Technical Description and BAT Assessment

Davis Commercial Services

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SITE DETAILS

Davis Commercial Services Ltd

12 Baron Avenue

Earls Barton

NORTHAMPTON

NN6 0JE

OPERATOR DETAILS

Davis Commercial Services Ltd

12 Baron Avenue

Earls Barton

NORTHAMPTON

NN6 0JE

PERMIT/APPLICATION REFERENCE

EA/EPR/EB3100HN/V002

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K256.1~20~030	Permit Boundary Plan	24/11/2023
K256.1~20~028	Site Layout Plans	24/11/2023
K256.1~20~029	Site Layout Plan Process Building and front yard	24/11/2023
K256.1~20~025	A1 Site Layout Plan	24/11/2023
K256.1~20~026	Site layout Plan Storage	24/11/2023
K256.1~20~022	Site Location Plan	24/11/2023

1 INTRODUCTION

This Best Available Techniques (BAT) Assessment has been produced on behalf of Davis Commercial Services Ltd. (DCS) (the operator and applicant) to support the variation of Environmental Permit (EPR/EB3100HN) at 12 Baron Avenue, Earls Barton, Northampton, NN6 0JE.

1.1 Permit Variation

The permit variation application proposes the following:

1. Addition of a building, known as the A1 building, to the Permitted area to carry out manual dismantling and 'preparation for re-use' processes.
2. Addition of a point source emission to air

   These need to be added to the permitted area to accommodate the new modernised process, which has been implemented in order to continue to meet the environmental standards and the technical guidance, as well as increase the process efficiency.

   The proximity of the new building allows for efficient transport of the waste streams between working areas, with minimal impact on surrounding environment.

3. Addition of the following activities to the permit:
   - Shredding
   - Density separation
   - Pelletising
   - Granulation
   - These activity descriptions are introduced to align their description to the treatment process carried out at DCS.
4. Additional EWC codes:
   - 17 04 01 copper, bronze, brass
   - 17 04 02 aluminium
   - 17 04 03 lead
   - 17 04 04 zinc
   - 17 04 05 iron and steel
   - 17 04 06 tin
   - 17 04 07 mixed metals
   - 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 06 03* other [non ACM] insulation materials consisting of or containing hazardous substances
- 17 06 04 insulation materials other than those mentioned in 17 06 01 and 17 06 03

The treatment process developed at DCS is suited to process these types of wastes, as mixed non-ferrous and ferrous metals as well as insulation panels are routinely processed as part of the EoL fridge units' treatment at the facility. The proposed additional EWC codes would not introduce any additional environmental risk.

5. Increase the storage capacity of WEEE to a maximum of 10,000 tonnes at any one time.
6. Increase the annual throughput at the site activities will be up to 40,000 tonnes.
   The proposed increase in storage and throughput is to reflect expansion of the business, increase in process efficiency and to future proof the business and make sure that environmental standards continue to be met.
   The increased storage and throughput are comparable to quantities allowed in Standard Rules permits for WEEE ATFs. Therefore, DCS's processes and infrastructure are suited to accommodate the increase without introducing any additional environmental risk

7. introduce preparation for re-use as a directly associated activity. This is to make sure that materials are managed according to the waste hierarchy.

1.2 Best Available Techniques

Originally published in August 2006, the Best Available Techniques (BAT) Reference (BREF) Document for Waste Treatment was updated in August 2018.

The variation application describes activities, control and risk management measures applied and how this will achieve the requirements of relevant BAT conclusions.

The document also makes reference to the requirements of the Waste electrical and electronic equipment (WEEE) and Waste temperature exchange equipment (WTEE) appropriate measures for permitted facilities which were published on 13 July 2022.

This document provides a technical description of the activities and how relevant elements of the BREF and appropriate measures are achieved. It should be read in conjunction with the other supporting documents included within the application.

The term ‘best available techniques’ is defined in Article 3 (10) of the Directive as ‘the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole.’

Article 3 (10) goes on to clarify further this definition as follows:

‘best’ means most effective in achieving a high general level of protection of the environment as a whole.

‘available techniques’ are those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator;

‘techniques’ includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;

Appropriate measures are the minimum standards that operators must meet to comply with their environmental permit requirements.

Furthermore, Annex III of the Industrial Emission Directive contains a list of criteria to be considered in determining BAT; of specific relevance to the variation are points;

6. the nature, effects and volume of the emissions concerned;

7. the commissioning dates for new or existing installations; and

8. the length of time needed to introduce the best available technique.

Additionally, consideration needs to be given to installations where the technical characteristics can be shown to be so different from those assumed in the sectoral

assessment of BAT described in the guidance documents, that the indicative BAT standards may not be appropriate.

1.3 Process description

The commercial units received at the site these can be divided into two distinct types; either be ‘remote’ or ‘integral’:

- Integral: Units which contain compressors with oils and refrigerants and are designed to independently cool within the cabinet shell.
- Remote: These units (the cabinet or shell in which products are placed) do not contain compressors with oils and refrigerants, as this element of the cooling system is held elsewhere within the retail units, providing refrigeration for a number of cabinets. The part of the unit received on site is the cabinet. Therefore, these units don’t contain refrigerant gas when delivered.

Reflective of the commercial refrigeration stock currently in use in the UK, the majority of units received at the site are Remote; the remaining are Integral, but a proportion of these will be received at site having already been ‘de-gassed’ as part of the planned maintenance programme at the point of use.

The end of life (EoL) refrigeration units treated at the facility do not contain Ozone Depleting Substances (non-ODS) as refrigerant or blowing agent in the insulating foam panels. Due to the possible presence of pentane as a blowing agent in some of the insulation foam of the refrigeration units, these units are considered hazardous by flammability (HP3).

