EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for Prospective Technological Studies (Seville)
Sustainable Production and Consumption Unit
European IPPC Bureau

Seville, 30 October 2013
ARES (2013)3383148

Final meeting of the Technical Working Group (TWG) for the review of the BAT reference document for Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector (CWW BREF)

Seville, 10 – 13 December 2013

BACKGROUND PAPER

Purpose of this paper and of the final Technical Working Group meeting

The objective of this background paper (BP) is to outline the main issues proposed for discussion at the final meeting of the Technical Working Group (TWG) for the review of the BAT reference document for 'Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector' under the Industrial Emissions Directive 2010/75/EU (IED).

The meeting objective is to agree on the remaining work to finalise the BREF review. In particular, it is proposed that the TWG meeting should focus on:

I. agreeing upon the text of Chapter 4 (and related items in Chapter 3) of the CWW BREF, i.e. the BAT conclusions;
II. identifying elements that should be mentioned in Chapter 6 of the CWW BREF (Concluding remarks and recommendations for future work);
III. agreeing upon the remaining work needed for finalising the BREF.

This BP includes:

- background information on the work already carried out for the review of the CWW BREF;
- the issues proposed for discussion at the final TWG meeting (including a summary of relevant comments received on the second draft of the revised CWW BREF and the EIPPCB assessments of those comments);
- the proposed modifications to be made in the revised CWW BREF arising from the comments of the TWG members.

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Background information

The kick-off meeting for the review of the CWW BREF was held from 16 to 18 June 2008 in Seville. The data collection process was officially scheduled from June 2008 until January 2009. However, some important information and data were provided at a later stage and have been taken on board by the EIPPCB during 2009–2013.

The first draft of the revised CWW BREF was issued in early October 2009 and the consultation period for TWG members ended on 27 November 2009. The EIPPCB received 1055 comments, which were made available to the whole TWG through BATIS.

The second draft of the revised CWW BREF was issued on 15 July 2011 and the consultation period for TWG members ended on 15 October 2011. The EIPPCB received 998 comments, which were made available to the whole TWG through BATIS.

The distribution of the comments received on the first and second drafts of the revised CWW BREF is summarised in Table 1.

Table 1: Distribution of the total number of comments received on the first and second drafts of the revised CWW BREF

BREF Chapter/Section	Comments on Draft 1 (October 2009)		Comments on Draft 2 (July 2011)	
	Number	Percentage	Number	Percentage
Whole document	20	1.9 %	15	1.5 %
Scope	18	1.7 %	46	4.6 %
Chapter 1	41	3.9 %	24	2.4 %
Chapter 2	40	3.8 %	26	2.6 %
Chapter 3	907	86.0 %	402	40.3 %
Chapter 4 (BAT conclusions)	NA	NA	464	46.5 %
Other sections	29	2.7 %	21	2.1 %
Total	1055	100 %	998	100 %
NB: NA = not applicable.				

The initial information collection that took place during the second semester of 2008 included the gathering of plant-specific data via questionnaires. These data were compiled by the EIPPCB and analysed by an ad-hoc TWG subgroup that met from 11 to 12 January 2010 and from 24 to 25 June 2010 in Paris, as well as from 11 to 13 April 2012 in Seville. From mid-October 2012 to the end of January 2013, an additional complementary information and data collection via questionnaires was carried out.

All the comments received on Draft 1 and Draft 2, as well as the additional information and data, have been assessed by the EIPPCB and have been used in the preparation of this BP. A revised draft of the CWW BREF will be made available to the TWG prior to the final TWG meeting. The colours used in this revised draft are explained in Table 2.

Table 2: Colours used for the revised draft of the CWW BREF

Black	Text from the original BREF
~~Black~~	~~Text from the original BREF proposed to be deleted~~
Blue	Updated and new text for Draft 1
Green	Updated and new text for Draft 2
~~Green~~	~~Text for Draft 2 proposed to be deleted~~
Red	Updated and new text for Draft 2
~~Red~~	~~Text for Draft 2 proposed to be deleted~~
Purple	Updated and new text for the revised draft of the CWW BREF
[Yellow highlights]	Comments and requests for clarifications/additional information

It is therefore recommended that the TWG members print a coloured copy of this revised draft as it will help identify text under discussion in the final TWG meeting.

Before coming to the meeting

As a TWG member, you should read this BP and the revised draft of the BREF before coming to the meeting to determine your position on the identified issues. Final TWG meetings are characterised by deep technical discussions and represent the last opportunity for the TWG to discuss the contents of the BREF (and of the BAT conclusions in particular).

Whether or not your position differs from any proposal in this BP, you should come to the meeting prepared to justify your position and, **if you have a different view, to present an alternative proposal and the evidential basis for that proposal.**

IMPORTANT: Please bring the following documents with you to the meeting (all of these will be made available in BATIS) as the *EIPPCB will not be able to provide you with copies*:

- this BP (coloured version);
- the second draft of the CWW BREF dated July 2011 (coloured version);
- the revised draft of the CWW BREF dated November 2013 (coloured version).

Aim and structure of this background paper

The aim of this BP is to provide a resource which can be used to structure the discussions in order to reach a decision on the BAT conclusions at the final TWG meeting. Some issues are proposed for discussion at the TWG meeting whilst others will be discussed only if requested in advance of the meeting (Section 2 of this BP). This is because, from an assessment of the TWG comments, some of the BAT conclusions are considered to be non-controversial, and therefore do not appear to require further discussion. Please note that the order of the discussion items in this BP will not necessarily be the order of the discussion at the meeting, and therefore TWG members are expected to attend the whole meeting.

TWG members are requested to contact the EIPPCB at least ten working days before the final TWG meeting **(Monday 25 November 2013 at the latest)** if they wish **to request the discussion at the meeting of any other items from Chapters 2, 3 and 4 (BAT conclusions) of the revised CWW BREF or to propose additional agenda items** for the meeting. Please note that the possibility of including additional items in the meeting agenda is limited due to time restrictions.

