Best Available Techniques & Operating Techniques

Environmental Permit Variation and Consolidation Support

Feralco (UK) Ltd

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Making Sustainability Happen

Revision Record

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Basis of Report

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Acronyms and Abbreviations

EP	Environmental Permit
EA	Environment Agency
EPR	Environmental Permitting (England and Wales) Regulations
BAT	Best Available Technique
BATOT	Best Available Technique and Operating Techniques
Bref	Best Available Techniques Reference
BATc	Best Available Techniques conclusions
IPPC	Integrated Pollution Prevention and Control
PASS	Polyaluminium Silicate Sulphate
AMP	Accident Management Plan
ERA	Environmental Risk Assessment
HDPE	High Density Polyethylene
GRP	Glass Reinforced Plastic
SSP	Site Specific Protocol
AERA	Air Emissions Risk Assessment
SDS	Safety Data Sheet
SCADA	Supervisory Control and Data Acquisition

1.0 Introduction

SLR Consulting Ltd (SLR) has been instructed by Feralco (UK) Ltd (Feralco) to prepare an Environmental Permit (EP) variation of the bespoke EP, reference WP3630WV for the manufacturing plant at Ditton Road, Widnes, Cheshire, WA8 0PH (the site), for submission to the Environment Agency (EA).

The site is currently permitted for the production of inorganic chemicals as a Part A (1) activity as described in the Environmental Permitting (England and Wales) Regulations (EPR) 2016 (as amended) for the following listed activity:

- Section 4.2 Part A(1)(a)(iv) - producing inorganic chemicals such as salts (for example ammonium chloride, potassium chlorate, potassium carbonate, sodium carbonate, perborate, silver nitrate, cupric acetate, ammonium phosphomolybdate)

This EP variation will not alter any of the above activities carried out on site but will allow for increased production of ferric sulphate through site expansion and the installation of a second production line including additional reactor vessels, storage tanks and water scrubber abatement system.

The existing reactor vessel on ferric sulphate production line 1, RTK01, is also being replaced as part of this variation. The current reactor is made from polypropylene and is being replaced with a rubber lined carbon steel vessel of equivalent size. Once the new production line has been commissioned, the existing slurry make up vessel, MTK01, will be taken out of use and isolated. The feed of magnetite slurry will be provided solely from the new production line and pumped over to RTK01 on the existing line.

The EP boundary is to be modified due to the additional land being added for the second production line. Additionally, two existing part A (1) installation permits, BP3833LA (PlusPac production) and PP3733LX (aluminium sulphate production), are to be consolidated with EP WP3630WV and will be included in the new consolidated permit boundary.

The activity relating to EP BP3533LC is to be surrendered but the land associated with the EP is to be retained. This land will also form part of the new consolidated permit boundary.

Activities defined as Installations are required to conform to Best Available Techniques (BAT) requirements. The essence of BAT is that the selection of techniques to protect the environment should achieve an appropriate balance between the environmental benefits they bring, and the costs to implement them. In addition, it should be demonstrated that no significant pollution is caused by an assessment of the environmental impact of emissions from the activity as a whole.

This Best Available Techniques and Operating Techniques (BATOT) report is an integrated document which describes both the operating techniques that will be implemented at the facility to ensure compliance with the conditions of the EP, and also demonstrates compliance with BAT where applicable.

This report has been drafted to satisfy the requirements of European Commission, Defra and EA Guidance (where applicable), most notably:

- European Commission Joint Research Centre – Bref and BATc for the production of Common Waste Gas Management and Treatment Systems in the Chemical Sector (December 2022);
- European Commission Integrated Pollution Prevention and Control (IPPC) Bref on BAT for the Production of Speciality Inorganic Chemicals (August 2007);
- European Commission Bref on BAT for Energy Efficiency (February 2009);
- Environment Agency - A1 installations: environmental permits (July 2023);

- Environment Agency - Legal operator and competence requirements: environmental permits (June 2019);
- Environment Agency - Develop a management system: environmental permits (April 2023);
- Environment Agency - Risk assessments for your environmental permit (August 2022);
- Environment Agency - Control and monitor emissions for your environmental permit (November 2022);
- Environment Agency - Best available techniques: environmental permits (February 2016);
- Environment Agency – Technical Guidance Note for the Inorganic Chemicals Sector (EPR 4.03) (February 2009) and;
- Environment Agency - Energy efficiency standards for industrial plants to get environmental permits (July 2019).

1.1 Site Setting

The site is located approximately 1.3km southwest of Widnes, which is located approximately 17.1km to the southeast of Liverpool city centre. The National Grid Reference (NGR) for the centre of the site is SJ 49984 84814. The site is an installation facility which occupies approximately 2.5 hectares and comprises of production facilities, maintenance facilities, warehousing and office space including laboratories.

The nearest residential properties are located approximately 500m northwest of the site and commercial properties lie in all directions for at least 600m.

Steward's Brook lies adjacent to the east of the site boundary which flows south to the River Mersey (approximately 720m south), open ground is located approximately 30m north and a railway line is located approximately 30m south.

The site location is show in Drawing 001. The proposed site layout, EP boundary & emission points are shown on Drawing 002, Drawing 005A illustrates the Local Receptors and Drawing 005B shows the Natural and Cultural Heritage.

The site has two vehicular access points via Ditton Road at the north of the site.

1.2 Summary of Existing Operations

The site is currently permitted for the production of inorganic chemicals as a Part A (1) activity as described in the EPR 2016 (as amended):

- Section 4.2 Part A(1)(a)(iv) - producing inorganic chemicals such as salts (for example ammonium chloride, potassium chlorate, potassium carbonate, sodium carbonate, perborate, silver nitrate, cupric acetate, ammonium phosphomolybdate)

Directly associated activities include:

- Air abatement – the use of wet scrubbing air abatement systems;
- Storage and handling of raw materials – offloading, storage and transfer on site of all process raw materials including hydrogen peroxide, sulphuric acid and magnetite and;
- Storage and handling of waste materials – handling and storage of wastes on site to removal off site including filter press waste and packaging waste.

The site manufactures a range of products, aluminium and iron-based coagulants and milled alumina compounds, in dedicated batch plants. These products are used in the water treatment industry for the treatment of effluent and potable water. The site specifically manufactures ferric sulphate, aluminium sulphate and PlusPac (poly aluminium hydroxychloride). There are no process discharges to controlled waters or sewer and the ferric sulphate process does not produce liquid effluent waste.

1.3 Proposed Operations

1.3.1 Additional EP Amendments Required

As part of the EP variation application, two other existing Part A installation EPs (EP BP3833LA for PlusPac production and EP PP3733LX for aluminium sulphate production) will be consolidated with WP3630WV to create one modern style EP. These EPs will be included within the overall permit boundary. Nothing has changed regarding the processes falling under EPs BP3833LA and PP3733LX. The consolidation was discussed with the EA as part of enhanced pre application advice (ref. EPR/WP3630WV/V004).

Feralco also wish to surrender the activity associated with EP BP3533LC for the production of polyaluminium silicate sulphate (PASS). This product has not been manufactured onsite since 2015 and all associated process equipment has been decommissioned and removed. Feralco wish to retain the land associated with this EP, which is part of a warehouse building, and use the area for production of alumina products involving non-permittable activities of milling and mixing. The area associated with the EP, will form part of the overall consolidated permit boundary. It has been confirmed in a second EA pre application advice application (ref. EPR/WP3630WV/P001) that EP BP3533LC is to be consolidated with the three other EPs and the permitted activities associated with this permit are to be removed as part of consolidation. This constitutes a minor technical variation.

2.0 Management

This section details the management system that will be in place to govern operations on site, ensuring all relevant pollution prevention and control techniques are implemented effectively and that the site is also running at an optimum standard for health and safety.

Feralco operate the site using management systems for health & safety, environment and quality, all of which are certified to ISO 45001, ISO 14001 and ISO 9001 respectively. The certification body is BSI who undertake audits twice a year for each standard.

The environmental management system (EMS) will ensure that:

- the risks that the activities pose to the environment are identified;
- the measures that are required to minimise the risks are identified;
- the activities are managed in accordance with the management system;
- performance against the management system is audited at regular intervals; and
- the EP is complied with.

The management system will be reviewed at least once every four years or in response to significant changes to the activities, accidents or non-compliance. The management system will be supplemented by this BATOT document which outlines the proposed operating techniques at the site and demonstrates conformance with the requirements of EA guidance.

2.1 Environmental Policy, Objectives & Targets

Details of the company's environmental policy including environmental targets and objectives and improvement programme are contained within the EMS.

2.2 Management Techniques

2.2.1 Operation Control, Preventative Maintenance and Calibration

Compliance with operating procedures ensure effective control of site operations.

As part of the EMS, procedures include the following general topics:

- management and training;
- environmental protection and risk assessment;
- equipment registers and calibration;
- defects, non-conformance and complaints; and
- operations control and equipment maintenance.

A maintenance programme for all equipment is implemented at the site. This follows the inspection and maintenance schedule recommended by equipment/plant manufacturer(s). The maintenance programme is reviewed at least annually to ensure any necessary changes are implemented.

Also held on site are the operation and maintenance manuals as provided by the equipment manufacturer(s) covering:

- machinery associated with reactor vessels
- routine maintenance procedures and requirements;
- environmental protection; and
- emergency procedures.

Where necessary, all monitoring and process control equipment will be calibrated in accordance with manufacturers' recommendations.

2.2.2 Monitoring, Measuring and Reviewing Environmental Performance

As part of the formalised management system, environmental performance is reviewed to ensure any necessary actions are taken.

The Managing Director reviews the facility's environmental performance, on a regular basis and as part of an annual management review, to ensure policy commitments are met, that policy remains relevant, and to ensure that actions to improve environmental performance are identified. Records of environmental performance are maintained on an electronic system and paper copies, where deemed necessary, within an appropriate filing system at the HSEQ Manager's allocated office (or appropriate alternative).

2.2.3 Staffing, Competence and Training

The HSEQ Manager is responsible for ensuring that training levels for operational staff are adequate, relevant and up to date. This ensures that people working within their department are competent to perform tasks. Feralco have a training matrix and conduct training needs analysis reviews to identify the competency level of existing employees and identify if further training is required.

Staff employed on site benefit from the training provided, which ensures their professional and technical development continues and contributes towards their competence. There is a commitment for staff at all levels to continual improvement, prevention of pollution and compliance with legislation. The training ensures that staff are aware of:

- skills and competencies required for each job;
- regulatory implications of the permit for the site and activities;
- potential environmental effects from operations under normal and abnormal circumstances;
- prevention of accidental emissions and actions to be taken in response to accidents;
- control of point source and fugitive emissions to air;
- control of odour;
- waste handling, minimisation, recovery and/or disposal;
- noise;
- OH&S hazard identification and assessment (as appropriate to the role);
- operational controls (including procedures and/or work instructions);
- workplace safety and environmental monitoring;
- emergency preparedness;
- incident management (including investigation methods as appropriate to the role); and
- process interactions.

Refresher training is provided on site policies/procedures regularly with the aim of reducing accidents and minimising the impact of the installation on the environment, by ensuring the site operates correctly.

Training records are maintained by the HSEQ Manager and held in the site office on file and in electronic format.

The EMS and BATOT documents are available for site personnel to access.

2.2.4 Communication and Reporting of Actual or Potential Non-Compliances and Complaints

Actual or potential non-compliances on site are recorded on an accident/incident/near miss/maintenance report form. The information from the forms is then entered onto the incident and nonconformity register (internally referred to as the actions spreadsheet). The HSEQ Manager investigates each event and identifies a solution to remedy it and prevent it from reoccurring. If the non-compliance event is sustained, the operations may be stopped until a solution can be found, to minimise harm to the environment.

The remedial actions taken in response to the non-compliance includes:

- obtaining additional information on the nature and extent of the non-compliance;
- discussing and testing alternative solutions;
- modifying procedures and responsibilities;
- seeking approval for additional resources and training;
- contacting suppliers and contractors to seek alterations to the way they operate; and
- informing the Environment Agency.

Members of the public can file complaints via the contact details on the Feralco website. All complaints received by the HSEQ Manager are recorded and investigated within one working day, with a follow up response communicated to the complainant within ten working days

2.2.5 Auditing

The site benefits from regular auditing to ensure that it is compliant with the conditions of its EP, namely record keeping, monitoring and emission levels. The audit will be carried out by an external company assessor to ensure that all activities on site are in accordance with the conditions of the EP. The outcome of the audit is reviewed and tracked to identify any frequent non-compliances.

2.2.6 Corrective Action to Analyse Faults and Prevent Reoccurrence

The HSEQ Manager deals with all environmental complaints and other incidents of non-conformance. These include:

- system failure discovered at internal audit;
- incidents, accidents, and emergencies; and
- other operational system failures.

Environmental non-compliances, including remedial action taken and any changes to operation made to avoid re-occurrence is recorded. Complaints are reported to and investigated by the HSEQ Manager and remedial measures implemented as required. Changes to prevent future complaints are proposed and implemented where appropriate. Records of non-conformances, complaints and other incidents are recorded on the incident and nonconformity register. Details logged include the date, time, and nature of the event, together with the results of investigations and remedial action taken.

2.2.7 Reviewing and Reporting Environmental Performance

Senior management review environmental performance annually and take actions to ensure that policy commitments are met, and that policy remains relevant.

2.2.8 Managing Documentation and Records

The HSEQ Manager is responsible for ensuring commitments to site audits and reviews are met and for ensuring that documents relevant to the environmental permit are issued, revised and maintained in a consistent manner.

An appropriate filing system is in place to ensure that all records relating to environmental monitoring, maintenance, reviews and audits are adequately maintained and updated. All records are held electronically and hard copies are stored in the site office.

3.0 Accident Management Plan

3.1 Action to Minimise the Potential Causes and Consequences of Accidents

Feralco recognise the importance of the prevention of accidents that may have environmental consequences and that it is crucial to limit those consequences.

An accident management plan (AMP) is implemented and maintained at the site to ensure the site's staff are fully prepared for such incidents. The AMP is reviewed every three years as a minimum, and after any reportable incident on site. The document is continually improved in these reviews to include best practice and minimise the risk of accidents occurring.

