OPERATING-TECHNIQUES & BAT
Fornax (North) Ltd

High Temperature Thermal Treatment Facility

On land off Heighington Lane,
Merchant Park,
Newton Aycliffe

March 2025

Fornax
Environmental Solutions

Basis of Report

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Contents

Closure 141

Appendix 1 – BAT NOX

Appendix 2 – Materials Data Sheets

Issue and revision record

Revision	Date	Originator	Description of changes
Vo.1		JH	Initial draft for comment
Vol. 2	01/11/24	JH	Final Document for submission
Vol 3	01/03/2025	JH	Document Review prior to Public consultation

1 Application documents

1.1 The Listed Activity

The Installation will consist of a single Schedule 1 installation activity (as defined in the Environmental Permitting Regulations) and directly associated activities.

Table 1: Environmental Permit Activities

Type of Activity	R&D Codes	Schedule Activity	Description of Activity
Installation	R1,D10	Section 5.1 Part2 Schedule 1	Incineration of hazardous waste with or without non-hazardous waste, and including high temperature or clinical waste incineration. (Less than 3t/h)
	Directly Associated Activities		
DAA 1	R13: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced). D15 Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where the waste is produced)		The receipt, screening and storage of non Hazardous Waste waste prior to combustion.
DAA 2	R12 Exchange of waste for submission to any of the operations numbered R1 to R11 (repackaging) D14 Repackaging prior to submission to any of the operations numbered D1 to D13		Repackaging of non-hazardous waste.

DAA 3	R13: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced). D15 Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where the waste is produced).	S5.6 A(1)(a) Temporary storage of hazardous waste with a total capacity exceeding 50 tonnes	The receipt, screening and storage of Hazardous Waste waste prior to combustion
DAA 4	R12 Exchange of waste for submission to any of the operations numbered R1 to R11 (repackaging) D14 Repackaging prior to submission to any of the operations numbered D1 to D13		Repackaging of hazardous waste.
DAA 5	Cleaning and disinfection of containers and carts		Washer that cleans and disinfects.
DAA 6	The export of heat via a district heating network from the installation.		Export of Hot water to a district heating scheme
DAA 7	From the receipt of waste to the emission of exhaust gas, storage of untreated Incinerator bottom ash (“IBA”) and disposal of Air Pollution Control Residue (“APCr”) waste arisings transfer of residues for		The handling, storage and transfer off-site.
DAA 8	Chemical adjustment via pH and Chemical Flocculants to site water in holding tank		

The Stationary Technical Unit (the Installation) includes the waste reception, waste preparation and storage, water, fuel oil and air supply systems, Combustion chamber, boiler, facilities for the treatment of exhaust

gases, on-site facilities for treatment or storage of residues and wastewater, stack, devices and systems for controlling combustion operations, recording and monitoring conditions and a district heat network to deliver heat to localised industry.

The nominal operating capacity of the Installation will be approximately 1.0 tonnes per hour of assorted hazardous and clinical waste streams, with a nominal calorific value of 18.8 MJ/kg.
The plant will have an estimated availability of around 8392 hours per annum. Therefore, the plant will have a nominal design capacity of approximately 10,490 tonnes per annum.

As shown in the Firing Diagram provided within the Application Pack, the Facility will process wastes with a waste composition of material fed into the plant homogenised sufficiently to achieve the design point CV of 18.8MJ/kg at all times (range of NCV's 10.7– 26.4 MJ/kg). Assuming the 18.8 MJ/kg NCV of the waste being treated, the facility will process up to 0.96 tph of waste. Assuming the maximum theoretical availability of 8392 hrs., the Facility will have a maximum capacity of up to 10,490 tonnes per annum.

An Installation boundary drawing is also presented in as Drawing 002

1.2 Main Activities

The main activities associated with the Installation will be the combustion of clinical and hazardous waste at temperatures in excess of 1100 degrees to raise steam which is then converted to hot water and delivered via a heat main to local industry consumers.

The installation will be based within 1 main buildings comprising of the Rotary Kiln and boiler house, separated from the waste reception and waste storage areas. Other main features of the plant include a stack of approximately 30m in height and an air-cooled condenser with additional ancillary infrastructure including;
The Installation will consist of a rotary kiln Incinerator capable of generating a nominal 6.2 Megawatt hours thermal ("MWH") of zero carbon rated renewable energy in the form of hot water to be distributed via a district heat main to local based consumers on the estate.
Through detailed design, it is estimated that 6.2MWh can be generated through the thermal treatment of up to 10,500 tonnes per annum of clinical, commercial and industrial hazardous wastes at an average of 19 Megajoules/Kilogram ("MJ/kg").
The heat recovered from the combustion of the waste streams incinerated is captured in a 4 drawer water tube boiler at approximately 130 degrees and then cooled before passing through the heat plate exchanger (HPE), and then exported into the district heating main.

The bin wash machine, the cabinet washer and manual washer will all take 95 degree hot water directly from the pipework between the water boiler and the HPE and the balance of the energy recovered and generated

will be sent directly into the district heat main via the HPE

Weighbridge;

1. **Offices, control room and staff welfare facilities; (housed within main building) & Laboratory**
2. **Site fencing and security barrier**;
3. **External hard standing areas for vehicle manoeuvring/parking;**
4. **Internal access roads and car parking**;
5. **Cooling fans;**

Waste Handling, Storage and Feeding System.

The feed in hopper will receive hazardous and clinical waste types via hydraulic lift or by loading directly to the hopper via forklift.

The hopper system is designed as airtight hydraulic locks which Is mounted to prevent backfire in the a overpressure event in the system.

In the bottom of the hopper a cylindrical hydraulic pusher is mounted with a diameter of app. 900mm. This will allow loading of the specified cans without operational stops.
The hydraulic feeder will include a 3 step position control by magnetic sensors to fit the different operation modes – start up, operation and emergency by backfire.

Thermal Waste Treatment – Rotary Kiln & Primary Combustion

The rotary kiln has been designed for a maximum of mixed waste according to the specifications in the EWC list of 1250kg/hour. To handle variants at the loading point it has been allowed a maximum 30 minutes overload of 1375kg/h, without eliminating the burnout in this short period.

The kiln is built in heat protected boiler steel and is covered inside with a ceramic layer as linings for incineration of difficult fuels at high temperatures.

The rotary kiln is working as the primary combustion where both the volatilizing and oxidization is secured. The temperature inside the first part of the kiln is lower and rising throughout to the last part of the kiln. Primary air is injected in the fuel end and is a streamline over the fuel. The primary air inlet is controlled by a frequency controlled blower which has connection to extract air from the warehouse or atmospheric air and to recirculate air through a controlled damper.

To secure an equal surface temperature of the fuel to kiln, is rotated according to the actual load given in combination with oxygen level and temperatures. The kiln is rotated between 0,5 and 1 rotations per minute giving a throughput time for the fuel between 30 minutes and 1 hour thereby sufficient residence time.

For easy start up the rotary kiln is equipped with a 90KW startup gas burner. This gas burner is mounted just before the material inlet to the combustion chamber.

Auxiliary Burners/Combustion Fans

The rotary kiln is connected to the EBK by a water cooled airtight unit The connection is linned with ceramic compound .

<u>The EBK and secondary combustion</u>

The outlet from the rotary kiln is connected to the inlet of the EBK through a water cooled connection unit.
A 4-draw stagged hot water boiler combined with a 3 draw hot water firetube boiler has been included in the plant.
The retention time of 2 seconds along with achieving the most optimal energy recovery from the hot raw gas.
3 open draws leads the raw gas from the rotary kiln outlet and further on to the low temperature recovery boiler: and outlet connecting to the water filled conveyor transporting the melting slag and the ash particles to container.

The design achieves maximum protection against clogging is achieved – especially when incineration EWC codes at 1100 degrees retention time.

The layout has been selected as previously referenced to achieve the required residence time of 2

seconds, but also to have the free space capacity of handling the flue gas amount of small 12.000Nm3 per hour without exceeding manageable temperatures.

The Air system –

Primary air support is added to the Rotary kiln the secondary and partly tertiary air support is added in the EBK. inlet tubes are controlled mainly by a matrix of the oxygen level and the intake of the secondary air.

For optimal air control separately, blowers are installed.

Inside the first draw the boiler walls will be protected by a layer of refractory lining.

The flue gas fan will be designed to handle the overall pressure drop from all components in the line and at the same time having the power to secure the balance with the primary and secondary blower for securing the oxygen level in the primary combustion chamber.

NOx handling system

The temperatures in the first draw has been calculated to be able to reach 1300 degrees in very short timeframes therefore the EBK has been designed for inlet of the cooling media ammonia mixture. Above 1300 degrees is the point where some of the nitrogen of fresh air can oxidate to NOx (thermal NOx).

The injection nozzles for ammonia mixture inlet placed for 850/2 sec and a set for 1100/2 sec.

The amount of mixture needed for thermal NOx reduction in case the temperature is delivered by the injection nozzles for ammonia mixture via a pump system controlled by a matrix of the NOx detection sensors placed before entering into the stack and the temperature sensors placed in the EBK.

Ash Conditioning and Removal

The Ash system: From the first draw and common for the second and third draw ash hoppers will lead ash down to the water filled ash transport in the floor mezzanine under the EBK.

From the first draw the ash will consist of a mixture of large particles and melting slag. The distribution level between the two types will be defined by the retention temperature level. From the common hopper for the second and the third draw mainly large particles will be the type of ash to be transported to ash transport system.

Temperature sensors will monitor for high temperature exceedance in the ash hoppers and will give indication to the operators in case of exceeded.

Hot Water Boiler and Economiser

After the EBK, specified energy in the form of hot water is produced 4 bars operation pressure and a max temperature of 110 degrees.

The boiler will be constructed in materials which are resistant to the aggressive fluids in the fluegas, and the boiler will be operated at a temperature of approximately 120-130 degrees and a pressure of 6 bars.

There will be one fluegas inlet and one outlet which will be connected to the tubes with a turning chamber large enough for securing depressurisation between the single draws. Inlet temperature has been calculated at max 650 degrees and an outlet temperature at max 180 degrees.

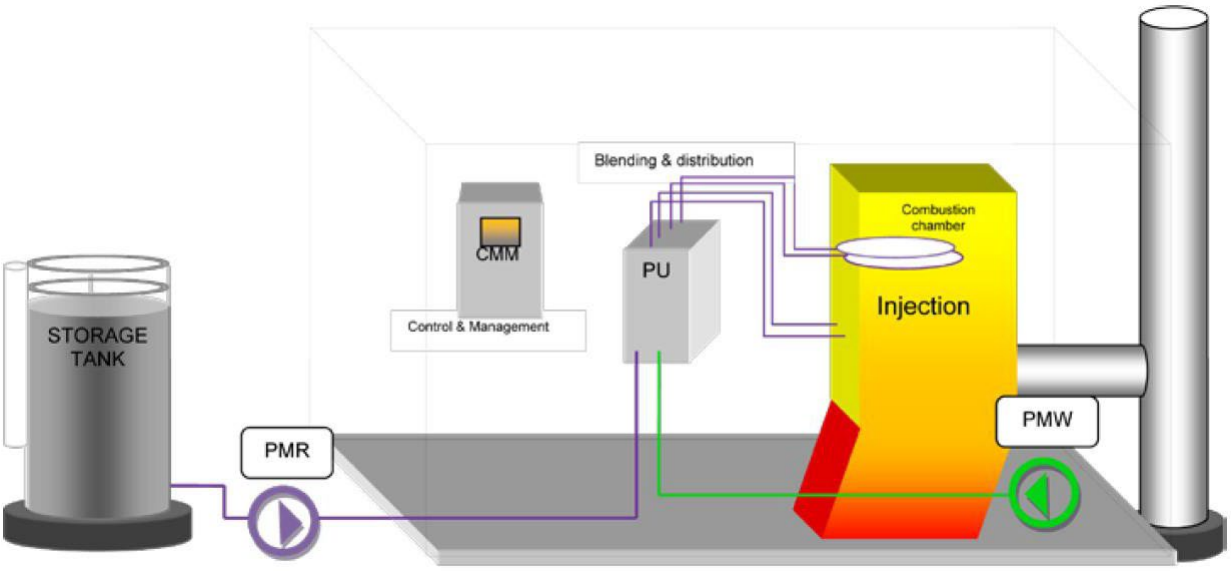
Water connections will be provided to an internal system and also to external district heating grid and will be the full hot water production circuit.

For automatic cleaning purpose the boiler will be equipped with a high pressure tube cleaning system. This system consist of pressurized containers connected to kevlar/metal membranes. Those membranes are activated in a cycle defines in the control system and can be adjusted at each load of the plant for automatically correction. To secure lowest possible wear on this system the membrane chambers are connected to the boiler inlet tubes by stainless steel pipes.

When cleaning the heat transfer tubes in the boiler the particles from this cleaning is very small and fine fragments. This meaning that the released particles are transported with the fluegas system further on to be collected particle cleaning unit. In this way no manual handling is necessary for this cleaning purpose.

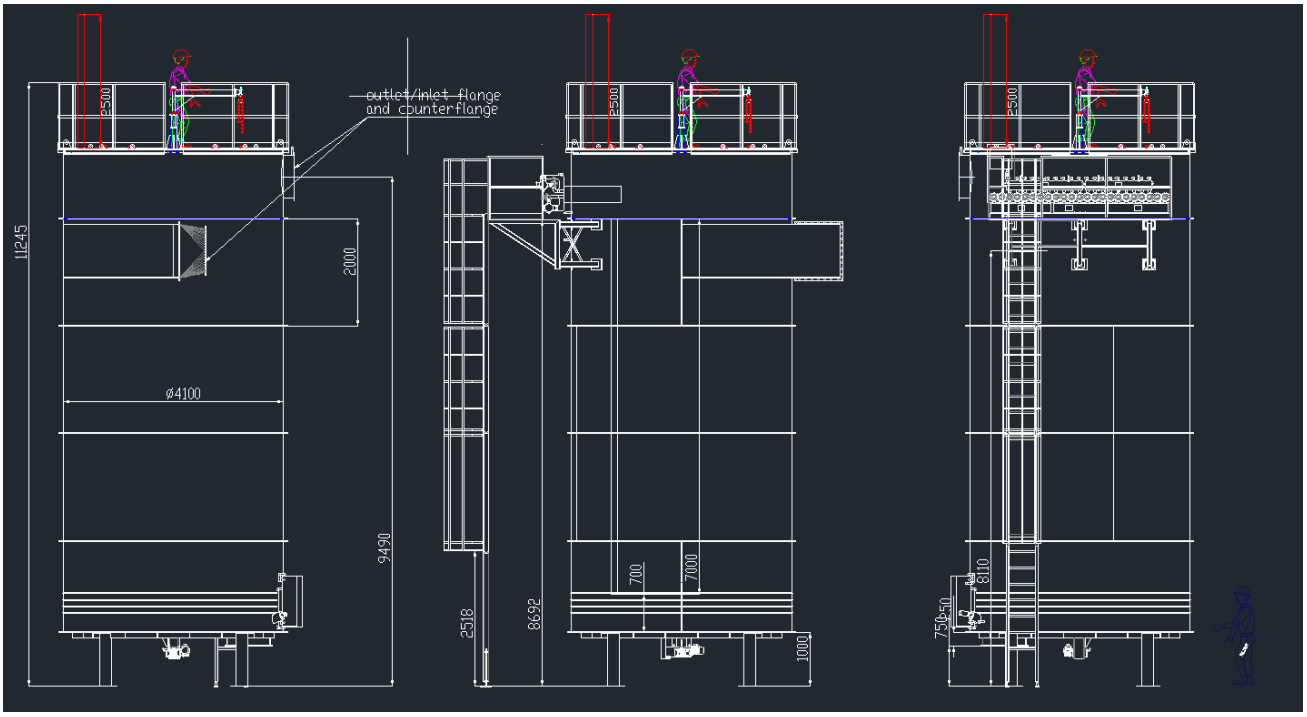
Selective Non-Catalytic Reduction (SNCR) of NOx

Please Refer to Best Available Techniques (BAT) Reference NOx reduction in Appendix 1 of this document.



Flue Gas Treatment

To reduce the particle emission to the approved level a full particle reduction unit will be mounted in the raw gas line. This is mechanical operational bag filter.



This bagfilter will be designed and constructed to be able with a normal level of pressure drop to handle a flue gas volume equal to incinerate 1250kg/h mixed waste according to the approved EWC list.

Inside the filter casing the bags will be designed for handling up to 220 degrees flue gas temperature and to handle the sizes of the particles that have to be sorted away for achieving the maximum weight in the demands.

In the bottom of the filter a robust and simple outlet is present to secure that the sorted particles from the bags and bagholders will easily be dispatched directly to a separate bag.

Air Pollution Control Residues (APCRs)

For reduction of the containment of lead, cadmium, copper and acid (SO2), this plant will be equipped with a dosing system based on a compound of lime and carbon.

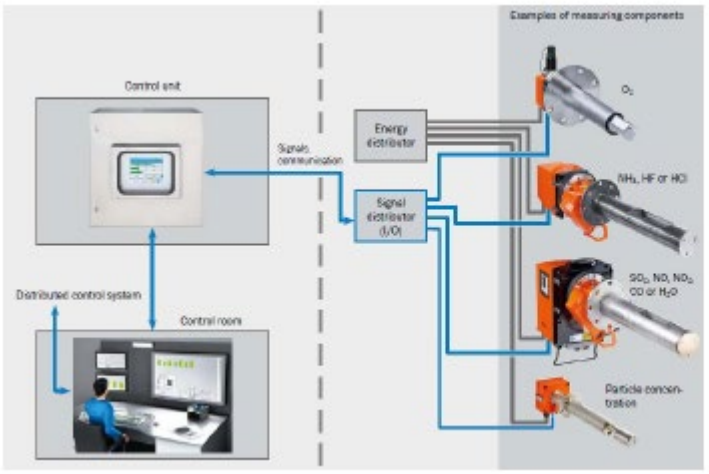
From the boiler the flue gas is introduced into the designed flue gas tubes where the selected compound is sprayed to interact with the fluegas. The compound binds heavy metals such as lead, cadmium and copper while the containment of lime neutralises the acid (SO2). The residual product from the cleaning is gypsum,

which is separated in a bag for offsite removal.. As the gypsum is contaminated with heavy metals, it cannot be used for gypsum boards in construction.

Continuous Emissions Monitoring System (CEMs)

In a separate air cooled room made by the building contractor all components for controlling the air emissions are installed.

Monitoring points will be situated within the flue gas tubes all calibrated. This unit will be wired to the SCADA system in the main control room. This wiring will contain the different measuring data and the selected alarm data.



Wastewater Management

Water treatment:

Only when required Water will go through a settling tank and pH adjustment.

Stack

As specified a 30 meter stack with one core will be mounted as the last unit in the fluegas transport line.

The stack will be equipped with the necessary safety equipment flight light system, a ladder, safety cord and ladder free at ground level.
In addition the stack will be supplied with a cleaning hatch at ground level as well as lightning protection, where a 2 meter metal earth spear is connected to the metal foundation of the chimney.

Distribution Control System (DCS)

The SCADA will run on two standard tower servers, each server with one monitor, English keyboard, and

mouse. Operating system will be Windows Server.

The PLC will be programmed to allow control for: Variable speed motor/pump, DOL motor/pump, Analogue input, Digital input/alarm, PID controller, Solenoid valve and motor valve.

The system will monitor the system processes for compliance with normal ranges of operations and apply corrective actions where required in accordance with its parameters either via automated systems or by actioning operator requirements.

6. Uninterruptible Power Supply (UPS)

7. Hot Water Distribution Network Connection

The offtake of hot water will be designed specifically in relation to customer need

.

The process is illustrated in Figure 1 below. A larger copy is also included in Annex 1.

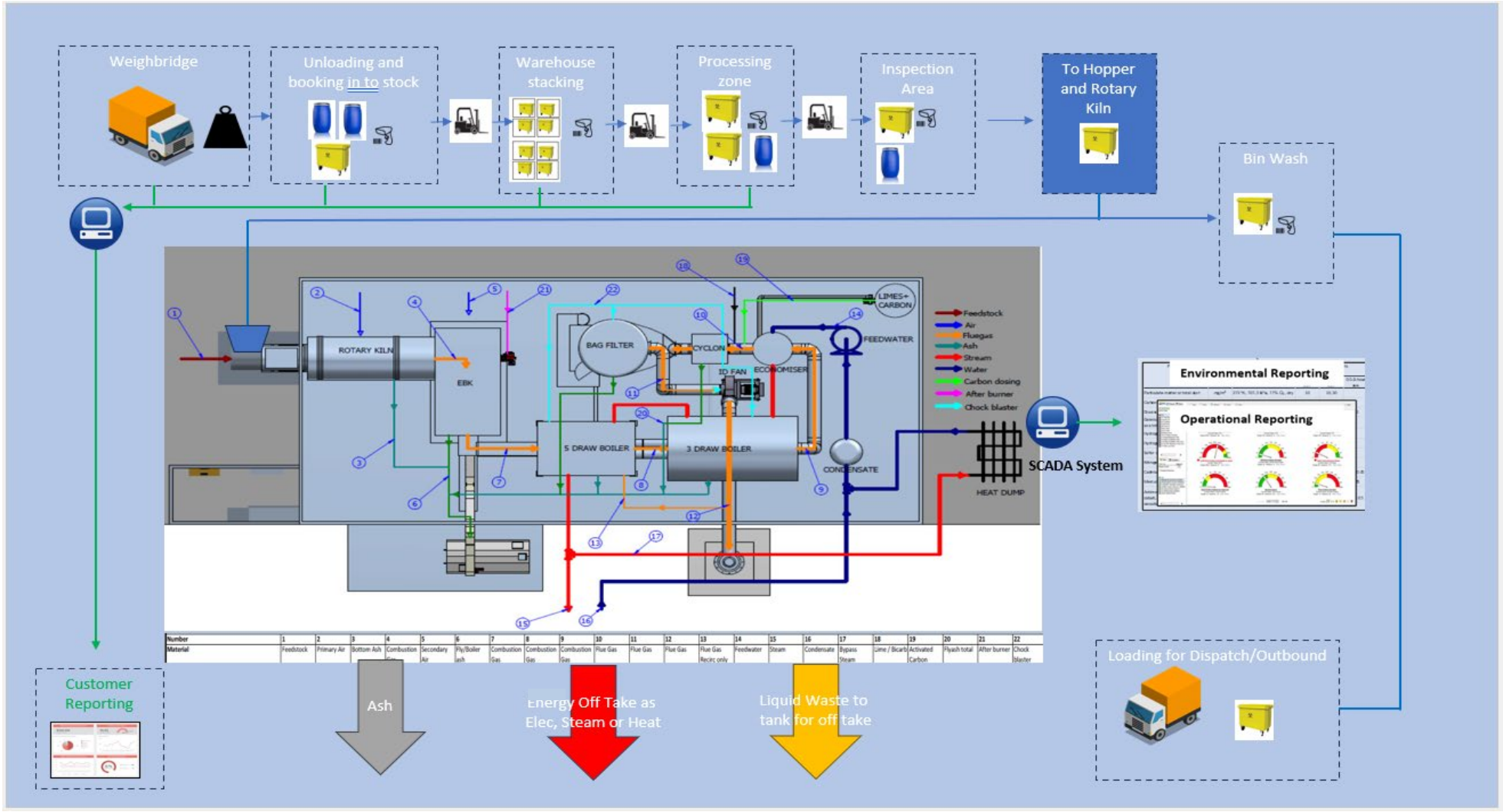


Figure 1 - Indicative Process Diagram

1.3 Raw Materials

The Installation will receive deliveries of clinical waste and hazardous wastes (to be used as fuel for the rotary kiln) by road.

Fornax will have in place a documented incoming waste acceptance procedure at the Installation, the primary purpose of which is to ensure that all incoming waste meets the relevant specifications.

The Installation will also use consumables including:

1. lime;
2. activated carbon;
3. ammonia (<19% solution);
4. Detergent (Surfactant) for the bin wash

1.4 Waste Reception Hall

Clinical waste and hazardous wastes (to be used as fuel) will be sourced from NHS, commercial and industrial sources. Incoming waste will be delivered in containerised vessels in covered vehicles.

(Mainly Eurobins as shown in plate 1 below:

Plate 1 Euro Bin

Dimensions :

1370mm (H) x 1370mm (W) x 780mm (D)

Total capacity :

770 Litres

The vehicles will be weighed via an automatic weighbridge before proceeding to the waste reception area.

Waste acceptance for clinical waste is provided in Section 7, Clinical Waste Process SOPS of the Application Pack.

When considering the storage of Hazardous waste in relation to the threshold values, the process is managed through stock controls via the operational management procedures in the management system.

Operational management procedures will ensure that:

- Hazardous waste undergoes a waste pre-acceptance check where hazards are identified.
- The measures that are required to minimise the risks of exceeding thresholds are identified.
- Compatibility assessment is considered where appropriate.
- The activities are managed in accordance with the Environment Agency assessed management system for the site;
- Performance against the management system is audited at regular intervals; and
- The Environmental Permit and planning conditions are complied with.

As per Sector Guidance Note S5.06 section 2.1[1], 'In order to prevent the acceptance of unsuitable wastes which may lead to adverse reactions or uncontrolled emissions, systems and procedures must be in place to ensure that wastes are subject to appropriate technical appraisal. This ensures their suitability for the proposed treatment route. These checks must be carried out before any decision is made to accept a waste'. With Specification for acceptance criteria for materials be provided from the stock control team.

Waste acceptance and pre-acceptance procedures Supply contracts will be held with a limited number of waste suppliers that will supply incoming waste to the Facility in line with set parameters, to ensure the incoming waste is in accordance with the waste specification. Documented procedures for pre-acceptance and acceptance of all wastes will be developed prior to the commencement of operation, in accordance with the documented management systems for the Facility as to manage stock to maintain hazardous materials to remain below the COMHA Schedule 1 thresholds (Appendix 1).

The Management System (the documented procedures) will be provided to the Environment Agency for assessment prior to commencement of operation. The pre-acceptance and acceptance checks on wastes being delivered to the Facility will include audits of waste producers / suppliers to review their operations to confirm that the waste which they are transferring to the Facility is in accordance with the waste descriptions, specifications and EWC codes that has been agreed for acceptance on that date/time period.

Procedures will be implemented on site for the review of incoming wastes at the weighbridges (i.e. a

[1] Sector Guidance Note S5.06: recovery and disposal of hazardous and non-hazardous waste - GOV.UK (www.gov.uk)

review of the relevant documentation accompanying the waste) and for relevant inspections of incoming wastes in the waste reception area against the agreed specifications. This may include placing waste loads onto the waste reception area floor for visual inspection. Forklift Truck drivers and other operatives will be trained in order to undertake waste acceptance tasks in addition to the specified reception staff receiving waste.

Prior to the receipt of waste at the Facility, pre-acceptance and acceptance procedures will be developed which comply with the Indicative BAT requirements in EPR5.01, including: Vehicles will be loaded and unloaded within the building in designated areas provided with impermeable hard standing. These areas will have appropriate falls to the process water drainage system. Should a significant spillage occur which has the potential to contaminate the surface water drainage system, an isolation valve will prohibit the release of any contaminated effluent off-site. Fire-fighting measures will be developed in relation to an installation specific Fire Prevention Plan designed by consultation with the Local Fire Service, with particular attention paid to the waste storage area and the control of quantities hazardous wastes.

Delivery and reception of waste will be controlled by a management system that will identify all risks associated with the reception of waste and shall comply with all legislative requirements, including statutory documentation. Incoming waste will be: – delivered in enclosed vehicles or other appropriate containers; and – unloaded in the enclosed waste reception area. Management procedures will ensure that there is waste pre acceptance and waste Inspection procedures that will be employed to ensure that any wastes which would take the storage of hazardous waste over the thresholds in compliance with its planning requirements are prevented from being accepted additional inspection will take place by the plant operatives during vehicle tipping/waste unloading.

1.5 Waste Acceptance

Quality parameters set on the waste feed stream into the facility will restrict waste to specific criteria to ensure the efficiency of the facility. The size restrictions for feed materials are usually restricted to a 25l drum or an IBC (for lance feed) unless a specific operational assessment has been undertaken by the site chemist. With prohibition on metal drums, cylinders or containers.

The Fornax technically competent staff will conduct a series of checks to ensure that the waste delivered conforms to the pre acceptance information detailed on the transport documentation, eg database, proposed treatment method and is complaint with the permit.

Following on from the initial booking in checks at the weighbridge all aspects of receipt/checking and, if necessary, rejection will take place internally within the building meaning no external storage / loading / unloading will take place.

The checks will be confirmatory inspections and or laboratory testing.
The container labelling/barcode is to be checked to ensure its presence and that the information relating to the waste description, chemical identity, associated hazards and other carriage notion is correct.
Once received on site each waste consignment will be individually and clearly identified with the following information.

- Date of arrival
- Relevant hazardous property code(s)
- The chemical identity /composition
- The unique reference number that allows identification through stock control and reference back to the acceptance and Pre-acceptance records

The incoming verification sheet will show the location of each individual waste as it is tracked through the system from acceptance to storage to destruction.

The Fornax technically competent staff will identify the most appropriate storage area, based upon Chemical composition and with due regards to compatibility with other material stored in the racking system. This is in accordance with HSE guidance note HSG71 Chemical warehousing: The storage of packaged dangerous substances [2]

The Fornax staff will ensure there are no extraneous labelling not related to the contents of the container, only one label per container.
All acceptance paperwork including that provided by the driver shall be submitted to the business service team for collection and then checked and validated by the technical management team.
Storage of waste in the reception area -containers must not remain in reception area for more than the agreed number of working days as agreed with the Environment Agency

Waste stored in the waste reception area will be sensibly segregated to HSG71 standards.

[2] Chemical warehousing: The storage of packaged dangerous substances - HSG71 (hse.gov.uk)

Laboratory smalls will only be accepted on site if packed by a third party who has packed the laboratory smalls in accordance the specified lab smalls procedure from the Fornax Management System (Laboratory smalls packing procedure) which will be developed as part of the management system.

Clinical waste acceptance will be in accordance with the requirements of Clinical waste (EPR 5.07) (Version 1.1 January 2011) in accordance with the Safe Management of Healthcare Waste (HTM 07 01).

At Waste Pre-Acceptance and Waste acceptance stage the presence of the following in clinical waste streams from healthcare activities will be marked for routing to the appropriate storage pending destruction:

- anatomical waste, other animal or human tissues, and blood products;
- medicines and medicinally contaminated waste);
- chemicals and chemically contaminated waste;
- microbiological cultures and related laboratory wastes
- non-hazardous wastes, for example
  municipal waste or offensive waste

All records shall be maintained within the company IT system.

Records shall be maintained for a minimum of three years after the waste has been treated or removed.

Standard Operating Procedures have been provided as separate documents contained within the Company EMS system

1.6 Waste Storage

Maximum storage times for different types of healthcare waste

The following waste will be stored for up to 14 days as stored with in a building:

- infectious clinical waste
- offensive waste
- treated waste from alternative treatment plant (for example, autoclave floc)

Storage of refrigerated anatomical waste for up to 14 days.

Unrefrigerated anatomical waste for up to 24 hours, or up to 72 hours if over a weekend.

The following waste will be stored for up to 6 months:

- cytotoxic and cytostatic drugs
- other medicines or drugs
- dental amalgam
- other chemicals or other wastes

Fornax will use the 'first in first out principal' and will prioritise the treatment or off-site transfer of waste based on:

- its type
- age on arrival (if known)
- date of arrival
- duration of storage on site

Dedicated storage racks with integral bunding are provided within the waste reception hall where the euro bins will be held in storage until sent for destruction.

Liquid Chemical storage will only be stored on the ground level and row 2 of racking or on the first beam of racking.

Waste will be stored in the appropriate segregated zones depending on chemical properties in accordance with HSG71.

1.7 Destruction of Waste

The Waste will be transferred from the waste storage warehouse onto the mezzanine level by way of a goods-lift or fork lift truck through pallet gates should the goods-lift be out of operation . The operative will scan the barcode, visually inspect the contents and position the bin onto the bin-lift to the combustion chamber feed hopper. Once in the hopper the waste is moved into the combustion

chamber via a ram.

Liquid hazardous wastes shall also be capable of being processed via the facility through the use of a retractable lance into the combustion chamber. The liquids will be supplied in either 205l drums or IBC units which are pumped into the lance for direct injection into the combustion chamber. There will be a 200 tons capacity of liquid waste incineration over our 8,000 hours burn.

That is equivalent to:-
1 x 205 ltd drum every >8 hours
1 x IBC every 40 hours

There are various procedures that will apply to waste deliveries during planned and unplanned shutdowns. During a short plant shutdown, waste will be unloaded in the designated unloading area. Waste deliveries will be suspended for the duration of longer shutdowns subject to the prevailing availability of storage capacity within the storage area.
The waste storage area is maintained under negative pressure at all times, with the extracted air passing through a carbon filter and via the energy centre to remove odour prior to exhausting to atmosphere via the dedicated stack located adjacent to the Waste Reception building.

1.8 Rejection of Waste

If a decision is to be taken by the Technically competent management team to reject any of the waste loads, then non-conforming waste outside the acceptance criteria of a commercial nature is labelled and rejected and the hazardous waste consignment note rejection procedures followed:

- The quarantined containers shall be marked for rejection
- If the hazard labelling is incorrect, correct hazard labelling shall be affixed to the containers (and the threshold values for the site re assessed for Hazardous Waste Storage)
- The producer shall be advised in writing of the reasons for rejection, including the non-conformance report and any supplementary documents e.g. photographs
- The producer shall be informed of the time frame in which materials are to be removed from our site
- A log shall be kept of rejected loads which shall be available for Environment Agency inspection.

