling pump and the sampling tube is placed in the sampling area or worker's breathing zone. At least 10 litres of air are drawn through the sampling tube.

6.3. After sampling, the silica gel tube is removed from the tubing, sealed and identified with OSHA Form 21, and shipped to the Laboratory for analysis.

6.4. With each batch of up to 20 samples, a blank tube which has had no air drawn through it, is submitted for analysis. The blank tube should be from the same lot of tubes used for sampling.

6.5. It is very important that when particulate acids or salts of an anion are known to be present in the workplace atmosphere they should be listed as interferences.

7. Analytical Procedure

7.1. Apparatus - Ion exchange chromatograph, equipped with electrical conductivity detector and recorder, or integrator (an auto sampler helps automate the analysis), 10 ml pipette, 1 ml plastic syringe with male luer fitting, Anion Separator Column 3 × 250 mm with Concentrator Column, Anion Suppressor Column 10 × 100 mm, and appropriate voltietric glassware for dilutions and standard preparation.

7.2. Reagents - All reagents used should be ACS analyzed reagent grade or better.

7.2.1. Deionized water with a specific conductance of 10 umho/cm or less for preparation of eluents and other solutions which will be used in the Ion Chromatograph.

7.2.2. Sodium Carbonate, Na_2CO_3.

7.2.3. Sodium Bicarbonate, $NaHCO_3$.

7.2.4. Bromide Stock Standard (1000 ug/ml Br^-). Dissolve 1.489 g KBr and dilute to 1 liter with deionized water. Bromide working standards are made by diluting the stock solution with eluent.

7.2.5. Nitrate Stock Standard (1000 ug/ml NO_3^-). Dissolve 1.3708 g $NaNO_3$ and dilute to 1 litre with deionised water. Nitrate working standards are made by diluting the stock solution with eluent.

7.2.6. Phosphate Stock Standard (1000 ug/ml PO_4^{-3}). Dissolve 1.495 g Na_2HPO_4 and dilute to 1 litre with deionised water. Phosphate working standards are made by diluting the stock solution with eluent.

7.2.7. Sulphate Stock Standard (1000 ug/ml $SO_4^=$). Dissolve 1.479 g of Na_2SO_4 into 1 litre of deionised water. Sulphate working standards are made by diluting the stock solution with eluent.

7.2.8. Standard Eluent (0.003 M $CO_3^=$/0.0024 M HCO_3^-). Dissolve 5 g Na_2CO_3 and 5 g $NaHCO_3$ in 20 litre carbuoy with deionised water.

7.2.9. Regenerant Solution (1 N H_2SO_4). Dilute 111 ml of concentrated H_2SO_4 to 4 litres in deionised water.

7.3. Safety Precautions

7.3.1. When using the Ion Chromatograph, the column door should be kept closed during the analysis in case the columns burst. To avoid this danger the pressure should be checked at the beginning of the analysis and periodically during the analysis. The pressure should never exceed 500 psi.

7.3.2. Care should be used when handling reagents, especially the regenerant solution (1 N H_2SO_4) to avoid chemical burns.

7.3.3. Care should be exercised when using laboratory glassware. Chipped pipettes, volumetric flasks, beakers, or any glassware with sharp edges exposed should not be used to avoid the possibility of cuts, abrasions, and lost samples.

7.3.4. Pipetting should never be done by mouth - a bulb should always be used.

7.4. Standard Preparation

7.4.1. Working standards are prepared in the analytical range of 0.2 ug/ml to 50 ug/ml from dilutions of the 1000 ug/ml stock solutions. These standard solutions should be prepared fresh weekly.

7.4.2. If an auto sampler capable of variable volume injections is used, a combination 50 ug/ml PO_4^{-3}, 10 ug/ml Br^-, 25 ug/ml NO_3^-, and 50 ug/ml $SO_4^=$ standard is used. This intermediate working standard should be prepared fresh monthly.

7.5. Sample Preparation

7.5.1. The sample tube used with this analysis can be separated into 3 parts. The first part is the glass fibre filter plug which will collect any particulate. The second part is a 150 mg silica gel section (section A) which collects the acid mists. The third part is a 75 mg silica gel section (section B) which is the backup section and will collect any acid mists which are not collected by section A. The second and third parts are separated by a foam plug which is to be discarded.

