6 BEST AVAILABLE TECHNIQUES (BAT) CONCLUSIONS FOR WASTE TREATMENT

Colour code used in this document:

Green text:	text included in Draft 1 (D1) of the revised WT BREF
~~Strikethrough text~~:	~~text~~ included in Draft 1 (D1) of the revised WT BREF that is proposed to be deleted
Purple text:	revised text of the WT BAT conclusions proposed for the final TWG meeting

[NOTE: Whilst cross-references are provided to other parts of this document in order to aid the work of the TWG, they will not be included in the final BAT conclusions themselves. Such cross-references are consequently displayed in *italic green* or *italic purple* between square brackets.]

Scope

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

- 5.1. Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving one or more of the following activities:
  - (a) biological treatment;
  - (b) physico-chemical treatment;
  - (c) blending or mixing prior to submission to any of the other activities listed in points 5.1 and 5.2 of Annex I to Directive 2010/75/EU;
  - (d) repackaging prior to submission to any of the other activities listed in points 5.1 and 5.2 of Annex I to Directive 2010/75/EU;
  - (e) solvent reclamation/regeneration;
  - (f) recycling/reclamation of inorganic materials other than metals or metal compounds;
  - (g) regeneration of acids or bases;
  - (h) recovery of components used for pollution abatement;
  - (i) recovery of components from catalysts;
  - (j) oil re-refining or other reuses of oil;

- 5.3.
  - (a) Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day involving one or more of the following activities, and excluding activities covered by Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment:
    - (i) biological treatment;
    - (ii) physico-chemical treatment;
    - (iii) pre-treatment of waste for incineration or co-incineration;
    - (iv) treatment of ashes;
    - (v) treatment in shredders of metal waste, including waste electrical and electronic equipment and end-of-life vehicles and their components.
  - (b) Recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day involving one or more of the following activities, and excluding activities covered by Directive 91/271/EEC:
    - (i) biological treatment;
    - (ii) pre-treatment of waste for incineration or co-incineration;
    - (iii) treatment of ashes;

(iv) treatment in shredders of metal waste, including waste electrical and electronic equipment and end-of-life vehicles and their components.

When the only waste treatment activity carried out is anaerobic digestion, the capacity threshold for this activity shall be 100 tonnes per day.

- 5.5. Temporary storage of hazardous waste not covered under point 5.4 ~~[~~of Annex I to Directive 2010/75/EU~~]~~ pending any of the activities listed in points 5.1, 5.2, 5.4 and 5.6 ~~[~~of Annex I to Directive 2010/75/EU~~]~~ with a total capacity exceeding 50 tonnes, excluding temporary storage, pending collection, on the site where the waste is generated.
- 6.11. Independently operated treatment of waste water not covered by Directive 91/271/EEC and discharged by an installation ~~[~~undertaking activities covered under points 5.1, 5.3 and 5.5 above~~]~~.

These BAT conclusions do not address the following:

- Surface impoundment~~ of waste~~.
- Disposal or recycling of animal carcases or of animal waste covered by the activity description in Section 6.5 of Annex I to Directive 2010/75/EU; this may be covered by the BAT conclusions on the slaughterhouses and animal by-products industries (SA).
- Direct recovery (i.e. without pretreatment) of waste as a substitute for raw materials in installations carrying out activities covered by other BAT conclusions, ~~i.e.~~ e.g.:
  - direct recovery of lead (e.g. from batteries), zinc or aluminium salts or recovery of the metals from catalysts; this may be covered by the BAT conclusions for the non-ferrous metals industries (NFM);
  - paper waste recycling; this may be covered by the BAT conclusions for the production of pulp, paper and board (PP);
  - use of waste as fuel/raw material in cement kilns; this may be covered by the BAT conclusions for the production of cement, lime and magnesium oxide (CLM).
- Waste (co-) incineration, ~~co-incineration,~~ pyrolysis and gasification; this may be covered by the BAT conclusions for waste incineration (WI) or the BAT conclusions for large combustion plants (LCP).
- Landfill of waste; this is covered by Directive 1999/31/EC on the landfill of waste. In particular, underground permanent and long-term storage (≥ 1 year before disposal, ≥ 3 years before recovery) are covered by Directive 1999/31/EC.
- *In situ* remediation of contaminated soil (i.e. unexcavated soil).
- Treatment of ~~slags and bottom ash~~ solid residues from incineration or combustion except fly ashes; this may be covered by the BAT conclusions for waste incineration (WI) and/or the BAT conclusions for large combustion plants (LCP);
- The smelting of scrap metal; this may be covered in the BAT conclusions for non-ferrous metals industries (NFM), the BAT conclusions for iron and steel production (IS), and/or the BAT conclusions for the smitheries and foundries industry (SF).
- Combustion of fuels when it does not generate hot gases which come into direct contact with the waste .This may be covered in the BAT conclusions for large combustion plants (LCP) or by Directive 2015/2193/EU.

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

- Economics and cross-media effects (ECM);
- Emissions from storage (EFS);
- Energy efficiency (ENE);
- Monitoring of emissions to air and water from IED installations (ROM);
- Production of cement, lime and magnesium oxide (CLM);
- Common waste water and waste gas treatment/management systems in the chemical sector (CWW).

Reference document	Subject
Economics and Cross-Media Effects (ECM)	Economics and cross-media effects of techniques
Emissions from Storage (EFS)	Storage, transfer and handling of solids and liquids
Energy Efficiency (ENE)	General aspects of energy efficiency
Monitoring of emissions to air and water from IED installations (ROM)	Monitoring of emissions to air and water
Production of Cement, Lime and Magnesium Oxide (CLM)	Waste quality control and safety management for the use of hazardous waste materials
Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector (CWW)	Waste water treatment techniques and treatment of water-based liquid waste

These BAT conclusions apply without prejudice to other relevant legislation, e.g. on health and safety.

Definitions

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

Term used	Definition
General terms	
Channelled emissions	Emissions of pollutants into the environment through any kind of duct, pipe, stack, etc.
Declaration of cleanliness	Written document provided by the waste producer/holder certifying that the concerned waste (e.g. drums, containers) has been cleaned.
Diffuse emissions	Non-channelled emissions (e.g. of dust, organic compounds~~VOC~~) which can result from 'area' sources (e.g. tanks) or 'point' sources (e.g. pipe flanges).
Direct discharge	Discharge to a receiving water body without further downstream treatment.
Dust	Total particulate matter (in air)
Emissions factors	Numbers that can be multiplied by known data such as plant/process ~~activity~~ data or throughput data to estimate emissions.
Existing plant	A plant that is not a new plant.
Flaring	High-temperature oxidation to burn combustible compounds of waste gases from industrial operations with an open flame. Flaring is primarily used for burning off flammable gas for safety reasons or during non-routine operating conditions.
Fly ash	The fine fraction of the ash that leaves the combustion chamber with the flue-gas.
Fugitive emissions	Diffuse emissions from 'point' sources.
Indirect discharge	Discharge which is not a direct discharge.
Laboratory smalls	Laboratory chemicals in containers of a small capacity (e.g. below five litres).
Major plant upgrade	A major change in the design or technology of a plant with major adjustments or replacements of the process and/or abatement technique(s) and associated equipment.
Mechanical biological treatment (MBT)	Treatment of mixed solid waste combining mechanical treatment (e.g. shredding) with biological treatment such as aerobic or anaerobic treatment.
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.
Output	The treated material exiting the waste treatment plant.
~~Pasty waste~~	~~Non-pumpable waste (e.g. sludge).~~
Periodic measurement	Determination of a measure (particular quantity subject to measurement) at specified time intervals using manual or automated methods.
Recovery	Recovery as defined in Article 3(15) of Directive 2008/98/EC.
Re-refining	Treatments carried out on waste oil to transform it to base oil.
Regeneration	Treatments and processes mainly designed to make the treated equipment (e.g. activated carbon) or material (e.g. spent solvent) ~~usable again~~ suitable again for a similar use.
Residues	Materials generated by the activities covered by the scope of this document, as waste or by-products.
Sensitive receptor	Area which needs special protection, such as: - residential areas; - areas where human activities are carried out (e.g. workplaces, schools, daycare centres, recreational areas, hospitals or nursing homes).
Surface impoundment	Placement of liquid or sludgy discards into pits, ponds, lagoons, etc.

Treatment of waste with calorific value	Treatment of waste wood, waste oil, waste plastics, waste solvents, etc. to obtain a fuel or to allow a better recovery of its calorific value.
VFCs	Volatile (hydro)fluorocarbons: VOCs consisting of fluorinated (hydro)carbons, in particular chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs).
VHCs	Volatile hydrocarbons: VOCs consisting entirely of hydrogen and carbon (e.g. ethane, propane, iso-butane, cyclopentane)..
VOC	Volatile organic compound as defined in Article 3(45) of Directive 2010/75/EU.
Waste holder	Waste holder as defined in Article 3(6) of Directive 2008/98/EC.
Waste input	The incoming waste to be treated in the waste treatment plant.
Water-based liquid waste	Waste consisting of aqueous liquids or sludge with a relatively high water content (e.g. > 80 wt-%).

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

~~**Parameters**~~	~~**Definition**~~
	Pollutants/parameters
AOX	Adsorbable organically bound halogens, expressed as Cl, include adsorbable organically bound chlorine, bromine and iodine.
Arsenic	Arsenic, expressed as As, includes all inorganic and organic arsenic compounds, dissolved or bound to particles.
Cadmium	Cadmium, expressed as Cd, includes all inorganic and organic cadmium compounds, dissolved or bound to particles.
Chromium	Chromium, expressed as Cr, includes all inorganic and organic chromium compounds, dissolved or bound to particles.
Hexavalent chromium	Hexavalent chromium, expressed as Cr(VI), includes all chromium compounds where the chromium is in the oxidation state +6.
COD	Chemical oxygen demand. Amount of oxygen needed for the total chemical oxidation of the organic matter to carbon dioxide. COD is an indicator for the mass concentration of organic compounds.
Copper	Copper, expressed as Cu, includes all inorganic and organic copper compounds, dissolved or bound to particles.
Cyanide	Free cyanide, expressed as CN^-.
Hydrocarbon oil index (HOI)	The sum of compounds extractable with a hydrocarbon solvent (including long-chain or branched aliphatic, alicyclic, aromatic or alkyl-substituted aromatic hydrocarbons).
HCl	All inorganic gaseous chlorine compounds, expressed as HCl.
HF	All inorganic gaseous fluorine compounds, expressed as HF.
H_2S	Hydrogen sulphide. Carbonyl sulphide and mercaptan are not included.
Lead	Lead, expressed as Pb, includes all inorganic and organic lead compounds, dissolved or bound to particles.
Mercury	Mercury, expressed as Hg, includes elementary mercury and all inorganic and organic mercury compounds, gaseous, dissolved or bound to particles.
NH_3	Ammonia.
Nickel	Nickel, expressed as Ni, includes all inorganic and organic nickel compounds, dissolved or bound to particles.
PCB	Polychlorinated biphenyl
Dioxin-like PCBs	Polychlorinated biphenyls as listed in Commission Regulation (EC) 199/2006.
PCDD/F	Polychlorinated dibenzo-*p*-dioxin/-furan(s)
Phenol index	The sum of phenolic compounds, expressed as phenol concentration and measured according to EN ISO 14402.
TOC	Total organic carbon, expressed as C (in water), includes all organic compounds.

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 P	Total phosphorus, expressed as P, includes all inorganic and organic phosphorus compounds, dissolved or bound to particles
Total suspended solids (TSS)	Total suspended solids. Mass concentration of all suspended solids (in water), measured via filtration through glass fibre filters and gravimetry.
TVOC	Total volatile organic carbon, expressed as C (in air).
VOC	Volatile Organic Compound as defined in Article 3(45) of Directive 2010/75/EU
Zinc	Zinc, expressed as Zn, includes all inorganic and organic zinc compounds, dissolved or bound to particles.

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

Acronym	Definition
APC	Air pollution control
EMS	Environmental management system
EoLVs	End-of-life vehicles (as defined in Article 2(2) of Directive 2000/53/EC)
~~FGT~~	~~Flue-gas treatment~~
HEPA	High-efficiency particle air filter
IBC	Intermediate bulk container
LDAR	Leak detection and repair
LEV	Local exhaust ventilation system
~~MBT~~	~~Mechanical biological treatment~~
~~MSW~~	~~Municipal solid waste~~
POP	Persistent organic pollutant (as listed in Regulation (EC) 850/2004)
~~VHC~~	~~Volatile hydrocarbon~~
~~VFC~~	~~Volatile fluorocarbon~~
WEEE	Waste electrical and electronic equipment (as defined in Article 3(1) of Directive 2012/19/EU)
~~WT~~	~~Waste treatment~~
~~WWTP~~	~~Waste water treatment plant~~

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.

[TWG: please note that in order to avoid repetition, this section contains general considerations that are essential to the understanding of the BAT conclusions taken as a stand-alone document, such as:

- reference conditions for air emissions (e.g. dry gas, standard temperature/pressure, oxygen concentration)
- averaging periods
- sampling times
- conversions to reference conditions
- adopted units of measures].

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

Unless stated otherwise, emission levels associated with the best available techniques (BAT-AELs) for 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 and a pressure of 101.3 kPa, without correction for ~~O_2~~ oxygen content, and expressed in µg/Nm³ or mg/Nm³.

For averaging periods of BAT-AELs for emissions to air, the following **definition** applies.

~~**Averaging period**~~	~~**Definition**~~
~~Average of values obtained during one year~~	~~Average of all valid measurement values obtained during one year~~

Averaging period	**Definition**
Average over the sampling period	Average value of three consecutive measurements of at least 30 minutes each (1) (2)
(1) For any parameter where, due to sampling or analytical limitations, 30-minute measurement is inappropriate, a more suitable measurement period may be employed. (2) For PCDD/F or dioxin-like PCBs, a sampling period of 6 to 8 hours is used.	

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

Unless stated otherwise, emission levels associated with the best available techniques (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.

Unless stated otherwise, averaging periods associated with the BAT-AELs ~~refer to the flow-weighted monthly average values of all the following samples taken during that period under normal operating conditions~~ refer to either of the two following cases:

- in the case of continuous discharge, daily average values, i.e. 24-hour flow-proportional composite sample;

- 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 grab sample taken before discharge.

1. for a continuous discharge or batch discharge with a duration of 24 hours or more: 24-hour flow-proportional composite samples,
2. for a batch discharge with a duration of less than 24 hours: flow-proportional composite samples taken over the discharge period,

Time-proportional composite sampling can be used provided that sufficient flow stability is demonstrated.

The flow-weighted monthly average concentration (c_w) is calculated using the following equation:

$$c_w = \sum_{i=1}^{n} c_i q_i \Big/ \sum_{i=1}^{n} q_i$$

Where n: number of measurements;
c_i: average concentration during i[th] measurement;
q_i: average flow rate during i[th] measurement.

All BAT-AELs for emissions to water apply at the point where the emission leaves the installation.

Abatement efficiency

The calculation of the average abatement efficiency referred to in these BAT conclusions (see Table 6.4bis) does not include, for COD and TOC, initial treatment steps aiming at separating the bulk organic content from the water-based liquid waste, such as evapo-condensation, emulsion breaking or phase separation.

