CHADWICK
ENVIRONMENTAL

AMG CHROME LIMITED

Substantial Variation Application

Operating Techniques

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Contents

AMG CHROME LIMITED 1
1. Introduction 5
1.1 Purpose of this Report 5
1.2 Scope and Limitations 5
2. Site Setting 6
2.1 Geology 6
2.2 Hydrogeology 6
2.3 Hydrology 6
2.4 Ecology 6
2.5 Site Layout 7
2.6 Plant and Equipment 7
2.7 Operating Hours 8
2.8 Permitted Activities 8
2.9 Raw Materials 9
3. Site Procedures 11
3.1 Overview of relevant procedures and processes 11
3.1.1 Main Chrome Production Activities 11
3.1.2 Pilot Plant Activities 18
4. Waste Management 19
4.1 Hazard and Non-hazardous Wastes 19
5. Air Quality Risk Assessment 20
6. Monitoring Requirements 20
6.1 Odour 21
6.2 Noise and vibration 21
7. Environmental Management System 25
7.1 Maintenance 25
7.2 Accidents, Incidents and Non-Conformances 25
7.3 Fires 25
7.4 Spills and Leaks 26
7.5 Site Diary 26
7.6 Energy and Resources 26
7.7 Site Security 27
7.8 Record Keeping and Documentation 27

Figure 1: Chrome Process Production 18
Figure 2: Pilot Plant Process 18
Figure 3: Exert from the AMG Chrome EMS detailing process responsibility on Site 28

Table 1 Raw Materials 9
Table 2 Proposed Air Quality Monitoring Requirements 21
Table 3 Point Source Emissions to Sewer 23

1. Introduction

1.1 Purpose of this Report

This Environmental Permit Variation Application (the Application) has been prepared by Chadwick Environmental on behalf of the operator AMG Chrome Limited (AMG). The application seeks to vary the Environmental Permit Ref. EPR/BK6866IW (the Permit) and to consolidate the Permit with Permit EPR/GP3639ZY (previously AMG Aluminium Limited but was transferred to AMG Chrome Limited in 2025). Note that activities under EPR/GP3639ZY are no longer undertaken on Site and AMG wish to vary these out of the permit and use the area for extended Chrome activities which will allow them to expand into the buildings which were used for EPR/GP3639ZY activities. The facility is located at Fullerton Road, Rotherham, South Yorkshire, S60 1DL (the Site).

The Operational procedures in this report detail the installation and operation of two new De-Starch Ovens (the existing de-starch oven is to be decommissioned and replaced with a new unit with an additional unit being added), along with the existing crushing activities, Pilot Plant, Base Prep Oven and Turnings Oven which were previously not included in the Permit but historically have been in operation for a number of years.

The following operational techniques includes consolidated operating techniques for activities already permitted on Site in addition to the above, to form one consolidated Operating Techniques for the Site.

The Operating Techniques report responds to Part C3 of the Environmental Permit application form, and specifically details the operating, monitoring and management procedures for the activities undertaken on Site.

This report forms part of the Site's EMS and will be reviewed every year or when required by a change in operations, breach of the permit, or significant fugitive emissions.

1.2 Scope and Limitations

This report: has been prepared by Chadwick Environmental for AMG Chrome Ltd and may only be used and relied on by AMG Chrome Ltd for the purpose agreed between Chadwick Environmental and AMG Chrome Ltd as set out in section 1.1 of the Non-Technical Summary.

Chadwick Environmental otherwise disclaims responsibility to any person other than AMG Chrome Ltd arising in connection with this report. Chadwick Environmental also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by Chadwick Environmental in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. Chadwick Environmental has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by Chadwick Environmental described in this report. Chadwick Environmental disclaims liability arising from any of the assumptions being incorrect.

Chadwick Environmental has prepared this report on the basis of information provided by AMG Chrome Limited and others who provided information to Chadwick Environmental (including Government authorities), which Chadwick Environmental has not independently verified or checked beyond the agreed scope of work. Chadwick Environmental does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Site Setting

The Site is located at the AMG Chrome Limited Facility, in Fullerton Road, Rotherham, S60 1DL and is centred on National Grid Reference (NGR) SK 42259 91154. The Site is located approximately 1.8 km southwest of the City of Rotherham.

AMG Chrome is located in an area of mixed land use with commercial and industrial and residential properties within 1 km of the Site Boundary, the closest of which are as follows:

- Residential properties are located approximately 60m south, southwest of the Installation boundary.
- A railway line borders the immediate Site to the west with commercial and industrial properties, and a golf course situated beyond the railway line.
- Commercial and industrial properties are located to the immediate north of the Site.
- Scrub land is located to the immediate south of the Site, with residential properties to the southwest.
- The River Rother is located along the eastern boundary, beyond which is the dual carriage way of the A630 with further residential properties located to the east of the A630.

The Site location and the environmental permit boundary are provided in Appendix A of this Report.

2.1 Geology

The British Geological Survey Geoindex website was utilised to determine the geological units underlying the Site. The GeoIndex indicates the following are present:

Artificial ground map, 1:50,000 scale: made ground is shown to be present beneath the entire Site area.

Superficial deposits map, 1:50,000 scale: alluvium (gravel, sand, silt and clay) is present beneath the made ground, in the eastern areas, associated with the River Rother.

Bedrock geology map, 1:50,000 scale: the bedrock geology comprises the Pennine Middle Coal Measures formation of mudstone, siltstone and sandstone. There is also a small area (the southern tip of the Site) where Mexborough Rock is present, comprising sandstone

2.2 Hydrogeology

The Site is not located within a Groundwater Source Protection Zone. However, the Site is located on a Secondary A designated bedrock aquifer and a Secondary A designated superficial deposit aquifer.

2.3 Hydrology

There are no surface water bodies located within the Site boundary.

A series of ponds and lakes are located approximately 220 m north, 290 m north, 400 m west, 560 m north, 960 m southwest and 980 m northwest of the Site.

The River Rother is located approximately 20 m east of the site and, and the River Don and Holmes Goit are located 530 m and 770 m north of the Site.

2.4 Ecology

There are 7 designated sites within 5 km of the Site:

- Bradgate Brickworks SSSI (located approximately 2 km north of the Site),
- Canklow Woods LNR (located approximately 200 m southeast of the site),

- Centenary LNR (located approximately 540 m northwest of the site),
- Sheffield & South Yorkshire Navigation (located approximately 540 m north of the site),
- Blackburn Meadows LWS (located approximately 825 m northwest of the site),
- Bawtry Road Wetlands LWS (located approximately 1 km south of the site)
- Whiston Meadows LWS (located approximately 1.7 km southeast of the site).

