ARUP

Indaver Ireland Limited

IE Licence Review Application

Reference Document on Best Available Techniques on Waste Incineration, 2019

Reference: LA010332

Issue | 13 March 2023

Job number 289377-00

Ove Arup & Partners Ireland Limited
One Albert Quay
Cork
T12 X8N6
Ireland
arup.com

ARUP

Document Verification

Project title	IE Licence Review Application
Document title	Reference Document on Best Available Techniques on Waste Incineration, 2019
Job number	289377-00
Document ref	LA010332
File reference	4-04 Reports

Revision	**Date**	**Filename**	Attachment 4-7-1 Reference Document on Best Available Techniques on Waste Incineration, 2019.
Issue	13 Mar 2023	**Description**	For Issue

	Prepared by	**Checked by**	**Approved by**
Name	David Horgan	Naoimh O Regan	Dan Garvey
Signature			

	Filename	
	Description	

	Prepared by	**Checked by**	**Approved by**
Name			
Signature			

	Filename	
	Description	

	Prepared by	**Checked by**	**Approved by**
Name			
Signature			

Issue Document Verification with Document	✓

Contents

Tables

1. Introduction

This report has been prepared for the purposes of **Section 4.7** of an Industrial Emissions Licence (IE) Review application submitted by Indaver Ireland for their site at Carranstown, Duleek, County Meath. This report, which applies to IE Licence W0167-03, consists of a review of the licensed activities on site and the proposed activities to which the licence review relates in the context of any applicable Best Available Techniques (BAT).

The Industrial Emissions Directive 2010/75/EU (IED) and the European Union (Industrial Emissions) Regulations 2013 (SI 138 of 2013) define BAT, BAT Reference Document (BREF) and BAT Conclusions (BATC) as follows:

The Industrial Emissions Directive defines Best Available Techniques as follows: 'best available techniques' means the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole: a) 'techniques' includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned. b) 'Available techniques' means 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; **c)** 'best' means most effective in achieving a high general level of protection of the environment as a whole;
The Industrial Emissions Directive definition of BAT Reference Document is as follows: "(11) 'BAT reference document' means a document, resulting from the exchange of information organised pursuant to Article 13, drawn up for defined activities and describing, in particular, applied techniques, present emissions and consumption levels, techniques considered for the determination of best available techniques as well as BAT conclusions and any emerging techniques, giving special consideration to the criteria listed in Annex III;" SI 138 of 2013 has a similar definition.
The Industrial Emissions Directive and SI 138 of 2013 have the same definition of BAT conclusions, as follows: 'BAT conclusions' means a document containing the parts of a BAT reference document laying down the conclusions on best available techniques, their description, information to assess their applicability, the emission levels associated with the best available techniques, associated monitoring, associated consumption levels and, where appropriate, relevant site remediation measures;

The Industrial Emissions Directive 2010/75/EU replaced seven existing directives including the Integrated Pollution Prevention and Control (IPPC) Directive (2008/1/EC).

- Historically, the BREF process for the IPPC Directive produced guidance documents that member states had to have regard to when permitting (licensing) installations.
- However, the IED has made BAT conclusions mandatory in the permitting process (Article 14(3) of the IED).

Where BAT conclusions are available for any new installations, they are expected to achieve the associated standard before commencement of operations.

For existing installations, the IED provides that where a Commission Implementing Decision on BAT conclusions is published, within four years (relating to the main activity of the installation), the Environmental Protection Agency (EPA) should undertake that 'all permit/licence conditions for the installation concerned are reconsidered, where necessary updated' and 'ensure compliance with the BAT'.

The European IPPC Bureau (EIPPCB) organises and co-ordinates the exchange of information between Member States and the industries concerned on Best Available Techniques (BAT), as set forth in Article 13 of the IED. The EIPPCB produces BAT reference documents (BREF) and BAT conclusions.

2. Activity

As per W0167-03 the facility is currently licensed to carry out the following activities as outlined in the First Schedule of the Environmental Protection Agency (EPA) Act 1992, as amended:

11.3: Disposal or recovery of waste in waste incineration plants or in waste co-incineration plants –

(a) for non-hazardous waste with a capacity exceeding 3 tonnes per hour,

(b) for hazardous wate with a capacity exceeding 10 tonnes per day.