Each item is presented in this BP according to the following structure:

Location in D2	Section and page number in the second draft of the CWW BREF (July 2011); BAT conclusion number, if applicable
Current text in D2	Text from the second draft of the CWW BREF (July 2011) (all BAT conclusions are in red)
Summary of comments	Individual comments or a summary of the main comments related to the item
EIPPCB assessment	EIPPCB assessment of the comments made, related to the item to be discussed
EIPPCB proposal	EIPPCB proposal and, if applicable/necessary, the text of the sections of the revised draft of the CWW BREF (November 2013) (all BAT conclusions are in purple)

The acronym 'D2' is used only for the purposes of this BP and will not appear in the final BREF or the standalone BAT conclusions document.

Working plan after this meeting

After this final TWG meeting, the revised draft of the CWW BREF will be completed by the EIPPCB including the addition of Chapter 6 (Concluding remarks and recommendations for future work). Afterwards, the TWG will be given another short commenting period that should focus on the changes made as a result of the conclusions of the final meeting. The EIPPCB will then take these comments into account to produce the final draft that will be submitted for opinion to the Article 13 Forum of the IED. In the final step, the BAT conclusions document will be submitted for formal approval to the Article 75 Committee under the IED.

Abbreviations frequently used in this background paper

Abbreviation	Meaning
AOX	Adsorbable organically-bound halogens
BAT	Best Available Techniques (as defined in Article 3(10) the IED)
BAT-AEL	Emission level associated with the BAT (as defined in Article 13(3) of the IED)
BATIS	BAT Information System
BOD	Biochemical oxygen demand
BP	Background paper
BREF	BAT reference document (as defined in Article 3(11) of the IED)
CAK BREF	BAT reference document for the Production of Chlor-alkali
COD	Chemical oxygen demand
CWW BREF	BAT reference document for Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector
D1	First draft of the CWW BREF from October 2009
D2	Second draft of the CWW BREF from July 2011
EFS BREF	BAT reference document on Emissions from Storage
EIPPCB	European IPPC Bureau
ELV	Emission limit value
EMS	Environmental Management System
EN	European Standard adopted by CEN (European Committee for Standardisation, from its French name Comité Européen de Normalisation)
ENE BREF	BAT reference document on Energy Efficiency
ICS BREF	BAT reference document on Industrial Cooling Systems
IED	Industrial Emissions Directive (2010/75/EU)
ISO	International Organisation for Standardisation. Also international standard adopted by this organisation
LCP BREF	BAT reference document on Large Combustion Plants
LVOC BREF	BAT reference document on Large Volume Organic Chemicals
MON REF	Reference document on General Principles of Monitoring
MS	EU Member State
OFC BREF	BAT reference document on the production of Organic Fine Chemicals
PP BREF	BAT reference document on the production of Pulp, Paper and Board
REF BREF	BAT reference document on the Refining of Mineral Oil and Gas
TOC	Total organic carbon
TSS	Total suspended solids
TWG	Technical Working Group
VOC	Volatile organic compounds
WI BREF	BAT reference document on Waste Incineration
WT BREF	BAT reference document on Waste Treatment Industries
WWTP	Waste water treatment plant

1 ITEMS PROPOSED FOR DISCUSSION AT THE FINAL CWW TWG MEETING

1.1 Scope, definitions and general considerations

1.1.1 Scope section in the BAT conclusions

Current state of Scope:	**Two revised versions of the CWW scope were posted in BATIS after D2: one in December 2011 and one in March 2012.**
Current text (30/03/2012)	**Note: The version of the scope below corresponds to the one posted in BATIS on 30 March 2012.** **SCOPE** These BAT conclusions cover the following operations taking place on chemical sites whose primary purpose is the carrying out of one or more of the chemical production activities specified in Section 4 of Annex I to Directive 2010/75/EU, including those that are performed in standalone chemical plants: 1. Collection and treatment of waste water streams in pre-treatment units and central waste water treatment plants. 2. Treatment and, where practicable, recovery of polluting substances from waste gas streams. 3. Other operations that cut across the whole chemical industry sector including: • treatment (with the exception of incineration) of waste water sludge arising from waste water pre-treatment units and central waste water treatment plants • prevention/reduction of odour/noise emissions • prevention/reduction of diffuse VOC emissions from chemical plants. These BAT conclusions also cover independently operated plants for the treatment of waste water, as specified in Section 6.11 of Annex I to Directive 2010/75/EU, if the primary purpose of the waste water treatment plant is to treat waste waters from chemical production activities specified in Section 4 of Annex I to Directive 2010/75/EU. These BAT conclusions do not address the following: 1. Process-integrated measures that are specific to particular chemical production activities covered by Section 4 of Annex I to Directive 2010/75/EU and treatment/recovery of polluting substances associated with the chemical production processes fall under the scope of the seven vertical chemical BREFs[1]. 2. Treatment of waste water sludge outside of chemical sites (this may fall under the scope of the Waste Treatments Industries (WT) BREF [109, EC 2006]). 3. Incineration of waste water sludge (this falls under the scope of the Waste Incineration (WI) BREF [108, EC 2006]). 4. Treatment of waste other than waste water sludge (this may fall under the scope of the Waste Treatments Industries (WT) BREF [109, EC 2006]). Other reference documents which are of relevance for the subjects covered by these BAT conclusions are the following:

<table>
<tr><td>Current state of Scope:</td><td>Two revised versions of the CWW scope were posted in BATIS after D2: one in December 2011 and one in March 2012.</td></tr>
<tr><td></td><td>
<table>
<tr><th>Reference documents</th><th>Subject</th></tr>
<tr><td>Energy Efficiency (ENE)</td><td>General energy efficiency at the installation level and energy efficiency in energy-using systems, processes, activities or equipment</td></tr>
<tr><td>Economics and Cross-media effects (ECM)</td><td>Economics and cross-media effects of techniques</td></tr>
<tr><td>Emissions from Storage (EFS)</td><td>VOC emissions from tanks</td></tr>
<tr><td>General Principles of Monitoring (MON)</td><td>Emissions and consumptions monitoring</td></tr>
</table>

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.