1.9 Consumables

All consumables (hydrated lime, NOx reagent and activated carbon) will be delivered to the Installation by road.

Ammonia will be stored in a dedicated area providing containment in accordance with CIRIA guidance, and activated carbon will be delivered to the plant for storage in 500kg bulk bags. The activated carbon will be transported via forklift truck from the delivery vehicle to the correct storage area, and then into the feed, whilst the lime is pumped directly into the lime silo via hoses direct from the tanker.

Silos will be fitted with high level alarms. The top of the silos will be equipped with a vent fitted with a fabric filter. Cleaning of the filter will be done automatically with compressed air after the filling operation. Filters will be inspected regularly for leaks.

All mobile plant will be electric and will not require fuel to be stored on site.

2 Process Control Arrangements

The Installation shall be operated and controlled via a comprehensive range of fully networked system management, control, and safety measures and systems to ensure that all elements of the plant can be safely operated at maximum efficiency at all times.

2.1 System Interlocks and alarms

The proposed Installation will be equipped with a comprehensive range of interlocks to comply with the requirements of the IED, The interlocks are designed to ensure that the plant will be operated appropriately and the potential for uncontrolled releases to the environment will be minimised

2.2 Emergency Shut Down Arrangements

In the event of a major system failure, the plant will have the capability of being closed down in a controlled manner though an integrated emergency stop procedure initiated in the Control Room.

2.3 Fire Suppression Arrangements

The facility will incorporate a comprehensive range of fire suppression and protection systems including fire walls, outdoor hydrants fire water storage tanks, hose reels and cannons (subject to requirements), fire extinguishers, sprinklers and deluge systems.

All such measures shall comply with the relevant British and European Standards and relevant Codes of Practice and are detailed within the Installation's Fire Prevention Plan

2.4 Combustion Process

The combustion system is a based on the waste injected via hydraulic ram of via lance (liquid waste) into the combustion chamber to react with the oxides of nitrogen, chemically reducing them to nitrogen and water.

The rotary kiln Primary chamber and secondary combustion system for ensuring the required minimum residence time of 2s at 850C is achieved for Clinical Waste and 2s at 1100C for relevant Non-Clinical

Waste with a minimum of 2 seconds flue gas residence time at this temperature to ensure the destruction of dioxins, furans, PAHs and other organics.

An adequate air supply will also be maintained to give the correct volume of oxygen for optimum combustion. The main source of airflow will be controlled through the kilns automated air inlet system. Gas temperatures will be continually monitored and recorded, and audible and visible alarms will trigger in the control room if the temperature starts to fall towards 850°C. The control system will regulate combustion conditions and control the boiler.

The plant will also be fitted with auxiliary burners, which will be designed for firing on mains gas The burners will be set to operate when the temperature within the furnace drops to 860-870°C. These auxiliary burners will also be fired during plant start up and shut down. High CV waste streams can also be used to raise temperatures within the kiln rather than introduce fossil fuels.

2.5 Energy Recovery

The heat generated by the combustion of the waste is recovered in a water tube boiler and economiser, which is integral to the furnace and will produce high pressure high temperature hot water.

The hot water from the boiler will then pass through a heat plate and used for cleaning the 770 litre clinical waste bins and the balance fed into a district heating network to supply carbon free energy to local industry. The net amount being fed into the district heating network should be over 5,000 kw/h per hour.

2.6 Flue Gas Treatment

The flue gas treatment system consists of:

- Selective Non-Catalytic Reduction (SNCR);
- hydrated lime and activated carbon injection; and
- a fabric filter.

Concentrations of NOx will be regulated by the careful control of combustion air and the use of the SNCR process in which an ammonia-based reagent which will be stored in IBC's will be injected into the high temperature region of the boiler to further reduce the amount of NOx in the gas stream.

Hydrated lime and activated carbon will be injected into the flue gases upstream of the fabric filter in order to abate acidic gases, heavy metals and any remaining dioxins and furans. The hydrated lime

will abate the emission of acidic components, including hydrogen fluoride, hydrogen chloride and sulphur dioxide. The activated carbon will abate emissions of mercury, organic compounds and dioxins. The hydrated lime and activated carbon will be stored in separate silos adjacent to the FGT system.

Following the injection of lime and activated carbon, the flue gas will then pass through the fabric filter, which will remove the particulates and reaction products, collectively known as Air Pollution Control residues (APCr).

2.7 Ancillary Operations

Water for firefighting will be stored in tank(s) with a dedicated pump set.

Standby generators will be provided. These will provide sufficient power to run or shut the plant down in the event of the loss of a grid connection.

2.8 Ash Handling

The main material produced by the installation will be bottom ash. Bottom ash is the burnt-out residue from the combustion process. Bottom ash collected at the end of the combustion grate and boiler ash collected at the bottom of the boiler passes will be removed by a wet ash conveyor. The conveyor will comprise a water-filled trough (or ash quench) into which the ash will fall.
Transportation of the wet ash in the conveyor is by means of a chain conveyor sliding on the bottom of the trough and the inclined section. The purpose of the ash quench is to cool and moisten the bottom ash to limit particulate emissions and to ensure an airtight seal to the furnace to avoid air ingress. The bottom ash will then be conveyed to a bottom ash storage ash reception area which is designed for 2-5 days storage and will contain receptacle sealed skips.
The APCr will be extracted from the hopper of the bag filter unit and conveyed to the fully enclosed storage silos which will have a 5-day operating capacity. The air vent from the storage silos will be fitted with filters to prevent dust releases during filling of the silos. The APCr, which is alkaline in nature, will be discharged from the silos into powder tankers or other suitable containers through specially adapted equipment. To prevent fugitive emissions during filling, a telescopic chute will be connected between the silo discharge and the filling opening of the tanker. Air displaced from the tanker will be vented via a filter unit to prevent fugitive emissions.
It is intended that the bottom ash and APCr would be transferred off-site to a suitably licensed waste management facility for recovery or disposal.

2.9 Liquid Effluent and Site Drainage

Process effluents from water treatment and boiler blowdown will be re-used within the ash quench system or used within the boiler to control combustion temperatures. Where not used within the system it will be directed to foul sewer holding tank where it will either undergo flocculant pH balancing or dosing treatment to ensure it can be released as a discharge to foul sewer or will be containerised and fed into the plant for secure destruction or tankerd off site.

Uncontaminated rainwater from buildings roofs will be discharge to the site surface water drainage system which discharges into the SUDS system.

Surface water run-off roadways, vehicle movement areas and areas of hardstanding will be collected and discharged into the site surface drainage system having passed through interceptors. All of the drainage systems have penstock valves that can be closed off to prevent discharge where required.

The site has an automated bin wash to ensure Euro carts are cleaned and disinfected (and checked for suitability to be re-used). The wash water containing surfactant will be cycled through the machine a number of wash cycles then sent for disposal. The contained wash-waters are held in the machine within an impermeable area and either discharge to foul sewer or disposed of to an appropriate facility.

2.10 Emissions Monitoring and Main Stack

An induced draught fan will draw the flue gas through the boiler and the flue gas cleaning system and release the cleaned flue gas via a 30m stack.

A Continuous Emission Monitoring Station (CEMS) will be installed to monitor the concentrations in the flue gas before it leaves the Installation through the stack. In addition, periodic sampling and measurement will be carried out.

Calibration will be carried out at regular intervals as recommended by the manufacturer and by the requirements of BS EN14181. Regular servicing and maintenance will be carried out under a service contract with the equipment supplier.

The CEMS system is monitored via the SCADA unit and will notify the site staff if abnormal readings are recorded. The CEMS system will be calibrated as required

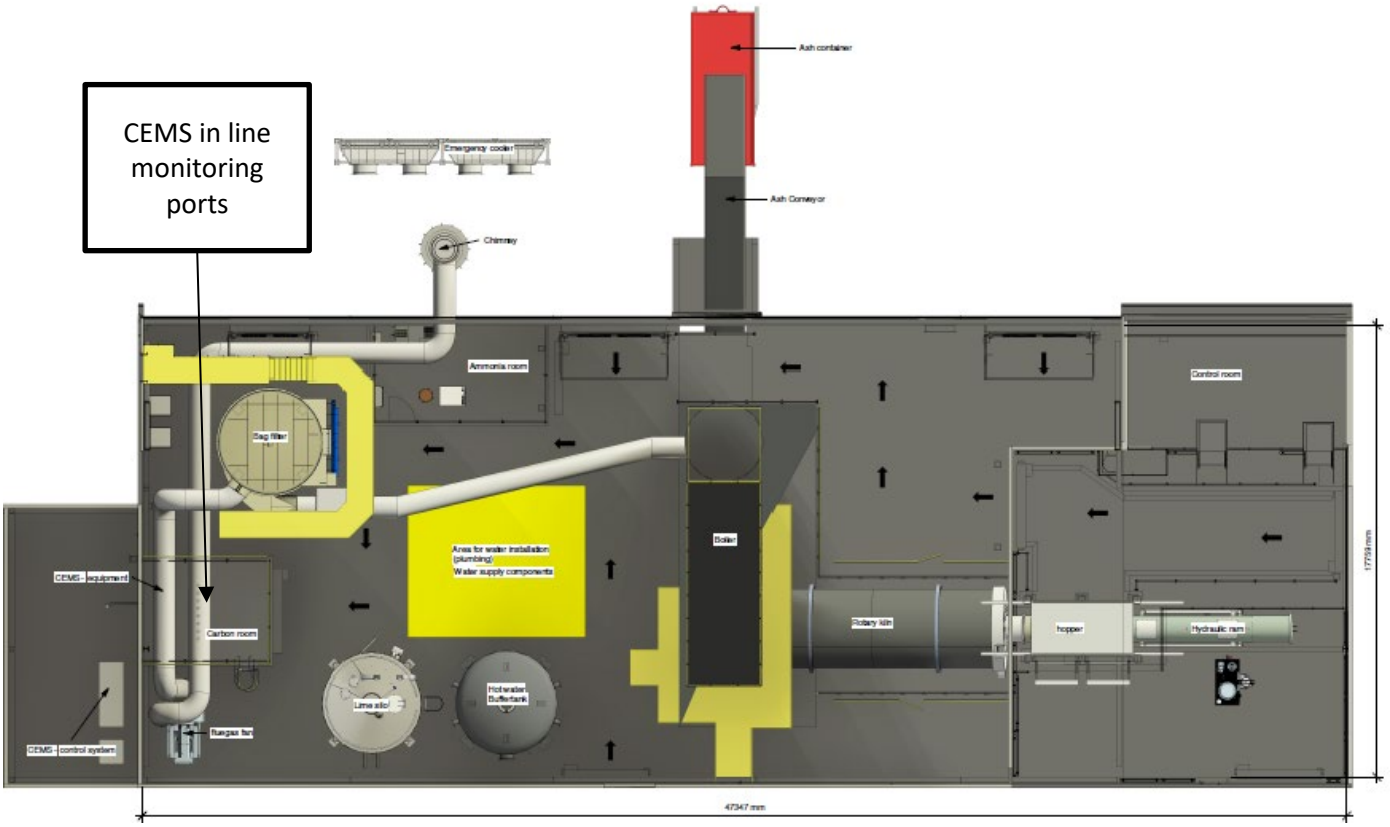


Plate 2: 3D Layout of CEMS Equipment

Emissions from the stack have been modelled See Document Ref: OLCO.01.01_ADM - Issue 1 and a Human Health Risk Assessment (See Document Ref: OLCO.01.01_HHRA) has also been prepared and the reports are available in Section 6 Air Quality of the application

The Stack Emission parameters taken from Document Ref: OLCO.01.01_ADM - Issue 1 have been modelled

Fornax Newton Aycliffe facility will carry out measurements using extractive sampling with an instrument permanently located near the stack in accordance with the guidance Section 8 of EN 15259 and MID 15259 explains the procedure.

We are proposing to use CEMS: The sampling point will be designed to meet BS EN 15259 clause 6.2 and 6.3

The sample ports are large enough for monitoring equipment and positioned in accordance with section 6 and appendix A of BS EN 15259

Access adjacent to the ports is large enough to provide sufficient working area, support and clearance for a sample team to work safely with their equipment throughout the duration of the test

The sample ports are over the carbon room and are post the ID fan and there are no process changes between the ID fan and the stack exhaust. Therefore the carbon room roof allows for laminar flow to be established which is the equivalent straight length of duct to 5 diameter dimensions.

The sample location(s) are least 2 HD upstream from any bend or obstruction
The sample location(s) are at least 5 HD downstream from any bend or obstruction
The sample plane has a constant cross sectional area
The horizontal, duct is round

If the CEMS fail we can apply 'abnormal operation' of the incineration plant under certain circumstances when the CEM for releases to air have failed. Annex VI, Part 3(2) sets maximum half hourly average release levels for particulates (150 mg/m3), CO (normal ELV) and TOC (normal ELV) during abnormal operation.

Table 2: Extract from ECL Air Modelling Report

Table 9: Stack Emission Parameters

Parameter	HTI Stack (A1)
Stack Height (m)	30
Stack Exit Diameter (m)	0.70
Stack Gas Discharge Velocity (actual) (m/s)	18.03
Stack Gas Discharge Temperature (°C)	200
Stack Centre Coordinates	426640 (X), 522436 (Y)
Oxygen Concentration in Stack Emission (%)	11
Moisture Concentration in Stack Emission (%)	8.4
Actual Volumetric Flowrate (m^3/s)	6.94
Normalised Volumetric Flowrate (Nm^3/s) [(a)]	3.67

Notes to Table 9
(a) Referenced to 273K, 1 atm, dry and 11% O_2.

The emissions values for monitoring requirements for the CEMS parameters are taken for the Air Quality Modelling report under normal conditions

Table 3: Extract from ECL Air Modelling Report

Table 29: Maximum Predicted One-hour Concentrations (PCs) for Emissions at the Half- hourly IED Emission Limit Values

Pollutant	Maximum Predicted Hourly Mean GLC (PC) ($\mu g/m^3$) [(b)]	Short-term AQS ($\mu g/m^3$)	PC as a %age of Short-term AQS
Particulate Matter (as PM_{10})	6.80	No hourly standard	n/a
VOCs (as Benzene)	4.53	No hourly standard	n/a
Hydrogen Chloride	13.6	750	1.81%
Hydrogen Fluoride	0.907	160	0.57%
Sulphur Dioxide	**45.3**	350	**12.95%**
Nitrogen Dioxide [(a)]	**31.7**	200	**15.86%**

Notes to Table 29

(a) Assuming 35% of NO_x is oxidised to NO_2 (see Section 2.23. of this document).

(b) Maximum predicted hourly concentration for all hours of the meteorological data set.

The emissions values for monitoring requirements for the CEMS parameters are taken from the Air Quality Modelling report under abnormal conditions

Table 4: Extract from ECL Air Modelling Report

Table 30: Short-term and Long-term Emission Concentrations for Abnormal Releases

Pollutant	Half Hour Limit (mg/Nm^3)	Normal Emission Concentration (mg/Nm^3)	Maximum Emission Concentration (mg/Nm^3)	Assumed Short-term Abnormal Emission Concentration (mg/Nm^3)	Assumed Long-term Abnormal Emission Concentration (mg/Nm^3)
Particulate Matter, as PM_{10}	30	5	150	29.2 [(a)]	5.99 [(b)]
Hydrogen Chloride	60	6	-	60	No Long-term AQS
Hydrogen Fluoride	4	1	-	4	1.02 [(c)]

Table 5: Extract from ECL Air Modelling Report

Table 30: Short-term and Long-term Emission Concentrations for Abnormal Releases (cont.)

Pollutant	Half Hour Limit (mg/Nm^3)	Normal Emission Concentration (mg/Nm^3)	Maximum Emission Concentration (mg/Nm^3)	Assumed Short-term Abnormal Emission Concentration (mg/Nm^3)	Assumed Long-term Abnormal Emission Concentration (mg/Nm^3)
Sulphur Dioxide	200	30	-	200	No Long-term AQS
Nitrogen Dioxide	400	120	-	400	121.09 (c)
Carbon Monoxide	100	50	150 (d)	100	No Long-term AQS

Notes to Table 30

(a) 4 hours at $150mg/Nm^3$ and 20 hours at the normal emissions concentration ($5mg/Nm^3$) for comparison with daily mean AQS.

(b) 60 hours at $150mg/Nm^3$ and the remainder of hours at the normal emission concentration of $5mg/Nm^3$.

(c) 60 hours at half hour limit and the remainder at the normal emissions concentration of $120\ mg/Nm^3$.

(d) Ten-minute average.

3.0 Other Information for application form

3.1 Raw Materials

Table 6: Types and amounts of raw materials (for the Schedule 1 Activities)

Material	Storage		Estimated Consumption (tonnes per annum)	Description
	Number of silos/ tanks	Storage facility		
Ammonia solution 19%	1	1000l IBC Stored in racking	170T	Ammonia solution
Lime	1	1 x 35 tonne capacity silo.	300	Dry, hydrated or conditioned delivered at 27 Tonne each load via road tanker
Activated carbon	1	500kg Dumpy bags. Stored in racking (Floor location)	50	Powdered material delivered via road 48 per delivery. Max on site is 36 t.
Other boiler treatment chemicals			3	Corrosion inhibitor, scale inhibitor, biocide, ion exchange resins (sodium hydroxide, sulphuric acid)
Surfactants			5	
Oils and Lubricants			10	As required delivery

Table 7: Raw materials and their effect on the environment

Product	Chemical composition	Expected quantity T	Units	Environmental medium			Impact potential	Comments
				Air	Water	Land		
Ammonia solution	NH_4O H	170	tpa	100	0	0	Low impact	**Reacts with nitrogen oxides to form nitrogen, oxygen, and water vapour. Any unreacted ammonia is released to atmosphere at low concentrations, and is continuously monitored.**
Lime	$Ca(OH)_2$ > 95%	300	tpa	0	0	100	Low impact	**Injected lime is removed with the APCr at the bag filter and disposed of as hazardous waste at a suitable licensed facility.**
Activated carbon	**C**	**50**	**tpa**	**0**	**0**	**100**	**Low impact**	**Injected carbon is removed with the APCr at the bag filter and disposed of as hazardous waste at a suitable licensed facility.**

Table 3: Raw materials and their effect on the environment

3.2 Operational Maintenance

Various other materials will be required for the operation and maintenance of the plant, including:

1. hydraulic oils and silicone-based oils;
2. electrical switchgear;
3. oxyacetylene, TIG, MIG welding gases;
4. CO2 / fire-fighting foam agents; and
5. test and calibration gases.

These will be supplied to standard specification offered by main suppliers. All chemicals will be handled in accordance with COSHH Regulations as part of the quality assurance procedures and full product data sheets will be available on site.

Periodic reviews of all materials used will be made in the light of new products and developments. Any significant change of material, where it may have an impact on the environment, will not be made without firstly assessing the impact and seeking approval from the Environment Agency. The Operator will maintain a detailed inventory of raw materials used on site and have procedures for the regular review of new developments in raw materials.

3.3 Reagent Storage

A range of chemical substances and hazardous materials associated with the HTI plant process, including ammonia solution, lime and activated carbon, will be stored on site. These materials will be stored in accordance with current CIRIA guidance. All liquid chemicals will be stored in controlled areas, with secondary containment facilities having a volume of 110% of the stored capacity.

The SNCR system will use ammonia solution as the reagent. The reagent and boiler water treatment chemicals will be stored in suitable containers or tanks provided with a pressure relief valve and vent scrubber system, as appropriate. In the event of a spillage, the bunds will retain the liquid.

Lime and activated carbon, used within the Air Pollution Control process, will be stored within separate storage racking will placed into the delivery system and be dosed with separate dosing controls. Storage will be in 500 kg dumpy bags and then transferred into the delivery system.

Silos will be fitted with high level alarms. The top of the silos will be equipped with a vent fitted with a fabric filter. Cleaning of the filter will be done automatically with compressed air after the filling operation. Filters will be inspected regularly for leaks. Delivery to site will be by 500 kg dumpy bags.

Boiler water treatment chemicals will be used to control water hardness, pH and scaling and will be delivered in sealed containers and stored in the racking in the warehouse room.

3.4 Reagent Selection

The clinical and hazardous rotary kiln incineration plant may burn highly acid waste primarily with a high content of chlorine but also to be expected sulphur and fluorine.

The flue gas cleaning will be based on bag filter with injection of sorbent in front of the filter in a reactor / duct.

Two sorbents have been considered: sodium bicarbonate (NaHCO3) and hydrated lime Ca(OH2).

Sodium bicarbonate has its optimal reaction temperature at 180-220C and a stoichiometric ration of 1,15 – 1,4 is expected (1,25 is used for comparison).

NaHCO3 + HCl => NaCl + H2O + CO2 2NaHCO3 + 2SO2 => Na2S2O5 + 2CO2 + H2O

Hydrated lime has its optimal reaction window at 145-155C and the stoichiometric ratio of 1,5 to 2,5 is typically seen (2 is used for comparison).

Ca(OH)2 + SO2 0,5 O2 => CaSO4 + H2O Ca(OH)2 + 2HCl => CaCl2 + 2H2O

Table 8: Flue Gas Composition

Flue gas composition						
o2	5,22%	%vol				
n2	69,87%	%vol				
co2	11,61%	%vol				
h2o	12,27%	%vol	Expected	Limit		
so2	0,11%	%vol	2276	50	mg/Nm3 @11%O2 dry	
hcl	0,08%	%vol	1036	10	mg/Nm3 @11%O2 dry	
ar	0,84%	%vol				
dixoins and furans			2	0,1	ng/Nm3 @11O2 dry	
HF			10	1	mg/Nm3 @11%O2 dry	
Cd+Tl			1	0,05	mg/Nm3 @11%O2 dry	
Hg			2	0,05	mg/Nm3 @11%O2 dry	
Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V			2,5	0,5	mg/Nm3 @11%O2 dry	
Dust_average (hourly average)			1000	10	mg/Nm3 @11%O2 dry	
Dust peak (max 2 min per hour)			5000	30	mg/Nm3 @11%O2 dry	

Which corresponds to a removal of SO2 by 98% and HCl by 99%. These reduction rates are

feasible with a dry system on sodium bicarbonate but are in the high end for hydrated lime (accepted 95% SO2 reduction).

Therefore, to increase the reactivity of the hydrated lime and increase hydrated lime usage, water and recirculated residue products must be added in hydrated lime-based system prior to injection to the reactor.

Expected performance:

Sodium bicarbonate

Sorbent Sodium bicarbonate kg/h 147
Residue NaCl Kg/h 55,3
Residue Na2S2O5 Kg/h 114,6
Unspent Sorbent Kg/h 29,4
Total residue Kg/h 200,2

Hydrated lime

Sorbent hydrated lime kg/h 103,6
Residue CaCl2 Kg/h 53,5
Residue CaSO4 Kg/h 164,1
Unspent Sorbent Kg/h 51,8
Total residue Kg/h 269,4
Quench water Kg/h 266,4

The costing is based on on-line prices for sodium bicarbonate and hydrated lime as delivered.

For the consumption of lime, a silo system is specified to avoid manual exchange of big bags, which will have to take place several times per day with the worst-case waste and overload.

Residue is dispatched from the bottom of the bag filter to a separate big bag mounted on a standalone frame. This bag containing residue product with separate EWC code must be sent for off-site disposal.

ITEMS RELATING TO MONATRY VALUES IN THIS SECTION MARKED IN RED ARE COMMERCIALLY SENSITIVE AS CONTAINS COST ANALYSIS AND HAVE BEEN REQUESTED THAT THE VALUES ARE NOT PUBLISHED

In the operating costs sections, the following unit costs have been assumed annually:

Sodium bicarbonate GBP/kg 0,3
Hydrated lime GBP/kg 0,13
Water* GBP/kg 0,01
Landfill cost GBP/kg 0,12

*Water may be rejected from water treatment plant.

Based on 8000h of operation, the operating costs are:

Sodium bicarbonate: £544.612 /year

Hydrated lime: £388.801 /year

Only the sorbent and reduction products are taken into account. Not the fly ash which is the same in both cases. For removal of dioxin, furans, heavy metals, etc. activated carbon must be added in the reactor before the filter. This amount will also be the same for both system and is not considered.In terms of CAPEX the difference between the two systems is:

Hydrated lime - Requires a mixer for recirculated residue and water injection and thus temperature measurement before the bag filter.

Sodium bicarbonate - taken from silo by dosing screw to a rotary valve dosing into an air stream from a fan blowing into the duct in front of the filter. Dosing is controlled by measurement of HCl and SO2 / SO3 after the bag house filter.

Hydrated lime is taken from the silo by extraction screw through a rotary valve into a mixer screw where water and residue from the bag filter is mixed before injection to reactor in front of the bag filter.

Water injection is controlled by the temperature in front of the filter and lime injection in controlled by HCl and SO2/SO3 measurement after the filter.

Recirculated residue amount is fixed proportional to rotary kiln load.

The CAPEX for bicarbonate silo, dosing and reactor is estimated to £100,000 GPB.

The CAPEX for hydrated lime silo, dosing, water injection, residue recirculation is estimated to be

£250,000 GBP.

Considering a 5-year evaluation period, the annual CAPEX + Costing is

Sodium bicarbonate: 544.612 + 100.000/5 = £564.612 GBP/year.

Hydrated lime: 388.801 + 250.000 /5 = £438.801 GBP/year

Overall conclusion is that a hydrated lime system is most feasible considering the high consumption.

If the acid flue gas concentrations are half, the numbers are:

Sodium bicarbonate: 268.739 + 100.000/5 = £288.739 GBP/year

Hydrated lime: 203.570 + 250.000 /5 = £253.570 GBP/year

Which still show hydrated lime is lower cost solution, but the difference is small and the system is much simpler to operate and maintain.

Due to the advantages and disadvantages of both reagents, both reagents are considered to represent BAT.

For the purposes of developing the different assessments within this EP application, it has been assumed that the selected reagent is Hydrated Lime.

END OF CEMERCIALLY SENSATIVE SECTION

3.5 Auxiliary Fuel (mains feed natural gas)

As stated in Article 50 (3) of the Industrial Emissions Directive:

Each combustion chamber of a waste incineration plant shall be equipped with at least one auxiliary burner. This burner shall be switched on automatically when the temperature of the combustion gases after the last injection of combustion air falls below the temperatures set out in paragraph 2 [850°C]. It shall also be used during plant start-up and shut-down operations in order to ensure that those temperatures are maintained at all times during these operations and as long as unburned waste is in the combustion chamber.

The auxiliary burner shall not be fed with fuels which can cause higher emissions than those resulting from the burning of gas oil as defined in Article 2(2) of Council Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulphur content of certain liquid fuels, liquefied gas or natural gas.

Therefore, as identified by the requirements of the IED, the only available fuels that can be used for

auxiliary firing are:

- natural gas;
- liquefied gas (LPG); or

Auxiliary burner firing on a well-managed waste combustion plant is only required intermittently, i.e. during start-up, shutdown, and when the temperature in the combustion chamber falls to 850°C.

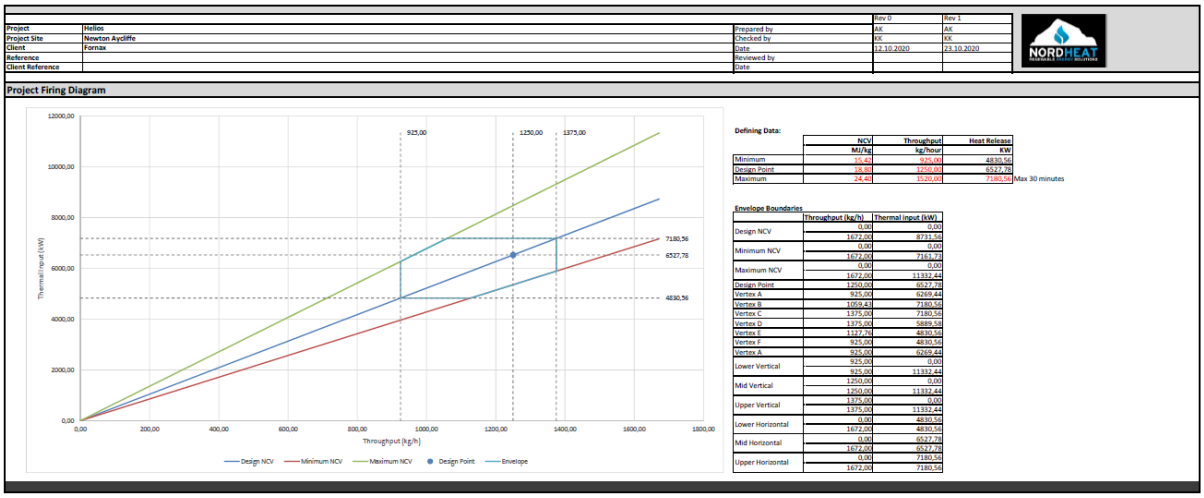
Natural gas can be used for auxiliary firing. As stated previously, auxiliary firing will only be required intermittently. When auxiliary firing, large volumes of gas would be required. These would need to be supplied from a high-pressure gas main.

The use of natural gas is considered to represent BAT for the installation. In order to ensure availability of fuels for auxiliary firing, the low NOx burners for auxiliary firing will be gas burners.

3.6 Incoming Waste

The Installation will consist of a rotary kiln Incinerator capable of generating a nominal 6.2 Megawatt hours thermal ("MWH") of zero carbon rated renewable energy in the form of hot water to be distributed via a district heat main to local based consumers on the estate.

Through detailed design, it is estimated that 6.2MWh can be generated through the thermal treatment of up to 10,500 tonnes per annum of clinical, commercial and industrial hazardous wastes at an average of 19 Megajoules/Kilogram ("MJ/kg"). Firing Diagram is included.Below:



The heat recovered from the combustion of the waste streams incinerated is captured in a 4-drawer water tube boiler at approximately 130 degrees and then cooled before passing through the heat plate exchanger (HPE), and then exported into the district heating main.

The bin wash machine and manual washer will all take 95 degree hot water directly from the pipework between the water boiler and the HPE…and the balance of the energy recovered and generated will be sent directly into the district heat main via the HPE.

The Facility expected operational availability is 7,884 hours per annum (90%), which is regarded as typical for this type of installation. Therefore, the nominal design capacity for the installation is 10500tonnes per annum.

The plant is designed to operate continuously throughout the year, 7 days a week, 24 hours a day, with the exception of plant shutdowns. Planned and unplanned shutdown time periods will vary from year to year.

However, the annual input capacity could increase or decrease depending on the availability of the plant. If the Installation performed above average and/or operated above the nominal availability during the year, it could be required to shut down unnecessarily if there was no 'headroom' allowance in the annual permitted tonnage.

Moreover, there will also be fluctuations in the net calorific value of the incoming waste feed. If the net calorific value of the waste received is lower than expected, the plant will operate at a higher mechanical throughput than its nominal design capacity. In this case, it again could be required to shut down unnecessarily before the end of the year if there was no 'headroom' allowance in the annual permitted tonnage.

3.6.1.1 List of EWC codes

The table below presents the wastes to be combusted within the Installation.