6.1 General BAT conclusions

6.1.1 Overall environmental performance

~~6.1.1. Environmental management systems (EMS)~~

BAT 1. In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features:

I. commitment of the management, including senior management;
II. definition, by the management, of an environmental policy that includes the continuous improvement of the environmental performance of the installation ~~by the management~~;
III. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment;
IV. implementation of procedures paying particular attention to:

(a) structure and responsibility,
(b) recruitment, training, awareness and competence,
(c) communication,
(d) employee involvement,
(e) documentation,
(f) effective process control,
(g) maintenance programmes,
(h) emergency preparedness and response,
(i) safeguarding compliance with environmental legislation;

V. checking performance and taking corrective action, paying particular attention to:

(a) monitoring and measurement (see also the JRC Reference Report on Monitoring of emissions to air and water from IED-installations – ROM),
(b) corrective and preventive action,
(c) maintenance of records,
(d) independent (where practicable) internal or external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained;

VI. review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness;
VII. following the development of cleaner technologies;
VIII. consideration for the environmental impacts from the eventual decommissioning of the plant at the stage of designing a new plant, and throughout its operating life;
IX. application of sectoral benchmarking on a regular basis.
X. waste stream management ~~treatment strategy that includes inventories of waste input streams~~ (see BAT 2 ~~and BAT 14~~);
~~XI. procedures to ensure the compatibility of wastes before mixing/blending (see BAT 2);~~
XI. residues management plan (see description in Section 6.6.5);
XII. accident management plan (see description in Section 6.6.5).
XIII. odour management plan (see BAT 8);
XIV. noise and vibration management plan (see 0);

Applicability
The scope (e.g. level of detail) and nature of the EMS (e.g. standardised or non-standardised) will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have (determined also by the type and amount of wastes processed).

[This BAT conclusion is based on information given in Sections 2.3.1.1 and 2.3.1.2]

~~6.1.2. Waste stream management~~

BAT 2. In order to improve the overall environmental performance of the plant, BAT is to use all of the techniques (a) to (e) given below and when relevant, technique (f) also.

	Technique	Description
a	To set up and implement waste characterisation and pre-acceptance procedures	These procedures aim to ensure the technical (and legal) suitability of waste treatment operations for a particular waste prior to the arrival of the waste at the plant. ~~It~~They include~~s~~ procedures to collect information about the waste input and may include waste sampling and characterisation to achieve sufficient knowledge of the waste composition. Waste pre-acceptance procedures are based on a risk assessment considering, for example, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s).
b	To set up and implement waste acceptance procedures	Acceptance procedures aim to confirm the characteristics of the waste, as identified in the pre-acceptance stage. These procedures define the elements to be verified upon the ~~waste~~ arrival of the waste at the plant as well as the waste acceptance and rejection criteria. They may include waste sampling, inspection and analysis. Waste acceptance procedures are based on a risk assessment considering, for example, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s).
c	To set up and implement a waste tracking system and inventory	A waste tracking system and inventory aim to track ~~keep control on~~ the location and quantity of waste in the plant. It holds all the information generated during waste pre-acceptance procedures (e.g. date of arrival at the plant and unique reference number of the waste, information on the previous waste holder(s), pre-acceptance and acceptance analysis results, intended treatment route, nature and quantity of waste held on site including all identified hazards), acceptance, storage, treatment and/or transfer off site. The waste tracking system is based on a risk assessment considering, for example, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s).
c1	To set up and implement an output quality management system	This technique involves setting up and implementing an output quality management system, so as to ensure that the output of the waste treatment is in line with the expectations. This management system also allows the performance of the waste treatment to be monitored and, for this purpose may include a material flow analysis of some components throughout the waste treatment. The use of a material flow analysis is based on a risk assessment considering, for example, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s).
d	To ensure waste segregation	Waste is ~~separated~~ kept separated ~~prior to treatment~~ depending on its properties in order to enable easier and environmentally safer storage and treatment. Waste segregation relies on the physical separation of waste and on procedures that ~~define~~ identify when and where wastes are stored.~~, when the mixing of waste is allowed and how it is carried out.~~

e	To ~~assess~~ ensure waste compatibility prior to mixing or blending of waste	Compatibility is ensured by ~~assessment consists of~~ a set of verification measures and tests in order to detect any unwanted and/or potentially dangerous chemical reactions between wastes (e.g. polymerisation, gas evolution, exothermal reaction, decomposition, crystallisation, precipitation) when mixing, blending, or carrying out other treatment operations. The compatibility tests are defined based on a risk assessment considering, for example, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s).
f	To sort incoming waste	~~Waste~~ Sorting of incoming waste ([1]) aims to prevent unwanted material ~~to enter~~ from entering ~~the~~ subsequent waste treatment process(es). For solid waste, it may include: • manual separation by means of visual examinations to sort out the recyclables and contaminants; • ferrous metals, non-ferrous metals or all-metals separators; • optical separation, e.g. by near-infrared spectroscopy or X-ray systems; • density separation, e.g. by air classification, sink-float tanks, vibration tables; • size separation by screening/sieving.
([1]) Sorting techniques are described in Section 6.6.4.		

[This BAT conclusion is based on information given in Sections 2.3.2.1, 2.3.2.2, 2.3.2.3, 2.3.2.4, 2.3.2.5, 2.3.2.6, 2.3.2.7, ~~and~~ 2.3.2.8 and 2.3.2.9]

BAT 2bis. In order to facilitate the reduction of emissions to water and air and the reduction of water usage, BAT is to establish and to maintain an inventory of waste water and waste gas streams, as part of the environmental management system (see BAT 1), that incorporates all of the following features:

(i) information about the waste to be treated and the waste treatment processes, including:
- (a) simplified process flow sheets that show the origin of the emissions;
- (b) descriptions of process-integrated techniques and waste water/waste gas treatment at source including their performances;

(ii) information, as comprehensive as is reasonably possible, about the characteristics of the waste water streams, such as:
- (a) average values and variability of flow, pH, temperature, and conductivity;
- (b) average concentration and load values of relevant substances and their variability (e.g. COD/TOC, nitrogen species, phosphorus, metals);
- (c) data on bioeliminability (e.g. BOD, BOD to COD ratio, Zahn-Wellens test, biological inhibition potential (e.g. nitrification));

(iii) information, as comprehensive as is reasonably possible, about the characteristics of the waste gas streams, such as:
- (a) average values and variability of flow and temperature;
- (b) average concentration and load values of relevant subtances and their variability (e.g. organic compounds);
- (c) flammability, lower and higher explosive limits, reactivity;
- (d) presence of other substances that may affect the waste gas treatment system or plant safety (e.g. oxygen, nitrogen, water vapour, dust).

[This BAT conclusion is based on information given in Section 2.3.1.2]

BAT 23. In order to ~~prevent or, where that is not practicable, to~~ reduce the environmental risk associated with ~~of~~ the storage of waste, BAT is to use all of the techniques given below.

	Technique	Description	Applicability
a	Storage location	Storage is located ~~away from watercourses.~~ in such a way so as to eliminate or minimise the unnecessary handling of wastes within the plant (e.g. the same wastes are handled twice or more)	Generally applicable to new plants.
b	**Technique b moved to BAT 13 (technique a1)**		
c	Sufficient ~~S~~storage capacity	Measures are taken to avoid ~~storage/~~accumulation of waste, such as: • ~~a waste acceptance (see BAT 2) plan is used;~~ • the maximum waste storage capacity is clearly established ~~and communicated~~ taking into account the characteristics of the wastes, e.g. regarding the risk of fire; • the quantity of waste stored is regularly ~~verified~~ monitored against the maximum allowed storage capacity; • the maximum residence time of waste is clearly established.	Generally applicable.
d	Safe storage operation	This includes measures such as: • equipment used for loading, unloading and storing waste is clearly documented and labelled; • ~~waste segregation measures are taken (see BAT 2);~~ • ~~substances~~ wastes known to be sensitive to heat, light, air, water, etc. are protected from such ambient conditions; • containers and drums are fit for purpose and stored securely.	
e	Separate area for ~~S~~storage and handling of laboratory smalls	When relevant, a dedicated area is used for sorting and repacking laboratory smalls.	~~Only applicable for plants storing laboratory smalls.~~ Generally applicable.

[This BAT conclusion is based on information given in Section 2.3.13.2]

BAT 24. In order to reduce the environmental risk associated with the handling and transfer of waste, BAT is to ~~use the following technique.~~ set up and implement handling and transfer ~~systems and~~ procedures.

Description

Handling and transfer procedures aim to ensure that wastes are safely handled and transferred to the respective storage or treatment. They include the following elements:

~~This includes:~~

- handling and transfer of waste ~~is~~ are carried out by qualified ~~and trained~~ staff;
- handling and transfer~~s and discharges~~ of waste are duly documented and validated prior to execution;
- ~~measures are taken to ensure couplings are correctly fitted when connecting hoses or pipes;~~
- measures are taken to prevent, detect and mitigate spills;
- ~~technical~~ operation and, if relevant, ~~construction~~ design precautions are taken ~~to protect human health and the environment~~ when mixing or blending wastes~~, depending on the composition and consistency of the wastes to be mixed or blended~~ (e.g. vacuuming ~~dust-like~~ dusty/powdery wastes).

Handling and transfer procedures are based on a risk assessment considering the likelihood of accidents and incidents and their environmental impact.

Note: BAT 24 was presented as a table in D1

[This BAT conclusion is based on information given in Section 2.3.13.3]

6.1.2 Monitoring

BAT 3bis. For relevant emissions to water as identified by the inventory of waste water streams (see BAT 2bis), BAT is to monitor key process parameters (including waste water flow, pH and temperature) at key locations (e.g. at the point where the emission leaves the installation and/or at the inlet to pretreatment and at the inlet to final treatment).

[This BAT conclusion is based on information given in Sections 2.3.1.2 and 2.3.3]

BAT 3. BAT is to monitor emissions to water with at least the frequency given below~~indicated in Table 6~~, 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.

~~Table 6.1: Monitoring of emissions to water~~

Substance/ parameter	Standard(s)	Waste treatment process	Minimum monitoring frequency (1) (2) ~~(3)~~	Monitoring associated with
Total organic carbon (TOC) (4) (6)	EN 1484	All treatments of waste except physico-chemical and/or biological treatment of water-based liquid waste	Once every ~~week~~ month	BAT 15
		Physico-chemical and/or biological treatment of water-based liquid waste	Once every day	
Chemical oxygen demand (COD) (4) (6)	No EN standard available	All treatments of waste except physico-chemical and/or biological treatment of water-based liquid waste	Once every ~~week~~ month	
		Physico-chemical and/or biological treatment of water-based liquid waste	Once every day	
Total suspended solids (TSS) (6)	EN 872	All treatments of waste except physico-chemical and/or biological treatment of water-based liquid waste	Once every ~~week~~ month	
		Physico-chemical and/or biological treatment of water-based liquid waste	Once every day	
Hydrocarbon oil index (HOI) (7)	EN ISO 9377-2	Mechanical treatment in shredders of metal waste	Once every ~~week~~ month	
		Mechanical treatment in shredders of WEEE containing refrigerants		
		Re-refining of waste oil		
		Physico-chemical treatment of liquid waste with calorific value		
		Water washing of excavated contaminated soil		
		Physico-chemical and/or biological treatment of water-based liquid waste	Once every day	
Total nitrogen (TN) (6)	EN 12260	~~Biological treatment of waste~~ All treatments of waste except physico-chemical and/or biological treatment of water-based liquid waste	Once every ~~week~~ month	
		~~Re-refining of waste oil~~		
		Physico-chemical and/or biological treatment of water-based liquid waste	Once every day	

Total phosphorus (TP) (6)	Various EN standards available (e.g. EN ISO 15681-1 and -2, EN ISO 6878, EN ISO 11885)	~~Biological treatment of waste~~ All treatments of waste except physico-chemical and/or biological treatment of water-based liquid waste	Once every ~~week~~ month	
		~~Re-refining of waste oil~~		
		Physico-chemical and/or biological treatment of water-based liquid waste	Once every day	
Phenol index (6)	EN ISO 14402	Re-refining of waste oil	Once every ~~week~~ month	
		Physico-chemical treatment of liquid waste with calorific value		
		Physico-chemical and/or biological treatment of water-based liquid waste	Once every day	
Easily liberatable cyanide (CN^-) (5) (7)	Various EN standards available (e.g. EN ISO 14403-1 and -2)	Physico-chemical and/or biological treatment of water-based liquid waste	Once every day	
Adsorbable organically bound halogens (AOX) (5) (7)	EN ISO 9562	Physico-chemical and/or biological treatment of water-based liquid waste	Once every day	
Benzene, toluene, ethyl benzene, xylene (BTEX) (5) (7)	EN ISO 15680	Physico-chemical and/or biological treatment of water-based liquid waste	Once every day	
Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), Zinc (Zn) (5) (7)	Various EN standards available (e.g. EN ISO 11885, EN ISO 17294-2, EN ISO 15586 ~~15585~~)	Mechanical treatment in shredders of metal waste	Once every ~~week~~ month	
		Mechanical treatment in shredders of WEEE containing refrigerants		
		Mechanical biological treatment of waste		
		Re-refining of waste oil		
		Physico-chemical treatment of liquid waste with calorific value		
		Physico-chemical treatment of solid and/or pasty waste		
		Water washing of excavated contaminated soil		
		Physico-chemical and/or biological treatment of water-based liquid waste	Once every day	
Manganese (Mn) (5) (7)		Physico-chemical and/or biological treatment of water-based liquid waste	Once every day	
Mercury (Hg) (5) (7)	Various EN standards	Mechanical treatment in shredders of metal waste	Once every ~~week~~ month	

	available (e.g. EN ISO 17852, EN ISO 12846)	Mechanical treatment in shredders of WEEE containing refrigerants		
		Mechanical biological treatment of waste		
		Re-refining of waste oil		
		Physico-chemical treatment of liquid waste with calorific value		
		Physico-chemical treatment of solid and/or pasty waste		
		Water washing of excavated contaminated soil		
		Physico-chemical and/or biological treatment of water-based liquid waste	Once every day	
Hexavalent chromium (Cr(VI)) ([5]) ([7])	Various EN standards available (e.g. EN ISO 10304-3, EN ISO 23913)	Physico-chemical and/or biological treatment of water-based liquid waste	Once every day	

([1]) Monitoring frequencies may be ~~adapted if the data series clearly demonstrate a sufficient stability of emissions over time.~~reduced if the emission levels are proven to be sufficiently stable.
([2]) The sampling point is located where the emission leaves the installation.
~~([3]) In the case of batch discharge with a duration < 24 hours, once per batch discharge.~~
([4]) Either TOC or COD is monitored. TOC is the preferred option, because its monitoring does not rely on the use of very toxic compounds.
([5]) The monitoring ~~may not~~ only applies when the substance concerned is ~~not present~~ identified as relevant in the waste water, based on the inventory mentioned in BAT 2bis.
([6]) The monitoring applies only in the case of a direct discharge to a receiving water body.
([7]) In the case of an indirect discharge to a receiving water body, the monitoring may be reduced if the downstream waste water treatment plant is designed to cope with and/or to treat the pollutants concerned.

[This BAT conclusion is based on information given in Section 2.3.3.2]

BAT 4. BAT is to monitor channelled emissions to air with at least the frequency given below ~~indicated in Table 6~~, 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.