7.5.2. Score the sampler with a file in front of the primary sorbant section (section A), then break the sampler at the score line. Transfer the glass fiber filter plug and section A to a clean 20 ml vial. If the analysis is to be done only for HNO_3 and/or HBr, the glass fiber filter plug can be discarded. If sulphuric and/or phosphoric acids are requested, the glass fibre filter plug must be analyzed separately. The glass fibre filter plug should be analyzed separately if sulphate and/or phosphate is requested and nitric and/or hydrobromic acids are also requested.

7.5.3. Place silica gel section B in a separate clean 20 ml vial. Discard the urethane plug.

7.5.4. If the air volume is greater than or equal to 20 litres pipette about 5 ml of eluent (0.003 M $CO_3^{=}$/0.0024 M HCO_3^{-}) into each sample vial and cap tightly. If the air volume is less than 20 litres, a smaller volume of eluent is used.

7.5.5. Place the vial in a large beaker with DI water and boil for 10 minutes. Let cool and dilute to 10.0 ml with eluent in a volumetric flask (if the air volume is less than 20 litres, dilute to 5 ml in a volumetric flask). When particulate acids are listed as interferences for HNO_3 and/or HBr, the glass fibre plug should be desorbed separately with about 2 ml of eluent which is then diluted to 10 ml with standard eluent. Sample solutions which are not clear should he filtered before analysis.

7.5.6. If using an auto sampler, transfer some of the sample into an appropriate sampling vial. The vial should be at least half full. Label each vial with the appropriate laboratory identification number.

7.5.7. For hand injection, use 1 ml of the eluent to flush the 0.1 ml injection loop thoroughly. When using automatic injection try to use about a 100 uL injection volume. The autosampler is less accurate below 100 uL.

7.6. Analysis (Ref. 9.4.)

7.6.1. For general instrument set up refer to Section 7 of the Ion Chromatography Standard Operating Procedure.

7.6.2. The normal instrument parameters are:

Sensitivity: 30 umho full scale

Eluent: 0.003 M Na_2CO_3 and 0.0024 M $NaHCO_3$

Flow Rate: 138 ml/hr approximately 30% on vernier

Concentrator Column: 3 mm I.D. × 50 mm

Anion Separator Column: 3 mm I.D. × 250 mm

Suppressor Column: 10 mm I.D. × 100 mm

Run Time: Approximately 30 minutes, depending upon analytical conditions.

7.6.3. With the instrument set up and stabilized, place the auto sampling vials into the sampling tray using tray positions one through five for standards.

7.6.4. Enter the proper parameters into the auto sampler (See Section 4 of the Ion Chromatography Standard Operating Procedure).

7.6.5. Start the auto sampler and observe the first few chromatograms to ensure proper operation. Periodically check the zero offset between samples to correct any baseline drift and to ensure proper sensitivity and retention time of the analytes.

7.6.6. Use the timer to stop the run if the auto sampler is to be left unattended.

7.6.7. For hand injection, a 1 ml aliquot is taken up in a syringe from the 20 ml vial and injected into the injection port with the toggle switch in the load position. After the sample is loaded, switch the toggle to the inject position and start the integrator or push the PIP button if a strip chart recorder is being used.

7.6.8. For both hand and auto sample injections, record the sample number onto the chromatogram. A record of the sample identity and instrument conditions should be kept.

7.6.9. As the analysis proceeds, check the retention times of standards vs. samples to ensure uniformity. A typical chromatograph of a mixed standard of Br^-, NO_3^-, PO_4^{-3}, and $SO_4^=$, is shown in Figure 1.

7.6.10. If interfering substances are present, establish positive identity of the peaks by spiking known amounts of standard solution or try to obtain better separation by changing the eluent concentration or by reducing the flow rate.

7.7. Calculations

7.7.1. Peak areas or heights of the standards are used to construct a standard curve using the OSHA Auto Colorimetric Program. The samples results are obtained from a plot of peak area vs. concentration.

The blank corrected sample values are then calculated using the Auto Colorimetric Program.

7.7.2. When using the OSHA Auto Colorimetric Program, sample numbers and volumes are entered into the calculator in the following manner:

Sample Number, Peak Area or Height, L Air Volume, ml Solution Volume, ml Aliquot Volume.