An initial assessment of the risk of accidents and abnormal operating conditions posed to the environment and site personnel is provided in the environmental risk assessment (ERA), enclosed in Section 4 of this application. The mitigation measures identified within the ERA will be implemented to limit the consequences of accidents affecting the environment and site personnel. The AMP was developed following conclusion of a detailed hazard and operability risk assessment process.

3.2 Hazard Identification

The following hazards have been identified:

- noise;
- odour;
- spill/leak from site equipment
- major fire;
- minor fire;
- security and vandalism;
- flooding;
- vehicle collision;
- plant failure;
- explosion;
- dust;
- asphyxiation;
- run off from site surfaces
- failure of site surfacing resulting in ground contamination; and
- litter;

For information on how these risks will be mitigated at the facility, please refer to the ERA in Section 4 of this application.

4.0 Authorised Activities

4.1 Current Regulated Facilities

The EPR 2016 (as amended) require regulated facilities to be operated in accordance with an EP. Regulated facilities include 'installations' as listed in Schedule 1 of EPR.

Feralco are applying to vary their EP for the following activity listed in Schedule 1 of EPR 2016:

- Section 4.2 Part A(1)(a)(iv) - producing inorganic chemicals such as salts (for example ammonium chloride, potassium chlorate, potassium carbonate, sodium carbonate, perborate, silver nitrate, cupric acetate, ammonium phosphomolybdate)

4.2 Directly Associated Activities

The following directly associated activities are undertaken at the site:

- Air abatement – the use of wet scrubbing air abatement systems;
- Storage and handling of raw materials – offloading, storage and transfer on site of all process raw materials including hydrogen peroxide, sulphuric acid and magnetite and;
- Storage and handling of waste materials – handling and storage of wastes on site to removal off site including filter press waste and packaging waste.

4.3 Proposed Plant Improvements

Feralco are proposing to install a second production line to increase the production of ferric sulphate. The current production output from the existing production line is up to 15,000 tonnes per annum and comprises the following equipment shown below in Table 1:

Table 1. Equipment for the Existing Ferric Sulphate Production Line

Tank/Vessel No.	Contents Stored/Vessel Function	Capacity/m^3	Material of Construction
RTK01	Reactor vessel	60	Currently polypropylene, to be replaced with an equivalent sized rubber lined carbon steel vessel
RTK02	Oxidation vessel	60	Polypropylene
MTK01	Magnetite slurry make up vessel	12	High Density Polyethylene (HDPE)
T1200	35% Hydrogen Peroxide	50	HDPE
STK01	Product Storage - 12% Ferric Sulphate	100	HDPE
STK02	Product Storage - 12% Ferric Sulphate	100	HDPE
STK03	Grey water process tank	100	HDPE
T1100	Filter prewash process tank	2	HDPE
WTK01	Recycled process water break tank	60	HDPE
T11	96% Sulphuric Acid	100	Stainless Steel
N/A	Water Scrubber Abatement System	2	Polypropylene

The existing reactor vessel, RTK01, is being replaced for an equivalent sized rubber lined carbon steel vessel as part of proposed plant improvements. Once the new production line has been commissioned, the existing slurry make up vessel, MTK01, will be taken out of use and isolated. The feed of magnetite slurry will be provided solely from the new production line and pumped over to RTK01 on the existing line.

The new equipment being installed for the second production line is detailed below in Table 2. In addition to the equipment detailed in this table, a cooling tower – air blast type cooler, will be installed for cooling of the scrubber abatement system and the filtration system.

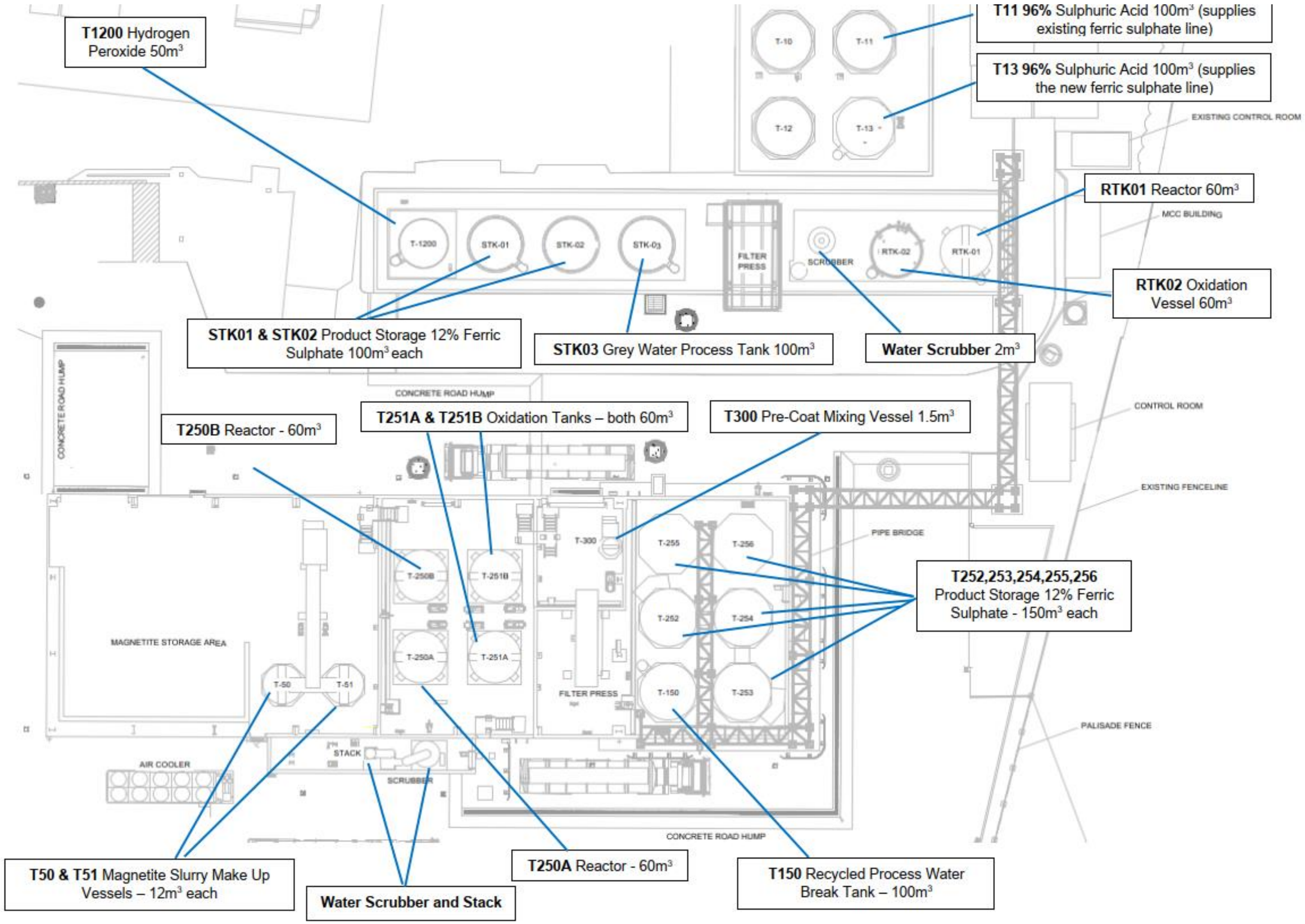
Table 2. Equipment for the New Ferric Sulphate Production Line

Tank/Vessel No.	Contents Stored/Vessel Function	Capacity/m^3	Material of Construction
T50	Magnetite slurry make up vessel	12	Polyethylene
T51	Magnetite slurry make up vessel	12	Polyethylene
T250A	Reactor vessel	60	Rubber lined carbon steel
T250B	Reactor vessel	60	Rubber lined carbon steel
T251A	Oxidation vessel	60	Rubber lined carbon steel
T251B	Oxidation vessel	60	Rubber lined carbon steel
T300	Pre coat mixing vessel	1.5	Polypropylene
T13	96% Sulphuric Acid	100	Stainless steel
T150	Recycled process water break tank	100	Glass Reinforced Plastic (GRP)
T252	Product Storage - 12% Ferric Sulphate	150	GRP
T253	Product Storage - 12% Ferric Sulphate	150	GRP
T254	Product Storage - 12% Ferric Sulphate	150	GRP
T255	Product Storage - 12% Ferric Sulphate	150	GRP
T256	Product Storage - 12% Ferric Sulphate	150	GRP
N/A	Water Scrubber Abatement System	9.56	Polypropylene

It should also be noted that an existing onsite rainwater storage tank, T13, is being replaced with a new 100m^3 stainless steel tank to store sulphuric acid. This tank will provide the sulphuric acid feed to the new ferric sulphate production line and will retain the T13 label. Hydrogen peroxide will be supplied to the new production line, from the existing tank T1200.

A detailed site layout plan showing the equipment comprising the existing and new ferric sulphate production lines is shown below in Figure A.

Figure A Detailed Site Layout Plan of the Existing and New Ferric Sulphate Production Lines



The proposed changes will allow the site to increase its overall production output of ferric sulphate as shown in Table 3.

Table 3. Production Output

Product	Metric tonnes/annum
Ferric Sulphate	45,000

4.3.1 Storage Capacity

Liquid raw material feedstock will be stored in bulk storage vessels and powdered raw material stored in a dedicated storage area in the new building. Raw material storage capacities are detailed in Table 4.

Table 4. Raw Material Storage Capacities

Raw Material	Storage Arrangements	Storage Capacity	Storage Capacity/tonnes	Annual Usage (tpa)
Magnetite Powder	Powder stored loose in a dedicated storage & handling building	300 tonnes	300	6960
96% Sulphuric Acid	Bulk storage vessel	$200m^3$ (2 x $100m^3$ tanks) *	368*	13040
35% Hydrogen Peroxide	Bulk storage vessel	$50m^3$	55	2600
Water	Bulk storage vessel	$100m^3$	100	18200

*There are three bulk storage tanks, all of $100m^3$ capacity on site that store 96% sulphuric acid, T10, T11 and T13. T10 supplies sulphuric acid for a different process on site and so this has not been included in the storage capacity figures above.

4.4 Operating Hours

The ferric sulphate process on the existing and new, second production line will be operational 250 days per year, 24hrs a day, Monday to Thursday, three shifts per day. Two shifts operate on a Friday covering 16 hours.

Routine maintenance will be undertaken during the week when vessels are not operational or at the weekend.

5.0 New Reactor Capacity and Performance

There are two new reactor vessels being installed as part of the new production line and one new reactor vessel being installed to replace the current reactor vessel on the existing production line. The vessels all have a capacity of $60m^3$ each, with heating and cooling services, solids and liquid charging points and PLC control system.

The raw materials utilised are a combination of liquids (sulphuric acid, hydrogen peroxide and water) and powder (magnetite powder). The feedstock is sourced from a variety of different certified sources.

5.1 Facility Performance

Energy and water modelling has been undertaken in the design process for Feralco's new reactor vessels. A summary of key performance indicators is provided in Table 5.

Table 5. Reactor Vessel Performance

Parameter	Unit	Value
Annual processing availability	tonnes	50,000
Manufactured output	tonnes	40,000
Yield of liquid products	% wt daf	>95%
Steam (produced by on site boiler plant)	Tonnes	N/A
Electrical consumption input	kW/tonne	Typically 10
Water usage	Tonnes/tonne of output	0.45
Cooling circuit	m^3/hr	94

5.2 Detailed Process Description

5.2.1 Feedstock Reception

Authorised vehicles delivering raw materials to the site are directed from the weighbridge to the storage area. The raw materials required for ferric sulphate production, are delivered to site and stored as follows:

- Magnetite powder - delivered in bulk loads and stored in a dedicated magnetite storage and handling building. A front loader will be used to transfer magnetite powder to a hopper which will feed a conveyer system;
- 96% sulphuric acid – delivered by tanker and stored in three 100m^3 storage tanks (two of these tanks are relevant to the ferric sulphate production process, T11 and T13). Sulphuric acid will be pumped to the process (reactors and oxidation tanks) as required;
- 35% hydrogen peroxide - delivered by tanker and stored in bulk tank (T1200 – 50m^3 capacity). Hydrogen peroxide will be pumped to the process (oxidation tanks) as required;
- Water – fresh water will be supplied from a process water break tank. Recycled water will be supplied from T150 – recycled process water storage tank

5.2.2 Ferric Sulphate Process Description

- Step 1: 7000kg of fresh mains water is metered to each of the magnetite slurry make up vessels, T50 and T51, and the agitator started before the magnetite powder is added to the vessel as the magnetite powder will drop out of the slurry unless it is continuously agitated. Fresh water must be used to produce the magnetite slurry, as recycled water is acidic and will react with the magnetite causing it to solidify and block pipework.
- Step 2: 7944 litres of water (for dilution) is added to the reactor and the agitator turned on in advance of the magnetite slurry being added. Water is added from the

recycled process water storage tank – T150, when available and is topped up to 7944 litres if required by using fresh mains water.

- Step 3: A magnetite slurry is made up in two batches of 4000kg each. Magnetite powder is transferred into a hopper which feeds a conveyor system. The conveyor system transports 4000kg of magnetite powder to each of the two slurry mixing vessels. The magnetite is transferred into the slurry vessel within a 15-minute timeframe.
- Step 4: Mixing of the slurry is instantaneous so once the magnetite powder addition is complete, the PLC control system is used to transfer the batch to the line 1 reactor (existing) or line 2 reactors, T250A and T250B. A removable mesh is in place to prevent any large lumps of magnetite from being pumped to the reactor.
- Step 5: Once the slurry transfer has been completed, the line is flushed with water to clear the pump and pipework of slurry to prevent any blockages between transfers. Step 4 is then repeated until the reactor holds 8000kg of slurry.
- Step 6: After the magnetite slurry has been added to the reactor containing water, 8.3m^3 (15300kg) of 96% sulphuric acid is metered to the reactor from T13.The reaction between magnetite and sulphuric acid produces a mixture of aqueous ferrous sulphate and ferric sulphate.
- Step 7: A sample is taken towards the end of the reaction to check the concentration. If the sample contains ≤ 4% sulphuric acid, the reaction is complete. If the sample has greater than 4% sulphuric acid, the reaction is left for a short period and resampled.
- Step 8: At the end of the reaction, the agitator is stopped for approximately one hour to allow any unreacted magnetite to settle out before the aqueous ferrous and ferric sulphate mixture is transferred to the oxidation vessel.
- Step 9: The aqueous mixture is transferred to the oxidation vessel, T251A and T251B, with the agitator running, at a temperature of 80-85°C and cooled to approximately 50°C before the oxidation is started.
- Step 10: If the concentration of sulphuric acid in the aqueous mixture is < 4%, further sulphuric acid is added to the oxidation vessel.
- Step 11: 2850 kg of 35% hydrogen peroxide is added, from T1200, to the bottom of the oxidation vessel whilst being agitated to keep the hydrogen peroxide in the liquid so it can react with the ferrous sulphate to produce ferric sulphate. The oxidation process takes approximately four hours.
- Step 12: Fresh mains water is added if necessary to adjust the concentration of ferric sulphate to 12%.
- Step 13: A precoat mix of water and perlite filter aid is produced in the pre coat mixing vessel, T300, before being pumped to the filter press.
- Step 14: Ferric sulphate is pumped to the filter press to remove any remaining solids.
- Step 15: 12% ferric sulphate is pumped to bulk storage tanks - T252, T253, T254, T255 and T256 and transferred to bulk road tankers at two loading stations.