The refrigeration units are treated as follows:

- Degassing (integral units only): the refrigeration gas is removed from the unit.
- Oil removal (integral units only): any residual oil is extracted from the fridge compressor.
- Dismantling: the refrigeration units’ components are separated for onward recovery.
- Treatment and storage prior to dispatch for recovery or disposal:
    - The fridges’ carcasses comprising of insulating panels, non-ferrous and ferrous metals are crushed/shredded and separate by density.
    - The separated crushed/shredded insulting foam is size reduced, compacted and stored prior to dispatch for recovery.

Due to the limited volume of pentane in the panels the quantity liberated in the process of cutting is small. The potential flammability of pentane has been taken into consideration, and the process has been designed to be intrinsically safe (in accordance with BARRT[1]), with the installation of an extraction and abatement system.

1.1 Application of BAT and appropriate measures standards to the specific process

In this BAT assessment, the following reference and guidance documents have been considered:

- *Commission Implementing Decision (EU) 2018/1147, of 10 August 2018, establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council.*

- *Best Available Techniques (BAT) Reference Document for Waste treatment Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control); EUR 29362 EN; Publications Office of the European Union, Luxembourg, 2018;*

- *Guidance on Best Available Treatment Recovery and Recycling Techniques (BATRRT) and treatment of Waste Electrical and Electronic Equipment (WEEE), Department for Environment, Food and Rural Affairs (Defra), November 2006.*

- *Guidance for the Recovery and Disposal of Hazardous and Non Hazardous Waste S5.06,* Integrated *Pollution Prevention and Control (IPPC), Issue 5, May 2013.*

- *The requirements of the WEEE and WTEE appropriate measures guidance have also been taken into account.*

The table references the relevant documents within the application pack that describe how compliance with all relevant guidance is met.

[1] Guidance on Best Available Treatment Recovery and Recycling Techniques (BATRRT) and treatment of Waste Electrical and Electronic Equipment (WEEE)

The process controls applied by DCS to the in-process operating techniques that have been implemented at the Earls Barton facility to avoid the release of polluting substances to the environment are summarised in Table 1 below.

Table 1. Potential gases present in EoL fridges, and process controls in place to avoid their release.

USE WITHIN EOL FRIDGES	SUBSTANCE	FLAMMABLE	ODP	GWP	ACCEPTANCE CHECKS	DE-GASSING	ATEX RATED FORCED AERATION SYSTEM	ADSORPTION
Refrigerants	CFC	NO	1	5350	Rejected	Rejected		
	HCFC	NO	0.5	3152	Rejected	Rejected		
	HFC	NO	0	3922	Accepted	√		
	HC	YES	0	<5	Accepted	√		
	HFO	NO	0	7	Accepted	√		
Blowing Agents in insulation panel	CFC	NO	1	5350	Rejected		Rejected	
	HCFC	NO	0.5	3152	Rejected		Rejected	
	HFC	NO	0	3922	Rejected		Rejected	
	HC	YES	0	<5	Accepted		√	√
	HFO	NO	0	7	Accepted		N/R	N/R
	WATER	NO	0	0	Accepted		N/R	N/R
	CO2	NO	0	1	Accepted		N/R	N/R

Key: CFC=chlorofluorocarbon; HCFC=hydrochlorofluorocarbon; HFC=hydrofluorocarbon; HC=hydrocarbon; HFO= hydrofluoroolefins.. N/R = Not required

ODP is the ratio of ability of a substance to degrade ozone, compared to that of chlorofluorocarbon-11 (CFC-11), which therefore, has a value of 1. DCS will accept only EoL fridges containing refrigerants or blowing agents with zero ODP.

GWP is the ratio of ability of a substance to trap heat in the atmosphere, compared to that of carbon dioxide. The most common F-gases have GWP in the order of a few thousands (e.g. CFC-11, 4,250) or a few hundred (HCFC-141b, 725). HFOs and HCs (such as pentane) have GWP of several orders of magnitude lower that F-gases, ranging from 0 to 7.

Given the controls in place, in normal circumstances the gases that may be liberated by DCS's process pose a significantly lower risk to the environment if released, when compared to the mix of gases assumed in the process described by the BAT documents.

Therefore, the focus of the abatement system employed by DCS is the avoidance of explosive atmospheres (due to flammability), which is achieved maintaining the hydrocarbon concentration below the lower explosive limit, through the forced aeration provided by the extraction system.

The residual risk of emission of hydrocarbons to air will be maintained at an acceptable level by using adsorption on granulated activated carbon as described in Section 5 of this document.

2 POLLUTION CONTROL MEASURES

The following section describes the in-process operating techniques that have been implemented at the Earls Barton facility to avoid the release of potentially polluting substances to the environment, taking into account relevant BAT requirement and site specific technical and economic factors.

2.1 Pre-acceptance procedure

At the Earls Barton facility, no ODS (ozone depleting substances) containing refrigeration units will be accepted for treatment.

DCS accepts commercial EoL fridges, and source segregated insulation panel and metals. The types of wastes to be accepted at the site are detailed in the List of Waste (K256.1~09~009), accompanying the application

A pre-acceptance procedure is followed in accordance with section 3.1 of the EA's appropriate measures guidance for WEEE and WTE.

The only EoL fridge units accepted are the following:

- using hydrofluorocarbons (HFCs), hydrocarbons (HCs) as refrigerants;
- using CO_2, water and HCs as insulating panels blowing agents.

To help determine the type of refrigerant and blowing agent prior to being scheduled for delivery to site, where possible, a pre-acceptance procedure will be used to gather information about the type of units in the load, obtained from the waste producer and assessed for acceptability.