There are also 4 recognised deciduous woodland priority habitat sites within a 1km radius of the site, ranging from 10m to 1000m from the Site Boundary.

2.5 Site Layout

As shown in the 'Site Layout Plan' in **Error! Reference source not found.**, the Site is divided into several departments and areas, including:

- Offices.
- Laboratories.
- Storage areas, buildings and warehouses.
- Open yards.
- Maintenance areas.
- Electrical areas.
- Gas House
- Decommissioned and disused plant and buildings.
- Welding and Fabrication buildings.
- Crushing Department.
- Hazemag Mills
- Exothermic Department including Steels building. (EXO).
- Shot Blasting Department.
- Machine Cell.
- Button Breaking
- High Purity Degassed (HPD) Vac Plant.
- Metal Powder Gas Department (MPG) and associated milling areas.
- Pilot Plant

2.6 Plant and Equipment

The following plant and machinery are used on the Site:

- Pilot Plant.
- Firing Stations
- De-starch Ovens and Afterburners.
- Turnings Oven.
- Furnaces.
- Hoppers.
- Turning Lathes /CNC machining
- Crushers.
- Grinding Mills.
- Briquetting Machines.

- Shot Blasters.
- Forklifts.
- Jack Hammers.
- Loading Shovels.
- Grab Excavators (used for smoothing Site surfaces).
- 360 Excavators (used for breaking)
- Breaking Arm
- Rumblers

2.7 Operating Hours

The facility operates 24 hours a day, 5 days a week with occasional weekend work. Activities are not undertaken during public holidays.

Operating hours will not change as a result of this application.

2.8 Permitted Activities

AMG are currently permitted to undertake the following activities (EPR/BK6866IW):

- S2.2 Part A 1(a) Producing non-ferrous metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic activities.

AMG also undertakes the following directly associated activities (EPR/BK6866IW):

- Material and product preparation.
- Delivery, storage and handling of raw materials.
- Breaking of materials.
- Handling and storage of waste material.
- De-starching activity.

AMG are currently permitted to undertake the following activities (EPR/GP3639ZY):

- S2.2 Part A 1(b) Melting, including making alloys of non-ferrous metals, including recovered products and the operation of non-ferrous metal foundries.

AMG also undertakes the following directly associated activities (EPR/GP3639ZY):

- Raw materials and handling
- Finishing activities
- Drying of aluminium raw materials prior to melting
- Potassium aluminium fluoride processing
- Effluent discharge to foul sewer
- Storage and handling of wastes
- Off gas-collection and abatement

As part of this Substantial Permit Variation AMG wish to consolidate the above Permits, however the activities within Permit EPR/GP3639ZY have ceased on Site and AMG wish to vary these out of the Permit but keep the permitted area in order to expand Chrome Activities (those activities undertaken under EPR/BK6866IW).

In addition to the consolidation, AMG wish to include new Directly Associated Activities (most of which are already operational but were left out of the pervious permit applications), namely the Pilot Plant, Base Prep Oven, the Turnings Oven and crushing activities.

AMG also seek to decommission the existing and permitted De-starch Oven and Afterburner and replace these with two new larger units which are more efficient and produce better / lower environmental emissions.

2.9 Raw Materials

The Site uses the following key raw materials in its chrome manufacturing processes:

Table 1 Raw Materials

Raw Material	Storage Location and arrangement	Purpose	Quantity (onsite at any one time)
CAPSUL® - 06670103 starch	1 pallet Hazemag Remainder in Warehouse 1	Mixing with chrome powder for the de-starching activity	2 – 5 mt
Chromium Oxide Powder	Exothermic Bays	Chrome generation	220T
Aluminium Powder	Exothermic Building, in sealed chemically resistant bulk bags upon pellets to prevent moisture	Aids ignition in the molten process	80T
Lime (Calcium Oxide) Powder	Exothermic Building, in sealed chemically resistant bulk bags upon pellets to prevent moisture	Aids ignition in the molten process	25T
Aqueous Chemical Degreasers	IBC's, drums or containers upon drip trays	Removes grease and moisture in the molten process	-
Argon Gas	External storage in a silo	For pressurising existing ovens and furnaces	-
Fuel	Double skinned tank with bunding	For Site vehicles and plant.	14,000 L
Oils and lubricants	Workshops within lockable cabinets	General plant maintenance	-
Refractory bricks	External Storage	Used in manufacture of the Pots and Bases	180 pallets
Refractory Sand	Exothermic Building	Used in manufacture of the Pots and Bases	22 bags/bins
Aluminium Sulphate	Exothermic Building	Used in the manufacture of Pot bases	2,000 – 3,000kg

Potassium Perchlorate	Warehouse 1	Used in the button manufacture process.	32 pallets (1.2 tonnes/pallet)
Carbon Black	Hazemag Building	Blended with chrome powder before being pressed into briquettes within the VAC plant	1,000 kg

3. Site Procedures

3.1 Overview of relevant procedures and processes

3.1.1 Main Chrome Production Activities

AMG produces speciality Chrome metal, metal alloys, hard-facing and welding to customer specification. There are a number of steps to the process depending on the product being produced. A simplified process diagram showing how the plant discussed in this application relate to the Site's procedures is provided in Figure 1.

3.1.1.1Primary Processing

Primary processing is undertaken in the EXO building which contains the EXO stack which is currently permitted as discharge point A1 within the Environmental Permit. In order to produce the chrome buttons, a 6 stage process is undertaken within the EXO building which incorporates:

- Base Prep Oven, to undertake drying and curing activities.
- Pot Preparation, which includes pot construction, ramming and drying.
- Blending (blending of chrome materials which will form buttons).
- Firing, where empty pots come into contact with raw materials which kick starts the exothermic reaction process.
- Cooling, where completed reaction pots are left to cool.
- Stripping, where Refractory pot linings are removed from the button with a pneumatic arm with a chisel point that is operated remotely from outside the stripping booth.

A detailed description of the primary processes is provided below.

Base prep

Refractory sand (consisting of virgin and recycled material) and water are mixed in a ribbon blender and dispensed into a metal base frame. This is then compacted using a whacker plate to ensure a uniform thickness. The completed bases are then transferred into the Base Prep Oven for curing. Once removed from the oven, they are tested for Shure hardness to ensure that they meet specifications for firing.

