

**Environmental Permitting (England and Wales)
Regulations 2016**

**Improvement Condition 4
BAT 3. Emission Inventory**

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1. Introduction

The site Environmental Permit Reference PP3430UL, was subject to a BREF permit review in 2019, with the permit review being completed and issued on the 07th May 2021. As a result of this permit review the permit requires the submission of a report for Improvement Condition which states:

BAT 3. Establish and to maintain an inventory of waste water and waste gas streams to facilitate the reduction of emissions to water and air

The operator shall submit to Natural Resources Wales information in order to evidence compliance with BAT 3 that incorporates all of the following features in accordance with requirements specified within BAT Conclusion of the Waste Treatment BREF Document (EU 2018):

(i) information about the characteristics of the waste to be treated and the waste treatment processes, including:

(a) simplified process flow sheets that show the origin of the emissions; (b) descriptions of process-integrated techniques and waste water/waste gas treatment at source including their performances;

(ii) information about the characteristics of the waste water streams, such as:

*(a) average values and variability of flow, pH, temperature, and conductivity;
(b) average concentration and load values of relevant substances and their variability (e.g. COD/TOC, nitrogen species, phosphorus, metals, priority substances/micropollutants);*

(iii) information about the characteristics of the waste gas streams, such as:

*(a) average values and variability of flow and temperature;
(b) average concentration and load values of relevant substances and their variability (e.g. organic compounds, POPs such as PCBs);
(c) flammability, lower and higher explosive limits, reactivity;
(d) presence of other substances that may affect the waste gas treatment system or plant safety (e.g. oxygen, nitrogen, water vapour, dust).*

Information resulting from this improvement condition will be used to assess the relevance of the BAT AELs and monitoring requirements as set in Schedule 3 and 4 of this permit.

This report is to satisfy this requirement and has been produced in-line with relevant guidance.

2. Establish and to maintain an Emission inventory

2.1. information about the characteristics of the waste to be treated and the waste treatment processes

The Bridgend site is an alternative treatment facility and a transfer station. An alternative treatment facility is designed to deactivate infectious micro-organisms such as bacteria commonly found in clinical waste (primarily 180103 Infectious Clinical Waste). The facility is authorised for the disposal of hazardous waste (other than by incineration or landfill) in a facility with a capacity of more than 10 tonnes per day.

The on-site treatment plant consists of a single steam auger with integral shredder for the following activities:

- Installation - the heat disinfection and mechanical re-processing of hazardous healthcare wastes for disposal or recovery
- Waste operation - the mechanical re-processing of non-hazardous healthcare wastes for disposal or recovery

Directly associated activities to the treatment plant:

- Boiler for the heating of oil used in the treatment process
- Bin washing system for re-usable waste containers
- Storage of treatment plant residues pending transfer off-site for disposal or recovery

The transfer station consists of the following activities:

- Installation - the storage of hazardous wastes pending on-site treatment or transfer off-site for disposal or recovery
- Waste operation - the storage of non-hazardous wastes pending on-site treatment or transfer off-site for disposal or recovery
- Waste operation – repackaging of offensive waste (light compaction) pending transfer off site for disposal or recovery
- Waste operation – repackaging of hazardous and non-hazardous wastes pending transfer off site for disposal or recover

Waste is received from the waste producers in accordance with the Guidance from the Department of Health: Safe Management of Healthcare Waste, which is subject to both pre-acceptance and acceptance checks.