As a minimum, information for each load will include:

- Age of the unit
- Manufacturer
- Type of unit (remote, integral)
- Information reported on the "appliance rating plate"
- Source of the refrigeration unit
- Blowing agent used in insulating panels
- Type of refrigerant used
- Weight(kg)
- Volume

Waste producers are encouraged to send pictures of the units in the load as well as pictures of the rating plates/labels, when available.

The Technical Competent manager (TCM) (or nominated alternative) will review the information provided to determine whether it is sufficient for acceptance of the waste on site.

A database of the common manufactures and models is available to the operators on site and, where not common knowledge, can be consulted to check if the units are compliant with the Permit (non-ODS). Where new units are encountered other sources of information such as phone apps, trade bodies, direct contact with manufactures, and internet, can be used to check that the refrigerant and blowing agent used are non-ODS.

Where the information provided is deemed insufficient, the Operator will request further information from the waste producer.

Where uncertainties remain on whether the refrigeration units in a load are compliant with the Permit, a precautionary approach will be used, and the operator will decline the load.

For every enquiry, the load is given a unique reference number, contents of the load listed along with the information provided by the waste producer, and whether the load has been accepted or not. The information is recorded.

The load schedule information is transferred daily to a database and will be used to ensure that capacity is available, as part of the site's stock control. Where there is no capacity the load shall be declined at the pre-acceptance check stage.

2.2 Waste acceptance

On receipt at the site the waste acceptance procedure will include review against pre-acceptance information, duty of care paperwork (Hazardous Waste Consignment Notes, HWCN or Waste Transfer Note) and a visual check for unit integrity and compliance. All relevant staff are trained in the waste acceptance procedure, which includes a visual inspection to identify any non-conforming wastes within the load.

- DCS-HSE-08 Waste acceptance
- DCS-SOP-04 Unloading vehicles

DCS will only accept those wastes that comply with the permit. Non-conforming loads will be quarantined or rejected depending on quantity of non-conforming waste.

All deliveries of units for processing arrive at the main storage area or main building front yard and are weighed on the weighbridge.

The duty of care paperwork (Hazardous Waste Consignment Notes (HWCN) or Waste Transfer Note (WTN)) shall be examined to check that it meets the legal requirements and that the information provided at the pre-acceptance stage is consistent.

The load shall then be subject to a visual check: trained operational staff shall check the load to ensure that the load contains only the units described in the schedule and duty of care documents. Non-permitted loads will be rejected at this stage and not allowed to be unloaded.

A detailed check is carried out to ensure the HWCN/WTN number matches the number consigned, and for the presence of units containing Ozone Depleting Substances (ODS) (as refrigerant and panels blowing agent) and Hydrofluorocarbon (HFC) (blowing agent).

Where identified after unloading non-permitted waste will be segregated and stored in a designated quarantine/isolation area prior to removal from site (Quarantine area in Site Layout Plan Storage Area K256.1~20~026).

Contaminated or non-conforming loads identified during the initial inspection will be rejected and details of the rejection along with dates, times and reasons recorded.

Where limited volumes of non-conforming material are identified the technically competent manager (TCM) will be consulted. Where possible and if safe to do so contaminated or non-conforming material will be removed by hand and quarantined pending recycling, recovery or disposal at a suitably permitted facility.

EoL fridges stored on site will be subject to regular inspections to identify any leaks, deteriorating containers and any other potential fire risks. Any faults identified will be reported to the technically competent manager (TCM) and records of preventative or corrective actions taken will be kept in the site diary.

2.3 Tracking

Once unloaded, each unit will be labelled according to their type (remote or integral) and the blowing agent used for the insulation foam. The information is recorded, and a unique label created for each unit which links to key information. Additional to type and blowing agent other useful information may be recorded e.g. date of arrival so that the operator can easily assign each unit to the correct treatment process and check storage limits will not be exceeded.

Once labelled, the integral and remote units are, stored in the work queue, prior to being sent for treatment. Integral units are degassed before the manual dismantling process.

Both unit types undergo manual dismantling. The manual dismantling process segregates the components of the units, which are stored in separate containers.

The records are kept up to date on an ongoing basis to reflect deliveries, on-site treatment and despatches.

All records relating to pre-acceptance will be maintained and available at the site's office for cross-reference and verification at the waste acceptance stage.

Records will be held for a minimum of two years after.

2.4 Waste storage

All deliveries will be accepted externally and will undergo a visual inspection of the load and supporting documents prior to unloading.

Waste inspections will be undertaken prior to acceptance and during unloading, non-permitted loads will be rejected. Where identified following unloading non-permitted waste will be segregated and stored in a designated quarantine/isolation area prior to removal from site.

All storage takes place on impermeable surfaces with sealed drainage.

Using a tracking system, after unloading, site operators will, dependant of workflow requirements, transport the units to the designated storage area. Whole units are store upright, with a maximum stacking height of two upright units.

Following dismantling, the components are stored separately in dedicated areas, segregated from each other.

During normal operating conditions units are processed continually, most units will be processed within the working week, where more feedstock is held then there will be a typical turnaround time of no longer than one (1) month. Staffing levels can be adjusted on an as required basis to achieve this.

Units will be treated on a priority basis with integral units that require degassing or damaged remote units processed first, as far as possible, or necessary from an environmental protection point of view, units will be processed on a 'first in first out' basis; rapid turnaround will help to ensure short storage periods. Due to the nature of the operation it does not benefit the business to store waste for long periods of time. No units will be stored at the site for longer than 3 months.

The main storage area is located approximately 100 m north west of the main building (see site layout plans K256.1~20~028) within a secure area to prevent vandalism: the site is protected from unauthorised access from Mallard Close by a two-metre-high palisade fence.

