2023/2749

18.12.2023

COMMISSION IMPLEMENTING DECISION (EU) 2023/2749

of 11 December 2023

establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions, for slaughterhouses, animal by-products and/or edible co-products industries

(notified under document C(2023) 8434)

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) ([1]), and in particular Article 13(5) thereof,

Whereas:

(1) Best available techniques (BAT) conclusions are the reference for setting permit conditions for installations covered by Chapter II of Directive 2010/75/EU. Competent authorities should set emission limit values that ensure that, under normal operating conditions, emissions do not exceed the emission levels associated with the best available techniques as laid down in the BAT conclusions.

(2) In accordance with Article 13(4) of Directive 2010/75/EU, the forum composed of Member States' representatives, the industries concerned and non-governmental organisations promoting environmental protection, established by Commission Decision of 16 May 2011 ([2]), provided the Commission on 22 May 2023 with its opinion on the proposed content of the BAT reference document for slaughterhouses, animal by-products and/or edible co-products industries. That opinion is publicly available ([3]).

(3) The BAT conclusions set out in the Annex to this Decision take into account the forum's opinion on the proposed content of the BAT reference document. They contain the key elements of the BAT reference document.

(4) The measures provided for in this Decision are in accordance with the opinion of the Committee established by Article 75(1) of Directive 2010/75/EU,

HAS ADOPTED THIS DECISION:

Article 1

The best available techniques (BAT) conclusions for slaughterhouses, animal by-products and/or edible co-products industries, as set out in the Annex, are adopted.

Article 2

This Decision is addressed to the Member States.

([1]) OJ L 334, 17.12.2010, p. 17.
([2]) Commission Decision of 16 May 2011 establishing a forum for the exchange of information pursuant to Article 13 of Directive 2010/75/EU on industrial emissions (OJ C 146, 17.5.2011, p. 3).
([3]) https://circabc.europa.eu/ui/group/06f33a94-9829-4eee-b187-21bb783a0fbf/library/e07eada3-2935-4ef4-b6d7-b7150f75e520?p=1&n=10&sort=modified_DESC

Done at Brussels, 11 December 2023.

For the Commission
Virginius SINKEVIČIUS
Member of the Commission

ANNEX

BEST AVAILABLE TECHNIQUES (BAT) CONCLUSIONS FOR SLAUGHTERHOUSES, ANIMAL BY-PRODUCTS AND/OR EDIBLE CO-PRODUCTS INDUSTRIES

SCOPE

These BAT conclusions concern the following activities specified in Annex I to Directive 2010/75/EU:

6.4. (a) Operating slaughterhouses with a carcass production capacity greater than 50 tonnes per day.

6.5. Disposal or recycling of animal carcases or animal waste with a treatment capacity exceeding 10 tonnes per day.

6.11. Independently operated treatment of waste water not covered by Directive 91/271/EEC ([1]), provided that the main pollutant load originates from the activities covered by these BAT conclusions.

These BAT conclusions also cover the following:

— the processing of animal by-products and/or edible co-products (such as rendering, fat melting, feather processing, fishmeal and fish oil production, blood processing and gelatine manufacturing) covered by the activity description in points 6.4 (b) (i) and/or 6.5 of Annex I to Directive 2010/75/EU;

— the combustion of meat-and-bone meal and/or animal fat;

— the combustion (e.g. in thermal oxidisers or steam boilers) of malodorous gases (originating from the activities covered by these BAT conclusions), including non-condensable gases;

— the incineration of carcasses if directly associated with the activities covered by these BAT conclusions;

— the preservation of hides and skins if directly associated with the activities covered by these BAT conclusions;

— the handling of casings and offal (viscera);

— composting and anaerobic digestion if directly associated with the activities covered by these BAT conclusions;

— the combined treatment of waste water from different origins, provided that the main pollutant load originates from the activities covered by these BAT conclusions and that the waste water treatment is not covered by Directive 91/271/EEC[1].

These BAT conclusions do not cover the following:

— On-site combustion plants, not covered by the above bullet points, generating hot gases that are not used for direct contact heating, drying or any other treatment of objects or materials. These may be covered by the BAT conclusions for Large Combustion Plants (LCP) or by Directive (EU) 2015/2193 of the European Parliament and of the Council ([2]).

— The production of food after the making of standard cuts for large animals or of cuts for poultry. This may be covered by the BAT conclusions for the Food, Drink and Milk Industries (FDM).

— Landfill of waste. This is covered by Council Directive 1999/31/EC ([3]). In particular, underground permanent and long-term storage (≥ 1 year before disposal, ≥ 3 years before recovery) are covered by Directive 1999/31/EC.

Other BAT conclusions and reference documents which could be relevant for the activities covered by these BAT conclusions include the following:

— Large Combustion Plants (LCP);

([1]) Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment (OJ L 135, 30.5.1991, p. 40).
([2]) Directive (EU) 2015/2193 of the European Parliament and of the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants (OJ L 313, 28.11.2015, p. 1).
([3]) Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste (OJ L 182, 16.7.1999, p. 1).

— Food, Drink and Milk Industries (FDM);

— Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector (CWW);

— Waste Treatment (WT);

— Waste Incineration (WI);

— Tanning of Hides and Skins (TAN);

— Monitoring of Emissions to Air and Water from IED Installations (ROM);

— Economics and Cross-Media Effects (ECM);

— Emissions from Storage (EFS);

— Energy Efficiency (ENE);

— Industrial Cooling Systems (ICS).

These BAT conclusions apply without prejudice to other relevant legislation, e.g. on hygiene, food/feed safety, animal welfare, biosecurity, energy efficiency (energy efficiency first principle).

DEFINITIONS

For the purposes of these BAT conclusions, the following definitions apply:

General terms	
Term used	Definition
Animal by-products	As defined in Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation) ([1]).
Channelled emissions	Emissions of pollutants to air through any kind of duct, pipe, stack, etc. This includes emissions from open-top biofilters.
Direct discharge	Discharge to a receiving water body without further downstream waste water treatment.
Edible co-products	Food-grade products intended for human consumption.
Existing plant	A plant that is not a new plant.
FDM activities	Activities covered by the BAT conclusions for the Food, Drink and Milk Industries.
FDM products	Products associated with activities covered by the BAT conclusions for the Food, Drink and Milk Industries.
Hazardous substance	Hazardous substance as defined in point 18 of Article 3 of Directive 2010/75/EU.
Indirect discharge	Discharge which is not a direct discharge.
New plant	A plant first permitted at the site of the installation following the publication of these BAT conclusions or a complete replacement of a plant following the publication of these BAT conclusions.
Sensitive receptor	Areas which need special protection, such as: — residential areas; — areas where human activities are carried out (e.g. neighbouring workplaces, schools, day-care centres, recreational areas, hospitals or nursing homes).

General terms	
Term used	Definition
Substances of very high concern	Substances meeting the criteria mentioned in Article 57 and included in the Candidate List of Substances of Very High Concern, according to the REACH Regulation ((EC) No 1907/2006 ([2])).

([1]) OJ L 300, 14.11.2009, p. 1.

([2]) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (OJ L 396, 30.12.2006, p. 1).