~~**Table 66.2: Monitoring of channelled emissions to air**~~

Susbtance/ Parameter	Standard(s)	Waste treatment process	Minimum monitoring frequency (1)	Monitoring associated with
Dust	EN 13284-1	Mechanical treatment of waste	Once every six months	BAT 25
		Mechanical biological treatment of waste	Once every ~~three~~ six months	BAT 32
		Physico-chemical treatment of solid and/or pasty waste	Once every six months	BAT 39
		Thermal treatment of spent activated carbon, waste catalysts and excavated contaminated soil		~~NA~~ BAT 48
		~~Treatment~~ Water washing of excavated contaminated soil		~~NA~~ BAT 49
TVOC	EN 12619	Mechanical treatment in shredders of metal waste	Once every six months	BAT 25
		Mechanical treatment in shredders of ~~equipment~~ WEEE containing refrigerants ~~VFCs and/or VHCs~~	Once every six months	BAT 29
		Mechanical treatment of waste with calorific value	Once every six months	BAT 29ter
		Mechanical biological treatment of waste	Once every ~~three~~ six months	BAT 32
		Physico-chemical treatment of solid and/or pasty waste (4)	Once every six months	BAT 39
		Re-refining of waste oil		BAT 41
		Physico-chemical treatment of liquid waste with calorific value		BAT 43
		Regeneration of spent solvents		BAT 45
		Thermal treatment of spent activated carbon, waste catalysts and excavated contaminated soil		~~NA~~ BAT 48
		~~Treatment~~ Water washing of excavated contaminated soil		~~NA~~ BAT 49
		Physico-chemical and/or biological treatment of water-based liquid waste (4)		BAT 52
		Decontamination of equipment containing ~~POPs~~ PCBs (3)		~~NA~~ BAT 50
VFC	No EN standard available	Mechanical treatment in shredders of WEEE containing refrigerants	Once every six months	BAT 26
NH_3	No EN standard available	All biological treatments of solid and non-pumpable waste (5)	Once every ~~three~~ six months	BAT 32
		Physico-chemical treatment of solid and/or pasty waste (4)	Once every six months	BAT 39

		Physico-chemical and/or biological treatment of water-based liquid waste (4)		BAT 52
H_2S	No EN standard available	All biological treatments of solid and non-pumpable waste (5)	Once every ~~three~~ six months	BAT 32
HCl	EN 1911	Thermal treatment of spent activated carbon, waste catalysts and excavated contaminated soil (4)	Once every six months	~~NA~~ BAT 48
		Physico-chemical and/or biological treatment of water-based liquid waste (4)		BAT 52
HF	~~ISO 15713~~ No EN standard available	Thermal treatment of spent activated carbon, waste catalysts and excavated contaminated soil (4)	Once every six months	~~NA~~ BAT 48
Hg ~~(total)~~	EN 13211	Treatment of ~~mercury-containing waste~~ WEEE containing mercury	Once every ~~six~~ three months	BAT 30
PCCD/F (4)	EN 1948-1, -2, -3, and -4 (2)	Mechanical treatment in shredders of metal waste	Once every year	BAT 25
Dioxin-like PCBs	EN 1948-1, -2, and -4 (2)	Mechanical treatment in shredders of metal waste(4)	Once every year	BAT 25
		Decontamination of equipment containing ~~POPs~~ PCBs	Once every ~~six~~ three months	~~NA~~ BAT 50
~~Relevant~~ metals and metalloids except mercury (e.g. As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Se, Tl, V) (4)	EN 14385	Mechanical treatment in shredders of metal waste	Once every year ~~six months~~	~~NA~~ BAT 25

~~NA: Not applicable~~
(1) Monitoring frequencies may be ~~adapted if the data series clearly demonstrate a sufficient stability~~ reduced if the emission levels are proven to be sufficiently stable.
(2) Instead of EN 1948-1, sampling may also be carried out ~~with~~ according to CEN/TS 1948-5.
(3) The monitoring only applies w~~W~~hen solvent is used for cleaning the contaminated ~~devices~~equipment.
(4) The monitoring only applies when the substance concerned is identified as relevant in the waste gas, based on the inventory mentioned in BAT 2bis.
(5) Odour may be monitored instead, with the same frequency and according to EN 13725.

[This BAT conclusion is based on information given in Section 2.3.3.3]

BAT 5. BAT is to monitor diffuse emissions of organic compounds ~~VOC~~ to air from the regeneration of spent solvents, ~~and the solvent-using decontamination of equipment containing POPs~~ the decontamination of equipment containing POPs with solvents, and the physico-chemical treatment of solvents for the recovery of their calorific value, at least once per year using one or a combination of the techniques given below.

	Technique	Description
a	Measurement	Sniffing methods, optical gas imaging, solar occultation flux or differential absorption ~~adsorption~~. See descriptions in Section 6.6.1.
b	Emissions factors	Calculation of emissions based on emissions factors, periodically validated (e.g. once every two years) by measurements.
c	~~Solvent m~~Mass balance	Calculation of diffuse~~ion~~ emissions using a mass balance considering the solvent input, channelled emissions to air, emissions to water, the solvent in the process output, and process (e.g. distillation) residues.

[This BAT conclusion is based on information given in Sections 5.4.3.2 and 5.8.1.3.2]

BAT 6. BAT is to periodically monitor odour emissions from relevant sources in accordance with EN standards.

Description

Emissions can be monitored by dynamic olfactometry according to EN 13725.

Applicability

~~The applicability is restricted to cases~~BAT 6 is only applicable where an odour nuisance at sensitive receptors ~~can~~is ~~be~~ expected and/or has been substantiated.

[This BAT conclusion is based on information given in Section 2.3.3.4]

BAT 7. BAT is to monitor the annual consumption of water, energy and raw materials as well as the annual generation of sludge, residues and waste water, ~~water consumption, energy consumption, raw material consumption, sludge generation, residues generation, and the amount of waste water generated, all broken down by process~~, with a frequency of at least once per year. ~~and considering any significant changes in plant operation.~~

Description

Monitoring includes direct measurements, calculation or recording, e.g. using suitable meters or invoices. The monitoring is broken down at the most appropriate level (e.g. at process or plant/installation level) and considers any significant changes in the plant/installation.

[This BAT conclusion is based on information given in Sections 2.3.7, 2.3.8, and 2.3.9]

6.1.3 ~~Odorous~~ Odour and diffuse emissions to air

BAT 8. In order to prevent or, where that is not practicable, to reduce odour~~ous~~ emissions ~~from the plant~~, 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 actions ~~(see BAT 9)~~ and timelines.

- A protocol for conducting odour monitoring as set out in BAT 6. It may be complemented by measurement/estimation of odour exposure or estimation of odour impact.
- A protocol for response to identified odour incidents.
- 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 ~~can be~~is expected and/or has been substantiated.

[This BAT conclusion is based on information given in Sections 2.3.3.4, 2.3.5.1 and 4.5.1.3].

BAT 9. In order to prevent or, where that is not practicable, to reduce odour~~ous~~ emissions, BAT is to use one or a combination of the techniques given below.

Technique		Description	Applicability
a	Minimising residence times	Minimising the residence time (e.g. 24 to 72 hours) of (potentially) odorous waste ~~and potentially odorous waste~~ in ~~collection and~~ storage or in handling systems (e.g. pipes, tanks, containers), in particular under anaerobic conditions. When relevant, adequate provisions are made for the acceptance of seasonal peak volumes of waste.	Generally applicable.
b	Using chemical treatment	Using chemicals to destroy or to reduce the formation of odorous compounds (e.g. ~~oxidation~~ to oxidise or ~~precipitation~~ to precipitate ~~of~~ hydrogen sulphide).	Generally applicable.
c	Optimising aerobic treatment	In the case of aerobic treatment of waste, the optimisation ~~can~~ may include: • controlling the oxygen content; • frequent maintenance of the aeration system. In the case of aerobic treatment of water-based liquid waste, it may include: • use of pure oxygen; • removal of scum in tanks; • frequent maintenance of the aeration system.	Generally applicable ~~in case of aerobic treatment of waste~~.

[This BAT conclusion is based on information given in Sections 2.3.5.2, 4.5.1.2, and 4.5.2.1]

BAT 10. In order to prevent or, where that is not practicable, to reduce diffuse emissions to air, in particular of dust, organic compounds and odour, BAT is to use one or a combination of the techniques given below.

	Technique	Description	Applicability
a.	Limiting the number of potential diffuse emissions sources	This includes techniques such as: • appropriate design of piping layout (e.g. minimising pipe run length, reducing the number of flanges and valves, using welded fittings and pipes); • favouring the use of ~~pressure~~ gravity transfer ~~(e.g. gravity)~~ rather than using pumps; • limiting the drop height of material.	~~The design of piping layout is~~ Only applicable to new plants and to major plant upgrades.
b.	Selection and use of high-integrity equipment	This includes techniques such as: • valves with double packing seals or equally efficient equipment; • high-integrity gaskets (such as spiral wound ring joints) for critical applications; • pumps/compressors/agitators fitted with mechanical seals instead of packing; • magnetically driven pumps/ compressors/agitators; • appropriate service hoses' access ports, piercing piers, drill heads, e.g. when degassing WEEE containing refrigerants.	~~Generally applicable~~. Magnetically driven equipment may not be applicable in the case of liquids containing ferrous particles.
c.	~~Select appropriate materials for equipment~~ Corrosion prevention	This includes techniques such as: • appropriate selection of construction materials; • lining or coating of equipment and painting of pipes with corrosion inhibitors ~~to prevent corrosion~~.	Generally applicable.
d.	~~Ensure~~ Containment, collection and treatment of diffuse emissions	This includes techniques such as: • storing and handling waste and material that may generate diffuse emissions in enclosed ~~equipment or~~ buildings and enclosed equipment; • maintaining the enclosed equipment or buildings under negative pressure; • collecting and directing the emissions to an appropriate abatement system (see Section 6.6.1) via an air extraction system and/or air suction systems close to the emission sources; ~~• dampening waste that can generate diffuse dust emissions with water~~	~~Generally applicable~~ The use of enclosed equipment or buildings may be restricted by safety considerations such as the risk of explosion or oxygen depletion. The used of enclosed equipment or buildings may also be constrained by the volume of waste..
d1	Dampening	Dampening potential sources of diffuse dust emissions (e.g. waste storage, traffic areas, and open handling processes) with water or fog.	Generally applicable.
e.	**Moved to BAT 34bis**		
f.	**Moved to BAT 34bis**		

Technique		Description	Applicability
g.	Maintenance and ~~cleaning~~ washing	This includes techniques such as: • ensuring access to potentially leaky equipment; • regularly controlling protective equipment such as lamellar curtains, fast-action doors; • regularly ~~cleaning~~ washing the whole waste treatment area (halls, traffic areas, storage areas, etc.), conveyor ~~bands~~ belts, equipment and containers.	Generally applicable.
h.	~~Set up and implement a~~ leak detection and repair (LDAR) programme	See ~~the description of the technique in~~ Section 6.6.1. When emissions of organic compounds are expected, a LDAR programme is set up and implemented using a risk-based assessment, considering in particular the design of the plant and the amount and nature of the organic compounds concerned.	~~Only applicable to plants that contain a large number of piping components (e.g. valves) and that process a significant amount of lighter hydrocarbons.~~ Generally applicable.

[This BAT conclusion is based on information given in Sections 2.3.5.3, 2.3.5.4 and 4.5.1.2, ~~4.5.2.2, and 4.5.2.3~~]

BAT 11. ~~In order to prevent emissions to air from flares,~~ BAT is to use flaring only for safety reasons or for non-routine operating conditions (e.g. start-ups, shutdowns) by using both of the techniques given below.

	Technique	Description	Applicability
a.	Correct plant design	This includes the provision of a gas recovery system with sufficient capacity and the use of high-integrity relief valves.	Generally applicable to new plants. A gas recovery system may be retrofitted in existing plants.
b.	Plant management	This includes balancing the gas system and using advanced process control.	Generally applicable.

[This BAT conclusion is based on information given in Section 2.3.5.5]

BAT 12. In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use both of the techniques given below.

	Technique	Description	Applicability
a.	Correct design of flaring devices	Optimisation of height, pressure, assistance by steam, air or gas, type of flare tips (either enclosed or shielded), etc., etc., to enable smokeless and reliable operation and to ensure the efficient combustion of excess gases.	Generally aApplicable to new flares. In existing plants, applicability may be restricted, e.g. due to maintenance time availability during the turnaround of the plant.
b.	Monitoring and recording as part of flare management	It includes continuous monitoring of the gas quantity sent to flaring, measurements of gas flow and temperature. It may include estimations of other parameters (e.g. composition of gas flow, heat content, ratio of assistance, velocity, purge gas flow rate, pollutant emissions (e.g. NO_X, CO, hydrocarbons, noise). The recording of flaring events usually includes the estimated/measured flare gas composition, the estimated/measured flare gas quantity and the duration and number of events operation. The recording and allows for the quantification of emissions and the potential prevention of future flaring events.	Generally applicable.

[This BAT conclusion is based on information given in Section 2.3.5.5]

6.1.4 Noise and vibrations

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

I. a protocol containing appropriate actions and timelines;
II. a protocol for conducting noise and vibration monitoring;
III. a protocol for response to identified noise and vibration events;
IV. a noise and vibration reduction programme designed to identify the source(s), to measure/estimate noise and vibration exposure, to characterise the contributions of the sources and to implement prevention and/or reduction measures.

Applicability

The applicability is restricted to cases where noise or vibration nuisance can be expected and/or has been substantiated.

[This BAT conclusion is based on information given in Sections 2.3.10.1 and 3.1.3.2.1]

BAT 19. In order to prevent or, where that is not practicable, to reduce noise and vibration 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, ~~and~~ using buildings as noise screens and relocating building exits or entrances.	For existing plants, the relocation of equipment and building exits or entrances may be restricted by a lack of space or excessive costs.
b	Operational measures	This includes techniques such as: i. ~~improved~~ 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 during maintenance, traffic and handling activities.	Generally applicable.
c	Low-noise equipment	This may include~~s~~ compressors, pumps and flares.	
d	Noise and vibration control equipment	This includes techniques such as: i. noise-reducers; ii. ~~equipment~~ acoustic and vibrational insulation of equipment; iii. enclosure of noisy equipment; iv. soundproofing of buildings.	Applicability may be restricted due to space requirements (for existing plants).
e	Noise abatement	Inserting obstacles between emitters and receivers (e.g. protection walls, embankments and buildings).	Applicable only to existing plants, as the design of new plants should make this technique unnecessary. For existing plants, the insertion of obstacles may be restricted by a lack of space. For mechanical treatment in shredders of metal wastes, it is applicable within the constraints ~~imposed by~~ associated with the risk of ~~possible~~ deflagration in shredders.

[This BAT conclusion is based on information given in Sections 2.3.10.2 and 3.1.3.2.2]

6.1.5 Emissions to water

BAT 13. In order to optimise water consumption, to reduce the volume of waste water generated and to prevent or, where that is not practicable, to reduce emissions to soil and groundwater ~~reduce water usage~~ and to prevent or, where that is not practicable, to reduce the discharge of pollutants to water from waste treatment, BAT is to use all of the techniques given below.