Gates and building are locked and secured every evening after operations finish.

The site security is visually inspected at the end of the working day, and 24-hour CCTV coverage operates across the site. CCTV cameras are located both inside the building and external areas, these provide surveillance of the entire site (See Site Layout Plans for location of CCTV cameras).

Units within the storage area are labelled. The label allows unique identification through stock control and cross-reference to pre-acceptance and acceptance records.

All labelling is resilient enough to stay attached and legible throughout whilst stored at the site, through to the dismantling of the unit within the process building. Site operatives will routinely check units to spot signs of damage and deterioration of the labels.

The drainage infrastructure of the storage area ensures that surface water run-off is contained. Procedures are in place for the regular inspection and maintenance of storage areas, including surfaces, curbs and the interceptor. Records of all inspections are kept detailing action taken.

Within the process building, daily inspections are carried out of the condition of containers If a container is found to be damaged, leaking or in a state of deterioration, the contents are immediately transferred to another container

Following a spillage, surface cleaning, checks to the integrity of the site's surfaces and infrastructure, drain clearance and residue removal will be undertaken, if required.

Access to units in the storage area will be maintained at all times such that the removal/transfer of containers is not impeded

2.4.1 Main storage area

Remote and pre-treated integral units will be delivered, inspected, and stored in the storage area, within which each individual storage pile will be no more than 420m^3 within the following dimensions: 15m wide, 7m long, and 4m high.

An area will be designated for storage of integral EoL refrigerators, which may contain a very small quantity of refrigerant gas and oils. This storage area will in normal conditions not exceed 100m3. Only EoL units in good conditions (i.e. no gas or oil leakage identified during acceptance checks) will be stored in this area. Due to the constant turnover of stock, this area will not be fixed but will be managed by the member of staff responsible for the storage area. The tracking system will allow identification of integral or remote units.

If following allocation to a storage area, routine site inspections identify any leakage; exposed foam or other issue which may give rise to harm to human health or the environment, the units would immediately be moved to the process building for treatment.

On an ‘as required’ basis units will be moved from the storage area to the process site, here they will either be offloaded directly into the dismantling area, or to the operational storage area where they will be moved to the dismantling area when capacity is available.

Maximum storage capacity will be determined on the basis of area of storage available at that time, detailed information will be provided within the Fire Prevention Plan (FPP) (K256.1~09~007). The storage area has been developed, covering an area of approximately 9700 m^2. Actual locations and numbers of stockpiles will be dependent upon space available at the time, whilst dimensions may vary they will always be such that the maximum volume of any one stockpile is not exceed, whilst maintaining separation distances described in the FPP.

The site is equipped with electric forklift trucks and one 360 loader.

All equipment is periodically inspected in accordance with manufacturers’ guidance and manuals to ensure the plant and equipment is available for work when required.

Integral EoL fridge units are handled with a forklift clamp attachment and in a way that avoids accidental damage to the unit, in particular to the cooling circuits, to avoid accidental leakage of hazardous substances and refrigerant gases.

2.4.2 Process site

Units will be moved from the main storage area to the A1 process building on an ‘as required’ basis, these units will be placed in the ‘to be worked’ bay (see Plan K256.1~20~025). It is anticipated that the number of units in this area will be sufficient to provide working stock for the dismantling area for the subsequent working day. Whilst numbers of units in this area will vary across the working day, at the end of the working day the volume of units will not exceed 450m3.

The purpose of the dismantling operation is to separate component materials with the aim of maximising resources recovery at other permitted sites. As units are dismantled materials are liberated, such as;

- Metals – Ferrous & non-ferrous
- Oil – removed from integral units – limited volumes created
- Gas – removed during de-gassing of integral units
- Compressors – removed during dismantling of integral units
- Fluorescent tubes – removed during dismantling of units
- Printed Circuit Boards – removed during dismantling of units

- Plastic & rubber – removed during dismantling of units
- Wood – limited volumes liberated from frames of certain types of units
- Insulating panels – non-hazardous (H2O & CO2 blown, polystyrene)
- Insulating panels – hazardous (due to flammability when containing pentane)
- General office waste – limited volumes created.

Storage of combustible materials will not exceed the capacity identified in the FPP guidance. Specific details are found in the FPP (K256.1~09~007).

Hazardous waste such as fluorescent tubes, printed circuit boards and compressors will be stored in containers within the main building.

3 WASTE TREATMENT

Waste treatment activities will primarily be restricted to removal of oil and de-gassing (Integral units only), manual dismantling, separation, and segregation into distinct materials, granulation, density separation and size reduction prior to subsequent dispatch of the materials to permitted facilities for recycling, recovery, or disposal.

During waste treatment activities control measures are employed to ensure the minimisation of dust, noise, and other nuisances. Waste treatment activities will be undertaken within the two buildings which are underlain by an impermeable surface with sealed drainage system.

The main treatment stages are described below.

3.1 Stage 1. Removal of refrigerants and oil

Refrigerants form the temperature exchange equipment are extracted into gas tight pressure vessels using a dedicated refrigerant recovery station (Figure 1).

The filled vessels are stored in a dedicated area within the recovery area (see Main Building Site Layout Plan K256.1~20~029).

When full, the vessels are dispatched from site for recovery of the refrigerant gases in a specialised facility. Given that integral units form a minor part of the materials received at the site, collection and dispatch of vessels is infrequent.

Figure 1. Refrigerant and oil recovery system

Compressor oil is removed by suction in the same area of the de-gassing process. As the oil may contain dissolved refrigerant it is retained within a closed system until is completely degassed. Recovered oil is contained prior to collection and disposal by a specialist contractor.