Pollutants and parameters	
Term used	Definition
AOX	Adsorbable organically bound halogens, expressed as Cl, include adsorbable organically bound chlorine, bromine and iodine.
As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Tl, V	Arsenic, cadmium, cobalt, chromium, copper, manganese, nickel, lead, antimony, thallium and vanadium.
Biochemical oxygen demand (BOD_n)	Amount of oxygen needed for the biochemical oxidation of the organic matter to carbon dioxide in *n* days (*n* is typically 5 or 7). BOD is an indicator for the mass concentration of biodegradable organic compounds.
Chemical oxygen demand (COD)	Amount of oxygen needed for the total chemical oxidation of the organic matter to carbon dioxide using dichromate. COD is an indicator for the mass concentration of organic compounds.
CO	Carbon monoxide.
Copper (Cu)	Copper, expressed as Cu, includes all inorganic and organic copper compounds, dissolved or bound to particles.
Dust	Total particulate matter (in air).
HCl	All inorganic gaseous chlorine compounds, expressed as HCl.
HF	All inorganic gaseous fluorine compounds, expressed as HF.
Hg	The sum of mercury and its compounds, expressed as Hg.
H_2S	Hydrogen sulphide.
Odour concentration	Number of European Odour Units (ou_E) in a cubic metre of gas at standard conditions for olfactometry according to EN 13725.
NO_X	The sum of nitrogen monoxide (NO) and nitrogen dioxide (NO_2), expressed as NO_2.
PCDD/F	Polychlorinated dibenzo-p-dioxins and -furans.
SO_X	The sum of sulphur dioxide (SO_2), sulphur trioxide (SO_3), and sulphuric acid aerosols, expressed as SO_2.

Pollutants and parameters	
Term used	Definition
Total nitrogen (Total N)	Total nitrogen, expressed as N, includes free ammonia and ammonium nitrogen (NH_4-N), nitrite nitrogen (NO_2-N), nitrate nitrogen (NO_3-N) and organically bound nitrogen.
Total organic carbon (TOC)	Total organic carbon (in water), expressed as C, includes all organic compounds.
Total phosphorus (Total P)	Total phosphorus, expressed as P, includes all inorganic and organic phosphorus compounds, dissolved or bound to particles.
Total suspended solids (TSS)	Mass concentration of all suspended solids (in water), measured via filtration through glass fibre filters and gravimetry.
Total volatile organic carbon (TVOC)	Total volatile organic carbon (in air), expressed as C.
Zinc (Zn)	Zinc, expressed as Zn, includes all inorganic and organic zinc compounds, dissolved or bound to particles.

ACRONYMS

For the purposes of these BAT conclusions, the following acronyms apply:

Acronym	Definition
CIP	Cleaning-in-place
CMS	Chemicals management system
EMS	Environmental management system
FDM	Food, drink and milk
IED	Industrial Emissions Directive (2010/75/EU)
OTNOC	Other than normal operating conditions
SA	Slaughterhouses, animal by-products and/or edible co-products industries

GENERAL CONSIDERATIONS

Best Available Techniques

The techniques listed and described in these BAT conclusions are neither prescriptive nor exhaustive. Other techniques may be used that ensure at least an equivalent level of environmental protection.

Unless otherwise stated, the BAT conclusions are generally applicable.

Emission levels associated with the best available techniques (BAT-AELs) for emissions to water

The BAT-AELs for emissions to water given in these BAT conclusions refer to concentrations (mass of emitted substances per volume of water), expressed in mg/l.

Averaging periods associated with the BAT-AELs refer to either of the following two cases:

— In the case of continuous discharge, daily average values, i.e. 24-hour flow-proportional composite samples.

— In the case of batch discharge, average values over the release duration taken as flow-proportional composite samples, or, provided that the effluent is appropriately mixed and homogeneous, a spot sample taken before discharge.

Time-proportional composite samples can be used provided that sufficient flow stability is demonstrated. Alternatively, spot samples may be taken, provided that the effluent is appropriately mixed and homogeneous.

In the case of total organic carbon (TOC), total nitrogen (TN) and chemical oxygen demand (COD), the calculation of the average abatement efficiency referred to in these BAT conclusions (see Table 1.1) is based on the influent and effluent load of the waste water treatment plant.

The BAT-AELs apply at the point where the emission leaves the installation.

Emission levels associated with the best available techniques (BAT-AELs) and indicative emission level for channelled emissions to air

The BAT-AELs and the indicative emission level for channelled emissions to air given in these BAT conclusions refer to concentrations (mass of emitted substances per volume of waste gas) under the following standard conditions: dry gas at a temperature of 273,15 K (or wet gas at a temperature of 293 K in the case of odour concentration) and a pressure of 101,3 kPa, without correction to a reference oxygen level, and expressed in the unit mg/Nm^3 or ou_E/m^3.

For averaging periods of BAT-AELs and the indicative emission level for channelled emissions to air, the following definition applies.

Type of measurement	Averaging period	Definition
Periodic	Average over the sampling period	Average value of three consecutive samplings/measurements of at least 30 minutes each ([1]).

([1]) For any parameter where, due to sampling or analytical limitations, a 30-minute sampling/measurement is inappropriate, a more representative sampling/measurement procedure may be employed (e.g. for the odour concentration).

When the waste gases of two or more sources (e.g. dryers) are discharged through a common stack, the BAT-AEL and the indicative emission level apply to the combined discharge from the stack.

Indicative emission levels for refrigerant losses

The indicative emission levels for refrigerant losses refer to a rolling average over 3 years of yearly losses. Yearly losses are expressed as a percentage (%) of the total amount of refrigerant contained in the cooling system(s). The losses for a specific refrigerant in 1 year are equal to the amount of that refrigerant used to refill the cooling system(s).

Other environmental performance levels associated with the best available techniques (BAT-AEPLs)

BAT-AEPLs for specific waste water discharge

The environmental performance levels related to specific waste water discharge refer to yearly averages and are calculated using the following equation:

$$\text{specific waste water discharge} = \frac{\text{waste water discharge}}{\text{activity rate}}$$

where:

waste water discharge:	total amount of waste water discharged (direct discharge, indirect discharge and/or landspreading) by the specific processes concerned, expressed in m^3/year, excluding any cooling water and run-off water that is discharged separately;
activity rate:	total amount of products or raw materials processed, expressed in: — tonnes of carcasses/year or animals/year for slaughterhouses; — tonnes of raw materials/year for installations processing animal by-products and/or edible co-products.

The carcass weight depends on the animal species under consideration:

— Pigs: the weight of the slaughtered animal's cold body, either whole or divided in half along the midline, after being bled and eviscerated and after removal of the tongue, bristles, hooves, genitalia, flare fat, kidneys and diaphragm.

— Cattle: the weight of the slaughtered animal's cold body after being skinned, bled and eviscerated, and after removal of the external genitalia, limbs, head, tail, kidneys and kidney fats, and the udder.

— Chickens: the weight of the slaughtered animal's cold body after being bled, plucked and eviscerated. The weight includes offal (viscera).

BAT-AEPLs for specific net energy consumption

The environmental performance levels related to specific net energy consumption refer to yearly averages and are calculated using the following equation:

$$\text{specific net energy consumption} = \frac{\text{final net energy consumption}}{\text{activity rate}}$$

where:

final net energy consumption:	total amount of energy consumed (excluding the recovered energy) by the installation (in the form of heat and electricity), expressed in kWh/year;
activity rate:	total amount of products or raw materials processed, expressed in: — tonnes of carcasses/year or animals/year for slaughterhouses; — tonnes of raw materials/year for installations processing animal by-products and/or edible co-products.

The carcass weight depends on the animal species under consideration (see General consideration for BAT-AEPLs for specific waste water discharge).

Unless otherwise stated, the calculation of the energy consumption of slaughterhouses may include the energy consumed by FDM activities.