Technique		Description	Applicability
a	~~Water-saving action plan and water audits~~ Water management	~~A water-saving plan includes: • flow diagrams and water mass balance, • establishment of water efficiency objectives, • implementation of water optimisation techniques (e.g. water pinch techniques, minimising use of washing and cleaning water).~~ ~~Water audits are carried out with the aim of increasing the reliability of the control and abatement performance of pollutants, reducing water usage, and preventing water contamination.~~ Water consumption is optimised by using measures which may include: • water-saving plans (e.g. establishment of water efficiency objectives, flow diagrams and water mass balance); • optimising the use of washing water (e.g. dry cleaning instead of hosing down, using trigger control on all washing equipment); • reducing the use of water for vacuum generation (e.g. use of liquid ring pumps with high boiling point liquids).	Generally applicable.
b	**Technique b moved down – Technique (a3)**		
c	~~Maximise internal water~~ Water recycling	~~Increase the number and/or capacity of water recycling systems.~~ Water streams are recycled within the plant, if necessary after treatment. The degree of recycling is limited by the water balance of the plant and the content of impurities.	~~Water recycling may be limited by the content of impurities in the water.~~ Generally applicable.
Ex-technique 20a	~~Sealed~~ Impermeable surface and ~~retention volume~~ secondary containment	The surface of the whole waste treatment area (e.g. waste reception, handling, storage, treatment and dispatch areas) is ~~sealed~~ concrete-based or impermeable ~~(e.g. concrete base). Each storage tank for liquids is located in a liquid-proof retention area.~~ Tanks for liquids are located in suitable secondary containment capable of retaining 110 % of the liquids' volume.	Generally applicable.
a1 (ex-technique 23b)	~~Storage design~~ Techniques to reduce the likelihood and impact of	This includes techniques such as: • overflow detectors; • ~~Measures are taken to prevent, detect and mitigate overflows from tanks and vessels. Vessel~~ overflow	Generally applicable.

	overflows from tanks and vessels	pipes that are directed to a contained drainage system (i.e. the relevant ~~bund area~~ secondary containment or another vessel); • isolation of tanks ~~Tanks and~~, vessels and secondary containment ~~are isolable~~ (e.g. closing of valves).	
a2	Roofing of waste storage and treatment areas	Waste is stored and treated in covered areas to prevent contact with rainwater and thus minimise the volume of contaminated run-off water.	Applicability may be constrained when high volume of waste are stored or treated (e.g. mechanical treatment in shredders of metal waste)
a3 (ex-technique 13b)	Segregation of ~~different~~ water streams ~~in the water and drainage systems~~	Each water stream (e.g. ~~road water,~~ surface run-off water, process water) is collected and treated separately, ~~depending~~ based on the pollutant ~~pollution~~ content and on the combination of treatment techniques~~)~~. ~~Uncontaminated water is reused as much as possible in the substitution of fresh water.~~ In particular, uncontaminated waste water streams are segregated from waste water streams that require treatment. ~~Drainages from incompatible wastes are not mixed.~~	Generally applicable to new plants. Generally aApplicable to existing plants within the constraints ~~given by~~ associated with the configuration of the water collection system ~~circuits~~.
Ex-technique 20b	Adequate drainage infrastructure	The waste treatment area is connected to ~~a~~ drainage infrastructure. ~~Run-off~~ Rainwater falling on the treatment and storage areas is collected in the drainage infrastructure along with ~~tanker~~ washing water, occasional spillages, ~~drum washings,~~ etc. and, depending on the pollutant content, ~~returned to the waste treatment plant or collected in an interceptor~~.recycled or collected for further treatment. ~~Interceptors with an overflow have automatic monitoring systems, such as pH checks which can trigger the shutting down of the overflow.~~	Generally applicable to new plants. Generally applicable to existing plants within the constraints associated with the configuration of the water drainage system.
Ex-technique 20c	Design and maintenance provisions to allow detection and repair of leaks	Regular monitoring for potential leakages is carried out based on a risk assessment, and, when necessary, equipment is repaired. The use of underground components is minimised. ~~Vessels and pipework are located above ground or~~ When underground components are used, secondary containment of underground components is put in place. ~~Regular monitoring for potential leakages is carried out. When underground pipework is used, it is equipped with suitable inspection channels.~~	The use of above ground components is generally applicable to new plants. It may be limited however by the risk of freezing. The installation of secondary containment may be limited in the case of existing plants.
Ex-technique 20d	~~Security basin~~ Buffer storage capacity	~~A basin used to collect surges that may be contaminated, e.g. firefighting water.~~ Appropriate buffer storage capacity is provided for waste water generated during other than normal operating conditions based on a risk assessment (e.g. taking into account the nature of the	Generally applicable to new plants. For existing plants, applicability may be limited by space availability and by the configuration of the

		pollutants, the effects of downstream waste water treatment, and the receiving environment). The discharge of waste water from this ~~basin~~ buffer storage ~~to a receiving water body or to the sewer~~ is only possible after ~~further~~ appropriate measures are taken (e.g. control, treat, reuse).	water collection system.

[This BAT conclusion is based on information given in Sections 2.3.7, 2.3.11 and 2.3.14]

BAT 14. **Deleted**

BAT 15. In order to reduce emissions to water (direct or indirect discharges), BAT is to treat waste water ~~before discharge to the environment with~~ using one or ~~an appropriate~~ a combination of the techniques given below.

	Technique (1)	**Typical pollutants targeted**	**Applicability**
Preliminary and primary treatment, e.g.			
a	Equalisation	All pollutants	Generally applicable.
b	Neutralisation	Acids, alkalis	
c	Physical separation, e.g. screens, sieves, grit separators, grease separators, oil-water separation or primary settlement tanks	Gross solids, suspended solids, oil/grease	
Physico-chemical treatment, e.g.			
d	Adsorption	Adsorbable dissolved non-biodegradable or inhibitory pollutants, e.g. hydrocarbons, mercury, AOX ~~Organics, inorganics~~	Generally applicable.
e	Distillation/rectification	Dissolved non-biodegradable or inhibitory pollutantsthat can be distilled, e.g. some solvents ~~organics~~	
f	Chemical precipitation	Precipitable dissolved non-biodegradable or inhibitory pollutants, e.g. metals, phosphorus	
g	Chemical oxidation	Oxidisable dissolved non-biodegradable or inhibitory pollutants, e.g. nitrite, cyanide	
h	Chemical reduction	Reducible dissolved non-biodegradable or inhibitory pollutants, e.g. hexavalent chromium (Cr(VI))	
h1	Evaporation	Soluble contaminants	
i	Ion exchange process	Ionic dissolved non-biodegradable or inhibitory pollutants, e.g. metals	

j	Stripping	Purgeable pollutants, e.g. hydrogen sulphide (H_2S), ammonia (NH_3), some adsorbable ~~adsordable~~ organically bound halogens (AOX), hydrocarbons	
Biological treatment, e.g.			
k	Activated sludge process	Biodegradable organic compounds	Generally applicable.
l	Membrane bioreactor		
Nitrogen removal			
m	Nitrification/denitrification when the treatment includes a biological treatment	Total nitrogen, ammonia	~~Not applicable when the final treatment does not include a biological treatment.~~ Nitrification may not be applicable in the case of high chloride concentrations (i.e. around 10 g/l) and when the reduction of the chloride concentration prior to nitrification would not be justified by the environmental benefits.
Solids removal, e.g.			
n	Coagulation and flocculation	Suspended solids and particulate-bound metals	Generally applicable.
o	Sedimentation		
p	Filtration (e.g. sand filtration, microfiltration, ultrafiltration)		
q	Flotation		
([1]) The descriptions of the techniques are given in Section 6.6.3.			

[This BAT conclusion is based on information given in Sections 2.3.6.1 to 2.3.6.7]

Table 6.3: BAT-associated emission levels (BAT-AELs) for direct discharges to a receiving water body

Substance/Parameter	BAT-AEL ~~(Monthly average)~~ (1)	Waste treatment process to which the BAT-AEL applies
Total organic carbon (TOC) (2)	10–~~40~~60 mg/l	~~• Mechanical treatment of waste~~ ~~• Biological treatment of waste~~ ~~• Physico-chemical treatment waste~~ • All waste treatments except treatment of water-based liquid waste
	10-100 mg/l (3bis)	• Treatment of water-based liquid waste
Chemical oxygen demand (COD) (2)	30–~~120~~180 mg/l	~~• Mechanical treatment of waste~~ ~~• Biological treatment of waste~~ ~~• Physico-chemical treatment waste~~ • All waste treatments except treatment of water-based liquid waste
	30-300 mg/l (3bis)	• Treatment of water-based liquid waste
Total suspended solids (TSS)	5–~~35~~60 mg/l	~~• Mechanical treatment of waste~~ ~~• Biological treatment of waste~~ ~~• Physico-chemical treatment waste~~ • All waste treatments
Hydrocarbon oil index (HOI)	0.5–~~5~~10 mg/l	• Mechanical treatment in shredders of metal waste • Mechanical treatment in shredders of WEEE containing refrigerants • Re-refining of waste oil • Physico-chemical treatment of waste with calorific value • Water washing of excavated contaminated soil
Total nitrogen (Total N)	1–25~~5–30~~ mg/l ~~(3)~~	• Biological treatment of waste • Re-refining of waste oil ~~• Physico-chemical and/or biological treatment of water-based liquid waste~~
	10–60 mg/l (3ter)	• Treatment of water-based liquid waste
Total phosphorus (Total P)	0.3–3 mg/l	• Biological treatment of waste
	1–5 mg/l	• Treatment of water-based liquid waste
Phenol index	0.05– 0.2 mg/l	• Re-refining of waste oil • Physico-chemical treatment of waste with calorific value ~~• Physico-chemical and/or biological treatment of water-based liquid waste~~
	0.05–0.3 mg/l	• Treatment of water-based liquid waste
Cyanide (CN^-) (4)	0.02-0.2 mg/l	• Treatment of water-based liquid waste
Adsorbable organically bound halogens (AOX) (4)	0.2-1 mg/l	• Treatment of water-based liquid waste
Metals and metalloids (4): Arsenic (expressed as As)	0.01–0.05 mg/l	• Mechanical treatment in shredders of metal waste • Mechanical treatment in shredders of WEEE containing refrigerants • Mechanical biological treatment of waste • Re-refining of waste oil ~~• Physico-chemical and/or biological~~
Metals and metalloids (4): Cadmium (expressed as Cd)	0.01–0.05 mg/l	
Metals and metalloids (4): Chromium (expressed as Cr)	0.01–~~0.05~~0.15 mg/l	
Metals and metalloids (4): Copper (expressed as Cu)	0.05–~~0.2~~0.5 mg/l	

	Lead (expressed as Pb)	0.05–0.1 mg/l (5)	~~treatment of water-based liquid waste~~ • Physico-chemical treatment of waste with calorific value • Physico-chemical treatment of solid and/or pasty waste • Regeneration of spent solvents • Water washing of excavated contaminated soil
	Nickel (expressed as Ni)	0.05–0.5 mg/l	
	Mercury (expressed as Hg)	~~0.001–0.01 mg/l~~ 0.5-5 µg/l	
	Zinc (expressed as Zn)	0.1–~~0.5~~ 1 mg/l (6)	
	Arsenic (expressed as As)	0.01–0.1 mg/l	• Treatment of water-based liquid waste
	Cadmium (expressed as Cd)	0.01–0.1 mg/l	
	Chromium (expressed as Cr)	0.01–0.3 mg/l	
	Hexavalent Chromium (expressed as Cr(VI))	0.01–0.1 mg/l	
	Copper (expressed as Cu)	0.05–0.5 mg/l	
	Lead (expressed as Pb)	0.05–0.3 mg/l	
	Nickel (expressed as Ni)	0.05–1 mg/l	
	Mercury (expressed as Hg)	1-10 µg/l	
	Zinc (expressed as Zn)	0.1–2 mg/l	

(1)-The averaging periods ~~may be adapted when the monitoring frequency is reduced (see footnote (1) of **Table 6**~~ are defined in the General considerations

(2) Either the BAT-AEL for COD or the BAT-AEL for TOC applies. TOC monitoring is the preferred option because it does not rely on the use of very toxic compounds.

~~(3) The upper end of the range may be up to 40 mg/l for Total N if the abatement efficiency is ≥ 70 % as a monthly average (considering all of the waste water treatment steps carried out).~~

(3bis) The upper end of the range may not apply when:

- the abatement efficiency is ≥ 95 % as a daily average; and
- the waste input shows the following characteristics: TOC > 2 g/l (or COD > 6 g/l) as a daily average and a high proportion of refractory organic compounds (i.e. which are difficult to biodegrade).

(3ter) The BAT-AEL only applies when biological treatment of waste water is used. When nitric acid is the main waste input, this BAT-AEL does not apply provided that the abatement efficiency is ≥ 90 % as a daily average

(4) The BAT-AELs ~~may not~~ only apply when the substance concerned is ~~not~~ identified as relevant ~~present in the waste to be treated~~ in the waste water inventory mentioned in BAT 2bis.

(5) The upper end of the range is 0.3 mg/l for mechanical treatment in shredders of metal waste.

(6) The upper end of the range is 2 mg/l for mechanical treatment in shredders of metal waste.

The associated monitoring is given in BAT 3.

Table 6.4: BAT-associated emission levels (BAT-AELs) for indirect discharges to a receiving water body

Substance/Parameter		BAT-AEL ~~(Monthly average)~~ ([1]) ([2])	Waste treatment process to which the BAT-AEL applies
Hydrocarbon oil index (HOI)		0.5–~~5~~10 mg/l	• Mechanical treatment in shredders of metal waste • Mechanical treatment in shredders of WEEE containing refrigerants • Re-refining of waste oil • Physico-chemical treatment of waste with calorific value • Water washing of excavated contaminated soil
Cyanide (CN^-) ([3])		0.02-0.2 mg/l	• Treatment of water-based liquid waste
Adsorbable organically bound halogens (AOX) ([3])		0.2-1 mg/l	• Treatment of water-based liquid waste
Metals and metalloids ([3])	Arsenic (expressed as As)	0.01–0.05 mg/l	• Mechanical treatment in shredders of metal waste • Mechanical treatment in shredders of WEEE containing refrigerants • Mechanical biological treatment of waste • Re-refining of waste oil • ~~Physico-chemical and/or biological treatment of water-based liquid waste~~ • Physico-chemical treatment of waste with calorific value • Physico-chemical treatment of solid and/or pasty waste • Regeneration of spent solvents • Water washing of excavated contaminated soil
	Cadmium (expressed as Cd)	0.01–0.05 mg/l	
	Chromium (expressed as Cr)	0.01–~~0.05~~0.15 mg/l	
	Copper (expressed as Cu)	0.05–~~0.2~~0.5 mg/l	
	Lead (expressed as Pb)	0.05–0.1 mg/l ([4])	
	Nickel (expressed as Ni)	0.05–0.5 mg/l	
	Mercury (expressed as Hg)	~~0.001–0.01 mg/l~~ 0.5-5 µg/l	
	Zinc (expressed as Zn)	0.1–~~0.5~~1 mg/l ([5])	
	Arsenic (expressed as As)	0.01–0.1 mg/l	• Treatment of water-based liquid waste
	Cadmium (expressed as Cd)	0.01–0.1 mg/l	
	Chromium (expressed as Cr)	0.01–0.3 mg/l	
	Hexavalent Chromium (expressed as Cr(VI))	0.01–0.1 mg/l	
	Copper (expressed as Cu)	0.05–0.5 mg/l	
	Lead (expressed as Pb)	0.05–0.3 mg/l	
	Nickel (expressed as Ni)	0.05–1 mg/l	
	Mercury (expressed as Hg)	1-10 µg/l	
	Zinc (expressed as Zn)	0.1–2 mg/l	

([1]) ~~-~~The averaging periods ~~may be adapted when the monitoring frequency is reduced (see footnote ([1]) of Table 6~~ are defined in the General considerations

([2]) The BAT-AELs may not apply if the downstream waste water treatment plant adequately treats the pollutants concerned.