[1] Chlor-Alkali Manufacturing Industry (CAK) [101, CAK BREF 2001], Large Volume Inorganic Chemicals - Ammonia, Acids and Fertilisers Industries (LVIC–AAF) [102, EC 2007], Large Volume Inorganic Chemicals - Solids and Others Industry (LVIC–S) [103, EC 2007], Large Volume Organic Chemical Industry (LVOC) [104, EC 2003], Manufacture of Organic Fine Chemicals (OFC) [105, EC 2006], Production of Polymers (POL) [106, EC 2007] and Production of Speciality Inorganic Chemicals (SIC) [107, EC 2007]).</td></tr>
<tr><td>Summary of comments:</td><td>Comments related to the scope in its version in D2 (Note: Comments that have become irrelevant with the revised version of the scope posted in BATIS in March 2012 are not listed here):

[AT 7, 31]: Include all issues relevant to chemical sites in the scope that are not covered by other BREFs (e.g. covered by vertical chemical BREFs, EFS, ENE, WI, WT BREFs).
[CEFIC 7; NL 6, 147]: Limit the scope to waste gas and waste water treatment.
[CEFIC 10; CONCAWE 5, 31]: Clarify that refineries are excluded from the scope.
[CEFIC 3, 4, 107, 108; CONCAWE 30; DE 23, 25, 40; FI 1]: For WWTPs that also treat waste water from other activities (covered or not covered by the IED such as urban waste water, combined refinery/chemical installations), clarify if/when they fall under the scope of the CWW BREF.
[PT 5, 26]: Clarify if/when independently operated WWTP outside the chemical site fall under the scope of the CWW BREF (activity 6.11 of Annex I to IED).
[CEFIC 6]: Add that WWTP at chemical sites sometimes also treat residues/waste.
[SARP 1]: Limit the scope to WWTP that receive waste water via a sewerage network. Waste water that is transported by other means is considered waste under the Waste Framework Directive: Its treatment would fall under the WT BREF.
[AT 6, 35; CEFIC 8; DE 26, 29; FI 6; FR 63]: Clarify the interface between the CWW BREF and the other vertical chemical BREFs.
[CEFIC 105; DE(LAWA) 12; PT 2]: Clarify that BAT conclusions in vertical chemical BREFs prevail over BAT conclusions in the CWW BREF.
[NL 2]: Clarify which BREF prevails if more than one BREF applies.
[CEFIC 111]: Clarify that these BAT conclusions are not applicable to individual emission sources at unit level, for which the vertical chemical BREFs apply.
[AT 34]: Add references to the ICS, WI, WT BREFs.

Comments related to the scope in its version posted in BATIS on 30 March 2012 (Note: Comments that were already contained in the comments on the scope in its version in D2 are not repeated here):

[BE, 27/07/2012; DE 2/05/2012; NL 26/04/2012]: Exclude all issues from the scope that are not related to waste water and waste gas.
[DE, 27/04/2012]: Remove waste gas treatment from the scope as the respective BAT conclusions are too generic.
[UK, 20/04/2012]: Clarify that the term 'final waste water treatment plant' does not include an urban WWTP.</td></tr>
</table>

Current state of Scope:	**Two revised versions of the CWW scope were posted in BATIS after D2: one in December 2011 and one in March 2012.**
	[UK, 20/04/2012]: Clarify if sites that only feed their waste water to another treatment plant are included in the scope. [AT, 27/04/2012; CEFIC, 30/04/2012; CONCAWE 26/04/2012; DE 2/05/2012; DK 3/05/2012; UK, 20/04/2012]: Clarify the meaning of 'primary purpose' which is used in two different contexts. Consider replacing it with other terms. [CONCAWE, 25/04/2012; UK, 20/04/2012]: Consider adding threshold values to define the term 'primary purpose'. [DE, 2/05/2012]: Define the 'primary purpose' for the combined treatment of waste water of different origins by setting a threshold value of 90 % influent load contribution from the chemical industry. [CEFIC, 30/04/2012; DE 2/05/2012; FR 6/04/2012]: Clarify that the BAT conclusions require adjustments in the case of combined treatment of waste water from different origins. [DE 2/05/2012; FR 6/04/2012]: Provide guidance for permit writers in cases where a WWTP treats waste water from different origins. [DE, 2/05/2012]: Exclude installations with a waste water volume of less than 10 m^3/d from the scope. Also exclude installations that only prepare chemical products by mixing, dissolving and filling. [DE, 2/05/2012]: Include a statement that off-site treatment plants (including urban WWTP) may be used if they ensure at least an equivalent level of environmental protection. [CONCAWE, 25/04/2012]: Replace the term 'site' with 'installation'. [CEFIC, 30/04/2012]: Remove the terms 'waste water pre-treatment units' and 'central waste water treatment plants' from the scope. [AT, 27/04/2012; BE, 27/04/2012; DE, 2/05/2012; ES 10/04/2012]: Replace 'central treatment' with 'final treatment'. [CEFIC, 30/04/2012; DE 2/05/2012]: Delete 'treatment/recovery of polluting substances associated with the chemical production process'. [BE, 27/07/2012]: Include the treatment of waste water sludge in independently operated WWTP in the scope. [UK, 20/04/2012]: Delete the exclusion of waste treatment from the scope, as waste water is also considered waste. [IT, 19/4/2012]: Include a graph that illustrates the scope. **Comments related to the interface as presented by the Commission during the IED Article 13 Forum meeting in September 2012 (Note: Comments that were already contained in the comments on the scope in its previous versions are not repeated here. In addition, comments that do not strictly relate to the scope are also not listed here (e.g. comments on BAT-AELs)):** [CEFIC, 10/2012; DE 5/10/2012]: The subdivision of waste water treatment steps (I, II, III, and IV) is conceptually correct, but in practice the boundaries depend on the plant configuration. For example, pretreatment could be carried out close to the source (step II) or after discharge to the collection system (step III). [FR 5/10/2012]: Do not use threshold values for WWTP to define the term 'primary purpose'. Use a qualitative definition instead.
EIPPCB assessment:	- The CWW BREF is the horizontal BREF covering generic aspects of the chemical industry. Therefore, common issues should be described therein and not be repeated in each vertical chemical BREF. The inclusion of some generic issues was also agreed at the kick-off meeting (e.g. management systems, odour, waste). - Although the list of waste gas treatment techniques is rather generic, it provides an overview that could be useful in setting permit conditions. - The scope should clearly define which IED activities are concerned (i.e. Sections 4 and 6.11 of Annex I). - The issue of combined treatment of waste water (and even waste) from different origins is not specific to the CWW BREF. WWTPs (either on the chemical site or independently operated off-site) should be included if they mainly treat waste water from chemical plants. - The term 'purpose' could be ambiguous. It seems more appropriate to refer to the