Following implementation of the proposed development, which includes an increase in the amount of waste being accepted at the facility and the construction of a hydrogen generation unit, two new activities as outlined in the First Schedule of the EPA Act 1992, as amended, will be carried out:

5.13 (a) The production of inorganic chemicals, such as gases, such as ammonia, chlorine or hydrogen chloride, fluorine, or hydrogen fluoride, carbon oxides, sulphur compounds, nitrogen oxides, hydrogen, sulphur dioxide, carbonyl chloride (production means the production on an industrial scale by chemical or biological processing);

11.6 Temporary storage of hazardous waste, (other than waste referred to in paragraph 11.5) pending any of the activities referred to in paragraph 11.2, 11.3, 11.5 or 11.7 with a total capacity exceeding 50 tonnes, other than temporary storage, pending collection, on the site where the waste is generated.

3. BAT/BREF Assessments

A review of the European Commission Integrated Pollution Prevention and Control *Reference Document on Best Available Techniques on Waste Incineration 2019* is presented in the table below.

Table 1: Review of European Commission Integrated Pollution Prevention and Control Reference Document on Best Available Techniques on Waste Incineration, 2019

Conclusions on BAT		Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
5.1.1. Environmental Management Systems			
BAT 1	In order to improve the overall environmental performance, BAT is to elaborate and implement an environmental management system (EMS) that incorporates all of the following features: i. commitment, leadership and accountability of the management, including senior management, for the implementation of an effective EMS; ii. an analysis that includes the determination of the organisation's context, the identification of the needs and expectations of interested parties, the identification of characteristics of the installation that are associated with possible risks for the environment (or human health) as well as of the applicable legal requirements relating to the environment; iii. development of an environmental policy that includes the continuous improvement of the environmental performance of the installation; iv. establishing objectives and performance indicators in relation to significant environmental aspects, including safeguarding compliance with applicable legal requirements; v. planning and implementing the necessary procedures and actions (including corrective and preventive actions where needed), to achieve the environmental objectives and avoid environmental risks; vi. determination of structures, roles and responsibilities in relation to environmental aspects and objectives and provision of the financial and human resources needed; vii. ensuring the necessary competence and awareness of staff whose work may affect the environmental performance of the installation (e.g., by providing information and training); viii. internal and external communication; ix. fostering employee involvement in good environmental management practices; x. establishing and maintaining a management manual and written procedures to control activities with significant environmental impact as well as relevant records; xi. effective operational planning and process control; xii. implementation of appropriate maintenance programmes;	Applicable Indaver's facilities in Ireland and elsewhere operate environmental management systems certified to ISO 14001.	Will be in place. The ISO 14001 system is in place and is independently certified by NSAI. There are some gaps e.g., the OTNOC plan. A gap analysis will be completed, and solutions put in place to adhere to BAT 1 prior to November 2023.

Conclusions on BAT			Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
	xiii.	emergency preparedness and response protocols, including the prevention and/or mitigation of the adverse (environmental) impacts of emergency situations;		
	xiv.	when (re)designing a (new) installation or a part thereof, consideration of its environmental impacts throughout its life, which includes construction, maintenance, operation and decommissioning;		
	xv.	implementation of a monitoring and measurement programme; if necessary, information can be found in the Reference Report on Monitoring of Emissions to Air and Water from IED Installations;		
	xvi.	application of sectoral benchmarking on a regular basis;		
	xvii.	periodic independent (as far as practicable) internal auditing and periodic independent external auditing in order to assess the environmental performance and to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained;		
	xviii.	evaluation of causes of nonconformities, implementation of corrective actions in response to nonconformities, review of the effectiveness of corrective actions, and determination of whether similar nonconformities exist or could potentially occur;		
	xix.	periodic review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness;		
	xx.	following and taking into account the development of cleaner techniques.		
	xxi.	Specifically for incineration plants and, where relevant, bottom ash treatment plants, BAT is also to incorporate the following features in the EMS:		
	xxii.	for incineration plants, waste stream management (see BAT 9);		
	xxiii.	for bottom ash treatment plants, output quality management (see BAT 10);		
	xxiv.	a residues management plan including measures aiming to: a. minimise the generation of residues; b. optimise the reuse, regeneration, recycling of, and/or energy recovery from the residues; c. ensure the proper disposal of residues;		
	xxv.	for incineration plants, an OTNOC management plan (see BAT 18);		
	xxvi.	for incineration plants, an accident management plan (see Section 5.2.4);		
	xxvii.	for bottom ash treatment plants, diffuse dust emissions management (see BAT 23);		
	xxviii.	an odour management plan where an odour nuisance at sensitive receptors is expected and/or has been substantiated (see Section 5.2.4);		