([3]) The BAT-AELs ~~may not~~ only apply when the substance concerned is ~~not~~ identified as relevant in the waste water inventory mentioned in BAT 2bis.

([4]) The upper end of the range is 0.3 mg/l for mechanical treatment in shredders of metal waste.

([5]) The upper end of the range is 2 mg/l for mechanical treatment in shredders of metal waste.

The associated monitoring is given in BAT 3

6.1.6 Emissions from accidents and incidents

BAT 22. In order to prevent or limit the environmental consequences of accidents and incidents, BAT is to use all of the techniques given below, as part of the accident management plan (see BAT 1).

Technique		Description
~~c~~ a **ex-Technique (c)**	Protection measures	~~These~~ This includes measures such as: • ~~security measures to protect~~ protection of the plant against malevolent acts ~~which could have environmental impacts~~; • fire and explosion protection system, containing equipment for prevention, ~~and~~ detection ~~equipment~~, and extinction ~~equipment~~; • accessibility and operability of relevant ~~instrumentation and~~ control equipment ~~is accessible and maintained~~ in emergency situations.
~~A~~ b **ex-Technique (a)**	Management of incidental/accidental emissions	Procedures are established and technical provisions are in place to manage (in terms of possible containment) ~~accidental~~ emissions from accidents and incidents such as emissions from spillages, firefighting water, or ~~emissions from~~ safety valves.
~~B~~ c **ex-Technique (b)**	~~Event~~ Incident/accident registration and assessment system	This includes techniques such as: • a log/diary to record all accidents, incidents, ~~near-misses,~~ changes to procedures, ~~abnormal events,~~ and the findings of ~~maintenance~~ inspections. ~~Leaks, spills and accidents can be recorded in the site diary.~~; • procedures to identify, respond to and learn from such incidents and accidents.

[This BAT conclusion is based on information given in Section 2.3.13.1]

6.1.7 Material efficiency ~~Consumption of raw materials and chemicals~~

BAT 16. ~~In order to reduce the raw material and chemical consumption of waste treatment, BAT is to use the technique given below~~ In order to use materials efficiently, BAT is to substitute materials with waste.

Description

Waste is used instead of ~~raw~~ other materials for the treatment of ~~other~~ wastes ~~by substituting chemicals or raw materials~~ (e.g. waste alkalis or waste acids are used for pH adjustment, fly ashes are used as binders~~, APC residues as a replacement for hydrated lime in the neutralisation of waste acid~~).

Applicability

Some applicability limitations derive from the presence of impurities in the waste that substitutes ~~the raw~~ other materials. Another limitation is the compatibility of the waste substituting other materials ~~to be used as raw material~~ with the waste input (see BAT 2).

Note: BAT 16 was presented as a table in D1

[This BAT conclusion is based on information given in Section 2.3.8]

6.1.8 Energy efficiency

BAT 17. In order to use energy efficiently ~~in waste treatment~~, BAT is to use both ~~all~~ of the techniques given below.

Technique		Description
a	~~Set up and implement~~ ~~an~~ Energy efficiency plan	An energy efficiency plan entails defining and calculating the specific energy consumption of the activity (or activities), setting key performance indicators on an annual basis (~~e.g. MWh~~ for example, specific energy consumption expressed in kWh/tonne of waste processed) and planning ~~the~~ periodic improvement targets and related actions. The plan is adapted to the specificities of the waste treatment in terms of process(es) carried out, waste stream(s) treated, etc.
b	~~Establish a detailed~~ Energy balance record	An ~~detailed~~ energy balance record provides a breakdown of the energy consumption and generation (including exportation) by the type of source (i.e. electricity, gas, conventional liquid fuels, conventional solid fuels, and waste). This includes ~~involves~~: (i) ~~reporting the~~ information on energy consumption ~~information~~ in terms of delivered energy; (ii) ~~reporting the~~ information on energy exported from the installation; (iii) ~~providing~~ energy flow information (for example, Sankey diagrams or energy balances) showing how the energy is used throughout the process. The energy balance record is adapted to the specificities of the waste treatment in terms of process(es) carried out, waste stream(s) treated, etc.

[This BAT conclusion is based on information given in Sections 2.3.9.1 and 2.3.9.2]

BAT 18 and BAT 19 moved under BAT 12

~~6.1.9. Emissions to soil and groundwater~~

BAT 20. Merged with BAT 13.

6.1.9 ~~Management of residues~~ Minimisation of waste sent for disposal

BAT 21. In order to reduce the quantity of waste sent for disposal~~amount of residues generated during waste treatment~~, BAT is to maximise the reuse of packaging ~~the technique given below~~, as part of the residues management plan (see BAT 1).

Description

Packaging (drums, containers, IBCs, palettes, etc.) is reused for containing waste, when it is in good ~~working order~~ condition and sufficiently clean, depending on ~~the basis of~~ a compatibility check between the two substances contained (first and second uses). If necessary, packaging is sent for appropriate treatment prior to reuse (e.g. reconditioning, ~~cleaning, and~~ washing).
[This BAT conclusion is based on information given in Section 2.3.12]

Note: BAT 21 was presented as a table in D1

BAT 22 moved under BAT 15.

~~6.1.10 Waste storage and handling~~

BAT 23 and BAT 24 are moved below BAT 2.

6.2 BAT conclusions for mechanical treatment of waste

Unless otherwise stated, the BAT conclusions presented in this section apply to the mechanical treatment of waste when it is not combined with biological treatment, and in addition to the general BAT conclusions of Section 6.1.

6.2.1 General BAT conclusions for mechanical treatment of waste

6.2.1.1 Emissions to air

BAT 25. In order to reduce emissions to air of dust, and of particulate-bound metals, PCDD/Fs and dioxin-like PCBs, BAT is to apply BAT 10d and to use one or a combination of the techniques given below.

Technique		Description	Applicability
a	Cyclone	See Section 6.6.1. Cyclones are mainly used as preliminary separators for coarse dust.	Generally applicable.
b	Fabric filter	See Section 6.6.1.	May not be applicable to exhaust air ducts directly connected to the ~~mill~~ shredder when there is a risk of deflagration ~~for mechanical treatment in shredders of metal waste~~.
c	Wet scrubber	See Section 6.6.1.	~~Not applicable to mechanical treatment of mercury-containing equipment.~~ Generally applicable.
d	Water injection into the shredder ~~mill~~	The ~~shredded material~~ waste to be shredded is ~~made~~ damped by injecting water into the shredder ~~mill~~. The amount of water injected is regulated in relation to the amount of waste being shredded (which may be monitored via the energy consumed by the ~~main~~ shredder motor). The ~~airflow~~ waste gas that contains residual dust is directed to cyclone(s) and/or a wet ~~(venturi)~~ scrubber.	Only applicable ~~to mechanical treatment in shredder of metal waste in combination with Techniques (a) and/or (b),~~ within the constraints ~~imposed by~~ associated with local ~~meteorological~~ conditions (e.g. low temperature, drought).

Table 6.5: BAT-associated emission levels (BAT-AEL~~s~~) for channelled dust emissions to air from mechanical treatment of waste

Parameter	Unit	BAT-AEL (Average over the sampling period ~~of samples obtained during one year~~)
Dust	mg/Nm³	2–5 ([1])
([1]) When a fabric filter is not applicable ~~cannot be applied in shredders of metal waste for safety reasons~~, the higher end of the range is 10 mg/Nm³.		

The associated monitoring is given in BAT 4.

[This BAT conclusion is based on information given in Sections 3.1.3.1.1, 3.2.3.1.2 and 3.3.4.1.1]

Note: the techniques have been put in alphabetical order

6.2.2 BAT conclusions for the mechanical treatment in shredders of metal waste

Unless otherwise stated, the BAT conclusions presented in this section apply to the mechanical treatment in shredders of metal waste, in addition to BAT 25.

6.2.2.1 ~~General~~ Overall environmental performance

BAT 26. In order to improve the ~~general~~ overall environmental performance, and to ~~reduce the risk of~~ prevent emissions due to accidents and incidents, BAT is to use all of the techniques given below:

a. ~~set up and~~ implementation of a detailed ~~baled material~~ inspection procedure for baled waste before shredding;
b. removal of ~~remove and return to the owner~~ dangerous items ~~(e.g. gas cylinders, dirty drums, EoLVs, with dangerous parts) left in~~ from the waste input stream, ~~by mistake~~ and their safe disposal (e.g. gas cylinders, ~~dirty drums,~~ non-depolluted EoLVs, non-depolluted WEEE, items contaminated with PCBs or mercury, radioactive items ~~with dangerous parts~~);
c. ~~reception and acceptance~~ treatment of ~~drums and~~ containers only when accompanied by a declaration ~~certificate~~ of cleanliness.

Note: BAT 26 was presented as a table in D1

[This BAT conclusion is based on information given in Sections 2.3.2 and 3.1.3.1.2.3]

6.2.2.2 ~~Diffuse emissions to air and d~~Deflagrations

BAT 27. In order to prevent ~~or reduce~~ deflagrations and to reduce emissions when deflagrations occur ~~related diffuse emissions~~, BAT is to use both of the techniques given below.

Technique		Description	Applicability
Technique (a) moved below Technique (b)			
b	~~To set and implement procedures to reduce the number of deflagrations~~ Deflagration management plan	This includes: • ~~a protocol containing appropriate actions and timelines;~~ • a protocol for conducting deflagration monitoring; • a protocol for response to deflagration incidents; • a deflagration reduction programme designed to identify the source(s), and to implement ~~elimination and/or reduction~~ measures to prevent deflagration occurrences, e.g. inspection of waste input as described in BAT 26a, removal of dangerous items as described in BAT 26b, ~~and management of prohibited materials~~ preliminary shredding of waste at low speed; • a review of historical deflagration incidents and remedies and the dissemination of deflagration knowledge.	Generally applicable
a	~~To use p~~Pressure relief dampers ~~equipment~~	~~In order to control deflagrations,~~ Pressure relief dampers are installed to relieve pressure waves coming from deflagrations that would otherwise cause major damage and subsequent emissions. ~~They are equipped with rubber flaps preventing diffuse emissions in normal operation.~~	Generally applicable.

[This BAT conclusion is based on information given in Sections 3.1.3.1.2.2 and 3.1.3.1.2.3]

6.2.2.3 Energy efficiency

BAT 28. In order to use energy efficiently, BAT is to ~~use the technique given below~~keep the shredder feed stable ~~mill feeding~~.

Description

~~Reduction of peak energy consumption and power losses and avoidance of unwanted shutdowns of the mill, by regulating the feed to ensure that the shredder load and motor speed are as constant as possible.~~

The shredder feed is equalised by avoiding disruption or overload of the waste feed which would lead to unwanted shutdowns and start-ups of the shredder.

Note: BAT 28 was presented as a table in D1

[This BAT conclusion is based on information given in Section 3.1.3.3.1]

6.2.3 BAT conclusions for the mechanical treatment in shredders of ~~equipment~~ WEEE containing refrigerants ~~VFCs and/or VHCs~~

Unless otherwise stated, the BAT conclusions presented in this section apply to the mechanical treatment in shredders of WEEE containing refrigerants, in addition to BAT 25.

6.2.3.1 Emissions to air

BAT 29. In order to prevent or, where that is not practicable, to reduce ~~,~~ emissions of organic compounds to air, BAT is to apply BAT 10d and to use one or both of the techniques given below.

	Technique	Description
a	~~Removal of VOC from the shredding area and treatment by~~ Cryogenic condensation	Waste gas containing organic compounds such as VFCs/VHCs are ~~is extracted from the shredding area, and inert gas (e.g. N_2) is blown in to reduce the O_2 concentration below 4 vol-%. This waste gas is then~~ sent to a cryogenic condensation unit where they are ~~it is~~ liquefied (see description in Section 6.6.1). The liquefied gas is stored in pressure tanks ~~for~~ further treatment. ~~The inert gas is recovered and reused to reduce the O_2 concentration.~~
b	~~Removal of VOC from the shredding area and treatment by~~ Adsorption	Waste gas containing organic compounds such as VFCs/VHCs is ~~extracted from the shredding area and~~ led into adsorption ~~filters~~ systems (see description in Section 6.6.1). The spent activated carbon is regenerated by means of heated air pumped into the filter to desorb the organic compounds~~evaporate trapped VFCs/VHCs~~. ~~After the filter~~ Subsequently, the gas is compressed and cooled in order to liquefy the organic compounds ~~VFCs/VHCs~~ (in some cases by cryogenic condensation). The liquefied gas is then stored in pressure vessels ~~tanks~~. The ~~emitted gas~~ waste gas from the compression stage is usually led back into the ~~adsorbing filter~~ adsorption system in order to minimise ~~recover any residual~~ VFC/VHC emissions.

Table 6.6: BAT-associated emission levels (BAT-AELs) for channelled TVOC and VFC emissions to air from the mechanical treatment in shredders of ~~equipment~~ WEEE containing refrigerants ~~VFCs /or VHCs~~

Parameter	**Unit**	**BAT-AEL (Average over the sampling period ~~of samples obtained during one year~~)**
TVOC	mg/Nm^3	~~2~~ 3–15
CFCs	mg/Nm^3	0.5–10

The associated monitoring is given in BAT 4.

[This BAT conclusion is based on information given in Section 3.2.3.1.1]

6.2.3.2 Explosions

BAT 29bis. In order to prevent emissions due to explosions when treating WEEE containing refrigerants, BAT is to use either of the techniques given below.

	Technique	**Description**
a	Inert atmosphere	By injecting inert gas (e.g. nitrogen), the oxygen concentration in enclosed equipment (e.g. in enclosed shredders, crushers, dust and foam collectors) is reduced (e.g. to 4 vol-%).
b	Forced ventilation	By using forced ventilation, the hydrocarbon concentration in enclosed equipment (e.g. in enclosed shredders, crushers, dust and foam collectors) is reduced to < 25 % of the lower explosion limit.

[This BAT conclusion is based on information given in Section 3.2.3.2]

6.2.4 BAT conclusions for the mechanical treatment of waste with calorific value

Unless otherwise stated, the BAT conclusions presented in this section apply to the mechanical treatment of waste with calorific value, in addition to BAT 25.

BAT 29ter. In order to reduce emissions to air of organic compounds, BAT is to apply BAT 10d and to use one or a combination of the techniques given below.

	Technique	**Description**
a	Adsorption	See Section 6.6.1.
b	Biofilter	
c	Thermal oxidation	
d	Wet scrubbing	

[This BAT conclusion is based on information given in Section 2.3.4 and 3.3.4.1.2]

Table 6.6bis: BAT-associated emission levels (BAT-AELs) for channelled TVOC emissions to air from the mechanical treatment of waste with calorific value

Parameter	Unit	BAT-AEL (Average over the sampling period)
TVOC	mg/Nm^3	10-30 mg/Nm^3

The associated monitoring is given in BAT 4

6.2.5 BAT conclusions for the mechanical treatment of ~~mercury-containing equipment~~ WEEE containing mercury

Unless otherwise stated, the BAT conclusions presented in this section apply to the mechanical treatment of WEEE containing mercury, in addition to BAT 25.

6.2.5.1 Emissions to air

BAT 30. In order ~~to prevent or, where that is not practicable,~~ to reduce mercury emissions to air, BAT is to ~~use the technique given below.~~ collect mercury emissions at source, to send them to abatement ~~devices~~ and to carry out adequate monitoring~~surveillance~~.