Table 10: EWC Codes to be processed at the Facility

EWC CODES	
02	WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING
0201	**wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing**
02 01 01	sludges from washing and cleaning
02 01 03	plant-tissue waste
02 01 04	waste plastics (except packaging)
02 01 06	animal faeces, urine and manure (including spoiled straw), effluent, collected separately and treated off-site
02 01 07	wastes from forestry
02 01 08	agrochemical waste containing dangerous substances
02 01 09	agrochemical waste other than those mentioned in 02 01 08
02 02 01	sludges from washing and cleaning
02 02 02	organic chlorinated wood preserves
02 02 03	materials unsuitable for consumption or processing
02 02 04	sludges from on-site effluent treatment
02 02 99	wastes not otherwise specified
0205	**wastes from the dairy products industry**
020502	sludges from on-site effluent treatment
0207	**wastes from the production of alcoholic and non- alcoholic beverages (except coffee, tea and cocoa)**
02 07 01	wastes from washing, cleaning and mechanical reduction of raw materials
02 07 01	wastes from spirits distillation
02 07 03	wastes from chemical treatment
02 07 04	materials unsuitable for consumption or processing
02 07 05	sludges from on-site effluent treatment
02 09 99	wastes not otherwise specified
03	**WASTES FROM WOOD PROCESSING AND THE PRODUCTION OF PANELS AND FURNITURE, PULP, PAPER AND CARDBOARD**
03 01	
03 01 01	waste bark and cork
03 01 04*	sawdust, shavings, cuttings, wood, particle board and veneer containing dangerous substances
03 01 05	sawdust, shavings, cuttings, wood, particle board and veneer other than those mentioned in 03 01 04
03 01 99	Wastes mot otherwise specified
03 02	**wastes from wood preservation**
03 02 01	non-halogenated organic wood preservatives
03 02 02	organochlorinated wood preservatives
03 02 03	organometallic wood preservatives
03 02 04	inorganic wood preservatives
03 02 05*	other wood preservatives containing dangerous substances
03 02 99	wastes not otherwise specified
03 03	**wastes from pulp, paper and cardboard production and processing**
03 03 01	waste bark and wood
03 03 02	green liquor sludge (from recovery of cooking liquor)
03 03 05	de-inking sludges from paper recycling
03 03 07	mechanically separated rejects from pulping of wastepaper and cardboard
03 03 08	wastes from sorting of paper and cardboard destined for recycling

03 03 10	fibre rejects, fibre-, filler- and coating-sludges from mechanical separation
03 03 11	sludges from on-site effluent treatment other than those mentioned in 03 03 10
03 03 99	wastes not otherwise specified
04	**WASTES FROM THE LEATHER, FUR AND TEXTILE INDUSTRIES**
04 01	**wastes from the leather and fur industry**
04 01 01	fleshings and lime split wastes
04 01 02	liming waste
04 01 03*	degreasing wastes containing solvents without a liquid phase
04 01 04	tanning liquor containing chromium
04 01 05	tanning liquor free of chromium b
04 01 06	sludges, in particular from on-site effluent treatment containing chromium
04 01 07	sludges, in particular from on-site effluent treatment free of chromium
04 01 08	waste tanned leather (blue sheetings, shavings, cuttings, buffing dust) containing chromium
04 01 09	wastes from dressing and finishing
04 01 99	wastes not otherwise specified
04 02	**wastes from the textile industry**
04 02 10	Organic matter from natural products (for example grease, wax)
04 02 14*	wastes from finishing containing organic solvents
04 02 16	dyestuffs and pigments containing dangerous substances
04 02 19*	sludges from on-site effluent treatment containing dangerous substances
04 02 21	wastes from unprocessed textile fibres
04 02 22	wastes from processed textile fibres
04 02 99	wastes not otherwise specified
05	**WASTES FROM PETROLEUM REFINING, NATURAL GAS PURIFICATION AND PYROLYTIC TREATMENT OF COAL**
05 01	**Waste from petroleum refining**
05 01 02*	desalter sludges
05 01 03*	tank bottom sludges
05 01 04*	acid alkyl sludges
05 01 05*	oil spills
05 01 06*	oily sludges from maintenance operations of the plant or equipment
05 01 07*	acid tars
05 01 08*	other tars
05 01 09*	sludges from on-site effluent treatment containing dangerous substances
05 01 10	sludges from on-site effluent treatment other than those mentioned in 05 01 09
05 01 11*	wastes from cleaning of fuels with bases
05 01 12*	oil containing acids
05 01 13	boiler feedwater sludges
05 01 14	wastes from cooling columns
05 01 15*	spent filter clays
05 01 16	sulphur-containing wastes from petroleum desulphurisation
05 01 17	bitumen
05 01 99	wastes not otherwise specified
05 06	**wastes from the pyrolytic treatment of coal**
05 06 04	waste from cooling columns
05 06 99	wastes not otherwise specified
05 07	**wastes from natural gas purification and transportation**
05 07 02	wastes containing sulphur
06	**WASTES FROM INORGANIC CHEMICAL PROCESSES**
06 01	**wastes from the manufacture, formulation, supply and use (MFSU) of acids**

06 01 01*	sulphuric acid and sulphurous acid
06 01 02*	hydrochloric acid
06 01 03*	hydrofluoric acid
06 01 04*	phosphoric and phosphorous acid
06 01 05*	nitric acid and nitrous acid
06 01 06*	other acids
06 01 99	wastes not otherwise specified
06 02	**wastes from the MFSU of bases**
06 02 01*	calcium hydroxide
06 02 03*	ammonium hydroxide
06 02 04*	sodium and potassium hydroxide
06 02 05*	other bases
06 02 99	wastes not otherwise specified
06 03	**wastes from the MFSU of salts and their solutions and metallic oxides**
06 03 11*	solid salts and solutions containing cyanides
06 03 13*	solid salts and solutions containing heavy metals
06 03 14	solid salts and solutions other than those mentioned in 06 03 11 and 06 03 13
06 03 15*	metallic oxides containing heavy metals
06 03 16	metallic oxides other than those mentioned in 06 03 15
06 03 99	wastes not otherwise specified
06 04	**metal-containing wastes other than those mentioned in 06 03**
06 04 03*	wastes containing arsenic
06 04 04*	wastes containing mercury
06 04 05*	wastes containing other heavy metals
06 04 99	wastes not otherwise specified
06 05	**Sludges from on-site effluent treatment**
06 05 02*	sludges from on-site effluent treatment containing dangerous substances
06 05 03	sludges from on-site effluent treatment other than those mentioned in 06 05 02
06 06	**wastes from the MFSU of sulphur chemicals, sulphur chemical processes and desulphurisation processes**
06 06 02*	wastes containing dangerous sulphides
06 06 03	wastes containing sulphides other than those mentioned in 06 06 02
06 06 99	wastes not otherwise specified
06 07	**wastes from the MFSU of halogens and halogen chemical processes**
06 07 01*	wastes containing asbestos from electrolysis
06 07 02*	activated carbon from chlorine production
06 07 03*	barium sulphate sludge containing mercury
06 07 04*	solutions and acids, for example contact acid
06 07 99	wastes not otherwise specified
06 08	**wastes from the MFSU of silicon and silicon derivatives**
06 08 99	wastes not otherwise specified
06 10	**wastes from the MFSU of nitrogen chemicals, nitrogen chemical processes and fertiliser manufacture**
06 10 99	wastes not otherwise specified
06 13	**wastes from inorganic chemical processes not otherwise specified**
06 13 01*	inorganic plant protection products, wood-preserving agents and other biocides.
07	WASTES FROM ORGANIC CHEMICAL PROCESSES
07 01	wastes from the manufacture, formulation, supply and use (MFSU) of basic organic chemicals
07 01 01*	aqueous washing liquids and mother liquors
07 01 03*	organic halogenated solvents, washing liquids and mother liquors

07 01 04*	other organic solvents, washing liquids and mother liquors
07 01 07*	halogenated still bottoms and reaction residues
07 01 08	other still bottoms and reaction residues
07 01 09*	halogenated filter cakes and spent absorbents
07 01 10*	other filter cakes and spent absorbents
07 01 11	sludges from on-site effluent treatment containing dangerous substances
07 02	**Wastes from the MFSU of plastics, synthetic rubber and man-made fibres**
07 02 01*	aqueous washing liquids and mother liquors
07 02 03*	organic halogenated solvents, washing liquids and mother liquors
07 02 04*	other organic solvents, washing liquids and mother liquors
07 02 07*	halogenated still bottoms and reaction residues
07 02 08	other still bottoms and reaction residues
07 02 09*	halogenated filter cakes and spent absorbents
07 02 10*	other filter cakes and spent absorbents
07 02 11	sludges from on-site effluent treatment containing dangerous substances
07 02 16	wastes containing silicones
07 02 17	Wastes containing silicone other than those mentioned in 027 02 16
07 02 99	Wastes not otherwise specified
07 03	**wastes from the MFSU of organic dyes and pigments (except 06 11)**
07 03 01*	aqueous washing liquids and mother liquors
07 03 03*	organic halogenated solvents, washing liquids and mother liquors
07 03 04*	other organic solvents, washing liquids and mother liquors
07 03 07*	halogenated still bottoms and reaction residues
07 03 08	other still bottoms and reaction residues
07 03 09*	halogenated filter cakes and spent absorbents
07 03 10*	other filter cakes and spent absorbents
07 03 11	sludges from on-site effluent treatment containing dangerous substances
07 03 12	Sludges from on-site effluent treatment other than those mentioned in 07 03 11
07 03 99	Wastes not otherwise specified
07 04	**wastes from the MFSU of organic plant protection products (except 02 01 08 and 02 01 09), wood preserving agents (except 03 02) and other biocides**
07 04 01*	aqueous washing liquids and mother liquors
07 04 03*	organic halogenated solvents, washing liquids and mother liquors
07 04 04*	other organic solvents, washing liquids and mother liquors
07 04 07*	halogenated still bottoms and reaction residues
07 04 08	other still bottoms and reaction residues
07 04 09*	halogenated filter cakes and spent absorbents
07 04 10*	other filter cakes and spent absorbents
07 04 11	sludges from on-site effluent treatment containing dangerous substances
07 04 12	Sludges from on-site effluent treatment other than those mentioned in 07 04 11
07 04 13	solid wastes containing dangerous substances
07 04 99	Wastes not otherwise specified
07 05	**wastes from the MFSU of pharmaceuticals**
07 05 01*	aqueous washing liquids and mother liquors
07 05 03*	organic halogenated solvents, washing liquids and mother liquors
07 05 04*	other organic solvents, washing liquids and mother liquors
07 05 07*	halogenated still bottoms and reaction residues
07 05 08	other still bottoms and reaction residues
07 05 09*	halogenated filter cakes and spent absorbents
07 05 10*	other filter cakes and spent absorbents

07 05 11	sludges from on-site effluent treatment containing dangerous substances
07 05 13	solid wastes containing dangerous substances
07 05 14	Solid wastes other than those mentioned in 07 05 13
07 05 99	Wastes not otherwise specified
07 06	**wastes from the MFSU of fats, grease, soaps, detergents, disinfectants and cosmetics**
07 06 01*	aqueous washing liquids and mother liquors
07 06 03*	organic halogenated solvents, washing liquids and mother liquors
07 06 04*	other organic solvents, washing liquids and mother liquors
07 06 07*	halogenated still bottoms and reaction residues
07 06 08	other still bottoms and reaction residues
07 06 09*	halogenated filter cakes and spent absorbents
07 06 10*	other filter cakes and spent absorbents
07 06 11	sludges from on-site effluent treatment containing dangerous substances
07 06 12	Sludges from on-site effluent treatment other than those mentioned in 07 01 11
07 06 99	Waste not otherwise specified
07 07	**wastes from the MFSU of fine chemicals and chemical products not otherwise specified**
07 07 01*	aqueous washing liquids and mother liquors
07 07 03*	organic halogenated solvents, washing liquids and mother liquors
07 07 04*	other organic solvents, washing liquids and mother liquors
07 07 07*	halogenated still bottoms and reaction residues
07 07 08*	other still bottoms and reaction residues
07 07 09*	halogenated filter cakes and spent absorbents
07 07 10*	other filter cakes and spent absorbents
07 07 11	sludges from on-site effluent treatment containing dangerous substances
07 07 12	Sludges from on-site effluent treatment other than those mentioned in 07 01 11
07 07 99	Waste not otherwise specified
08	WASTES FROM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS), ADHESIVES, SEALANTS AND PRINTING INKS
08 01	**wastes from MFSU and removal of paint and varnish**
08 01 11*	waste paint and varnish containing organic solvents or other dangerous substances
08 01 12	waste paint and varnish other than those mentioned in 08 01 11
08 01 13	sludges from paint or varnish containing organic solvents or other dangerous substances
08 01 14	sludges from paint or varnish other than those mentioned in 08 01 13
08 01 15	aqueous sludges containing paint or varnish containing organic solvents or other dangerous substances
08 01 16	aqueous sludges containing paint or varnish other than those mentioned in 08 01 15
08 01 17	wastes from paint or varnish removal containing organic solvents or other dangerous substances
08 01 18	wastes from paint or varnish removal other than those mentioned in 08 01 17
08 01 19	aqueous suspensions containing paint or varnish containing organic solvents or other dangerous substances
08 01 20	aqueous suspensions containing paint or varnish other than those mentioned in 08 01 19
08 01 21	waste paint or varnish remover
08 01 99	Waste not otherwise specified
08 02	**Wastes from the MFSU of other coatings (including ceramic materials)**
08 02 01	Waste coating powders
08 03	wastes from MFSU of printing inks
08 03 12	waste ink containing dangerous substances
08 03 13	waste ink other than those mentioned in 08 03 12
08 03 14	ink sludges containing dangerous substances
08 03 15	ink sludges other than those mentioned in 08 03 14
08 03 16*	waste etching solutions
08 03 17	waste printing toner containing dangerous substances

08 03 18	waste printing toner other than those mentioned in 08 03 17
08 03 19	Disperse oil
08 03 99	Wastes not otherwise specified
08 04	**wastes from MFSU of adhesives and sealants (including waterproofing products)**
08 04 09*	waste adhesives and sealants containing organic solvents or other dangerous substances
08 04 10	waste adhesives and sealants other than those mentioned in 08 04 09
08 04 11*	adhesive and sealant sludges containing organic solvents or other dangerous substances M
08 04 12	adhesive and sealant sludges other than those mentioned in 08 04 11
08 04 13*	aqueous sludges containing adhesives or sealants containing organic solvents or other dangerous substances
08 04 14	aqueous sludges containing adhesives or sealants other than those mentioned in 08 04 13
08 04 15*	aqueous liquid waste containing adhesives or sealants containing organic solvents or other dangerous substances
08 04 16	aqueous liquid waste containing adhesives or sealants other than those mentioned in 08 04 15
08 04 17*	rosin oil
08 04 99	Waste not otherwise specified
08 05	**wastes not otherwise specified in 08**
08 05 01*	waste isocyanates
09	Wastes from the photographic industry
09 01 01	Water based developer and activator solutions
09 01 02	Water based off-set plate developer solutions
09 01 03	Solvent based developer solutions
09 01 04	Fixer solution
09 01 05	Bleach solutions and bleach fixer solutions
09 01 06	Wastes containing silver from on-site treatment of photographic wastes
09 01 07	Photographic film and paper containing silver or silver compound
09 01 08	Photographic film and paper free of silver or silver compounds
09 01 10	Single-use cameras without batteries
09 01 11*	Single use cameras containing batteries included in 16 06 01, 16 06 02 or 16 06 03
09 01 12	Single-use cameras containing batteries other than those mentioned in 09 01 11
09 01 13*	Aqueous liquid waste from on-site reclamation of silver other than those mentioned in 09 01 06
09 01 99	Wastes not otherwise specified
10	Wastes from thermal processes
10 01	**Wastes from power stations and other combustion plants**
10 01 09*	Sulphuric acid
10 02	**Wastes from the iron and steel industry**
10 02 11*	Wastes from cooling-water treatment containing oil
10 03	**Wastes from aluminium thermal metallurgy**
10 03 15*	Skimming's that are flammable or emit, upon contact with water, flammable gases in hazardous quantities
10 03 16	Skimming's other than those mentioned in 10 03 15
10 03 23	Solid wastes from gas treatment containing hazardous substances
10 03 24	Solid wastes from gas treatment other than those mentioned in 10 03 23
10 03 25*	Sludges and filter cakes from gas treatment containing hazardous substances
10 03 26	Sludges and filter cakes from gas treatment other than those mentioned in 10 03 25
10 03 27*	Wastes from cooling-water treatment containing oil
10 03 28	Wastes from cooling-water treatment other than those mentioned in 10 03 27
10 03 29*	Wastes from treatment of salt slags and black drosses containing hazardous substances
10 03 30	Wastes from treatment of salt slags and drosses other than those mentioned in 10 03 29
10 05	**Wastes from zinc thermal metallurgy**
10 05 10*	Dross and skimming's that are flammable or emit, upon contact with water, flammable gases in hazardous quantities

10 05 11	Dross and skimming's other than those mentioned in 10 05 10
10 07	**Wastes from silver, gold and platinum thermal metallurgy**
10 07 07*	Wastes from cooling-water treatment containing oil
10 07 08	Wastes from cooling-water treatment other than those mentioned in 10 07 07
11	wastes from chemical surface treatment and coating of metals and other materials: non-ferrous hydro-metallurgy
11 01	**Wastes from chemical surface treatment and coating of metals and other materials (example galvanic processes, zinc coating processes, pickling processes, etching, phosphating, alkaline degreasing, anodising)**
11 01 05*	Pickling acids
11 02 06*	not otherwise specified
11 01 07*	pickling bases
11 01 08*	Phosphatising sludges
11 01 09*	sludges and filter cakes containing hazardous substances
11 01 10	Sludges and filter cakes other than those mentioned in 11 01 09
11 01 11*	Aqueous rinsing liquids containing hazardous substances
11 01 12	Aqueous rinsing liquids other than those mentioned in 11 01 11
11 01 13*	Degreasing wastes containing hazardous substances
11 01 14	Degreasing wastes other than those mentioned in 11 01 13
11 01 15*	Eluate and sludges from membrane system or ion exchange system containing hazardous substances
11 01 16*	Saturated or spent ion exchange resins
11 01 98*	Other wastes containing hazardous substances
11 01 99	Wastes not otherwise specified
11 02	**Wastes from non-ferrous hydrometallurgical processes**
11 02 02*	Sludges from zinc hydrometallurgy (including jarosite, geothite)
11 02 03	Wastes from the production of anodes for aqueous electrolytical processes
11 02 05*	Wastes from copper hydrometallurgical processes containing hazardous substances
11 02 06	Wastes from copper hydrometallurgical processes other than those mentioned in 11 02 05
11 02 07*	Other wastes containing hazardous substances
11 02 99	Wastes not otherwise specified
11 03	**Sludges and solids from tempering processes**
11 03 01*	Wastes containing cyanide
11 03 02*	Other waste
11 05	**Wastes from hot galvanising processes**
11 05 01	Hard zinc
11 05 02	Zinc ash
11 05 03*	Solid wastes from gas treatment
11 05 04*	Spent flux
11 05 99	Wastes not otherwise specifies
12	Wastes from Shaping and Physical and Mechanical Surface Treatment of Metals and Plastics
1201	**wastes from shaping and physical and mechanical surface treatment of metals and plastics**
12 01 06*	mineral-based machining oils containing halogens (except emulsions and solutions)
12 01 07*	mineral-based machining oils free of halogens (except emulsions and solutions)
12 01 08*	machining emulsions and solutions containing halogens
12 01 09*	machining emulsions and solutions free of halogens
12 01 10*	synthetic machining oils
12 01 12*	spent waxes and fats
12 01 14	machine sludges
12 01 16*	waste blasting materials
12 01 17	Waste blasting materials other than those mentioned in 12 01 16
12 01 18*	Metal sludge (grinding, honing and lapping sludge) containing oil

12 01 19	Readily biodegradable matching oil
12 01 20*	Spent grinding bodies and grinding materials containing hazardous substances
12 01 21	Spent grinding bodies and grinding materials other than those mentioned in 12 01 20
12 01 99	Wastes not otherwise specified
12 03	**Wastes from water and steam degreasing processes**
12 03 01*	Aqueous washing liquids
12 03 02*	Steam degreasing wastes
13	**Oil Wastes and Wastes of Liquid Fuels (except edible oils, and those in chapters 05, 12 and 19)**
13 01	**waste hydraulic oils**
13 01 01*	hydraulic oils, containing PCBs1
13 01 04*	chlorinated emulsions
13 01 05*	non-chlorinated emulsions
13 01 09*	mineral-based chlorinated hydraulic oils
13 01 10*	mineral-based non-chlorinated hydraulic oils
13 01 11*	synthetic hydraulic oils
13 01 12*	readily biodegradable hydraulic oils
13 01 13*	other hydraulic oils
13 02	**waste engine, gear and lubricating oils**
13 02 04*	mineral-based chlorinated engine, gear and lubricating oils
13 02 05*	mineral-based non-chlorinated engine, gear and lubricating oils
13 02 06*	synthetic engine, gear and lubricating oils
13 02 07*	readily biodegradable engine, gear and lubricating oils
13 02 08*	other engine, gear and lubricating oils
13 03	**waste insulating and heat transmission oils**
13 03 01*	insulating or heat transmission oils containing PCBs
13 03 06*	mineral-based chlorinated insulating and heat transmission oils other than those mentioned in 13 03 01
13 03 07*	mineral-based non-chlorinated insulating and heat transmission oils
13 03 08*	synthetic insulating and heat transmission oils
13 03 09*	readily biodegradable insulating and heat transmission oils
13 03 10*	other insulating and heat transmission oils
13 04	**bilge oils**
13 04 01*	bilge oils from inland navigation
13 04 02*	bilge oils from jetty sewers
13 04 03*	bilge oils from other navigation
13 05	**oil/water separator contents**
13 05 01*	solids from grit chambers and oil/water separators
13 05 02*	sludges from oil/water separators
13 05 03*	interceptor sludges
13 05 06*	oil from oil/water separators
13 05 07*	oily water from oil/water separators
13 05 08*	mixtures of wastes from grit chambers and oil/water separators
13 07	**wastes of liquid fuels**
13 07 01*	fuel oil and diesel
13 07 02*	petrol
13 07 03*	other fuels (including mixtures)
13 08	**oil wastes not otherwise specified**
13 08 01*	desalter sludges or emulsions
13 08 02*	other emulsions

13 08 99*	wastes not otherwise specified
14	WASTE ORGANIC SOLVENTS, REFRIGERANTS AND PROPELLANTS (except 07 and 08)
14 06	**waste organic solvents, refrigerants and foam/aerosol propellants**
14 06 01*	chlorofluorocarbons, HCFC, HFC
14 06 02*	other halogenated solvents and solvent mixtures
14 06 03*	other solvents and solvent mixtures
14 06 04*	sludges or solid wastes containing halogenated solvents
14 06 05	sludges or solid wastes containing other solvents
15	WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED
15 01	**packaging (including separately collected municipal packaging waste)**
15 01 01	paper and cardboard packaging
15 01 02	plastic packaging
15 01 03	wooden packaging
15 01 04	metallic packaging
15 01 05	composite packaging
15 01 06	mixed packaging
15 01 07	glass packaging
15 01 09	textile packaging
15 01 10*	packaging containing residues of or contaminated by dangerous substances
15 01 11*	Metallic packaging containing a hazardous solid porous matrix (for example asbestos), including empty pressure containers
15 02	**absorbents, filter materials, wiping cloths and protective clothing**
15 02 02	oily rags
15 02 03	Absorbing, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing other than those mentioned in 15 02 02
16	WASTES NOT OTHERWISE SPECIFIED IN THE LIST
16 01	**end-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance (except 13, 14, 16 06 and 16 08)**
16 01 07	oily filters
16 01 13	Brake fluids
16 01 14	Anti-freeze fluids containing hazardous substances
16 01 15	Anti-freeze fluids other than those mentioned in 16 01 14
16 01 21	Hazardous components other than those mentioned in 16 01 07, 16 01 11 and 16 0113 and 16 01 14
16 01 22	Components not otherwise specified
16 02	**wastes from electrical and electronic equipment**
16 02 09*	transformers and capacitors containing PCBs
16 02 10*	discarded equipment containing or contaminated by PCBs other than those mentioned in 16 02 09
16 02 11*	discarded equipment containing chlorofluorocarbons, HCFC, HFC
16 02 12*	discarded equipment containing free asbestos
16 02 13	discarded equipment containing hazardous components (2) other than those mentioned in 16 02 09 to 16 02 12
16 02 14	discarded equipment other than those mentioned in 16 02 09 to 16 02 13
16 02 15*	hazardous components removed from discarded equipment
16 02 16	components removed from discarded equipment other than those mentioned in 16 02 15
16 03	**off-specification batches and unused products**
16 03 03	inorganic wastes containing dangerous substances
16 03 04	inorganic wastes other than those mentioned in 16 03 03
16 03 05	organic wastes containing dangerous substances
16 03 06	organic wastes other than those mentioned in 16 03 05
16 05	**gases in pressure containers and discarded chemicals**

16 05 04*	gases in pressure containers (including halons) containing dangerous substances
16 05 05	gases in pressure containers other than those mentioned in 16 05 04
16 05 06*	laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals
16 05 07*	discarded inorganic chemicals consisting of or containing dangerous substances
16 05 08*	discarded organic chemicals consisting of or containing dangerous substances
16 05 09*	Discarded chemicals other than those mentioned in 116 05 06, 16 05 07 or 16 05 08
16 06	**Batteries and accumulators**
16 06 01*	Lead batteries
16 06 02*	Ni-Cd batteries
16 06 03*	Mercury containing batteries
16 06 04	Alkaline batteries (except 16 06 03)
16 06 05	Other batteries and accumulators
16 05 06*	Separately collected electrolyte from batteries and accumulator
16 07	**Wastes from transport tank, storage tank and barrel cleaning**
16 07 08*	wastes containing oil
16 07 09*	wastes containing other dangerous substances
16 07 99	Waste not otherwise specified
16 08	**Spent catalysts**
16 08 01	Spent catalysts containing gold, silver rhenium, rhodium, palladium
16 08 02*	Spent catalysts containing hazardous transition metals or hazardous transition metal compounds
16 08 03	Spent catalysts containing transition metals or transition metal compounds not otherwise specifies
16 06 04	Spent fluid catalysts cracking catalysts (expect 16 08 07)
16 06 05*	Spent catalysts containing phosphoric acid
16 06 06	Spent liquids used as catalysts
16 08 07*	Spent catalysts contaminated with hazardous substances
16 09	**oxidising substances**
16 09 01*	permanganates, for example potassium permanganate
16 09 02*	chromates, for example potassium chromate, potassium or sodium dichromate
16 09 03*	peroxides, for example hydrogen peroxide
16 09 04*	oxidising substances, not otherwise specified
16 10	**Aqueous liquid wastes destined for off-site treatment**
16 10 01*	Aqueous liquid wastes containing hazardous substances
16 10 02	Aqueous liquid waste other than those mentioned in 16 10 01
16 10 03*	Aqueous concentrates containing hazardous substances
16 10 04	Aqueous concentrates other than those mentioned in 16 10 03
17	**Construction and demolition wastes (including excavated soil from contaminated sies)**
17 02	**Wood, glass and plastic**
17 02 03	Plastic
17 02 04*	Glass, plastic and wood containing or contaminated with hazardous substances
17 03	**Bituminous mixtures, coal tar and barred products**
17 03 01*	Bituminous mixtures containing coal tar
17 03 02	Bituminous mixtures other than those mentioned in 17 03 01
17 03 03*	Coal, tar and tarred products
17 04	**Metals (including alloys)**
17 04 09*	Metal waste contaminated with hazardous substances
17 04 10*	Cables containing oil, coal tar and other hazardous substances
17 04 11	cables other than those mentioned in 17 04 10
17 09	**Other construction and demolition wastes**
17 09 02*	Construction and demolition wastes containing PCB for example PCB- containing sealants, PCB- containing

	resin-based floorings, PCB-containing sealed glazing units, PCB-containing capacitors
17 09 03*	Other construction and demolition waste (including mixed wastes containing hazardous substances
18	WASTES FROM HUMAN OR ANIMAL HEALTH CARE AND/OR RELATED RESEARCH (except kitchen and restaurant wastes not arising from immediate health care)
18 01	**wastes from natal care, diagnosis, treatment or prevention of disease in humans ALL 18's apart from amalgam**
18 01 01	sharps (except 18 01 03)
18 01 02	body parts and organs including blood bags and blood preserves (except 18 01 03)
18 01 03	wastes whose collection and disposal is subject to special requirements in order to prevent infection
18 01 04	wastes whose collection and disposal is not subject to special requirements in order to prevent infection (for example dressings, plaster casts, linen, disposable clothing, diapers)
18 01 06	chemicals consisting of or containing dangerous substances
18 01 0716	chemicals other than those mentioned in 18 01 06
18 01 08	cytotoxic and cytostatic medicines
18 01 09	medicines other than those mentioned in 18 01 08
18 01 10*	amalgam waste from dental care
18 02	**Wastes from research, diagnosis, treatment or prevention of disease involving animals**
18 02 01	sharps (except 18 02 02)
18 02 02	wastes whose collection and disposal is subject to special requirements in order to prevent infection
18 02 03	wastes whose collection and disposal is not subject to special requirements in order to prevent infection
18 02 05	chemicals consisting of or containing dangerous substances
18 02 06	chemicals other than those mentioned in 18 02 05
18 02 07	cytotoxic and cytostatic medicines
18 02 08	medicines other than those mentioned in 18 02 07
19	Wastes from Waste Management Facilities, Off-site Waste Water Treatment Plants and the Preparation of Water Intended for Human Consumption and Water for Industrial Use
19 01	**wastes from incineration or pyrolysis of waste**
19 01 02	ferrous materials removed from bottom ash
19 01 05*	filter cake from gas treatment
19 01 06*	aqueous liquid wastes from gas treatment and other aqueous liquid wastes
19 01 07*	solid wastes from gas treatment
19 01 10*	spent activated carbon from flue-gas treatment
19 01 17*	Pyrolysis wastes containing hazardous substances
19 01 18	Pyrolysis wastes other than those mentioned in 19 01 17
19 01 99	Wastes not otherwise specified
19 02	**wastes from physico/chemical treatments of waste (including dechromatation, decyanidation, neutralisation)**
19 02 03	Premixed waste composed only of non-hazardous wastes
19 02 04*	oil sludge waste
19 02 05*	Sludges from physico/chemical treatment containing hazardous substances
19 02 06	Sludges from physico/chemical treatment other than those mentioned in 19 02 05
19 02 07*	Oil and concentrates from separation
19 02 08*	liquid combustible wastes containing dangerous substances
19 02 09*	solid combustible wastes containing dangerous substances
19 02 10	combustible wastes other than those mentioned in 19 02 08 and 19 02 09
19 02 11*	other wastes containing dangerous substances
19 02 99	wastes not otherwise specified
19 03	**stabilised/solidified wastes (4)**
19 03 04*	wastes marked as hazardous, partly (5) stabilised
19 03 05	stabilised wastes other than those mentioned in 19 03 04
19 03 06*	wastes marked as hazardous, solidified

19 07	**landfill leachate**
19 07 02*	Landfill leachate containing hazardous substances
19 07 03	Landfill leachate other than those mentioned in 19 07 02
19 08	**Wastes from wastewater treatment plants not otherwise specified**
19 08 06*	Saturated or spent ion exchange resins
19 06 07*	Solution or sludges from regeneration of ion exchange
19 06 08*	Membrane system waste containing heavy metals
19 08 10*	Grease and oil mixture from oil/water separation containing only edible oils and fats
19 08 11*	Sludges containing hazardous substances from biological treatment of industrial wastewater
19 08 13*	Sludges containing hazardous substances from other treatment of industrial wastewater
19 11	**Wastes from oil regeneration**
19 11 01*	Spent filter clays
19 11 02*	Acid tars
19 11 03*	Aqueous liquid wastes
19 11 04*	Wastes from cleaning of fuel with bases
19 11 05*	Sludges from on-site effluent treatment containing hazardous substances
19 11 06	Sludges from on-site effluent treatment other than those mentioned in 19 11 05
19 11 07*	Wastes from flue-gas gleaning
19 11 99	Wastes not otherwise specified
19 12	**wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified (for example sorting, crushing, compacting, pelletising) not otherwise specified**
19 12 02	Ferrous metal
19 12 06*	wood containing dangerous substances
19 12 11*	other wastes (including mixtures of materials) from mechanical treatment of waste containing dangerous substances
19 12 12	Other wastes (including mixtures of materials) from mechanical treatment of wastes other than those ,mentioned in 19 12 11
19 13	**Wastes from soil and ground water redemption**
19 13 01*	Solid wastes from soil remediation containing hazardous substances
19 13 02	Solid wastes from soil remediation other than those mentioned in 19 13 01
19 13 03*	Sludges from soil remediation containing hazardous substances
19 13 04	Sludges from soil remediation other than those mentioned in 19 13 03
19 13 05*	Sludges from groundwater remediation containing hazardous substances
19 13 06	Sludges from groundwater remediation other than those mentioned in 19 13 05
19 13 07*	Aqueous liquid wastes and aqueous concentrates from ground water remediation containing hazardous substances
19 13 08	Aqueous liquid wastes and aqueous concentrates from ground water remediation other than those mentioned in 19 13 07
20	MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS
20 01	**separately collected fractions (except 15 01)**
20 01 01	paper and cardboard
20 01 02	glass
20 01 08	biodegradable kitchen and canteen waste
20 01 10	clothes
20 01 11	textiles
20 01 13	solvents
20 01 14*	acids
20 01 15*	alkalines
20 01 17*	photochemicals
20 01 19	pesticides

20 01 21*	fluorescent tubes and other mercury-containing waste
20 01 23*	discarded equipment containing chlorofluorocarbons
20 01 27	paints inks, adhensives and resins
20 01 28	Paint inks adhensives and resins not inc in 20 01 27
20 01 29	detergents containing dangerous substances
20 01 30	detergents other than those mentioned in 20 01 29
20 01 31	cytotoxic and cytostatic medicines
20 01 32	medicines other than those mentioned in 20 01 31
20 01 33*	batteries and accumulators included in 16 06 01, 16 06 02 or 16 06 03 and unsorted batteries and accumulators containing these batteries
20 01 34	batteries and accumulators other than those mentioned in 20 01 33
20 01 35*	discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components (6)
20 01 36	discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35
20 01 37*	wood containing dangerous substances
20 01 38	wood other than that mentioned in 20 01 37
20 01 39	plastics
20 01 99	other fractions not otherwise specified

Checks will be made on the paperwork accompanying each delivery to ensure that only waste for which the plant has been designed will be accepted. During waste unloading operations, the operator will undertake a visual inspection of the waste to confirm it complies with the specifications of the supporting paperwork.

Any unacceptable materials will be rejected and stored in a designated area within the reception and storage building. The Environmental Management System (EMS) will include procedures to control the inspection, storage and onward disposal of unacceptable waste delivery, Reception and Handling

The procedures used will comply with the Indicative BAT requirements in the Sector Guidance Note, including the measures listed below.

- The weight and EWC code for each waste delivery to the Installation will be recorded and records retained in accordance with the Installations management systems.
- A high standard of housekeeping will be maintained in all areas and suitable equipment to clean up spilled materials will be provided and maintained.
- Loading and unloading of vehicles will take place in designated areas provided with impermeable hard standing. These areas will have appropriate falls to the process water drainage system.
- Firefighting measures will be designed by consultation with the Local Fire Officers, with particular attention paid to the waste handling and storage equipment.
- Delivery and reception of waste will be controlled by a management system that will identify all risks associated with the reception of fuel and shall comply with all legislative

requirements, including statutory documentation.

- Inspection procedures will be employed to ensure that any wastes which would prevent the HTI from operating in compliance with its permit are segregated and placed in a designated storage area pending removal.
- The feed stock for the high temperature Incinerator will be a hazardous and clinical waste derived.
- All waste streams will be delivered to site in covered/enclosed waste delivery vehicles.
- Waste reception and handling equipment, building and procedures will be designed to minimise fugitive emissions from loading/unloading areas.
- Conveyors for the transfer of wastes within the Installation will be covered.