<table>
<tr><th colspan="2">Conclusions on BAT</th><th>Applicability Assessment (describe how the technique applies or not to your installation)</th><th>State whether it is in place or state schedule for implementation</th></tr>
<tr><td></td><td>xxix. a noise management plan (see also BAT 37) where a noise nuisance at sensitive receptors is expected and/or has been substantiated (see Section 5.2.4).</td><td></td><td></td></tr>
<tr><td colspan="4">5.1.2. Monitoring</td></tr>
<tr><td>BAT 2</td><td>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.</td><td>Applicable
The gross electrical efficiency will as a minimum meet the requirements set out in the Waste Framework Directive in order that the plant is classified as an R1 or Recovery facility.</td><td>In place.
A management of change procedure is in place that would address a review of the potential impact on the efficiency of the plant if a significant change was to be made. In that case it would trigger a performance test to be completed.</td></tr>
<tr><td>BAT 3</td><td>BAT is to monitor key process parameters relevant for emissions to air and water including those given below.
<table>
<tr><th>Stream/Location</th><th>Parameter(s)</th><th>Monitoring</th></tr>
<tr><td>Flue-gas from the incineration of waste</td><td>Flow, oxygen content, temperature, pressure, water vapour content</td><td rowspan="4">Continuous measurement</td></tr>
<tr><td>Combustion chamber</td><td>Temperature</td></tr>
<tr><td>Waste water from wet FGC</td><td>Flow, pH, temperature</td></tr>
<tr><td>Waste water from bottom ash treatment plants</td><td>Flow, pH, conductivity</td></tr>
</table></td><td>Applicable
Flue gas and combustion chamber parameters are continuously analysed.
There is no wastewater generated from FGC and there is no bottom ash treatment plant on site.</td><td>In place – where relevant.</td></tr>
<tr><td>BAT 4</td><td>BAT is to monitor channelled emissions to air with at least the frequency given below 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.</td><td>Applicable
NOx – in place
NH3 – will be in place.
N2O – not applicable, this plant does not use urea and the plant is not a fluidised bed incinerator. This is currently measured quarterly.
CO – in place
SO2 – in place
HCl – in place
HF – in place
Dust – in place
Metals – Measured biannually.</td><td>In place.
Indaver have already completed a study to prove that there is no requirement for continuous mercury monitoring. This was submitted to the EPA as LR069686 on 29/07/22.
Benzo(a)pyrene will be implemented once the agency outlines a suitable testing method, currently there is no EN standard available.
Indaver already complete PCDD/F testing as per current licence requirements.</td></tr>
</table>

Conclusions on BAT	Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation

Substance/ Parameter	Process	Standard(s) ([1])	Minimum monitoring frequency ([2])	Monitoring associated with
NO_X	Incineration of waste	Generic EN standards	Continuous	BAT 29
NH_3	Incineration of waste when SNCR and/or SCR is used	Generic EN standards	Continuous	BAT 29
N_2O	• Incineration of waste in fluidised bed furnace • Incineration of waste when SNCR is operated with urea	EN 21258 ([3])	Once every year	BAT 29
CO	Incineration of waste	Generic EN standards	Continuous	BAT 29
SO_2	Incineration of waste	Generic EN standards	Continuous	BAT 27
HCl	Incineration of waste	Generic EN standards	Continuous	BAT 27
HF	Incineration of waste	Generic EN standards	Continuous ([4])	BAT 27
Dust	Bottom ash treatment	EN 13284-1	Once every year	BAT 26
	Incineration of waste	Generic EN standards and EN 13284-2	Continuous	BAT 25
Metals and metalloids except mercury (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Tl, V)	Incineration of waste	EN 14385	Once every six months	BAT 25
Hg	Incineration of waste	Generic EN standards and EN 14884	Continuous ([5])	BAT 31
TVOC	Incineration of waste	Generic EN standards	Continuous	BAT 30
PBDD/F	Incineration of waste ([6])	No EN standard available	Once every six months	BAT 30

Hg – demonstrated low and stable, periodic testing in place.