The fully enclosed suction system guarantees recovery of more than 99% of the refrigerants and oils. Once refrigerant has been removed, compressors my be drilled and further dripped to ensure all oil has been removed and avoid spillage during storage.

The process is checked for recovery of at least 90% of the refrigerant and for <0.9% residual refrigerant in the oil (See Section 4 of this document).

3.2 Stage 2a. Manual dismantling

The integral depolluted units are transferred to the main building dismantling area (see Main Building Site Layout Plan K256.1~20~029).

The remote units are instead transferred from the main storage yard to the A1 building's dismantling area (see A1 building Suite Layout Plan).

In this area the different components of the units are separated manually using handheld tools, where necessary. The components separated are then stored awaiting collection or undergo further treatment. The separate components are segregated and stored in containers and in dedicated areas.

The following materials are classified (subject to a WM3[2] assessment) as hazardous wastes and are stored within the buildings:

- Compressors, stored in IBCs awaiting bulking in one of the skips in the front yard
- Fluorescent tubes, stored in dedicated containers ('coffins')
- Printed circuit boards, stored in IBCs or bags
- Cables, stored in stored in IBCs awaiting bulking in one of the skips in the front yard

[2] Technical Guidance WM3: Waste Classification - Guidance on the classification and assessment of waste

Other separated components are classified as non-hazardous wastes and may be stored within appropriate containers in the front yard, awaiting dispatch to recovery/recycling facilities. These are:

- Other lamps e.g. LED, halogen and incandescent, stored in IBCs or bags
- Plastics and rubber, stored in IBCs or bags
- Glass, stored in IBCs or bags
- Metals, stored in the bay in the main front yard

The following materials are also classified as POPs waste:

- Printed circuit boards
- Electrical Cables
- Plastics and rubber

The main components of the refrigeration unit undergo further treatment. These are the EoL fridges carcasses which are composed of insulating panels, ferrous metals and non-ferrous metals

A small amount residual non-recyclable material is disposed of as general waste.

3.3 Stage 2b. Destruction of carcasses and compaction of insulation panels

Following manual dismantling, the fridge carcasses are transferred to the automated treatment system within the main building (see Main Building Site Layout Plan K256.1~20~029).

The EoL fridges carcasses are fed by conveyor belt to a crusher/shredder which reduces the size and separates metals and foam. This stage of the process is fully enclosed

The crushing/shredding is followed by a water-based density separator and series of magnets. This system separates the crushed/shredded metals from the foam.

Following separation, the foam is further size reduced in a grinder and then filtered using cyclones, prior to being pelletised and bagged ready for dispatched.

Given that the panels are hazardous according to their flammability the system is sealed, intrinsically safe and incorporates an extraction system: any gas captured by the extraction system passes through a granular activated carbon (GAC) filter.

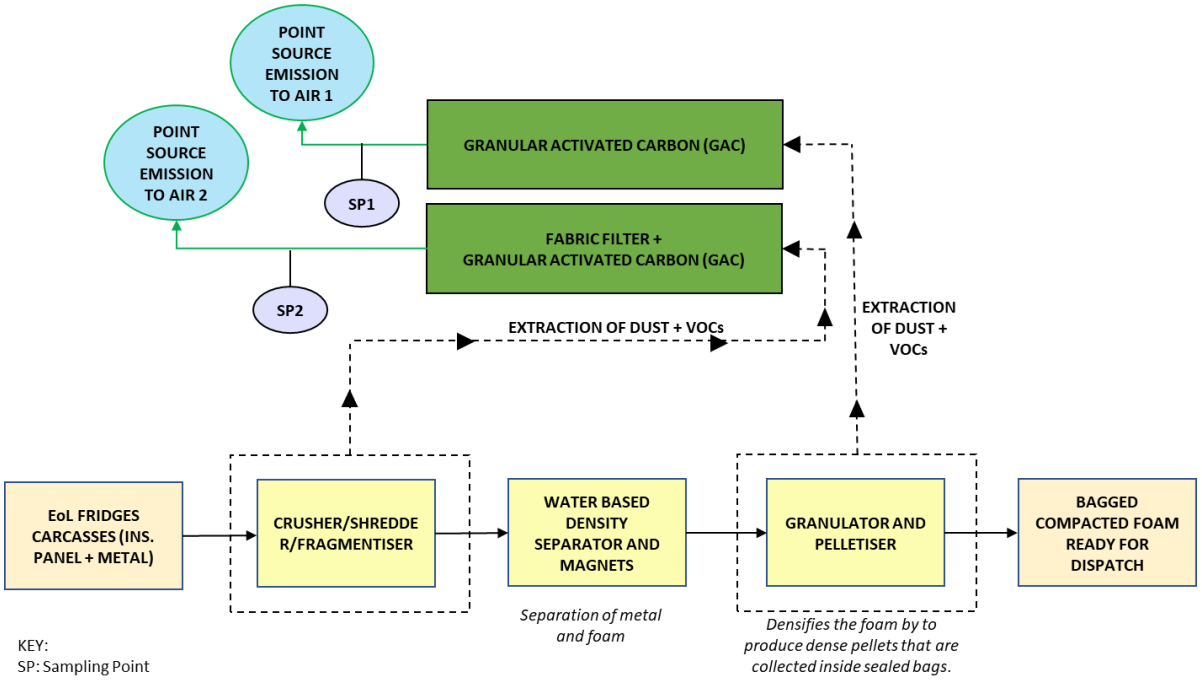

Figure 2. Schematic of Stage 2: destruction of carcasses and compaction of insulation panels

4 RECOVERY ASSESSMENT

4.1 Refrigerant Recovery

Measure 9 of section 5.1 of the WTEE appropriate measures requires a minimum of 90% recovery of the refrigerant.