1.1 *General BAT conclusions*

1.1.1 Overall environmental performance

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 and 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;

xiii. emergency preparedness and response protocols, including the prevention and/or mitigation of the adverse (environmental) impacts of emergency situations;

xiv. when (re)designing a (new) installation or a part thereof, consideration of its environmental impacts throughout its life, which includes construction, maintenance, operation and decommissioning;

xv. implementation of a monitoring and measurement programme; if necessary, information can be found in the Reference Report on Monitoring of Emissions to Air and Water from IED Installations;

xvi. application of sectoral benchmarking on a regular basis;

xvii. periodic independent (as far as practicable) internal auditing and periodic independent external auditing in order to assess the environmental performance and to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained;

xviii. evaluation of causes of nonconformities, implementation of corrective actions in response to nonconformities, review of the effectiveness of corrective actions, and determination of whether similar nonconformities exist or could potentially occur;

xix. periodic review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness;

xx. following and taking into account the development of cleaner techniques.

Specifically for slaughterhouses as well as the processing of animal by-products and/or edible co-products, BAT is also to incorporate the following features in the EMS:

xxi. an odour management plan (see BAT 18);

xxii. an inventory of inputs and outputs (see BAT 2);

xxiii. a chemicals management system (see BAT 3);

xxiv. an energy efficiency plan (see BAT 9 (a));

xxv. a water management plan (see BAT 10 (a));

xxvi. a noise management plan (see BAT 16);

xxvii. an OTNOC management plan (see BAT 4).

xxviii. a refrigeration management plan for slaughterhouses (see BAT 21 (a) and BAT 23 (a)).

Note

Regulation (EC) No 1221/2009 establishes the European Union eco-management and audit scheme (EMAS), which is an example of an EMS consistent with this BAT.

Applicability

The level of detail and the degree of formalisation of the EMS will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have.

BAT 2. In order to improve the overall environmental performance, BAT is to establish, maintain and regularly review (including when a significant change occurs) an inventory of inputs and outputs, as part of the environmental management system (see BAT 1) that incorporates all of the following features:

I. Information about the production process(es), 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 techniques to prevent or reduce emissions, including their performance (e.g. abatement efficiency).

II. Information about energy consumption and usage.

III. Information about water consumption and usage (e.g. flow diagrams and water mass balances).

IV. Information about the quantity and characteristics of the waste water streams, such as:

(a) average values and variability of flow, pH and temperature;

(b) average concentration and mass flow values of relevant substances/parameters (e.g. COD/TOC, nitrogen species, phosphorus) and their variability.

V. Information about the characteristics of the waste gas streams, such as:

(a) emission point(s);

(b) average values and variability of flow and temperature;

(c) average concentration and mass flow values of relevant substances/parameters (e.g. dust, TVOC, NO_X, SO_X) and their variability;

(d) presence of other substances that may affect the waste gas treatment system or plant safety (e.g. oxygen, water vapour, dust).

VI. Information about the quantity and characteristics of the chemicals used:

(a) the identity and the characteristics of the chemicals used, including properties with adverse effects on the environment and/or human health;

(b) the quantities of chemicals used and the location of their use.

Applicability

The level of detail and the degree of formalisation of the inventory will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have.

BAT 3. In order to improve the overall environmental performance, BAT is to elaborate and implement a chemicals management system (CMS) as part of the EMS (see BAT 1) that incorporates all of the following features:

I. A policy to reduce the consumption and risks associated with chemicals, including a procurement policy to select less harmful chemicals and their suppliers with the aim of minimising the use and risks associated with hazardous substances and substances of very high concern and avoiding the procurement of an excess amount of chemicals. The selection of chemicals is based on:

(a) the comparative analysis of their bioeliminability/biodegradability, ecotoxicity and potential to be released into the environment, in order to reduce emissions to the environment;

(b) the characterisation of the risks associated with the chemicals, based on the chemicals' hazard classification, pathways through the plant, potential release and level of exposure;

(c) the regular (e.g. annual) analysis of the potential for substitution to identify potentially new available and safer alternatives to the use of hazardous substances and substances of very high concern (e.g. use of other chemicals with no or lower impacts on the environment and/or human health, see BAT 11 (a));

(d) the anticipatory monitoring of regulatory changes related to hazardous substances and substances of very high concern and the safeguarding of compliance with applicable legal requirements.

The inventory of chemicals (see BAT 2) may be used to provide and keep the information needed for the selection of chemicals.

II. Goals and action plans to avoid or reduce the use and risks associated with hazardous substances and substances of very high concern.

III. Development and implementation of procedures for the procurement, handling, storage and use of chemicals to prevent or reduce emissions to the environment.

Applicability

The level of detail and the degree of formalisation of the CMS will generally be related to the nature, scale and complexity of the plant.

BAT 4. In order to reduce the frequency of the occurrence of OTNOC and to reduce emissions during OTNOC, BAT is to set up and implement a risk-based OTNOC management plan as part of the EMS (see BAT 1) that includes all of the following elements:

i. 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;

ii. appropriate design of critical equipment (e.g. waste water treatment plant);

iii. set-up and implementation of an inspection plan and preventive maintenance programme for critical equipment (see BAT 1 xii.);

iv. monitoring (i.e. estimating or, where possible, measuring) and recording of emissions during OTNOC and of associated circumstances;

v. 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;

vi. regular review and update of the list of identified OTNOC under point i. following the periodic assessment of point v.;

vii. regular testing of backup systems.

Applicability

The level of detail and degree of formalisation of the OTNOC management plan will generally be related to the nature, scale and complexity of the plant, and the range of environmental impacts it may have.

1.1.2 **Monitoring**

BAT 5. For waste water streams identified by the inventory of inputs and outputs (see BAT 2), BAT is to monitor key process parameters (e.g. continuous monitoring of waste water flow, pH and temperature) at key locations (e.g. at the inlet and/or outlet of the waste water pretreatment, at the inlet to the final waste water treatment, at the point where the emission leaves the installation).

BAT 6. BAT is to monitor at least once per year:

— the yearly consumption of water and energy;

— the yearly amount of waste water generated;.

— the yearly amount of refrigerant(s) used to refill the cooling system(s) in slaughterhouses.

Description

Monitoring preferentially includes direct measurements. Calculations or recording, e.g. using suitable meters or invoices, can also be used. The monitoring is performed at installation level (and can be broken down to the most appropriate process level) and considers any significant changes in the processes.

BAT 7. BAT is to monitor emissions to water 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.

Substance/Parameter	Activities	Standard(s)	Minimum monitoring frequency ([1])	Monitoring associated with
Adsorbable organically bound halogens (AOX) ([2]) ([3])	All activities	EN ISO 9562	Once every 3 months ([4])	BAT 14
Biochemical oxygen demand (BOD_n) ([5])		Various EN standards available (e.g. EN 1899-1, EN ISO 5815-1)	Once every month	

Substance/Parameter		Activities	Standard(s)	Minimum monitoring frequency ([1])	Monitoring associated with
Chemical oxygen demand (COD) ([5]) ([6])			No EN standard available	Once every week ([7])	
Total nitrogen (TN) ([5])			Various EN standards available (e.g. EN 12260, EN ISO 11905-1)		
Total organic carbon (TOC) ([5]) ([6])			EN 1484		
Total phosphorus (TP) ([5])			Various EN standards available (e.g. EN ISO 6878, EN ISO 15681-1 and -2, EN ISO 11885)		
Total suspended solids (TSS) ([5])			EN 872		
Metals	Copper (Cu) ([2]) ([3])	Slaughterhouses	Various EN standards available (e.g. EN ISO 11885, EN ISO 17294-2 or EN ISO 15586)	Once every 6 months	
	Zinc (Zn) ([1]) ([2])				
Chloride (Cl^-) ([2]) ([3])		— Slaughterhouses — Hide/skin salting — Gelatine manufacturing using bones as raw material	Various EN standards available (e.g. EN ISO 10304-1, EN ISO 15682)	Once every month ([4])	-

([1]) In the case of batch discharge less frequent than the minimum monitoring frequency, monitoring is carried out once per batch.
([2]) In the case of an indirect discharge, the monitoring frequency may be reduced to once every year for Cu and Zn and once every 6 months for AOX and Cl^- if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned.
([3]) The monitoring only applies when the substance/parameter concerned is identified as relevant in the waste water stream based on the inventory of inputs and outputs mentioned in BAT 2.
([4]) The minimum monitoring frequency may be reduced to once every 6 months if the emission levels are proven to be sufficiently stable.
([5]) The monitoring only applies in the case of a direct discharge.
([6]) Either COD or TOC is monitored. TOC monitoring is the preferred option because it does not rely on the use of very toxic compounds.
([7]) The minimum monitoring frequency may be reduced to once every month if the emission levels are proven to be sufficiently stable.