The typical times for each of the stages in the ferric sulphate production process is shown in Table 6.

Table 6. Typical Timings for Stages of the Ferric Sulphate Production Process

Make Up of Slurry	Transfer of Slurry to Reactor	Reaction	Transfer to Oxidation Vessel	Oxidation	Filtration
30 minutes	10 minutes	4 hours followed by 1 hour settling	30 minutes	2 hours colling followed by 4 hours oxidation reaction	1 hour
Steps 1,3 & 4	Step 5	Steps 2,6,7 & 8	Step 9	Steps 10,11 & 12	Steps 13 & 14

Process flow diagrams for the existing and new ferric sulphate production lines are shown below in Figures B and C.

Figure B: Existing Ferric Sulphate Production Line Process Flow

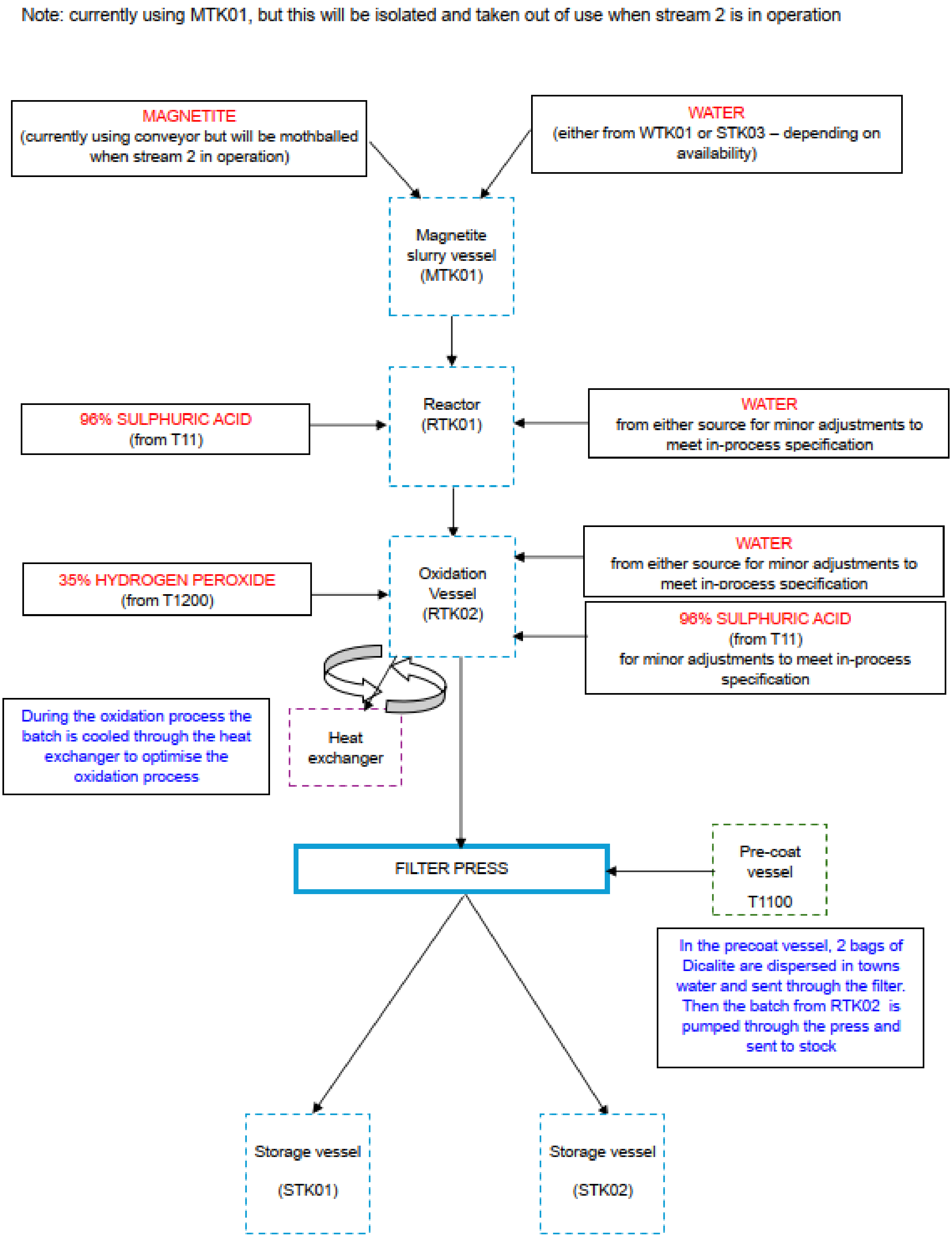
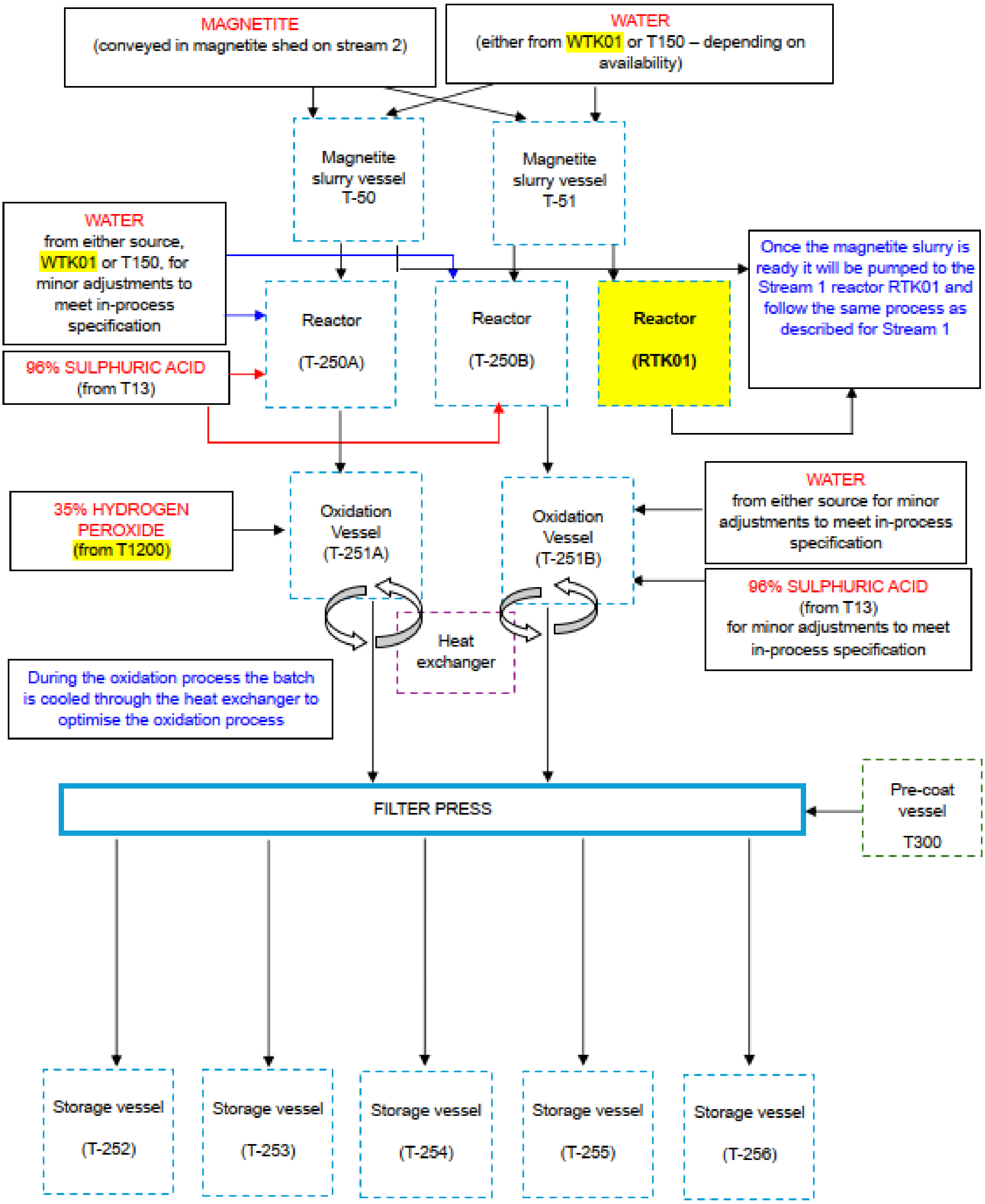


Figure C: Existing Ferric Sulphate Production Line Process Flow

Note: Items highlighted yellow indicate where there is a link between the existing and new stream



5.2.3 Air Emissions Abatement System

A new water scrubber abatement system will be installed as part of the new production line and will be connected to both reactors, T250A and T250B, and both oxidation vessels, T251A and T251B, to treat sulphuric acid vapours before emission to atmosphere. The scrubber will also condense approximately 2000kg of water vapour during the production process from the reactor and oxidation vessel. The new scrubber abatement system will be controlled by a PLC system. During production, the temperature and level of the liquor in the sump will be continuously monitored. A heat exchanger will be used to cool down the scrubber liquor.

The spent scrubbing liquor will be discharged to the recycled process water tank and fresh water used to make up the volume that has been discharged. The frequency at which the spent scrubbing liquor is to be discharged, is to be determined during the commissioning period by measuring and monitoring the pH of the scrubber liquor. The spent liquor from the existing water scrubber, is discharged after every batch.

5.2.4 Filter Press Waste

A solid waste is produced as part of step 14 when the ferric sulphate is filtered. This comprises of solid impurities in the magnetite, such as insoluble mica and silica, and perlite filter aid. Currently, the filter press can be used for 2-3 batches before cleaning. To clean the filter press, the press is opened, and compressed air used to remove any solid residue. The solid is then transferred to drums for hazardous waste disposal.

The filter sequences are being amended so that the filter press can be washed and used for an increased number of batches before cleaning is required. Bottom valves are to be added to the filter press on the new production line so that the filter can fill more efficiently during the wash stage and 'pre coat' more evenly. Washing of the filter results in a reduced level of sulphate in the filter cake. Air is blown through the filter cake to make it as dry as possible before it is dropped from the press. Once the second production line is operational, analysis is to be carried out on the filter cake waste to determine the baseline sulphate levels and appropriate disposal method. The water used for washing the filter cake is used in the process and pumped back to the recycled process water tank.

If there is a leak while the filter press is in operation, it will be collected in a sump pit and pumped to the recycled process water tank.

5.3 Assessment of BAT

5.3.1 Best Available Techniques Reference Document for Common Waste Gas Treatment Management and Treatment Systems in the Chemical Sector

BAT Requirement	Specific Measure
Environmental Management Systems	
BAT 1. In order to improve the overall environmental performance, BAT is to elaborate and implement an environmental management system (EMS) that incorporates all of the following features: i. commitment, leadership, and accountability of the management, including senior management, for the implementation of an effective EMS; ii. an analysis that includes the determination of the organisation's context, the identification of the needs and expectations of interested parties, the identification of characteristics of the installation that are associated with possible risks for the environment (or human health) as well as of the applicable legal requirements relating to the environment; iii. development of an environmental policy that includes the continuous improvement of the environmental performance of the installation; iv. establishing objectives and performance indicators in relation to significant environmental aspects, including safeguarding compliance with applicable legal requirements; v. planning and implementing the necessary procedures and actions (including corrective and preventive actions where needed), to achieve the environmental objectives and avoid environmental risks; vi. determination of structures, roles, and responsibilities in relation to environmental aspects and objectives and provision of the financial and human resources needed; vii. ensuring the necessary competence and awareness of staff whose work may affect the environmental performance of the installation (e.g., by providing information and training); viii. internal and external communication; ix. fostering employee involvement in good environmental management practices; x. establishing and maintaining a management manual and written procedures to control activities with significant environmental impact as well as relevant records;12.12.2022 EN Official Journal of the European Union L 318/167	Feralco operates an environmental management system (EMS) which is certified by BSI to ISO 14001. The EMS incorporates all the required features that are identified in this BAT requirement. **Outcome - Compliant**

BAT Requirement	Specific Measure
xi. effective operational planning and process control; xii. implementation of appropriate maintenance programmes; xiii. emergency preparedness and response protocols, including the prevention and/or mitigation of the adverse (environmental) impacts of emergency situations; xiv. when (re)designing a (new) installation or a part thereof, consideration of its environmental impacts throughout its life, which includes construction, maintenance, operation, and decommissioning; xv. implementation of a monitoring and measurement programme; if necessary, information can be found in the Reference Report on Monitoring of Emissions to Air and Water from IED Installations; xvi. application of sectoral benchmarking on a regular basis; xvii. periodic independent (as far as practicable) internal auditing and periodic independent external auditing in order to assess the environmental performance and to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; xviii. evaluation of causes of nonconformities, implementation of corrective actions in response to nonconformities, review of the effectiveness of corrective actions, and determination of whether similar nonconformities exist or could potentially occur; xix. periodic review, by senior management, of the EMS and its continuing suitability, adequacy, and effectiveness; xx. following and taking into account the development of cleaner techniques. Specifically for the chemical sector, BAT is also to incorporate the following features in the EMS: xxi. an inventory of channelled and diffuse emissions to air (see BAT 2); xxii. an OTNOC management plan for emissions to air (see BAT 3); xxiii. an integrated waste gas management and treatment strategy for channelled emissions to air (see BAT 4); xxiv. a management system for diffuse VOC emissions to air (see BAT 19); xxv. a chemicals management system that includes an inventory of the hazardous substances and substances of very high concern used in the process(es); the potential for substitution of the substances that are listed in this inventory, focusing on those substances other than raw materials, is analysed periodically (e. g. annually) in order to identify possible new available and safer alternatives, with no or lower environmental impacts.	