3.6.2 Waste Minimisation Audit (Minimising the Use of Raw Materials)

A number of specific techniques will be employed to minimise the production of residues. All of these techniques meet the Indicative BAT requirements from the Sector Guidance Note on Waste Incineration.

3.6.2.1 Feedstock Homogeneity

Improving feedstock homogeneity can improve the operational stability of the plant, leading to reduced reagent use and reduced residue production. The Installation will be designed to combust a variety of both hazardous and clinical wastes. Off-site processing and mixing of waste within the hopper will ensure that the waste fed into the hopper and ultimately fed into the Kiln is a homogeneous fuel.

3.6.2.2 Dioxin & Furan Reformation

As identified within the sector guidance for the Incineration of Waste (EPR5.01), there are a number of BAT design considerations required for the boiler. The boiler has been designed to minimise the formation of dioxins and furans as follows:

- Slow rates of combustion gas cooling will be avoided via boiler design to ensure the residence time is minimised in the critical cooling section and avoid slow rates of combustion gas cooling to minimise the potential for de-novo formation of dioxins and furans.
- The gas residence time in the critical temperature range will be minimised by ensuring high gas velocities exist in these sections. Additional NOx control measures up stream of the boiler and the

residence time and temperature profile (between 450 and 200°C) of flue gas will be considered during the detailed design phase to ensure that dioxin formation is minimised throughout the process.

- Transfer surfaces will be above a minimum temperature of 170°C subject to other reaction considerations.
- Computational Fluidised Dynamics (CFD) will be applied to the design, where considered appropriate, to ensure gas velocities are in a range that negates the formation of stagnant pockets / low velocities. A copy of the CFD model will be supplied to the Environment Agency following detailed design and prior to commencement of commissioning.
- Minimising the volume access in the critical cooling sections will ensure high gas velocities.
- Boundary layers of slow-moving gas along boiler surfaces will be prevented via design and a regular maintenance schedule to remove build-up of any deposits that may have occurred.

3.6.2.3 Rotary Furnace Conditions

Furnace conditions will be optimised in order to minimise the quantity of residues arising for further disposal.

3.6.2.4 Flue Gas Treatment Control

Close control of the flue gas treatment system will minimise the use of reagents and hence minimise the residues produced. SNCR reagent dosing will be optimised to prevent ammonia slip.

Lime usage will be minimised by trimming reagent dosing to accurately match the acid load using fast response upstream acid gas monitoring. Variable lime dosing rates will be rapidly and precisely varied to match the acid load. The plant preventative maintenance regime will include regular checks and calibration of the lime dosing system to ensure optimum operation. Back-up feed systems will be provided to ensure no interruption in lime dosing. The bag filter is designed to build up a filter cake of unreacted acid gas reagent, which acts as a buffer during any minor interruptions in dosing.

Activated carbon dosing will be based on flue gas volume flow measurement. The activated carbon dosing screw speed frequency control responds automatically to the increase and decrease of flue gas volume. Maintaining a steady concentration of activated carbon in the flue gas and consequently on the filter bags will maintain the adsorption rate for gaseous metals and dioxins.

Activated carbon and lime are stored separately and then mixed by components supplied by Nord Heat (the designer) before being injected into the flue.

3.6.2.5 Waste Management

Details of waste management arrangements and procedures can be found in Section 2.7. In particular, bottom-ash and residues from the flue gas treatment system will be stored and disposed of separately.

3.6.3 Water Use

3.6.3.1 Water Balance Overview

The main use of water at the Installation will be make- up water for the boiler. Other water consuming processes include the following:

Bottom ash conveyor

Bottom Ash Conveyor consumption is based on 3 consumptions:

1. Radiation from PCC to water causing evaporation
2. Sensible heat in the bottom ash falling into the conveyor. Ash is assumed 1000C upon entry
3. Water carried away with the ash on surface etc. Set to 30% according to experience but may be higher dependent upon fuel. 7% ash assumed in fuel.

Blow-down tank

Water consumption is based on cooling of the blow-down flow from the fire tube boiler. The blow down amount is for design set to 1.5% which highly depends upon the boiler water quality. Main source of pollution may be return water from employer's consumers. Exact amount depends upon raw water quality and efficiency of water treatment.

Make-up water generation unit

Reject from RO unit in water treatment plant for make-up water

Dilution water for SNCR

25% NH3 in water for SNCR is diluted with water for better penetration into the boiler. Typical injection concentration is 5% NH3 but may vary dependent upon NOx concentration in

flue gas. Dilution water for SNCR must be softened in order to prevent injection nozzles from clogging.

Quench water

In order to cool the flue gas from 190C to 150C, water is added to reactor which lowers temperature and increase relative humidity for higher reactivity of the hydrated lime.

Fire water is not included in the balance.

The key points listed below should be noted.

1. The water system has been designed with the key objective of minimal consumption of potable water.
2. Most of the steam produced will be recycled as condensate. The remainder will be lost as blow down to prevent build-up of sludge and chemicals, through soot blowing and through continuously flowing sample points.
3. Lost condensate will be replaced with demineralised treated water.
4. Process effluents will be re-used in the bottom ash quench system
5. The Installation will have completely separate foul sewer systems and storm water systems (surface drainage).

3.6.3.2 Potable and Amenity Water

Water for drinking supplies for the offices and mess facilities will come from a potable water supply. The quantity of this water is expected to be small compared to the other water uses on site.
Waste water from showers, toilets, and other mess facilities will be discharged into foul waste water discharges.

3.6.3.3 Process Water

There will be no process- related releases from the Installation to surface watercourses.

Process waters will be supplied by mains water and be de-mineralised.

The Installation shall incorporate an on-site Sustainable Urban Drainage System (“SUDS”) for surface water run off which discharges to an attenuation basin on-site, and ultimately to a controlled watercourse, Demon Beck, located on the southern boundary.

Demineralised water will be used to compensate for boiler blow down losses It is anticipated that

the Installation will consume a nominal 1.054 m^3/hr of water.

Washdown water consumption will be minimised by the use of trigger controls on all wash hoses.

Waste water will be collected in a waste water pit. Effluent collected in the waste water pit will be re-used in the ash quench system and as combustion temperature control. Under normal operating conditions, waste water will be generated from the following processes:

- process effluent collected in site drainage system (e.g. boiler blowdown);
- condensate from the condensate tank;
- effluent generated through washing and maintenance procedures; and
- water run-off collected from the bottom ash quench.

The waste water pit will provide containment of the waste water that is not re-used on site. It will be transferred off-site via road tanker for treatment at a suitably licenced waste management facility or disposal unless disposed of via direct injection into the kiln via the lance.

An Indicative Water flow diagram is presented within Figure 2. A larger version of this drawing is included within Annex 1

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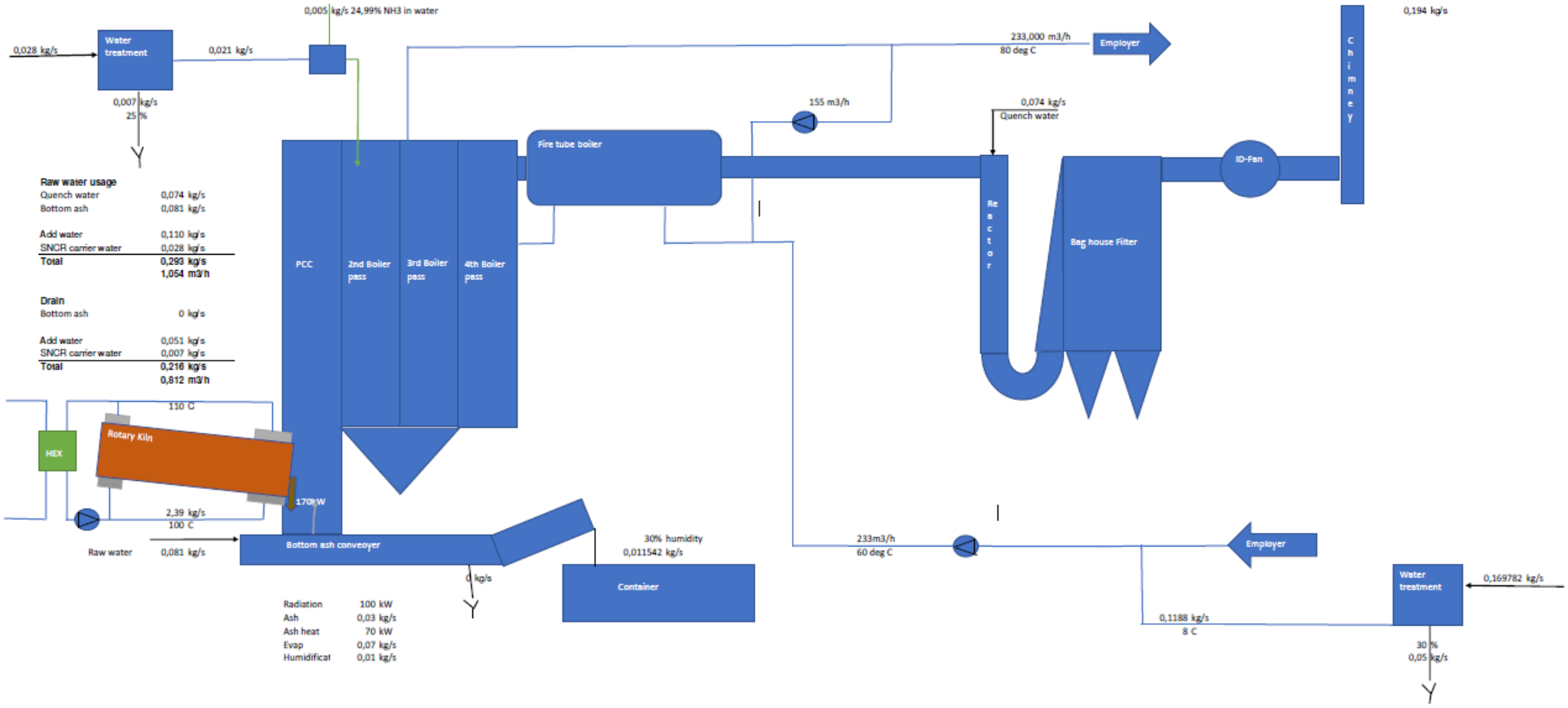


Figure 3 – R1 Process flow diagram with Indicative Water Flow

3.7 Emissions

3.7.1 Point Source Emissions to Air

The Installation will discharge releases to atmosphere from the incineration process at a height of 30m via a dedicated discharge stack.

The concentrations of the pollutants in the releases from the process discharge stack shall not exceed the Emission Limit Values ("ELVs") listed in Part 3 of Annex VI of the IED and any future ELVs as lower ELVs are proposed in the BAT Conclusions Document for the Waste Incineration Sector.

3.7.2 Fugitive Emissions to Air

In addition to the point source emissions to air, there will be potential fugitive emissions to air from refilling of raw material storage tanks such as fuel oil or ammonia. These will be vented to the tanker during refilling. Bulk liquid storage tanks will be fitted with high level controls and alarms.

The APCr silo will be filled by dumpy bag . These raw materials will be offloaded pneumatically into the relevant silos with displaced air vented through a reverse pulse jet filter. Silos will be fitted with high-level control and alarm. Silos will be equipped with a vent fitted at the top with a fabric filter. Filter residues will be returned to the silo. Cleaning of the filter is done automatically with compressed air after the filling operation. The filter will be inspected regularly for leaks.

Fugitive dust emissions will be controlled as described below:

1. Incoming waste/fuel will be delivered in covered vehicles;
2. Waste will be stored within an enclosed waste reception and storage building;
3. Conveyors for the transfer of waste will be covered;
4. Waste will be stored in accordance with the latest industry standards; and
5. Ground surface damping and will be used to prevent vehicle movements producing yard dust problems and mobile "mist air" water-based dust suppression is used to suppress material movement generated dust. These are typically only necessary in summer months or during extremely dry periods. If necessary, foam / water will be added to the material at the point it is transferred into the fuel reception (this is the stage at which most dust is produced).

3.7.3 Point Source Emissions to Water and Sewer

Surface water run-off from all external areas of hardstanding (roads and storage areas) will be discharged into the surface water system having passed through interceptors. All surface water run- off will be collected in the site surface water drainage system and discharged via emission point W1. Surface water run-off will discharge into the River Tees.

The facility will give rise to process effluents of boiler blowdown, waste water from the water treatment process and washdown waters. Process effluents will be recirculated through the ash quench system or injected to the furnace to control combustion temperatures. All excess process effluents which cannot be recirculated will be collected in the waste water system and removed from site for disposal at an appropriately licenced facility.

Contaminated Water

External areas of hardstanding will be provided with kerbed containment, where appropriate, to prevent any potential spills from causing pollution of the ground/groundwater and surface water.

All chemicals will be stored in an appropriate manner incorporating the use of bunding and other measures (such as acid and alkali resistant coatings) to ensure appropriate containment. The potential for accidents, and associated environmental impacts, is therefore limited.

Adequate quantities of spillage absorbent materials will be made available on-site, at an easily accessible location(s), where liquids are stored. A site drainage plan, including the locations of foul and surface water drains and interceptors, will be made available on-site.

Tanker off-loading of chemicals will take place within areas of concrete hardstanding with falls to a gully and/or a sump.

Storage tanks will be bunded at 110% of the tank capacity and the offloading point will be fully contained with the appropriate capacity to contain any spills during fuel or ammonia delivery.

Process water drains within the Installation will drain to the sedimentation basin.

Site drainage for external areas will be fitted with a shut-off alarm, linked to the fire detection systems to contain any contaminated water from firefighting from external areas. Additional storage will be available from site kerbing.

In accordance with the EMS, spillages will be reported to the site management and a record of the incident will be made. The relevant authorities (Environment Agency/ Health and Safety Executive) will be informed if spillages/leaks are significant.

The effectiveness of the Emergency Plan for spillages is subject to Management Review and will be reviewed following any major spillages and revised as appropriate.

3.7.4 Odour

As the storage and handling of clinical and Hazardous Waste will introduce a potential for odour, an odour abatement system will be installed to extract the potentially odorous air from the reception and storage building. The extracted air from the enclosed reception and storage building will be fed into the kiln to regulate temps or passed through a carbon filter system prior to release to atmosphere via a dedicated stack. There is not expected to be an off site impact caused by odour from the facility.

The waste types and quantities on site will be strictly controlled.
Section 15 of the Application provides details by way of an odour management plan.

3.8 Monitoring Methods

3.8.1 Emissions Monitoring

Sampling and analysis of all pollutants including dioxins and furans will be carried out to CEN or equivalent standards (e.g. ISO, national, or international standards). This ensures the provision of data of an equivalent scientific quality.

The plant will be equipped with modern monitoring and data logging devices to enable checks to be made of process efficiency.

The three main objectives of monitoring are:

1. to provide the information necessary for safe and efficient plant operation;
2. to warn the operator if any emissions deviate from predefined ranges; and
3. to provide records of emissions and events for the purposes of demonstrating regulatory compliance.

3.8.2 Monitoring Emissions to Air

The following parameters at the stack will be monitored and recorded continuously using a Continuous Emissions Monitoring System (CEMS):

- oxygen;

- carbon monoxide;
- hydrogen chloride;
- hydrogen fluoride;
- sulphur dioxide;
- nitrogen oxides;
- nitrous oxide;
- ammonia;
- VOCs; and
- particulates.

In addition, the water vapour content, temperature, and pressure of the flue gases will be monitored so that the emission concentrations can be reported at the reference conditions required by the Industrial Emissions Directive.

The continuously monitored emissions concentrations will also be checked by an independent testing company at frequencies agreed with the Environment Agency.

The following parameters will also be monitored by means of spot sampling at frequencies agreed with the Environment Agency:

1. heavy metals; and
2. dioxins and furans.

The methods and standards used for emissions monitoring will be in compliance with Environment Agency Guidance Note S5.01 and the Industrial Emissions Directive. In particular, the CEMS equipment will be certified to the MCERTS standard and will have certified ranges which are no greater than 1.5 times the relevant daily average emission limit.

It is anticipated that:

1. HCl, CO, SO_2, NOx (NO, N_2O and NO_2), HF and NH_3 will be measured by an FTIR-type multi-gas analyser;
2. VOCs will be measured by an FID-type analyser;
3. particulate matter will be measured by an opacimeter; and
4. oxygen will be monitored by a zirconium probe.

Sampling and analysis of all pollutants, including dioxins and furans, will be carried out to CEN or equivalent

standards (e.g. ISO, national, or international standards). This ensures the provision of data of an equivalent scientific quality.

The frequency of periodic measurements will comply with the Industrial Emissions Directive as a minimum. The flue gas sampling points, techniques and the sampling platform will comply with Environment Agency Technical Guidance Notes M1 and M2.

3.8.2 Reliability

IED Annex VI Part 8 Paragraph 1.2 allows a valid daily average to be obtained only if no more than 5 half-hourly averages during the day are discarded due to malfunction or maintenance of the continuous measurement system. The IED also requires that no more than 10 daily averages are discarded per year.

These reliability requirements will be met primarily by selecting MCERTS certified equipment.

Calibration will be carried out at regular intervals as recommended by the manufacturer and by the requirements of BS EN14181. Regular servicing and maintenance will be carried out under a service contract with the equipment supplier. The CEMS will be supplied with remote access to allow service engineers to provide remote diagnostics.

3.8.3 Start-up and shutdown

The emission limit values under the Industrial Emissions Directive do not apply during start-up and shutdown. Therefore, a signal would be sent from the main plant control system to the CEMS package to indicate when the plant is operational and burning waste.. The averages would only be calculated when this signal was sent, but raw monitoring data would be retained for inspection.

Start-up ends when all the following conditions are met.

- The temperature within the combustion chamber is greater than 850°C
- The flue gas cleaning plant, control systems, monitoring equipment, grate and ash extractors are all running.
- Exhaust gas O_2 is less than 15% (wet measurement); and
- The fuel feeding system is loading fuel into the boiler.

Shutdown begins when all of the following conditions are met.

- The fuel feeding system is not loading fuel into the furnace.
- The flue gas treatment systems are running.
- Exhaust gas O_2 is equal to or greater than 15% (wet measurement); and
- The auxiliary burner is maintaining the temperature at greater than 850°C within the boiler.

3.8.4 Monitoring Emissions to Land

Disposal of residues to land will comply with all relevant legislation.

3.8.5 Monitoring Emissions to Water

There will be no release of process emissions to water from the Installation, so there will be no monitoring requirements for emissions to water.

The Installation shall incorporate an on-site Sustainable Urban Drainage System ("SUDS") for surface water run off which discharges to an attenuation basin on-site, and ultimately to a controlled watercourse, Demon Beck, located on the southern boundary.

3.8.6 Monitoring of Process Variables

The following process variables have particular potential to influence emissions.

- At least the daily and annual fuel throughput will be recorded to enable comparison with the design throughput.
- Combustion temperature will be monitored at a suitable position to demonstrate compliance with the requirement for a residence time of 2 seconds at a temperature of at least 850^{o}C.
- The oxygen concentration will be measured at the outlet from the boiler.
- The differential pressure across the bag filters will be measured, in order to optimise the performance of the cleaning system and to detect bag failures.
- The concentration of HCl and/or SOx in the flue gases upstream of the flue gas treatment system will be measured in order to optimise the performance of the emissions abatement equipment.

Additionally, water use will be monitored and recorded regularly at various points throughout the process to help highlight any abnormal usage. This will be achieved by monitoring the incoming town water, the water treatment plant, and the boiler water makeup.

3.9 Technology Selection

3.9.2 Combustion Technology

It is proposed that the combustion technology for the plant will be a Rotary Kiln. Rotary Kiln systems are relatively simple and well proven. The Incinerator Sector Guidance Note EPR5.01 discusses a number of alternative technologies for the combustion of waste derived fuels.

Moving Grate Furnaces

As stated in the Sector Guidance Note, these are designed to handle large volumes of solid fuels. Moving Grate Furnaces are therefore not regarded as being an appropriate combustion technology for the Installation. The technology can achieve up to 980C to 1230C however the temperature can fluctuate across the bed making the technology unsuitable for hight temperature incineration of Hazardous and clinical waste.

Fixed Hearth

These are not considered suitable for the volumes of waste throughput of waste, and would not be suitable for the quantities / mix of waste proposed. They are best suited to low volumes of consistent waste. Fixed Hearth technologies are therefore not regarded as being an appropriate combustion technology for the Installation.

As confirmed in the Sector Guidance Note, fixed hearth designs can have difficulty in meeting the Chapter IV (Waste Incineration and Co-incineration) IED standards, mainly due to the semi-batch nature of the fuel travel on the grate and de-ashing operations. This is a further justification for not applying this technology to the Installation.

Pulsed Hearth

Pulsed hearth technology has been used for the combustion of solid fuels. However pulsed hearth Installations have had difficulties in achieving reliable and effective burnout of fuel and it is considered that the burnout criteria required by Chapter 4 of the IED would be difficult to achieve. Therefore, Pulsed Hearth Furnaces are not regarded as being an appropriate combustion technology for the Installation.

Rotary Kiln

Rotary Kilns have been proven to achieve good fuel agitation and associated burn-out rates. Rotary kilns have been demonstrated to achieved good results with clinical waste, however they have previously had limited application in the UK.

Rotary Kilns operate at high temperature and are considered BAT for hazardous waste and lower throughput mixed feeds. The high temperatures promote NOx formation which may require additional abatement. The

tumbling action of the kilns can generate high concentrations of fine particles which may require a secondary combustion chamber and additional abatement.

Rotary Kilns are regarded as being an appropriate combustion technology for the Installation.

Pyrolysis/Gasification

Various technology suppliers are developing pyrolysis and gasification systems. While pyrolysis and gasification systems which generate a syngas can theoretically take advantage of gas engines or gas turbines, which are more efficient than a standard steam turbine cycle, the syngas would require cleaning and filtration prior to combustion – if burnt in an engine. Additional products (such as oils) can be recovered from these techniques, but it is expected that this would be limited from a waste derived feed stock.

The losses associated with making the syngas and the additional electricity consumption of the site would mean that the overall efficiency is no higher than for a traditional combustion plant and for this type of waste derived fuel would generally be lower. This implies that a traditional combustion plant will have a more beneficial effect on climate change.

Pyrolysis and gasification are therefore not regarded as being appropriate energy recovery technologies for the Installation.

Fluidised Bed

Fluidised bed combustion can sometimes lead to slightly lower NOx generation, although injection of ammonia solution is still required to achieve the emission limits specified in the Industrial Emissions Directive. Fluidised bed technologies are designed to treat large quantities of waste derived fuel and are therefore regarded as being an appropriate combustion technology for the Installation.

Conclusions

Rotary Kilns operate at high temperature and are considered BAT for hazardous waste and clinical waste.

3.9.3 NOx Reduction System

NOx levels will primarily be controlled by monitoring the combustion air supply control of the combustion temperatures. Selective non-catalytic NOx reduction (SNCR) methods will also be installed, using ammonia solution as a reagent. SNCR involves the introduction of ammonia (NH3) into a heated gas zone containing NOx under high temperatures and in the presence of oxygen. This reaction breaks down the NOx into nitrogen (N2) and water (H2O).

The use of Selective Catalytic Reduction (SCR) has also been considered. In this technique, the reagent is

injected into the flue gases immediately upstream of a reactor vessel containing layers of catalyst. The reaction is most efficient in the temperature range 200 to 350°C. The catalyst is expensive and to achieve a reasonable working life, it is necessary to install the SCR downstream of the flue gas treatment plant. This is because the flue gas treatment plant removes dust which would otherwise cause deterioration of the catalyst.

Since the other flue gas cleaning reactions take place at an optimum temperature of around 140°C, the flue gases have to be reheated before entering the SCR. This requires some thermal energy which would otherwise be converted to electrical power output, reducing the overall energy recovery efficiency of the facility. The catalytic reactor also creates additional pressure losses to be compensated by a bigger exhaust fan, further reducing the overall energy efficiency of the Installation.

3.9.4 Flue Gas Recirculation (FGR)

FGR is not a bolt-on abatement technique. FGR involves the recirculation of a proportion of the flue gases into the combustion chamber to replace some of the secondary air and changes the operation of the plant in various ways, by changing the temperature balance and increasing turbulence.

The HTI has not been designed to incorporate FGR. This has been included as an improvement condition to define if required.

3.9.3.1 Conclusion

A BAT assessment of both SNCR and SCR has been carried out in the H1 assessment.

3.9.5 Acid Gas Abatement System

There are currently three technologies widely available for acid gas treatment on waste HTI plants in the UK.

1. Wet scrubbing, involving the mixing of the flue gases with an alkaline solution of sodium hydroxide or hydrated lime. This has a good abatement performance, but it consumes large quantities of water, produces large quantities of liquid effluent which require treatment and has high capital and operating costs. It is mainly used in the UK for hazardous waste incineration plants where high and varying levels of acid gases in the flue gases require the buffering capacity and additional abatement performance of a wet scrubbing system.
2. Semi-dry, involving the injection of lime as a slurry into the flue gases in the form of a spray of fine droplets. The acid gases are absorbed into the aqueous phase on the surface of the droplets and react with the lime. The fine droplets evaporate as the flue gases pass through the system, cooling the gas. This means that less energy can be extracted from the flue gases in the boiler,

making the steam cycle less efficient. The lime and reaction products are collected on a bag filter, where further reaction can take place.

3. Dry, involving the injection of solid lime into the flue gases as a powder. The lime is collected on a bag filter to form a cake and most of the reaction between the acid gases and the lime takes place as the flue gases pass through the filter cake. In its basic form, the dry system consumes more lime than the semi-dry system. However, this can be improved by recirculating the flue gas treatment residues, which contain some unreacted lime and reinjecting this into the flue gases.

Wet scrubbing is not considered to represent BAT for this type of waste burning Installation, due to the production of a large volume of hazardous liquid effluent and a reduction in the power generating efficiency of the plant.

The dry and semi-dry systems can easily achieve the emission limits required by the Industrial Emissions Directive and both systems are in operation on plants throughout Europe. Both can be considered to represent BAT by the Environment Agency Sector Guidance Note EPR 5.01. The advantages and disadvantages of each technique are varied which makes assessment complex; therefore, the assessment methodology described in Horizontal Guidance Note H1 has been used. .

The overall performance of the two technical options is similar and therefore could be considered to represent BAT for the Installation. However, whilst the dry solution generates slightly more APC residues, it has a lower Global Warming Potential, water consumption and annualised costs. A semi dry system is considered to represent BAT for the Installation and has been considered most appropriate.

3.9.6 Particulate Abatement

The Installation will use a multi-compartment fabric filter for the control of particulates. There are a number of alternative technologies available, but none offer the performance of the fabric filter. Fabric filters represent BAT for this type of waste burning Installation for the reasons listed below.

1. Wet scrubbers are not as efficient as fabric filters.
2. Electrostatic precipitators are also not capable of abating particulates to the same level as fabric filters. They could be used to reduce the particulate loading on the fabric filters and so increase the acid gas reaction efficiency and reduce lime residue production, but the benefit is marginal and would not justify the additional expenditure, the consequent increase in power consumption and significant increase in the footprint of the Installation.
3. Ceramic Filters have not been proven for this type of waste combustion plant and are more

suited to high temperature filtration.

Fabric filters are therefore considered to represent BAT for the removal of particulates.

3.9.7 Steam Condenser

There are three potential BAT solutions considered in Sector Guidance Note EPR 5.01 as representing indicative BAT for the Installation, which are:

1. air cooled condenser (ACC);
2. once though cooling (Water Cooling); or
3. evaporative condenser.

The facility will have hot water from the boiler that may require cooling in the unlikely event that the external uptake supply demand dropped. The two main alternatives to an ACC are a water-cooled condenser or an evaporative condenser and all are considered in Sector Guidance Note S5.01 as potential BAT solutions. The former uses a recirculating water supply to condense the steam and the latter uses water which is evaporated directly from the condenser surface and lost to the atmosphere to provide the required cooling.

Water cooled systems require significant volumes of water and a receiving watercourse for the off- site discharge of the cooling water. There is not an adequate watercourse that would be suitable., due to this reason provided, the use of water-cooling is not considered to be an available option.

Air cooled condensers are therefore considered to represent BAT for the Installation.

3.9.8 Specific requirements of the Industrial Emissions Directive (2010/75/EU)

This section contains information how the plant will comply with the Waste Incineration requirements of the Industrial Emissions Directive (IED).[3]

Chapter IV of the IED includes 'Special Provisions for Waste Incineration Plants and Waste Co- incineration Plants'. Review of provisions for waste incineration as presented in the IED has identified that the following requirements could be applicable to the Installation:

- Article 46 – Control of Emissions;

[3] Directive - 2010/75 - EN - EUR-Lex

- Article 47 – Breakdown;
- Article 48 – Monitoring of Emissions;
- Article 49 – Compliance with Emission Limit Values;
- Article 50 – Operating Conditions;
- Article 52 – Delivery & Reception of Waste;
- Article 53 – Residues; and
- Article 55 – Reporting & public information on waste incineration plants and waste co- incineration plants.

Articles 51 (Authorising to change operating conditions) and 54 (Substantial change) will not apply to this application. In addition, the requirements of Article 55 (Reporting & public information on waste incineration plants and waste co-incineration plants) will apply to the competent authority (the Environment Agency), not the applicant.

A table showing compliance with the Waste Incineration requirements of the Industrial Emissions Directive is presented below.

Table 11: Summary Table for IED Compliance

IED Reference	Demonstrating Compliance
Article 22, paragraph (2)	**A Site Condition Report for the Installation is presented in Section 4 of the application pack.**
Article 44 paragraph (a)	**Refer to of the Supporting Information within this application to confirm that the plant will be designed and maintained**
Article 44 paragraph (b)	**Refer to Section 18 of the Supporting Information and R1**
Article 44 paragraph (c)	**Refer to Section 2.8 of this report**
Article 44 paragraph (d)	**Refer to Section 2.8 of the this report**
Article 46, paragraph 1	**A stack height assessment was developed and submitted in support of the planning application. This demonstrated that a stack height of 30 m would be appropriate for emissions from the Installation to safeguard human health and the environment.**

	Please refer to Section 6 of the application pack for Air Quality
Article 46, paragraph 2	**As presented in Section 6 of the application pack for Air Quality, the Installation has been designed to achieve the relevant emission limits within the IED.**
Article 46, paragraph 3	**There will be no discharges to water from the cleaning of waste gases from the Installation, therefore paragraph 3 will not apply to the Installation.**
Article 46, paragraph 4	**There will be no discharges to water from the cleaning of waste gases from the Installation, therefore paragraph 4 will not apply to the Installation.**
Article 46, paragraph 5	**As detailed in section 12 of the application pack the drainage strategy for, the facility has been designed to prevent the release potentially polluting substances into soil, surface water and groundwater.** **The containment arrangements for contaminated fire water have been detailed in Section 11 of the application pack FPP**
Article 46, paragraph 6	**The Installation will comply with the abnormal operation requirements in accordance with the EP.**
Article 47	**The Installation will comply with the breakdown requirements in accordance with the EP.**
Article 48, paragraph 1	**As detailed in the Section 2.10 of this report the plant will have a CEMS which will continuously record the following pollutants within Annex VI:** • **Carbon monoxide;** • **Hydrogen chloride;**

IED Reference	Demonstrating Compliance
Article 48, paragraph 1 cont	• **Sulphur dioxide;** • **Hydrogen fluoride;** • **Nitrogen oxides;**

	• **VOCs; and** • **Particulates.** **In addition, the following parameters will also be monitored by means of spot sampling the following pollutants within Annex VI:** • **Heavy metals; and** • **Dioxins and furans.** **In addition, the water vapour content, temperature and pressure of the flue gases will be monitored so that the emission concentrations can be reported at the reference conditions required by the sector guidance.**
Article 48, paragraph 2	**As detailed in section 2.10, calibration will be carried out at regular intervals as recommended by the manufacturer and by the requirements of BS EN14181. Regular servicing and maintenance will be carried out under a service contract with the equipment supplier.**
Article 48, paragraph 3	**As detailed in section 2.10, the location of sampling points will be installed in accordance with the requirements of Environment Agency Technical Guidance Notes M1 and M2.**
Article 48, paragraph 4	**The operator will submit all relevant emissions monitoring reports in accordance with the requirements of the EP.**
Article 48, paragraph 5	**At the time of submitting this application, the operator is not aware of there being recognised measurement techniques for the continuous measurement of heavy metals and dioxins and furans. Therefore, paragraph 5 does not apply to this application.**
Article 49	**The Installation has been designed with monitoring equipment which will be used to demonstrate compliance with the emission limits within Part 4 of Annex V of the IED. As required by the permit, reports will be submitted to the Environment Agency which will demonstrate compliance with the EP.**
Article 50, paragraph 1	**The Installation is an incineration facility, so this requirement**

	does not apply.
Article 50, paragraph 2	**As detailed in section 2., there will be process monitoring to ensure that the combustion temperature will be monitored at a suitable position to demonstrate compliance with the requirement for a residence time of 2 seconds at a temperature of at least 850°C.**
Article 50, paragraph 3	**The Installation will have auxiliary burners, which will burn gas as detailed in section 2.7.** **As detailed in section 2.7, the auxiliary burners will maintain the temperature at 850°C and will also be used for start-up and shutdown.**
IED Reference	**Demonstrating Compliance**
Article 50, paragraph 4	**The Installation will meet the indicative BAT requirements outlined in the Incinerator Sector Guidance Note for waste charging and the specific requirements of the IED.** **The combustion control and feeding system will be in accordance with the requirements of the IED. The conditions within the furnace will be continually monitored to ensure that optimal conditions are maintained and that the mandatory IED emission limits are not exceeded.** **The fuel charging and feeding systems will be interlocked to prevent fuel charging when the furnace temperature is below 850°C, both during start-up and if the temperature falls below 850°C during operation. Or below 1100°C for clinical waste.** **The fuel charging and feeding systems will also be interlocked to prevent fuel charging if the emissions to atmosphere are in excess of an emission limit value due to disturbance or failures of the abatement equipment.**
Article 50, paragraph 5	**Heat generated by the plant will be utilised on site and excess distributed to district heating scheme**

Article 50, paragraph 6	**The HTI will meet the requirement to incinerate infectious clinical waste within the Installation by direct input into the hopper via a bin-lift. Human contact with the waste will not be permitted.**
Article 50, paragraph 7	**The operator will ensure that the appropriate management structure and management systems are in place proper to commencement of operation of the Installation. Where Operating Techniques are required to be added or altered the Environment Agency will be informed. The facility will be maintained and will be operated in accordance with the**
Article 52, paragraph 1	**The fuel reception and handling arrangement for the Installation are presented in section 1.5 of this document.**
Article 52, paragraph 2	**The fuel delivery, reception and handling arrangements for the Installation are presented in section 1.5.**
Article 52, paragraph 3	**The Installation will undertake pre acceptance checks and audit producers as detailed in Section 1.5**
Article 52, paragraph 4	**The Installation will undertake pre acceptance checks and audit producers as detailed in Section 1.5.**
Article 52, paragraph 5	**The operator does not wish to apply for any exemptions from any of the requirements stated within. Therefore, this requirement will not apply to the Installation.**
Article 53, paragraph 1	**The proposed arrangements for residues generated by the Installation are detailed in section 2.7.**
Article 53, paragraph 2	**The arrangements for the containment of dusts from the transport and intermediate storage of dry residues generated by the Installation are detailed in sections 3.62 and will be incorporated into the IMS**

IED Reference	Demonstrating Compliance
Article 53, paragraph 3	**Prior to the commencement of any transfer of residues generated by the Installation, they will be tested to ensure that they are acceptable to receiving facility.**

3.10 Energy Efficiency

3.10.1 General

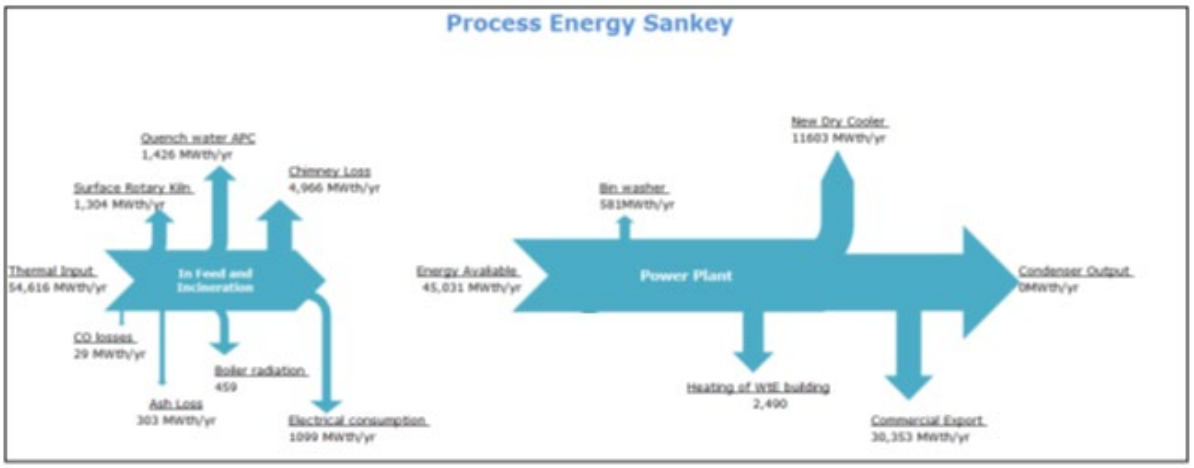
The recovered energy from the process of incineration will be distributed via a district heating main in the form of hot water.