BAT 8. 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.

Substance/ Parameter	Activities/Processes	Standard(s)	Minimum monitoring frequency ([1])	Monitoring associated with
CO	Combustion (e.g. in thermal oxidisers or steam boilers) of malodorous gases, including non-condensable gases	EN 15058	Once every year	BAT 15
	Incineration of carcasses			-
Dust	Combustion (e.g. in thermal oxidisers or steam boilers) of malodorous gases, including non-condensable gases	EN 13284-1		BAT 15
	Incineration of carcasses			-
NO_X	Combustion (e.g. in thermal oxidisers or steam boilers) of malodorous gases, including non-condensable gases	EN 14792		BAT 15
	Incineration of carcasses			-
SO_X	Combustion (e.g. in thermal oxidisers or steam boilers) of malodorous gases, including non-condensable gases	EN 14791		BAT 15
	Incineration of carcasses			-
H_2S	Rendering, fat melting, blood and/or feather processing ([2])	No EN standard available		BAT 25
NH_3	Rendering, fat melting, blood and/or feather processing	EN ISO 21877		
	Combustion (e.g. in thermal oxidisers or steam boilers) of malodorous gases, including non-condensable gases			
	Incineration of carcasses			-
TVOC	Rendering, fat melting, blood and/or feather processing	EN 12619		BAT 25
	Combustion (e.g. in thermal oxidisers or steam boilers) of malodorous gases, including non-condensable gases			
	Incineration of carcasses			-

Substance/ Parameter	Activities/Processes	Standard(s)	Minimum monitoring frequency ([1])	Monitoring associated with
Odour concentration	Slaughterhouses ([3]) ([4])	EN 13725	-	
	Incineration of carcasses ([3])		-	
	Gelatine manufacturing ([3])		-	
	Fishmeal and fish oil production ([3])		BAT 25	
	Rendering, fat melting, blood and/or feather processing ([3])			
HCl	Incineration of carcasses	EN 1911	-	
HF		No EN standard available		
Hg		EN 13211		
Metals and metalloids except mercury (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Tl, V)		EN 14385		
PCDD/F		EN 1948-1, EN 1948-2, EN 1948-3		

([1]) To the extent possible, the measurements are carried out at the highest expected emission state under normal operating conditions.
([2]) The monitoring only applies when H_2S is identified as relevant in the waste gas stream based on the inventory of inputs and outputs mentioned in BAT 2.
([3]) This includes combustion (e.g. in thermal oxidisers or steam boilers) of malodorous gases, including non-condensable gases.
([4]) The monitoring only applies when odour is identified as relevant in the waste gas stream based on the inventory of inputs and outputs mentioned in BAT 2.

1.1.3 **Energy efficiency**

BAT 9. In order to increase energy efficiency, BAT is to use both of the techniques given below.

Technique		Description	Applicability
a	Energy efficiency plan and audits	An energy efficiency plan is part of the environmental management system (see BAT 1) and entails defining and calculating the specific energy consumption of the activity (or activities), setting key performance indicators on an annual basis (for example for the specific energy consumption) and planning periodic improvement targets and related actions. Audits are carried out at least once every year to ensure that the objectives of the energy efficiency plan are met and the energy audits' recommendations are followed up and implemented.	The level of detail of the energy efficiency plan and audits will generally be related to the nature, scale and complexity of the plant.

Technique		Description	Applicability
b	General energy-saving techniques	These include techniques such as: — heat recovery with heat exchangers and/or heat pumps; — energy-efficient motors; — frequency converters on motors; — process control systems; — combined heat and power generation (cogeneration); — insulation of pipes, vessels and other equipment; — combustion regulation and control; — feed water preheating (including the use of economisers); — minimisation of the blowdown of boilers; — optimisation of steam distribution systems; — reduction of compressed air system leaks; — lighting management systems; — energy-efficient lighting; — optimisation of design and operation of cooling system(s).	Applicability of cogeneration to existing plants may be restricted by a suitable heat demand and/or by the plant layout/lack of space.

Further sector-specific techniques to increase energy efficiency are given in Section 1.2.1 and Section 1.3.1 of these BAT conclusions.

1.1.4 **Water consumption and waste water generation**

BAT 10. In order to reduce water consumption and the amount of waste water generated, BAT is to use both techniques (a) and (b), and an appropriate combination of the techniques (c) to (k) given below.

Technique		Description	Applicability
Management, design and operation techniques			
a	Water management plan and water audits	A water management plan and water audits are part of the environmental management system (see BAT 1) and include: — flow diagrams and water mass balances of the plant and processes as part of the inventory of inputs and outputs mentioned BAT 2; — establishment of water efficiency objectives; — implementation of water optimisation techniques (e.g. control of water usage, reuse/recycling, detection and repair of leaks). Water audits are carried out at least once every year to ensure that the objectives of the water management plan are met and the water audits' recommendations are followed up and implemented.	The level of detail and nature of the water management plan and water audits will generally be related to the nature, scale and complexity of the plant.
b	Segregation of water streams	Water streams that do not need treatment (e.g. uncontaminated cooling water, uncontaminated run-off water) are segregated from waste water that has to undergo treatment, thus enabling uncontaminated water recycling.	Applicability to existing plants may be restricted by the layout of the water collection system and the lack of space for temporary storage tanks.

Technique		Description	Applicability
c	Water reuse and/or recycling	Recycling and/or reuse of water streams (preceded or not by water treatment), e.g. for cleaning, washing, cooling or for the process itself.	May not be applicable due to hygiene and safety requirements.
d	Optimisation of water flow	Use of control devices, e.g. photocells, flow valves, thermostatic valves, to automatically adjust the water flow to the minimum amount needed.	Generally applicable.
e	Optimisation and appropriate use of water nozzles and hoses	Use of correct number and position of nozzles; adjustment of water pressure of nozzles and hoses.	

Techniques related to cleaning operations

f	Dry cleaning	Removal of as much residual material as possible from raw materials and equipment, e.g. by using compressed air, vacuum systems or catchpots with a mesh cover.	Generally applicable.
g	High-pressure cleaning	Spraying of cleaning water at pressures ranging from 15 bar to 150 bar.	May not be applicable due to health and safety requirements.
h	Optimisation of chemical dosing and water use in cleaning-in-place (CIP)	The amounts of hot water and chemicals used are optimised by measuring for example turbidity, conductivity, temperature and/or pH.	Generally applicable.
i	Low-pressure foam and/or gel cleaning	Use of low-pressure foam and/or gel to clean walls, floors and/or equipment surfaces.	
j	Optimised design and construction of equipment and process areas	The equipment and process areas are designed and constructed in a way that facilitates cleaning. When optimising the design and construction, hygiene requirements are taken into account.	
k	Prompt cleaning of equipment	Cleaning is applied as soon as possible after use of equipment to prevent hardening of residual material.	

Further sector-specific techniques to reduce water consumption and the volume of waste water generated are given in Section 1.2.2 and Section 1.3.2 of these BAT conclusions.

1.1.5 **Harmful substances**

BAT 11. In order to prevent or, where that is not practicable, to reduce the use of harmful substances in cleaning and disinfection, BAT is to use one or a combination of the techniques given below.