TVOC – TOC is measured continuously.

PBDD/F – Indaver do not accept brominated flame retardants and therefore this is not applicable.

PCDD/F – test regime in place

Benzo(a)pyrene – not currently tested

Conclusions on BAT					Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation

PCDD/F	Incineration of waste	EN 1948-1, EN 1948-2, EN 1948-3	Once every six months for short-term sampling	BAT 30
		No EN standard available for long-term sampling, EN 1948-2, EN 1948-3	Once every month for long-term sampling ([7])	BAT 30
Dioxin-like PCBs	Incineration of waste	EN 1948-1, EN 1948-2, EN 1948-4	Once every six months for short-term sampling ([8])	BAT 30
		No EN standard available for long-term sampling, EN 1948-2, EN 1948-4	Once every month for long-term sampling ([7])([8])	BAT 30
Benzo[*a*]pyrene	Incineration of waste	No EN standard available	Once every year	BAT 30

([1]) Generic EN standards for continuous measurements are EN 15267-1, EN 15267-2, EN 15267-3 and EN 14181. EN standards for periodic measurements are given in the table or in the footnotes.
([2]) For periodic monitoring, the monitoring frequency does not apply where plant operation would be for the sole purpose of performing an emission measurement.
([3]) If continuous monitoring of N_2O is applied, the generic EN standards for continuous measurements apply.
([4]) The continuous measurement of HF may be replaced by periodic measurements with a minimum frequency of once every six months if the HCl emission levels are proven to be sufficiently stable. No EN standard is available for the periodic measurement of HF.
([5]) For plants incinerating wastes with a proven low and stable mercury content (e.g. mono-streams of waste of a controlled composition), the continuous monitoring of emissions may be replaced by long-term sampling (no EN standard is available for long-term sampling of Hg or periodic measurements with a minimum frequency of once every six months. In the latter case the relevant standard is EN 13211.
([6]) The monitoring only applies to the incineration of waste containing brominated flame retardants or to plants using BAT 31 d with continuous injection of bromine.
([7]) The monitoring does not apply if the emission levels are proven to be sufficiently stable.
([8]) The monitoring does not apply where the emissions of dioxin-like PCBs are proven to be less than 0.01 ng WHO-TEQ/Nm^3.

BAT 5	BAT is to appropriately monitor channelled emissions to air from the incineration plant during OTNOC.	Applicable Measurement campaigns by independent stack testers to be carried out during start-up and shutdown while no waste is being incinerated e.g., every 3 years. Direct emission measurements are measured continuously by the CEMS for certain parameters as per the licence. During a controlled shutdown, the continuous emissions monitoring equipment shall be active until all waste is burned out and removed from the grate.	Will be in place – Indaver will organise independent stack testers to monitor during a planned shutdown and start-up on a periodic basis. This will be completed prior to 2026.
BAT 6	BAT is to monitor emissions to water from FGC and/or bottom ash treatment with at least the frequency given below and in accordance with EN standards.	Not applicable – there are no process water emissions from the facility, no water generated by FGC.	Not applicable.