In considering the energy efficiency of the Installation, due account has been taken of the requirements of the Environment Agency's Horizontal Guidance Note H2 on Energy Efficiency.

3.10.2 Basic Energy Requirements

An indicative Sankey Diagram for the Installation is presented in Figure 3:

Figure 3 – Indicative Sankey diagram.



The flow of materials and energy within the R1 system. Key components include the Bin Washer, which consumes 70 kW of power to clean bins, and the Heating of Warehouse Building, which requires 300 kW to maintain optimal temperature conditions. The system also includes Dry Coolers that dissipate excess heat, and the SNCR System, which reduces NOx emissions by injecting ammonia into the flue gas. The Heat Recovery Unit captures waste heat from the process, enhancing overall energy efficiency. The PFD details various flow rates, temperatures, and energy inputs and outputs at different stages, providing a comprehensive overview of the operational setup.

The R1 Data Sheet presents critical operational data for the R1 process. It specifies one boiler line operating for 8300 hours annually, with a waste feed rate of 1250 kg/hr, totalling 10,375 tonnes per year. The system

uses 209 MWh of natural gas for start-up, with a total fuel energy input of 6580.195 kW. The total electrical consumption is 1,099.1 MWh per year. This data highlights the system's capacity to handle significant waste volumes and its efficiency in converting energy inputs to outputs. The R1 value, calculated at 66.44%, indicates a high conversion rate of energy inputs to useful outputs, demonstrating the system's effectiveness in energy recovery.

The Sankey diagram visualizes the energy distribution within the R1 process, emphasizing the flow of energy inputs, outputs, and losses. Energy inputs primarily come from the waste feed and natural gas used for start-up. Energy outputs are distributed to various applications, including the heating of the warehouse, bin washing, and commercial export. The diagram also identifies energy losses occurring at different stages, such as through exhaust gases and cooling processes. This visualization is instrumental in identifying areas for potential improvement in energy efficiency, allowing for targeted optimizations in the R1 process.

The R1 process demonstrates a calculated value of 66.44%, reflecting a high efficiency in energy recovery. This value aligns well with regulatory-defined standards for waste-to-energy systems, which require an R1 value of at least 60% to qualify as efficient energy recovery facilities. The high R1 value indicates that the system effectively converts a significant portion of the energy input from waste materials into useful outputs, such as heat. The efficient energy recovery capabilities of the R1 system position it as a viable solution for meeting both operational efficiency and regulatory requirements.

3.10.2.1 Energy Consumption and Thermal Efficiency

The most significant electrical consumers are anticipated to be the following:

- combustion air fans;
- induced draught fan;
- boiler feed water and cooling water pumps;
- air cooled condenser fans;
- air compressors;
- fuel loading systems and ash and residue conveying systems; and
- offices and ancillary rooms.

The Installation will be designed with careful attention being paid to all normal energy efficiency design features, such as high efficiency motors, high standards of cladding and insulation, etc.

The plant will be designed to achieve a very high thermal efficiency applying the following measures.

1. The boilers will be equipped with economisers and superheaters to optimise thermal cycle efficiency without prejudicing boiler tube life, having regard for the nature of the fuel that is being burnt.
2. Unnecessary releases of steam and hot water will be avoided, to avoid the loss of boiler water treatment chemical and the heat contained within the steam and water.
3. Steady operation will be maintained where necessary by using auxiliary fuel firing.
4. Boiler heat exchange surfaces will be cleaned on a regular basis to ensure efficient heat recovery.
5. Due consideration will be given to the recommendations given in the Sector Guidance Note.

3.10.2.2 Operating and Maintenance Procedures

An O&M manual will be developed for the Installation. The O&M procedures will include the following aspects.

- Good maintenance and housekeeping techniques and regimes across the whole plant.
- Plant Condition Monitoring will be carried out on a regular basis. This will ensure, amongst other things, that motors are operating efficiently, insulation and cladding are not damaged and that there are no significant leaks.
- Operators will be trained in energy awareness and will be encouraged to identify opportunities for energy efficiency improvements.

3.10.2.3 Energy Efficiency Measures

An energy efficiency plan will be built into the operation and maintenance procedures of the plant ensuring maximum, practical, sustainable, safe and controllable electricity generation.

During normal operation, procedures will be reviewed and amended, where necessary, to include improvements in efficiency as and when proven new equipment and operating techniques become available. These will be assessed on the implementation cost compared with the anticipated benefits.

3.10.3 Further Energy Efficiency Requirements

Under the Industrial Emissions Directive, heat should be recovered as far as practicable. In order to demonstrate this, the following points should be noted.

- Economisers are installed to recover flue gas heat,
- compatibly with the temperature requirements of the flue gas treatment system
- The boiler will operate with superheated steam
- The plant will not be subject to a Climate Change Levy agreement, and the energy generated will be exempt from the levy.

3.11 Residue Recovery and Disposal

3.11.1 Introduction

The main residue streams arising from the Installation are:

1. bottom ash from the combustion process (Residue Type RT1); and
2. APC residue and fine ash particles (Residue Type RT2). As described below, the waste recovery and disposal techniques will be in accordance with the indicative BAT requirements. The main wastes to be generated from the operation of the Installation are summarised in Table 12.

3.11.2 Air Pollution Control residues

APCr are predominantly composed of calcium as hydroxide, carbonate, sulphate, and chloride/hydroxide complexes. Typical major element concentration ranges for the UK residues are as follows:

1. 30-36% w/w calcium;
2. 12-15% w/w chlorine;
3. 8-10% w/w carbonate (as C); and
4. 3-4% w/w sulphur (as S).

Silicon, aluminium, iron, magnesium, and fluorine are also present in addition to traces of dioxins and the following heavy metals: zinc, lead, manganese, copper, chromium, cadmium, mercury, and arsenic.

It may be possible to send the residue to an effluent treatment contractor, to be used to neutralise acids and similar materials or to be used in the production of concrete building products. Using the residues in this way avoids the use of primary materials. If this option is not practicable then it will be sent to a secure landfill for disposal as a hazardous waste.

APCr will be removed from site in enclosed tankers, thereby minimising the chance of spillage and dust emissions. During the tanker filling operation, displaced air will vent back to the silo and any releases to atmosphere would pass through a fabric filter.

3.11.3 Bottom Ash

Boiler ash will be mixed with bottom ash. The mixture of boiler ash and bottom ash is a non- hazardous waste which can typically be recycled in the manufacture of blocks. If the boiler ash were to be mixed with the APCr, the mixture would be defined as hazardous waste, and this would restrict the ability of the operator to recycle the boiler ash.

3.12 Management

3.12.1Introduction

Fornax commitment to their socio-environmental responsibilities will be demonstrated by operating the facility to the highest environmental, health and safety and professional standards. The Newton Aycliffe facility will use the most up-to-date international and national regulations, standards and guidance that govern the good design and construction of waste combustion plant.

An integrated management system will be employed as outlined in the Environment Agency Guidance Note IPPC S5.06 and Horizontal Guidance Note H6 – Environmental Management Systems. This will be required to implement an EMS in accordance with BS EN ISO 14001:2004 Environmental Management System Standard and with the operating and maintenance instructions of the designer of the plant.

3.12.2Management Systems

Fornax will develop an EMS that clearly defines the Installations management structure as well as setting out roles and responsibilities of all staff. The development of the EMS will also include:

- An Environmental Policy;
- Health and Safety Procedures; and
- An operational guidance manual which will include process plant operating procedures for both standard and emergency conditions.

The Construction (Design and Management) Regulations will apply during the construction and

commissioning period. In addition, management will undertake inspections and reviews for quality control, performance measurements, and staff appraisals.

3.12.2.1 Scope and Structure

The scope of the ISO 14001 certification will cover the receipt, handling and combustion of clinical and hazardous waste for destruction and the transfer of residues off-site. Also covered is the transfer of wastes from site in case of plant down time.

Where applicable, documented procedures will detail specifically how each activity is to be controlled. These will be contained in the Environmental Procedures Manual and identified related documents.

The site EMS will contain procedures for accident management that comply with the requirements set out in Agency guidance "How to comply with your Environmental Permit" EPR1.00. This will be in the form of an accident management plan that will be developed before the plant is commissioned.

3.12.2.2 General Requirements

ISO 14001 certification will require Fornax to maintain the EMS in accordance with the standard. The EMS objectives and scope will ensure that Fornax meets these requirements by:

- Identifying potential environmental impacts;
- Documenting and implementing standard procedures to mitigate and control these impacts;
- Determining a procedural hierarchy that considers the interaction of the relevant processes;
- Ensuring adequate responsibility, authority and resources to management necessary to support the EMS;
- Establishing performance indicators to measure the effectiveness of the procedures;
- Monitoring, measuring and analysing the procedures for effectiveness; and
- Implementing actions as required based on the results of auditing to ensure continual improvements of the processes.

3.12.3 Personnel

Operation and maintenance of the plant will be undertaken by the applicant's own staff. Sufficient numbers of staff, in various grades, will be provided to manage, operate and maintain the plant on a continuous basis, seven days per week throughout the year. The plant will be managed, operated and maintained by experienced managers, boiler operators and maintenance staff.

The key environmental management responsibilities will be allocated as described below:

- The **General Manager** will have overall responsibility for management of the Fornax Newton Aycliffe facility and compliance with the operating permit. He or she will also be responsible for waste management and scheduling. The general manager will have extensive experience relevant to their responsibilities.
- The **Production Foreman** will have day-to-day responsibility for the operation of the plant, to ensure that the plant is operated in accordance with the permit and that the environmental impact of the plant's operations is minimised. In this context, he or she will be responsible for designing and implementing operating procedures which incorporate environmental aspects.
- The **H&S, QMS and EMS Manager** will be responsible for the development and management of the EMS, for the monitoring of authorised releases and for interaction with the Environment Agency.
- The **Maintenance & Procurement Manager** will be responsible for the management of maintenance activities, for maintenance planning and for ensuring that the plant continues to operate in accordance with its design.
- The **Site Chemists** will have direct responsibility for the site Waste acceptance and compatibility checks . They will be qualified as HNC qualified chemist or higher

3.12.4 Competence, Training and Awareness

Fornax will ensure that any persons performing tasks for it, or on its behalf, which have the potential to cause significant environmental impact, are competent on the basis of appropriate education and training or experience.

The EMS will contain a training procedure to make employees aware of:

- The importance of conformity with the environment policies and procedures and with the requirements of the EMS;

- Potentially significant environmental aspects associated with their work;
- Their roles and responsibilities in achieving conformity with the requirements of the EMS, including emergency preparedness and response requirements;
- The relevance and importance of their activities and how they contribute to the achievement of the environmental and quality objectives; and
- The potential consequences of the departure from specified procedures.

Fornax will comply with the relevant industry standards or codes of practice for training, where they exist. The EMS will contain an archiving procedure to ensure all training is recorded and all associated records are retained.

2.8.4.1 Competence

Line Managers will identify the minimum competencies required for each role. These will then be applied to the recruitment process to ensure that key role responsibilities are satisfied. Particular attention will be paid to potential candidate's experience, qualifications, knowledge and skills.

A Technically Competent Manager will be in place for the site who holds the relevant qualification for the facility.

2.8.4.2 Induction and Awareness

Staff induction programmes are location and job role specific and will include, as a minimum, the induction of:

- The Environmental Policy;
- The Health and Safety Policy and Procedures; and
- The EMS Awareness Training.

2.8.4.3 Training

Staff training will be completed during commissioning of the Installation and before the plant is operational. Line Managers will identify and monitor staff training needs as part of the appraisal system. The training needs of employees will be addressed using on-the-job training, mentoring, internal training and external training courses/events.

Training records will be maintained onsite. The operation of the Installation will comply with the relevant industry standards or codes of practice for training (e.g CIWM(WAMITAB), where they exist.

3.13 Closure

3.13.1 Introduction

The Installation is designed for an operational life of approximately 30 years but its actual operational lifetime is dependent on a number of factors including the cost of the fuel and the cost of operating the facility.

When the Installation has reached the end of its operational life, it may be adapted for an alternative use or demolished as part of a redevelopment scheme and cleared and left in a fit-for- use condition.

3.13.2 General

At the end of the economic life of the plant, the development site and buildings may be converted to other uses or form part of an appropriate landscape restoration plan. The responsibility for this may well rest with other parties if the Installation is sold. However, the Applicant recognises the need to ensure that the design, the operation and the maintenance procedures facilitate decommissioning in a safe manner without risk of pollution, contamination or excessive disturbance.

To achieve this aim a site closure plan will be prepared. The following is a summary of the measures to be considered within the closure plan to ensure the objective of safe and clean decommissioning.

3.13.2.1 General Requirements

- Underground tanks and pipework to be avoided except for supply and discharge utilities such as towns water, sewerage lines and gas supply;
- Safe removal of all chemical and hazardous materials;
- Adequate provision for drainage, vessel cleaning and dismantling of pipework;
- Disassembly and containment procedures for insulation, materials handling equipment, material extraction equipment, fabric filters and other filtration equipment without significant leakage, spillage, dust or hazard;
- The use of recyclable materials where possible;
- Methodology for the removal/decommissioning of components and structures to minimise the exposure of noise, disturbance, dust and odours and for the protection of surface and groundwater;
- Soil sampling and testing of sensitive areas to ensure the minimum disturbance (sensitive areas

to be selected with reference to the initial site report).

3.13.2.2 Specific Details

A list of recyclable materials/components and current potential outlet sources;

A list of materials/components not suitable for recycle and potential outlet sources;

A list of materials to go to landfill with current recognised analysis, where appropriate;

A list of all chemicals and hazardous materials, location and current containment methods;

A Bill of Materials detailing total known quantities of items throughout the facility such as:

Steelwork;

Plastics;

Cables;

Concrete and Civils Materials;

Oils;

Chemicals;

Consumables;

Contained Water and Effluents; and

Bottom Ash and APC Residues.

3.13.2.3 Disposal Routes

Each of the items listed within the Bill of Materials will have a recognised or special route for disposal identified; e.g. Landfill by a licensed contractor, disposal by high sided, fully sheeted road vehicle or for sale to a scrap metal dealer, disposal by skip/fully enclosed container, dealer to collect and disposal by container.

3.14 Improvement programme

3.14.1 Pre-operational conditions

Fornax would propose that the following conditions, which are typically included for this type of installation, as follows:

1.0 Submit a written report to the Environment Agency on the commissioning of the Installation. The report will summarise the environmental performance of the plant as installed against the design parameters set out in the Application.

2.0 Submit a written report to the Environment Agency describing the performance and

optimisation of the Selective Non-Catalytic Reduction (SNCR) system and combustion settings to minimise oxides of nitrogen (NOx) emissions within the emission limit values described in this permit with the minimisation of nitrous oxide emissions. The report will also confirm and justify the selection of the reagent to be used within the SNCR system. This will include provision of procedures for the safe handling and management of the reagent.

3.0 The report will include an assessment of the level of NOx and N_2O emissions that can be achieved under optimum operating conditions.

4.0 Submit a written summary report to the Agency to confirm by the results of calibration and verification testing that the performance of Continuous Emission Monitors for parameters as specified within the EP complies with the requirements of BS EN 14181, specifically the requirements of QAL1, QAL2, and QAL3.

5.0 Submit a report which confirms whether FGR has been included within the final design of the Installation.

6.0 Submit a site plan showing location and dimensions and construction of the proposed cold store/secure storage and flammable bay prior to install. The approximate location has been indicated on Warehouse FPP Plan.

3.14.2 Commissioning conditions

Prior to commissioning of the Facility, Fornax will comply with the typical Pre-operational Conditions which will be included for this type of installation, as follows:

1. Submit to the Environment Agency for approval a protocol for the sampling and testing of bottom ash for the purposes of assessing its hazardous status. Sampling and testing shall be carried out in accordance with the protocol as approved.

2. Provide a written commissioning plan, including timelines for completion, for approval by the Environment Agency. The commissioning plan shall include the list of waste types to be used and the expected emissions to the environment during the different stages of commissioning, the expected durations of commissioning activities and the actions to be taken to protect the environment and report to the Environment Agency in the event that actual emissions exceed expected emissions. Commissioning shall be carried out in accordance with the commissioning plan as approved.

3.14.3 ISO14001 accreditation

Fornax will ensure that a management structure and a site-specific EMS accredited to ISO 14001 is adopted for the Installation. This EMS will be required to be in place before the start of operation, but cannot be accredited until the plant is operation. Fornax therefore suggests an improvement condition which requires the O&M contractor's environmental management system to be independently accredited to ISO 14001 within 18 months of the start of full operation.

3.14.4 Post Commissioning

Following commissioning of the Facility, Fornax will comply with the typical Improvement Conditions which will be included for this type of installation, as follows:

- carry out checks to verify the residence time, minimum temperature and oxygen content of the exhaust gases in the furnace whilst operating under the anticipated most unfavourable operating conditions. Results shall be submitted to the EA.
- provide a written proposal to the EA, for carrying out tests to determine the size distribution of the particulate matter in the exhaust gas emissions to air, identifying the fractions in the PM10 and PM2.5 ranges. The report will detail a timetable for undertaking the tests and producing a report on the results.

4 BAT and Appropriate Measures Compliance

Waste Incineration Directive	
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 a list of features (as identified in the BAT Conclusions document).**
Response/evidence	Fornax will implement an environmental management system (EMS) in accordance with ISO14001. The EMS will include standard operating procedures and safe working practices that minimise the environmental risks and impacts of the normal operations and include contingency plans to minimise the effect of breakdown, accidents etc. These will include procedures relating to other than normal operating conditions (OTNOC), waste stream management and environmental monitoring. The IMS will include the following sections/procedures: • IMS Policy Manual • Environmental Policy • Operations and Maintenance • Environmental Aspects • Objective and Performance Indicators • Accident Investigation & Reporting Procedure • Legal and Other Requirements • Complaints Procedure • Site Inspection, Audit and Reporting Procedure • Emergency Preparedness and Response Protocols

	• HTI Plants Safety • Process Safety Management • Managing Non-Conformance, Corrective & Preventive Action Procedure • Training, Awareness & Competence Procedure • Maintenance Programs • Management Plan • Environmental Monitoring and Measurement • Residues Management Plan • Site Closure Plan • The EMS will be in place prior to the HTI coming into operation.
BAT 2	**BAT is to determine either the gross electrical efficiency, the gross energy efficiency, or the boiler efficiency of the incineration plant as a whole or of all the relevant parts of the incineration plant.**
Response/evidence	The HTI gross boiler efficiency will be determined by carrying out a performance test at full load during the commissioning stage. The expected efficiencies and associated management have been set out in R1 Submission document and in the Energy Balance provided as within the R1 Information application. Details of this testing will be incorporated within the commissioning plan. See Section 18 of the Application Pack
BAT 3	**BAT is to monitor key process parameters relevant for emissions to air and water**
	As set out in Application Pack Section 6 of the main application document, continuous measurement of the following process parameters will be carried out within the HTI, in accordance with BAT 3:

Response/evidence	• Flow, oxygen content, temperature, pressure and water vapour content of flue gas • Temperature of the combustion chamber Monitoring of flow, pH and temperature of wastewater from wet flue gas cleaning is not applicable as wet flue gas cleaning will not be carried out. Monitoring of flow, pH and conductivity of wastewater is also not applicable as there will be no treatment of bottom ash.
BAT 4	**BAT is to monitor channelled emissions to air with at least the frequency given 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.**
Response/evidence	Section 2.10 of the document sets out the proposed monitoring to be undertaken in relation to emissions to air from the HTI as well as the monitoring standards to be used for each pollutant. These comply with the relevant standards and frequencies for each pollutant as set out in BAT 4. Continuous measurement of the following will be carried out: NOx; NH_3; CO; SO_2; HCl; Dust and TVOC (as TOC). As permitted under Annex VI Part 6, continuous measurement of HF will not be undertaken on the basis that the acid gas abatement system will operate to guarantee that the emission limit for HCl will not be exceeded. Periodic measurement of HF will be carried out at the HTI. Periodic measurement of the following will be undertaken HF, N_2O; Metals and metalloids (including Hg); PCDD/F; Dioxin-like PCBs; and Benzo[α]pyrene.
BAT 5	**BAT is to appropriately monitor channelled emissions to air from the incineration plant during other than normal operating conditions (OTNOC).** **The monitoring can be carried out by direct emission measurements (e.g. for the pollutants that are monitored continuously) or by monitoring of surrogate parameters if this proves to be of equivalent or better scientific quality than direct emission measurements. Emissions during start-up and shutdown while no waste is being incinerated, including emissions of PCDD/F, are estimated based on measurement campaigns, e.g. every three years, carried out during planned start-up/shutdown operations.**
Response/evidence	Monitoring of emissions to air during OTNOC will be set out in the facility OTNOC plan. Direct emission measurements will be used for the pollutants that are monitored continuously. Emissions during start up and shutdown while no waste is being incinerated will be estimated for pollutants monitored periodically based on a calculation informed by measurement campaigns carried out every three years during planned start-up/shutdown operations.

	The plant will follow established start-up and shutdown procedure.
BAT 7	**BAT is to monitor the content of unburnt substances in slags and bottom ashes at the incineration plant with at least the frequency given below and in accordance with EN standards.** **Monitoring of the following is required at least once every 3 months:** **Loss on ignition or total organic carbon**
Response/evidence	total organic carbon (TOC) in bottom ash will be monitored quarterly.
BAT 8	**For the incineration of hazardous waste containing POPs, BAT is to determine the POP content in the output streams (e.g. slags and bottom ashes, flue-gas, waste water) after the commissioning of the incineration plant and after each change that may significantly affect the POP content in the output streams.**
Response/evidence	All out put waste will be classified in accordance with WM3 Guidance this includes the requirement to undertake the assessment of POPS.
General environmental and combustion performance	
BAT 9	**In order to improve the overall environmental performance of the incineration plant by waste stream management (see BAT 1), BAT is to use all of the techniques (a) to (c) given below, and, where relevant, also techniques (d), (e) and (f).** **a) Determination of the types of waste that can be incinerated** **b) Set-up and implementation of waste characterisation and pre-acceptance procedures** **c) Set-up and implementation of waste acceptance procedures** **d) Set-up and implementation of a waste tracking system and inventory** **e) Waste segregation** **Verification of waste compatibility prior to the mixing or blending of hazardous wastes**

Response/evidence	The plant will only accept the waste types set out in the list of EWC codes in the main application document (BAT 9a). An overview of the waste pre-acceptance and acceptance procedures is set out in Section 3.1 of the main application (BAT 9b and 9c). The procedure for tracking waste deliveries is also set out in Section 2.1 (BAT 9d). These procedures will be documented within the site's EMS. BAT 9e is not applicable as the waste types that will be accepted to the HTI will have similar properties, so there is no need for segregation into different waste types for easier or safer storage and incineration. Mixing or blending of hazardous wastes will not take place at the site and BAT 9f is therefore also not applicable.
BAT 10	**In order to improve the overall environmental performance of the bottom ash treatment plant, BAT is to include output quality management features in the EMS (see BAT 1).** **Output quality management features are included in the EMS, so as to ensure that the output of the bottom ash treatment is in line with expectations, using existing EN standards where available. This also allows the performance of the bottom ash treatment to be monitored and optimised.**
Response/evidence	Not applicable as there is no bottom ash treatment plant at the site. Bottom ash is sent to a third party bottom ash processing plant for recovery.
BAT 11	**In order to improve the overall environmental performance of the incineration plant, BAT is to monitor the waste deliveries as part of the waste acceptance procedures (see BAT 9(c)) including, depending on the risk posed by the incoming waste, the elements given below:** **For MSW and other non-hazardous waste:** **— Radioactivity detection** **— Weighing of the waste deliveries** **— Visual inspection** **Periodic sampling of waste deliveries and analysis of key properties/substances (e.g. calorific value, content of halogens and metals/metalloids). For municipal solid waste, this involves separate unloading.**
Response/evidence	Waste deliveries to the HTI will be weighed at the weighbridge. Visual spot checking of waste deliveries will be carried out during unloading and periodic sampling and analysis will be undertaken. The frequency of sampling will be set out in the waste acceptance procedures to be developed prior to the facility accepting any waste. Hazardous waste such as clinical wastes will not be managed at the site. It is accepted that UK radioactive

	substances regulation is sufficiently robust so as to minimise the risk of radioactive material inadvertently arriving at the site and therefore radioactivity detection will not be provided.
BAT 12	**In order to reduce the environmental risks associated with the reception, handling and storage of waste, BAT is to use both of the techniques given below.** **a) Impermeable surfaces with an adequate drainage infrastructure** **b) Adequate waste storage capacity**
Response/evidence	The surface of the waste reception, handling and storage areas will be impermeable and fitted with an adequate drainage infrastructure. The integrity of this surface will be checked regularly. The racking is designed to hold circa 5 days' storage of waste. The maximum waste storage capacity of circa 5,500 t will not be exceeded, taking into account the characteristics of the wastes (e.g. regarding the risk of fire) and the treatment capacity. The quantity of waste stored will be regularly monitored against the maximum allowed storage capacity.
BAT 13	**In order to reduce the environmental risk associated with the storage and handling of clinical waste, BAT is to use a combination of the techniques given below.**
Response/evidence	Clinical waste is delivered in sealed Eurobin and robust combustible containers that are never opened throughout storage and handling operations. If needles and sharps are disposed of in them, the containers are puncture-proof. Clinical wastes are unloaded from the vehicle to the storage area using a manual system. Reusable waste containers are cleaned in a designated cleaning area and disinfected in a facility specifically designed for disinfection. Any leftovers from the cleaning operations are incinerated.
BAT 14	**In order to improve the overall environmental performance of the incineration of waste, to reduce the content of unburnt substances in slags and bottom ashes, and to reduce emissions to air from the incineration of waste, BAT is to use an appropriate combination of the techniques given below.** **a) Waste blending and mixing** **b) Advanced control system** **c) Optimisation of the incineration process** **BAT-associated environmental performance levels for unburnt substances in slags and bottom ashes:** • **TOC = 1-3 dry wt-%**

	• **LOI = 1-5 dry wt-%** ***either TOC or LOI BAT-AEPL applies.**
Response/evidence	Waste blending and mixing will be carried out in the delivery hopper and then pushed in to chamber via hydraulic ram (BAT 14a). Not applicable where direct furnace feeding is required due to safety considerations or waste characteristics (e.g. infectious clinical waste, odorous wastes, or wastes that are prone to releasing volatile substances).The advanced control system and how the combustion process, waste feed and furnace design will be optimised are set out in Section 3 of the main application document (BAT 14b and BAT 14c). The continuous emissions monitoring system (CEMS) will feed back to the combustion control system so the combustion conditions will be able to be adjusted as required. The plant will be controlled using a suitably designed distributed control system (DCS) following standard practices for this type of facility. The plant will run in automatic mode with minimal interference required by the operators. Settings which require adjustment will be able to be put into manual although this will only be for short term excursions. Typical process parameters such as pressure, flow, temperature, current etc. are all monitored and the DCS will control the process. The CEMS will run as a separate system with a duty/standby configuration and will communicate with the DCS. There will also be a separate control system for the turbine which will be delivered as part of the turbine supplier package, this will also communicate with the DCS. There will be a separate safety information system to measure and control the required safety interlocks for the plant and will not be able to be accessed by the operators and only by a trained competent person. TOC will be monitored in accordance with the permit requirements to demonstrate that a TOC of <3% is achieved (see BAT 7 response).
BAT 15	**In order to improve the overall environmental performance of the incineration plant and to reduce emissions to air, BAT is to set up and implement procedures for the adjustment of the plant's settings, e.g. through the advanced control system (see description in Section 2.1), as and when needed and practicable, based on the characterisation and control of the waste (see BAT 11).**
Response/evidence	The control system to be installed at the HTI will be designed to control the process to ensure operations meet IED and/or BAT-AEL requirements, minimise emissions that can be influenced by operating conditions on the grate (CO, NOx and VOC), achieve a constant level of steam production and maintain operation within the design envelope. The control system will incorporate a combustion control system, described in further detail in Section 3 of the main application document. The system will be an advanced control system as it will involve the use of a computer-based automatic system to

	control the combustion efficiency and support the prevention and/or reduction of emissions, including the use of high performance monitoring of operating parameters and of emissions.
BAT 16	**In order to improve the overall environmental performance of the incineration plant and to reduce emissions to air, BAT is to set up and implement operational procedures (e.g. organisation of the supply chain, continuous rather than batch operation) to limit as far as practicable shutdown and start-up operations.**
Response/evidence	The HTI has been designed and will be operated to ensure that start-up and shutdown operations, including emergency shutdown scenarios are carried out safely and without significant environmental impact. The plant has been designed for continuous operation and is expected to operate for 8,000 hours per year. See Section 3 of the main application document. The procedures for start-up and shutdown will be documented, these procedures will be in place prior to commissioning of the HTI.
BAT 17	**In order to reduce emissions to air and, where relevant, to water from the incineration plant, BAT is to ensure that the FGC system and the waste water treatment plant are appropriately designed (e.g. considering the maximum flow rate and pollutant concentrations), operated within their design range, and maintained so as to ensure optimal availability.**
Response/evidence	The flue gas cleaning system will be appropriately designed, operated and maintained in order to reduce emissions to air. Details on the proposed techniques are set out in Section 2.6 of this document. Waste acceptance and waste feed management will assist with controlling the waste feed to the HTI and assisting in ensuring it is well mixed. The advanced control system will regulate the combustion phase to keep within the design range which seeks to minimise pollutant formation. The flue gas cleaning system will also be monitored and automatically controlled to ensure it is operated within the design range set out by the manufacturer and that it is regularly maintained to ensure optimal availability. No wet flue gas cleaning plant is proposed therefore associated wastewater treatment is not carried out.
BAT 18	**In order to reduce the frequency of the occurrence of OTNOC and to reduce emissions to air and, where relevant, to water from the incineration plant 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 elements:** **— identification of potential OTNOC (e.g. failure of equipment critical to the protection of the environment ('critical equipment')), of their root causes and of their potential consequences, and regular review and update of the list of identified OTNOC following the periodic assessment below;**