Technique		Description
a	Proper selection of cleaning chemicals and/or disinfectants	Avoidance or minimisation of the use of cleaning chemicals and/or disinfectants that are harmful to the aquatic environment, in particular those that contain priority substances considered under the Water Framework Directive ([1]). When selecting the cleaning chemicals and/or disinfectants, hygiene and food safety requirements are taken into account. This technique is part of the CMS (see BAT 3).
b	Reuse of cleaning chemicals in cleaning-in-place (CIP)	Collection and reuse of cleaning chemicals in CIP. When reusing cleaning chemicals, hygiene and food safety requirements are taken into account.
c	Dry cleaning	See BAT 10 (f).
d	Optimised design and construction of equipment and process areas	See BAT 10 (j).

([1]) Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L327, 22.12.2000, p. 1)

1.1.6 **Resource efficiency**

BAT 12. In order to increase resource efficiency, BAT is to use both techniques (a) and (b), if appropriate in combination with one or both of the techniques (c) and (d) given below.

Technique		Description	Applicability
a	Minimisation of biological degradation of animal by-products and/or edible co-products	Animal by-products and/or edible co-products are promptly collected in slaughterhouses and are stored in closed vessels or rooms in SA installations, for as short a time as possible, before further treatment. Raw materials intended for human consumption (e.g. fat, blood), feed material or pet food may require refrigeration.	Generally applicable.
b	Residues separation and recycling/recovery	Residues are separated, e.g. using accurately positioned screens, flaps, catchpots, drip trays and troughs, for recycling and recovery.	
c	Anaerobic digestion	Treatment of biodegradable residues by microorganisms in the absence of oxygen, resulting in the generation of biogas and digestate. The biogas is used as a fuel, e.g. in a gas engine or in a boiler. The digestate may be used, e.g. as a soil improver, on site or off site.	May not be applicable due to the quantity and/or nature of the residues.

	Technique	Description	Applicability
d	Phosphorus recovery as struvite	See Section 1.4.1.	Only applicable to waste water streams with a high total phosphorus content (e.g. above 50 mg/l) and a significant flow.

1.1.7 **Emissions to water**

BAT 13. In order to prevent uncontrolled emissions to water, BAT is to provide an appropriate buffer storage capacity for generated waste water.

Description

The appropriate buffer storage capacity is determined by a risk assessment (taking into account the nature of the pollutant(s), the effects of these pollutants on further waste water treatment, the receiving environment, the amount of waste water generated, etc.).

A buffer tank is typically designed to store the amounts of waste water generated during several peak hours of operation.

The waste water from this buffer storage is discharged after appropriate measures are taken (e.g. monitoring, treatment, reuse).

Applicability

For existing plants, the technique may not be applicable due to lack of space and/or due to the layout of the waste water collection system.

BAT 14. In order to reduce emissions to water, BAT is to use an appropriate combination of the techniques given below.

	Technique ([1])	Typical pollutants targeted	Applicability
Preliminary, primary and general treatment			
a	Equalisation	All pollutants	Generally applicable.
b	Neutralisation	Acids, alkalis	
c	Physical separation, e.g. screens, sieves, grit separators, fat separators, primary settlement tanks	Gross solids, suspended solids, oil/grease	
Physico-chemical treatment			
d	Precipitation	Precipitable dissolved non-biodegradable or inhibitory pollutants, e.g. metals	Generally applicable.
e	Chemical oxidation (e.g. with ozone)	Reducible dissolved non-biodegradable or inhibitory pollutants, e.g. AOX, antimicrobial-resistant bacteria	

	Technique ([1])	Typical pollutants targeted	Applicability
Aerobic and/or anaerobic treatment (secondary treatment)			
f	Aerobic and/or anaerobic treatment (secondary treatment), e.g. activated sludge process, aerobic lagoon, anaerobic contact process, membrane bioreactor	Biodegradable organic compounds	Generally applicable.
Nitrogen removal			
g	Nitrification and/or denitrification	Total nitrogen, ammonium/ammonia	Nitrification may not be applicable in the case of high chloride concentrations (e.g. above 10 g/l). Nitrification may not be applicable when the temperature of the waste water is low (e.g. below 12 °C).
Phosphorus removal			
h	Precipitation	Total phosphorus	Generally applicable.
i	Enhanced biological phosphorus removal		
j	Phosphorus recovery as struvite		Only applicable to waste water streams with a high total phosphorus content (e.g. above 50 mg/l) and a significant flow.
Final solids removal			
k	Coagulation and flocculation	Suspended solids and particulate-bound non-biodegradable or inhibitory pollutants	Generally applicable.
l	Sedimentation		
m	Filtration (e.g. sand filtration, microfiltration, ultrafiltration, reverse osmosis)		
n	Flotation		

([1]) The descriptions of the techniques are given in Section 1.4.1.

Table 1.1

BAT-associated emission levels (BAT-AELs) for direct discharges

Substance/Parameter	Unit	BAT-AEL ([1]) ([2])
Chemical oxygen demand (COD) ([3])	mg/l	25–100 ([4]) ([5])
Total organic carbon (TOC) ([3])		7–35 ([5]) ([6])
Total suspended solids (TSS)		4–30 ([5]) ([7]) ([8])
Total nitrogen (Total N)		2–25 ([5]) ([9]) ([10])

Substance/Parameter		Unit	BAT-AEL ([1]) ([2])
Total phosphorus (Total P)			0,25–2 ([5])
Adsorbable organically bound halogens (AOX) ([11])			0,02–0,3
Metals	Copper (Cu) ([11])		0,01–0,2 ([12])
	Zinc (Zn) ([11])		0,05–0,5 ([12])

([1]) The averaging periods are defined in the general considerations.
([2]) No BAT-AEL applies for biochemical oxygen demand (BOD). As an indication, the yearly average BOD_5 level in the effluent from a biological waste water treatment plant will generally be ≤ 20 mg/l.
([3]) Either the BAT-AEL for COD or the BAT-AEL for TOC applies. The BAT-AEL for TOC is the preferred option because TOC monitoring does not rely on the use of very toxic compounds.
([4]) The upper end of the BAT-AEL range may be higher and up to 120 mg/l for installations processing animal by-products and/or edible co-products, only if the COD abatement efficiency is ≥ 95 % as a yearly average or as an average over the production period.
([5]) The BAT-AEL range may not apply for discharges of seawater from fishmeal and fish oil production.
([6]) The upper end of the BAT-AEL range may be higher and up to 40 mg/l for installations processing animal by-products and/or edible co-products, only if the TOC abatement efficiency is ≥ 95 % as a yearly average or as an average over the production period.
([7]) The lower end of the BAT-AEL range is typically achieved when using filtration (e.g. sand filtration, microfiltration, ultrafiltration).
([8]) The upper end of the BAT-AEL range may be higher and up to 40 mg/l for gelatine manufacturing.
([9]) The BAT-AEL may not apply when the temperature of the waste water is low (e.g. below 12 °C) for prolonged periods.
([10]) The upper end of the BAT-AEL range may be higher and up to 40 mg/l for installations processing animal by-products and/or edible co-products only if the Total N abatement efficiency is ≥ 90 % as a yearly average or as an average over the production period.
([11]) The BAT-AEL only applies when the substance/parameter concerned is identified as relevant in the waste water stream based on the inventory of inputs and outputs mentioned in BAT 2.
([12]) The BAT-AEL only applies to slaughterhouses.

The associated monitoring is given in BAT 7.