Current state of Scope:	**Two revised versions of the CWW scope were posted in BATIS after D2: one in December 2011 and one in March 2012.**
	share of waste water originating from chemical activities. To define this share, the pollutant load seems to be a more pertinent parameter than the waste water volume. - It seems difficult to set threshold values for the 'main' pollutant load below which a WWTP would be outside the scope (i.e. not belonging to the chemical industry). Giving a value would also trigger the need for further clarification in cases of WWTPs where the contribution of the chemical industry to the load of one pollutant exceeds that value, while for another pollutant, the contribution is below that level. Care has also to be taken to ensure consistency with the Urban Waste Water Treatment Directive. Given that this is a generic issue concerning all BREFs, it might be more appropriate to draft a specific guidance document. - In principle, the descriptive BAT conclusions should also be applicable to installations with small waste water volumes. It therefore does not seem appropriate to generally exclude these installations from the scope. However, threshold values seem to be appropriate in the case of BAT-AELs (see Section 1.4.2.3.2 of this BP). - Guidance on what is meant by 'production on an industrial scale' is already available on the DG Environment website. - Provisions for setting ELVs for indirect discharges are given in Article 15(1) of the IED. - The interface between the CWW BREF and the vertical chemical BREFs was outlined in the Commission presentation at the IED Article 13 Forum meeting in September 2012. According to the Commission Implementing Decision 2012/119/EU, horizontal and vertical BREFs should be complementary and not result in conflicting conclusions. Therefore, neither the CWW BREF nor the vertical chemical BREFs prevail over each other. They all apply on their own merits. - It is not necessary to define 'pretreatment' and 'central/final treatment' in the scope, as these are techniques that are described in detail in the BAT conclusions. - The EIPPCB believes that the revised scope is clear enough. A graph is already given in the scope section of the BREF.
EIPPCB proposal:	- Align the wording and the structure of the scope to those of recently adopted BAT conclusions (e.g. start with the concerned Annex I activities). - Include generic issues such as environmental management systems, diffuse VOC emissions, odour emissions, flaring, and noise emissions in the scope. - Keep waste gas treatment within the scope. - Include the combined treatment of waste water from different origins in the scope, if the main pollutant load originates from the chemical industry. - Avoid the term 'purpose'. - Do not set a threshold value to define 'main pollutant load'. - Do not add further provisions on the BREF interfaces. - Delete 'treatment/recovery of polluting substances associated with the chemical production process'. - Include the treatment of waste water sludge in independently operated WWTP in the scope. - Add the ICS, WI and WT BREFs to the list of reference documents.

Text proposal:

These BAT conclusions concern the activities specified in Sections 4 and 6.11 of Annex I to Directive 2010/75/EU, namely:

- 4 Chemical industry;
- 6.11 Independently operated treatment of waste water not covered by Directive 91/271/EEC and discharged by an installation covered by Chapter II of Directive 2010/75/EU (provided that the main pollutant load originates from the activities specified in Section 4 of Annex I to Directive 2010/75/EU, i.e. chemical industry).

In particular, these BAT conclusions cover the following issues:

- environmental management systems;
- waste water management, collection, and treatment;
- waste management;
- treatment of waste water sludge with the exception of incineration;
- diffuse emissions of volatile organic compounds (VOC) to air;
- odour emissions;
- waste gas management, collection, and treatment;
- flaring;
- noise emissions.

These BAT conclusions cover the combined treatment of waste water from different origins if the main pollutant load originates from the activities specified in Section 4 of Annex I to Directive 2010/75/EU (i.e. chemical industry).

These BAT conclusions do not address the following activities or processes:

- process-integrated techniques; these are currently covered by the seven vertical chemical BAT reference documents, namely: Production of Chlor-alkali (CAK), Manufacture of Large Volume Inorganic Chemicals – Ammonia, Acids and Fertilisers Industries (LVIC–AAF), Manufacture of Large Volume Inorganic Chemicals – Solids and Others Industry (LVIC–S), Production of Speciality Inorganic Chemicals (SIC); Large Volume Organic Chemical Industry (LVOC), Manufacture of Organic Fine Chemicals (OFC), and Production of Polymers (POL);
- treatment of waste water sludge outside the activities concerned by these BAT conclusions (i.e. Sections 4 and 6.11 of Annex I to Directive 2010/75/EU); this may be covered by the BAT reference document on Waste Treatments Industries (WT);
- incineration of waste water sludge; this is covered by the BAT reference document on Waste Incineration (WI);
- treatment of waste other than waste water sludge; this may be covered by the BAT reference document on Waste Treatments Industries (WT).

Other reference documents which are of relevance for the activities covered by these BAT conclusions are the following:

Reference document	Subject
Emissions from Storage (EFS)	Storage and handling of materials
Energy Efficiency (ENE)	General energy efficiency at the installation level and energy efficiency in energy-using systems, processes, activities or equipment
General Principles of Monitoring (MON)	Emissions and consumption monitoring
Industrial Cooling Systems (ICS)	Indirect cooling with water
Large Combustion Plants (LCP)	Combustion of fuels
Waste Incineration (WI)	Waste incineration (e.g. incineration of waste water sludge)
Waste Treatments Industries (WT)	Waste treatment
Economics and Cross-media effects (ECM)	Economics and cross-media effects of techniques

1.1.2 Definitions and general considerations

<table>
<tr><td>Current state of definitions and general considerations:</td><td>Two revised versions of the definitions and general considerations were posted in BATIS after D2: one in December 2011 and one in March 2012.</td></tr>
<tr><td>Current text (30/03/2012)</td><td>Note: This version of the definitions and general considerations corresponds to the one posted in BATIS on 30 March 2012 (as part of the scope).