	— appropriate design of critical equipment (e.g. compartmentalisation of the bag filter, techniques to heat up the flue-gas and obviate the need to bypass the bag filter during start-up and shutdown, etc.); **— set-up and implementation of a preventive maintenance plan for critical equipment (see BAT 1(xii));** **— monitoring and recording of emissions during OTNOC and associated circumstances (see BAT 5);** **periodic assessment of the emissions occurring during OTNOC (e.g. frequency of events, duration, amount of pollutants emitted) and implementation of corrective actions if necessary.**
Response/evidence	OTNOC management will be included within the OTNOC plan, in conjunction with BAT 1, and will cover the elements set out in BAT 18. Review, updating and auditing of the OTNOC procedures will be in accordance with the requirements of the IMS.
Energy efficiency	
BAT 19	**In order to increase the resource efficiency of the incineration plant, BAT is to use a heat recovery boiler.**
Response/evidence	Energy is recovered from the hot flue gases within the EBK boiler. The resulting hot water is directed to the exported to the internal and export district heating grid. Energy is therefore recovered to hot water.
BAT 20	**In order to increase the energy efficiency of the incineration plant, BAT is to use an appropriate combination of the techniques given below.** **a) Drying of sewage sludge** **b) Reduction of flue-gas flow** **c) Minimisation of heat losses** **d) Optimisation of the boiler design** **e) Low-temperature flue-gas heat exchangers** **f) High steam conditions**

	g) Cogeneration **h) Flue-gas condenser** **i) Dry bottom ash handling**
Response/evidence	The flue gas flow will be reduced through the design of the primary and secondary air distribution. The volume of both primary and secondary air will be regulated by an automatic combustion control system, as set out in Section 3 of the main application (BAT 20b). Heat losses will be minimised where possible, for example through the use of an integral furnace-boiler and insulation of plant as set out in Section 3 of the main application document (BAT 20c). The boiler design will be optimised, as described in Section 3 of the main application document (BAT 20d). The HTI will be designed initially for hot water export to district heating system and has therefore been optimised for this mode of generation. See Section 18 of permit application pack.
Emissions to air	
BAT 21	**In order to prevent or reduce diffuse emissions from the incineration plant, including odour emissions, BAT is to:** **— store solid and bulk pasty wastes that are odorous and/or prone to releasing volatile substances in enclosed buildings under controlled subatmospheric pressure and use the extracted air as combustion air for incineration or send it to another suitable abatement system in the case of a risk of explosion;** **— store liquid wastes in tanks under appropriate controlled pressure and duct the tank vents to the combustion air feed or to another suitable abatement system;** **— control the risk of odour during complete shutdown periods when no incineration capacity is available, e.g. by:** **+ sending the vented or extracted air to an alternative abatement system, e.g. a wet scrubber, a fixed adsorption bed;**

	+ minimising the amount of waste in storage, e.g. by interrupting, reducing or transferring waste deliveries, as a part of waste stream management (see BAT 9); **+ storing waste in properly sealed bales.**
Response/evidence	The incoming waste will be stored in an enclosed building under controlled sub atmospheric pressure and the air from the building is extracted for use as combustion air, as described in Section 3 of the main application document. The control measures for fugitive emissions and odour are set out in sections 4.4 and 4.5 respectively of the main application and an odour management plan is included as Appendix L. As the availability of the facility will be high (8,000 hours per year), normal operations with these systems in operation will be happening most of the time. In the event of a full plant shutdown, the amount of waste in storage will be minimised by stopping/diverting deliveries and/or having run down waste beforehand (if a planned shutdown), as described in Section 3 of the main application document. In the event of an unplanned shutdown waste will be contained within the warehouse and the doors to the waste reception building will be kept shut. Waste types are not expected to malodourous Refrigerated storage will be available for any identified wastes requiring specific management.
BAT 22	**In order to prevent diffuse emissions of volatile compounds from the handling of gaseous and liquid wastes that are odorous and/or prone to releasing volatile substances at incineration plants, BAT is to introduce them into the furnace by direct feeding**
Response/evidence	No gaseous liquid waste delivered by bulk tanker will be accepted at the HTI. Liquid waste will be pre booked in and directed feeding is carried out by introducing the containers directly into the furness or via a lance, for 'as soon as possible destruction'. Containerised to prevent diffuse emissions of releases.
BAT 23	**In order to prevent or reduce diffuse dust emissions to air from the treatment of slags and bottom ashes, BAT is to include in the environmental management system (see BAT 1) the following diffuse dust emissions management features:** **— identification of the most relevant diffuse dust emission sources (e.g. using EN 15445);** **definition and implementation of appropriate actions and techniques to prevent or reduce diffuse emissions over a given time frame.**
Response/evidence	Not applicable as there is no bottom ash treatment plant at the site. Bottom ash is sent to a third-party bottom ash processing plant for recovery.
BAT 24	**In order to prevent or reduce diffuse dust emissions to air from the treatment of slags and bottom ashes, BAT is to use an appropriate combination of the techniques given below.**

Response/evidence	Not applicable as there is no bottom ash treatment plant at the site. Bottom ash is sent to a third-party bottom ash processing plant for recovery.
BAT 25	**BAT 25: In order to reduce channeled emissions to air of dust, metals and metalloids from the incineration of waste, BAT is to use one or a combination of the techniques given below.** **a) Bag filter** **b) Electrostatic precipitator** **c) Dry sorbent injection** **d) Wet scrubber** **e) Fixed- or moving-bed adsorption** **BAT-AELs to be complied with are:** **- Dust, <2 – 5 mg/Nm^3, daily average** **- Cd+Tl, 0.005 – 0.02 mg/Nm^3, average over the sampling period** **Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V, 0.01 -0.3 mg/Nm^3, average over the sampling period**
Response/evidence	A bag filter (BAT 25a) and semi dry/dry system with hydrated lime and injection of activated carbon (BAT 25c) will be used at the HTI, The HTI will comply with the BAT-AELs for new plant and will perform at or below the limits set out in Application Pack Section 6 of the main application document under normal operating conditions.
BAT 26	**In order to reduce channelled dust emissions to air from the enclosed treatment of slags and bottom ashes with extraction of air (see BAT 24(f)), BAT is to treat the extracted air with a bag filter (see Section 2.2).**
Response/evidence	Not applicable as there is no bottom ash treatment plant at the site. Bottom ash is sent to a third-party bottom ash processing plant for recovery
	In order to reduce channeled emissions of HCl, HF and SO_2 to air from the incineration of waste, BAT is to use one or a combination of the techniques given below. **a) Wet scrubber**

BAT 27	**b) Semi-wet absorber** **c) Dry sorbent injection** **d) Direct desulphurisation** **Boiler sorbent injection**
Response/evidence	Dry or semi-wet injection of hydrated lime (BAT 27c) will be injected (BAT 27e) for reduction of acid gases. The BAT case for this approach has been set out in the options appraisal in Section 3.12of this document.
BAT 28	**In order to reduce channeled peak emissions of HCl, HF and SO_2 to air from the incineration of waste while limiting the consumption of reagents and the amount of residues generated from dry sorbent injection and semi-wet absorbers, BAT is to use technique (a) or both of the techniques given below.** **a) Optimised and automated reagent dosage** **b) Recirculation of reagents BAT-AELs** • **HCl, <2-6 mg/Nm^3, daily average** • **HF, <1 mg/Nm^3, daily average or average over the sampling period** **SO_2 mg/Nm^3, 5-30, daily average**
Response/evidence	Reagent dosage will be optimised and automated as set out in 3.9.2 of the main application document (BAT 28a). Dosage rates of hydrated lime will be controlled and monitored to ensure usage is optimised and to avoid overdosage resulting in increased quantities of unreacted material within the APC residues. Dosage will be controlled against raw gas concentrations of SO_2 and HCl. Flow of reagent will be monitored and alarmed to indicate a failure. The HTI will comply with the BAT-AELs for new plant and will perform at or below the limits set out in of the main application document under normal operating conditions.

BAT 29	**BAT 29: In order to reduce channeled NO_X emissions to air while limiting the emissions of CO and N_2O from the incineration of waste and the emissions of NH_3 from the use of SNCR and/or SCR, BAT is to use an appropriate combination of the techniques given below.** **a) Optimisation of the incineration process** **b) Flue-gas recirculation** **c) SNCR** **d) SCR** **e) Catalytic filter bags** **f) Optimisation of the SNCR/SCR design and operation** **g) Wet scrubber BAT-AELs:** • **NO_x, 50-120 mg/Nm^3, daily average** • **CO, 10-50 mg/Nm^3, daily average** **NH_3, 2-10 mg/Nm^3, daily average**
Response/evidence	The optimisation of the incineration process is described in Section 3 of the main application document (BAT 29a). Selective non catalytic reduction (SNCR) will be in place for NOx reduction (BAT 29c) as described in Section 4.1 of the main application and the options appraisal in section 2.3 of this document. The location of the SNCR reagent injection points will be optimised during the detailed design stage, during commissioning the reagent injection rate will be optimised, and during operation feedback from the emissions monitoring will be used to continually optimise reagent dosing (BAT 29f). The BAT position on flue gas recirculation is set out in Section 2.3 of this document. The HTI will comply with the BAT-AELs for new plant and will perform at or below the limits set out in 3.9.2 of the main application document under normal operating conditions.
	In order to reduce channeled emissions to air of organic compounds including PCDD/F and PCBs from the incineration of waste, BAT is to use techniques (a), (b), (c), (d), and one or a combination of techniques (e) to (i) given below.

BAT 30	**a) Optimisation of the incineration process** **b) Control of the waste feed** **c) Online and offline boiler cleaning** **d) Rapid flue gas cooling** **e) Dry sorbent injection** **f) Fixed- or moving-bed adsorption** **g) SCR** **h) Catalytic filter bags** **i) Carbon sorbent in a wet** **scrubber BAT-AELs:** • **TVOC, <3-10 mg/Nm^3, daily average** • **PCDD/F, <0.01-0.04 ng I-TEQ/Nm^3 average over the sampling period <0.01-0.06 ng I-TEQ/Nm^3 long-term sampling period** • **PCDD/F + dioxin-like PCBs, <0.01-0.06 ng WHO-TEQ/Nm^3 average over the sampling period <0.01-0.08 ng WHO-TEQ/Nm^3 long-term sampling period** **Either PCDD/F or PCDD/F + dioxin-like PCBs BAT-AEL applies.**
Response/evidence	As set out in the response to BAT 29, the optimisation of the incineration process is described in Section 3 of the main application document (BAT 30a). Both online and offline boiler cleaning will be carried out as required at the HTI (BAT 30c). Flue gas is cooled rapidly as set out in the description of the boiler design in Section 3 of the main application document (BAT 30d). Dry injection of activated carbon (BAT 30e) will be used at the HTI, as described in Section 4.1 of the main application document. The waste feed is controlled through only accepting permitted waste codes and management of the feedstock (BAT 30b). The HTI will comply with the BAT-AELs for new plant and will perform at or below the limits set out in Section 3.9.4 of the main application document under normal operating conditions.

BAT 31	**In order to reduce channeled mercury emissions to air (including mercury emission peaks) from the incineration of waste, BAT is to use one or a combination of the techniques given below.** **a) Wet scrubber (low pH)** **b) Dry sorbent injection** **c) Injection of special, highly reactive activated carbon** **d) Boiler bromine addition** **e) Fixed- or moving-bed adsorption BAT-AELs:** • **Hg, <5-20 µg/Nm^3 daily average or average over the sampling period, 1-10 µg/Nm^3 long term sampling period** **Either of the above BAT-AELs applies.**
Response/evidence	Dry sorbent injection of activated carbon (BAT 31b) will be used at the HTI, as described in Section 3.94 of the main application document. The HTI will comply with the BAT-AELs for new plant and will perform at or below the limit set out in 3.9 of the main application documents under normal operating conditions
Emissions to water	
BAT 32	**In order to prevent the contamination of uncontaminated water, to reduce emissions to water, and to increase resource efficiency, BAT is to segregate waste water streams and to treat them separately, depending on their characteristics.**
Response/evidence	All waste water has been assessed as to the potential for contamination is minimal. Waste water is collected and discharged off site or sent for disposal either in house via incineration or sent to a suitably licenced facility.
BAT 33	**In order to reduce water usage and to prevent or reduce the generation of waste water from the incineration plant, BAT is to use one or a combination of the techniques given below.**

	a) **Waste-water-free FGC techniques** b) **Injection of waste water from FGC** c) **Water reuse/recycling** d) **Dry bottom ash handling**
Response/evidence	Dry injection of activated carbon and injection of hydrated lime (BAT 33a) will be used at the HTI therefore no waste waters are generated from flue gas cleaning (see Section 4.1 of the main application document). Process waste waters (i.e. from process area cleaning) and rainwater will be collected for re-use where possible, as described in Section 2.5 of the main application document (BAT 33c). Excess water from the bottom ash quench will be directed back into the quench bath for reuse (BAT 33 c).
BAT 34	**In order to reduce emissions to water from FGC and/or from the storage and treatment of slags and bottom ashes, BAT is to use an appropriate combination of the techniques given below, and to use secondary techniques as close as possible to the source in order to avoid dilution.** **Primary** a) **Optimisation of the incineration process and/or of the FGC system** **Secondary** b) **Equalisation** c) **Neutralisation** d) **Physical separation** e) **Adsorption on activated carbon** f) **Precipitation** g) **Oxidation** h) **Ion exchange**

	i) Stripping j) Reverse osmosis k) Coagulation and flocculation l) Sedimentation m) Filtration n) Flotation
Response/evidence	Not applicable as there will be no aqueous process emissions from flue gas cleaning or from the storage of Bottom Ash.
Material efficiency	
BAT 35	**In order to increase resource efficiency, BAT is to handle and treat bottom ashes separately from FGC residues.**
Response/evidence	Bottom Ash and APC residues will be collected separately at the HTI. At present no planned emissions from flue gas cleaning.
BAT 36	**In order to increase resource efficiency for the treatment of slags and bottom ashes, BAT is to use an appropriate combination of the techniques given below based on a risk assessment depending on the hazardous properties of the slags and bottom ashes.** **a) Screening and sieving** **b) Crushing** **c) Aeraulic separation** **d) Recovery of ferrous and non-ferrous metals** **e) Ageing** **f). Washing**

Response/evidence	Not applicable as there is no bottom ash treatment plant at the site. Bottom ash is sent to a third-party bottom ash processing plant for recovery
Noise	
BAT 37	**In order to prevent or, where that is not practicable, to reduce noise emissions, BAT is to use one or a combination of the techniques given below** **a) Appropriate location of equipment and buildings** **b) Operational measures** **c) Low-noise equipment** **d) Noise attenuation** **e) Noise-control equipment/infrastructure**
Response/evidence	Operational measures (BAT 37b) will include inspection and maintenance of equipment; closing of doors and windows of enclosed areas, if possible; operation of equipment by experienced staff; and provisions for noise control during maintenance activities. Low-noise equipment such as low-noise compressors, pumps and fans will be installed at the HTI (BAT 37c). Noisy plant and equipment will be contained within enclosed buildings (BAT 37d) and noise control equipment/infrastructure will include silencers including the ID fan and equipment insulation (BAT 37e). See the Noise Assessment in Application pack 14. for more detail. The noise modelling was done for planning and a review was undertaken and the model is still relevant

Clinical Waste Compliance With - Healthcare Waste: Appropriate Measures for Permitted Facilities[4]	
1, Introduction	
Response/evidence	**Where Appropriate Measures Apply for the Fornax Facility** For healthcare waste incineration activities, the following sections apply in addition to the Incineration sector guidance: ● Waste pre-acceptance, acceptance and tracking ● Waste storage, segregation and handling **Definition of Healthcare Waste** : **'Clinical waste'** is healthcare waste that: ● contains viable micro-organisms or their toxins which are known or reliably believed to cause disease in humans or other living organisms ● contains or is contaminated with a medicine that contains a biologically active pharmaceutical agent ● is a sharp, or a body fluid, or other biological material (including human and animal tissue), containing or contaminated with a hazardous substance ● is waste of a similar nature from a non-healthcare activity '**Offensive waste'** is waste that: ● is not clinical waste ● contains body fluids, secretions or excretions ● falls within waste codes 18 01 04, 18 02 03 or 20 01 99 '**Medicine**' is a drug or other preparation for the treatment or prevention of disease. Medicines may also include diagnostic agents. '**Cytotoxic and cytostatic** medicine' is medicine that possesses hazardous properties which are toxic, carcinogenic, mutagenic or toxic for reproduction. **A 'sharp'** is an item that could cause cuts or puncture wounds. This includes needles, hypodermic needles, scalpels and other blades, knives, infusion sets, saws, broken glass, and nails. The Guidance defines that *" You should send for incineration all anatomical, chemical and medicinal wastes, including wastes that are medicinally or chemically contaminated. Wastes containing cytotoxic or cytostatic medicines require high temperature incineration (that is at temperatures greater than 1,000°C)."* ● all pharmaceutically active substances (hazardous or non-hazardous) will be destroyed ● chemicals will be fully treated and not diluted and released to the environment ● anatomical waste will be fully destroyed and any chemicals (for example, preservatives) will be fully treated
2	**General Management Appropriate Measures**

[4] [4] Healthcare waste: appropriate measures for permitted facilities - Guidance - GOV.UK

Response/evidence	**2.1 Management System** The facility will have an accredited EMS ISO14001 & ISO45001 H&S **2.2 Staff Competence** All staff will be appropriately trained for the activities they carry out. Site Technically Competent Management will be on site for the required timescales as required by Environment Agency Guidance. Site Chemist will be qualified with Degree or HND in Chemistry standard as a minimum. Technical assessment will be carried out by appropriately trained staff. Site operatives will be trained in the for the tasks that they are to carried out via several methods such as external qualifications, in-house training courses, Tool Box Talks. **2.3 Accident Management Plans** See section 13 of the application for Emergency Plan **2.4 Accident Prevention Measures** See section 13 of the application for Emergency Plan HAZOP & DSEAR assessments are carried out for the facility where zoning of areas is assigned to ensure specialist safety measures such as ATEX zoning assigned. **2.5 Contingency plan and Procedures** See Section 13 of the application Emergency Plan See EMS procedures **2.6 Plant Decommissioning** Prior to decommissioning all vessels, aboveground tanks, bunds and pipework will be drained and cleaned out prior to dismantling. The site infrastructure will be decommissioned on site and the component parts will be removed individually and if still in working order sold as operational equipment or disposed of to a suitably licenced facility. For larger components they will be removed from the site by, removing of a number of roof panels and the components will then be craned out through the roof. They will then be removed off site via low loaders. The Decommissioning plan will be included in the site Environment Management System EMS and will include details on Fornax will maintain a decommissioning plan to demonstrate that: plant will be decommissioned without causing pollution the site will be returned to a satisfactory condition The decommissioning plan will include details on: • removing or flushing out pipelines and vessels (where appropriate) and how these will be emptied, including identification of any potentially harmful contents • site plans showing the location of all underground pipes are available • the method and resources needed to clear any on-site lagoons • No asbestos or other potentially harmful materials are identified as being used in the building.

	• methods for dismantling buildings and other structures, and for protecting surface water and groundwater at construction and demolition sites • any soil testing needed to check for any pollution caused by the site activities, and information on any remediation needed to return the site to a satisfactory state, as defined by the initial site report • the measures proposed, once activities have definitively stopped, to avoid any pollution risk and to return the site of operation to a satisfactory state (including, where appropriate, measures relating to the design and construction of the plant) • the clearing of deposited residues, waste and any contamination resulting from the waste treatment activities
3	**Waste pre-acceptance, acceptance and tracking**
Response/evidence	**3.1 Waste Pre-Acceptance** See Section 7 of this application 1_Fornax pre-waste acceptance SOP **3.2 Waste Acceptance** See Section 7 of this application 2_Fornax Clinical Waste Process Acceptance SOP **3.3 Waste Tracking** See Section 7 of this application 2_Fornax Clinical Waste Process Acceptance SOP 3- Fornax Waste rejection and quarantine SOP 4- Fornax waste reception and storage SOP
4	**Waste Storage and handling Appropriate Measures.**
Response/evidence	See Section 7 of this application 1_Fornax pre-waste acceptance SOP 2_Fornax Clinical Waste Process Acceptance SOP 3- Fornax Waste rejection and quarantine SOP 4- Fornax waste reception and storage SOP See section 11 of this application FPP

Chemical waste: appropriate measures for permitted facilities	
1	When Appropriate Measures Apply
Response/evidence	Waste pre-acceptance, acceptance and tracking Waste storage, segregation and handling
2	General Management Appropriate Measures
Response/evidence	**2.1 Management System** The facility will have an accredited EMS ISO14001. **2.2 Staff Competence** All staff will be appropriately trained for the activities they carry out. Site Technically Competent Management will be on site for the required timescales as required by Environment Agency Guidance. Site Chemist will be qualified with Degree or HND in Chemistry standard as a minimum. Technical assessment will be carried out by appropriately trained staff. Site operatives will be trained in the for the tasks that they are to carried out via several methods such as external qualifications, in-house training courses, Tool Box Talks. **2.3 Accident Management Plans** See section 13 of the application for Emergency Plan **2.4 Accident Prevention Measures** See section 13 of the application for Emergency Plan See section 17 of the application HAZOP & DSEAR **2.5 Contingency plan and Procedures** See Section 13 of the application **2.6 Plant Decommissioning** Prior to decommissioning all vessels, aboveground tanks, bunds and pipework will be drained and cleaned out prior to dismantling. The site infrastructure will be decommissioned on site and the component parts will be removed individually and if still in working order sold as operational equipment or disposed of to a suitably licenced facility. For larger components they will be removed from the site by, removing of a number of roof panels and the components will then be craned out through the roof. They will then be removed off site via low loaders. The Decommissioning plan will be included in the site Environment Management System EMS and will include details on Fornax will maintain a decommissioning plan to demonstrate that: plant will be decommissioned without causing pollution the site will be returned to a satisfactory condition The decommissioning plan will include details on:

	removing or flushing out pipelines and vessels (where appropriate) and how these will be emptied, including identification of any potentially harmful contents site plans showing the location of all underground pipes are available the method and resources needed to clear any on-site lagoons No asbestos or other potentially harmful materials are identified as being used in the building. methods for dismantling buildings and other structures, and for protecting surface water and groundwater at construction and demolition sites any soil testing needed to check for any pollution caused by the site activities, and information on any remediation needed to return the site to a satisfactory state, as defined by the initial site report the measures proposed, once activities have definitively stopped, to avoid any pollution risk and to return the site of operation to a satisfactory state (including, where appropriate, measures relating to the design and construction of the plant) the clearing of deposited residues, waste and any contamination resulting from the waste treatment activities
3	**Waste pre-acceptance, acceptance and tracking appropriate measures**
	3.1 Waste Pre-Acceptance
Response/evidence	The site will request information regarding the composition of the waste from the waste producer/holder and the catagorisation of the waste. The customer will provide the information on a waste declaration form along with supporting information such as analysis. The site will ensure that the waste is suitable for acceptance of the waste type and quantity. See Section 21 Fornax pre-waste acceptance SOP
	3.2 Waste Acceptance
	Hazardous waste should only be received under the supervision of a suitably qualified person (HNC qualified chemist or higher). See Section 21 Fornax Acceptance of Chemical Waste Standard operating procedure. On arrival loads will: • Be weighed, unless alternative reliable volumetric systems linked to specific gravity data are available. • Not be accepted into site unless sufficient storage capacity exists, and site is adequately manned to receive waste. • Have all documents checked and approved, and any discrepancies resolved before the waste is accepted. Documents include consignment notes, transfer notes and waste lists. • The chemist receiving the waste shall conduct a generic suite of tests on each waste the Technical Assessor who will determine the appropriate compliance testing necessary

	3.3 Waste Tracking
	See Section 21 of this application Fornax Acceptance of Chemical Waste Fornax Chemical rejection and quarantine Fornax waste reception and storage SOP
4	**Waste Storage, segregation and handling appropriate measures**
	1. You must store waste in locations that minimise the handling of waste. Waste handling must be carried out by competent staff using appropriate equipment
Response/evidence	The warehouse is laid out to ensure the waste reception area is situated adjacent to the good in. The surface of the waste reception, handling and storage areas will be impermeable and fitted with an adequate drainage infrastructure. The integrity of this surface will be checked regularly.
	2. Where possible, you should locate storage areas away from watercourses and sensitive perimeters (for example, those close to public rights of way, housing or schools). You must store all waste within the secure area of your facility to prevent unauthorised access and vandalism.
	Waste will be stored within the sealed warehouse with no unauthorised access. The site has been designed with sealed drainage and impermeable surfaces in accordance with the requirements of CIRIA 736
	3. Where relevant, you must conform to HSE standards
	Storage will comply with the following Guidance • HSG51 Storage of flammable liquids in containers • HSG71 Chemical warehousing: storage of packaged dangerous substances • HSG76 Warehousing and storage: a guide to health and safety • HSG140 Safe use and handling of flammable liquids • HSG176 Storage of flammable liquids in tanks • CS21 Storage and handling of organic peroxides • C736 Containment systems for the prevention of pollution • Racking System will be separated into rows and have inbuilt spill trays/bunding. The Racking Systems are to be designed in accordance with HSG76 Warehousing and storage: a guide to health and safety
	4. You must clearly document the maximum storage capacity of your site and the designated storage areas. You must not exceed these maximum capacities. You should define capacity in terms of, for example, maximum tank or vessel capacities, tonnage and numbers of skips, pallets or

<table>
<tr><td></td><td>containers. You must regularly monitor the quantity of stored waste on site and designated areas and check against the allowed maximum capacities.</td></tr>
<tr><td></td><td>Each storage area will be designated based upon chemical or waste type. The storage areas will be marked with signage clearly defining the waste type and maximum quantity permitted in the storage area. In addition to the signage an automated system will keep an inventory of the location and the amount of material already stored in the location. The inventory will alarm if the material is unsuitable for that location for the area has reached maximum capacity
<table>
<tr><th>Waste Type</th><th>Maximum Storage Time</th><th>Maximum Tonnage Stored at Any one Time</th></tr>
<tr><td>infectious clinical waste</td><td>14 days in building</td><td>200 T</td></tr>
<tr><td>offensive waste</td><td>14 days in building</td><td>200T</td></tr>
<tr><td>treated waste from alternative treatment plant (for example, autoclave floc)</td><td>14 days in building</td><td>200T</td></tr>
<tr><td>Pharmaceuticals</td><td>6 months</td><td>200T</td></tr>
<tr><td>Anatomical Waste</td><td>14 days refrigerated</td><td>5T</td></tr>
<tr><td>Chemical Waste</td><td>6 Months</td><td>1000T</td></tr>
</table></td></tr>
<tr><td></td><td>5. You must clearly mark hazardous waste storage areas and provide signs showing the maximum quantity and hazardous properties of wastes that can be stored there.</td></tr>
<tr><td></td><td>Each storage area will be designated based upon chemical or waste type. The storage areas will be marked with signage clearly defining the waste type and maximum quantity permitted in the storage area. In addition to the signage an automated system will keep an inventory of the location and the amount of material already stored in the location. The inventory will alarm if the material is unsuitable for that location for the area has reached maximum capacity.</td></tr>
<tr><td></td><td>6. Storage area drainage infrastructure must:
contain all possible contaminated run-off
prevent incompatible wastes coming into contact with each other
make sure that fire cannot spread</td></tr>
<tr><td></td><td>The application pack Section 12 contains all information on the site drainage and infrastructure which have been designed to meet the requirements of CIRIA Guidance C736</td></tr>
<tr><td></td><td>7. Secondary and tertiary containment systems must conform to CIRIA guidance C736 Containment systems for the prevention of pollution.</td></tr>
<tr><td></td><td>The application pack Section 12 contains all information on the site drainage and infrastructure which have been designed to meet the requirements of CIRIA Guidance C736</td></tr>
</table>

	8. You must store containerised wastes that are sensitive to air, light, heat, moisture or extreme ambient temperatures under cover protected from such ambient conditions. Covered areas must have good ventilation. This applies to any such container:
	All wastes are required to undergo Waste Pre Acceptance The site facility has a laboratory to assess incoming waste materials. If any of the materials are flagged with Hazardous Properties they are sent for either immediate destruction or routed for storage at the appropriately signed location area in a suitable containing vessel depending upon the properties of the waste. The building is designed to have adequate ventilation. Ventilation is managed via extraction of intake air from the warehousing area/ storage area which is taken as intake for the combustion process and is them treated via the abatement system and stack.
	9. You must store wastes in sealed metal containers under cover if they have the potential for self-heating or self-reactivity. You must monitor the containers for heat build-up. Such wastes include rags and filter materials contaminated with metal swarf, low boiling point oils or low flash point solvents.
	All wastes are required to undergo Waste Pre Acceptance The site facility has a laboratory to assess incoming waste materials. If any of the materials are flagged with Hazardous Properties they are sent for either immediate destruction or routed for storage at the appropriately signed location area in a suitable containing vessel depending upon the properties of the waste.
	10. Wherever practicable you should store all other wastes under cover. Covered areas must have good ventilation. This applies to any such container: • **held in general storage, reception storage (pending acceptance) or quarantine** • **being emptied, repackaged or otherwise managed** **Under cover storage provides better protection for containers than open air storage and minimises the generation of contaminated water. Covered storage also:** • **lowers temperature fluctuations that can cause pressure build up in containers** • **reduces the degradation of containers through weathering**
	All waste accepted on site is stored within the waste reception building and stored in designated areas appropriate to the waste type.
	11. You must not store hazardous waste in open-topped containers. Empty open-topped containers should be kept in a building or undercover to prevent rainwater ingress.
	Waste will not be stored in open topped containers. No empty open topped containers will be stored outside.
	12. You must not store or hold wastes on site in vehicles or vehicle trailers unless you are receiving them or preparing them for imminent transfer (meaning that you will remove them from site within 24 hours, or 72 hours if over a weekend).
	Fornax will not store or hold wastes on site in vehicles or vehicle trailers unless you are receiving them or preparing them for imminent transfer (meaning that you will remove them from site within 24 hours, or 72 hours if over a weekend).
	13. You should pay particular attention to avoid the build-up of static electricity when you are storing or handling flammable wastes and materials. You should use leak detection systems and alarms (for example VOC alarms) and automatic fire suppression equipment based on a recorded risk assessment.

	Fornax will limit the storage of flammable materials on site . The site will benefit from automated detection and automated fire suppression measures.
	14. You must provide adequate bunding of all storage areas, and containment and treatment of any water run-off.
	Site storage is within the building utilising designed storage areas and racking. Segregation and storage bays to keep incompatible wastes separate. Bunded storage areas. The application pack Section 12 contains all information on the site drainage and infrastructure which have been designed to meet the requirements of CIRIA Guidance C736
	15. You must not accumulate waste. You must treat wastes, or remove them from the site, as soon as possible. Generally you should do this within one month of receipt but all wastes must be removed within 6 months of receipt. This applies even when the waste might be used as a reactant. Where a shorter time period is given in a permit condition you must comply with the permit for that waste. Where a waste is stored for longer than allowed you must inform the Environment Agency.
	Waste will be provided by suppliers at pre agreed weights and quantities to allow a steady feed to the kiln and to avoid stocks of waste being stored on site where possible. Waste will be combusted on site. No treatment will be undertaken on site other than repackaging for movement or storage. A stock automated management system and inventory will
	16. All stored containers must keep the labelling they had at acceptance. If the label is damaged or no longer legible you should replace the label with that same information.
	All stored containers will keep the labelling they had at acceptance. If the label is damaged or no longer legible it will be replaced with that same information
	17. You must handle and store containers so that the label is easily visible and continues to be legible.
	The labels will be inspected regularly to ensure that they remain easily visible and continues to be legible
	18. You should keep solid waste dry and avoid the dilution of hazardous waste.
	Solid waste will be kept dry. It will be stored within the building.
	19. You must keep clean rainwater and clean cooling water separate from wastes and waste waters.
	The application pack Section 12 contains all information on the site drainage and infrastructure which have been designed to meet the requirements of CIRIA Guidance C736
	20. You must keep incompatible wastes segregated so that they cannot come into contact with one another. You must store flammable wastes apart from other wastes to prevent fire spreading between them and other materials. You must use sealed drainage systems to prevent leaks and spillages contaminating other wastes.
	Site storage is within the building utilising designed storage areas and racking. Segregation and storage bays to keep incompatible wastes separate.