7.7.3. Air Concentration values are calculated by the following equation:

$$mg/m^3 = \frac{(\mu g \text{ calculated})(\text{ml sample vol})(GF^*)(\text{dilution factor})}{(\text{liters of air})(\text{ml aliquot})}$$

$$GF^* = \text{Gravimetric Factor} = \begin{matrix} 1.013 \text{ for HBr} \\ 1.016 \text{ for } HNO_3 \\ 1.021 \text{ for } H_2SO_4 \\ 1.032 \text{ for } H_3PO_4 \end{matrix}$$

7.7.4. HNO_3 and HBr are reported in ppm rather than in mg/m^3. To convert the mg/m^3 values to ppm, the mg/m^3 value must be multiplied by the appropriate conversion factor.

Acid	Conversion Factor
HBr	0.302

HNO_3	0.388

8. Reporting Results for Compounds Determined by Ion Chromatography

8.1. Results are reported on the OSHA Form 91 in milligram per cubic meter for H_2SO_4 and H_3PO_4 and in ppm for HBr and HNO_3, using two significant figures.

8.2. The estimated detection limit calculated by the Auto Colorimetric Program is reported on the OSHA Form 91 when no analyte is detected.

8.3. The presence of significant unidentifiable peaks is noted on the OSHA Form 91.

8.4. All data processor printouts and chart recorded chromatograms are filed in a central file according to laboratory sample identification.

8.5. Calculations are checked by a fellow chemist before the completed OSHA Form 91's are given to the supervisor.

9. References

9.1. Encyclopedia of Chemical Technology, Third Edition, 1981.

9.2. CRC Handbook of Chemistry & Physics, 62nd Edition, 1981-1982.

9.3. Merck Index, Tenth Edition, 1983.

9.4. OSHA Ion Chromatography Standard Operating Procedure, Prepared by the Ion Chromatography Committee, Occupational Safety & Health Administration Analytical Laboratory, Inorganic Division.

9.5. NIOSH Manual of Analytical Methods, Second Edition, Volume 7, Method Number P&CAM 339 (revised), Issued on 2/15/84.

9.6. Nitric Acid in Workplace Atmospheres, Method No. ID-127, OSHA Laboratory, Salt Lake City, UT.

9.7. Phosphoric Acid in Workplace Atmospheres, Method No. ID-111, OSHA Laboratory, Salt Lake City, UT.

9.8. Sulphuric Acid in Workplace Atmospheres, Method No. ID-113, OSHA Laboratory, Salt Lake City, UT.

9.9. Monitoring for Airborne Inorganic Acids, M.E. Cassinelli and D.G; Taylor, National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, OH, 45226.