<table>
<tr><th colspan="2">Conclusions on BAT</th><th>Applicability Assessment (describe how the technique applies or not to your installation)</th><th>State whether it is in place or state schedule for implementation</th></tr>
<tr><td></td><td>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.</td><td>No bottom ash treatment takes place other than metals removal.</td><td></td></tr>
<tr><td>BAT 7</td><td>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.
<table>
<tr><th>Parameter</th><th>Standard(s)</th><th>Minimum monitoring frequency</th><th>Monitoring associated with</th></tr>
<tr><td>Loss on ignition (1)</td><td>EN 14899 and either EN 15169 or EN 15935</td><td rowspan="2">Once every three months</td><td rowspan="2">BAT 14</td></tr>
<tr><td>Total organic carbon (1) (2)</td><td>EN 14899 and either EN 13137 or EN 15936</td></tr>
<tr><td colspan="4">(1) Either the loss on ignition or the total organic carbon is monitored.
(2) Elemental carbon (e.g. determined according to DIN 19539) may be subtracted from the measurement result.</td></tr>
</table></td><td>Applicable
Monitoring of total organic carbon of residues (bottom ash, boiler ash, and flue gas residue) already takes place on a quarterly basis.
Loss of ignition can also be tested if TOC monitoring is not available.</td><td>In place.</td></tr>
<tr><td>BAT 8</td><td>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.</td><td>Not applicable – hazardous waste with POP levels prior to incineration exceeding the concentration limits defined in Annex IV to Regulation (EC) No 850/2004 are not accepted at the facility.
A test programme procedure is in place, which ensures for any new type of hazardous waste that has not been previously accepted, a methodology is followed, and a test programme is completed. This test programme includes the classification and characterisation of the residues produced and this would include POP testing as appropriate.</td><td>Not applicable.</td></tr>
<tr><td colspan="4">5.1.3. General Environmental Combustion Performance</td></tr>
<tr><td>BAT 9</td><td>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
f) Verification of waste compatibility prior to the mixing or blending of hazardous wastes</td><td>Applicable
Types of waste that can be incinerated are outlined in schedule A1 and A2 of the licence W0167-03.
Waste characterisation and pre-acceptance procedures are in place.
Implementation of waste acceptance procedures – Waste deliveries are monitored as per BAT 11 techniques.
SAP system used to track all waste accepted into facility, keeps information on date accepted, type of waste (EWC code), haz/non-haz, where stored.</td><td>In place.</td></tr>
</table>

Conclusions on BAT		Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
		Waste segregation – bulk aqueous waste is stored in a separate area and injected into the furnace at a different point to the municipal waste to ensure better incineration. All aqueous wastes are sampled and analysed according to set procedures to ensure that they are compatible for the incineration process and will not pose any risk in terms of process safety, occupational safety and environmental impact.	
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)	Not applicable – bottom ash treatment does not take place on site (other than metals removal).	Not applicable.
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 (see BREF).	Applicable Procedures in place for waste acceptance and handling cover this BAT.	In place.
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	Applicable Waste is unloaded in the tipping hall area, the floor of which is composed of hardstanding. Water generated in this area and contained within the waste itself drains to the waste bunker. The aqueous waste storage area is also on hardstanding, with drainage that flows to an underground storage tank for process water, kept separate from surface water in line with BAT 32. The volume of waste contained within the bunker is monitored continuously on DCS system and reported daily to ensure it is within acceptable levels. The waste inputs are planned to ensure that the bunker is not over capacity.	In place.
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. a) Automated or semi-automated waste handling b) Incineration of non-reusable sealed containers, if used c) Cleaning and disinfection of reusable containers, if used	Not Applicable - Clinical waste is defined as “Infectious or otherwise hazardous waste arising from healthcare institutions e.g., hospitals.” This is not accepted at the facility.	Not applicable.
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	Applicable Waste blending and mixing prior to incineration is carried out as follows:	In place.

Conclusions on BAT		Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
	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 d) The associated monitoring is BAT 7.	Waste cranes mix solid waste in the bunker prior to feeding to the hopper to give a homogeneous solid waste feed. Waste pushers at the bottom of the chute connecting the hopper with the furnace control the speed and amount of solid waste feed to the furnace. Bulk liquid wastes are fed to the furnace at rates of between 0.5 and 2 tonnes per hour depending on the process conditions at the time and this is dictated by the control room operators. DCS computer system automatically monitors and controls combustion efficiency and supports the prevention and/or reduction of emissions. Optimisation of the design is not applicable to existing furnaces. Note 2 states that the lower end of the BAT-AEPL range for TOC and LOI is applicable to fluidised bed furnaces and rotary kiln incinerators, so not applicable to this facility.	
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 5.2.1), as and when needed and practicable, based on the characterisation and control of the waste (see BAT 11).	Applicable Indaver employ a process engineer whose role it is to monitor the process conditions and create changes when needed. Regular reporting of the environmental performance of the facility is reviewed by senior management and action taken as required by the Production Manager and/or the Process Engineer, to investigate the reasons for any deviations or negative trends and to make the necessary process adjustments as required. There are multiple methods currently in place for this- morning meetings, weekly meetings, one to one meetings, work order systems, request for changes through automation, KPI's etc. The plant has been operating in line with environmental performance as a KPI since the start of operations.	In place.
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	Applicable Monitoring of plant availability gives KPI's for shutdowns. Try to reduce start-up/shutdowns as much as possible	In place.