The Base Prep Oven is a bespoke high temperature oven manufactured by Airflow. Internally, the oven is 2,000 mm in height, 5,500 mm in width, and 2,500 mm in depth. The Base Prep Oven consists of the following major components:

- Bespoke air re-circulation oven with front access hinged double-doors.
- Control panel.
- Two centrifugal fans driving 11.3 air-changes per minute.
- Multiple stage dampers.
- Packaged gas burner.
- Gas supply.
- Full proof pressure relief panels.
- 24 hr / 7-day timer.
- Over-temperature policeman and oven-mounted traffic light indicator.
- Programmable and ramping control.
- Chart recording.
- Forced cooling.

The Base Prep Oven has a discharge point which is to be added to Schedule 3 of the Permit. An air quality Assessment has been undertaken of emissions from the Base Prep Oven and are discussed in Section 5 below.

Pot prep

Once the bases have been treated via the Base Prep oven, the bases are placed on a turntable; The inner part of the pot mould is placed onto the base while an outer casing is placed over the top. The Casing and Base are pinned together and then the unit is transferred to ramming unit.

In the ramming unit refractory material is blended and then dispensed into the void created by the inner profile and the outer casing.

The assembled pots are then moved to the Pot drying area where they are demoulded and placed into an open fronted heated chamber, heated with natural gas from the chamber hood. Once the pot is sufficiently dried the Pots are moved to the firing pits.

The Pot prep is recognised as a significant area of energy use, however the pots must be dried to ensure the robustness of the pot and to remove moisture which could impact on the pot firing reaction. There are no emissions from this process.

Blending

At the same time as the manufacturing of the pots for the chromium to be fired in (base prep and pot prep) is undertaken, blending of raw materials which will be made into buttons is undertaken. The chromium raw materials are weighed into a blender. The blender has local LEV with a hood which discharges into bag filters to manage the dust from the mixing station.

The blended material is then transferred into metal hoppers with lids. The hoppers are stored inside the building until they are required in the firing process.

The outlet from the LEV on the blender is into the main EXO building and not to atmosphere which reduces the risk of fugitive dust. Fugitive emissions from the building are discharged via LEVs on the side of the building. An Air Quality Risk Assessment has been completed for all vents on process buildings to determine the efficiency of the abatement measures in place and are discussed in Section 5 below.

Firing

The firing process is considered as the primary process creating emissions within the process. Discharges from the firing process are discharged via emission point A1 and are already permitted within the Permit.

When ready for firing, the Hoppers are placed on the firing station(s) above the pot, and the pre-batch material created in the blending process is dispensed into the pot. A pyrotechnic charge is placed into the pot on top of the prebatch to initiate the exothermic reaction. The remaining material is then dispensed throughout the reaction until firing is complete and a chrome ‘button’ is formed.

Above each firing station is an extraction hood which extracts air through ducting to four bag filters in the fume plant. The exhaust air from this is sent up the main EXO stack A1. This stack is monitored using a QAL991 dust monitor. The dust monitor is certified to:

- MCERTs and TÜV (UBA) certified to EN15267-3
- QAL1 as defined by EN14181
- QAL3 compliance to EN14181
- EX Zone 2,
- US EPA MACT Compliant BLD

The continuous monitor provides and indicative measure of dust levels in the stack. The alarm is set at 50% of the extractive emissions level of 20 mg/m$^{3.}$ In the event of an alarm, maintenance are called and steps are taken to restore control. Firing then continues.

Once firing is complete the pots are taken out of the firing stations and transferred to the cooling process.

Cooling

Once firing reaction is completed, the pots are removed via a forklift truck and transferred to the external cooling area to air cool over approximately 60 hrs.

Stripping

Once the buttons are sufficiently cool, they are transferred to the stripping station. The refractory coating is stripped away from the button using the remotely operated pneumatic chisel.

The refractory pot lining (which consist of mag brick and refractory sand) which is no longer suitable for use is currently removed from Site for crushing and grading at a licenced waste treatment site, before being brought back to Site for reintroduction into the process. To reduce waste and the lessen the carbon footprint of the Site, the Site proposes to install a new crusher within Building 11 which will be fitted with dust suppression (most likely LEV's and bag filters) in order to crush the waste pots on Site so that the material can be reused on Site. At the time of writing, the crusher had not yet been procured by the Site, therefore no other details are available, but the crusher has been identified as a potential major area of improvement with regards to AMG's waste reduction and Site efficiency initiatives.

Once stripped the slag (Chrome Alumina) which is a by-product is removed from the button and is sent to the Steels yard where it is collected and sold as an abrasive.

The slag is stockpiled until enough slag has been accumulated to bring in a mobile crusher. The slag is then crushed within the yard, potential dust from this activity is controlled by dust suppression (water suppression where the crushed slag is misted when it comes out of the crusher).

The slag is then sold as a byproduct to manufacturers of abrasive materials for relevant industries which require abrasives (sandpaper, grinding wheels). The material has been assessed against the four key criteria for a byproduct and meets these tests.

The chrome button is then placed into the Quenching tank. Once quenched the button is stored in the Goliath storage yard before secondary processing. The Goliath storage yard is undercover to prevent any runoff.

3.1.1.2Secondary Processing

Secondary Processes are undertaken dependant on the final destination and customer requirements of the Chrome Buttons which have been produced in the primary process. Secondary processing includes the following:

- Shot Blasting, removes impurities from the surface of the buttons.
- Machine Celling, to strip the buttons.
- Button Breaking, this reduces the buttons into small manageable pieces, at this stage the chrome can either be sold off site, or sent for further treatment.
- Power Production, where broken buttons are reduced to a power.
- Briquette Production, where broken buttons are made into to briquettes via additional processes.

A detailed description of the secondary processes is provided below.

Initial phase secondary processing

An initial phase of secondary processing is completed for all buttons produced. Initial processing consists of Shotblasting and Machining on Horizontal Milling machines.

Shot Blasting

In the shot blast building, the chrome button is loaded into a shot blaster, which fires abrasive metal material via centrifugal force at the surface of the button to remove impurities that may still be in the metal, this stage also further cleans the button.

The buttons are then checked to ensure that the impurities have been removed, and the surface is suitable for onwards treatment. If the button is not considered sufficiently treated, it is sent for machining whereby the chrome button is further treated to remove impurities and to improve the surface. There are no emissions from the shot blasting activity.

Machine Cell

In the machine cell building, the chrome button is stripped using Vertical Turning Lathe to remove the outer coating of the button and any rough edges. The machines use a water-based coolant Ultrasol X-4304. The coolant is subject to an internal and external coolant monitoring regime to ensure that the coolant remains effective and that the safety of Site Staff is managed. There are no emissions from the machine cell.