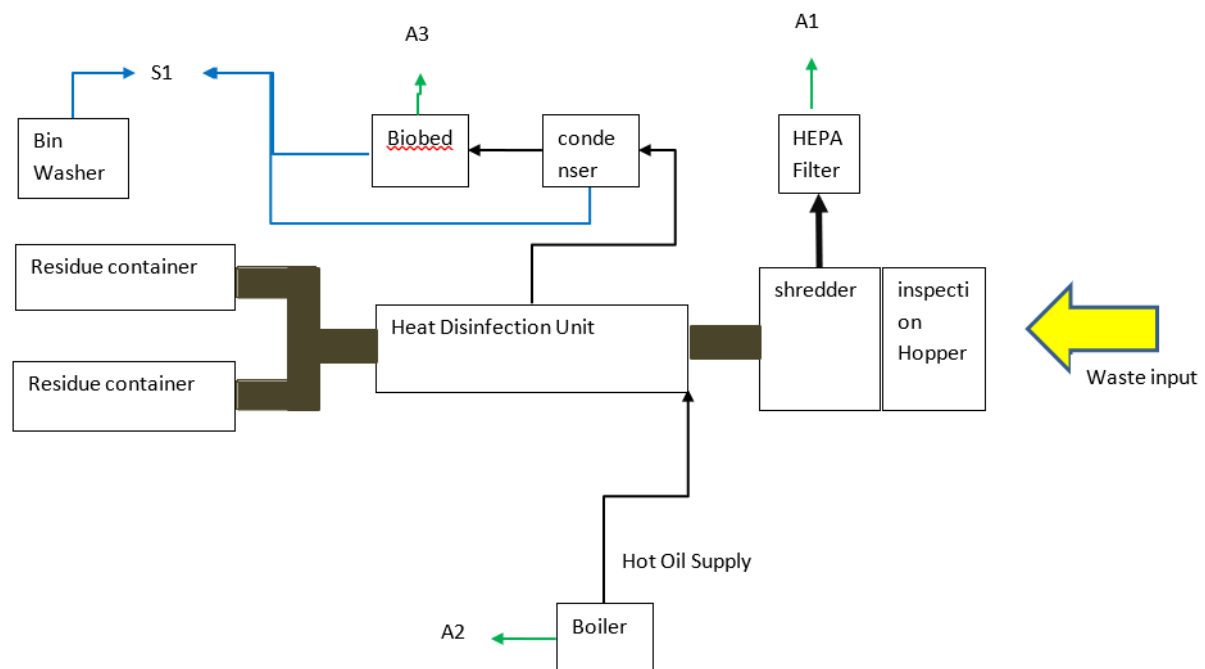
2.1.1. The Treatment Process

Waste is treated by an HDU, with a throughput of one tonnes per hour. The clinical waste is loaded into the loading hopper direct from the 770ltr capacity wheeled carts used to deliver and store the waste. This is a mechanical process to minimise manual handling of the waste. The clinical waste then passes through a shredder, designed to reduce individual items to a size not exceeding 25 mm. The shredded waste is known as 'flock'. The shredder is maintained under negative pressure, with air from the process discharged via a HEPA filtration system.

The shredded waste then passes along a rotating holoflite, where the screws are heated using heat transfer oil which has in turn been heated using a gas fired boiler. As the screws in the treatment chamber turn they expose the surface of the waste to temperatures in excess of 140°C driving off moisture and rendering safe any pathogens present.

The shredded, inactivated waste flock is then discharged into walking floor trailers, where it is stored prior to removal to an approved licenced facility for disposal or recovery. The waste has now been rendered harmless and is classified as a non-hazardous waste, and suitable for use as an RDF/SRF material, with the EWC code 19 02 10 – combustible wastes.

2.2. simplified process flow sheets that show the origin of the emissions



2.3. descriptions of process-integrated techniques and waste water/waste gas treatment at source including their performances.

Waste water arises from the washing of the wheeled carts, and the process condenser and bio-beds.

There is no treatment of waste water on site. All waste water is discharged through an agreed trade effluent discharge consent.

2.4. Information about the characteristics of the air streams

Emission Point:	A1	Emission Type:	Point source to air
Average flow:	5 m ³ /s	Flow range:	1 – 9 m ³ /s
Other relevant parameters:	Efflux temperature 20-30°C; effective stack height 0m		
Monitoring:	Microbial emissions to air monitored annually as required by appropriate measures guidance. Local exhaust ventilation conducted to required frequency. Routine chemical emissions monitoring not required (see comments below) and TVOC not speciated.		
Comments:	Treatment plant does not process chemical or pharmaceutical wastes. Abatement system is in effect with HEPA filter and carbon adsorption. Waste pre-acceptance audits are in effect. All parameters screened out as insignificant using H1 tool.		
Characterised emissions	Parameter	Average Concentration	Threshold value / limit
Microbial emissions	Bacterial colony forming units	<100 CfU / m ³	1000 CfU / m ³
Chemical emissions	Total volatile organic compounds	<10 mg / m ³	30 mg / m ³