Conclusions on BAT		Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
	(e.g., organisation of the supply chain, continuous rather than batch operation) to limit as far as practicable shutdown and start-up operations.	through good maintenance (preventative and corrective) programme also. There are multiple procedures, process maps and manuals in place for ensuring the plant works continuously e.g., creating sales orders for MSW (municipal solid waste), commercial sales for regional sales, waste acceptance, waste handling, waste profiling, non-conformity process maps etc. All of these are part of standard processes and already in place.	
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 wastewater 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.	Applicable Existing plant – FGC system has been designed to appropriately remove pollutants and is operated within design range. No wastewater treatment plant at the facility. There are no wastewater emissions from the FGC, it is a dry sorbent process. Wastewater from floor washing is reused in the process.	In place.
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.	Applicable OTNOC management plan will need to be implemented.	Will be in place. OTNOC management plan will be available in time for the implementation of the BREF (Nov 2023).

Conclusions on BAT		Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
5.1.4. Energy Efficiency			
BAT 19	In order to increase the resource efficiency of the incineration plant, BAT is to use a heat recovery boiler.	Applicable A heat recovery boiler is in place.	In place.
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 the flue-gas flow c) Minimisation of heat losses d) Optimisation of the boiler design e) Low-temperature flue-gas heat exchanger f) High steam conditions g) Cogeneration h) Flue-gas condenser i) Dry bottom ash handling j) The associated monitoring is BAT 2.	Applicable a) Not applicable b) In place c) In place- insulation of the furnace and boilers d) In place e) In place (boiler cleaning, on/offline) f) Not applicable g) Continues to be investigated. h) Not applicable i) Not applicable	In place.
5.1.5. Emissions to Air			
5.1.5.1. Diffuse Emissions			
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 sub atmospheric 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.	Applicable All solid wastes and sludges will be stored in the bunker which is within an enclosed building from where primary air for the furnace is extracted when the plant is in operation. Aqueous Bulk liquid wastes will be stored in a closed tank. Bulk Liquid wastes are pumped to the furnace from this tank or can also be fed directly from an incoming tanker delivery by way of direct injection. An odour abatement system is already in place for when the plant is in planned or unplanned shutdown. There will be a reduction in intake of waste during shutdowns to ensure odour is controlled also.	In place. Bulk Liquid waste streams are reviewed and when necessary, for example to stop odours, can be directly injected.

Conclusions on BAT		Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
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 feed them to the furnace by direct feeding.	Applicable In the event that any particularly odorous bulk liquid wastes are being accepted, diffuse emissions can be prevented by utilising the direct injection system from the tanker to the furnace (see BAT 21 also).	In place.
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.	Not Applicable. Only metals removal will be carried out on the bottom ash. Bottom ash is collected in an indoor hall.	Not applicable.
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. a) Enclose and cover equipment. b) Limit height of discharge c) Protect stockpiles against prevailing winds. d) Use water sprays. e) Optimise moisture content. f) Operate under sub-atmospheric pressure	Not Applicable. Only metals removal will be carried out on the bottom ash. Bottom ash is collected in an indoor hall.	Not applicable.
5.1.5.2. Channelled Emissions			
5.1.5.2.1. Emissions of dust, metals and metalloids			
BAT 25	In order to reduce channelled 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. f) The associated monitoring is in BAT 4.	Applicable The facility has the following. a) In place b) Not applicable c) In place d) Not applicable e) Not applicable A bag filter is installed for the reduction of dust in the flue gases.	In place.