During the machining process, turnings are generated (scrap metal pieces) which are collected and treated prior to being sold for scrap.

The turnings are washed with water and degreaser to remove hydraulic oils, coolants, and other impurities that may have been present in the Vertical Turning Lathe. The turnings are then drip dried over drip trays before being tested to determine their composition (typically 98.02% chrome, 0.59% oil and 1.39% water). Dried turnings are then placed in the Turnings Oven to evaporate any remaining moisture.

The Turnings Oven is a gas heated oven fitted with a gas fired afterburner (serial number 1341-3) manufactured by Airflow. Internally, the oven is 1,890 mm in height, 2,000 mm in width, and 3,358 mm in depth. The Turnings Oven reaches a maximum temperature of 600˚C while the afterburner reaches a maximum temperature of 800 ˚C.

The Turnings Oven consists of the following major components:

- Gas-heated box oven with double doors.
- Two circulations fans and one exhaust fan.
- Gas powered burner.
- Gas powered afterburner and exhaust.
- Temperature policeman.
- Oven temperature control, afterburn temperature control and oven temperature protection.

The Turnings Oven has a discharge point which is to be added to Schedule 3 of the Permit. An air quality Assessment has been undertaken of emissions from the Turnings Oven and are discussed in Section 5 below.

Button Breaking

Once the button has been shotblasted and machined to a satisfactory state it is sent for breaking in the Button Breaking Building. The button breaking machine is a fixed hydraulic breaking arm which is used remotely to break the buttons into smaller pieces. The buttons are reduced to a suitable size for crushing within two smaller crushers which are attached to this process and a sample is sent for testing to determine if the button meets the customer order.

If the broken button meets the customer order with regards to purity, then it is crushed to the required size using either the S75 crusher or the Maintrain crusher and at this point may be loaded into drums and sent to the warehouse awaiting dispatch. Both the S75 crusher and the Maintrain crusher are fitted with bag filters to remove particulates and to prevent fugitive dust emissions.

If the button is to be made into a powder or briquettes, then it is sent for secondary phase secondary processing. Dust is not generated from this process.

Secondary phase secondary processing

Powder Production

Broken buttons which are to be made into powders are crushed in either the S75 crusher or the Maintrain crusher (they may be processed through these crushers multiple times to make the chrome suitable for grinding). The crushed chrome is then ground through either the Allis or Pulpit mills to create various grades of powdered chrome. The powered chrome of various grades is then packed in to drums and stored in the Warehouse until required for despatch.

The Maintrain crushers are fitted with bag filters to capture dust emissions from the crushing process. The Alice and Pulpit Mill buildings are fitted with bag filters to capture dust emissions from the grinding process.

An Air Quality Assessment has been undertaken of all vents on site which service production processes, including the Alice and Pulpit Mill buildings to determine the effectiveness of the abatement measures and are discussed in Section 5 below.

Briquette Production

Crushing

Feedstock from Breaking that will produce briquettes is crushed in the Maintrain crusher to further reduce its size before being sent to the Hazemag department where it enters the Hazemag machines. The Hazemag Department houses three Hazemag Mills. The Hazemag Machines use internal hammer action to pulverise the material down into a fine powder before discharging the powder through a graded sieve. Any material has not been suitably processed is recirculated in the Hazemag until it can pass through the sieve.

Additive addition

Once the has been through the Hazemag, it is fed into hoppers where Starch and Carbon black as well as Tin are added, to aid homogenisation. The hoppers are then blended in rotary blending machines which clamp the hopper in place and rotate it in various axis until a homogenised powder is produced.

The hoppers containing the blended powder are then transferred to the Vacuum for briquetting where the powder is compressed (pressed) under high pressure in to briquettes of various shapes and sizes. The briquettes exit the machine into open hoppers.

De-starching

The briquettes are then transferred from the hoppers into trays which are loaded into the de-starch ovens (of which there are two) where the starch is burnt off with all emissions from the de-starch oven passing through a high temperature afterburner before discharging to the environment. The Ovens operate at circa 425^{o}C, while the afterburners operate at a temperature circa 975^{o}C.

The de-starch ovens with associated afterburners already have one existing discharge point which is already included in the Permit. One of the replacement de-starch ovens will discharge from the existing discharge point, while the additional oven will have a separate discharge point. The additional discharge point is to be included in Schedule 3 of the Permit to facilitate the second de-starch oven.

An Air Quality Assessment has been undertaken of emissions from the de-starch ovens as well as a Human Health Risk Assessment due to the potential for the formation of Dioxins, Dioxin-like PCB's and Furans to form during the de-starching process. The Air Quality Assessment and Human Health Risk Assessment are discussed in Section 5 below.

Argon Vacuum Furnaces

Once the briquettes have been through the de-starching process, the trays are removed and placed in the Vacuum furnaces where impurities are removed via a degassing process. Argon is used as the

gas for purification and the Argon Furnaces run at approximately 1250^{o}C and the process takes approximately 8 hours, depending on the grade. The Argon Furnaces are already permitted on Site and AMG do not propose any changes to the running of these furnaces.

Rumbling

Once the briquettes have been through the Argon Furnaces, they then undergo final treatment whereby they are run through a rumbling process to remove flash/ rough edges from the briquettes before being packed in steel drums / barrels to await removal from Site.

Finished product is then transported by road in steel barrels with 4 Barrels to a pallet, within Shipping containers.