DEFINITIONS

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

<table>
<tr><th>Term used</th><th>Definition</th></tr>
<tr><td>Central waste water treatment plant</td><td>A waste water treatment plant (WWTP) located on a chemical site whose primary purpose is to treat waste water streams originating from one or more chemical production activities. These plants may also treat waste water streams from other activities (that may or may not fall under the scope of Annex I to Directive 2010/75/EU).</td></tr>
<tr><td>Waste water pre-treatment unit</td><td>A unit located on a chemical site whose primary purpose is to treat waste water streams arising from one or more of the chemical production activities specified in Section 4 of Annex I to Directive 2010/75/EU prior to a downstream waste water treatment plant in order to ensure that the operation of the downstream WWTP is not impeded. These pre-treatment units may also treat waste water streams from other activities (that may or may not fall under the scope of Annex I to Directive 2010/75/EU).</td></tr>
<tr><td>New plant</td><td>A plant first operated at the site of the installation following the publication of these BAT conclusions or a complete replacement of a plant on the existing foundations of the installation following the publication of these BAT conclusions</td></tr>
<tr><td>Existing plant</td><td>A plant which is not a new plant</td></tr>
</table>

GENERAL CONSIDERATIONS

Emission levels associated with the best available techniques (BAT-AELs) for emissions to water are expressed as mass of pollutant per unit volume of waste water.

NOTE to the TWG: Whilst cross-references are provided to other parts of the BREF in this draft 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 square brackets and italics.</td></tr>
<tr><td>Summary of comments:</td><td>Comments related to 'Definitions' and 'General considerations' in its version in D2 (Note: Comments that have become irrelevant with the revised versions of the scope are not listed here):

[AT 36, 38, 46, 49, 50, 51, 52, 53, 59; CEFIC 110, 111, 112, 134, 135, 168, 172, 175, 176, 177, 180, 181, 182, 183, 189, 190, 191, 192, 193, 196; SE 3]: Clarify that the lists of techniques in these BAT conclusions are non-prescriptive and non-exhaustive.
[PT 4]: Add a definition of 'central waste water treatment plant'.
[NL 148]: Add the definitions of pollutants (e.g. for VOC).
[DE 30, 70]: Add a statement that the BREF including the BAT conclusions does not contain BAT-AELs for emissions to air.
[CEFIC 246]: Add a statement that the control of emissions requires an integrated approach as laid out in the IED.</td></tr>
</table>

Current state of definitions and general considerations:	**Two revised versions of the definitions and general considerations were posted in BATIS after D2: one in December 2011 and one in March 2012.**
	Comments related to 'Definitions' and 'General considerations' in its version posted in BATIS on 30 March 2012 (Note: Comments that were already contained in the comments on the scope in its version in D2 are not repeated here): [BE, 27/04/2012; CONCAWE 25/04/2012]: Clarify the relation between unit, plant, installation and site. Ensure coherence with the IED. [BE, 27/07/2012]: Clarify what is meant by 'in order to ensure that the operation of the downstream WWTP is not impeded.' [DE, 2/05/2012]: Add a definition for total or whole effluent.
EIPPCB assessment:	- It is not necessary to define 'pretreatment' and 'central/final treatment' in the scope, as these are techniques that are described in detail in the BAT conclusions. - The terms 'unit', 'plant', 'installation' and 'site' are sometimes interpreted differently in different Member States. However, an installation is most commonly interpreted as being composed of different plants. - An integrated approach is generally used to derive BAT conclusions. This does not need to be repeated here. - A definition of total effluent is not necessary as it is a term not used in the BAT conclusions.
EIPPCB proposal:	- Add the following sentence to the 'General considerations': '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.' - Add that no BAT-AELs for emissions to air are given. - Delete the definitions of 'Central waste water treatment plant' and 'Waste water pretreatment unit'. - Keep the definitions for new and existing plants, but modify 'first operated' to 'first permitted' in line with recently adopted BAT conclusions. - Add a definition for **new** and **existing** installations and refer to the definition of an installation in Article 3(3) of the IED. - Add the definitions of those pollutants for which BAT-AELs are given, in line with recently adopted BAT conclusions and recent draft BREFs.

Text proposal:

GENERAL CONSIDERATIONS

Best Available Techniques

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

Emission levels associated with BAT

Emission levels associated with the best available techniques (BAT-AELs) for emissions to water given in these BAT conclusions refer to concentration levels expressed as mass of emitted substances per volume of waste water, with the units µg/l and mg/l. Unless otherwise stated, the BAT-AELs refer to weighted yearly averages of 24-hour flow-proportional samples, taken with the minimum frequency set for the relevant parameter and under normal operating conditions (weighting according to the corresponding daily flows).

No BAT-AELs for emissions to air are set in these BAT conclusions.

DEFINITIONS

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

Term used	Definition
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 on the existing foundations of the installation following the publication of these BAT conclusions.
Existing plant	A plant that is not a new plant.
New installation	An installation (as defined in Article 3(3) of Directive 2010/75/EU) first permitted following the publication of these BAT conclusions or a complete replacement of an installation following the publication of these BAT conclusions.
Existing installation	An installation which is not a new installation.
Total suspended solids (TSS)	Mass concentration of all suspended solids, measured via filtration through glass fibre filters and gravimetry.
Chemical oxygen demand (COD)	Amount of oxygen needed for the total oxidation of the organic matter to carbon dioxide. COD is an indicator for the mass concentration of organic compounds.
Total organic carbon (TOC)	Total organic carbon, expressed as C, includes all organic compounds.
Total nitrogen (TN)	Total nitrogen, expressed as N, includes free ammonia and ammonium (NH_4–N), nitrites (NO_2–N), nitrates (NO_3–N) and organic nitrogen compounds.
Total inorganic nitrogen (N_{inorg})	Total inorganic nitrogen, expressed as N, includes free ammonia and ammonium (NH_4–N), nitrites (NO_2–N) and nitrates (NO_3–N).
Total phosphorous (Total P)	Total phosphorous, expressed as P, includes all inorganic and organic phosphorus compounds, dissolved or bound to particles.
Adsorbable organically-bound halogens (AOX)	Adsorbable organically-bound halogens, expressed as Cl, include adsorbable organically-bound chlorine, bromine and iodine.
Chromium (Cr)	Chromium, expressed as Cr, includes all inorganic and organic chromium compounds, dissolved or bound to particles.
Copper (Cu)	Copper, expressed as Cu, includes all inorganic and organic copper compounds, dissolved or bound to particles.
Nickel (Ni)	Nickel, expressed as Ni, includes all inorganic and organic nickel compounds, dissolved or bound to particles.
Zinc (Zn)	Zinc, expressed as Zn, includes all inorganic and organic zinc compounds, dissolved or bound to particles.