Table 1.2

BAT-associated emission levels (BAT-AELs) for indirect discharges

Substance/Parameter		Unit	BAT-AEL ([1]) ([2])
Adsorbable organically bound halogens (AOX) ([3])		mg/l	0,02–0,3
Metals	Copper (Cu) ([3])		0,01–0,2 ([4])
	Zinc (Zn) ([3])		0,05–0,5 ([4])

([1]) The averaging periods are defined in the general considerations.
([2]) The BAT-AELs may not apply if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned, provided this does not lead to a higher level of pollution in the environment.
([3]) The BAT-AEL only applies when the substance/parameter concerned is identified as relevant in the waste water stream based on the inventory of inputs and outputs mentioned in BAT 2.
([4]) The BAT-AEL only applies to slaughterhouses.

The associated monitoring is given in BAT 7.

1.1.8 **Emissions to air**

BAT 15. In order to reduce emissions to air of CO, dust, NO_X and SO_X from the combustion (e.g. in thermal oxidisers or steam boilers) of malodorous gases, including non-condensable gases, BAT is to use technique (a) and one or an appropriate combination of the techniques (b) to (d) given below.

	Technique	Description	Main compounds targeted	Applicability
a	Optimisation of thermal oxidation or combustion in boilers	Optimisation of design and operation of boilers or thermal oxidisers to promote the oxidation of organic compounds, as well as to reduce the generation of pollutants such as NO_X and CO.	CO, NO_X	Generally applicable.
b	Removal of high levels of dust, NO_X and SO_X precursors	Removal (if possible, for reuse) of high levels of dust, NO_X and SO_X precursors prior to combustion of malodorous gases or thermal oxidation, e.g. by condensation. Additional post-combustion removal of dust, NO_X and SO_X may be carried out using wet scrubbing for example.	Dust, NO_X, SO_X	
c	Fuel choice	The use of fuel (including support/auxiliary fuel) with a low content of potential pollution-generating compounds (e.g. low sulphur, ash, nitrogen, fluorine or chlorine content in the fuel).	Dust, NO_X, SO_X	
d	Low-NO_X burner	The technique is based on the principles of reducing peak flame temperatures. The air/fuel mixing reduces the availability of oxygen and reduces the peak flame temperature, thus retarding the conversion of fuel-bound nitrogen to NO_X and the formation of thermal NO_X, while maintaining high combustion efficiency. This may be associated with a modified design of the furnace combustion chamber.	NO_X	Applicability to existing plants may be restricted by design and/or operational constraints.

Table 1.3

BAT-associated emission levels (BAT-AELs) for channelled emissions to air of dust, NO_X and SO_X from the combustion in thermal oxidisers of malodorous gases, including non-condensable gases

Substance/Parameter	Unit	BAT-AEL (average over the sampling period)
Dust	mg/Nm³	< 1–5 (1)
NO_X		50–200 (1) (2)
SO_X		6–100

(1) The BAT-AEL range only applies when using exclusively natural gas as a fuel.
(2) The upper end of the BAT-AEL range may be higher and up to 350 mg/Nm³ for recuperative thermal oxidisers.

The associated monitoring is given in BAT 8.

Table 1.4

Indicative emission level for channelled CO emissions to air from the combustion in thermal oxidisers of malodorous gases, including non-condensable gases

Substance	Unit	Indicative emission level (average over the sampling period)
CO	mg/Nm^3	3–30

The associated monitoring is given in BAT 8.

1.1.9 **Noise**

BAT 16. In order to prevent or, where that is not practicable, to reduce noise emissions, BAT is to set up, implement and regularly review a noise management plan, as part of the environmental management system (see BAT 1), that includes all of the following elements:

— a protocol containing appropriate actions and timelines;

— a protocol for conducting noise emissions monitoring;

— a protocol for response to identified noise events, e.g. complaints;

— a noise reduction programme designed to identify the source(s), to measure/estimate noise exposure, to characterise the contributions of the sources and to implement prevention and/or reduction measures.

Applicability

The applicability is restricted to cases where a noise nuisance at sensitive receptors is expected and/or has been substantiated.

BAT 17. 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.

Technique		Description	Applicability
a	Appropriate location of equipment and buildings	Increasing the distance between the emitter and the receiver, by using buildings as noise screens and by relocating equipment and/or buildings' exits or entrances.	For existing plants, the relocation of equipment and buildings' exits or entrances may not be applicable due to lack of space and/or excessive costs.
b	Operational measures	These include techniques such as: i. inspection and maintenance of equipment; ii. closing of doors and windows of enclosed areas, if possible; iii. equipment operation by experienced staff; iv. avoidance of noisy activities at night, if possible; v. provisions for noise control, e.g. during production and maintenance activities; vi. limitation of noise from animals in slaughterhouses (e.g. through careful transport and handling).	Generally applicable.
c	Low-noise equipment	This includes techniques such as low-noise compressors, pumps and fans.	

Technique		Description	Applicability
d	Noise control equipment	This includes techniques such as: i. noise reducers; ii. acoustic insulation of equipment; iii. enclosure of noisy equipment; iv. soundproofing of buildings.	May not be applicable to existing plants due to lack of space.
e	Noise abatement	Inserting obstacles between emitters and receivers (e.g. protection walls, embankments).	Generally applicable.

1.1.10 **Odour**

BAT 18. In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to set up, implement and regularly review an odour management plan, as part of the environmental management system (see BAT 1), that includes all of the following elements:

— A protocol containing appropriate actions and timelines.

— A protocol for conducting odour monitoring. It may be complemented by measurement/estimation of odour exposure or estimation of odour impact.

— A protocol for response to identified odour incidents, e.g. complaints.

— An odour prevention and reduction programme designed to identify the source(s); to measure/estimate odour exposure; to characterise the contributions of the sources; and to implement prevention and/or reduction measures.

Applicability

The applicability is restricted to cases where an odour nuisance at sensitive receptors is expected and/or has been substantiated.

BAT 19. In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to use an appropriate combination of the techniques given below.

Technique		Description	Applicability
a.	Regular cleaning of installations and equipment	Regular cleaning (e.g. daily) of installations and equipment including areas where animal by-products and/or edible co-products are stored and processed.	Generally applicable.
b.	Cleaning and disinfection of vehicles and equipment used to transport and deliver animal by-products and/or edible co-products	Transport vehicles and delivery equipment (e.g. containers) are cleaned and disinfected after being emptied.	
c.	Enclosure of animal by-products and/or edible co-products during transport, reception, loading/unloading and storage	Loading/unloading and reception areas are situated in enclosed ventilated buildings. Appropriate equipment is used for transport and storage of the animal by-products and/or edible co-products.	May not be applicable to existing plants due to lack of space.

Technique		Description	Applicability
d.	Minimisation of biological degradation of animal by-products and/or edible co-products	See BAT 12 (a).	Generally applicable.
e.	Air extraction as close as possible to the point of odour generation.	Air extraction as close as possible to the point of odour generation with full or partial enclosure. Extracted air may be treated (see BAT 25).	Generally applicable.

BAT-AELs for channelled emissions to air of odour: see Table 1.10 and Table 1.11.

1.1.11 **Use of refrigerants**

BAT 20. In order to prevent emissions of ozone-depleting substances and of substances with a high global warming potential from cooling and freezing, BAT is to use refrigerants without ozone depletion potential and with a low global warming potential.

Description

Suitable refrigerants include for example water, carbon dioxide, propane and ammonia.

1.2 ***BAT conclusions for slaughterhouses***

The BAT conclusions in this section apply in addition to the general BAT conclusions given in Section 1.1.

1.2.1 **Energy efficiency**

BAT 21. In order to increase energy efficiency, BAT is to use both of the techniques given in BAT 9 in combination with both of the techniques given below.

Technique		Description	Applicability
a	Refrigeration management plan	See Section 1.4.3.	Generally applicable.
b	Techniques for efficient scalding of pigs and/or poultry	These include techniques such as: — steam scalding of pigs; — immersion scalding of pigs and/or poultry with optimised water flow systems.	Applicability to existing plants may be restricted by the plant layout/lack of space.