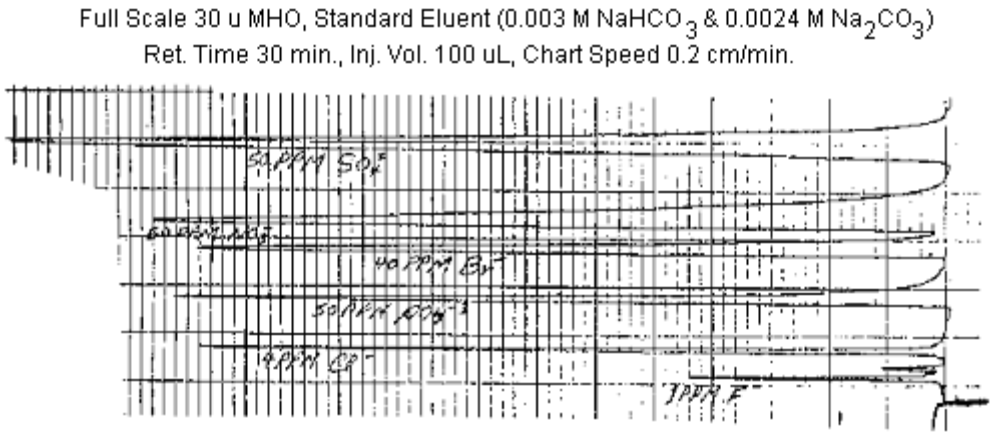


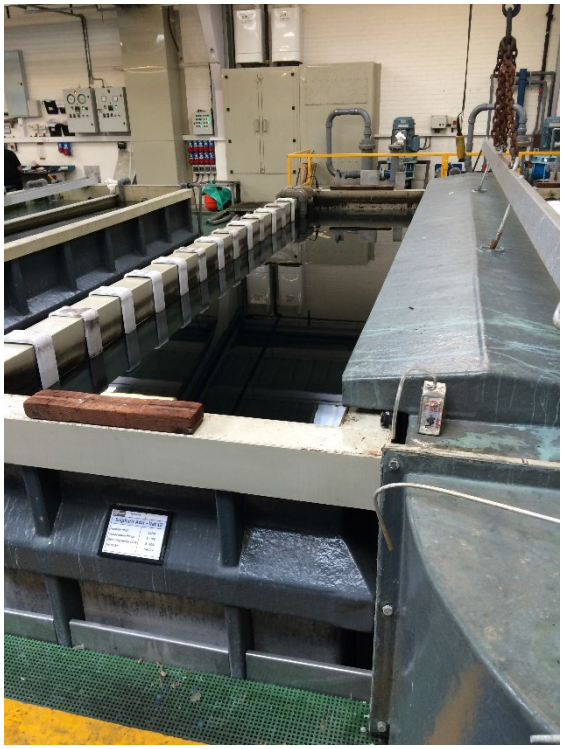
Figure 1

APPENDIX 3

PHOTOGRAPHS

PHOTOGRAPH 1: A12 / A2 Tank Extraction Systems

PHOTOGRAPH 2: Factory 2 Vat 9



PHOTOGRAPH 3: Factory 2 Vat 12

APPENDIX 4

STATEMENT OF COMPETENCY

Halcyon Environmental
27 Brunel Grove
The Woodlands
Perton
Wolverhampton
WV6 7YD

Mobile: 07779 008725

E-Mail: tim@halcyon-environmental.co.uk

Qualifications:
B Sc (Hons) Applied Chemistry
Member of the Royal Society of Chemistry MRSC
Chartered Chemist C Chem
Chartered Scientist C Sci
Member of the Institute of Metal Finishing (MIMF)

Current Position

Halcyon Environmental: Senior Partner

Responsible for the operation of a specialist environmental consultancy including sales and marketing, presentations, technical procedures, litigation protocol, analytical strategies and Environmental Management Systems Protocols.

Halcyon Environmental is a consultancy specifically committed to advise and support Industrial and Private Sector clients in achieving and effectively maintaining compliance with existing and new environmental legislation.

Courses Attended and Achievement

1997	Introduction to Air Sampling; SKC Ltd
1994	GEC A Practical Approach to Health and Safety Management
1994	MOHS – Health Surveillance

Recent Awards, Presentations And Publications

2018	The History of Bayliss, Jones and Bayliss – Company History
2016	The History of Vaughtons – 200 years of Gold and Silversmithing for W H Darby

Career Resume

Tim Growcott is the Senior Partner in Halcyon Environmental, a UK based consultancy, which specialises in Environmental Consulting Services. The consultancy works with around 150 company customers, from engineering to chemical specialists, foam and plastic users, MOD site's and specialist operators.

Trained formally as an Industrial Chemist, he has worked with companies including Mander Brothers in paints, BL Heavy Vehicles Division at Guy Motors in heavy vehicle manufacturing and Wilkins & Mitchell in domestic appliance manufacturing.

He worked with the Inmont Corporation and BASF in automotive and printing industry coatings development; this encompassed undertaking the short and long term formulation, testing and development of an extensive range of OEM primers, primer surfacers, underbody coatings and repair systems for British Leyland, Ford Dagenham, Peugeot, Jaguar Browns Lane, Rolls Royce (Crewe and London) and Vauxhall (Luton and Ellesmere Port).

All of these locations used primary formulations in the corrosion prevention development programs operated at all sites. These programs were supported by specific method developments for product optimisation when in use.

As an Analytical Chemist this encompassed GC/FID/ECD, IR/Vis/UV spectroscopy, HPLC and SIE systems development. With further training in Munster this was extended to GC-MS, double de-gated NMR and Raman spectroscopy.