BAT Requirement	Specific Measure
BAT 2. In order to facilitate the reduction of emissions to air, BAT is to establish, maintain and regularly review (including when a substantial change occurs) an inventory of channelled and diffuse emissions to air, as part of the environmental management system (see BAT 1), that incorporates all of the following features: i. information, as comprehensive as is reasonably possible, about the chemical production process(es), including: a. chemical reaction equations, also showing side products; b. simplified process flow sheets that show the origin of the emissions; ii. information, as comprehensive as is reasonably possible, about channelled emissions to air, such as: a. emission point(s); b. average values and variability of flow and temperature; c. average concentration and mass flow values of relevant substances/parameters and their variability (e.g., TVOC, CO, NO_X, SO_X, Cl_2, HCl); d. presence of other substances that may affect the waste gas treatment system(s) or plant safety (e.g., oxygen, nitrogen, water vapour, dust); e. techniques used to prevent and/or reduce channelled emissions to air; f. flammability, lower and higher explosive limits, reactivity; g. monitoring methods (see BAT 8); h. presence of substances classified as CMR 1A, CMR 1B or CMR 2; the presence of such substances may for example be assessed according to the criteria of Regulation (EC) No 1272/2008 on classification, labelling and packaging (CLP). iii. information, as comprehensive as is reasonably possible, about diffuse emissions to air, such as: a. identification of the emission source(s); b. characteristics of each emission source (e.g., fugitive, or non-fugitive; static or moving; accessibility of the emission source; included in an LDAR programme or not); c. the characteristics of the gas or liquid in contact with the emission source(s), including: 1. physical state;	The EMS incorporates an inventory of channelled and diffuse emissions to air which includes all the requirements listed. **Outcome - Compliant**

BAT Requirement	Specific Measure
2. vapour pressure of the substance(s) in the liquid, pressure of the gas; 3. temperature; 4. composition (by weight for liquids or by volume for gases); 5. hazardous properties of the substance(s) or mixtures, including substances or mixtures classified as CMR 1A, CMR 1B or CMR 2;	
Other than Normal Operating Conditions (OTNOC)	
BAT 3. In order to reduce the frequency of the occurrence of OTNOC and to reduce emissions to air during OTNOC, BAT is to set up and implement a risk based OTNOC management plan as part of the environmental management system (see BAT 1) that includes all of the following features: i. identification of potential OTNOC (e.g., failure of equipment critical to the control of channelled emissions to air, or equipment critical to the prevention of accidents or incidents that could lead to emissions to air ('critical equipment')), of their root causes and of their potential consequences; ii. appropriate design of critical equipment (e.g., equipment modularity and compartmentalisation, backup systems, techniques to obviate the need to bypass waste gas treatment during start-up and shutdown, high integrity equipment, etc.); iii. set-up and implementation of a preventive maintenance plan for critical equipment (see BAT 1 xii.); iv. monitoring (i.e., estimating or, where this is possible, measuring) and recording of emissions and associated circumstances during OTNOC; v. periodic assessment of the emissions occurring during OTNOC (e.g., frequency of events, duration, amount of pollutants emitted as recorded in point iv.) and implementation of corrective actions if necessary; vi. regular review and update of the list of identified OTNOC under point i. following the periodic assessment of point v.; vii. regular testing of backup systems.	Abnormal and emergency conditions for ferric sulphate production are considered in the company Aspects Register. The risks and mitigating actions are detailed in the register **Outcome - Compliant**
Channelled Emissions to Air – General Techniques	
BAT 4. In order to reduce channelled emissions to air, BAT is to use an integrated waste gas management and treatment strategy that includes, in order of priority, process-integrated recovery and abatement techniques.	A water scrubber abatement system is to be installed as part of the new ferric sulphate production line which will treat the sulphuric acid vapours produced from the new production line only. A separate, existing water scrubber treats

BAT Requirement	Specific Measure
The integrated waste gas management and treatment strategy is based on the inventory in BAT 2. It takes into account factors such as greenhouse gas emissions and the consumption or reuse of energy, water and materials associated with the use of the different techniques.	the sulphuric acid vapours produced from the existing ferric sulphate production line. **Outcome - Compliant**
BAT 5. In order to facilitate the recovery of materials and the reduction of channelled emissions to air, as well as to increase energy efficiency, BAT is to combine waste gas streams with similar characteristics, thus minimising the number of emission points. The combined treatment of waste gases with similar characteristics ensures more effective and efficient treatment compared to the separate treatment of individual waste gas streams. The combination of waste gases is carried out considering plant safety (e.g. avoiding concentrations close to the lower/upper explosive limit), technical (e.g. compatibility of the individual waste gas streams, concentration of the substances concerned), environmental (e.g. maximising recovery of materials or pollutant abatement) and economic factors (e.g. distance between different production units).Care is taken that the combination of waste gases does not lead to the dilution of emissions.	Due to the location of the new production line, it is not possible to combine the gas streams for the ferric sulphate production lines together. A water scrubber abatement system is to be installed as part of the new ferric sulphate production line which will treat the sulphuric acid vapours produced from the new production line only. **Outcome - Compliant**
BAT 6. In order to reduce channelled emissions to air, BAT is to ensure that the waste gas treatment systems are appropriately designed (e.g., considering the maximum flow rate and pollutant concentrations), operated within their design ranges, and maintained (through preventive, corrective, regular and unplanned maintenance) so as to ensure optimal availability, effectiveness and efficiency of the equipment.	The new water scrubber abatement system to be installed, has been appropriately designed and is capable of processing a maximum flow of 10000m^3/hr, containing sulphuric acid vapours. The new water scrubber will be operated and maintained in accordance with this BAT requirement. **Outcome - Compliant**
Channelled Emissions to Air – Monitoring	
BAT 7. BAT is to continuously monitor key process parameters (e.g., waste gas flow and temperature) of waste gas streams being sent to pretreatment and/or final treatment	Key process parameters including temperature, waste gas flow and sump liquor level, will be monitored as part of the new scrubber abatement system being installed as part of the second ferric sulphate production line **Outcome – Compliant**
BAT 8. BAT is to monitor channelled emissions to air with at least the frequency given in the table and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	Air emissions monitoring for the existing ferric sulphate plant is conducted annually in accordance with current requirements in EP WP3630WV. Air emissions will be monitored according to the frequency and standard stipulated in the new EP.

BAT Requirement	Specific Measure

Substance/Parameter	Process(es)/Source(s)	Emission Points	Standard	Min. Monitoring Frequency	Monitoring Associated with
$PM_{2,5}$ and PM_{10}	All processes/ sources	Any stack	EN ISO 23210	Once every year	BAT 14
Sulphur dioxide (SO_2)	All other processes/ sources	Any stack with a SO_2 mass flow of ≥ 2,5 kg/h	Generic EN standards	Continuous	BAT 18
		Any stack with a SO_2 mass flow of < 2,5 kg/h	EN 14791	Once every 6 months [3, 4]	

3 To the extent possible, the measurements are carried out at the highest expected emission state under normal operating conditions.

4 The minimum monitoring frequency may be reduced to once every year or once every 3 years if the emission levels are proven to be sufficiently stable.

Outcome - Compliant

Channelled Emissions to Air – Organic Compounds

BAT Requirement	Specific Measure
BAT 9. In order to increase resource efficiency and to reduce the mass flow of organic compounds sent to the final waste gas treatment, BAT is to recover organic compounds from process off-gases by using one or a combination of the techniques given below and to reuse them.	N/A as organic compounds are not produced during the ferric sulphate production process
BAT 10. In order to increase energy efficiency and to reduce the mass flow of organic compounds sent to the final waste gas treatment, BAT is to send process off-gases with a sufficient calorific value to a combustion unit that is, if technically possible, combined with heat recovery. BAT 9 has priority over sending process off-gases to a combustion unit. Process off-gases with a high calorific value are burnt as a fuel in a combustion unit (gas engine, boiler, process heater or furnace) and the heat is recovered as steam or for electricity generation, or to provide heat to the process. For process off-gases with low VOC concentrations (e.g. < 1 g/Nm3), pre-concentration	

<table>
<tr><th>BAT Requirement</th><th>Specific Measure</th></tr>
<tr><td>steps may be applied using adsorption (rotor or fixed bed, with activated carbon or zeolites), in order to increase the calorific value of the process off-gases.

Molecular sieves (‘smoothers’), typically composed of zeolites, may be used to level down high variations (e.g. concentration peaks) of VOC concentrations in the process off-gases.</td><td rowspan="3"></td></tr>
<tr><td>BAT 11. In order to reduce channelled emissions to air of organic compounds, BAT is to use one or a combination of the techniques given in table 1.1.</td></tr>
<tr><td>BAT 12. In order to reduce channelled emissions to air of PCDD/F from thermal treatment of waste gases containing chlorine and/or chlorinated compounds, BAT is to use techniques a. and b., and one or a combination of techniques c. to e., given in table 1.2.</td></tr>
<tr><td colspan="2">Channelled Emissions to Air – Dust (including PM_{10} and $PM_{2,5}$) and particulate-bound metals</td></tr>
<tr><td>BAT 13. In order to increase resource efficiency and to reduce the mass flow of dust and particulate-bound metals sent to the final waste gas treatment, BAT is to recover materials from process off-gases by using one or a combination of the techniques given below and to reuse them
<table><tr><th>Technique</th><th>Description</th></tr><tr><td>Cyclone</td><td>See section 1.4.1</td></tr><tr><td>Fabric Filter</td><td>See section 1.4.1</td></tr><tr><td>Absorption</td><td>See section 1.4.1</td></tr></table></td><td>A water scrubber abatement system is to be installed as part of the new ferric sulphate production line.
Outcome - Compliant</td></tr>
<tr><td>BAT 14. In order to reduce channelled emissions to air of dust and particulate-bound metals, BAT is to use one or a combination of the techniques given below.
<table><tr><th>Technique</th><th>Description</th><th>Applicability</th></tr><tr><td>Absolute Filter</td><td>See section 1.4.1</td><td>Applicability may be limited in the case of sticky dust or when the temperature of the waste gases is below the dew point.</td></tr><tr><td>Absorption</td><td>See section 1.4.1</td><td>Generally applicable</td></tr><tr><td>Fabric Filter</td><td>See section 1.4.1</td><td>Applicability may be limited in the case of sticky dust or when the</td></tr></table></td><td>Please see above response under BAT 13
Outcome - Compliant</td></tr>
</table>

BAT Requirement	Specific Measure
<table><tr><td></td><td></td><td>temperature of the waste gases is below the dew point.</td></tr><tr><td>High efficiency air filter</td><td>See section 1.4.1</td><td>Generally applicable</td></tr><tr><td>Cyclone</td><td>See section 1.4.1</td><td>Generally applicable</td></tr><tr><td>Electrostatic precipitator</td><td>See section 1.4.1</td><td>Generally applicable</td></tr></table>	
Channelled Emissions to Air – Inorganic Compounds	
BAT 15. In order to increase resource efficiency and to reduce the mass flow of inorganic compounds sent to the final waste gas treatment, BAT is to recover inorganic compounds from process off-gases by using absorption and to reuse them.	A water scrubber abatement system is to be installed as part of the new ferric sulphate production line to treat sulphuric acid vapours and reduce the quantity of inorganic compounds that would be discharged to atmosphere. **Outcome - Compliant**
BAT 16. In order to reduce channelled emissions to air of CO, NO_X and SO_X from thermal treatment, BAT is to use technique c. and one or a combination of the other techniques given in table 1.4.	N/A
BAT 17. In order to reduce channelled emissions to air of ammonia from the use of selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) for the abatement of NOX emissions (ammonia slip), BAT is to optimise the design and/or operation of SCR or SNCR (e.g., optimised reagent to NOX ratio, homogeneous reagent distribution and optimum size of the reagent drops).	N/A
BAT 18. In order to reduce channelled emissions to air of inorganic compounds other than channelled emissions to air of ammonia from the use of selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) for the abatement of NOX emissions), channelled emissions to air of CO, NOX and SOX from the use of thermal treatment, and channelled emissions to air of NOX from process furnaces/heaters, BAT is to use one or a combination of the techniques given in table 1.6.	N/A

5.3.2 Best Available Techniques Reference Document for the Production of Speciality Inorganic Chemicals

BAT Requirement	Specific Measure
Raw and Auxiliary Materials Supply, Storage, Handling and Operation	
BAT is to reduce the amount of packaging materials disposed of by, e.g., recycling ‘hard’ and ‘soft’ used packaging materials (see Sections 4.2.1 and 4.2.2), unless safety or hazard considerations prevent it.	All packaging materials onsite are either reused or recycled where possible **Outcome - Compliant**
Synthesis/Reaction/Calcination	
BAT is to: 5.2 reduce emissions and the number of residues generated by implementing one or more of the following measures: a. using high purity feedstock (see Section 4.3.1) b. improving reactor efficiencies (see Section 4.3.2) c. improving catalyst systems (see Section 4.3.3).	All the equipment in the production line has been designed to be efficient and to reduce the quantity of residues and emissions produced. The agitator in the reactor has been designed to lift the contents of the reactor to ensure the magnetite slurry is fully suspended and to enable full digestion of the magnetite in the sulphuric acid. The used scrubber liquor is discharged to the recycled process water tank to be reused in the process. Improvements have also been made to the filter sequences enabling the filter press to be used to filter more batches before cleaning is required. These amendments will reduce the sulphate levels in the filter cake and make it less hazardous. **Outcome – Compliant**
For discontinuous processes, BAT is to: 5.3 optimise yields, lower emissions, and reduce waste by sequencing the addition of reactants and reagents (see Section 4.3.4).	Reactants are added to the process in stages using a PLC control system as described in section 5.2.2. The only waste produced in the process, is the filter cake. **Outcome – Compliant**
For discontinuous processes, BAT is to: 5.4 minimise cleaning operations by optimising the sequences for addition of raw and auxiliary materials (see Section 4.3.4).	Cleaning operations required for this process are minimal. The only cleaning required is that of the filter press where compressed air is used to dry the filter cake before it is dropped from the press and collected for waste disposal. **Outcome – Compliant**