1.2 Environmental management

1.2.1 Generic issues

Location in D2:	Section 4.1, page 663 (BAT 1)
Current text in D2:	**1. BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features:** I. commitment of the management; II. definition of an environmental policy that includes the continuous improvement of the installation by the management; III. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment (see BAT 2); IV. implementation of procedures paying particular attention to (see BAT 2): a. structure and responsibility b. training, awareness and competence c. communication d. employee involvement e. documentation f. efficient 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 Reference Document on the General Principles of Monitoring) (see BAT 53 to BAT 58) b. corrective and preventive action (see BAT 2) 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 of the EMS and its continuing suitability, adequacy and effectiveness by senior management; VII. requirement to follow the development of cleaner technologies; VIII. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life; IX. application of sectoral benchmarking on a regular basis. *[This BAT conclusion is based on information given in Section 3.1.1.]*

Location in D2:	**Section 4.1, page 663 (BAT 1)**
Summary of comments:	[DE 45]: Refer to the commitment of 'senior' management as was done in former versions of this BAT. [UK 2]: Replace 'definition of an environmental policy' with 'an environmental policy'. [UK 3]: Replace 'at the stage of designing' with 'at the design stage'. [CEFIC 115; CONCAWE 112]: Benchmarking is only possible if similar sites exist and data are available. [AT 37]: Add the feature 'adherence to a standardised EMS such as EMAS or ISO 140001'. [DE 46]: Add the three complementary features that were part of the EMS standard text adopted by the IEF: 1) external examination/validation, 2) preparation and publication of an environment statement, 3) EMAS or ISO 14001. [CEFIC 114; DE 47]: Add provisions on the applicability of an EMS as was done in the first paragraph of the EMS standard text adopted by the IEF (i.e. depending on the nature, scale and complexity of the installation, and the environmental impacts).
EIPPCB assessment:	- The availability of comparable data is an inherent precondition of benchmarking.
EIPPCB proposal:	- Generally, revise the BAT on EMS in line with recently adopted BAT conclusions and recent draft BREFs. - Add an environmental goal to the BAT statement. - Include the commitment of senior management in feature I. - Add the proposed provisions on applicability. - Include minor editorial changes.

Text proposal: See Section 1.2.3 of this BP.

1.2.2 Specific issues for chemical sites

Location in D2:	**Section 4.2, page 664 (BAT 2 I. – BAT 2 IV.)**
Current text in D2:	**2. BAT is to reduce the environmental risks and impacts by applying all of the following management techniques:** I. establishing a convention between two or more operators or owners of installations that operate on the same chemical site in order to enhance cooperation between the various operators on environment, health and safety issues; II. setting operating procedures that describe the necessary interactions between the operators of the individual installations producing the waste waters and the operators of the central waste water treatment plant; III. establishing local emergency procedures at all plants/units or areas of the chemical site to ensure that leaks of harmful substances are appropriately dealt with; IV. establishing a pollution incident response plan at the site level; V. … [see Section 1.4.1.1 and 1.6.1.1 of this BP]; VI. … [see Section 2.4.1.2 of this BP]. *[This BAT conclusion is based on information given in Section 3.1.2.]*
Summary of comments:	[CEFIC 116]: Clarify the objective of BAT 2. Is it to promote good operations (I, II, V), to prevent incidents (III, IV) or to mitigate their consequences (VI)? [DE 31]: Permits are issued for individual plants. Therefore, a convention between operators cannot be part of a permit. [CEFIC 117]: Conventions are only an issue when two or more operators are present on a site. [FR 33]: Add that a convention should clarify the roles and responsibilities of individual operators. [DE 32]: Local emergency procedures are covered by the Seveso Directive.
EIPPCB assessment:	- Conventions are commonly part of an EMS on a chemical site. - BAT 2 II. is a subset of BAT 2 I. - Many chemical installations are covered by the Seveso Directive which requires operators to design and implement a major accident prevention policy. Chemical installations holding large quantities of dangerous substances must also draw up a safety report and an internal emergency plan. - The EFS BREF stipulates that BAT in preventing incidents and accidents is to apply a safety management system (Sections 5.1.1.3 and 4.1.6.1). A cross-reference to the EFS BREF is given in the Scope. - Emergency preparedness and response is also a feature of an EMS. - BAT 2 V. is addressed in Sections 1.4.1.1 and 1.6.1.1 of this BP and BAT 2 VI. in Section 2.4.1.2 of this BP.
EIPPCB proposal:	- Merge BAT 2 I. and 2 II. and move them to the generic BAT on EMS. - Clarify that conventions should define roles, responsibilities and operating procedures. - Delete techniques 2 III. and 2 IV. - Add cross-references to the BAT conclusions on stream inventories (see Sections 1.4.1.1 and 1.6.1.1 of this BP), waste management (see Section 1.5.1 of this BP), on odour management (see Section 1.6.4.1 of this BP), and on noise management (see Section 1.6.5 of this BP).

Text proposal: See Section 1.2.3 of this BP.