Description
This includes all of the following:

- ~~Processes~~ equipment used to treat ~~mercury-containing equipment~~ WEEE containing mercury ~~are~~ is enclosed, under negative pressure and connected to a local exhaust ventilation system (LEV);
- ~~Extracted air~~ waste gas from the processes is treated by dedusting techniques such as cyclones, fabric filters, and HEPA filters, ~~as well as~~ followed by adsorption on activated carbon ~~filters~~ (see Section 6.6.1);
- ~~Treated air is either released outside the buildings or recycled.~~
- the air flow from the local exhaust ventilation system (LEV) and mercury concentration in the air extracted from the LEV are monitored to enable the assessment of the effectiveness of the waste gas treatment ~~LEV performance~~;
- mercury levels ~~in ambient air~~ in the vicinity of the equipment are measured regularly ~~around the processes~~ to detect potential mercury leaks.

Note: BAT 30 was presented as a table in D1

[This BAT conclusion is based on information given in Section 5.8.2.3.1]

Table 6.7: BAT-associated emission levels (BAT-AELs) for channelled mercury emissions to air from mechanical treatment of ~~mercury-containing waste~~ WEEE containing mercury

Parameter	Unit	BAT-AEL (Average over the sampling period ~~of samples obtained during one year~~)
Mercury (Hg)	$\mu g/Nm^3$	2 – 7

The associated monitoring is given in BAT 4.

6.3 BAT conclusions for biological treatment of solid and non-pumpable waste

Unless otherwise stated, the BAT conclusions presented in this section apply to biological treatment of solid and non-pumpable waste, and in addition to the general BAT conclusions ~~mentioned~~ in Section 6.1.

6.3.1 General BAT conclusions for biological treatment of solid and non-pumpable waste

6.3.1.1 ~~General~~ Overall environmental performance

BAT 31. In order to reduce odour~~minimise the generation of odorous~~ emissions and to improve the ~~general~~ overall environmental performance, BAT is to select the waste input ~~use the technique given below~~.

Description

The technique consists of carrying out the pre-acceptance, acceptance, and sorting of the waste input (see BAT 2) so as to ensure the suitability of the waste input for the waste treatment, e.g. in terms of ~~enable an appropriate~~ nutrient balance, moisture or toxic compounds which may reduce the~~, and to prevent toxic compounds (i.e. toxic in terms of reducing~~ biological activity~~)~~ ~~entering the biological systems~~.

Note: BAT 31 was presented as a table in D1

[This BAT conclusion is based on information given in Section 4.5.1.1]

6.3.1.2 Emissions to air

BAT 32. In order to reduce ~~channelled~~ emissions of dust, organic compounds and odorous compounds ~~substances~~, including H_2S and NH_3, BAT is to apply BAT 10d and to use one or a combination of the techniques given below~~: a biofilter (See Section 6.6.1)~~.

Technique		Description
a	Adsorption	See Section 6.6.1.
b	Biofilter	See Section 6.6.1. A pretreatment of the waste gas before the biofilter (e.g. with a water or acid scrubber) may be needed in the case of high NH_3 content (e.g. 5–40 mg/Nm^3) in order to control the media pH and to limit the formation of N_2O in the biofilter. Some other odorous compounds (e.g. mercaptans, H_2S) can cause acidification of the biofilter media and necessitate the use of a water or alkaline scrubber as pretreatment of the waste gas before the biofilter.
c	Fabric filter	See Section 6.6.1. The fabric filter is used in the case of mechanical biological treatment.
d	Thermal oxidation	See Section 6.6.1.
e	Wet scrubbing	See Section 6.6.1. Water, acid or alkaline scrubbers are used in combination with a biofilter, thermal oxidation or adsorption on activated carbon.

Table 6.8: BAT-associated emission levels (BAT-AELs) for channelled NH_3, ~~and~~ H_2S, dust and TVOC emissions to air from the biological treatment of solid and non-pumpable waste

Parameter	Unit	BAT-AEL (Average over the sampling period ~~of samples obtained during one year~~)	Waste treatment process
NH_3 ([1])	mg/Nm^3	0.3 ~~0.1~~ –10	All biological treatments of solid and non-pumpable waste
H_2S ([1])	mg/Nm^3	$\leq$ 0.6 ~~0.1 – 1 ([1])~~	
Dust	mg/Nm^3	2–5	Mechanical biological treatment of waste
TVOC	mg/Nm^3	5–20 ~~15~~	
~~([1]) The lower end of the range is associated with the use of a wet scrubber before the biofilter~~ ([1]) A BAT-AEL for odour of 100–400 OU_E/Nm^3 is an alternative to the BAT-AELs for NH_3 and H_2S.			

The associated monitoring is given in BAT 4.

[This BAT conclusion is based on information given in Section 4.5.1.4 and 4.5.4.1]

Note: the techniques have been put in alphabetical order

6.3.1.3 Emissions to water and water usage

BAT 33. In order to ~~minimise~~ reduce the generation of ~~leachate and the volume of~~ waste water~~, as well as to avoid contamination of ground or surface waters~~ and to reduce water usage, BAT is to use all of the techniques given below.

	Technique	Description	Applicability
a	~~Water and leachate management~~ Segregation of water streams	Segregation of leachate seeping from compost piles and windrows~~,~~ from surface run-off water ~~arising from roads, and uncontaminated run-off water from buildings~~ (see BAT 13a3).	Generally applicable to new plants. Generally ~~a~~Applicable to existing plants within the constraints ~~imposed~~associated with ~~by~~ the configuration of the water circuits.
b	Minimisation of the generation of condensate	~~When relevant in aerobic processes, the ceiling of the biological degradation hall is thermally insulated~~ The enclosed processes are designed and operated in order to minimise the water condensation ~~generation of condensate~~ (e.g. by the use of ventilation or thermal insulation).	Generally applicable.
c	Water recycling	Recycling process water streams (e.g. from dewatering of liquid digestate in anaerobic processes) or ~~muddy residues, or~~ using as much as possible ~~alternative sources of water,~~ other water streams (e.g. ~~condensed~~ water condensate, rinsing water, surface run-off water~~, within the process~~). The degree of recycling is limited by the water balance of the plant	~~The recycling of water into the process is limited by potential contents of impurities (heavy metals, salts, pathogens, etc.).~~ Generally applicable.

		and the content of impurities (e.g. heavy metals, salts, pathogens).	
d	Minimisation of the generation of leachate	Adjusting Optimising the moisture content of the waste to its water-holding capacity and therefore minimising in order to minimise the generation of leachate.	Generally applicable.

[This BAT conclusion is based on information given in Section 4.5.1.5]

6.3.2 BAT conclusions for aerobic treatment of waste

Unless otherwise stated, the BAT conclusions presented in this section apply to the aerobic treatment of waste, and in addition to the general BAT conclusions for biological treatment of solid and non-pumpable waste in Section 6.3.1.

6.3.2.1 General Overall environmental performance

BAT 34. In order to reduce emissions to air and to improve the general overall environmental performance, BAT is to monitor the process and to and/or control the key waste and process parameters as mentioned below.

Description

Proper mMonitoring and and/or control of key waste and process parameters, including:

- waste input characteristics (e.g. C: to N ratio, particle size);
- temperature and moisture content at different points in the windrow;
- water content;
- aeration of the windrow (e.g. via the windrow turning frequency, O_2 and/or CO_2 concentration in the windrow, temperature of air streams in the case of forced aeration);
- windrow porosity, height and width air diffusion through the waste.
- Temperature

Applicability

Monitoring of the water moisture content in the windrow is not applicable to enclosed processes when health and/or safety issues have been identified. In that case, the moisture content can be monitored before loading the waste into the enclosed composting stage and adjusted when it exits the enclosed composting stage.

Note: BAT 34 was presented as a table in D1

[This BAT conclusion is based on information given in Section 4.5.2.1]

6.3.2.2 Odour and diffuse emissions to air

BAT 34bis. In order to reduce diffuse emissions to air of dust, odour and bioaerosols from open-air treatment steps, BAT is to use one or both of the techniques given below.

Technique		Description	Applicability
ex-Technique BAT 10e	Use of ~~with~~ semipermeable membrane covers and forced positive aeration	Active composting windrows ~~heaps~~ are ~~located in positively aerated plants~~ covered by ~~with under~~ semipermeable membranes ~~and sealed closed~~ and aerated with positive (pressure) aeration.	~~Only applicable to aerobic treatment of waste.~~ Generally applicable.
Ex-Technique BAT 10f	~~Limit potential generation of odour, dust and bioaerosols by considering meteorological conditions in the operation of the plant~~ Adaptation of operations to the meteorological conditions	This includes techniques such as the following: • ~~Monitoring weather conditions and wind direction and t~~Taking ~~those conditions~~ into account weather conditions and forecasts when undertaking major outdoor process activities. For instance, avoiding formation or turning of windrows or piles, screening or shredding ~~on windy days.~~ in the case of adverse meteorological conditions in terms of emissions dispersion (e.g. ~~undertaking screening and shredding when~~ the wind speed is too low, or too high, or the wind blows in the direction ~~is away from~~ of sensitive receptors)~~.~~. • Orientating windrows, so that the ~~considering the direction of the prevailing wind. The~~ smallest possible area of composting mass is exposed to the prevailing wind, to reduce ~~'stripping' of~~ the dispersion of pollutants from the windrow surface~~,~~. The windrows and piles are preferably located ~~and~~ at the lowest elevation within the overall site layout.	~~Only applicable to aerobic treatment of waste, when techniques (d) and (e) are not used.~~ Generally applicable.

[This BAT conclusion is based on information given in Sections 4.5.2.2 and 4.5.2.3]

6.3.3 BAT conclusions for anaerobic treatment of waste

Unless otherwise stated, the BAT conclusions presented in this section apply to the anaerobic treatment of waste, and in addition to the general BAT conclusions for biological treatment of solid and non-pumpable waste in Section 6.3.1.

~~6.3.3.1 General environmental performance~~

BAT 35. In order to reduce emissions to air and to improve the ~~general~~ overall environmental performance, BAT is ~~to monitor the process and~~ to monitor and/or control the key waste and process parameters ~~as mentioned below~~.

Description

Implement a manual and/or automatic monitoring system to:

- ensure a stable ~~reactor~~ digester operation;
- minimise operational difficulties, such as foaming, which may lead to odour emissions ~~problems~~;
- provide sufficient early warning of system failures which may lead to loss of containment and~~, potentially,~~ explosions.

This includes monitoring and/or control of key waste and process parameters, e.g.~~ such as~~:

- pH and alkalinity of the digester feed;
- digester operating temperature~~ and temperature distribution~~ ;
- hydraulic and organic loading rates of the digester feed;
- ~~organic loading rate including total solids and volatile solids fractions;~~
- concentration of volatile fatty acids (VFA) and ammonia within the digester and digestate;
- ~~Ammonia;~~
- ~~C:N ratio;~~
- biogas quantity~~ generation, and~~, composition (e.g. H_2S) and pressure;
- ~~gas pressure;~~
- ~~H_2S concentration in the gas;~~
- liquid and foam levels in the digester.

Note: BAT 35 was presented as a table in D1

[This BAT conclusion is based on information given in Section 4.5.3.1]

6.3.4 BAT conclusions for mechanical biological treatment (MBT) of waste

Unless otherwise stated, the BAT conclusions presented in this section apply to MBT, and in addition to the general BAT conclusions for biological treatment of solid and non-pumpable waste in Section 6.3.1.

The BAT conclusions for aerobic treatment (Section 6.3.2) and anaerobic treatment (Section 6.3.3) of waste apply, when relevant, to mechanical biological treatment of waste.

~~6.3.4.1 Emissions to air~~

BAT 36. In order ~~to prevent or, where that is not practicable,~~ to reduce emissions to air, BAT is to use ~~all~~ both of the techniques given below.

	Technique	Description	Applicability
a	~~Separate collection of air flows~~ Segregation of the waste gas streams	Splitting of the total ~~volume~~ waste gas stream ~~flow that is to be treated~~ into ~~heavily polluted exhaust air~~ waste gas streams with a high pollutant content and ~~lightly polluted exhaust air~~ waste gas streams with a low pollutant content, as identified in BAT 2bis.	Generally applicable to new plants. Generally ~~a~~Applicable to existing plants within the constraints ~~imposed by~~ associated with the configuration of the air circuits.
b	~~Partial reuse of exhaust air in the biological process~~ Recirculation of waste gas	~~Use the exhausted air from the delivery waste input area (such as low bunkers and underground bunkers with or without mechanical treatment), or reuse the treated air as air supply (process air) for biological degradation.~~ Recirculation of waste gas with a low pollutant content in the biological process followed by waste gas treatment adapted to the concentration of pollutants (see BAT 32). The use of waste gas in the biological process may be limited by the waste gas temperature and the pollutant content. It may be necessary to condense the water vapour contained in the ~~exhausted air~~ waste gas before reuse. In this case, cooling is necessary, and the condensed water is recirculated when possible (see BAT 33) or treated before discharge.	

[This BAT conclusion is based on information given in Section 4.5.4.1]

BAT 37. Merged with BAT 32

Table 6.9 merged with table 6.8.

6.4 BAT conclusions for physico-chemical treatment of waste

Unless stated otherwise, the BAT conclusions presented in this section apply to physico-chemical treatment of waste, and in addition to the general BAT conclusions ~~mentioned~~ in Section 6.1.

6.4.1 BAT conclusions for the physico-chemical treatment of solid and/or pasty waste

6.4.1.1 ~~General~~ Overall environmental performance

BAT 38. In order to improve the ~~general~~ overall environmental performance, BAT is to monitor the waste input as part of the waste pre-acceptance and acceptance procedures (see BAT 2)~~: use the technique given below~~.

Description
Monitoring the waste input, e.g.in terms of:

- ~~the waste input content of e.g.:~~
- content of organics, oxidising agents, metals (e.g. mercury), salts, odorous compounds;
  - ~~solid cyanides,~~
  - ~~oxidising agents;~~
  - ~~mercury;~~
- H_2 formation potential upon mixing of ~~emissions when fly ashes or~~ air pollution control (APC) residues, e.g. fly ashes, ~~are mixed~~ with water.

~~**Applicability**~~
~~Controlling H_2 emissions is only applicable when the fly ashes or APC residues contain carbonate~~

Note: BAT 38 was presented as a table in D1

[This BAT conclusion is based on information given in Section 5.1.4.1.1]

6.4.1.2 Emissions to air

BAT 39. In order to reduce emissions of dust, organic compounds ~~VOC~~ and NH_3 ~~emissions~~ to air, BAT is to apply BAT 10d and to use one or a combination of the techniques given below.

	Technique	Description
a	Adsorption	See Section 6.6.1.
b	Biofilter	
c	Fabric filter	
d	Wet scrubber	

[This BAT conclusion is based on information given in Section 5.1.4.2]

Table 6.8: BAT-associated emission levels (BAT-AELs) for channelled emissions of dust, ~~TVOC and NH_3~~ ~~emissions~~ to air from the physico-chemical treatment of solid and/or pasty waste

Parameter	Unit	BAT-AEL (Average over the sampling period ~~of samples obtained during one year~~)
Dust	mg/Nm^3	2–5
~~TVOC~~		~~2–15~~
~~NH_3~~		~~0.1–5~~

The associated monitoring is given in BAT 4.