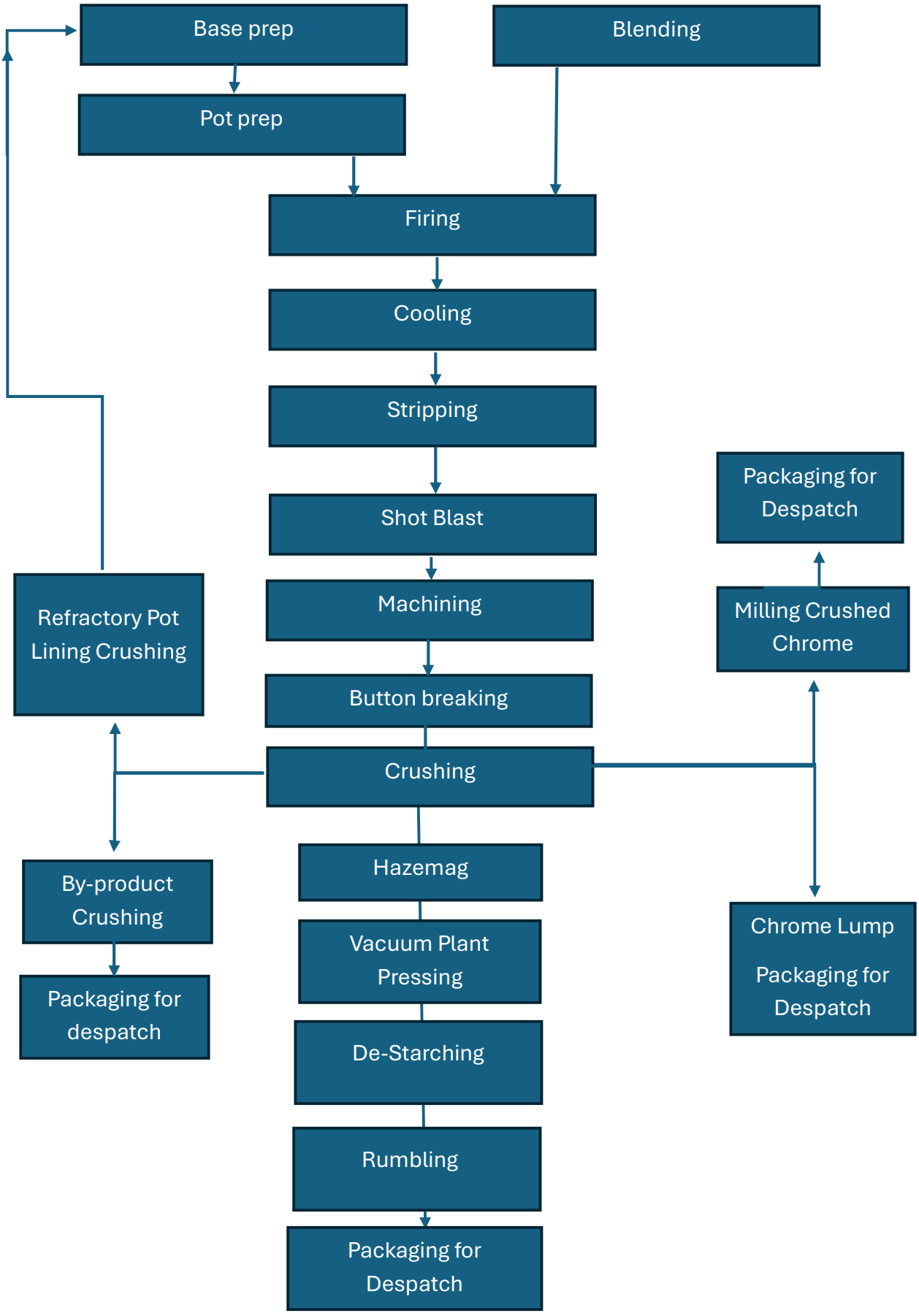

Base prep
Blending
Pot prep
Firing
Cooling
Stripping
Shot Blast
Machining
Button breaking
Crushing
Refractory Pot Lining Crushing
By-product Crushing
Packaging for despatch
Hazemag
Vacuum Plant Pressing
De-Starching
Rumbling
Packaging for Despatch
Packaging for Despatch
Milling Crushed Chrome
Chrome Lump
Packaging for Despatch

Figure 1: Chrome Process Production

3.1.2 Pilot Plant Activities

The Pilot Plant is a stand-alone process and is operated intermittently for lower grade customer requests and allows the Operator to utilise leftover chrome or chrome that is not of a high enough specification to be processed into briquettes. A flow diagram for the Pilot Plant can be found in Figure 2 below.

In the pilot plant, lower quality chrome from the rest of the process is blended with chrome carbon fines/ floor sweeps and Graphite (72 micron) and then melted in a crucible. The crucible is made of graphite, silica and clay. The mix is melted using an induction coil furnace at a temp of around 1100^{o}C.

A thermal reaction takes place to produce a lower grade Chromium.

The process has a LEV leading to a bag filter to capture dust from the process.

A thermal reaction takes place to produce a lower grade Chromium.

The material is cooled following melting and then is transferred to the breaking shed where it is broken up into size and then crushed in central crushing department before packing in to drums.

This is sold to a customer who does not require the high purity levels of the other processes and provides an outlet for lower specification material which might otherwise enter the waste process.

The Pilot Plant has been in operation for a number of years but was never added to the Permit. The Pilot Plant has an emission point to air from the furnace and as such this discharge point has been included within the Air Quality Assessment which has been prepared for the Site. The Air Quality Assessment is discussed in more detail in Section 5.

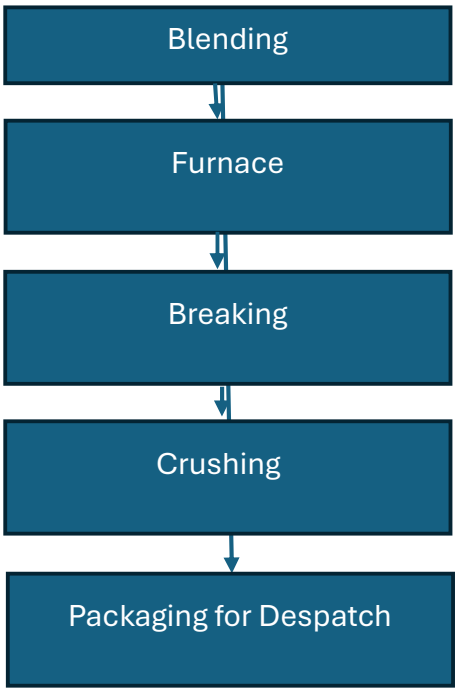


Figure 2: Pilot Plant Process

4. Waste Management

4.1 Hazard and Non-hazardous Wastes

Wastes generated by the Site are wastes that are generated by the day to day running of the facility and consist of the following, note that this list is not exhaustive but considers the main wastes generated on Site:

- Waste Electronic and Electrical Equipment (WEEE) – non-hazardous, stored externally in a dedicated WEEE skip.
- Wood Waste – non-hazardous, stored externally in a dedicated skip.
- Plastic Waste – non-hazardous and stored externally in a dedicated skip.
- Metal Wastes – non-hazardous and stored externally in a dedicated skip.
- General wastes – non-hazardous general mixed wastes, stored externally in a covered bin.
- Disused PPE, rags and cleaning / maintenance equipment (potentially contaminated with oils, lubricants) – hazardous and stored internally in various operational buildings in sealed containers.
- Batteries – both hazardous and non-hazardous, stored in containers, hazardous batteries are stored in the hazardous waste cage while non-hazardous batteries are stored separately with the non-hazardous wastes.
- Liquid Wastes – hazardous and stored within a dedicated lockable cage in IBCs with sealed drainage.
- Empty Drums and containers which contained oils and lubricants – hazardous and stored within a dedicated lockable cage with sealed drainage.
- Waste skins and refractory bricks. Stored in skips with covers
- Shotblast Waste. Drummed and stored in Goliath yard.
- Sweepings. Stored in covered skips.
- The site is considering compacting general waste purely to reduce volume on site and would like this to be clearly identified as an activity within this permit variation.