Conclusions on BAT		Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
		Dry sorbent injection (activated carbon and clay mixture) is utilised for the reduction of metals in the flue gases.	
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 5.2.2). The associated monitoring is in BAT 4.	Not Applicable. Only metals removal will be carried out on the bottom ash. Bottom ash is collected in an indoor hall.	Not applicable.
5.1.5.2.2. Emissions of HCl, HF and SO_2			
BAT 27	In order to reduce channelled emissions of HCl, HF and SO2 to air from the incineration of waste, BAT is to use one or a combination of the techniques given below. a) Wet scrubber b) Semi-wet absorber c) Dry sorbent injection d) Direct desulphurisation e) Boiler sorbent injection	Applicable A semi wet absorber and dry sorbent injection is used in the process to control acids.	In place.
BAT 28	In order to reduce channelled peak emissions of HCl, HF and SO2 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 The associated monitoring is in BAT 4.	Applicable The use of sorbent is optimised using continuous upstream and downstream monitoring of HCl and SO_2. Flue gas cleaning residues are recirculated to reduce stoichiometric factor and manage peaks emissions of HCl, HF & SO_2 by using maturation silo.	In place.
5.1.5.2.3. Emissions of NOx, N_2O, CO and NH_3			
BAT 29	In order to reduce channelled NOX emissions to air while limiting the emissions of CO and N2O from the incineration of waste and the emissions of NH3 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) Selective non-catalytic reduction (SNCR) d) Selective catalytic reduction (SCR) e) Catalytic filter bags f) Optimisation of the SNCR/SCR design and operation	Applicable The following techniques are in place to reduce the channelled emissions of NOx. (a) Optimisation of the incineration process. Flow modelling was performed during the boiler design in order to: (i) optimise furnace and boiler geometry so as to improve combustion performance (ii) optimise combustion air injection so as to improve combustion performance	In place.

Conclusions on BAT		Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
	g) Wet scrubber h) The associated monitoring is in BAT 4.	The excess oxygen in the post combustion chamber is ~ 6 vol %. This is a compromise between enough air to control the CO-peaks and too much air to avoid primary NOx forming. (c) Use of Selective non-catalytic reduction (SNCR). This technique is applied in preference to SCR in favour of the overall energy balance of the installation. (f) Optimisation of the SNCR design and operation. Use of CFD modelling in the design phase to optimise reagent injection points of the SNCR system so as to improve the efficiency of NOx abatement whilst minimising the generation of nitrous oxide, ammonia and the consumption of reagent. Additional injection points have been installed during regular outages at the plant to drive improvement and to reduce ammonia consumption. The flow of the SNCR reagent is designed to get a full coverage of the cross section of the post combustion chamber.	
5.1.5.2.4. Emissions of Organic Compounds			
BAT 30	In order to reduce channelled 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. a) Optimisation of the incineration process b) Control of the waste feed c) On-line and off-line 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 j) The associated monitoring is BAT 4.	Applicable a, c d, and e apply. (a) Optimisation of the incineration process. Well-controlled combustion secured by means of flow modelling (see BAT 14 & BAT 29 above) at the design stage, and an advanced combustion control system to aid the reduction of PCDD/F and its precursors. The 3 T's are applied: Temperature is higher than 850°C ; residence Time of the flue gas is at least 2 s and the Turbulence is actively realised by the in speed velocity and orientation of the secondary air in the post combustion chamber. (c) On-line and off-line boiler cleaning. As described in detail in BAT 20 fixed boiler cleaning systems is installed to reduce the amount of fly ash remaining in the boiler.	In place.

Conclusions on BAT		Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
		(d) Rapid Flue Gas Cooling. During normal operation, the temperature in the three empty passes of the boiler will be above 600 °C. When entering the convection pass, the flue gas is cooled very rapidly due to the large heat convection surfaces. This reduces the dust-laden gas residence time in the temperature zone from 450 to 250°C, in which zone PCDD/F is likely to reform (the de-novo synthesis). (e) Dry Sorbent Injection. As per BAT 25, an activated carbon and clay mixture is employed as part of the process in conjunction with a baghouse filter.	
5.1.5.2.5. Emissions of Mercury			
BAT 31	In order to reduce channelled 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. f) The associated monitoring is in BAT 4.	Applicable The reduction of the channelled emissions of Mercury, the following technique is in place. (b) Dry Sorbent Injection. As per BAT 25, an activated carbon and clay mixture is in place as part of the process in conjunction with a baghouse filter.	In place.
5.1.6. 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 wastewater streams and to treat them separately, depending on their characteristics.	Applicable Wastewater from the process (boiler blow down, floor washings etc) is collected in a dedicated network and will eventually drain to an underground tank. The underground tanks are split into 2 separate holding tanks. The boiler blowdown is used as water for the lime milk preparation. The floor washings are in the other underground tank, this water stored for re-use in the process for cooling the ash in the wet de-slagger. There is very little water from the bottom ash but it is kept in the bottom ash storage building which is contained drainage and has no connection to the process water drainage system or the stormwater collection system on site.	In place.