BAT Requirement	Specific Measure
Product Handling and Storage	
BAT is to: 5.5 reduce the number of residues generated by, e.g., using returnable product transportation containers/drums (see Section 4.2.1).	All the raw materials used in the ferric sulphate process are delivered in bulk and stored in bulk storage tanks. Magnetite powder is stored loose in a dedicated building. **Outcome - Compliant**
Waste Gas Emission Abatement	
BAT is to: 5.6 minimise emissions of total dust in off-gases and achieve emission levels of 1 - 10 mg/Nm3 by using one or more of the following techniques: a. cyclone (see Section 4.4.2.1.2) b. fabric or ceramic filter (see Section 4.4.2.1.5) c. wet dust scrubber (see Section 4.4.2.1.3) d. ESP (see Section 4.4.2.1.4). The lower end of the range may be achieved by using fabric filters in combination with other abatement techniques. However, the range may be higher, depending on the carrier gas and particle characteristics (see Section 4.4.2.1). Using fabric filters is not always possible e.g., when other pollutants have to be abated (e.g., SOx) or when the offgases present humid conditions (e.g., presence of liquid acid). The particulate matters recovered/removed are recycled back into production when this is feasible. The scrubbing medium is recycled when this is feasible.	A water scrubber will be used to treat sulphuric acid vapours emitted during the process. The used scrubbing liquor will be discharged to the recycled process water tank to be reused in the process. **Outcome - Compliant**
BAT is to: 5.7 reduce HCN emissions and achieve emission levels of <1 mg/m3 by scrubbing with an alkaline solution. The scrubbing medium is recycled when this is feasible (see Section 4.4.2.2.5).	N/A
BAT is to: 5.8 reduce NH_3 emissions and achieve emission levels of <1.2 mg/m3 by scrubbing with an acidic solution. The scrubbing medium is recycled when this is feasible (see Section 4.4.2.2.5).	N/A
BAT is to: 5.9 reduce HCl emissions, e.g., by wet gas scrubbing under alkaline conditions (see Section 4.4.2.2.4). If HCl is the main pollutant to be treated and alkali scrubbing is used, BAT is to achieve 3 – 10 mg/Nm^3 HCl.	N/A
Wastewater Management and Water Emissions Abatement	
As a general measure, BAT is to: 5.10 allocate contaminated waste water streams according to their pollutant load. Inorganic waste water without relevant organic components is segregated from organic waste water and ducted to special treatment facilities (see Section 4.4.1 and Figure 4.1).	The entire installation is served by a closed loop drainage system. Used scrubber liquor (water) is discharged to the recycled process water break tank to be reused in the process. **Outcome – Compliant**

BAT Requirement	Specific Measure
For rainwater, BAT is to: 5.11 minimise pollution to receiving watercourses by applying all of the following measures: a. minimising the contamination of rainwater from activities carried out at the installation in particular by applying measures for reducing fugitive and diffuse emissions (see BAT 5.12 and BAT 5.13 and BAT 5.17) b. ducting and storing rainwater (see Section 4.7.4) expected to be contaminated from activities carried out at the installation and treating it if necessary. Other rainwater may be directly discharged (see Section 4.7.4) c. monitoring the discharge of this other rainwater as outlined in Section 4.7.4. Rainwater found to be contaminated is treated as in b. above (see Section 4.7.4). In some cases, the use of rainwater as process water to reduce fresh water consumption may be environmentally beneficial.	Any surface water runoff from the hard-surfaced area of the site is collected by the site's closed loop drainage system. Sumps are present on site to manage surface runoff and are emptied routinely. A 100m^3 rainwater attenuation tank has been installed underground in the area of the second ferric sulphate production line. Uncontaminated rainwater from non-operational areas of the site is discharged to Steward's Brook via surface grids. **Outcome – Compliant**
Infrastructure	
For diffuse emissions, BAT is to: 5.12 minimise diffuse dust emissions where dust may arise (in particular from the storage and handling of materials/products) by applying one or more of the following techniques: a. storing materials in closed systems (e.g. silos, see Section 6.3.4.1) b. using covered areas protected from rain and wind (see Section 6.3.4.1) c. having production equipment, e.g. conveyors, totally or partially enclosed (see Section 2.2) d. having equipment designed with hooding and ducting to capture diffuse dust emissions (e.g. during loading into storage) and abating it (e.g. using a fabric filter, see Section 6.3.4.1) e. carrying out housekeeping regularly, e.g. by vacuuming (see Section 4.7.6).	Magnetite powder is stored indoors in a dedicated warehouse. A front-end loader will be used to load the hopper which then conveys the magnetite powder to the magnetite slurry make up vessel. The magnetite powder is 'damped' and heavy which limits the generation of dust. Regular housekeeping is carried out on site. **Outcome - Compliant**
5.13 minimise fugitive gaseous and liquid emissions by applying (according to the substances that may require controlling) one or more of the following techniques: a. having periodic leak detection and repair programmes (see Sections 4.7.1 and 2.6.6) b. operating equipment at slightly below atmospheric pressure (see Section 6.3.4.16) c. replacing flanges by welded connections (see Section 2.6) d. using seal-less pumps and bellow valves (see Section 2.6) e. using high performance sealing systems (e.g. effective gaskets and flanges, valves and pumps with high integrity packing, see Section 2.6) f. carrying out housekeeping regularly (see Section 4.7.6).	Regular maintenance and service programmes are in place regarding production equipment. Housekeeping is also carried out regularly **Outcome - Compliant**

BAT Requirement	Specific Measure
For new installations, BAT is to: 5.14 use a computerised control system to operate the plant (see Section 4.5.2). However, this does not apply where safety issues do not permit automatic operations (e.g., in the production of SIC explosives).	A PLC control system is being installed to operate the ferric sulphate production process **Outcome - Compliant**
For installations where solid hazardous compounds can build up in pipelines, machines and vessels, BAT is to: 5.15 have in place a closed cleaning and rinsing system (see Section 4.5.1).	N/A
Energy	
BAT is to: 5.16 reduce the consumption of energy by optimising plant design, construction, and operation, e.g., by using pinch methodology, except if safety issues prevent it (see Section 4.6.1).	The new ferric sulphate production facility has been designed so as to minimise energy use. To optimise energy efficiency, equipment is subject to planned preventative maintenance and serviced as required. **Outcome - Compliant**
Cross Boundary Techniques	
BAT is to: 5.17 minimise soil and groundwater pollution by designing, building, operating, and maintaining facilities, where substances (usually liquids) which represent a potential risk of contamination of ground and groundwater are handled, in such a way that material escapes are minimised (see Section 4.7.1). This includes all of the following: a. having facilities sealed, stable and sufficiently resistant against possible mechanical, thermal, or chemical stress. This is particularly important for highly toxic substances – e.g. cyanides, phosphorus compounds b. providing sufficient retention volumes to safely retain spills and leaking substances in order to enable treatment or disposal c. providing sufficient retention volume to safely retain firefighting water and contaminated surface water d. carrying out loading and unloading only in designated areas protected against leakage run-off e. storing and collecting materials awaiting disposal in designated areas protected against leakage run-off f. fitting all pump sumps or other treatment plant chambers from which spillage might occur with high liquid level alarms or having pump sumps regularly inspected by personnel g. establishing programmes for testing and inspecting tanks and pipelines including flanges and valves h. providing spill control equipment, such as containment booms and suitable absorbent material i. testing and demonstrating the integrity of bunds	The facility has been designed and is maintained so that the potential escape of material to the environment is minimal. There are no point source emissions to groundwater. The site benefits from impermeable surfacing and a sealed closed loop drainage system. Containment engineering will prevent the release of potentially polluting liquids to surface water and groundwater. **Outcome - Compliant**

BAT Requirement	Specific Measure
j. equipping tanks with overfill prevention k. storing materials/products in covered areas to keep rainfall out.	
BAT is to: 5.18 have a high level of education and continuous training of personnel (see Section 4.7.2). This includes all of the following: a. having personnel with sound basic education in chemical engineering and operations b. continuously training plant personnel on the jobs c. regularly evaluating and recording the performance of personnel d. regularly training personnel on how to respond to emergency situations, health and safety at work, and on product and transportation safety regulations.	Regular training is carried out according to a training matrix and training needs analysis reviews are carried out to identify where further training is required. The training provided encompasses the list in this BAT requirement. **Outcome - Compliant**
BAT is to: 5.19 apply, if available, the principles of an Industry Code (see Section 4.7.3). This includes all of the following: a. applying very high standards for safety, environmental and quality aspects in the production of the SIC substances b. carrying out activities such as auditing, certification, training of plant personnel (related to BAT number 5.18 and 5.22).	Feralco operate the site using management systems for health & safety, environment, and quality, all of which are certified to ISO 45001, ISO 14001 and ISO 9001 respectively. The certification body is BSI who undertake audits twice a year for each standard. Regular internal audits are also carried out on each management system. **Outcome - Compliant**
BAT is to: 5.20 carry out a structured safety assessment for normal operation and to take into account effects due to deviations of the chemical process and deviations in the operation of the plant (see Section 4.7.5).	A safety assessment (HAZOP) for the second ferric sulphate production line has been carried out. **Outcome - Compliant**
In order to ensure that a process can be controlled adequately, BAT is to: 5.21 apply one individual or a combination of the following techniques (without ranking, see Section 4.7.5): a. organisational measures b. concepts involving control engineering techniques c. reaction stoppers (e.g., neutralisation, quenching) d. emergency cooling e. pressure resistant construction f. pressure relief	Raw materials are added to the process as and when required as controlled by a PLC system. Heat exchangers are to be installed to cool the reactor contents and the scrubber liquor during the reaction. **Outcome - Compliant**
5.22 implement and adhere to an Environmental Management System (EMS) that incorporates, as appropriate to individual circumstances, the following features (see Section 4.7.6): a. definition of an environmental policy for the installation by top management (commitment of the top management is regarded as a precondition for the successful application of other features of the EMS) b. planning and establishing the necessary procedures c. implementation of the procedures, paying particular attention to: • structure and responsibility	Please refer to section 5.3.1 BAT 1 **Outcome - Compliant**

BAT Requirement	Specific Measure
• training, awareness and competence • communication • employee involvement • documentation • efficient process control • maintenance programmes • emergency preparedness and response • safeguarding compliance with environmental legislation d. checking performance and taking corrective action, paying particular attention to: • monitoring and measurement (see also the Reference Document on General Principles of Monitoring) • corrective and preventive action • maintenance of records • independent (where practicable) internal auditing in order to determine whether or not the environmental management system conforms to planned arrangements and has been properly implemented & maintained e. review by top management.	

5.3.3 Technical Guidance Note for the Inorganic Chemicals Sector (EPR 4.03)

Indicative BAT Requirement	Specific Measure
Managing Your Activities – Environmental Performance Indicators	
Monitor and benchmark your environmental performance and review this at least once a year. Your plans for minimising environmental impacts should be incorporated into on-going Improvement Programmes. Indicators can be derived using the Horizontal Guidance Note H1 Environmental Risk Assessment (see GTBR Annex 1). It is suggested that indicators are based on tonnes of inorganics produced (tOP) as they provide a good basis for measuring performance within an installation or a single company year on year.	Environmental performance is reviewed regularly and also during the annual management review which is carried out as part of the ISO 14001 environmental management system. **Outcome - Compliant**
Managing Your Activities – Efficient Use of Raw Materials and Water	
Assess the environmental impact of each process and choose the one with the lowest environmental impact. (We recognise that your choice may be constrained, for example, by the integration of processes on a complex site).	A water scrubber will be used to treat sulphuric acid vapours emitted during the production of ferric sulphate and the used scrubbing liquor will be discharged to the recycled process water tank to be reused in the process. Raw materials will be metered into the reaction vessels ensuring only quantities required are added. Any unreacted magnetite remaining in the reactor once the reaction is complete, will be utilised in the next batch.

Indicative BAT Requirement	Specific Measure
	Outcome - Compliant
Managing Your Activities – Avoidance, Recovery and Disposal of Wastes	
1. Maximise heat transfer between process streams where water is needed for cooling. Use a recirculating system with indirect heat exchangers and a cooling tower in preference to a once-through cooling system. 2. Where water is used in direct contact with process materials, recirculate the water after stripping out the absorbed substances. 3. Use cleaning techniques that reduce the quantity of water needed. 4. Establish opportunities for reuse using pinch analysis.	Recycled process water is used during the ferric sulphate production process with fresh mains water only added where critical for the reaction or process. Heat exchangers and a cooling tower are to be installed as part of the production line **Outcome - Compliant**
1. Demonstrate that the chosen routes for recovery or disposal represent the best environmental option. Consider avenues for recycling back into the process or reworking for another process wherever possible. 2. Where you cannot avoid disposing of waste, provide a detailed assessment identifying the best environmental options for waste disposal.	The amendments to the filter sequence enable the filter press to be used to filter more batches before cleaning is required. The amendments will potentially make the solid waste residue (filter cake) less hazardous. Once the second production line is operational, the filter cakes will be analysed to determine baseline sulphate levels and the appropriate method of disposal. The filter cake waste will then be sent for disposal. **Outcome - Compliant**
Operations – Design of a New Process	
1. Consider all potential environmental impacts from the outset in any new project for manufacturing chemicals. 2. Undertake the appropriate stages of a formal HAZOP study as the project progresses through the process design and plant design phases. The HAZOP studies should consider amongst other things the points noted above.	Potential environmental impacts have been considered during the design stage. A HAZOP study has been conducted for the second ferric sulphate production line. **Outcome - Compliant**
Operations – Storage and Handling of Raw Materials, Products and Wastes	
1. Store reactive chemicals in such a way that they remain stable, such as under a steady gas stream, for example. If chemical additions are necessary, then tests should be carried out to ensure the required chemical composition is maintained. Inhibitors may also be added to prevent reactions. 2. Vent storage tanks to a safe location. 3. Use measures to reduce the risk of contamination from large storage tanks. In addition to sealed bunds, use double-walled tanks and leak detection channels. 4. Use HAZOP studies to identify risks to the environment for all operations involving the storage and handling of chemicals and wastes. Where the risks are identified as significant, plans and timetables for improvements should be in place.	Hydrogen peroxide is stored in an existing bulk storage tank, T1200, that is constructed from HDPE and has a storage capacity of 50m^3. . The tank is fitted with a level transmitter, high level switch, atmospheric vent, emergency vent and an overflow. The temperature of the ambient air is monitored outside the tank and the temperature of the tank contents is also monitored. If the temperature difference between the two, is greater than 3°C, an alarm is triggered to warn of potential decomposition of the contents. Pressure relief valves are also in place along the run of hydrogen peroxide pipework. The tank is sited within a bund with a capacity of 110% volume of the largest tank within the bund. Sulphuric acid is stored in a bulk storage tank, T13, which is constructed from stainless steel and has a storage capacity of 100 m^3. This tank sits within a bund with two other tanks onsite that also store sulphuric acid, T10 and T11. The bund