He then moved to SGS in specialist environmental roles, undertaking diverse environmental issues including sales, marketing, site investigation work, litigation and liability, the development of environmental systems including EN ISO 14001.

Within SGS, as Business Manager, this encompassed significant input to the Hillsborough Barrier Enquiry, London Metals Exchange Analyses, Perfume and Fragrance analyses for the determination of fraudulent products, the development of organic chemistry within the SGS matrix and extended Product Developments.

Halcyon has undertaken specific and broad spectrum environmental issues with regard to environmental compliance, forward business environmental planning, and cradle to grave strategies that include environmental significance in product design and manufacturing, product finite life analysis, design for disassembly and renewable and recyclable resources.

Hard Anodising Surface Treatments Ltd

Surface Tension Log 2025

CHROMIUM TANK SURFACE TENSION TEST LOG

INTRODUCTION

As per HSE Guidance regarding Hexavalent Chromium and the Prevention and Control of Chromic Acid Mists the following procedure has been introduced to maintain compliance.

Surface Tension measurements must be recorded in a log.

If a measurement of the surface tension of the solution is above the 40 dynes per centimetre limit when measured using a stalagmometer, above 33 dynes per centimetre when measured using a tensiometer, or above an alternate surface tension limit established during the performance test, the time interval shall revert back to the original monitoring schedule. A subsequent decrease in frequency would then be reviewed.

Date of Test	Instrument	Compliance Standard	Test Result (dynes / cm)	Pass / Fail
17.02.2025	2.5 ml	35 max	31	Pass
19.04.2025	2.5 ml	35 max	27	Pass
24.04.2025	2.5 ml	35 max	25	Pass
28.04.2025	2.5 ml	35 max	23	Pass
29.05.2025	2.5 ml	35 max	21	Pass
30.04.2025	2.5 ml	35 max	24	Pass
02.05.2025	2.5 ml	35 max	36	Pass
	2.5 ml	35 max		
	2.5 ml	35 max		
	2.5 ml	35 max		
	2.5 ml	35 max		
	2.5 ml	35 max		
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	2.5 ml	35 max		
	2.5 ml	35 max		
	2.5 ml	35 max		

Date of Issue:	05/2025			:
Issue:	01			
Issued By:	TG			

HARD 7477 CHROMIUM TANK SURFACE TENSION TEST LOG 2025 REP

Hard Anodising Surface Treatments Ltd

List of Testing & Sampling Activities

ITEM	ACTIVITY	ACTIONS	TEST METHOD	DEVIATIONS	STATUS
1	Stack Emission testing of permitted emissions	As per EA-PPC A1 permit provisions	Reference Methods	None	Ongoing
2	Annual reporting of Pollution Index (PI) values to air, land and water and waste returns	As per Environment Agency template	Reference Methods	None	Ongoing
3	Annual CoSHH personal exposure monitoring	As per HSE, ACOP and approved methods	Reference Methods	None	Ongoing
4	Annual “Above Tank” monitoring for specified metals, mineral acid and alkalis	As per HSE, ACOP and approved methods	Reference Methods	None	Ongoing
5	Quarterly testing of 2 x specified water discharge points (third party consultancy)	As per EA-PPC A1 permit provisions	Reference Methods	None	Ongoing
6	Severn Trent testing from specified water discharge points	As per Consent to Discharge Trade Effluent Provisions	Reference Methods	None	Ongoing
7	Annual inspection and testing of bunds containing chromium containing chemicals	As per In-house procedure	Reference Methods	None	Ongoing
8	Verification of Process Treatment Capacity	As per EA-PPC D1/D2 provisions	Reference Methods	None	Ongoing
9	Minimisation of water, waste and energy	As per EA-PPC minimisation provisions	Reference Methods	None	Ongoing
10	Optimisation of processes WRT temperature, concentration, time	In-house procedures	Reference Methods	None	Ongoing
11	Limitation of usage of chlorinated hydrocarbons (Trichloroethylene)	< 1 t/annum	Reference Methods	None	Ongoing
12	Schedule review of energy, water and waste minimisation	As per EA-PPC A1 permit provisions	Reference Methods	None	Ongoing
13	Traffic Management Plan	As per EA-PPC A1 permit provisions	Reference Methods	None	Ongoing
14	Training of personnel in Spillage and Containment procedure	As per EA-PPC A1 permit provisions	Reference Methods	None	Ongoing
15	Installation and operation of site isolation valves	As per EA-PPC A1 permit provisions	Reference Methods	None	Ongoing
16	Installation and operation of 2 off certified flow meters	As per EA-PPC A1 permit provisions	Reference Methods	None	Ongoing
17	Monthly reporting of environmetrics	As per EA-PPC A1 permit provisions	Reference Methods	None	Ongoing
18	Maintenance and operation of EN ISO 14001 and 9000 Management system	As per EA-PPC A1 permit provisions	Reference Methods	None	Ongoing
19	In-house laboratory testing and working solutions	As per EA-PPC A1 permit provisions	Reference Methods	None	Ongoing
20	In-house maintenance capability	As per EA-PPC A1 permit provisions	Reference Methods	None	Ongoing