1.2.3 Text proposal for new BAT conclusion on EMS

BAT 1. In order to improve the overall environmental performance of installations covered by these BAT conclusions, 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 of an environmental policy that includes the continuous improvement 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. training, awareness and competence;
c. communication;
d. employee involvement;
e. documentation;
f. efficient 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:

j. monitoring and measurement (see also the Reference Document on the General Principles of Monitoring);
k. corrective and preventive action;
l. maintenance of records;
m. 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 of the EMS and its continuing suitability, adequacy and effectiveness by senior management;
VII. following the development of cleaner technologies;
VIII. consideration for the environmental impacts from the eventual decommissioning of the plant at the design stage of a new plant, and throughout its operating life;
IX. application of sectoral benchmarking on a regular basis.

Specifically for chemical sector activities, BAT is to incorporate the following features in the EMS:

X. on multi-operator sites, establishment of a convention that sets out the roles, responsibilities and operating procedures of each plant operator;
XI. establishment of inventories of waste water and waste gas streams (see BAT 6 and BAT 15, respectively);
XII. implementation of a waste management plan (see BAT 13);
XIII. implementation of an odour management plan (see BAT 22);
XIV. implementation of a noise management plan (see BAT 24).

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.

[This BAT conclusion is based on information given in Section 3.1.1.]

1.3 Monitoring

1.3.1 Generic issues

Location in D2:	**Section 4.11, page 686 – 687**
Current text in D2:	Section 4.11
Summary of comments:	[AT 67]: Move the BAT conclusions on monitoring from Section 4.11 to the respective BAT conclusions of individual pollutants. [DK 40]: Add a reference to the MON REF in Section 4.11. [DE(LAWA) 69]: Clarify that Section 4.11 only refers to effluents from biological treatment plants.
EIPPCB assessment:	- A reference to the MON REF is given in the Scope. - The monitoring provisions apply to all emissions to water, irrespective of the techniques that are used.
EIPPCB proposal:	- Keep separate BAT conclusions on monitoring in line with recently adopted BAT conclusions and recent draft BREFs.

Text proposal: See Section 1.3.4 of this BP.

1.3.2 Chemical parameters

Location in D2:	**Section 4.11, page 686 (BAT 53 – 56)**
Current text in D2:	**53. BAT is to measure all relevant parameters to adjust and optimise continuously the waste water treatment and to ensure stable and smooth operation of the waste water treatment plant. The parameters to be monitored as well as the frequency of monitoring is site-specific and depend in particular on the type of chemical production, the type and amount of pollutants in the waste waters, and the nature of the recipient water body.** **54. BAT is to continuously monitor at least waste water flow, pH and temperature in the effluents discharged from central waste water treatment plants.** **55. BAT is to monitor chemical oxygen demand (COD) (or total organic carbon, TOC), biochemical oxygen demand (BOD_5), total suspended solids (TSS), total nitrogen and ammoniacal nitrogen in the effluent of the treatment plant by using flow-proportional 24-hour composite samples collected at the same well-defined point at the outlet of the central waste water treatment plant. These samples are the basis for reporting yearly average emission values.** **56. When one or more of the following pollutants are likely to be emitted in significant quantities, BAT is to measure these pollutants periodically (the monitoring frequency is site-specific):** I. heavy metals II. adsorbable organically bound halogens (AOX) (or extractable organic halogens, EOX) III. other relevant pollutants (e.g. chlorides, sulphates, phenols, specific organic compounds). *[These BAT conclusions are based on information given in Section 3.1.5.2.2.1.]*
Summary of comments:	[CEFIC 233] – BAT 53: Delete BAT 53 as it is too generic to be used in permits. [DE(LAWA) 70] – BAT 53: Parameters and monitoring frequencies also depend on the type of treatment. [CEFIC 234] – BAT 54: Continuous monitoring of flow, pH and temperature may not always be needed. [CEFIC 235] – BAT 55: Remove the monitoring of BOD_5, as this is not a reliable parameter. Define the term 'total nitrogen'. At small plants, there is often no daily monitoring. Delete 'proportional'. There is no need to mention the reporting of yearly values. [DE(LAWA) 73] – BAT 55: Monitoring of BOD_5 is unnecessary if the TOC levels are low and there are no hints that the biological treatment does not work properly. [DE(LAWA) 72; FR 60] – BAT 55 and 56: Clarify the monitoring frequencies. [DE(LAWA) 77] – BAT 56: Add provisions on the reporting of yearly loads (EPRTR) as in BAT 55. [SE 8] – BAT 56: AOX and EOX are not interchangeable. [DE(LAWA) 78] – BAT 56 III: Specify that the specific organic compounds include all organic compounds from the Environmental Quality Directive and the PRTR that are emitted in relevant concentrations.

Location in D2:	**Section 4.11, page 686 (BAT 53 – 56)**
EIPPCB assessment:	- Continuous monitoring of flow, pH and temperature is carried out on most of the sites as indicators of correct operation. - The techniques listed and described in these BAT conclusions are neither prescriptive nor exhaustive. - The monitoring frequencies depend on the potential environmental impact. Therefore, smaller installations often monitor less frequently. - The monitoring of BOD can in some cases be useful to ensure that a biological WWTP is well designed and operated (see Sections 1.4.2.3.3 and 1.4.2.3.4 of this BP). - If BAT-AELs are set as yearly average values, the BAT conclusion should contain provisions on how to calculate them, but not for their reporting. - EOX only covers non-polar organic compounds. For many pollutants, the method is not suitable and AOX measurement is the preferred method. - For some parameters, monitoring results are only equivalent if the same analytical method is used.
EIPPCB proposal:	- Merge BAT 53 and BAT 54: Key process parameters relevant for emissions to water as identified by the inventory of waste water streams should be monitored, including the continuous measurement of flow, pH, and temperature. - Summarise BAT 55 – 57 in one single BAT conclusion in line with recently adopted BAT conclusions and recent draft BREFs and specify the monitoring frequencies. - Set the minimum monitoring frequencies according to the most commonly reported frequencies in the surveys (see Section 1.4.2.3 of this BP). - Set threshold values for emissions and specify that monitoring may be carried out less frequently if the emissions do not exceed the threshold values for the annual pollutant load. Use the same threshold values as for the BAT-AELs (see Section 1.4.2.3 of this BP). - Define 'total nitrogen' in the definitions section. - Maintain a monitoring requirement for BOD in the case of high TOC or COD emissions (see Section 1.4.2.3.4 of this BP). - Delete the provisions on reporting. - Delete the reference to the EOX method. - Specify the monitoring method when EN standards are available and when the monitoring result is highly dependent on the analytical method (i.e. for BOD, TOC, TSS, TN, AOX, toxicity). - Specify in the 'General considerations' how to calculate the yearly average concentration.