Indicative BAT Requirement	Specific Measure
	has a capacity of 110% of the largest tank within it. T13 is fitted with a level transmitter, level high switch, atmospheric vent and an overflow pipe. **Outcome - Compliant**
Operations – Plant Systems and Equipment	
1. Formally consider potential emissions from plant systems and equipment and have plans and timetables for improvements, where the potential for substance or noise pollution from plant systems and equipment has been identified. 2. Carry out systematic HAZOP studies on all plant systems and equipment to identify and quantify risks to the environment. 3. Choose vacuum systems that are designed for the load and keep them well maintained. Install sufficient instrumentation to detect reduced performance and to warn that remedial action should be taken.	Air emissions monitoring is carried out on the existing ferric sulphate production line annually according to requirements in the EP. A water scrubber is to be installed as part of the new production line which will have the appropriate sized monitoring ports installed for monitoring. The relevant stages of a HAZOP study have been conducted where deemed necessary. **Outcome - Compliant**
1. Carry out a systematic HAZOP study for all relief systems, to identify and quantify significant risks to the environment from the technique chosen. 2. Identify procedures to protect against overpressure of equipment. This requires the identification of all conceivable over-pressure situations, calculation of relief rates, selection of relief method, design of the vent system, discharge and disposal considerations, and dispersion calculations. In some cases, careful design can provide intrinsic protection against all conceivable over-pressure scenarios, so relief systems and their consequential emissions can be avoided. 3. Maintain in a state of readiness all equipment installed in the venting system even though the system is rarely used.	There are pressure relief valves in place on the hydrogen peroxide feed line. **Outcome - Compliant**
You should where appropriate: 1. Consider leak detection, corrosion monitoring and materials of construction, preferably in a formal HAZOP study. Plans and timetables for improved procedures or replacement by higher integrity designs should be in place where the risks are identified as significant. 2. If corrosion is likely, ensure methods for rapid detection of leaks are in place and a regime of corrosion monitoring in operation at critical points. Alternatively, use materials of construction that are inert to the process and heating/cooling fluids under the conditions of operation. 3. For cooling water systems, use techniques that compare favourably with relevant techniques described in the “Industrial Cooling Systems” BREF.	Heat exchangers are to be installed to cool the reactor contents and the scrubber liquor. The heat exchangers are constructed of materials that will not corrode as a result of the process. **Outcome - Compliant**
1. Assess the potential for the release to air of VOCs and other pollutants along with discharged purge gas and use abatement where necessary.	N/A
Operations – Reaction Stage	

Indicative BAT Requirement	Specific Measure
1. With a clear understanding of the physical chemistry, evaluate options for suitable reactor types using chemical engineering principles. 2. Select the reactor system from a number of potentially suitable reactor designs – conventional stirred tank reactor (STR), process-intensive or novel-technology - by formal comparison of costs and business risks against the assessment of raw material efficiencies and environmental impacts for each of the options. 3. Undertake studies to review reactor design options based on process-optimisation where the activity is an existing activity and achieved raw material efficiencies and waste generation suggest there is significant potential for improvement. The studies should formally compare the costs and business risks, and raw material efficiencies and environmental impacts of the alternative systems with those of the existing system. The scope and depth of the studies should be in proportion to the potential for environmental improvement over the existing reaction system. 4. Maximise process yields from the selected reactor design, and minimise losses and emissions, by the formalised use of optimised process control and management procedures (both manual and computerised where appropriate). 5. Minimise the potential for the release of vapours to air from pressure relief systems and the potential for emissions of organic solvents into air or water, by formal consideration at the design stage - or formal review of the existing arrangements if that stage has passed.	A competent engineering firm have been employed to design the production line and process equipment including the new reactors. The reactor on the existing production line is also being replaced for an equivalent sized reactor constructed of rubber lined carbon steel as part of the project. A PLC system is being installed as part of the new production line to control the addition of raw materials during the process. **Outcome - Compliant**
1. Use the following features that contribute to a reduction in waste arisings from clean-outs: • Low-inventory continuous throughput reactors with minimum surface area for cleaning. • Minimum internals such as baffles and coils in the reactor. • Smooth reactor walls, no crevices. • Flush bottom outlet on reaction vessels. • All associated piping to slope back to the reactor or to a drain point. • Sufficient headroom under the reactor for collection of all concentrated drainings in drums or other suitable vessel, if necessary. • Minimal pipework, designed to eliminate hold-up and to assist drainage. • Pipework designed to allow air or nitrogen blowing. • System kept warm during emptying to facilitate draining. • HAZOP studies used to assess the potential for the choking of lines by high-melting-point material. • Campaigns sequenced so that cleaning between batches is minimised. • Campaigns made as long as possible to reduce the number of product changeovers. • Where a complete clean is necessary, use cleaning methods that minimise the	The features listed have been considered during the design stage of the reactor vessels and have been implemented where possible. **Outcome - Compliant**

Indicative BAT Requirement	Specific Measure
use of cleaning agents, (e.g., steam-cleaning, rotating spray jets or high-pressure cleaning) or use a solvent which can be re-used. ƒ • Carry out HAZOP studies to minimise the generation of wastes and to examine their treatment/disposal. • Consider use of disposable plastic pipe-liners. • Eliminate or minimise locations for solids to settle-out. • Consider duplicate or dedicated equipment where it can reduce the need for cleaning that is difficult	
Operations – Separation Stage	
1. Choose your separation technique following a detailed process design and HAZOP study. Follow formal operating instructions to ensure effective separation and minimisation of losses. Adhere to design conditions such as heat input, reflux flows and ratios, etc. 2. Install instrumentation to warn of faults in the system, such as a temperature, pressure, or low coolant-flow alarms.	Please refer to Operations – Separation Stage Solid-Liquid Separations section
Operations – Separation Stage Liquid-Liquid Separations	
1. Use techniques which maximise physical separation of the phases (and also aim to minimise mutual solubility) where practicable. 2. When the phases are separated, use techniques which prevent (or minimise the probability and size of) breakthrough of the organics phase into a waste-water stream. This is particularly important where the environmental consequences of subsequent releases of organics to air or into controlled waters may be significant (e.g. where the effluent is treated in a DAF unit or some of the organic components are resistant to biological treatment). 3. When a separation is done by hand, use a "dead man's handle", backed-up by good management, to improve the chance of the flow being properly controlled as the phase boundary approaches. 4. Consider if automatic detection of the interface is practicable. 5. Where you are discharging to drain, consider whether there should be an intermediate holding or "guard" tank to protect against accidental losses from the organics phase.	N/A
Operations – Separation Stage Solid-Liquid Separations	

Indicative BAT Requirement	Specific Measure
1. Use techniques to minimise, re-use and/or recycle rinse water, and to prevent breakthrough of solids. 2. Install instrumentation or other means of detecting malfunction as all of the techniques are vulnerable to solids breakthrough 3. Consider installing "guard" filters of smaller capacity downstream which, in the event of breakthrough, rapidly 'clog' and prevent further losses. 4. Have good management procedures to minimise loss of solids, escape of volatiles to air and excessive production of wastewater.	Ferric sulphate will be pumped to a filter press to remove any remaining unwanted solids from the reaction. Filter sequences have been amended to allow the filter press to be washed and used for an increased number of batches before cleaning is required. Bottom valves are to be added to the filter press on the new production line so that the filter can fill more efficiently during the wash stage and 'pre coat' more evenly. The water used for washing will be pumped back to the recycled process water tank to be reused in the process. **Outcome - Compliant**
Operations – Chemical Process Controls	
1. Monitor the relevant process controls and set with alarms to ensure they do not go out of the required range.	Reaction conditions including temperature and addition of raw materials are monitored during the reaction. **Outcome – Compliant**
Operations - Analysis	
1. Analyse the components and concentrations of by products and waste streams to ensure correct decisions are made regarding onward treatment or disposal. Keep detailed records of decisions based on this analysis in accordance with management systems.	The sulphate content of the filter cake has been analysed on the existing ferric sulphate line. Once the second ferric sulphate production line is operational, the resultant filter cakes will be analysed to establish a baseline sulphate content and to determine the appropriate disposal method. **Outcome – Compliant**
Emissions and Monitoring – Point Source Emissions to Air	
1. Formally consider the information and recommendations in the BREF on Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector (see Reference 1, Annex 2) as part of the assessment of BAT for point-source releases to air, in addition to the information in this note. 2. The benchmark values for point source emissions to air listed in Annex 1 should be achieved unless we have agreed alternative values. 3. Identify the main chemical constituents of the emissions, including VOC speciation where practicable. 4. Assess vent and chimney heights for dispersion capability and assess the fate of the substances emitted to the environment.	Please refer to section 5.3.1 for details
Emissions and Monitoring – Point Source Emissions to Water	
1. Control all emissions to avoid a breach of water quality standards as a minimum. Where another technique can deliver better results at reasonable cost it will be considered BAT and should be used.	N/A

Indicative BAT Requirement	Specific Measure
2. Use the following measures to minimise water use and emissions to water: • Where water is needed for cooling, minimize its use by maximising heat transfer between process streams. • Use water in recirculating systems with indirect heat exchangers and a cooling tower rather than a once through system. (A water make-up treatment plant and a concentrated purge stream from the system to avoid the build-up of contaminants are likely to be necessary.) • Leaks of process fluids into cooling water in heat exchangers are a frequent source of contamination. Monitoring of the cooling water at relevant points should be appropriate to the nature of the process fluids. In a recirculatory cooling system, leaks can be identified before significant emission to the environment has occurred. The potential for environmental impact is likely to be greater from a once through system. Planned maintenance can help to avoid such occurrences. • Reduce water used for cleaning. • Strip process liquor and treat, if necessary, then recycle/reuse. • Use wet air oxidation for low volumes of aqueous effluent with high levels of organic content, such as waste streams from condensers and scrubbers • Neutralise waste streams containing acids or alkalis to achieve the required pH for the receiving water. • Strip chlorinated hydrocarbons in waste streams with air or steam and recycle by returning to process where possible. • Recover co-products for re-use or sale. • Periodically regenerate ion exchange columns. • Pass waste water containing solids through settling tanks, prior to disposal. • Treat waste waters containing chlorinated hydrocarbons separately where possible to ensure proper control and treatment of the chlorinated compounds. Contain released volatile chlorinated hydrocarbons and vent to suitably designed incineration equipment. • Non-biodegradable organic material can be treated by thermal incineration. However, the thermal destruction of mixed liquids can be highly inefficient, and the waste should be dewatered prior to incineration.	
Emissions and Monitoring – Point Source Emissions to Land	
1. Use the following measures to minimise emissions to land: • Use settling ponds to separate out sludge (Note: Sludge can be disposed of to incinerator, encapsulation, land, or lagoon depending upon its make up.) • Chlorinated residues should be incinerated and not released to land. (Chlorinated hydrocarbons are not to be released to the environment due to their high global	N/A

Indicative BAT Requirement	Specific Measure
warming and ozone depletion potentials.) • Either recycle off specification product into the process or blend to make lower grade products where possible • Many catalysts are based on precious metals and these should be recovered, usually by return to the supplier.	
Emissions and Monitoring – Fugitive Emissions	
You should where appropriate: 1. Identify all potential sources and develop and maintain procedures for monitoring and eliminating or minimising leaks. 2. Choose vent systems to minimise breathing emissions (for example pressure/ vacuum valves) and, where relevant, should be fitted with knock-out pots and appropriate abatement equipment. 3. Use the following techniques (together or in any combination) to reduce losses from storage tanks at atmospheric pressure: • maintenance of bulk storage temperatures as low as practicable, taking into account changes due to solar heating etc. • tank paint with low solar absorbency • temperature control • tank insulation • inventory management • floating roof tanks • bladder roof tanks • pressure/vacuum valves, where tanks are designed to withstand pressure fluctuations • specific release treatment (such as adsorption condensation)	The temperature of the hydrogen peroxide storage tank is monitored for potential decomposition of the contents. Level indicators are in place on all storage tanks. Monitoring programmes are in place for existing bulk storage tanks, pipework and bunds to check integrity and for evidence of any leaks. This programme will extend to the new production line and associated equipment onsite. Regular servicing and maintenance programmes are also in place. **Outcome - Compliant**
1. Provide hard surfacing in areas where accidental spillage or leakage may occur, e.g., beneath prime movers, pumps, in storage areas, and in handling, loading and unloading areas. The surfacing should be impermeable to process liquors. 2. Drain hard surfacing of areas subject to potential contamination so that potentially contaminated surface run-off does not discharge to ground. 3. Hold stocks of suitable absorbents at appropriate locations for use in mopping up minor leaks and spills and dispose of to leak-proof containers. 4. Take particular care in areas of inherent sensitivity to groundwater pollution. Poorly maintained drainage systems are known to be the main cause of groundwater contamination and surface/above-ground drains are preferred to facilitate leak detection (and to reduce explosion risks). 5. Additional measures could be justified in locations of particular environmental sensitivity. Decisions on the measures to be taken should take account of the risk to groundwater. 6. Surveys of plant that may continue to contribute to leakage should also be	Operational areas of the site benefit from an engineered containment system comprising an impermeable concrete surface. The entire installation is bunded and any spills from site in operational areas will enter the closed loop drainage system. **Outcome - Compliant**