Wastes are collected and bulked within their relevant areas until a full load is available. Once a full load is available, the Site will notify their waste management contractors to come and remove the wastes. All wastes are provided with the relevant consignment or waste transfer note and records are kept of how much waste the Site has produced and where the waste has been sent.

In addition, under Waste Producer Responsibility, waste carrier licences are checked to ensure that they are current and that the waste carrier is authorised to carry the load. Waste facilities which will receive the wastes are audited periodically to ensure that the Permit they hold allows for the treatment activity required, that the relevant waste codes are included and that the Site is able to safely accept and treat AMG wastes.

4.2 Wastewater Management

With the exception of crushing activities, the Site does not generate wastewater.

Wastewater from crushing activities is generated by the decanting of settled water from the sludge produced in the wet filter system within the crushing department. This process water is then discharged to sewer under a discharge consent issued by Yorkshire Water (S/76/62/C). There are no point source emissions to surface water courses or groundwater from this process.

Surface water generated via rainfall on roofs and external yard surfaces drains to the Sites surface water system where it discharges into Yorkshire Waters surface water network.

5. Air Quality and Human Health Risk Assessment

5.1 Air Quality Assessment

An air quality risk assessment has been completed and forwarded with the application. The air quality assessment has been completed for all relevant potential contaminants from the facility:

- NOx
- Particulate matter
- SO2
- CO
- PAHs
- PCDD/F
- PCBs
- Cr

Note that for the purposes of the air quality assessment, the PCDD/F levels have been reported, however as there is no quality standard associated with dioxins and furans, they have been discussed within the Human Health Risk Assessment that has been completed for the facility.

The results indicated that, with the exception of annual mean levels of chromium, impacts on pollutant concentrations were not predicted to be significant at any human or ecological receptor location in the vicinity of the site, taking into consideration emissions monitoring data for the facility and the overall scale and nature of releases from the relevant sources.

Predicted annual mean chromium concentrations, inclusive of background levels, were above the relevant EQS at the assessed receptor locations. However, review of baseline conditions in the vicinity of the site indicated that ambient chromium concentrations are already in excess of the EQS in the absence of emissions from the installation.

Further analysis undertaken using measured emissions data for the facility demonstrated that annual mean chromium concentrations attributable to the installation, when considered in isolation from background levels, remain below the relevant EQS at all receptor locations. The assessment therefore indicates that the predicted exceedances are attributable to existing baseline conditions. Consequently, the operation of the installation is not predicted to cause an exceedance of the annual mean chromium EQS in isolation.

5.2 Human Health Risk Assessment

A Human Health Risk Assessment has been prepared and submitted with the application which determines the Dioxin, Furan and Dioxin-like PCB’s emissions form the Site.

6. Monitoring Requirements

6.1 Odour

Odour has been considered within the Environmental Risk Assessment for the Site. As the Site does not produce odour, odour monitoring is not required for the facility.

6.2 Noise and vibration

Nosie and vibration emissions from the facility have been considered within the Environmental Risk Assessment. As all noise and vibration generating activities are undertaken within sealed buildings and provided with acoustic attenuation and appropriate encasement, noise monitoring is not required for the facility.

6.3 Fugitive Dust Emissions

As outlined in Section 5, an Air Quality Assessment has been undertaken for the Site to determine the effectiveness of the LEV's and dust suppression systems for Chromium on Site and has also been considered within the Environmental Risk Assessment.

The Air Quality Assessment was undertaken to determine if there were any discharges coming out of the vents on the sides of production buildings. The results indicate that while there are discharges from these vents, they are acceptable, with the exception of Chromium. Background concentrations of Chromium currently exceed the relevant Environmental Quality Standard (EQS). However, modelling results show that the process contribution from the facility is well below the EQS.

The air quality modelling exercise has concluded that emissions from Site vents are acceptable, therefore abatement measures taken by the Site to prevent fugitive emissions are appropriate and as such, continued monitoring of the vents is not required.

6.4 Point Source Emissions – Air

An Air Quality Risk Assessment and a Human Health Risk Assessment has been completed for the Site as outlined in Section 5 above, which considers both the impacts on air quality as well as the risk to human health from Site Activities.

As previously discussed, when the facility was originally permitted a number of point source emissions to air were not included within the Permit: the Pilot Plant, the Base Prep Oven and the Turnings Oven. This application seeks to rectify this and add these emission points to the Permit, as well as to allow for the decommissioning and replacement of the existing de-starch oven with a larger more efficient unit and the addition of a second unit, both of which are fitted with high temperature afterburners.

In accordance with this, the following monitoring programme is proposed in accordance with BAT requirements (Note that A1 is already permitted and there are no changes proposed to the monitoring requirements with the exception of the introduction of PCDD/F to ensure monitoring of Dioxins, Dioxin-like PCB's and Furans).

Table 2: Proposed Air Quality Monitoring Requirements

Emission Point ref / Source	Parameter	Limit (including unit)	Reference Period	Monitoring Frequency	Monitoring Standard or Method
A1 – Main EXO stack	Particulates	20 mg/m^3		Continuous plus once a year extractive	Indicative monitoring plus extractive monitoring

					BS EN 13284-1
	Chromium and its compounds	2 mg/m^3	Average over the sample period	Once a year extractive	Indicative monitoring plus extractive monitoring BS EN14385
	PCDD/F	≤ 0.05 (ng I-TEQ/NM^3)		Once a year extractive	EN 1948 parts 1, 2 and 3
A2 – Base Prep Oven	Particulates	20 mg/m^3		Continuous plus once a year extractive	Indicative monitoring plus extractive monitoring BS EN 13284-1
	Chromium and its compounds	2 mg/m3	Average over the sample period	Once a year extractive	Indicative monitoring plus extractive monitoring BS EN14385
	PCDD/F	≤ 0.05 (ng I-TEQ/NM^3)		Once a year extractive	EN 1948 parts 1, 2 and 3
A3 – Turnings Oven	Particulates	20 mg/m^3		Continuous plus once a year extractive	Indicative monitoring plus extractive monitoring BS EN 13284-1
	Chromium and its compounds	2 mg/m^3	Average over the sample period	Once a year extractive	Indicative monitoring plus extractive monitoring BS EN14385
	PCDD/F	≤ 0.05 (ng I-TEQ/NM^3)		Once a year extractive	EN 1948 parts 1, 2 and 3
	TVOC	20 mg/m^3		Once a year extractive	EN 12619
A4 – Pilot Plant	Particulates	20 mg/m^3		Continuous plus once a year extractive	Indicative monitoring plus extractive monitoring BS EN 13284-1
	Chromium and its compounds	2 mg/m^3	Average over the sample period	Once a year extractive	Indicative monitoring plus extractive monitoring BS EN14385
	PCDD/F	≤ 0.05 (ng I-TEQ/NM^3)		Once a year extractive	EN 1948 parts 1, 2 and 3