Table 1.5

BAT-associated environmental performance levels (BAT-AEPLs) for specific net energy consumption in slaughterhouses

Slaughtered animals	Unit ([1])	Specific net energy consumption (yearly average) ([2])
Cattle	kWh/tonne of carcasses	116–240 ([3])
	kWh/animal	30–80 ([4])

Slaughtered animals	Unit ([1])	Specific net energy consumption (yearly average) ([2])
Pigs	kWh/tonne of carcasses	65–370 ([5])
	kWh/animal	4–35 ([5])
Chickens	kWh/tonne of carcasses	170–490 ([5])
	kWh/animal	0,25–0,90 ([5])

([1]) Either the BAT-AEPL expressed in kWh/tonne of carcasses or the BAT-AEPL expressed in kWh/animal applies.
([2]) The BAT-AEPLs refer to the exclusive slaughtering of the animals in question.
([3]) The upper end of the BAT-AEPL range may be higher and up to 415 kWh/tonne of carcasses if the specific net energy consumption includes energy consumed by FDM activities.
([4]) The upper end of the BAT-AEPL range may be higher and up to 150 kWh/animal if the specific net energy consumption includes energy consumed by FDM activities.
([5]) The BAT-AEPL range may not be applicable to installations producing more than 50 % convenience products (i.e. meat products processed further than simple meat cuts, e.g. marinated products, sausages) as a proportion of the total weight of the FDM products.

The associated monitoring is given in BAT 6.

1.2.2 **Water consumption and waste water generation**

BAT 22. In order to reduce water consumption and the amount of waste water generated, BAT is to use both techniques (a) and (b) given in BAT 10, together with an appropriate combination of the techniques (c) to (k) given in BAT 10 and of the techniques given below.

Technique		Description	Applicability
a	Dry emptying of cattle/pig stomachs	Cattle/pig stomachs are emptied by using machines without water.	Generally applicable.
b	Dry collection of the contents of pigs' small intestines	Pigs' small intestines are emptied by pulling them between a pair of rollers. Their content is collected in a tray and pumped to a container.	
c	Techniques for efficient scalding	See BAT 21 (b).	Applicability to existing plants may be restricted by the plant layout/lack of space.

Table 1.6

BAT-associated environmental performance levels (BAT-AEPLs) for specific waste water discharge

Slaughtered animals	Unit ([1])	Specific waste water discharge (yearly average) ([2])
Cattle	m^3/tonne of carcasses	1,85–3,90 ([3])
	m^3/animal	0,30–1,30 ([4])
Pigs	m^3/tonne of carcasses	0,70–3,50
	m^3/animal	0,07–0,30

Slaughtered animals	Unit ([1])	Specific waste water discharge (yearly average) ([2])
Chickens	m^3/tonne of carcasses	1,45–6,30
	m^3/animal	0,002–0,013

([1]) Either the BAT-AEPL expressed in m^3/tonne of carcasses or the BAT-AEPL expressed in m^3/animal applies.
([2]) The BAT-AEPLs refer to the exclusive slaughtering of the animals in question.
([3]) The upper end of the BAT-AEPL range may be higher and up to 5,25 m^3/tonne of carcasses in case the specific waste water discharge includes water used by FDM activities.
([4]) The upper end of the BAT-AEPL range may be higher and up to 2,45 m^3/animal in case the specific waste water discharge includes water used by FDM activities.

The associated monitoring is given in BAT 6.

1.2.3 **Use of refrigerants**

BAT 23. In order to prevent or, where that is not practicable, to reduce refrigerant losses, BAT is to use technique (a) and one or both of the techniques (b) and (c) given below.

Technique		Description
a	Refrigeration management plan	See Section 1.4.3.
b	Preventive and corrective maintenance	The correct operation of the refrigeration equipment is regularly reviewed and any deviations/malfunctions are corrected/fixed in a timely manner.
c	Use of refrigerant leak detectors	A centralised alarm system is used in order to promptly identify refrigerant leaks.

Table 1.7

Indicative emission level for refrigerant losses

Type of refrigerant	Unit	Indicative emission level (rolling average over 3 years)
Any type of refrigerant	Percentage (%) of the total amount of refrigerant contained in the cooling system(s)	< 1–5

The associated monitoring is given in BAT 6.

1.3 ***BAT conclusions for installations processing animal by-products and/or edible co-products***

The BAT conclusions in this section apply in addition to the general BAT conclusions given in Section 1.1.

1.3.1 **Energy efficiency**

BAT 24. In order to increase energy efficiency, BAT is to use both of the techniques given in BAT 9, if appropriate in combination with multiple-effect evaporators.

Description

Multiple-effect evaporators are used to remove water from liquid mixtures generated for example in fat melting, rendering, and fishmeal and fish oil production. Steam is introduced in a series of successive vessels, each one exhibiting a lower temperature and pressure than the previous one.

Table 1.8

BAT-associated environmental performance levels (BAT-AEPLs) for specific net energy consumption in installations processing animal by-products and/or edible co-products

Type of installation/process(es)	Unit	Specific net energy consumption (yearly average)
Rendering, fat melting, blood and/or feather processing	kWh/tonne of raw material	120–910
Fishmeal and fish oil production		420–710
Gelatine manufacturing		1 380–2 500 ([1])

([1]) The BAT-AEPL applies to installations using exclusively pig skin as raw material.

The associated monitoring is given in BAT 6.

1.3.2 **Water consumption and waste water generation**

The environmental performance levels for specific waste water discharge given below are associated with the general BAT conclusions given in Section 1.1.4.

Table 1.9

BAT-associated environmental performance levels (BAT-AEPLs) for specific waste water discharge

Type of installation/process(es)	Unit	Specific waste water discharge (yearly average)
Rendering, fat melting, blood and/or feather processing	m^3/tonne of raw material	0,2–1,55
Fishmeal and fish oil production		0,20–1,25 ([1])
Gelatine manufacturing		16,5–27 ([2])

([1]) The BAT-AEPL range may not apply for discharges of seawater from fishmeal and fish oil production.
([2]) The BAT-AEPL applies to installations using exclusively pig skin as raw material.

The associated monitoring is given in BAT 6.

1.3.3 **Emissions to air**

BAT 25. In order to reduce emissions to air of organic compounds and malodorous compounds, including H_2S and NH_3, BAT is to use one or a combination of the techniques given below.

Technique		Description
a.	Condensation	See Section 1.4.2. The technique is used together with one or a combination of the techniques (b) to (g) for the treatment of non-condensable gases.
b.	Adsorption	See Section 1.4.2.
c.	Biofilter	
d.	Combustion in a steam boiler of malodorous gases, including non-condensable gases	
e.	Thermal oxidation	
f.	Wet scrubber	
g.	Bioscrubber	

Table 1.10

BAT-associated emission levels (BAT-AELs) for channelled emissions to air of odour, organic compounds, NH_3 and H_2S from rendering, fat melting, blood and/or feather processing

Substance/Parameter	Unit	BAT-AEL
Odour concentration	ou_E/m^3	200–1 100 ([1]) ([2])
TVOC	mg C/Nm^3	0,5–16
NH_3	mg/Nm^3	0,1–4 ([3])
H_2S		< 0,1–1 ([4])

([1]) The BAT-AEL range may not apply in the case of combustion (e.g. in thermal oxidisers or steam boilers) of malodorous gases when both of the following conditions are fulfilled:
— the combustion temperature is sufficiently high (typically in the range 750– 850 °C) with a sufficient residence time (typically between 1 and 2 seconds); and
— the odour abatement efficiency is ≥ 99 %, or as an alternative, process odour is not perceptible in the treated waste gases.