Note: the techniques have been put in alphabetical order

6.4.2 BAT conclusions for the re-refining of waste oil

6.4.2.1 ~~General~~ Overall environmental performance

BAT 40. In order to improve the ~~general~~ overall environmental performance ~~of waste oil re-refining~~, BAT is to ~~use both of the techniques given below.~~ select the waste input.

Description
The technique consists of carrying out the pre-acceptance, acceptance, and sorting of the waste input (see BAT 2) so as to ensure the absence of chlorinated compounds (e.g. chlorinated solvents or PCBs) in the waste input.

[This BAT conclusion is based on information given in Section 5.2.3.1 ~~and 5.2.3.3~~]

BAT 40bis – In order to reduce the quantity of waste sent for disposal, BAT is to use one or both of the techniques given below.

	Technique	Description
a	Material recovery	Using the residues from vacuum distillation or thin film evaporators, e.g. in asphalt products.
b	Energy recovery	Using the residues from distillation as fuels.

	Technique	Description
~~a~~	~~Set up and implement acceptance procedures~~ ~~Selection of waste input~~	~~Acceptance procedures include controlling the waste input content in chlorinated compounds (e.g. solvents or PCBs).~~
b	~~Residue management~~	~~Using the residues as heater feed in a heater equipped with wet scrubber to generate energy for the plant~~

[This BAT conclusion is based on information given in Section ~~5.2.3.1 and~~ 5.2.3.3]

6.4.2.2 Emissions to air

BAT 41. In order to reduce emissions of organic compounds ~~VOC emissions~~ to air, BAT is to apply BAT 10d and to use one or a combination of the techniques given below.

	Technique	Description
a	Adsorption	See Section 6.6.1.

b	Thermal oxidation	See Section 6.6.1. This includes when the waste gas is sent to ~~may also be fed into~~ a process furnace or a boiler.
c	Wet scrubber	See Section 6.6.1.

[This BAT conclusion is based on information given in Section 5.2.3.4]

~~**Table 6.9: BAT-associated emission levels (BAT-AELs) for TVOC emissions to air from re-refining of waste oil**~~

~~Parameter~~	~~Unit~~	~~BAT-AEL (Average of samples obtained during one year)~~
~~TVOC~~	~~mg/Nm^3~~	~~5–15~~

The BAT-AEL set out in Section 6.4.5 applies.

The associated monitoring is given in BAT 4.

~~6.4.2.3 Emissions to water and water usage~~

BAT 42. Deleted.

6.4.3 BAT conclusions for the physico-chemical treatment of liquid waste with calorific value

6.4.3.1 Emissions to air

BAT 43. In order to reduce emissions of organic compounds ~~VOC emissions~~ to air ~~from plants performing physico-chemical treatment of liquid and semi-liquid waste with calorific value~~, BAT is to apply BAT 10d and to use one or a combination of the techniques given below.

Technique		Description
a.	Adsorption	See Section 6.6.1
b.	Cryogenic condensation	
c.	Thermal oxidation	
d.	Wet scrubber	

[This BAT conclusion is based on information given in Section 5.3.4.1]

~~**Table 6.10: BAT-associated emission levels (BAT-AELs) for VOC emissions to air from plants performing physico-chemical treatment of liquid and semi-liquid waste with calorific value**~~

~~Parameter~~	~~Unit~~	~~BAT-AEL (Average of samples obtained during one year)~~
~~TVOC~~	~~mg/Nm^3~~	~~5–15~~

The BAT-AEL set out in section 6.4.5. applies.

The associated monitoring is given in BAT 4.

Note: the techniques have been put in alphabetical order

6.4.4 BAT conclusions for the regeneration of spent solvents

6.4.4.1 ~~General~~ Overall environmental performance

BAT 44. In order to improve the ~~general~~ overall environmental performance of the regeneration of spent solvents, BAT is to use one or both of the techniques given below.

	Technique	Description
a	~~Recover solvents from distillation residues~~ Material recovery	Solvents are recovered from the distillation residues by evaporation ~~Vacuum drying and other drying techniques are used to evaporate the residues from the distillation columns and recover the solvents.~~
b	Energy recovery	Using the residues from distillation as fuels.

[This BAT conclusion is based on information given in Section 5.4.3.1]

6.4.4.2 Emissions to air

BAT 45. In order to ~~prevent or, where that is not practicable, to~~ reduce emissions of organic compounds ~~VOC emissions~~ to air, BAT is to apply BAT 10d and to use a ~~suitable~~ combination of the techniques given below.

	Technique	Description	Applicability
a	Recirculation of waste gases ~~from solvents regeneration process~~ in a steam boiler	~~Collected waste gas is cooled and chilled to condense and partially separate solvents. This waste gas with remaining solvents is fed to the steam boiler supplying the plant. If the steam boiler is not in operation or the waste gas volume would exceeds the steam boiler air demand, the pretreated waste gas is treated by activated carbon filters before release.~~ The waste gases from the condensers are sent to the steam boiler supplying the plant.	Not applicable to the treatment of halogenated solvent wastes, in order to avoid generating and emitting PCBs and/or PCDD/F.
b (ex c)	~~Activated carbon~~ Adsorption	See Section 6.6.1~~ for the description of the technique~~.	There may be limitations to the applicability of the technique due to safety reasons (e.g. activated carbon beds tend to self-ignite when loaded with ketones).
c (ex b)	Condensation~~/~~ or cryogenic condensation	See Section 6.6.1~~ for the description of the techniques. Adequate control of condenser parameters is essential to minimise VOC emissions from the condenser vents. Condenser (cooling) failure results in an automatic process shutdown.~~	Generally applicable.
d	Wet scrubber	See Section 6.6.1~~ for the description of the technique~~.	Generally applicable.

[This BAT conclusion is based on information given in Sections 5.4.3.3 and 5.4.3.4]

~~**Table 6.6 11: BAT-associated emission levels (BAT-AELs) for VOC emissions to air from plants performing regeneration of spent solvents**~~

~~**Parameter**~~	~~**Unit**~~	~~**BAT-AEL (Average of samples obtained during one year)**~~
~~TVOC~~	~~kg per tonne of spent solvent treated~~	~~0.02–0.36~~

The BAT-AEL set out in Section 6.4.5 applies.

The associated monitoring is given in BAT 4.

BAT 46. Deleted

6.4.5 BAT-AEL for emissions of organic compounds to air from re-refining of waste oil, physico-chemical treatment of liquid waste with calorific value and regeneration of spent solvents

Table 6.13bis: BAT-associated emission levels (BAT-AELs) for channelled emissions of TVOC to air from the re-refining of waste oil, the physico-chemical treatment of liquid waste with calorific value and the regeneration of spent solvents

Parameter	**Unit**	**BAT-AEL (1) (Average over the sampling period)**
TVOC	mg/Nm^3	5–30
(1) The BAT AEL only applies when the emission is above 1 kg/h.		

6.4.6 BAT conclusions for the thermal treatment of spent activated carbon, waste catalysts and excavated contaminated soil

6.4.6.1 ~~General~~ Overall environmental performance

BAT 47. In order to improve the ~~general~~ overall environmental performance of the thermal treatment of spent activated carbon, waste catalysts and excavated contaminated soil, BAT is to use all of the techniques given below.

	Technique	Description	Applicability
a	Heat recovery from the furnace off-gas	Recovered heat may be used, for example, for~~This involves gas/gas heat exchangers to allow the~~ preheating of combustion air ~~and waste gas reheating. There may also be a waste heat boiler used~~ or for the generation of steam, which is also used in the reactivation of the carbon.	Generally applicable.
b	~~Reduction of waste gas to be treated.~~ Indirectly fired furnace	~~Use~~ An indirectly fired ~~kiln~~ furnace is used to avoid contact between the ~~kiln~~ furnace content and the flue-gases from ~~waste gases generated by~~ the burner(s).	Indirectly fired ~~kilns~~ furnaces are normally constructed with a metal tube and applicability may be restricted due to corrosion problems ~~that may appear during treatment of some activated carbons used in industrial applications~~.
c	~~Primary~~ Process-integrated techniques ~~for reducing particulate and acid gas emissions~~	This includes techniques such as: • control of the furnace temperature~~,~~ and of the turning rate of the rotary furnace~~,~~; • choice of fuel ~~type~~; ~~- design of the regenerator and associated ducting and equipment to operate under a reduced pressure, in order to prevent the escape of regenerator gases into the air;~~ • use of a sealed furnace or operation of the furnace at a reduced pressure to avoid diffuse emissions to air.	~~Design measures are generally only applicable to new plants.~~ Generally applicable.

[This BAT conclusion is based on information given in Sections 5.5.3.1 and 5.5.4.1]

6.4.6.2 Emissions to air

BAT 48. In order to reduce emissions of HCl, HF, dust and organic compounds to air, BAT is to apply BAT 10d and to use one or a combination of the techniques given below.

	Technique	Description
a	Cyclone	See Section 6.6.1. The technique is used in combination with further abatement techniques.
b	Electrostatic precipitator (ESP)	See Section 6.6.1.
c	Fabric filter~~ ([3])~~	
d	Wet scrubber~~ ([2])~~	
e	Adsorption	
f	Condensation~~ of waste gas~~	
g	Thermal oxidation~~ ([1])~~	

~~([1]) Thermal oxidation is carried out with a minimum temperature of 1100 °C and two second residence time for the regeneration of activated carbons used in industrial applications where refractory halogenated or other thermally resistant substances are likely to be present. In the case of activated carbon used for potable water- and food-grade applications, an afterburner with a minimum heating temperature of 850 °C and two second residence time is sufficient (see Section 6.6.1).~~
~~([2]) Caustic or soda ash scrubbing solutions are used to neutralise acid gases for thermal treatment of activated carbon used in industrial applications.~~
~~([3]) Cooling the waste gas prior to a fabric filter is an important technique as it provides temperature protection for the filter and allows a wider choice of fabric.~~

[This BAT conclusion is based on information given in Sections 5.5.3.1 and 5.5.4.1]

The associated monitoring is given in BAT 4.

6.4.7 BAT conclusions for the water washing of excavated contaminated soil

~~6.4.7.1 Emissions to air~~

BAT 49. In order to reduce emissions of dust and organic compounds ~~VOC emissions~~ to air from the storage, handling, and washing steps, BAT is to apply BAT 10d and to use one or a combination of the techniques given below.

	Technique	Description
a	Adsorption	See Section 6.6.1.
b	Fabric filter	
c	Wet scrubber	

[This BAT conclusion is based on information given in Section 5.6.3.2.2]

The associated monitoring is given in BAT 4.

Note: the techniques have been put in alphabetical order

6.4.8 BAT conclusions for the decontamination of equipment containing PCBs

~~6.4.8.1 General environmental performance~~

BAT 50. In order to improve the ~~general~~ overall environmental performance and to reduce channelled emissions of PCBs and organic compounds, ~~of PCB decontamination~~, BAT is to ~~apply~~ use all of the techniques given below.

	Technique	Description
a	~~Design measures to prevent dispersion of PCBs from~~ Coating of the storage and treatment areas	This includes techniques such as: ~~Dedicated storm and run-off water collection system.~~ • resin coating applied to the ~~whole~~ concrete floor of the whole storage and treatment areas.
b	Implementation of staff access rules ~~to prevent dispersion of contamination~~	This includes techniques such as: • access points to storage and treatment areas are locked; • special qualification is required to access the area where the ~~waste or polluted~~ contaminated equipment is stored and handled; • separate 'clean' and 'dirty' cloakrooms to put on/remove individual protective outfit.
c	~~Prevention of liquid PCB dispersion during the decontamination process~~ Optimised equipment cleaning and drainage	This includes techniques such as: • external surfaces of the contaminated ~~electrical~~ equipment are cleaned with anionic detergent; ~~liquid.~~ • ~~Pumping the PCB oil out~~ emptying of the ~~electrical~~ equipment with a pump or under vacuum instead of gravity emptying; • procedures are defined and used for filling, emptying and (dis)connecting the vacuum vessel; • long period of ~~dripping~~ drainage (at least 12 hours) is ensured to avoid any ~~PCB drop~~ dripping of contaminated liquid during further treatment operations, after the separation of the core from the casing of an electrical transformer.
d	Control of emissions to air	This includes techniques such as: • the ~~ambient~~ air of the decontamination workshop is collected and treated with ~~on~~ activated carbon filters; • the exhaust of the vacuum pump mentioned in technique (c) above is connected to an end-of-pipe abatement system (e.g. a high-temperature ~~kiln~~ thermal oxidation or adsorption on activated carbon ~~filters~~).
e	~~Management~~ Disposal of waste treatment residues	This includes techniques such as: • porous, contaminated parts of the electrical transformer (wood and paper) are sent to ~~fed into a~~ high-temperature incineration ~~kiln (≥ 1100 °C)~~; • ~~destruction of the~~ PCBs in the oils are destroyed (e.g. dechlorination, hydrogenation, solvated electron processes, high-temperature incineration).
f	Recovery of solvent when solvent washing is used	Organic solvent is collected and distilled to be reused in the process.

[This BAT conclusion is based on information given in Sections 5.8.1.3.1 and 5.8.1.3.2]

~~6.4.8.2 Emissions to air~~

BAT 51. Merged with BAT 50

6.5 BAT conclusions for the ~~physico-chemical and/or biological~~ treatment of water-based liquid waste

Unless stated otherwise, the BAT conclusions presented in this section apply to ~~physico-chemical and/or biological~~ the treatment of water-based liquid waste, and in addition to the general BAT conclusions ~~mentioned~~ in Section 6.1.

6.5.1 Overall environmental performance

BAT 52bis. In order to improve the overall environmental performance, BAT is to monitor the waste input as part of the waste pre-acceptance and acceptance procedures (see BAT 2).

Description
Monitoring the waste input in terms of e.g.:

- bioeliminability (e.g. BOD, BOD to COD ratio, Zahn-Wellens test, biological inhibition potential);
- feasibility of emulsion breaking, e.g. by means of laboratory-scale tests.

[This BAT conclusion is based on information given in Section 2.3.2.1, 2.3.2.2 and 2.3.2.3]

6.5.2 Emissions to air

BAT 52. In order to reduce emissions of HCl, NH_3 and organic compounds ~~VOC channelled emissions~~ to air, BAT is to apply BAT 10d and to use one or a combination of the techniques given below.

Technique		Description
a	Adsorption	See Section 6.6.1.
b	Biofilter	
c	Thermal oxidation	
d	Wet scrubber	

[This BAT conclusion is based on information given in Section 5.7.3.1]

Table 6.12: BAT-associated emission levels (BAT-AELs) for channelled emissions of HCl, NH_3 and TVOC ~~emissions~~ to air from physico-chemical and/or biological treatment of water-based liquid waste

Parameter	Unit	BAT-AEL ([1]) (Average over the sampling period ~~of samples obtained during one year~~)
Hydrogen chloride (HCl)	mg/Nm^3	1–5 ~~3 ([1])~~
~~Ammonia (NH_3)~~		~~0.1–5~~
TVOC		3–20 ([2])

([1]) These BAT-AELs only apply when the substance concerned is identified as relevant in the waste gas, based on the inventory mentioned in BAT 2bis .
~~([1]) This BAT-AEL does not apply if only biological treatment is carried out.~~
([2]) The upper end of the range is 45 mg/Nm^3 when the load is below 0.5 kg/h.

The associated monitoring is given in BAT 4.