A5 – De-starch Oven and Afterburner	Particulates	20 mg/m^3		Continuous plus once a year extractive	Indicative monitoring plus extractive monitoring BS EN 13284-1
	Chromium and its compounds	2 mg/m^3	Average over the sample period	Once a year extractive	Indicative monitoring plus extractive monitoring BS EN14385
	PCDD/F	≤ 0.05 (ng I-TEQ/NM^3)		Once a year extractive	EN 1948 parts 1, 2 and 3
A6 – De-starch Oven and Afterburner	Particulates	20 mg/m^3		Continuous plus once a year extractive	Indicative monitoring plus extractive monitoring BS EN 13284-1
	Chromium and its compounds	2 mg/m^3	Average over the sample period	Once a year extractive	Indicative monitoring plus extractive monitoring BS EN14385
	PCDD/F	≤ 0.05 (ng I-TEQ/NM^3)		Once a year extractive	EN 1948 parts 1, 2 and 3

6.5 Point Source Emissions – Surface Water

There are no point source emissions to surface water from the Site. However, the Site currently has a discharge point to sewer. This discharge point is already included within the Permit, and this application does not seek to amend this permitted activity, Table x below has been reproduced from the Permit for completeness.

Table 3 Point Source Emissions to Sewer

Point source emissions to sewer, effluent treatment plant or other transfers off-site– emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (incl. Unit)	Reference period	Monitoring frequency	Monitoring standard or method
S1 (as shown in Schedule 7 – emissions to air and water)	Decanting of settled water from sludge produced in the wet filter system in the crushing department	-	-	-	-	-

6.6 Point Source Emissions – Groundwater

Discharges to groundwater have been considered as part of the Environmental Risk Assessment. Site processes are undertaken within sealed building with which are provided with appropriate drainage systems. Storage of raw and finished product is undercover and within sealed bags to prevent rain ingress.

It is considered that here are no point source emissions to groundwater and as such, groundwater monitoring is not required.

7. Environmental Management System

As aforementioned, the Site has an EMS that is summarised below. This EMS meets the requirements of the EA's relevant guidance and is ISO 14001 certified. A summary of the EMS is provided below.

The EMS identifies and minimises the risk of pollution from the activities associated with the operation, particularly operations, maintenance, accidents, incidents and non-conformance.

Relevant sections of the EMS are described below.

7.1 Maintenance

The Site implements a Planned Preventative Maintenance (PPM) programme to minimise the risk to the environment through appropriate maintenance and inspections. The Base Prep Oven, Turnings Oven, De-starch Oven, Crushing Activities and Pilot Plant are already a part of the PPM program and are included within the EMS.

All plant on Site is maintained in accordance with manufacturers recommendations, including scheduled services and inspections. Details of faults, breakdowns and repairs are documented, and records are maintained at the site office. Faults and breakdowns will be investigated and the service schedule revised if necessary.

Regular inspection and maintenance of the ovens and vacuum furnaces as well as associated systems are essential to the safe and reliable operation of this equipment. All components of the ovens and furnace systems will be maintained in accordance with the manufacturer's specifications.

7.2 Accidents, Incidents and Non-Conformances

The Site's EMS has procedures for investigating and recording any incidents and non-conformances at the Site, and for taking any corrective action. The following types of incidents will require investigation:

- Malfunction, breakdown or failure of plant and equipment.
- Deviation from site procedures and operating techniques.
- Near misses.
- Complaints from external parties.
- Breach of Permit conditions.

All staff are trained to detect and report any such occurrences. Procedures will be taken to allow operations to resume, and preventative measures may be put in place if required to ensure that the incident does not reoccur.

All fuel, other combustible material, or hazardous chemicals, are secured in lockable containment. Similarly, plant and machinery will be locked and secured when not in use.

7.3 Fires

There is an approved Fire Prevention Plan for the Site. The changes requested within this variation are to include plant that is already operational on Site and is included within the current Fire Prevention Plan. The risk from Fires is not expected to increase and the Fire Prevention Plan has not been updated.

Appropriate firefighting equipment of a suitable type is available at the Site for fire wardens or firefighters to use. All firefighting equipment is kept in good condition, unobstructed and be serviced at least once a year by a competent person. Given the flammable and explosive nature of some of the material handled on Site, staff are primarily instructed to do the following in the event of an emergency:

- Notify the Fire Brigade immediately.
- Notify the Environment Agency as soon as practicable.
- Evacuate the area with staff proceeding to the designated muster point.

Any waste or wastewater used by firefighters will be contained by placement of booms and closing surface water discharge outlet valves. Retained liquids will be tested and disposed of appropriately.

7.4 Spills and Leaks

In the event of a leak or spillage from on-site plant or stored raw materials, the procedures identified in the Site's EMS and the Environmental Risk Assessment will be followed:

- Identify the cause of the leak or spill.
- Isolate the area / equipment, if necessary, shut down and 'lock out' the item.
- Deploy booms / isolate any surface water drains.
- Deploy spill kits as required.
- Record the incident in the Site Diary and if the leak or spill was of a mechanical nature, schedule maintenance.

7.5 Site Records

All incidents on site involving accidents, spillages, vandalism, complaints etc are recorded on the Sites various specially designed systems. This procedure provides an ongoing record and allows for investigative and corrective action to take place in line with the requirements of the client's EMS.

Details recorded include the following:

- Details of all visitors, including status and times of arrival and departure.
- Details of maintenance, modification, repair, replacement, delivery and return, and breakdown of any plant and machinery in line with the principles of planned preventative maintenance.
- Adverse weather conditions that could result in a pollution incident (i.e. winds, flooding etc).
- Non-conformances and associated actions.
- Damage to vehicles, fences, gates, etc. and incidents of trespass.
- A copy of the site's Environmental Permit will be displayed in a convenient location in the site office, allowing suitable access for all persons working on or visiting the site.
- Details of faults, breakdowns and repairs are documented and records are maintained at the site office. Faults and breakdowns will be investigated and the service schedule revised if necessary.