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2.5. Information about the characteristics of the waste water streams

Emission Point:	S1	Emission Type:	Point source to sewer
Average flow:	0.0001 m ³ /s	Flow range:	0 – 0.00015 m ³ /s
Other relevant parameters:	Efflux temperature 20-30°C; effective stack height 0m		
Monitoring:	Microbial emissions to wastewater monitored annually as required by appropriate measures guidance. Annual monitoring completed to verify compliance with discharge consent.		
Comments:	Treatment plant does not process chemical or pharmaceutical wastes. Abatement system is in effect with HEPA filter and carbon adsorption for condensate from treatment plant. Waste pre-acceptance audits are in effect. All parameters screened out as insignificant using H1 tool.		
Characterised emissions	Parameter	Average Concentration	Threshold value / limit
Microbial emissions	Bacterial colony forming units	<30 CfU / litre	300 CfU / litre
Chemical emissions	Chemical Oxygen Demand	<400 mg / litre <5 kg / day	100 kg / day
	Ammoniacal nitrogen	<2 mg / litre	n/a
	Total toxic metals	<1600 µg / litre	10,000 µg / litre
	Phosphorus	<5 mg / litre	n/a
	Sulphates as SO ₄	<30 mg / litre	1000 mg / litre
	pH	7.1	6 – 10
Physical emissions	Suspended solids	<500 mg / litre	n/a
	hydrocarbon oil Index (HOI)* See comments in section 3	6000mg / litre	10

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3. Supporting monitoring details

Discussions held with NRW that further monitoring was required to demonstrate the emission inventory and providing supporting data against relevant BAT points from the Waste Treatment BREF.

3.1. Emissions to air

With regard to the Bridgend facility, the following parameters were listed in BAT 8, BAT 41 and BAT 45 for Physio-chemical treatment of waste with calorific value

Substance/ Parameter	Standard	BAT Reference	Frequency	Limit / comment
Dust	EN 13284-1	BAT41	Once every 6 months	5 mg/m ³
Ammonia	No EN standard available	BAT41	Once every 6 months	None specified
TVOC	EN 12619	BAT45	Once every 6 months	refers back to BAT 8 and 6.6.1 Channelled emissions to air

Monitoring has been undertaken for these parameters and are displayed below:

Substance/ Parameter	Limit (mg/m ³)	Emission result (mg/m ³)	uncertainty
Total Particulate Matter	5	0.79	0.05
Ammonia	Not specified	0.00038	0.00003
Total Volatile Organic Compound (VOCS)	30	128.8	2.59

Particulate matter and ammonia emissions from the facility are insignificant.

With regard to the VOC emissions, the exhaust gases from the treatment plant, are exhausted through the bio-bed (a Biofilter in line with technique for section 6.6.1 channelled emissions to air).

The monitoring results are higher than we expected. This increase is related to the COVID-19 pandemic, where more alcohol gels and surface disinfection of the bags has been undertaken. While the monitoring at Bridgend was not speciated, monitoring at other facilities has shown that the elevated parameters are ethanol and propanal, which support this position.

We will look to repeat the VOC monitoring with speciation to confirm this.

3.2. Emissions to water

With regard to the Bridgend facility, the following parameters were listed in BAT 7 and BAT 20 for Physio-chemical treatment of waste with calorific value

Substance/ Parameter	Standard	Frequency	Limit / comment
COD (5) (6)	No EN Standard	Monthly	N/A - no direct discharge to receiving water
hydrocarbon oil Index (HOI) (4)	EN ISO 9377-2	Monthly	10 - In the case of an indirect discharge to a receiving water body, the monitoring frequency may be reduced if the downstream waste water treatment plant abates the pollutants concerned.
Arsenic	Various (e.g EN ISO 11885, EN ISO 17294-2, EN ISO 15586)	Monthly	0.05
Cadmium			0.05
Chromium			0.15
copper			0.5
nickel			0.5
lead			0.1
zinc (3) (4)			1
Mercury	Various (e.g EN ISO 17582 / EN ISO 12846)	monthly	0.005
PFOA (3)	No EN Standard available	Every six months	monitoring only applies if in inventory

PFOS (3)	No EN Standard available	Every six months	monitoring only applies if in inventory
Phenol Index (6)	EN ISO 14402	monthly	N/A - no direct discharge to receiving water
TOC (5) (6)	EN 1484	monthly	N/A - no direct discharge to receiving water
Total suspended solids (6)	EN 872	monthly	N/A - no direct discharge to receiving water

With the following notes at the end of the section.