	Bunded storage areas. The application pack Section 12 contains all information on the site drainage and infrastructure which have been designed to meet the requirements of CIRIA Guidance C736
	21. There must be pedestrian and vehicular access (for example, forklift) at all times to the whole storage area so that you can retrieve containers without removing others that may be blocking access – other than removing those in the same row.
	There is designated pedestrian and vehicular access (for example, forklift) at all times to the whole storage area so that containers can be retrieved without removing others that may be blocking access – other than removing those in the same row.
	22. You must store all waste containers in a way that allows easy inspection. You must maintain safe access, with a gap of at least 0.7m between rows of bulk containers or palletised wastes.
	Storage is designed to maintain safe access, with a gap of at least 0.7m between rows of bulk containers or palletised wastes. Racking is utilised for storage to allow easy access
	23. You must move drums and other mobile containers between different locations (or loaded for removal off site) following written procedures. You must then amend your waste tracking system to record these changes.
	Chemical waste will be moved in accordance wit the traffic management plan and with Procedure Fornax waste reception and storage SOP
	24. You must stack bags and boxes of waste no more than 1m high on a pallet. You must not stack pallets more than 2 high.
	All waste will be stored within containers such as eurocarts , drums or palletised and will be stored in accordance with Fornax waste reception and storage SOP. Storage will be within racking
	25. You must stack containers specifically designed for stacking, and no more than 2.2m high on a pallet.
	All waste will be stored within containers such as eurocarts , drums or palletised and will be stored in accordance with Fornax waste reception and storage SOP. Storage will be within racking
	26. You must store all other containers on pallets. You must not stack these pallets more than 2 high, except for empty containers which can be stacked 3 high.
	All waste will be stored within containers such as eurocarts , drums or palletised and will be stored in accordance with Fornax waste reception and storage SOP. Storage will be within racking
	27. Stacked bags, boxes and containers must be stable. They must be secured with, for example, banding or shrink-wrap, if required. The packages must not extend beyond (over-hang) the sides of the pallet. Any shrink-wrap used must be clear or transparent so that you can identify waste types, damaged containers, leaks or spillages and incorrectly stacked containers. You must be careful not to damage any packages during stacking.
	No unsecured waste will be stored or stacked on site

	28. All waste containers must remain fit for purpose. You must check any containers (and pallets they may be stored on) daily and record non-conformances. Non-compliant containers and pallets must be made safe. You must immediately and appropriately manage any unsound, poorly labelled or unlabelled containers (for example, by relabelling, over drumming and transferring the container's contents). You must risk assess, approve and record the use of containers, tanks and vessels: • **beyond their specified design life** • **where you use them for a purpose, or substances, other than the ones they were designed for**
	All waste receptacles will be inspected for suitability and state of repair. If any repairs are required they will be taken out of service until a repair is facilitated in the onsite work area.
	29. You must not handle waste or its packaging in a way that might damage its integrity, unless it is appropriate to destroy a waste or its packaging, for example by shredding. You must not, for example, walk on or throw waste or waste packages.
	Waste will be kept within the packaging container until it is loaded into the hopper for destruction
	30. You should, where applicable and based on a recorded risk assessment, make inert the atmosphere of tanks containing organic liquid waste with a flashpoint less than 21°C. This can be done, for example, by using nitrogen gas.
	Not Applicable as no tanks with a flashpoint of 21^0C on site.
	31. You must store asbestos waste double bagged or wrapped, in sealed, closed and locked containers. You must not store asbestos waste loose. You must not put asbestos wastes into bays or transfer it between different skips or containers. You must not use mechanical equipment, for example loading shovels, chutes and conveyors to move asbestos waste.
	Not Applicable
	32. You must not stack wheeled containers on top of one another. Do not stack empty wheeled containers into one another more than 2.2m high.
	Wheeled containers stored on specifically designed racking or designated areas
	33. All containers that need them should have a lid or bung, and the lid or bung must be closed except when the container is being sampled, having waste added into it or having waste removed from it.
	All containers that need them will have a lid or bung, and the lid or bung must be closed except when the container is being sampled, having waste added into it or having waste removed from it.
	34. You must not stack skips containing waste. Skips containing hazardous waste must be enclosed when not being loaded or unloaded. You should store loose bulk hazardous wastes under cover.
	Ash skip will be suitable covered to prevent loss of contents. Skips will not be stacked.
	35. You can use racking systems to store waste but you must consider segregation, ability to inspect, separation and fire suppression measures. Racking systems must be designed and constructed in accordance with HSG76 Warehousing and storage.
	Racking systems are designed and constructed in accordance with HSG76 Warehousing and storage

	36. You must: • **contain wash waters within an impermeable area and either discharge them to foul sewer or dispose of them appropriately off site.** • **prevent run-off into external areas or to surface water drains**
	Wash waters are contained in a suitable bunded tank and either taken to be disposed of via the kiln or taken for offsite disposal.
	37. You must manage waste in a way that prevents pests or vermin. You must have specific measures and procedures in place to deal with wastes that are identified as causing pests or vermin.
	Pest management contractor will be appointed to ensure flies, rats, mice are monitored and prevented from causing issues
	38. You must inspect storage areas, containers and infrastructure daily. You must deal with any issues immediately. You must keep written records of the inspections. You must rectify and log any spillages of waste.
	Site inspections will be undertaken at least daily and will be recorded on the daily site inspection form.
	39. You must train forklift drivers in the handling of palletised goods, to minimise forklift truck damage to the integrity of containers and infrastructure.
	Forklift drivers will be trained to an appropriate standard with the relevant training certificates.
	40. You must not carry out activities that represent a clear fire risk within any storage area. Examples include: • **grinding** • **welding or brazing of metalwork** • **smoking** • **parking normal road vehicles, except while unloading or loading** • **recharging batteries**
	All works that could represent a fire risk will require activity specific RAMS and permit to work.
Bulk storage	**41. Where relevant, bulk storage systems must conform to CIRIA guidance, and in particular to:** • **C535 Above ground proprietary prefabricated oil storage tank systems** • **C598 Chemical storage tank systems - good practice** • **C736 Containment systems for the prevention of pollution**

	• NA
	42. You must use tanks and associated equipment that are suitably designed, constructed and maintained. You must do a risk assessment to validate the design and operation of bulk storage systems. Before you use new tanks and equipment you must check they are working correctly. You must periodically examine and test that your tanks meet the standards set out in EEMUA Publication 231: The mechanical integrity of plant containing hazardous substances.
	NA
	43. You should vent bulk storage tanks and silos through suitable abatement.
	NA
	44. You must locate bulk storage vessels on an impermeable surface which is resistant to the material being stored. The surface must have self-contained drainage to prevent any spillage entering the storage systems or escaping off site. Impermeable surfaces must have sealed construction joints.
	NA
	45. You must provide bunds for all tanks containing liquids (whether waste or otherwise) which could be harmful to the environment if spilled. Bunds must meet the CIRIA C535 or C736 standard and: • **be impermeable, stable and resistant to the stored materials** • **have no outlet (that is, no drains or taps), and drain to a blind collection point** • **have pipework routed within bunded areas with no penetration of contained surfaces** • **be designed to catch leaks from tanks or fittings** • **have a capacity calculated following the relevant CIRIA guidance** • **have regular visual inspections – you must pump out or remove any contents under manual control after you have checked for contamination** • **be fitted with a high level probe and an alarm (as appropriate) if not frequently inspected** • **have tanker connection points within the bund where possible – if not possible you must provide adequate containment for spillages or leakage** • **have programmed engineering inspections (extending to water testing if structural integrity is in doubt)** • **be emptied of rainwater regularly to maintain the containment capacity**
	NA
	46. You must control sludge build up and foam in tanks, for example by regularly sucking out the sludge and using anti foaming agents.
	NA

	47. You should equip storage and treatment tanks with an automatic level monitoring system and an associated alarm or trip system. These systems must be sufficiently robust (for example, be able to work if sludge and foam are present) and regularly maintained. You must fit tanks with suitable overfill protection.
	NA
	48. You must be able to close all connections to vessels, tanks and secondary containment via suitable valves. You must fit a valve close to the tank if you have bottom outlets, and have at least 2 isolation points in case of valve failure.
	HAZOP assessment for all isolation points with at least 2 being designed into system
	49. You must direct overflow pipes to a contained drainage system (for example the relevant secondary containment) or to another vessel where suitable control measures are in place.
	NA
	50. Tanks, pipework and fittings must be examined by a competent person, following a written scheme. The scope and frequency of examination must also be determined by a competent person. You must work out how often to carry out these internal examinations using a risk assessment approach. This should be based on: • **tank service** • **maintenance history** • **known and potential damage mechanisms and their rates of attack** **You should also do intermediate external examinations. You must act on the results of the examinations and do any necessary repairs to ensure the tanks remain fit for service. You must keep the results of examinations and repairs.**
	NA
	51. You must have systems in place to make sure that loading, unloading and storage are safe, considering any associated risks. This can include: • **having piping and instrumentation diagrams** • **using ticketing systems** • **using key locked coupling systems** • **having colour coded points, fittings and hoses** • **using specific coupling or hose sizes for certain waste transfers**
	52. As a general rule, you must not use open topped tanks, containers, vessels or pits to store or treat hazardous or liquid wastes.
	NA
Sorting, Repacking and bulking	**78. Sorting is the placing together of containers with other waste containers of the same type, without emptying the contents from the container. You must have a permit that specifically allows you to carry out storage activities (coded D15 or R13).**
	The site will benefit from a Integrated ISO accredited management system that will provide operational procedures to define quality control and measures to against the requirements of the process.

	79. Repackaging is the removal of waste from a container, or into a container. This may involve bulking it with other wastes of the same type from other containers. You must have a permit that specifically allows you to carry out repackaging activities (coded D14 or R12).
	The site will benefit from a Integrated ISO accredited management system that will provide operational procedures to define quality control and measures to against the requirements of the process.
	80. Bulking of waste that is not regarded as repackaging includes: • **discharging from a tanker to bulk storage of wastes of the same type** • **tank to tank transfer where both tanks contain wastes of the same type** **These activities are storage (coded D15 or R13).**
	NA
	81. You must only bulk or repackage wastes together if they are materially the same. They must not react when they are bulked and they must not change the waste's composition.
	NA
	82. If a waste is mixed with other similar wastes, where the resulting mixture does not have significantly different characteristics from the mixed wastes (for example blending compatible combustible or flammable wastes as a fuel), this activity is mixing or blending (coded D13 or R12). Any other mixing that changes a waste is treatment.
	NA
	83. You must have a permit that specifically allows you to mix hazardous waste with any: • **non-hazardous waste** • **hazardous waste in a different category** • **non-waste**
	NA
	84. You must not mix, bulk or repackage: • **wastes which could be recovered with other wastes if this means that the waste must now be sent for disposal or a lower form of recovery** • **liquid wastes or infectious wastes with other wastes for the purpose of landfilling** • **oils where this could affect their regeneration or recycling** • **wastes containing Persistent Organic Pollutants (POPs) with another material solely to generate a mixture below the defined low POPs content** • **waste to deliberately dilute it**

	NA
	85. You must transfer wastes from containers into other storage vessels using a dip pipe, not by pouring.
	NA
	86. Repackaging or mixing must only take place in a dedicated area or store which has the plant and equipment needed to deal with the specific risks of that process. For example, this could include abatement or local exhaust ventilation.
	NA
	87. Except for small packages with a volume less than 5 litres, or damaged containers, you must move containers using mechanical means. For example, use a forklift truck with a rotating drum handling fitting, or using pumps for liquids.
	Adequate lifting equipment will be on site The site will benefit from a Integrated ISO accredited management system that will provide operational procedures to define quality control and measures to against the requirements of the process.
	88. You must label containers of repackaged or mixed wastes so that you can identify their contents and origin through the tracking system. After repackaging, you must move the bulked materials and emptied containers to an appropriate segregated storage area.
	Formax will label containers of repackaged or mixed wastes so that you can identify their contents and origin through the tracking system. After repackaging, you must move the bulked materials and emptied containers to an appropriate segregated storage area.
	89. You must have a risk assessment and carry out appropriate compatibility testing to make sure that bulked wastes will not react with each other, or with the container into which they are being placed.
	NA no bulking to take pkace
Laboratory Smalls	**90. Where possible, you should sort and segregate laboratory smalls at source so that you do not need to reopen or re-sort containers.**
	Lab smalls will be pre sorted before coming to site for disposal
	91. If you sort laboratory smalls for compatibility reasons you must carry this out in a dedicated area of a building, with self-contained drainage.
	NA Pre sorted
	92. You must write and follow procedures for the segregation, sorting and repackaging of laboratory smalls.
	The site will benefit from a Integrated ISO accredited management system that will provide operational procedures to define quality control and measures to against the requirements of the process.

5	**Waste Treatment Appropriate Measures**
Response/evidence	Treatment is limited to Repackaging is limited to: • taking a waste package (for example a bag, jar, drum or box) out of one cart or bulk container and placing it into another cart or bulk • taking a waste package from a cart or bulk container and placing it onto a pallet or vehicle • taking a waste package from a pallet and placing it into a cart or bulk container • transferring, removing or separating waste from its primary packaging (for example container, bags, bins, boxes).

6.	**Emissions Control appropriate measures**
6.1 Point Source emissions to air	**These are the appropriate measures for emissions control at regulated facilities with an environmental permit for treating or transferring chemical waste.** **You must identify, characterise and control emissions from your activities that may cause pollution.**
	1. You must contain storage tanks, silos and waste treatment plant (including shredders) to make sure you collect, extract and direct all process emissions to an appropriate abatement system for treatment before release.
	Extracted air from the warehouse will be directed to combustion air intake and will undergo combustion and abatement.
	2. You must identify the main chemical constituents of the site's point source emissions as part of the site's inventory of emissions to air.
	CEMS System will continuously monitor emissions in accordance with the site permit
	3. You must assess the fate and impact of the substances emitted to air, following the Environment Agency's risk assessment methodology.
	Section 6 of the application pack provides Air Dispersion Modelling and Human Health Risk Assessment
	4. To reduce point source emissions to air (for example, dust, volatile organic compounds and odour) from the treatment of waste, you must use an appropriate combination of abatement techniques, including one or more of the following systems: • **adsorption (for example, activated carbon)** • **biofiltration** • **wet scrubbing** • **fabric filters** • **high efficiency particulate (HEPA) filtration** • **condensation and cryogenic condensation** • **cyclonic separation** • **electrostatic precipitation** • **thermal oxidation**
	Section 6 of the application pack contains a report titled Air Abatement Requirements
	5. You must assess and design vent and stack locations and heights to make sure dispersion capability is adequate. Where monitoring is required, including for odour, you must install suitable monitoring points.
	Section 6 of the application pack provides Air Dispersion Modelling and Human Health Risk Assessment

	6. Your procedures must make sure you correctly install, operate, monitor and maintain abatement equipment. For example, this includes monitoring and maintaining: • **appropriate flow and chemical concentration of scrubber liquor** • **the handling and disposal or regeneration of spent scrubber or filter medium**
	The abatement system is detailed in the OT document within this document. It is monitored via the SCADA for operational performance. The generated APCR will be sent for off site disposal once spent.
	7. You should design and operate abatement systems to minimise water vapour plumes.
	The design and operation of the abatement system will minimise water vapour plumes.
6.2 Fugitive Emissions to air (including odour)	**1. You must use appropriate measures to prevent emissions of dust, mud and litter and odour.**
	Odour Management is provided in Section 15 of the application
	2. You must design, operate and maintain storage and treatment plant in a way that prevents fugitive emissions to air, including dust, organic compounds and odour. Where that is not possible, you must minimise these emissions. Storage and treatment plant includes associated equipment and infrastructure such as: • **shredders** • **conveyors** • **skips or containers** • **building fabric, including doors and windows** • **pipework and ducting**
	All operations are undertaken within a building.no shredders
	3. To make sure fugitive emissions are collected and directed to appropriate abatement, your treatment plant must use high integrity components (for example, seals or gaskets). Your treatment plant must be fully enclosed, with air extraction systems located close to emission sources where possible.
	Kiln plant uses high integrity components (for example, seals or gaskets). The treatment plant is be fully enclosed within a building , with air extraction systems located close to emission sources where possible.
	4. You must use your waste pre-acceptance, waste acceptance and site inspection checks and procedures to identify and manage wastes that could cause, or are causing, fugitive emissions to air. When you identify any of these wastes you must: • **take appropriate, risk assessed measures to prevent and control emissions** • **prioritise their treatment or transfer**

	waste pre-acceptance, waste acceptance and site inspection checks and procedures will identify and manage wastes that could cause, or are causing, fugitive emissions to air. If identifed these wastes site operatives wil: • take appropriate, risk assessed measures to prevent and control emissions • prioritise their treatment or transfer
	5. Where necessary, to prevent fugitive emissions to air from the storage and handling of wastes, you should use a combination of the following measures: • **store and handle such wastes within a building or enclosed equipment** • **keep buildings and equipment under adequate negative pressure with an appropriate abated air circulation or extraction system** • **where possible, locate air extraction points close to potential emissions sources** • **use fully enclosed material transfer and storage systems and equipment, for example, conveyors, hoppers, containers, tanks and skips** • **use fast-acting or 'airlock' doors that default closed** • **keep building doors and windows shut to provide containment, other than when access is required** • **minimising drop height** • **use misting systems and wind barriers to prevent dust**
	Where necessary, to prevent fugitive emissions to air from the storage and handling of wastes, the site will use a combination of the following measures: • store and handle such wastes within a building or enclosed equipment • keep buildings and equipment under adequate negative pressure with an appropriate abated air circulation or extraction system • Use fully enclosed containers • keep building doors and windows shut to provide containment, other than when access is required
	6. You must set up a leak detection and repair programme and use it to promptly identify and mitigate any fugitive emissions from treatment plant and associated infrastructure (for example, pipework, conveyors, tanks).
	The site will undertake daily inspection of treatment plant and associated infrastructure, along with monitoring via the SCADA systems. With any leaks detected repaired promptly.
	7. You must regularly inspect and clean all waste storage and treatment areas, equipment (including conveyor belts) and containers. You must have an appropriate regular maintenance programme covering all buildings, plant and equipment. This must also include protective equipment such as air ventilation and extraction systems, curtains and fast-action doors used to prevent and contain fugitive releases.
	A cleandown program of the site storage reception areas and operational areas are undertaken at least daily. In addition planned maintenance of the plant will also be undertaken on a regular basis.
	8. Your inspection, maintenance and cleaning schedules must make sure that tanks and plant are regularly cleaned to avoid large-scale decontamination activities.

	A cleandown program of the site storage reception areas and operational areas are undertaken at least daily. In addition planned maintenance of the plant will also be undertaken on a regular basis.
	9. You must take measures to prevent the corrosion of plant and equipment (for example, conveyors or pipes). This includes selecting and using appropriate construction materials, lining or coating equipment with corrosion inhibitors and regularly inspecting and maintaining plant.
	The plant and equipment has been specifically designed with the use of ceramic lining, corrosion inhibitors, chemical resistant cement. The plant will have an annual shut down for inspection as well as daily site inspections.,
	10. If you wash containers or tanks, you must design and operate the washing process and associated equipment in a way that prevents fugitive emissions to air. For example, you could do this activity in a contained or enclosed system.
	Bin Wash is within building with air abatement
	11. You must fully enclose and contain pre- and post-treatment shredder plant to prevent emissions. You must design and operate the shredder plant using appropriate process interlocks. The plant should not operate unless it is enclosed and contained, for example, only working when the loading door on the hopper has been closed or sealed. Dust and microbial emissions from the shredder plant must be contained and extracted to an appropriate abatement system, for example HEPA air filtration.
	NA - No Shredder plant
	12. Where a dust management plan is required, you must develop and implement it following our guidance.
	The Environmental Risk Assessment has not indicated a need for a Dust Management Plan due to activities taking place within the building
	13. You must have procedures to minimise the amount of time odorous wastes spend in your storage and handling systems (for example, pipes, conveyors, hoppers, tanks). In particular, you must have provisions to manage waste during periods of peak volume
	Waste is strictly controlled in terms of holding time on site. Held within sealed container Direct discharge into hopper for incineration.
	14. You must have measures to contain, collect and treat odorous emissions, including using contained buildings and plant or equipment with appropriate air extraction and abatement. We do not consider masking agents to be appropriate measures for the treatment of odorous emissions.
	First in last out principle for odorous waste. All activity in building with air extraction and abatement
	15. You must monitor and maintain odour abatement systems to ensure optimum performance. For example, you should make sure that scrubber liquors are maintained at the correct pH and replenished or replaced at an appropriate frequency.
	Daily perimeter inspections by non operational staff. Abatement system monitored automatically via the SCADA unit
	16. You must store contaminated waters that have potential for odours in covered or enclosed tanks or containers vented through suitable abatement.
	NA no odourous waters expected.

	17. Where odour pollution at sensitive receptors is expected, or has been substantiated, you must periodically monitor odour emissions using European (EN) standards, for example either: • **dynamic olfactometry according to EN 13725 to determine the odour concentration** • **EN 16841-1 or -2 to determine the odour exposure** **If you are using alternative methods for which no EN standards are available (for example, estimating odour impact), you should use ISO, national or other international standards to make sure you use data of an equivalent scientific quality. You must set out the monitoring frequency in the odour management plan.**
	Odour Management Plan in place for the site detailing monitoring
	18. Where odour pollution at sensitive receptors is expected, or has been substantiated, you must also set up, implement and regularly review an odour management plan. It must be part of your management system and include all of the following elements: • **actions and timelines to address any issues identified** • **a procedure for odour monitoring** • **a procedure for responding to odour incidents, for example, complaints** • **an odour prevention and reduction programme designed to identify the source(s), characterise the contributions of the sources and prevent and reduce them**
	Odour Management Plan in place for the site detailing monitoring
	19. Where an odour management plan is required, you must develop and implement it following our guidance.
	Odour Management Plan in place for the site detailing monitoring
6.3 Emissions of noise and vibration	**1. You should design the facility so that potential sources of noise (including building exits and entrances) are away from sensitive receptors and boundaries. You should locate buildings, walls, and embankments so they act as noise screens.**
	Environmental risk assessment has not identified a risk of Noise or vibration issue. Entrance/egress
	2. You must employ appropriate measures to control noise, for example, including: • **adequately maintaining plant or equipment parts which may become more noisy as they deteriorate – for example, bearings, air handling plant, building fabric, and specific noise attenuation kit associated with plant or machinery** • **closing doors and windows of enclosed areas and buildings** • **avoiding noisy activities at night or early in the morning** • **minimising drop heights and the movement of waste and containers** • **using broadband (white noise) reversing alarms and enforcing the on-site speed limit** • **using low-noise equipment, for example, drive motors, fans, compressors and pumps**

	• **adequately training and supervising staff** • **where possible, providing additional noise and vibration control equipment for specific sources of noise – for example, noise reducers or attenuators, insulation, or sound-proof enclosures**
	Fornax will employ appropriate measures to control noise, for example, including: • adequately maintaining plant or equipment parts which may become more noisy as they deteriorate – for example, bearings, air handling plant, building fabric, and specific noise attenuation kit associated with plant or machinery • closing doors and windows of enclosed areas and buildings
	3. Where noise or vibration pollution at sensitive receptors is expected, or has been substantiated, you must create, use and regularly review a noise and vibration management plan. This must be part of the environmental management system, and must include: • **actions and timelines to address any issues identified** • **a procedure for noise and vibration monitoring** • **a procedure for responding to identified noise and vibration events, for example, complaints**
	NA
	4. Your noise and vibration management plan should also include a noise and vibration reduction programme designed to: • **identify the sources of noise and vibration** • **measure or estimate noise and vibration exposure** • **characterise the contributions of the sources** • **implement prevention and reduction measures**
	NA
	5. Where a noise and vibration management plan is required, you must develop and implement it following our guidance.
	NA
6.4 Point Source Emissions to Water and sewer	**1. You must identify the main chemical constituents of the site's point source emissions to water and sewer as part of the site's inventory of emissions.**
	NA – Emissions to sewer will be foul water from toilets and sinks, washing water from non operational areas. Clean surface water to suds. Dirty water from site activities will be collected and disposed of via kiln or taken off site for disposal.
	2. You must assess the fate and impact of the substances emitted to water and sewer, following the Environment Agency's risk assessment guidance.

	NA
	3. Discharges to water or sewer must comply with the conditions of an environmental permit or trade effluent consent. Relevant sources of waste water include: • **water or condensate collected from treatment processes** • **waste compactor run-off** • **vehicle washing** • **vehicle oil and fuel leaks** • **washing of containers** • **spills and leaks in waste storage areas** • **loading and unloading areas**
	NA Clean surface water to suds. Dirty water from site activities will be collected and disposed of via kiln or taken off site for disposal.
	4. To reduce emissions to water and sewer, if you need to treat waste water before discharge or disposal, you must use an appropriate combination of treatment techniques, including one or more of the following: • **preliminary or primary treatment – for example, equalisation, neutralisation or physical separation** • **physico-chemical treatment – for example, adsorption, distillation or rectification, precipitation, chemical oxidation or reduction, evaporation, ion exchange, or stripping** • **biological treatment – for example, activated sludge process or membrane bioreactor** • **nitrogen removal – for example, nitrification and denitrification** • **solids removal – for example, coagulation and flocculation, sedimentation, filtration or flotation**
	NA
	5. You must direct wash waters from cleaning containers to a foul sewer or sealed drainage system for on-site re-use or off-site disposal. You may need to pre-treat the waters to meet any limits on the effluent discharge consent. Discharges of wash waters to surface water or storm drains are not acceptable.
	Bin wash recycles water with suffactant. When spent it will be
6.5 Fugitive Emissions to land and water	**1. You must use appropriate measures to control potential fugitive emissions and make sure that they do not cause pollution. See the guidance on emissions to water and leaks from containers.**
	See Env Risk Assessment
	2. You must have these in all operational areas of the facility: • **an impermeable surface**

	• **spill containment kerbs** • **sealed construction joints** • **a sealed drainage system**
	NA Impermeable Surface with sealed joints and sealed drainage system. Spill containment bunding
	3. You must have measures in place to prevent overflows and failures from tanks and vessels, including where relevant: • **overflow detectors and alarms** • **directing over-flow pipes to a contained drainage system** • **locating tanks and packaged liquids in suitable secondary containment (bunds)** • **providing isolation mechanisms (for example, closing valves) for tanks, vessels and secondary containment**
	NA Impermeable Surface with sealed joints and sealed drainage system. Spill containment bunding
	4. You must collect and treat separately each water stream generated at the facility, for example, surface run-off water or process water. Separation must be based on pollutant content and treatment required. In particular you must make sure you segregate uncontaminated water streams from those that require treatment.
	SUDS for clean surface water. Containment for site generated water. Foul water to sewer
	5. You must use suitable drainage infrastructure to collect surface drainage from areas of the facility where you store, handle and treat waste. You must also collect wash waters and occasional spillages. Depending on the pollutant content, you must either recirculate what you have collected or send it for further treatment.
	Section 12 of the application provides Drainage strategy
	6. You must have design and maintenance provisions in place to detect and repair leaks. These must include regularly monitoring, inspecting and repairing equipment and minimising underground equipment and infrastructure.
	Maintenance inspections carried out daily and preventative maintenance is carried out periodically
	7. You should provide appropriate buffer storage capacity at your facility to store waste waters, taking into account: • **potential abnormal operating scenarios and incidents** • **the nature of any polluting substances and their impact on the downstream waste water treatment plant and receiving environment**
	See FPP for containment provisions. Spill kits will also be provided on site for localised spillages
	8. You must have appropriate measures in place to monitor, treat and reuse water held in the buffer storage before discharging.

	The site will benefit from and integrated ISO accredited system where a procedure will cover this requirement.
	9. You must take measures to prevent emissions from washing and cleaning activities, including: • **directing liquid effluent and wash waters to foul sewer or collecting them in a sealed system for off-site disposal – you must not discharge them to surface or storm drains** • **where possible, using biodegradable and non-corrosive washing and cleaning products** • **storing all detergents, emulsifiers and other cleaning agents in suitable bunded or containment facilities, within a locked storage area, or in a building away from any surface water drains** • **preparing cleaning solutions in contained areas of the site and never in areas that drain to the surface water system**
	Section 12 of the application provides Drainage strategy
	10. Where relevant, you must have measures to prevent pollution from the on-site storage, handling and use of oils and fuels.
	The site will benefit from and integrated ISO accredited system where a procedure will cover this requirement.
	11. You must produce and implement a spillage response plan and train staff to follow and test it.
	The site will benefit from and integrated ISO accredited system where a procedure will cover this requirement.
	12. Your procedures and associated training must make sure you deal with spillages immediately.
	The site will benefit from and integrated ISO accredited system where a procedure will cover this requirement.
	13. You must keep spill kits at locations close to areas where a spillage could occur and make sure relevant staff know how to use them. Make sure kits are replenished after use.
	The site will benefit from and integrated ISO accredited system where a procedure will cover this requirement.
	14. You must stop spillages from entering drains, channels, gullies, watercourses and unmade ground. You must make proprietary sorbent materials, sand or drain mats available.
	The site will benefit from and integrated ISO accredited system where a procedure will cover this requirement.
	15. You must make sure your spillage response plan includes information about how to recover, handle and correctly dispose of waste produced from a spillage.
	The site will benefit from and integrated ISO accredited system where a procedure will cover this requirement.
	16. Container washing equipment must be contained and located in a designated area of the facility that has self-contained drainage. The equipment must be designed to collect and contain all wash waters, including any spray. Trained staff must operate, inspect and maintain it regularly.

	The site will benefit from and integrated ISO accredited system where a procedure will cover this requirement.
	17. For sub-surface structures, you must: • **establish and record the routing of all site drains and sub-surface pipework** • **identify all sub-surface sumps and storage vessels** • **engineer systems to minimise leakages from pipes and make sure they are detected quickly if they do occur, particularly where hazardous substances are involved** • **provide secondary containment or leakage detection for sub-surface pipework, sumps and storage vessels** • **establish an inspection and maintenance programme for all sub-surface structures, for example, pressure tests, leak tests, material thickness checks or CCTV**
	Section 12 of the application provides Drainage strategy
	18. For surfacing, you must design appropriate surfacing and containment or drainage facilities for all operational areas, taking into account: • **collection capacities** • **surface thicknesses** • **strength and reinforcement** • **falls** • **materials of construction** • **permeability** • **resistance to chemical attack** • **inspection and maintenance procedures**
	All surfaces have been designed to hold the strains and forces of the site plant and equipment and chemicals; and to provide adequate containment.
	19. You must have an inspection and maintenance programme for impermeable surfaces and containment facilities.
	Daily inspections will take place which incorporate inspection of bunds and impermeable surfaces and site containment facilities.
7	**Emissions Monitoring and Limits appropriate measures**
	These are the emissions limits and appropriate measures for monitoring emissions to air and water at regulated facilities with an environmental permit for treating or transferring chemical waste. We may set emission limits and monitoring requirements in your permit, based on your emissions inventory and environmental risk assessment.