7.6 Energy and Resources

The Site uses energy to carry out its permitted activities. As per the existing Environmental Permit, AMG records all energy use and submits these annually to the Environment Agency with a four-yearly review being undertaken in accordance with Permit conditions, during which potential methods for increased efficiency are considered.

The Site currently uses mains water as its main source of water for Site Activities. As per the existing Environmental Permit, AMG records all water use and submits these annually to the Environment Agency with a four-yearly review being undertaken in accordance with Permit conditions, during which potential methods for increased efficiency are considered.

Similarly, reports of resource use are also submitted to the Environment Agency on a four-yearly basis, as per the Site's Environmental Permit requirements. Resources used on Site are detailed in the Operating Techniques (Section 2.9).

7.7 Site Security

Given the Site's location, between the railway line to the west and the River Rother to the east, the only road access to the Site is provided via the main entrance at Fullerton Road, or via the A631, at the Southern end of the Site. The Site's security office is located next to the Fullerton Road entrance, which is secured using a vehicle barrier operated by the security guards to allow for authorised vehicle movements on and off Site.

The A631 back entrance leads into the Site's unused non-operational woodland area and is secured by lockable palisade security fencing. An additional layer of security, in the form of additional lockable fencing, exists between this non-operational woodland area and the operational section of the Site. Access to the non-operational section of the Site is highly restricted, and the gates remain locked at both ends, apart from for occasional authorised vehicle movements or pedestrians.

The rest of the Site is surrounded by unbroken barbed wire or security palisade fencing with no further entry points.

The Site is continuously manned, with two dedicated in-house security guards present on Site, at all times (24 hours a day, 7 days a week). Security undertakes regular scheduled patrols of the Site, via foot and via vehicle, throughout the day and night. In the event that unauthorised persons are found on Site, they will be challenged and escorted from the Site if safe to do so. If not safe to do so, the authorities will be contacted and called out to Site.

CCTV cameras with motion and audio sensors, continuously monitor the aluminium and chrome processing facilities and wider Site from a variety of points. CCTV footage is continuously available to Site security in the Security office.

Site staff are briefed that in the event of evidence suggesting unauthorised access, or vandalism being found, the matter must be recorded in the Site Conditions Log and referred onwards for further investigation. If the identified incident, involved unauthorised tipping or spillage of waste that has resulted in a significant pollution incident, the Environment Agency will be informed (via telephone or email within 24 hours of the incident).

Any identified damage to infrastructure that could prejudice the Site's security will be recorded and temporarily repaired as necessary before the end of that working day. Permanent repair or replacement will be undertaken as soon as practicable.

7.8 Record Keeping and Documentation

AMG has an Environmental Management System (EMS) in place which is audited each year by an independent third party and is ISO 14001 accredited. The EMS includes procedures and check sheets for the recording of accidents and incidents, maintenance of the site and any plant and equipment, as well as staff training, technical competence and health and safety. All training, experience and qualifications gained by the site staff are noted and kept up to date within the site records using a training matrix, these are held within the HSE department.

A summary of the EMS is presented in Section 8 below and summarises the responsibilities of various roles in Site including environmental related matters. The EMS has been updated as part of this application and will be made available to the EA upon request.

Records of the EMS and its updates are maintained as electronically controlled copies. Changes are only carried out after consultation with the Head of HSE. The Head of HSE controls the status, issue, review, and disposal of Environmental documentation via the electronic control to avoid outdated references, out-of-date procedures, and non-compliance with Legislation. The Quality Department is responsible for ensuring only the latest copies of procedures are available for reference at the workplace.

When changes to departmental procedures are required, the Relevant Function or Operations / Department Manager contacts the Quality Department to amend the hardcopy and electronic versions. This contact can either be face-to-face or by submitting a copy of AMG Q 162 (procedure amendment form). Once completed, the amended procedure is submitted to the requester for approval.

Process Responsibility

Requirement	MD/D	GQM	HoEHS	EHS	HRM	TT	HoM	O/FM	SCH	SR	EMP
Context of organisation	P	S	S	S	S	S	S	S	S	S	S
Leadership	P	S	S	S	S	S	S	S	S	S	S
Planning	S	P	P	P	S	S	P	S	P	S	S
Support (Business)	S	P	S	S	S	P	P	S	S	S	S
Support (Personnel)	S	S	P	S	P	S	S	P	S	S	P
Operation	S	S	S	S	S	P	P	S		S	S
Performance evaluation	P	S	S	S	S	S	S	S	S	S	S
Improvement	S	S	S	S	S	P	P	S	S	S	S
Health and safety, Quality and Environmental Policies	P	S	S	S	S	S	S	S	S	S	S
Hazard identification & risk assessment	S	S	P	P	S	S	S	S	S	S	S
Hazard identification & risk assessment for Psychological	S	S	P	S	P	S	S	S	S	S	S
Environmental aspects	S	S	P	P	S	S	S	P	S	S	S
Legal and other requirements	S	S	P	P	S	S	S	S	S	S	S
Emergency preparedness and response	S	S	P	P	S	S	P	S	S	S	S
Performance measurement and monitoring	S	P	S	S	S	P	P	P	S	S	S
Evaluation of compliance	S	S	P	P	S	S	S	S	S	S	S
Control of non-conforming product (Downgrades)	S	P	S	S	S	P	S	P	P	S	S
Internal audit	S	P	P	P	S	S	S	S	S	S	S
Management review	S	P	S	S	S	S	S	S	S	S	S
Change Management	P	S	P	P	S	S	P	S	S	S	S
Business Management Systems	P	P	P	P	S	S	S	S	S	S	S

Key to abbreviations

P Primary responsibility *S Secondary responsibility*

MD/D	Managing Director / Directors
GQM	Head of Quality & Technical (Quality Management Representative)
HoEHS	Head of EHS
EHS	EHS Officer
HRM	Head of Human Resources
TT	Technical Team (The technical dept has the overall authority for monitoring & release of raw material)
HoM	Head of Manufacturing
SCH	Scheduling (The Scheduling dept has overall authority for controlling downgrades)
O/FM	Operations / Function Managers
SR	Safety Representative
EMP	Employee

Figure 3: Exert from the AMG Chrome EMS detailing process responsibility on Site