- (1) Monitoring frequencies may be reduced if the emission levels are proven to be sufficiently stable.
- (2) In the case of batch discharge less frequent than the minimum monitoring frequency, monitoring is carried out once per batch.
- (3) The monitoring only applies when the substance concerned is identified as relevant in the waste water inventory mentioned in BAT 3.
- (4) In the case of an indirect discharge to a receiving water body, the monitoring frequency may be reduced if the downstream waste water treatment plant abates the pollutants concerned.
- (5) Either TOC or COD is monitored. TOC is the preferred option, because its monitoring does not rely on the use of very toxic compounds.
- (6) The monitoring applies only in the case of a direct discharge to a receiving water body

Monitoring has been undertaken for these parameters and are displayed below:

Substance / parameter	mg/l	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
hydrocarbon oil Index (HOI)	10	17	0.3	1.1	0.9	2.2	1.2
Arsenic	0.05	<0.01	<0.01	<0.01	<0.01	0.01	0.01
Cadmium	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	0.15	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
copper	0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
nickel	0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
lead	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
zinc	1	<0.01	<0.01	<0.01	<0.01	0.05	<0.01
Mercury	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PFOA (ug/l)	monitoring only applies if in inventory	<0.0001	<0.1	<0.1	0.09	<0.1	<0.1
PFOS (ug/l)		<0.0001	<0.1	<0.1	0.09	<0.1	<0.1
COD	N/A - no direct discharge to receiving water	588	1070	58	740	2890	764
Phenol Index		0.6	0.2	0.3	0.9	2.0	1.9
TOC		18	4.6	18	10.6	24.1	63.1
Total suspended solids		73	7	8	49	53	82

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Substance / parameter	Sample 7	Sample 8	Sample 9	Sample 10	Sample 11	Sample 12	Sample 13
hydrocarbon oil Index (HOI)	4.2	3.7	1.9	1.7	0.9	5.4	5.0
Arsenic	<0.01	<0.01	<0.01	<0.01	0.01	0.01	0.01
Cadmium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	<0.01	<0.01	<0.01	<0.01	0.1	<0.01	<0.01
copper	<0.01	<0.01	<0.01	<0.01	0.2	0.02	<0.01
nickel	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
lead	<0.01	<0.01	<0.01	<0.01	0.1	0.03	<0.01
zinc	<0.01	<0.01	<0.01	<0.01	0.06	0.06	<0.01
Mercury	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PFOA	<0.1	<0.1	<0.1	<0.1	0.5	<0.1	<0.1
PFOS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
COD	152	299	2860	2780	197	291	500
Phenol Index	0.4	0.5	1.7	1.7	0.5	1.0	1.0
TOC	41	79.9	20.7	21.0	5.89	47	10.3
Total suspended solids	43	54	74	69	115	60	70

With regard to the parameters were listed for Physio-chemical, COD, Phenol Index, TOC and Total suspended solids have been eliminated as there is no direct discharge to receiving water.

In addition to these parameters, PFOA, PFOS, mercury, zinc, lead, nickel, copper, chromium, cadmium and arsenic have been ruled out from further analysis, as all samples for these were the limit of detection, and supporting the position that these parameters are not within the waste water inventory for the facility, and thereby no further monitoring requirement.

Update 8 June 2022

Previous reported noted that the only parameter remaining is hydrocarbon oil Index (HOI). Since that report we continued to review and follow up on this to determine the potential source and were unable to identify any. Following results of another sample, the laboratory confirmed that results for HOI had been reported in the wrong units. This is now corrected in the results table.