ITEM	ACTIVITY	ACTIONS	TEST METHOD	DEVIATIONS	STATUS
21	Annual site visit and OPRA documentation assessment	As per EA-PPC A1 permit provisions	Reference Methods	None	Ongoing
22	Revision of site drawings, tanks, capacities etc	In-house procedure	Reference Methods	None	Ongoing
23	Use of third-party consultancy	As appropriate	Reference Methods	None	Ongoing
24	Usage of approved STA and HSE methodologies in all reporting formats	As appropriate	Reference Methods	None	Ongoing
25	Calculation of D2 stack height	Deferred to date	Reference Methods	None	Ongoing
26	Stack Emission / Odour Modelling	Deferred to date	Reference Methods	None	Ongoing
27	Background Pollutants calculations	Deferred to date	Reference Methods	None	Ongoing
28	Releases to Permitted Water and Impact Plan	Completed and submitted to EA	Reference Methods	None	Ongoing
29	Soil sampling and reporting	Completed and reported where applicable	Reference Methods	None	Ongoing
30	Drain Marking and Drain Plans	Completed	Reference Methods	None	Ongoing
31	Dedicated Waste Containment Area	Assigned and dedicated	Reference Methods	None	Ongoing
32	Site Permit Awareness Training for all levels of personnel	Completed	Reference Methods	None	Ongoing
33	Evaluation of alternative chromium Cr^3 and Cr free technologies	Continuously ongoing	Reference Methods	None	Ongoing
34	Evaluation IP 1-6 Improvement Programmes	Continuously ongoing	Reference Methods	None	Ongoing
35	Visual and Olfactory emissions evaluation	Continuously ongoing	Reference Methods	None	Ongoing
36	Address of CTAC procedures to obtain appropriate approval	Continuously ongoing	Reference Methods	None	Ongoing
37	Address of ECHA Activities WRT Chromium and its continued usage	Continuously ongoing	Reference Methods	None	Ongoing
38	Liaison with SEA/MFA WRT Chromium and its continued usage	Continuously ongoing	Reference Methods	None	Ongoing
39	Input in Rambol Information Sweep WRT Chromium	Completed and submitted	Reference Methods	None	Ongoing
40	Liaison with Supplier WRT to REACH and chromium usage	Direct contact and ongoing discussion	Reference Methods	None	Ongoing
41	Stack Integrity Test	As per HSE Provisions	Reference Methods	None	Ongoing
42	Stack Portal Compliance	As per EA-PPC A1 provisions and EA M1 and M2 provisions	Reference Methods	None	Ongoing

ITEM	ACTIVITY	ACTIONS	TEST METHOD	DEVIATIONS	STATUS
43	Stack End Portal Geometry	As per EA-PPC A1 provisions and EA M1 and M2 provisions	Reference Methods	None	Ongoing
44	Sector Guidance Note Review	As per EA Inspection and Review	Reference Methods	None	Ongoing
45	Review of PECs, AGLs	As per EA Inspection and Review	Reference Methods	None	Ongoing
46	Disclosure of Results	EN 14001 Review and submission to Environment Agency	Reference Methods	None	Ongoing
47	Disclosure of Non-Compliances	EN 14001 review and submission to Environment Agency	Reference Methods	None	Ongoing
48	Trade Affiliations, External Informative sources	STA and Halcyon quarterly brief	Reference Methods	None	Ongoing