Indicative BAT Requirement	Specific Measure
considered, as part of an overall environmental management system. In particular, you should consider undertaking leakage tests and/or integrity surveys to confirm the containment of underground drains and tanks.	
Emissions and Monitoring – Odour	
1. Manage the operations to prevent release of odour at all times. 2. Where odour releases are expected to be acknowledged in the permit, (i.e., contained and treated prior to discharge or discharged for atmospheric dispersion): • for existing installations, the releases should be modelled to demonstrate the odour impact at sensitive receptors. The target should be to minimise the frequency of exposure to ground level concentrations that are likely to cause annoyance • for new installations, or for significant changes, the releases should be modelled and it is expected that you will achieve the highest level of protection that is achievable with BAT from the outset • where there is no history of odour problems then modelling may not be required although it should be remembered that there can still be an underlying level of annoyance without complaints being made • where, despite all reasonable steps in the design of the plant, extreme weather or other incidents are liable, in our view, to increase the odour impact at receptors, you should take appropriate and timely action, as agreed with us, to prevent further annoyance (these agreed actions will be defined either in the permit or in an odour management statement). 3. Where odour generating activities take place in the open, or potentially odorous materials are stored outside, a high level of management control and use of best practice will be expected. 4. Where an installation releases odours but has a low environmental impact by virtue of its remoteness from sensitive receptors, it is expected that you will work towards achieving the standards described in this guidance note, but the timescales allowed to achieve this might be adjusted according to the perceived risk. 5. Where further guidance is needed to meet local needs, refer to Horizontal Guidance Note H4 Odour (see GTBR, Annex 1).	The ferric sulphate production process does not generate significant odour and the site has not received any complaints regarding odour in the past. Regular routine observations onsite include qualitative assessment of noise, litter, and odour, the results of which are recorded. **Outcome - Compliant**
Emissions and Monitoring – Noise and Vibration	
1. Install particularly noisy machines such as compactors and pelletisers in a noise control booth or encapsulate the noise source. 2. Where possible without compromising safety, fit suitable silencers on safety valves.	All new equipment to be installed has been designed to appropriate European or UK standards and will be subject to regular servicing and planned preventative maintenance. There have been no previous issues or complaints relating to noise from site. **Outcome - Compliant**

Indicative BAT Requirement	Specific Measure
3. Minimise the blow-off from boilers and air compressors, for example during start up, and provide silencers.	
Emissions and Monitoring – Monitoring	
1. Carry out an analysis covering a broad spectrum of substances to establish that all relevant substances have been taken into account when setting the release limits. The need to repeat such a test will depend upon the potential variability in the process and, for example, the potential for contamination of raw materials. Where there is such potential, tests may be appropriate. 2. Monitor more regularly any substances found to be of concern, or any other individual substances to which the local environment may be susceptible and upon which the operations may impact. This would particularly apply to the common pesticides and heavy metals. Using composite samples is the technique most likely to be appropriate where the concentration does not vary excessively. 3. If there are releases of substances that are more difficult to measure and whose capacity for harm is uncertain, particularly when combined with other substances, then "whole effluent toxicity" monitoring techniques can be appropriate to provide direct measurements of harm, for example, direct toxicity assessment.	Feralco already produce ferric sulphate onsite and conduct emissions monitoring annually for sulphur dioxide and particulate matter in accordance with their EP requirements. Monitoring is conducted by an external provider who are part of the MCERTS certification scheme. **Outcome - Compliant**
Emissions and Monitoring – Monitoring and Reporting of Waste Emissions	
1. Monitor and record: • the physical and chemical composition of the waste • its hazard characteristics • handling precautions and substances with which it cannot be mixed.	Washing of the filter cake will result in a potentially reduced level of sulphate, making it less hazardous for disposal. The sulphate content of the filter cake has been analysed on the existing ferric sulphate line. Once the second ferric sulphate production line is operational, the resultant filter cakes will be analysed to establish a baseline sulphate content and to determine the appropriate disposal method. Reactors are cleaned 3-4 times per year and the residues disposed of. **Outcome - Compliant**
Monitoring - Process Variables	
1. Identify those process variables that may affect the environment and monitor as appropriate.	Process variables including but not limited to energy consumption, water use and performance of the water scrubber will be monitored throughout the process. **Outcome - Compliant**

6.0 Infrastructure and Equipment Inventory

6.1 Engineered Containment System

6.1.1 Surfacing

Operational areas of the site benefit from an engineered containment system comprising an impermeable concrete surface.

6.1.2 Sub-Surface Structures

The precise locations of subsurface drains, pipework and interceptors is established and recorded, and relevant documentation maintained in the site office.

6.1.3 Bunds

Bunds are provided for all tanks containing liquids whose spillage could be harmful to the environment. Containment bunds are provided to make sure that any leaks/spillages are contained in the event of a leak of the primary containment. The containment measures comprise of the following:

- bunds on site are capable of containing at least 110% of the volume of the largest tank within the bund;
- bunds are constructed of materials which are impermeable (reinforced concrete coated with resin) and resistant to the stored materials in accordance with relevant safety data sheets (SDS).;
- bunds are constructed to the appropriate British Standard and Health and Safety Executive (HSE) guidance;
- of a type suitable for the containment of the materials in the event of leak or spill;
- pipework will be routed within bunded areas so that no penetration of walls or base of the bund takes place; and
- connection points will be located within the bund

Bunds are visually inspected monthly to check the integrity and to determine if there is any damage. Any maintenance this is required is promptly carried out.

The following bunds are installed on site as part of the existing ferric sulphate production line:

- One bund containing T10, T11, T12 and T13;
- One bund containing the water scrubber, RTK01 and RTK02 and;
- One bund containing STK01, STK02, STK03 and T1200

The following bunds are to be installed on site as part of the new ferric sulphate production line:

- One bund containing the new water scrubber abatement system;
- One bund (volume 66m^3) containing T250A, T250B,T251A and T251B and;
- One bund (volume 212.5 m^3) containing T150, T252, T253, T254, T255 and T256

6.1.4 Management and Operational Techniques

Containment engineering will prevent the release of potentially polluting liquids to surface water and groundwater. Plant operatives undergo awareness training to ensure a full understanding of the containment engineering to help minimise the environmental impact of the site. The engineered containment system is subject to routine visual inspection. Identified breaches in the engineered containment are remedied to ensure continued integrity of the facility, and to prevent pollution of surface or groundwater. Records of inspection and maintenance are maintained by the HSEQ Manager.

6.2 Engineered Drainage and Surface Water Management

The processing and raw material storage areas are underlain by concrete surfacing to capture and prevent percolation of potentially contaminated water into the ground.

Water that collects in the various sumps on site, including tank farm, road loading, scrubber and pump over from the hydrogen peroxide bund, is pumped to the recycled process water storage tank and used in the reactor vessels. There is no process water effluent discharge to sewer.

The entire installation is bunded and any spills from site in operational areas will enter the closed loop drainage system. Bunding will be subject to routine inspections, with any remedial work undertaken and recorded.

Surface water from building roofs and other uncontaminated areas of site is discharged to the public surface water system without treatment.

6.3 New Equipment

The key items of plant and equipment that will be used at the site to manufacture ferric sulphate are detailed below. All items of plant and equipment will be maintained in accordance with the manufacturer’s recommendations.

The key components will include, but not be limited to:

- two magnetite slurry make up vessels, each with 12m^3 capacity;
- two reactor vessels, each with 60m^3 capacity;
- two oxidation vessels, each with 60m^3 capacity;
- pre coat mixing vessel;
- sulphuric acid storage tank;
- recycled process water storage tank;
- five product storage tanks;
- water scrubber abatement system;
- feed hopper;
- cooling services, powder handling system;
- cooling tower;
- aeromechanical conveying system;
- PLC control system; and
- one new reactor vessel for line 1.

Full details of the equipment being installed as part of the new production line, are detailed in Table 2.

7.0 Raw Materials

7.1 Inventory of Raw Materials

The raw materials that are used on site for the manufacture of ferric sulphate are detailed in Table 4.

A Control of Substances Hazardous to Health (COSHH) assessment is undertaken prior to the use of chemicals, and if the chemical is found to present a hazard to health, it is added to the COSHH inventory.

Safety Data Sheets (SDS) for any potentially hazardous materials or chemicals are kept on site together with the COSHH assessment register. The SDS provides information on how chemicals should be handled, stored and disposed of, and what to do in the event of an accident.

7.2 Raw Materials Selection

Wherever possible, raw materials are selected to minimise environmental impact. Consideration is given to such factors as degradability, bioaccumulation potential, product contamination and toxicity. Reviews are frequently undertaken to ensure that all raw materials are appropriate for use, that consumption is optimised and that opportunities for reduction and improvements are implemented through an action plan.

Alternative raw materials are evaluated for their environmental impact on an on-going basis and, where there is no overriding quality requirement, substitution is given appropriate consideration. The on-going programme of professional and technical development for all site personnel is to ensure awareness of new developments in product availability and their implication.

7.2.1 Waste Minimisation Audit (minimising the use of raw materials)

Waste generation at the site is reviewed annually and where necessary an appropriate improvement programme is implemented.

7.2.2 Water Use

The main use of water at the site is for use during production of ferric sulphate.

The use of water is regularly reviewed to ensure maximum efficiency and to ensure that any further potential for reduction in consumption and recycling opportunities are identified. Recycled process water is used in the reactor vessel during production of ferric sulphate. The recycled process water is collected from various sumps on site, including the tank farm, road loading and scrubber bund. Spent scrubber liquor is discharged to the recycled process water tank to be reused in the process and fresh water is used to make up the volume of spent liquor that has been discharged.

8.0 Waste Handling, Recovery or Disposal

Waste present at the site falls into one category:

- Waste generated from on-site processes.

All solid waste is managed and disposed or recovered in accordance with the Duty of Care and the Environmental Permitting Regulations. All waste recovered or generated during the processes undertaken at the site is removed to a suitable licensed processing or disposal site.

The categories of waste, storage arrangement on site, and recovery/disposal options are detailed in Table 7 below.

Table 7. Waste Storage, Recovery and Disposal

Waste Material	Storage Arrangements	Disposal or Recovery
Wastes from on-site processes		
Filter cake (from filter press)	200 litre UN approved drums	Disposal
Reactor residues following reactor clean (approx. four times per year)	200 litre UN approved drums	Disposal

Waste storage on site is protected from vandalism by site security fencing around the site. The site gates are securely locked when there is no on-site presence.

8.1 Waste Minimisation

The key methods of ensuring that waste minimisation occurs on site includes;

- incentivise feedstock suppliers to supply high quality feedstock (improved off site separation);
- working proactively with feedstock suppliers to measure and report on quality;
- the ongoing identification and implementation of waste prevention opportunities;
- the active participation and commitment of staff in all areas of the business; and
- monitoring of materials usage and reporting against key performance measures.

Feralco are taking appropriate measures to ensure that;

- the waste hierarchy (referred to in Article 3 of the Waste Framework Directive) is applied in the generation of waste on site by the activities;
- any waste generated by the activities is treated in accordance with the waste hierarchy; and
- where disposal is necessary, as opposed to recovery, that it is undertaken in a manner which minimises its impact on the environment.

Feralco undertake a review and record at least every four years whether changes to those measures should be made and take any further appropriate measures identified by the review. Feralco look to avoid waste production as much as possible. Any waste produced on site is recovered, unless there are instances whereby it is not technically or economically practicable to do so. Plastic IBCs are recycled as much as possible. Second hand drums and IBCs are utilised for waste disposal where possible.

9.0 Energy

9.1 Energy Consumption

The primary purpose of the site is to produce water treatment chemicals. The main energy consumption items are detailed in Table 8.

Table 8. Energy Consumption

Energy Source	Annual Consumption (MWh)
Electricity from National Grid	Ferric Sulphate Line 1 (Existing) – 99.8 Ferric Sulphate Line 2 (New) - 363

The site is not part of a Climate Change Agreement.

9.2 Energy Management Measures

A number of features have been incorporated within the design of the site in order to minimise energy use:

- Low energy light fittings will be used where practicable;
- Category IE3 high efficiency electrical drive motors; and
- Use of variable speed drives.

To optimise energy efficiency, equipment is maintained and serviced as required. Plant and equipment are subject to regular maintenance to ensure it continues to operate at optimum energy efficiency and that energy consumption does not increase due to inefficient performance.

Energy use is monitored and recorded and periodically reviewed to identify areas of improvement and to ensure that any inefficiencies are investigated, and appropriate actions taken.

Energy use and energy minimisation is included within the management system for the control of resources. Within the management system the review process identifies energy use by source for the different site operations. The results are used to identify potential measures for improving energy efficiency.

9.3 In-Process Controls

9.4 Material Storage and Handling

Arrangements for raw material storage are detailed in Section 4 and waste details are in Section 8 of this BATOT.

Feralco site tanks are manufactured from a range of materials as detailed in Table 1 and 2 of this document.).

The storage procedures that are implemented on site are considered to be best practice for the following reasons:

- storage areas are clearly marked;

- procedures are in place for the regular inspection and maintenance of storage areas with any repairs being undertaken as soon as is practicable;
- storage tanks are designed to be fit for purpose, taking into account the nature of the material to be stored and the required design life;
- tanks are fully quality assured and tested for leakage prior to commissioning;
- bulking and mixing only takes place under instruction from appropriately trained personnel; and
- written records of all tanks will be kept, detailing:
  - capacity;
  - maintenance schedules and inspection results; and
  - materials stored in the vessel.

9.5 Process Control Monitoring

The new proposed ferric sulphate manufacturing line, line 2, will benefit from a number of process control features which will ensure adequate control of the processes and prevent the development of abnormal operating conditions. Specific measures are detailed in Section 5 of this document alongside details of the manufacturing processes; however, additional information is provided below.

9.5.1 Process Control System

The plant will be fitted with its own Supervisory Control and Data Acquisition system. (SCADA). The SCADA shall be fully configured, both hardware and software, with the plant and its various controllers. The key function of the SCADA shall be to control, monitor and report the activities of the plant through the direction of the operators. Normal operation and supervision will be performed from workstations located in the central control room.

9.6 Inspection, Maintenance and Monitoring

Infrastructure and equipment on site are inspected on a regular basis and maintained and repaired as necessary. In addition, the operator undertakes visual checks on all plant and equipment at least once a week and, if deemed necessary, brings forward any planned maintenance or undertake remedial works. Routine inspections are undertaken and include the following:

- Pressure systems;
- High Low voltage electrical equipment;
- Portable Appliance Testing;
- Non-Destructive Testing; and
- Calibration on temperature and weighing equipment.