	1. Where you are required to monitor emissions to comply with the requirements of your environmental permit, you must follow our monitoring guidance. 2. You must create and maintain an emissions inventory of point source emissions to air and water (including emissions to sewer) for your facility.
7.1 Emissions to Air	**1. Your facility's emissions inventory must include information about the relevant characteristics of point source emissions to air, such as the:** • **average values and variability of flow and temperature** • **average concentration and load values of relevant substances and their variability** • **flammability, lower and higher explosive limits and reactivity** • **presence of other substances that may affect the waste gas treatment system or plant safety – for example, oxygen, nitrogen, water vapour, dust**
	CEMS will record the emissions to air for materials from Stack emissions. Air Dispersion and HHRA is available in section 6 of the application
7.2 Emissions to Water or Sewer	**1. Your facility's emissions inventory must include information about the relevant characteristics of point source emissions to water or sewer, such as:** • **average values and variability of flow, pH, temperature, and conductivity** • **average concentration and load values of relevant substances and their variability – for example, COD (chemical oxygen demand) and TOC (total organic carbon), nitrogen species, phosphorus, metals, priority substances or micropollutants** • **data on bio-eliminability – for example, BOD (biochemical oxygen demand), BOD to COD ratio, Zahn-Wellens test, biological inhibition potential, for example, inhibition of activated sludge**
	NA
	2. For relevant emissions to water or sewer identified by the emissions inventory, you must monitor key process parameters (for example, waste water flow, pH, temperature, conductivity, or BOD) at key locations. For example, these could either be at the: • **inlet or outlet (or both) of the pre-treatment** • **inlet to the final treatment** • **point where the emission leaves the facility boundary**
	NA

8	**Process Efficiency appropriate Measures**
	These are the appropriate measures for process efficiency at regulated facilities with an environmental permit for treating or transferring chemical waste. 1. For your facility, you must monitor and review the annual quantity of: • water, energy and raw materials used • residues and waste water produced You must do this at least once a year. Section 3.10 of this document discusses energy efficiency
8.1 Energy Efficiency (Installations only)	**1. You must create and implement an energy efficiency plan at your facility. This must:** • **define and calculate the specific energy consumption of the activity (or activities) you do and waste stream(s) you treat** • **set annual key performance indicators – for example, specific energy consumption (expressed in kWh/tonne of waste processed)** • **plan periodic improvement targets and related actions**
	R1 Process efficiency calculations are provided in section 18 of the application pack. Section 3.10 of this document discusses energy efficiency
	2. You must regularly review and update your energy efficiency plan as part of your facility's management system.
	R1 efficiency calculations and Sankey diagram will be reviewed annually.
	3. You must have and maintain an energy balance record for your facility. This must provide a breakdown of your energy consumption and generation (including any energy or heat exported) by the type of source (electricity, gas, conventional liquid fuels, conventional solid fuels and waste). You should provide Sankey diagrams or energy balances to show how energy is used in your waste treatment processes.
	R1 efficiency calculations and Sankey diagram will be reviewed annually.
	4. You must regularly review and update your energy balance record as part of your facility's management system, alongside the energy efficiency plan.
	R1 efficiency calculations and Sankey diagram will be reviewed annually. The Energy efficiency will be assessed to inform the energy efficiency plan.
	5. You must have operating, maintenance and housekeeping measures in place in relevant areas, for example for: • **air conditioning, process refrigeration and cooling systems (leaks, seals, temperature control, evaporator or condenser maintenance)** • **the operation of motors and drives** • **compressed gas systems (leaks, procedures for use)**

	• **steam distribution systems (leaks, traps, insulation)** • **space heating and hot water systems** • **lubrication to avoid high friction losses** • **boiler operation and maintenance, for example, optimising excess air** • **other maintenance relevant to the activities within the facility**
	The site will have a dedicated maintenance regime and dedicated staff for the whole site. The maintenance contract will including a call out arrangement. The site will maintain a critical spares inventory. The site will benefit from a Integrated ISO accredited management system that will provide operational procedures
	6. You must have measures in place to avoid gross energy inefficiencies. These should include, for example: • **insulation** • **containment methods (such as seals and self-closing doors)** • **avoiding unnecessary discharge of heated water or air (for example, by fitting timers and sensors)**
	R1 efficiency calculations and Sankey diagram will be reviewed annually. The Energy efficiency will be assessed to inform the energy efficiency plan.
	7. You should implement additional energy efficiency measures at the facility as appropriate, following our guidance.
	• The site is designed to be energy efficient using the techniques listed in section 3 of the Reference Document on Best Available Techniques for Energy Efficiency Section 3.10 of this document discusses energy efficiency
8.2 Raw Materials (installation Only)	**1. You must maintain a list of the raw materials used at your facility and their properties. This includes auxiliary materials and other substances that could have an environmental impact.**
	Section 3.1 of the OT document contains information relating to the Raw Materials
	2. You must regularly review the availability of alternative raw materials and use any suitable ones that are less hazardous or polluting. This should include, where possible, substituting raw materials with waste or waste-derived products.
	The site will benefit from a Integrated ISO accredited management system that will provide operational procedures and measures to review raw materials against the requirements of the process for appropriate alternatives
	3. You must justify the continued use of any substance for which there is a less hazardous alternative.
	The site will benefit from a Integrated ISO accredited management system that will provide operational procedures and measures to review raw materials against the requirements of the process for appropriate alternatives

	4. You must have quality assurance procedures in place to control the content of raw materials.
	The site will benefit from a Integrated ISO accredited management system that will provide operational procedures to define quality control and measures to review raw materials against the requirements of the process for appropriate alternatives
8.3 Water Use (Installations Only)	**1. You must make sure you optimise water consumption to:** • **reduce the volume of waste water you generate** • **prevent or, where that is not practicable, reduce emissions to soil and water**
	Water Balance calculations have been carried out and incorporated into the OT document including water balance diagram
	2. Measures you must take include: • **implementing a water saving plan (involving establishing water efficiency objectives, flow diagrams and water mass balances)** • **optimising the use of wash waters (for example, dry cleaning instead of hosing down and using trigger controls on all washing equipment)** • **recirculating and reusing water streams within the plant or facility, if necessary after treatment** • **reducing the use of water for vacuum generation (for example, using liquid ring pumps with high boiling point liquids), where relevant**
	Water Balance calculations have been carried out and incorporated into the OT document including water balance diagram
	3. You must review water use (a water efficiency audit) at least every 4 years
	Water Balance calculations have been carried out and incorporated into the OT document including water balance diagram which will be reviewed at least every 4 years.
	4. You must also: • **produce flow diagrams and water mass balances for your activities** • **establish water efficiency objectives and identify constraints on reducing water use beyond a certain level (usually this will be site specific)** • **identify the opportunities for maximising reuse and minimising use of water** • **have a timetabled improvement plan for implementing additional water reduction measures**
	Water Balance calculations have been carried out and incorporated into the OT document including water balance diagram
	5. To reduce water use and associated emissions to water, you should apply these general principles in sequence: • **use water efficient techniques at source where possible**

	• **reuse water within the process, by treating it first if necessary – if not practicable, use it in another part of the process or facility that has a lower water quality requirement** • **if you cannot use uncontaminated roof and surface water in the process, you should keep it separate from other discharge streams – at least until after you have treated the contaminated streams in an effluent treatment system and have carried out final monitoring**
	Water Balance calculations have been carried out and incorporated into the OT document including water balance diagram
	6. You should establish the water quality requirements associated with each activity and identify whether you can substitute water from recycled sources. Where you can, include it in your improvement plan.
	Water Balance calculations have been carried out and incorporated into the OT document including water balance diagram
	7. Where there is scope for reuse (possibly after some form of treatment) you should keep less contaminated water streams, such as cooling waters, separate from more contaminated streams.
	Water Balance calculations have been carried out and incorporated into the OT document including water balance diagram
	8. You must minimise the volume of water you use for cleaning and washing down by: • **vacuuming, scraping or mopping in preference to hosing down** • **reusing wash water (or recycled water) where practicable** • **using trigger controls on all hoses, hand lances and washing equipment**
	Where possible water will be minimised for cleaning and washing down by • vacuuming, scraping or mopping in preference to hosing down • reusing wash water (or recycled water) where practicable • using trigger controls on all hoses, hand lances and washing equipment
	9. You must directly measure fresh water consumption and record it regularly at every significant usage point, ideally on a daily basis.
	A water meter is installed to measure fresh water usage.
8.4 Water Minisiation, Recovery and Disposal	**1. You must have and implement a residues management plan that:** • **minimises the generation of residues from waste treatment** • **optimises the reuse, regeneration, recycling or energy recovery of residues, including packaging** • **makes sure you properly dispose of residues where recovery is technically or economically impractical**

	The site will benefit from a Integrated ISO accredited management system that will provide operational procedures to define quality control and measures to review materials against the requirements of the process for
	2. Where you must dispose of waste, you must do a detailed assessment to identify the best environmental options for waste disposal.
	The site will benefit from a Integrated ISO accredited management system that will provide operational procedures to define quality control and measures to review water against the requirements of the process
	3. You must regularly review options for recovering and disposing of waste produced at the facility. You must do this as part of your management system to make sure you are using the best environmental options and promoting the recovery of waste where technically and economically viable.
	The site will benefit from a Integrated ISO accredited management system that will provide operational procedures to define quality control and measures waste to review materials against the requirements of the process

Closure

This report has been prepared by Olive Compliance Ltd with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Fornax (North) Ltd; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from Olive Compliance Ltd.

Olive Compliance Ltd disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

APPENDIX 1

BAT Assessment for NOX reduction

BAT assessment for NOx Reduction project Helios

Preamble

As outlined in the *"guide to design documents"* from SLR dated march 2021, the intention of this document is to consider the chosen NOx abatement techniques and confirm that those techniques are in line with "Best available techniques" described in BREF of December 2019.

BREF 2019 with comments

Attached to this document is appendix 1 – chapter 2.5.5 to be found in BREF, describing best available techniques for NOx reduction. Furthermore, other investigations and trials for improving NOx reduction further compared to BREF is described in comments to the listed BAT recommendations.

The techniques described in BREF is as follows.

2.5.5.1.1 Air supply, gas mixing and temperature control

This is an essential part of any combustion and in this matter, we do not perceive this as much an important point according to BAT, as a design issue that is the foundation for building any energy plant based on every kind of fuel.

By choosing the rotary kiln combined with a secondary combustion chamber for incineration of waste the advantages gained by fully separating the primary and secondary air are fulfilled. It is important that the level of primary air can be controlled without interference from the secondary air to be able to control the fuel temperatures in both the volatilizing and oxidization area according to the actual load situation. In the same way it is important that the level of secondary air can be controlled accurately without interference from the primary air to be able to control the oxygen level in the raw gas in a precise way for controlling the temperature development in the raw gas for reducing raw gas melting and for reducing the generation of temperature related NOx. Furthermore, it is important to ensure that the raw gas temperature remains a certain temperature to ensure the complete burnout of heavy metal particles and CO.
Mixing of fuel oxidized gas and oxygen from the primary inlet is optimized by securing the right flow speed at primary inlet. By ensuring the right speed it is possible to secure that the flow stream of primary air will enter into turbulence from laminar flow exact where the stage goes from volatilizing to oxidization and at that reason where the most fuel gasses are generated. This is controlled by over dimensioned frequency regulated air blowers and a special inlet system. This combined with a control matrix programmed in the control system and calibrated with the actual load scheme, temperature sensor and O2 control system.

2.5.5.1.2 Flue-gas recirculation

Lowering the amount of oxygen in the primary air can contribute to a lower temperature in the fuel generated gas and lowering the amount of oxygen in the secondary air can contribute to lowering the amount of oxygen generated NOx at high temperatures. The challenge arise when using this at high temperature waste incineration because the load will vary a lot and at lower loads the recirculation will contribute to insufficient combustion. The plant is equipped with recirculation controlled by the control system. The experience is the fact that this system is used in a very limited amount of operation time.
The benefits of flue gas recirculation are most obvious when designing biomass or waste plants based on stepping grate technology or fluidized bed technology.

2.5.5.1.3 Oxygen injection

The amount of oxygen is controlled by levelling the amount of direct air and recirculated flue gas to the kiln. Direct oxygen injection will interfere in securing the combustion balance and is to be avoid.

2.5.5.1.4 Staged combustion

This point is mainly related to stepping grate technology, where separate primary zones can be established with different containment of oxygen levels to differentiate the combustion intensity over a large area. In this project this is optimized by controlling the place of turbulence (2.5.5.1.1)

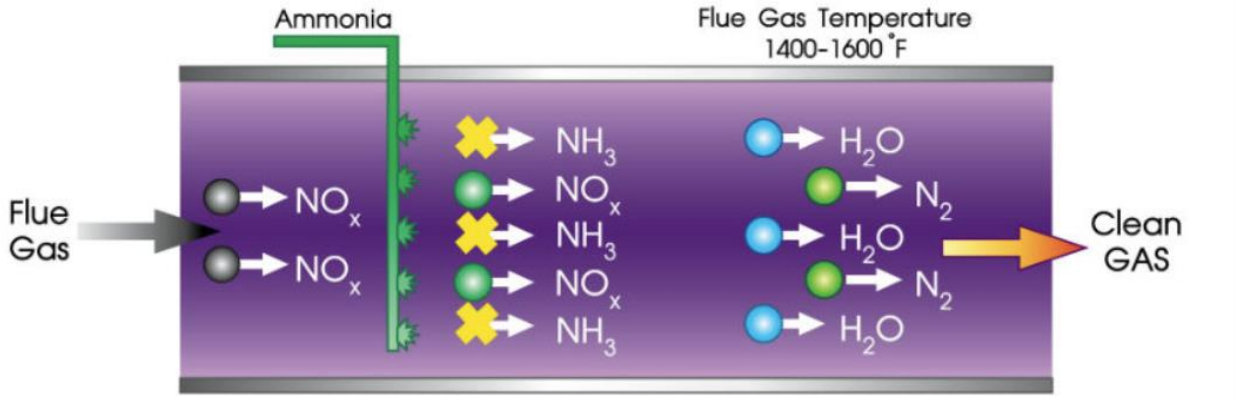
2.5.5.1.5 Natural gas injection (reburn)

This technique is not an optimal technique at very high combustion temperatures, because the reaction wanted between the gasses is optimal at very narrow temperatures. Experience has shown a much larger effect by using ammonia or urea dozing later in the secondary zone. See 2.5.5.2.1.

2.5.5.1.6 Injection of water into furnace/flame

Because the entire kiln is designed as primary zone is the risk of hot spots lowered to nearly zero caused by the relatively lower temperatures needed for volatilizing and oxidization. Where the temperature rises (by the addition of secondary air) it is not possible to use water as cooling media because we do not want any cooling of the raw gas at this point. This technology is mainly used in stepping grate systems, but practically no one uses this technology caused by a very high wear of the components as result.

2.5.5.2.1 Selective non-catalytic reduction (SNCR) process

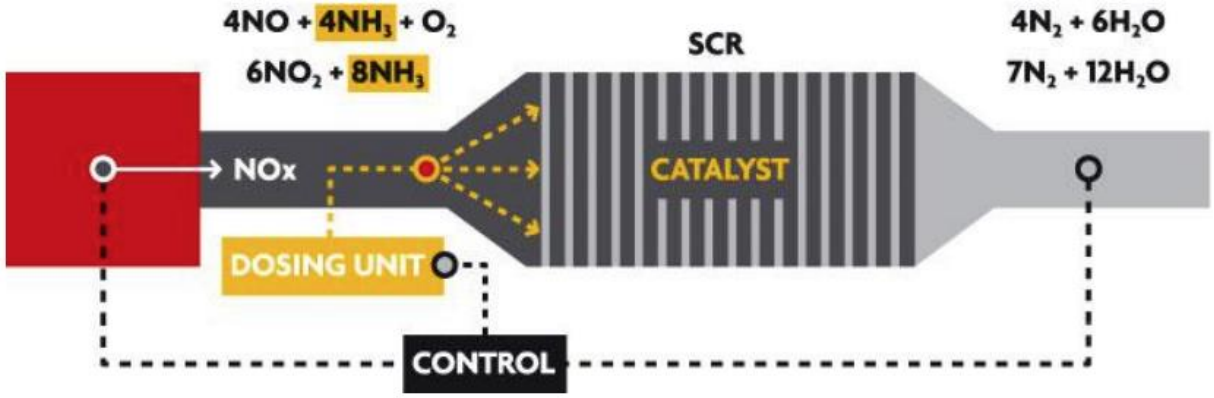


The use of ammonia water or Urea mixture injection is a bit less efficient than the catalytic solution. Instead, the advantages when used in waste incineration plants are significant compared to catalytic solutions. The temperature span needed for injection can be determined precisely at the exact placement where the interaction between the activator and the raw gas is optimal. At the same time this solution is more or less unaffected by the level of dirt and particles present in the raw gas.

Which precise activator mixture to be used is determined by the temperature span developed for the actual purpose. Generally, the use of ammonia mix will be optimal between 800 and 1050 degrees and the urea compound a bit higher.

For the Helios plant this technique for lowering the fuel bound NOx and the lower thermal generated NOx will be preferrable and the chosen solution. Which activator compound to be used will be determined after the detail construction for the EBK has been finished and the temperature span are known. Furthermore, the number of reduction layers will also be determined – normally 1 layer are enough but can be between 1 and 3 layers.

2.5.5.2.2 Selective catalytic reduction (SCR) process



If the surroundings allow for installation of a catalytic installation, this technique is quite efficient regarding lowering the fuel bound NOx. This technique is originally developed for usage in lowering NOx emissions in gas related installation – installations where the exhaust gas is clean.
The biggest challenges of using a catalyst in waste incineration is partly the fact that the exhaust gas before treatment is very unclean and very corrosive. To solve this fact the idea of the installation of a catalyst solution in connection with this incineration plant would be placement of the solution just before the exhaust outlet to the chimney.
Because the reaction between the activation compound and the raw gas is optimal at a temperature above 220 degrees it will be necessary to reheat the raw gas before dozing activation compound. This will be a very energy heavy process resulting in lower energy production and lower efficiency on the plant.

Another crucial challenge by implementing catalytic units in incineration plants based on this type of waste is controlling the SO2 level because at very small deviations the amount of SO2 can cause deactivation of the catalytic process in a degree which will be crucial to the NOx reduction.

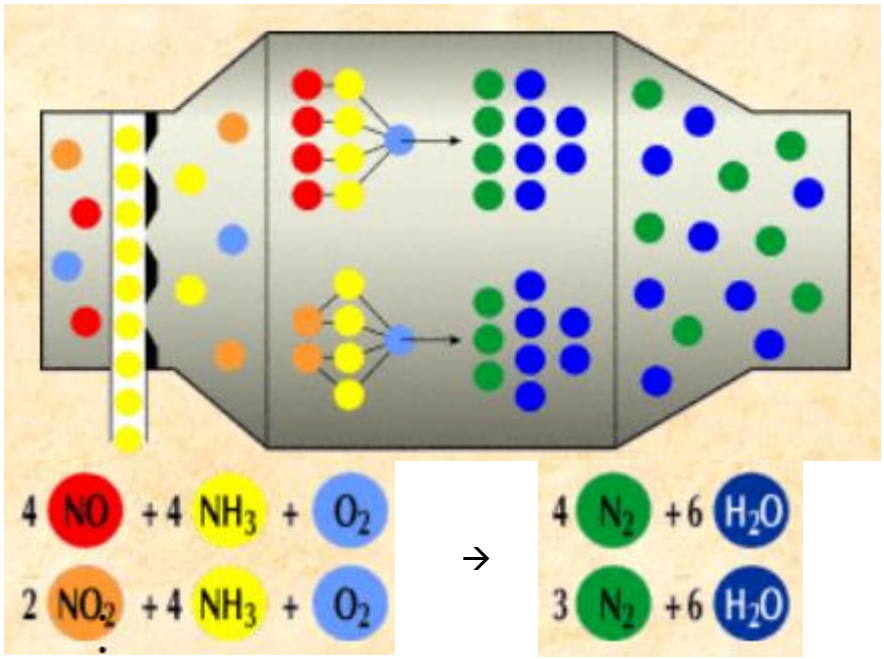
Nordheat SNCR NOx reduction system

Nordheat waste incineration boilers can as optional be mounted with an SNCR (Selective Non Catalytic Reduction) system.

This system will add an ammonia mixture or Urea compound to the secondary combustion chamber for achieving a reduction of the amount of NOx.

NOx is a mixture of Nitrogen Oxide (NO) and Nitrogen Dioxide (NO2). At waste combustion there will be most components of the Nitrogen Dioxide which we primarily want to remove. The process is developed in a way where as many as possible NOx particles are removed though. This is mainly secured in the exact placement of the layer(s) and the exact amount of reaction supported to the raw gas.

On the picture below is the chemical reaction illustrated (in a simplified way), where both NOx components – marked with red and red-brown and oxygen marked with light blue – are reduced and converted.
This is being done by the fact that ammonia (NH3) at the mix with oxygen and at a temperature at more than 320 degrees will attach to the Nitrogen dioxide.



To make it possible to inject ammonia (if chosen) by valves in the combustion chamber, a special water fluid is added to the ammonia. This makes it possible to inject the mixture as a fine fog making a kind of "wall" in the chamber – also called layer. This will make it difficult for the harmful NOx components to pass this layer(s) without any interaction with the ammonia.

To achieve success with this process it is very important that the boiler has been constructed for this purpose. The Nordheat waste boilers are at that reason constructed with a long and

narrow combustion chamber that allows the injection system to generate the "wall" of ammonia mixture.

Below it is stated why:

- *Ammonia or Urea mixture must be added as homogeneous as possible seen over the combustion chamber cross section. This is because the nitrogen dioxide is primarily generated in the hot fields in the combustion chamber, so if the cooling added mixture does not cover the entire cross section will be created NOx around the uncovered field.*

- *It is very important that the combustion chamber is built as cool as possible as SNCR technology works best in a temperature range from 800 to 1050 degrees. Nordheat waste incineration boilers are designed with water cooling and natural flow throughout the grid including the walls and ceiling of the EBK. Together with the right combination of refractory lining this is a very important function in order to reduce NOx.*

Nordheat has experience of being able to reduce the total NOx content of about 50-60% by using this system.

The advantage of SNCR systems is that the components to be used are easily available, there are no waste products (since our combustion chamber is long and relatively narrow which means that the pyrolyser and residues are nearly burnt out) as well as to the purchase price is not related to a special limited components with high price.

Following are pictures of a similar facility:

Pump Unit as well as standard IBC containers for ammonia and softened water (if used)


Dosing system and spray lances

Conclusion

Choosing the right basis technology for the purpose is in fact the most important factor for achieving the best possible results. In this case when incinerating a mixture of clinical waste and a small amount of hazardous waste, the combination of a "high temperature" rotary kiln and a special designed EBK with both circular and angular part with resistance walls are giving the best base case for achieving BAT technology.

Based on the support techniques described in the BREF 2019 and the comments above we conclude that following techniques will be present to secure the lowest possible NOx emission in the line.

Optimal air supply and temperature control, flue gas recirculation (only when needed), partly stages combustion (100% separated primary and secondary air support) and finally a SNCR system consist of 1-3 layers placed in flexible positions and based on either ammonia or Urea compound/mixture.

The final details can only be provided when the detail construction of kiln and EBK has been finalized after ordering those components.

Appendix

- *Best Available Techniques (BAT) Reference NOx reduction*
- *Nordheat DeNOx system*

APPENDIX 2

Material Data Sheet $CA(OH)_2$

Material Data Sheet Carbon

IMPRÄGNIERTER HERDOFENKOKS
HOK® ZUR ENTFERNUNG VON QUECKSILBER AUS ABGASEN

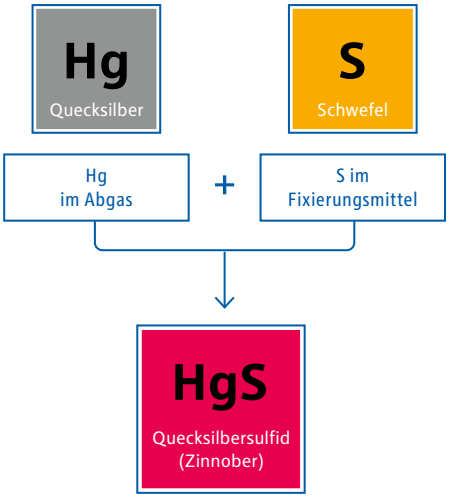
RWE
GROUP

HOK® PLUS PRP^{ox} ist ein Aktivkoks, der mit einem wirkungsvollen Fixierungsmittel beschichtet ist. Dies verbessert die Aufnahme und Fixierung von elementarem Quecksilber und weiteren Schwermetallen aus Abgasen. Das Produkt ist eine wirtschaftliche und effektive Alternative zu anderen imprägnierten Aktivkohlen.

DIE IMPRÄGNIERUNG

HOK® PLUS PRP^{ox} wird bei der RWE Power AG durch die Imprägnierung von HOK® mit einem exklusiv entwickelten Fixierungsmittel hergestellt. Hohe Anforderungen an den Herstellungsprozess gewährleisten eine konstante Produktqualität. Das Fixierungsmittel basiert auf einer Schwefellösung und wird speziell für die Imprägnierung von HOK® im rheinischen Revier hergestellt.

WIRKUNGSWEISE

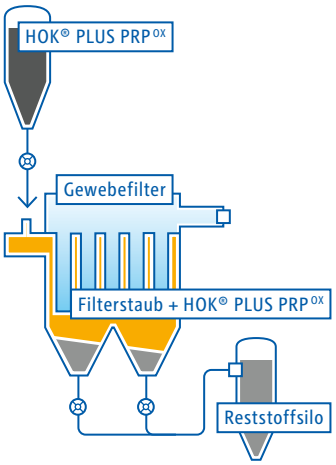


KÖRNUNG IM FOKUS

Die Reaktionskinetik ist ein wichtiger Faktor für die Adsorption von Schadstoffen. Daher sind die Korngröße wie auch die Porenstruktur essenziell für eine optimale Abscheideleistung. Durch den Pyrolyse- und Aktivierungsprozess der rheinischen Braunkohle entsteht zum einen eine günstige Porenstruktur (hoher Anteil an Meso- und Makroporen) und zum anderen eine hochfeine Körnung (d50 < 24 µm).

EINSATZMÖGLICHKEITEN

Als staubförmiges Produkt wird HOK® PLUS PRP^{ox} in der Flugstromadsorption eingesetzt und scheidet dort Quecksilber ab. Das Fixierungsmittel reagiert beim Einsatz im Abgas spontan mit ionischem und metallischem Quecksilber direkt zu Quecksilbersulfid (HgS, auch Zinnober genannt). Dieses HgS ist ein ungiftiger, nicht mehr wasserlöslicher Feststoff, welcher im Porensystem des HOK® fest fixiert ist. Zum Einsatz kommt es daher in Anlagen, deren Rauchgas Quecksilber enthält. Hierzu zählen z. B. Abfall-, Sonderabfall und Klärschlammverbrennungsanlagen sowie Kohlekraft- und Zementwerke. Wie mit herkömmlichen Herdofenkoks HOK® lassen sich auch mit HOK® PLUS PRP^{ox} alle weiteren emissionsrelevanten Schadstoffe wie z. B. die Schwermetalle Cd, As, Pb, Schwefeldioxid (SO2), Chlorwasserstoff (HCl), Fluorwasserstoff (HF), Schwefelwasserstoff (H2S), Dioxine und Furane sowie eine Vielzahl organischer Komponenten sicher abscheiden. Die Schadstoffe werden dabei durch Adsorption, Chemisorption oder katalytische Umwandlung aus dem Abgas bzw. der Abluft entfernt.

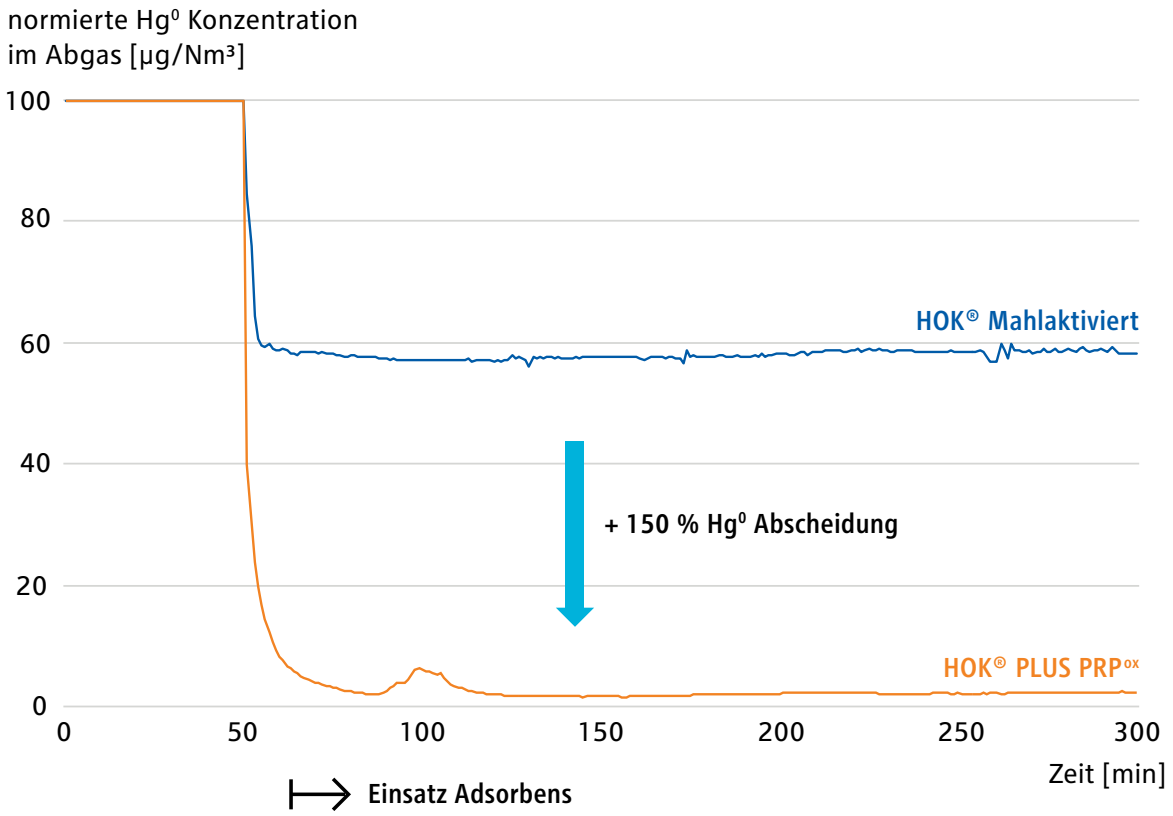


QUALITÄT UND VERFÜGBARKEIT

Produktion, Vertrieb und Logistik erfolgen nach einem konsequent praktizierten Qualitäts-Sicherungssystem in Anlehnung an die DIN ISO 9001. Die große Produktionskapazität und der eigene Rohstoff gewährleisten ein höchstes Maß an Verfügbarkeit und Liefersicherheit.

INSTITUT / REFERENZ

Versuche im Institut IUTA (Institut für Energie- und Umwelttechnik, Duisburg) zeigen, dass sich die Abscheiderate für elementares Quecksilber von HOK® PLUS PRP^{ox} im Vergleich zu HOK® um 150 % steigert.



Analysenanhaltswerte von HOK® PLUS PRP^{ox}	
Zusammensetzung	
Wasser	< 1,0 %
Asche	9,5 %
Flüchtige Bestandteile	< 4,8 %
Anteil schwefelhaltiges Imprägniermittel	< 5,0 %
Physikalische Eigenschaften	
Spezifische Oberfläche [1]	300 m²/g
Schüttdichte [1]	0,55 g/cm²
Körnung	
< 63 µm [1]	min. 80 %
d_{50} [1]	24 µm

[1] gemäß Analysenanhaltsblatt HOK® Mahlaktiviert

EIGENSCHAFTEN

- sehr gute Abscheidung von
  - elementarem Quecksilber
  - Schwermetallen
  - Dioxinen und Furanen
- wirtschaftlich attraktiv
- höchster Qualitätsstandard
- hohe Produktverfügbarkeit
- Made in Germany

VERPACKUNGSARTEN

- lose per Silofahrzeug
- Big Bags
- Sackware
- weitere Verpackungseinheiten auf Anfrage

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GROUP

RBB-HOK/04.22

Hydratkalk

$Ca(OH)_2$

Synonymer: Hydratkalk 500 kg BB - kvalitet 2. Saniblanc H.

Fremstilling: Hydratkalk fremstilles på basis af let brændt kalk. Den brændte kalk læskes med netop så meget vand, at hydratkalken dannes som et tørt og fint pulver.

Kemisk sker følgende:

CaO	+ H_2O	-> $Ca(OH)_2$	+ varme
Brændt kalk	+ vand	-> hydratkalk	+ varme.

Analysedata: Kalk er et naturprodukt, hvis sammensætning varierer indenfor visse grænser. Samtlige analysedata skal derfor betragtes som retningsgivende. De kemiske og fysiske egenskaber beskrives af samme grund ved en middelværdi ($\overline{X}$)og tilhørende standardafvigelse (s).

Middelværdien plus/minus to gange standardafvigelsen ($\overline{X}$ ± 2 x s) angiver grænserne, indenfor hvilke 95 % af vore analyseresultater vil falde.

Kemisk analyse:

		Middelværdi	S
Calciumoxid	(CaO_{aktiv})	68 %	1,0 %
Calciumhydroxid	($Ca(OH)_2$)	90 %	1,3 %
Fugtighed (v/110°C)	(H_2O)	1,4 %	0,43 %

Kravene til CaO+MgO er i overensstemmelse med standardens krav for produktet med betegnelsen CL 90-S

Oprindelsesland: **Danmark**

Fysiske egenskaber

Sigteanalyse:

Alpine Luftstrålesigte	Middelværdi	S
Sigterest på 200 µm	0,17 %	0,14 %
Sigterest på 90 µm	0,78 %	0,42 %
Specifik overflade efter DIN ISO 9277: 13,82	13,82 m^2/kg	2 m^2/kg

Soundness: 1 mm iht. EN 196-3:1994

	Middelværdi	S
Løst:	500 kg/m³	50 kg/m³
Pakket:	500 kg/m³	50 kg/m³

Levering: Hydratkalk leveres i bulk á 22-23 tons(33-34 m³), big bags á 500 kg og 25 kg sække.

Opbevaring: **H**oldbarheden er ubegrænset under forudsætning af fugtfri opbevaring.

pH (10%w/w): 12,5

Advarsel: Støv kan irritere luftvejene og medføre halsirritation og hoste. Der skal derfor ved arbejde med kalken anvendes beskyttelsesbriller, støvmaske og arbejdshandsker.
Skulle der ved et uheld komme hydratbrændt kalk i øjnene, skylles disse med vand i mindst 15 minutter, hvorefter den tilskadekomne person bringes til øjenlæge eller sygehus.

Kommer der hydratkalk i forbindelse med huden, skylles med rigeligt vand i mindst 15 minutter, og der efterbehandles eventuelt med håndbalsam.

Indtagelse kan forårsage kvalme, mavesmerter og opkastning kan forekomme. Risiko for ætsning i svælg, spiserør og mave samt chok. Læge ***SKAL*** kontaktes

Anvisning: Der henvises til vort sikkerhedsdatablad for calciumhydroxid.

Øvrigt: Hydratkalk fra **dankalk** overholder kravene til bygningskalk i EN 459-1 med betegnelsen: EN 459-1 CL 90-S

REACH pre-registration no. CR150296-24

Ovenanførte analysedata er fundet ved prøvningsmetoder der afviger fra de i standard angivne

Oplysningerne i dette tekniske datablad vedrører kun det specifikke materiale, der er udpeget heri og vedrører ikke brugen og kombination med andre materialer eller i en proces. Oplysningerne heri er baseret på tekniske data, som dankalk anser for at være pålidelige, men dankalk giver ingen repræsentation eller garanti med hensyn til fuldstændighed eller nøjagtighed heraf og dankalk påtager sig intet ansvar som følge af dets brug, eller for nogen krav, tab eller skader af nogen tredjepart. Modtagere der modtager denne information skal udøve deres egen dømmekraft over for hensigtsmæssigheden af dets brug, og det er brugerens ansvar at vurdere materialets egnethed (herunder sikkerhed) til et bestemt formål forud for sådan anvendelse.

CE

0615

dankalk K/S
Aggersundvej 50
DK - 9670 Løgstør

14
DoP 0615-CPD-9639 750060

EN 459-1
Hydrated Lime CL 90 S

Building lime

4.4.2 Kemisk sammensætning		
CaO + MgO ≥ 90	≥ 90	Massefraktion i %
*MgO ≤ 5	≤ 5	Massefraktion i %
CO_2 ≤ 4	≤ 4	Massefraktion i %
SO_3 ≤ 2	≤ 2	Massefraktion i %
Available Lime ≥ 80	≥ 80	Massefraktion i %
4.4.4 Soundness	≤ 20	mm
5.4.2 Free Water	≤ 2	%
6.1 Kornstørrelse		
0,09 mm sigte	≤ 7	mm
0,02 mm sigte	≤ 2 mm	mm
6.8 Penetration	> 10	mm
-indtrængningsmål	< 50	mm
6.10 Luftindhold	≤ 12	%
Holdbarhed	Så længe produktet holdes tørt	

*MgO indhold op til 7% er tilladt hvis Soundness test er iht. EN 459-2.

datablad/Hydratkalk/november/2022