This is assessed during every quarter (i.e. every three months) by sampling 100 or more intact (as far as practically possible) integral EoL fridge units and, using calibrated electronic scales, record the following:

• the mass before and after degassing

• the mass of refrigerant and oil collected

To calculate the amount of refrigerant collected as a percentage, for comparison to the performance standard, the following formula is used:

(A ÷ (B − C)) × 100 = % recovered

Where, A is the mass of refrigerant recovered (grams), B is the reduction in mass of degassed appliances (that is, mass of appliances before degassing minus mass after degassing (grams)) and C is the mass of oil recovered (grams).

Quarterly reporting to the Environment Agency contains a record of the quantity of EoL units by type and the quantities of refrigerants and oil recovered. This reporting includes integral and remote units.

4.2 Blowing agent recovery

Measure 13 of section 5.3 of the WTEE appropriate measures requires that the blowing agent recovery rate is assessed monthly.

Recovery of blowing agent is not carried out at the Earls Barton facility. Therefore, this measure in not applicable to the process.

As explained earlier in this document, DCS does not accept appliances with ODS or GWP (CFC, HCFC, HFC)

The only blowing agents in the panels accepted are pentane (HC), HFO, WATER and CO_2. Due to limited volume of pentane in the panels and the potential flammability of pentane the process has been designed to be intrinsically safe with the installation of an extraction and abatement system at the crushing/shredding and granulation stages, resulting with abatement rather than recovery of the refrigerant.

4.3 Residual materials

The quantity (mass) of waste fractions and residues produced by the treatment processes and removed from site are reported to the Environment Agency every quarter, in line with

permit conditions.

In compliance with WTEE appropriate measure 10 of Section 5.1 and WTEE appropriate measure 15 and 16 of Section 5.2, the following are tested once a quarter minimum:

- refrigerant in degassed oil (% w/w) – limit 0.9%
- blowing agent in treated foam (% w/w) – limit 0.2%
- untreated foam in ferrous metal fraction (% w/w) – limit 0.5%

Representative samples of each waste stream are sent to UKAS accredited MECERTS certified external laboratories,

5 MONITORING AND ABATEMENT OF EMISSIONS TO THE AIR

There is a two-point source emission point to air from the Earls Barton fridge recycling facility process, from the extraction abatement system associated with the treatment of EoL carcasses (crusher/shredder) and foam granulation and compaction (granulator and pelletiser).

Abatement of the potential emissions of dust and VOC/VHC's from the insulation panels cutting process is by way of fabric filer followed by adsorption in a GAC filter.

A schematic and picture of the carbon filter is shown in *Figure 3*.

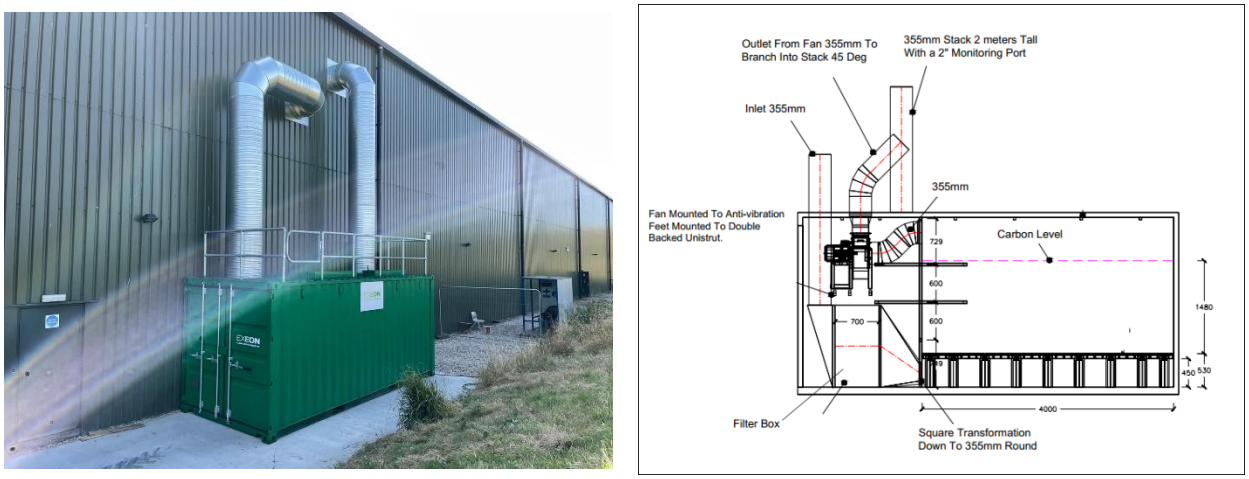

Figure 3. DCS Earls Barton carbon filter and extraction

Monitoring of emissions from this point source will be carried out using a volatile organic compounds (VOCs) monitor with photoionization detection (PID).

The abatement and monitoring system reflects relevant elements of; the European Commission BAT Conclusions document[3] , Defra's 'Guidance on Best Available Treatment Recovery and Recycling Techniques (BATRRT) and treatment of Waste Electrical and Electronic Equipment (WEEE), (November 2006), EA Sector Guidance Note S5.06: recovery and disposal of hazardous and non-hazardous waste and WEEE and WTEE appropriate measures guidance.

[3] Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070) (Text with EEA relevance.) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018D1147&from=EN

5.1 Commissioning of the extraction and abatement system

The extraction and abatement system encapsulating the crusher/shredder and granulator have been commissioned to confirm the system would continue to meet relevant emission limits.

During commissioning the negative pressure of the system was tested using smoke tests.

Emission testing was performed by third party MCERTS/UKAS accredited stack emission testing and monitoring specialist provider.