Note: the techniques have been put in alphabetical order

6.6 Description of techniques

6.6.1 Channelled emissions to air

Technique	Typical pollutant(s) abated	Description
Absolute filter	Dust	In absolute filters (e.g. HEPA = high-efficiency particle air filter, ULPA = ultra-low penetration air filter), the filter medium is paper or matted glass fibre with a high packing density. The waste gas stream is passed through the filter medium, where particulate matter is collected.
Adsorption	Mercury, volatile organic compounds, hydrogen sulphide odorous compounds	Adsorption is a heterogeneous reaction in which gas molecules are retained on a solid or liquid surface (adsorbent also referred to as a molecular sieve) that prefers specific compounds to others and thus removes them from effluent streams. When the surface has adsorbed as much as it can, the adsorbent is replaced or the adsorbed content is desorbed as part of the regeneration of the adsorbent. When desorbed, the contaminants are usually at a higher concentration and can either be recovered or disposed of. The most common adsorbent is granular activated carbon.
Fabric filter	Dust	Bag or 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	Ammonia, hydrogen sulphide, volatile organic compounds, odorous compounds	The waste gas stream is passed through a bed of organic material (such as peat, heather, compost, root, tree bark, compost, softwood and different kinds of 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. 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, the bed has an appropriate height and surface area and 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 (e.g. empty bed residence time from 40 to 100 seconds). The biofilter is operated by monitoring and controlling the moisture content and the pH of the bed as well as by monitoring and controlling the temperature and humidity of the waste gas entering the biofilter.

Condensation and cryogenic condensation	Volatile organic compounds	Condensation is a technique that eliminates solvent vapours from a waste gas stream by reducing its temperature below its dew point. For cryogenic condensation, the operating temperature can be down to -120 °C, in practice often operated between -40 °C and -80 °C in the condensation device. Cryogenic condensation can cope with all VOCs and volatile inorganic pollutants, irrespective of their individual vapour pressures. The low temperatures applied allow for very high condensation efficiencies ~~in such a way that~~ which make it ~~is~~ well-suited as a final VOC emission control technique.
Cyclone	Dust	Cyclone filters are used to remove heavier particulates, which 'fall out' as the waste gases are forced into a rotating motion before they leave the separator ~~again~~. Cyclones are used to control particulate material, primarily PM_{10}. ~~There are high-efficiency cyclones (e.g. multi-cyclones) designed to be effective even for $PM_{2.5}$.~~
Electrostatic precipitator (ESP)	Dust	Electrostatic precipitators operate such that particles are charged and separated under the influence of an electrical field. Electrostatic precipitators are capable of operating under a wide range of conditions. In a dry ESP, the collected material is mechanically removed (e.g. by shaking, vibration, compressed air), while in a wet ESP it is flushed with a suitable liquid, usually water.
Thermal oxidation	Volatile organic compounds	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. When the waste gas contains halogenated compounds, the oxidation temperature exceeds 1100 °C with a minimum residence time of 2 seconds, and with subsequent rapid cooling of exhaust gases to prevent the *de novo* synthesis of PCDD/F.
Wet scrubbing	Dust, volatile organic compounds, gaseous acids (basic scrubber), gaseous alkalis (acid scrubber)	Wet scrubbing (or absorption) is a mass transfer between a soluble gas or dust and a solvent – often water – in contact with each other. Physical scrubbing is preferred for chemical recovery, whereas chemical scrubbing is restricted to removing and abating gaseous compounds. Physico-chemical scrubbing takes an intermediate position. The component is dissolved in the absorbing liquid and involved in a reversible chemical reaction, which enables the recovery of the gaseous component.

6.6.2 Diffuse emissions of organic compounds to air

Leak detection and repair (LDAR) programme	Volatile organic compounds	A structured approach to reduce fugitive ~~VOC~~ emissions of organic compounds by detection and subsequent repair or replacement of leaking components. Currently, sniffing (described by EN 15446) and optical gas imaging methods are available for the identification of leaks. **Sniffing method**: The first step is the detection using hand-held ~~VOC~~ organic compound analysers measuring the concentration adjacent to the equipment (e.g. using flame ionisation or photo-ionisation). The second step consists of enclosing the component in an impermeable bag to carry out a direct measurement at the source of the emission. This second step is sometimes replaced by mathematical correlation curves derived from statistical results obtained from a large number of previous measurements made on similar components. **Optical gas imaging methods**: Optical imaging uses small lightweight hand-held cameras which enable the visualisation of gas leaks in real time, so that they appear as 'smoke' on a video recorder together with the normal image of the component concerned, to easily and rapidly locate significant ~~VOC~~ organic compound leaks. Active systems produce an image with a back-scattered infrared laser light reflected on the component and its surroundings. Passive systems are based on the natural infrared radiation of the equipment and its surroundings.
Measurement of diffuse VOC emissions ~~monitoring~~	Volatile organic compounds	Sniffing and optical gas imaging methods are described under leak detection and repair programme. Full screening and quantification of emissions from the installation can be undertaken with an appropriate combination of complementary methods, e.g. Solar occultation flux (SOF) or Differential absorption LIDAR (DIAL) campaigns. These results can be used for trend evaluation ~~in~~ over time, cross-checking and updating/validation of the ongoing LDAR programme. **Solar occultation flux (SOF)**: The technique is based on the recording and spectrometric Fourier Transform analysis of a broadband infrared or ultraviolet/visible sunlight spectrum along a given geographical itinerary, crossing the wind direction and cutting through VOC plumes. **Differential absorption LIDAR (DIAL)**: This is a laser-based technique using differential absorption LIDAR (light detection and ranging), which is the optical analogue of radio wave-based RADAR. The technique relies on the back-scattering of laser beam pulses by atmospheric aerosols, and the analysis of the spectral properties of the returned light collected with a telescope.

6.6.3 Emissions to water

Technique	Typical pollutant(s) targeted	Description
Equalisation	All pollutants	Balancing of flows and pollutant loads by using tanks or other management techniques.
Neutralisation	Acids, alkalis	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 ($Ca(OH)_2$) may be used to increase the pH, whereas sulphuric acid (H_2SO_4), hydrochloric acid (HCl) or carbon dioxide (CO_2) may be used to decrease the pH. The precipitation of some ~~substances~~ pollutants may occur during neutralisation.
Oil-water separation	Oil/grease	The separation of oil and water and subsequent oil removal by gravity separation of free oil, using separation equipment or emulsion breaking (using emulsion breaking chemicals such as metal salts, mineral acids, adsorbents and organic polymers).
Coagulation and flocculation	Suspended solids and particulate-bound metals	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. The flocs formed are subsequently separated by sedimentation, air flotation or filtration.
~~Electrocoagulation~~		~~The release of coagulants in the waste water to be treated is realised by electrolytically dissolving an electrode (i.e. anode, normally made of Fe or Al). When the electrode is dissolved, gas is released (i.e. O2, H2) which results in a flotation effect. If necessary, a (support) flocculant can be added to improve the flotation yield.~~
Filtration		The separation of solids from waste water by passing them 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 filtration		Microfiltration (MF) and ultrafiltration (UF) are membrane filtration processes that retain and concentrate, on one side of the membrane, ~~substances~~ pollutants such as suspended particles and colloidal particles contained in waste waters.
Sedimentation		The separation of suspended particles by gravitational settling.
Adsorption	Adsorbable dissolved ~~Soluble~~ non-biodegradable or inhibitory pollutants ~~contaminants~~, e.g. ~~organics~~ hydrocarbons, mercury, AOX	Separation method in which compounds (i.e. pollutants) in a fluid (i.e. waste water) are retained on a solid surface (typically activated carbon). ~~Adsorption is the transfer of soluble substances (solutes) from the waste water phase to the surface of solid, highly porous particles (the adsorbent). The adsorbent most commonly used is activated carbon.~~
Distillation/rectification	Dissolved Soluble non-biodegradable or inhibitory pollutants ~~contaminants~~ that can be distilled, e.g. some solvents	Distillation is a technique to separate compounds with different boiling points by partial evaporation and recondensation. Waste water distillation is the removal of low-boiling contaminants from waste water by transferring them into the vapour phase. Distillation is carried out in columns, equipped with plates or packing material, and a downstream condenser. ~~Distillation or rectification is the separation of waste water from its contaminants by transferring them into the vapour phase. The enriched vapour phase is condensed afterwards.~~
Chemical precipitation	Precipitable dissolved ~~Soluble~~ non-biodegradable or inhibitory pollutants ~~contaminants~~, e.g. metals, phosphorus	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. ~~If necessary, this may be followed by microfiltration or ultrafiltration.~~
Chemical oxidation	Oxidisable dissolved ~~Soluble~~ non-biodegradable or inhibitory pollutants ~~contaminants~~, e.g. nitrite, cyanide	Organic compounds are oxidised with ozone or hydrogen peroxide, optionally supported by catalysts or UV radiation, to convert them into less harmful and more easily biodegradable compounds. ~~Chemical oxidation is the conversion of pollutants by chemical oxidising agents other than oxygen/air, or by bacteria, into similar but less harmful or hazardous compounds and/or into short-chained and more easily degradable or biodegradable organic components.~~ Chemical oxidation is also used to degrade organic compounds causing odour, taste and colour and for disinfection purposes.

Chemical reduction	Reducible dissolved ~~Soluble~~ non-biodegradable or inhibitory pollutants ~~contaminants~~, e.g. hexavalent chromium (Cr(VI))	Chemical reduction is the conversion of pollutants by chemical reducing agents into similar but less harmful or hazardous compounds.
Evaporation	Soluble ~~non-biodegradable or inhibitory~~ pollutants ~~contaminants~~	The use of distillation (see above) to concentrate aqueous solutions of high-boiling substances for further use, processing or disposal (e.g. waste water incineration) by transferring water to the vapour phase. Typically carried out in multistage units with increasing vacuum, to reduce the energy demand. The water vapours are condensed, to be reused or discharged as waste water. ~~Evaporation of waste water is a distillation process where water forms the vapour phase, leaving the concentrate as bottom residues to be disposed of. The volatile steam is collected in a condenser and the condensed water is, if needed after subsequent treatment, recycled.~~
Ion exchange process	Ionic dissolved ~~Soluble~~ non-biodegradable or inhibitory pollutants ~~contaminants~~, e.g. metals	Ion exchange is the removal of undesired or hazardous ionic constituents of waste water and their replacement by more acceptable ions from an ion exchange resin, where they are temporarily retained and afterwards released into a regeneration or backwashing liquid.
~~Nanofiltration and reverse osmosis~~	~~Soluble non-biodegradable or inhibitory contaminants~~	~~A membrane process is the permeation of a liquid through a membrane, to be segregated into permeate that passes through the membrane and concentrate that is retained. The driving force of this process is the pressure difference across the membrane. Nanofiltration and reverse osmosis membranes can hold back all particles down to the size of organic molecules and even ions.~~
Stripping	~~Soluble~~Purgeable ~~non-biodegradable or inhibitory~~ pollutants ~~contaminants~~, e.g. hydrogen sulphide (H_2S), ammonia (NH_3), some adsorbable ~~adsordable~~ organically bound halogens (AOX), hydrocarbons	The removal of ~~volatile~~ purgeable pollutants from the aqueous phase by a gaseous phase (e.g. steam, nitrogen or air) that is passed through the liquid, and are subsequently recovered (e.g. by condensation) for further use or disposal. Removal efficiency may be enhanced by increasing the temperature or reducing the pressure. ~~waste water by bringing them into contact with a high-volume flow of a gas current in order to transfer them to the gas phase. The pollutants are removed from the stripping gas in a downstream treatment, such as condensation and phase separation, and may potentially be reused.~~

Activated sludge process	Biodegradable organic compounds	The biological oxidation of dissolved organic ~~substances~~pollutants with oxygen using the metabolism of microorganisms. In the presence of dissolved oxygen (injected as air or pure oxygen), the organic components are transformed into carbon dioxide, water or other metabolites and biomass (i.e. the activated sludge). 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.
~~Anaerobic treatment~~		~~Anaerobic waste water treatment converts the organic content of waste water, with the help of microorganisms and without entry of air, to a variety of products such as methane, carbon dioxide, sulphide, etc.~~
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, the biomass remaining in the tank.
Nitrification/denitrification	Total nitrogen, ammonia	A two-step process that is typically incorporated into biological waste water treatment plants. The first step is 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.

6.6.4 Sorting techniques

Technique	Description
Air classification	Air classification (or air separation, or aeraulic separation) is a process of approximate sizing of dry mixtures of different particle sizes into groups or grades at cut points ranging from 10 mesh to sub-mesh sizes. Air classifiers (also called winds~~h~~ifters) complement screens in applications requiring cut points below commercial screen sizes, and supplement sieves and screens for coarser cuts where the special advantages of air classification warrant it.
All metal separator	Metals (ferrous and non-ferrous) are sorted by means of a detection coil, in which the magnetic field is influenced by metal particles, linked to a processor that controls the air jet for ejecting the materials that have been detected.
Ballistic separation	Materials are separated in a ballistic separator, or ballistic sieve, composed of a series of parallel paddles, with orbital motion, arranged with a variable angle ~~with respect to the horizontal~~. The materials fed into the ballistic separator, having different physical characteristics (weight, shape, surface, etc.), assume different trajectories following the orbital movement of the paddle/conveyor belts.
Electromagnetic separation of non-ferrous metals	Non-ferrous metals are sorted by means of eddy current separators. An eddy current is induced by a series of rare earth magnetic or ceramic rotors at the head of a conveyor that spins at high speed independently of the conveyor. This process induces temporary magnetic forces in non-magnetic metals of the same polarity as the rotor, causing the metals to be repelled away and then separated from the other feedstock.
Manual separation	Material is manually separated by means of visual examination by staff on a picking line either to selectively remove a target material from a general waste stream, or to remove contamination from an output stream to increase purity. This technique generally targets recyclables (glass, plastic, etc.) and any contaminants, hazardous materials and oversized materials such as WEEE. ~~Manual separation takes place within a covered cabin isolated from the rest of the mechanical treatment hall, to limit staff exposure, e.g. to dust and particulates, vehicle movements, and vibration.~~
Magnetic separation	Ferrous metals are sorted by means of a magnet which attracts ferrous metal materials. This can be carried out, for example, by an overband magnetic separator or a magnetic drum.
Near infrared spectroscopy (NIRS)	Materials are sorted by means of a near infrared sensor which scans the whole width of the belt conveyor and transmits the characteristic spectra of the different materials to a data processor which controls an air jet for ejecting the materials that have been detected.
Sink-float tanks	Solid materials are separated into two flows by exploiting the different material densities.
Size separation	Materials are sorted according to their particle size. This can be carried out by drum screens, linear and circular oscillating screens, flip-flop screens, flat screens, tumbler screens and moving grates.
Vibration table	Materials are separated according to their density and size, moving (in slurry in the case of wet tables~~,~~ or wet density separators) across an inclined table, which oscillates backwards and forwards.

X-ray systems	Metal composites are sorted according to various material densities, halogen components, or organic components, with the aid of X-rays.

6.6.5 Management techniques

Accident management plan	The accident management plan is part of the EMS (see BAT 1) and identifies hazards posed by the plant and the associated risks and defines measures to address these risks. It considers the inventory of ~~substances~~pollutants present or likely to be present which could have environmental consequences if they escape.
Residues management plan	A residues management plan is part of the EMS (see BAT 1) and is a set of measures aiming to 1) minimise the generation of residues arising from the treatment of waste, 2) optimise the reuse, ~~or~~ regeneration, recycling and/or recovery of energy of the residues, and 3) ensure the proper disposal of internal residues or waste.