Conclusions on BAT		Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
		The storm water from all of the roads, roofs and hard standings is conveyed via a class 1 hydrocarbon interceptor to the attenuation pond, after a pre-test for pH, conductivity and TOC. One the results are within specification it is entered into the pond. If the water is outside of its specification, then it is automatically diverted to an underground fire water retention tank for holding until the cause of the issue is investigated. The attenuation pond has a capacity of ~1,600m^3. The fire water retention tank has a capacity of 300m^3. The outlet of the surface water attenuation pond is constantly monitored with automatic interlocks to stop discharge when limits are exceeded. In case of an alarm, the outlet valve for discharging the water off site will close and therefore, no potentially contaminated water will leave the site. Drainage in the unloading area for the Ammonia, Fuel Oil are separated from the rest of the stormwater drains in this area via a 2.5m^3 holding tank followed by a forecourt separator.	
BAT 33	In order to reduce water usage and to prevent or reduce the generation of wastewater 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 wastewater from FGC c) Water reuse/recycling d) Dry bottom ash handling	Applicable In order to reduce water usage and to prevent or reduce the generation of wastewater from the incineration plant, the following techniques are employed. (a) Wastewater free Flue Gas Cleaning Techniques. Dry sorbent injection is used as per BAT 25. (c) Water re-use/recycling. Wastewater from the process is re-used in the wet-deslagger system and in the production of lime milk for the abatement system. See BAT 32 also.	In place.
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 (in the Bref document), and to use secondary techniques as close as possible to the source in order to avoid dilution. The associated monitoring is in BAT 6.	Not Applicable. There are no emissions to water from the flue gas cleaning or bottom ash storage on site.	Not applicable.
5.1.7. Material Efficiency			
BAT 35	In order to increase resource efficiency, BAT is to handle and treat bottom ashes separately from FGC residues.	Applicable	In place.

Conclusions on BAT		Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
		Bottom ashes are collected separately and stored in a dedicated bottom ash storage building and tipping hall prior to transport off-site for treatment or recovery. Flue Gas Cleaning residues are collected in separate silos for further treatment. There is no mixing of these residues.	
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	Not Applicable. Only metals removal is carried out on the bottom ash.	Not applicable.
5.1.8. 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	Applicable a) Appropriate location of equipment & buildings. The orientation of the plant and the location of the main process building, and ancillary equipment was considered during the planning/design stage from a noise reduction perspective. Measures include, setting the main building to the back of the site and away from the main road. Locating the air-cooled condenser at the back of the site where there are no immediate neighbours. Increased cladding in the turbine building and enclosing other potentially noisy areas of the plant such as the tipping hall. b) Operational Measures. Standard maintenance procedures including condition monitoring of equipment will ensure that noise levels of relevant equipment are maintained within their design ranges. Noise levels as defined in the operational licence are observed. c) Low Noise Equipment. As a basic standard, Indaver define 82dB at 1m from all process equipment to suppliers.	In place.

Conclusions on BAT		Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
		d) Noise Attenuation. The following noise reduction measures have been implemented to meet local noise requirements: (i) An enclosed waste tipping hall significantly reduces the noise from unloading of waste. (ii) Noisy process equipment is located inside the main process building or in its own enclosure/building (e.g., turbine). (iii) Separate noise attenuating housing or insulation of equipment with higher noise production (higher than 82 dB at 1 m) such as the tail end fan, hydraulic units, air compressor, turbine. (iv) Turbine and air-cooled condenser buildings are shielded from noise sensitive receptors by their location. e) Noise-control equipment/infrastructure. (i) Noise damper between tail end fan and stack. (ii) Noise dampers of steam valves to atmosphere except for valves with a safety function. (iii) Frequency driven motors to avoid unnecessary high rotation speed of higher noise generating equipment. (iv) Low noise fan blades for the air-cooled condenser.	