During commissioning and air emissions testing the process was loaded with 60 carcasses per hour which represents the maximum throughput of the process, in order to represent a worst-case scenario in terms of dust and VOCs concentration.

All monitoring during the commissioning and subsequent compliance monitoring show the extraction and abatement system consistently removes dust and TVOCs to below thresholds.

5.2 Sampling methodology and monitoring frequency

For the monitoring of emissions to air two sampling points have been identified (see Figure 1) SP1 and SP2, at the two corresponding points of emission to air (A1 and A2).

These sampling points are used for 6-monthly dust and Total VOCs emission testing using a third party MCERTS/UKAS accredited stack emission testing and monitoring specialist provider.

The measurements at the SP1 monitoring point will be used to evaluate the levels of VOCs liberated during the panels cutting process and captured by the extraction system. Where measurements indicate the current system is not providing the required abatement then alternative technology will be considered, and commissioned, within the BAT implementation period. Control of this process can be regulated through the use of an Improvement Condition within the environmental permit.

The measurements at the SP2 monitoring point will be used to evaluate the adequacy of the GAC filter for removal of the polluting substances.

The six-monthly frequency is in line with the minimum monitoring frequency required by the European Commission BAT Conclusions document.

The monitoring schedule is summarised in Table 2.

Table 2. Monitoring schedule for emissions to air.

PARAMETER	ANALYTICAL METHOD	ACCREDITATION STATUS	FREQUENCY
Total Suspended Particulates (dust)	BS EN 13284-1	MCERTS/UKAS	Quarterly
Total VOCs	According to EN 12619	MCERTS/UKAS	Quarterly

5.3 Compliance assessment

The quarterly measurements are collected in a database and assessed for compliance against the Permitted Emission Limits Values (ELVs) which correspond to the relevant BAT-associated emission levels (BAT-AELs) for channelled dust and TVOC emissions to air from the treatment of WEEE containing VFCs and/or VHCs specified in the European Commission BAT Conclusions (BAT29) document. They also correspond to the emission limits required by WTEE appropriate measures.

Emission point	PARAMETER	UNIT	BAT-AEL (AVERAGE OVER THE SAMPLING PERIOD)*
A1, A2	Total VOCs	mg/Nm^3	15
A1	Total Suspended Solids (Dust)	mg/Nm^3	10**
A2			5

* Average value of three consecutive measurements of at least 30 minutes each.

**BAT-AEL for system without the fabric filter

5.4 Breach of emission limit value

If the ELVs are breached during the quarterly measurements, arrangements will be made for the abatement system to be replaced as soon as practically possible.

The measurement would be repeated once the system has been restored until the measurement demonstrates that the values return to compliance with the ELVs.

Following this an investigation into possible causes of the breach will be instigated to establish the reasons for the exceedance. The results of this investigation will be reported to senior management and actions taken to prevent re-occurrence if any improvements to systems are identified. Results of the analysis and copies of the investigation and outcomes will be made available to the EA upon request.

6 MONITORING OF EMISSIONS TO WATER

All processes at the DCS Earls Barton facility are carried on impermeable surface with sealed drainage systems. There is no point source emission directly to surface or groundwater.

The impermeable surface in the storage area (K256.1~20~026) falls to a low point which is connected to an interceptor, for the physical separation of gross solids, suspended solids, oil greases and other potential contaminants. To avoid any potential contaminated water reaching the environment, the water is sampled from the interceptor on a monthly basis and the information reviewed against assessment criteria. The surface water drainage system will be kept clear to ensure capacity is retained, and all water run-off is collected, with only clean run-off discharged on a 'positive release' basis.

A surface water monitoring plan has been developed in accordance with the Environment Agency's WTEE appropriate measures guidance to ensure that the interceptor performs as intended, and that any discharge from this area will not cause pollution to surface or groundwater.

Samples will be collected on a monthly basis from the discharge of the surface water interceptor.

The dataset will be analysed to assess what potentially polluting substances are present within the discharge and allow a statistically robust Emission Limit Value (ELV) to be set for any substance of concern.

Preliminary ELVs have been taken from the Environment Agency 'H1 Annex D-Basic Surface Water discharges' and the Drinking Water Inspectorate 'What are the Drinking Water Standards?'.

6.1 Sampling methodology

Spot samples have been identified as a suitable means of assessing discharge quality as:

- the composition of the surface water is relatively constant;
- the quality of the discharge is to be checked at a particular moment, to assess compliance with permit conditions; and
- the discharge is not continuous.

Recovered samples will be transferred to a selected UKAS Accredited laboratory. The laboratory provides the required sample containers for the analysis to be undertaken. The samples are transferred within an insulated container equipped with ice packs to ensure sample integrity/stability.

The samples are to be analysed for the determinands detailed in Table 3 below.