Records of all visual and scheduled inspections and details and certificates (where appropriate) of any maintenance work will be regularly updated and maintained. Maintenance schedules for equipment will be regularly reviewed and updated.

Monitoring and recording of conditions within the plant is carried out on a continuous basis by the comprehensive network of sensors and instrumentation as discussed above and displayed via the process control system. This will enable continuous mapping of the process in order to ensure efficiency of the process.

10.0 Control of Noise

Feralco recognises that the site should be operated in a manner that minimises or prevents noise and / or vibration nuisance.

10.1 Noise Mitigation and Management Measures

Mitigation to reduce the impact to receptors that may be affected by the noise emissions from the site are detailed below.

10.1.1 Operating Hours

The facility will operate 24 hours a day, Monday – Thursday 250 days a year.

10.1.2 Building and Plant Design

Opening of doors will be kept to a minimum and roller shutter doors will be installed where appropriate.

10.1.3 Plant Selection

Plant options with lower noise levels will be used wherever possible to ensure noise is kept to a minimum.

Plant and equipment will be maintained regularly to minimise noise resulting from deterioration and inefficient operation. If any items of plant are found to give rise to unacceptable noise levels, consideration will be given to their replacement with quieter designs. If equipment continues to generate unacceptable noise levels, consideration will be given to modification to incorporate noise suppression equipment or replacement components.

10.1.4 Management Measures

The HSEQ Manager will be responsible for ensuring that in the event of any nuisances arising from site noise are minimised. All site personnel will be trained in the need to minimise site noise and will be responsible for monitoring and reporting excessive noise when carrying out their everyday duties.

10.1.5 Noise Action Plan

In the event that noise is found to be causing a problem, action will be taken to determine the source and to take remedial actions as follows:

- shut down, replace, service or repair equipment to reduce noise levels; and
- modify plant to incorporate noise suppression equipment.

Records relating to the management and monitoring of noise will be maintained and include:

- inspections undertaken;
- noise problems (including date, time, duration, prevailing weather conditions and cause of the problem);
- complaints received; and

- corrective action taken and changes to operational procedures to prevent future occurrences.

11.0 Control of Emissions to Air

11.1 Air Emissions Risk Assessment Summary

An Air Emissions Risk Assessment (AERA) is provided in Section 5 of this application. Please refer to the assessment for a detailed account of the potential emissions from the new process, emission rates and abatement technologies provided. The locations of the point source emission points to air are detailed in Drawing 002.

However, a short summary of the methodology and conclusions is given below.

11.1.1 Methodology

The AERA screening assessment has been undertaken using the EA's 'Air emissions risk assessment for your environmental permit' guidance. The screening guidance provides the following steps for screening emissions:

- Step 1: Calculate the environmental process contribution (PC).
- Step 2: Identify PCs with insignificant environmental impact so that they can be 'screened out'.
- Step 3: For PCs not screened out in Step 2, calculate the predicted environmental concentration (PEC)
- Step 4: Identify emissions that have insignificant environmental impact.
- Step 5: Undertake a detailed assessment for the emissions that cannot be screened out.

11.2 Conclusions

The conclusions of the AERA are as follows:

- the process contributions as a result of the proposed new scrubber abatement system, do not lead to any exceedances of the standards (long-term or short-term) for the protection of human health at any location outside of the site; and
- the process contributions as a result of the proposed new scrubber are considered to cause 'no likely significant effects' and 'no significant pollution' at designated ecological receptors.

The new ferric sulphate production line has its own dedicated water scrubber abatement system to treat sulphuric acid vapours. The emissions from the new production line have been modelled and, with reference to the conclusions above and to the AERA in section 5 of this application, clearly demonstrate the new water scrubber is sufficiently sized to treat and manage the emissions from the new production line.

12.0 Control of Emissions to Groundwater, Surface Water and Sewer

The potential risks from the proposed activities have been evaluated in the ERA, and preventative and mitigating measures have been designed in accordance with the identified risks. The control measures are presented in this section.

12.1 Point Source and Fugitive Emissions to Groundwater

There are no point source emissions to groundwater. The site benefits from impermeable surfacing and a sealed closed loop drainage system.

The containment measures in place at the site are described in Section 6 of this BATOT. These ensure there are no point source or fugitive emissions to groundwater.

Consequently, there is no direct or indirect discharges of contaminating materials into groundwater from the site.

12.2 Point Source Emissions to Surface Water

Feralco drainage and containment arrangements for the site are described in Section 6 of this BATOT.

Uncontaminated rainwater from non-operational areas of the site is discharged to Steward's Brook via surface grids.

12.3 Fugitive Emissions to Surface Water

The containment measures in place at the site are described in Section 6 of this BATOT. These will ensure there are no fugitive emissions to surface water.

12.4 Point Source Emissions to Sewer

There is no discharge to foul sewer from trade effluent. There are no foul sewers on site.

Surface water from building roofs and other uncontaminated areas of site is either collected in bunds and transferred to storage or discharged to Steward's Brook via surface grids.

12.5 Fugitive Emissions to Sewer

There are no sewers on site. The drainage and containment arrangements for the site are described in Section 6 of this BATOT.

13.0 Control of Litter and Dust

13.1 Litter

Feralco maintain the site in a tidy condition and prevent the escape of litter onto surrounding land by undertaking the following the measures:

- The site is kept clean and tidy by way of a daily housekeeping regime.
- All raw materials for the process are delivered in bulk so there is no packaging waste that could create litter.
- Daily monitoring is carried out by the HSEQ Manager, Production Manager or a designated individual. Litter picking is undertaken as necessary in response.
- Perimeter walls surrounding the site reduce the chance of litter blowing off site.
- The HSEQ Manager and Production Manager are responsible for monitoring the site and maintain it free of litter. Records are maintained of monitoring, complaints and remedial actions taken.

13.2 Dust

Magnetite powder is stored in a dedicated building and a front-end loader will be used to load the powder into the hopper which then feeds the conveyor leading to the magnetite slurry make up vessel, leading to minimal dust generation. The magnetite powder is 'damped' and heavy which also minimises dust generation.

The other steps involved in the production process are not considered to be dusty activities.

Due to the nature of the process and the mitigation measures employed on site, the need for a dust management plan has been scoped out.

In order to prevent other potential sources of dust, Feralco implement the following measures:

- Good housekeeping of roads and surfaces; and
- Speed limits are implemented at the site.

In the event dust is detected, investigations will be undertaken to determine the cause and appropriate remedial action.

14.0 Monitoring

The site is subject to a comprehensive programme of monitoring to ensure it operates to the specified design standards and does not give rise to unacceptable environmental impact.

Monitoring comprises the following:

- general observations;
- monitoring of infrastructure and equipment;
- monitoring of process variables; and
- emissions monitoring.

14.1 General Observations

Routine observations and monitoring are undertaken daily by site personnel to ensure that the site operates correctly and without giving rise to unacceptable levels of emissions.

Routine regular observations include qualitative assessment of noise, litter, and odour at the installation.

14.2 Monitoring of Infrastructure and Equipment

Infrastructure and equipment are subject to regular visual inspection. In the event of deterioration or damage, appropriate remedial action is taken to restore the infrastructure and equipment to a satisfactory condition.

14.3 Emissions Monitoring

14.3.1 Monitoring Emissions to Air

Emissions to air are subject to a routine monitoring programme as detailed in EP WP3630WV and below in Table 9.

Table 9. Emissions Limits and Monitoring Programme

Parameter	Emission Limit (mg/m^3)	Reference Period	Monitoring Frequency	Monitoring Method
Sulphur Dioxide	50	15 mins average	Annual	BS EN 14791:2017
Particulate Matter	10	1 hour average	Annual	BS EN 13284-1

14.4 Monitoring Standards and Techniques

Monitoring is undertaken in compliance with recognised techniques or using ‘standard methods. Monitoring equipment is calibrated, serviced and maintained in line with manufacturer recommendations.

14.4.1 Monitoring Stack Emissions

Emissions monitoring of the new scrubber stack will be undertaken in accordance with the requirements of the EA’s M1 technical guidance document.

Prior to undertaking stack emissions monitoring a Site-Specific Protocol (SSP) will be prepared to ensure the monitoring is carried out in accordance with EA technical guidance note M1, Sampling Requirements for Stack Emissions Monitoring.

Specifically, the SSP will consider the following aspects:

- selection of the sampling position, sampling plan and sampling points;
- access, facilities and services required; and
- safety considerations.

The SSP will ensure that a representative sample is obtained from the stack.

The sampling approach, technique, method and equipment that are chosen will ensure:

- a safe means of access to the sampling position;
- a means of entry for sampling equipment into the stack;
- adequate space for the equipment and personnel; and
- provision of essential services such as electricity.

14.5 Monitoring Action Plan

In the event that the monitoring programme identifies a potentially significant release, the following actions are undertaken:

- the HSEQ Manager is informed immediately;
- actions to isolate and contain the source of release is undertaken; and
- the causes of the release are evaluated, and where possible, procedures put in place to prevent a recurrence.

In the event that abnormal monitoring results are identified, site personnel will inform the HSEQ Manager and appropriate action will be taken to return the process to normal operating conditions. An inspection of the facility will be undertaken to identify the cause and necessary remedial action will be taken.

14.6 Management, Reporting and Training

All monitoring results are recorded and stored electronically. The HSEQ Manager or their nominated deputy inspect the monitoring records at a suitable frequency to ensure monitoring is being undertaken in accordance with procedures. Results are examined annually as part of the site's management review.

Staff involved in sampling and monitoring are trained sufficiently to carry out the set procedures and are trained in the reporting requirements of the environmental permit.

15.0 Closure

15.1 Operations During the Period of the Environmental Permit

The operations at the site should not lead to a deterioration of the land by the introduction of any polluting substances due to the containment and control measures which are implemented to ensure the processes are contained within the appropriate structure / containers.

In the unlikely event of a potentially polluting incident, which impacts the site, the HSEQ Manager records the details of the incident together with any further investigation or remediation work carried out. This ensures that there is a continuous record of the state of the site throughout the period of the permit.

15.2 Design of Site

Records are maintained of the location of facilities, services, and sub-surface structures. During any modifications or alterations on site, care is taken to update these records to ensure easy closure of the site.

The design ensures that:

- there are no underground tanks for the containment of potentially polluting substances;
- there is provision for the draining and clean out of vessels and pipe work prior to dismantling; and
- materials used are recyclable, if practicable (having regard for operational and other environmental protection objectives).

All supporting equipment manuals and documentation is maintained in a duplicate hard copy ring binder and one electronic version of all documentation and manuals is maintained on the company SharePoint system.

15.3 Site Closure Plan

Definite closure will occur when the site stops producing water treatment chemicals. Actions that will be taken at this point to avoid pollution risk and return the site to a satisfactory condition are set out below.

15.3.1 Communication

Feralco will inform the EA in writing of the date of the cessation the production of water treatment chemicals. This will enable the EA to inspect the site, approve the closure and agree upon the actions that should occur post-closure.

15.3.2 Access and Security

Security provision will be audited to ensure that the site is in a secure condition and that unauthorised access is avoided. Site security will be maintained through local perimeter brick, concrete and chain linked fencing with barbed wire and lockable gates at the site entrance. Regular inspections of the perimeter and gates will be carried out, and damage will be repaired as soon as practicable. If necessary temporary repairs will be implemented until permanent repairs can be carried out.

15.3.3 Restoration

Substances will be removed in such a way as to protect land and groundwater from potentially harmful contents. Containers and other structures will be dismantled in such a way as to prevent pollution risk to the surrounding environment.

Storage and treatment vessels and drainage systems will be drained and cleaned prior to dismantling, with all effluent and solid residues being contained and taken to an appropriate treatment or disposal facility.

16.0 Environmental Impact

16.1 Impact Assessments

A number of impact assessments have been undertaken in support of this application to demonstrate that the operation of the proposed reactor vessel at the site will not give rise to unacceptable impact on the environment.

The assessments carried out in line with current EA guidance are as follows;

- ERA (Section 4); and
- Air Emissions Risk Assessment (Section 5)

The conclusions of the assessments are summarised below.

16.2 Environmental Risk Assessment

The ERA considers numerous potential risks including, but not limited to odour, fugitive emissions, dust, releases to water, litter, and potential for accidents and incidents. The assessment concludes that with the implementation of the risk management measures described, potential hazards from the proposed development are not likely to be significant.

The ERA is enclosed as Section 4 of this application.

16.3 Air Emissions Risk Assessment

The AERA has quantified and assessed the potential air quality impacts associated with operations on site using EA approved techniques against published standards for the protection of human health and designated ecological sites.

The AERA concluded that the emissions process contribution can be considered ‘insignificant’ against relevant long-term and short-term standards for the protection of human health.

The AERA also concluded that the emissions process contribution is not likely to cause significant effects or significant pollution at the designated ecological receptors.

The emissions from the new ferric sulphate production line have been modelled and, with reference to the conclusions above and to the AERA in section 5 of this application, clearly demonstrate that the new water scrubber abatement system is sufficiently sized to treat and manage the emissions from the new production line.

The AERA is enclosed as Section 5 of this application.

17.0 Information

17.1 Reporting and Notifications

All relevant notifications and submissions to the EA regarding the site are made in writing and quote the permit reference number and the name of the permit holder.

Records are maintained for at least six years, however in the case of off-site environmental effects, and matters which affect the condition of land and groundwater, the records are kept until permit surrender

17.1.1 Waste Type and Quantities

A report summarising the raw material types and quantities accepted and removed from the site is submitted to the EA annually.

17.1.2 Relevant Convictions

The EA are notified of the following events:

- the operator being convicted of any relevant offence; and
- any appeal against a conviction for a relevant offence and the results of such an appeal.

17.1.3 Notification of Change of Operator of Holder Details

The EA are notified of the following:

- any change in the operator's trading name, registered name or registered office address; and
- any steps taken with a view to the company going into administration, entering into a company voluntary arrangement or being wound up.

17.1.4 Adverse Effects

The EA are notified without delay following the detection of the following:

- any malfunction, breakdown or failure of equipment or techniques;
- any accident;
- fugitive emissions which have caused, is causing or may cause significant pollution; and
- any significant adverse environmental and health effect.

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