([2]) In the case of abatement technique(s) other than combustion of malodorous gases, the upper end of the BAT-AEL range may be higher and up to 3 000 ou_E/m^3 if the abatement efficiency is ≥ 92 % or, as an alternative, process odour is not perceptible in the treated waste gases.

([3]) The upper end of the BAT-AEL range may be higher and up to 7 mg/Nm^3 in the case of combustion (e.g. in thermal oxidisers or steam boilers) of malodorous gases.

([4]) The BAT-AEL range only applies when H_2S is identified as relevant in the waste gas stream based on the inventory of inputs and outputs mentioned in BAT 2.

The associated monitoring is given in BAT 8.

Table 1.11

BAT-associated emission levels (BAT-AELs) for channelled emissions to air of odour, organic compounds and NH_3 from fishmeal and fish oil production

Substance/Parameter	Unit	BAT-AEL
Odour concentration	ou_E/m^3	400–3 500 ([1])
TVOC ([2])	mg C/Nm^3	1–14
NH_3 ([2])	mg/Nm^3	0,1–7

([1]) The BAT-AEL range may not apply in the case of combustion (e.g. in thermal oxidisers or steam boilers) of malodorous gases when both of the following conditions are fulfilled:
— the combustion temperature is sufficiently high (typically in the range 750– 850 °C) with a sufficient residence time (typically between 1 and 2 seconds) and;
— the odour abatement efficiency is ≥ 99 % or, as an alternative, process odour is not perceptible in the treated waste gases.

([2]) The BAT-AEL only applies to the combustion (e.g. in thermal oxidisers or steam boilers) of malodourous gases, including non-condensable gases.

The associated monitoring is given in BAT 8.

1.4 *Description of techniques*

1.4.1 **Emissions to water**

Technique	Description
Activated sludge process	A biological process in which the microorganisms are maintained in suspension in the waste water and the whole mixture is mechanically aerated. The activated sludge mixture is sent to a separation facility from where the sludge is recycled to the aeration tank.
Aerobic lagoon	Shallow earthen basin for the biological treatment of waste water, the content of which is periodically mixed to allow oxygen to enter the liquid through atmospheric diffusion.
Anaerobic contact process	An anaerobic process in which waste water is mixed with recycled sludge and then digested in a sealed reactor. The water/sludge mixture is separated externally.
Chemical oxidation (e.g. with ozone)	Chemical oxidation is the conversion of pollutants by chemical-oxidising agents other than oxygen/air or bacteria into similar but less harmful or hazardous compounds and/or to short-chained and more easily degradable or biodegradable organic components. Ozone is one example of a chemical-oxidising agent applied.
Coagulation and flocculation	Coagulation and flocculation are used to separate suspended solids from waste water and are often carried out in successive steps. Coagulation is carried out by adding coagulants with charges opposite to those of the suspended solids. Flocculation is carried out by adding polymers, so that collisions of microfloc particles cause them to bond to produce larger flocs.
Equalisation	Balancing of flows and pollutant loads by using tanks or other management techniques.
Enhanced biological phosphorus removal	A combination of aerobic and anaerobic treatment to selectively enrich polyphosphate-accumulating microorganisms in the bacterial community within the activated sludge. These microorganisms take up more phosphorus than is required for normal growth.

Technique	Description
Filtration	The separation of solids from waste water by passing it through a porous medium, e.g. sand filtration, microfiltration and ultrafiltration.
Flotation	The separation of solid or liquid particles from waste water by attaching them to fine gas bubbles, usually air. The buoyant particles accumulate at the water surface and are collected with skimmers.
Membrane bioreactor	A combination of activated sludge treatment and membrane filtration. Two variants are used: a) an external recirculation loop between the activated sludge tank and the membrane module; and b) immersion of the membrane module in the aerated activated sludge tank, where the effluent is filtered through a hollow fibre membrane, with the biomass remaining in the tank.
Neutralisation	The adjustment of the pH of waste water to a neutral level (approximately 7) by the addition of chemicals. Sodium hydroxide (NaOH) or calcium hydroxide ($Ca(OH)_2$) is generally used to increase the pH, whereas sulphuric acid (H_2SO_4), hydrochloric acid (HCl) or carbon dioxide (CO_2) is generally used to decrease the pH. The precipitation of some substances may occur during neutralisation.
Nitrification and/or denitrification	A two-step process that is typically incorporated into biological waste water treatment plants. The first step is the aerobic nitrification where microorganisms oxidise ammonium (NH_4^+) to the intermediate nitrite (NO_2^-), which is then further oxidised to nitrate (NO_3^-). In the subsequent anoxic denitrification step, microorganisms chemically reduce nitrate to nitrogen gas.
Phosphorus recovery as struvite	Phosphorus contained in waste water streams is recovered by precipitation in the form of struvite (magnesium ammonium phosphate).
Precipitation	The conversion of dissolved pollutants into insoluble compounds by adding chemical precipitants. The solid precipitates formed are subsequently separated by sedimentation, air flotation, or filtration. Multivalent metal ions (e.g. calcium, aluminium, iron) are used for phosphorus precipitation.
Sedimentation	The separation of suspended particles by gravitational settling.

1.4.2 **Emissions to air**

Technique	Description
Adsorption	Organic compounds are removed from a waste gas stream by retention on a solid surface (typically activated carbon).
Bag filter	Bag filters, often referred to as fabric filters, are constructed from porous woven or felted fabric through which gases are passed to remove particles. The use of a bag filter requires the selection of a fabric suitable for the characteristics of the waste gas and the maximum operating temperature.
Biofilter	The waste gas stream is passed through a bed of organic material (such as peat, heather, compost, root, tree bark, softwood and different combinations) or some inert material (such as clay, activated carbon, and polyurethane), where it is biologically oxidised by naturally occurring microorganisms into carbon dioxide, water, inorganic salts and biomass.

Technique	Description
	A biofilter is designed considering the type(s) of waste input. An appropriate bed material, e.g. in terms of water retention capacity, bulk density, porosity, structural integrity, is selected. Also important are an appropriate height and surface area of the filter bed. The biofilter is connected to a suitable ventilation and air circulation system in order to ensure a uniform air distribution through the bed and a sufficient residence time of the waste gas inside the bed. Biofilters can be divided into open-top biofilters and enclosed biofilters.
Bioscrubber	A packed tower filter with inert packing material which is normally continuously moistened by sprinkling water. Air pollutants are absorbed in the liquid phase and subsequently degraded by microorganisms settling on the filter elements.
Combustion in a steam boiler of malodorous gases, including non-condensable gases	Malodorous gases, including non-condensable gases, are burned in a steam boiler in the installation.
Condensation	The removal of vapours of organic and inorganic compounds from a process off-gas or waste gas stream by reducing its temperature below its dew point so that the vapours liquefy.
Thermal oxidation	The oxidation of combustible gases and odorants in a waste gas stream by heating the mixture of contaminants with air or oxygen to above its auto-ignition point in a combustion chamber and maintaining it at a high temperature long enough to complete its combustion to carbon dioxide and water.
Wet scrubber	The removal of gaseous or particulate pollutants from a gas stream via mass transfer to a liquid solvent, often water or an aqueous solution. It may involve a chemical reaction (e.g. in an acid or alkaline scrubber). In some cases, the compounds may be recovered from the solvent.

1.4.3 **Use of refrigerants**

Refrigeration management plan	A refrigeration management plan is part of the environmental management system (see BAT 1) and entails: — monitoring of energy consumption of the refrigeration system (see BAT 6); — operational measures such as inspection and maintenance of equipment, closing of doors when possible; equipment operation by experienced staff; — monitoring of refrigerant losses (see BAT 6).