Table 3. Water analysis

Determinand	Analytical Method	Accreditation Status	Detection Limit	Units
pH	Potentiometric	ISO 17025	+/- 0.1	pH units
Electrical Conductivity at 20°	Potentiometric	ISO 17025	10	µs/cm
Ammonium as NH_4	Discrete Analyser	ISO17025	<15	µg/litre
Total Organic Compound (TOC)	TOC Analyser	ISO 17025	<0.1	mg/litre
Chemical Oxygen Demand (COD)	Colorimetric	ISO 17025	<2	mg/litre
Total Phenols (monohydric)	Skalar CFA	ISO 17025	2	mg/litre
Aluminium (Total)	ICP-MS	ISO17025	<1	µg/litre
Arsenic (dissolved)	ICP-MS	ISO 17025	0.15	µg/litre
Boron (dissolved)	ICP-OES	ISO 17025	<10	µg/litre
Cadmium (dissolved)	ICP-MS	ISO 17025	<0.02	µg/litre
Chromium (dissolved)	ICP-MS	ISO 17025	<0.2	µg/litre
Copper (dissolved)	ICP-MS	ISO 17025	<0.5	µg/litre
Lead (dissolved)	ICP-MS	ISO 17025	<0.2	µg/litre
Mercury (dissolved)	ICP-MS	ISO 17025	<0.05	µg/litre
Nickel (dissolved)	ICP-MS	ISO 17025	<0.5	µg/litre
Selenium (dissolved)	ICP-MS	ISO 17025	<0.6	µg/litre
Zinc (dissolved)	ICP-MS	ISO 17025	<0.5	µg/litre
Methyl Tertiary Butyl Ether (MTBE)	H-GC/MS	ISO 17025	<10	µg/litre
TPH1 (C10-C40)	GC/MS	None	<10	µg/litre

6.2 Sampling frequency

In line with Environment Agency guidance 'Control and monitor emissions for your environmental permit', and additional guidance: 'Site-specific quality numeric permit limits: discharges to surface water and groundwater' the discharge will be sampled on a monthly basis until review of the results allows to decrease the frequency. This would be done only with the Environment Agency authorisation.

6.3 Baseline values

To be able to use monitoring data to detect potential impacts from the storage of units, the normal pattern of variation in a monitoring record needs to have been established at an early stage in the monitoring process. Baseline (or background) monitoring data is defined as measurements that characterise physical, chemical or other distinctive properties of the surface water unaffected by contamination from the waste operation.

Monitoring data, including those collected during and after operation of the waste site remain part of the baseline record until a significant deviation from the established pattern of baseline variation is identified.

To be statistically robust the baseline data should be taken over a sufficient period to take into account seasonal variation and any other natural variation. Following the end of this monitoring period the data can be reviewed against established assessment criteria to determine the need for further assessment.

6.4 Compliance assessment

Routine samples taken from the discharge will be assessed for compliance using percentile limits.

The 95th percentile limit will be used for routine sampling of the following parameters:

- Ammoniacal nitrogen
- Heavy metals / metalloids
- TOC
- COD
- BTEX, MBTE
- TPH (C10-C40)
- Phenols

Compliance limits will be established using the most relevant emission limits from the available guidance.

Parameter	Units	Limit
Arsenic as As	mg/l	0.05
Cadmium as Cd	mg/l	0.05
Copper as Cu	mg/l	0.5
Lead as Pb	mg/l	0.1
Mercury as Hg	mg/l	0.005
Nickel as Ni	mg/l	0.5
Zinc as Zn	mg/l	1
Total Organic Carbon	mg/l	60
Hydrocarbon oil index: sum of >C6-C10, >C10-C25, >C25-C40, Total TPH >C8-C40, Benzene, Ethylbenzene, m and p-Xylene, MTBE, o-Xylene, Toluene	mg/l	10
COD (Settled)	mg/l	180

For other substances monitored, Maximum Allowable Concentration of the Environmental Quality Standards (MAC-EQS) will be used. Where there is no MAC-EQS information for certain substances, the Annual Average (AA) is used. The AA numeric value is multiplied by 5 to ascertain a parameter limit. Where there is no AA information for certain substances, parameter numeric values are compared to the Drinking Water Standards (DWS). Due to the stringent requirements of pollutant limits in drinking water, parameter numeric values within the DWS limits are assumed to be within the ELV. Where more appropriate compliance limits can be established then these will be used, and justification provided.

If a parameter sample result is higher than its 95th percentile numeric limit it's an individual look-up table (LUT) exceedance.

When a LUT exceedance happens, the number of exceedances for that parameter are compared with the number of samples taken in the 6-month period. The 6-month period ends on the last day of the month in which the latest exceedance occurred.

6.5 Breach of emission limit values

Once established, if an ELV is breached on the Percentile Limit then another sample will be recovered as soon as practicable. If this sample returns above the limit arrangements will be made for the sump to be emptied and taken offsite for disposal at an appropriately permitted treatment facility.

This will continue until either:

- the samples demonstrate that the values return to compliance with the emission limit value; or
- a reassessment of the ELV is carried out and demonstrates that a higher ELV will not cause pollution.

Following this an investigation into possible causes of the breach will be instigated to establish the reasons for the exceedance. The results of this investigation will be reported to senior management and actions taken to prevent re-occurrence if any improvements to systems are identified e.g. emptying/maintenance of the interceptor. Results of the analysis and copies of the investigation and outcomes will be made available to the EA upon request.

7 Process efficiency

Energy efficiency: The process is mostly manual and the automatic equipment uses relatively small energy.

Energy efficiency is one of the environmental Key Performance Indicator (KPI) recorded in the KPI register kept by the HSEQ Manager as part DCS's Management system improvement process.

Energy used by the process is prevalently electricity. The electricity consumption is monitored on regular basis by the HSEQ manager and reported to Senior management at regular Management meeting.

Due to the scale of the operations the energy consumption is relatively low. Should opportunities for energy saving arise, these would be considered and implemented and the energy saving documented.

Water consumption of the process is also relatively low. Th process using most water is the density separator. This recirculates waters which are replaced at once every quarter.

due to the process consisting of manual dismantling followed by physical treatment, it requires low quantities of raw materials purely for the maintenance of too, equipment and vehicles. Where these materials are substances that could have an environmental impact, a record is kept in the COSHH register together with the risk assessment for their use.

Usage of energy, water and raw materials is tracked in the environmental the KPI register kept by the HSEQ Manager.

Regular reviews of energy, water and raw materials are carried out at least every 4 years, as required by the environmental permit.

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