Text proposal: See Section 1.3.4 of this BP.

1.3.3 Toxicity/Whole effluent assessment

Location in D2:	**Section 4.11, page 686 – 687 (BAT 57 – 58)**
Current text in D2:	**57. BAT is to minimise the ecotoxic impact of waste water effluents by biomonitoring of the effluents and taking measures based on the biomonitoring results.** **Description** Biomonitoring is the monitoring of final waste water effluents by using bio-assays to ensure that the (acute) toxic potential of the waste water is minimised. **Applicability** Applicable to chemical sites where toxicity is a major concern due to the production spectrum or where other parameters indicate variations in the performance of the biological waste water treatment plant. *[This BAT conclusion is based on information given in Section 3.1.5.2.2.2.]* **58. BAT is to assess and to minimise the release of hazardous substances by discharge of waste water effluents containing chemicals which are persistent, liable to bioaccumulate and/or toxic by using the whole effluent assessment (WEA) technique.** **Description** The WEA technique estimates the degradability, bioaccumulation potential and toxicity of waste waters. The aim of WEA is to assess the possibly hazardous character of effluents that would be insufficiently controlled when relying only on the physical and chemical indications provided by the conventional environmental variables (e.g. TOC, COD) or by limits set on individual chemicals. *[This BAT conclusion is based on information given in Section 3.1.5.2.2.3.]*
Summary of comments:	[CEFIC 237, 238]: Delete BAT 57 as biomonitoring is only practised in one Member State. The type of biomonitoring is not specified. Biomonitoring is an emerging technique for plant effluents. Biomonitoring is technically difficult to carry out. Biomonitoring should only apply for troubleshooting at plants where there is a significant concern. [FR 58]: Biomonitoring includes both acute and chronic toxicity tests. [DE(LAWA) 74, 75]: Separate biomonitoring and WEA from the techniques to reduce the emissions. [DE(LAWA) 76]: Clarify if BAT 57 and 58 apply simultaneously or as alternatives. [CEFIC 239, 240]: WEA is not routinely used and is thus an emerging technique. Only the acute toxicity tier is routinely applied in one Member State. There are no laboratories to routinely run WEA. [FR 59]: Delete BAT 58, as it is too early to impose WEA as BAT.
EIPPCB assessment:	- Toxicity tests allow for an integrated assessment of the properties of a waste water sample (including synergistic/antagonistic effects) that cannot be achieved by analysing single substances or other chemical sum parameters. - At least five Member States generally use toxicity tests for permitting, while at least three Member States sometimes use them (see Section 1.4.2.3.11 of this BP). - WEA covers toxicity, persistence and bioaccumulation. WEA is not routinely used to monitor emissions.
EIPPCB proposal:	- Delete BAT 57 as it stands and include toxicity tests in the BAT conclusion on monitoring (see Section 1.4.2.3.11 of this BP for details). - Delete BAT 58 on whole effluent assessment.

Text proposal: See Section 1.3.4 of this BP.

1.3.4 Text proposal for new BAT conclusions on monitoring

BAT 2. BAT is to monitor key process parameters relevant for emissions to water as identified by the inventory of waste water streams (see BAT 6), including continuous monitoring of waste water flow, pH and temperature.

BAT 3. BAT is to monitor emissions to water in accordance with EN standards with at least the minimum frequency given below. 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. Monitoring may be carried out less frequently if the emissions do not exceed the threshold values for the annual pollutant load.

Substance/parameter		Standard(s)	Threshold value for emissions	Minimum monitoring frequency ([1])
Biochemical oxygen demand (BOD)		EN 1899–1	Not applicable	Weekly ([2])
Total organic carbon (TOC) ([3])		EN 1484	2.0 t/yr	Daily
Chemical oxygen demand (COD) ([3])		No EN standard available	6.0 t/yr	Daily
Total suspended solids (TSS)		EN 872	2.5 t/yr	Daily
Total nitrogen (TN) ([4])		EN 12260	2.5 t/yr	Daily
Total inorganic nitrogen (N_{inorg}) ([4])		Various EN standards available	2.0 t/yr	Daily
Total phosphorous		Various EN standards available	150 kg/yr	Daily
Adsorbable organically-bound halogens (AOX)		EN ISO 9562	100 kg/yr	Monthly
Metals	Cr	Various EN standards available	2.0 kg/yr	Monthly
	Cu		5.0 kg/yr	Monthly
	Ni		5.0 kg/yr	Monthly
	Zn		30 kg/yr	Monthly
	Other metals, if relevant		Not applicable	Monthly
Toxicity	Fish eggs (*Danio rerio*)	EN ISO 15088	Not applicable	Quarterly ([5])
	Daphnia (*Daphnia magna Straus*)	EN ISO 6341		Quarterly ([5])
	Luminescence bacteria (*Vibrio fischeri*)	EN ISO 11348–1, EN ISO 11348–2 or EN ISO 11348–3		Quarterly ([5])
	Duckweed (*Lemna minor*)	EN ISO 20079		Quarterly ([5])
	Algae	EN ISO 8692, EN ISO 10253 or EN ISO 10710		Quarterly ([5])

([1]) The sampling point is located where the emission leaves the installation prior to any dilution with other waste water streams after the final waste water treatment.
([2]) BOD monitoring only applies when the annual average TOC emissions are higher than 20 mg/l or the annual average COD emissions are higher than 60 mg/l.
([3]) Either TOC or COD is monitored. TOC monitoring is the preferred option, because it does not rely on the use of very toxic compounds.
([4]) Either TN or N_{inorg} is monitored.
([5]) The minimum monitoring frequency for toxicity only applies when the waste water volume exceeds 1 000 000 m^3/yr. Toxicity monitoring may be carried out less frequently in the case of smaller waste water volumes (e.g. when changes in production processes occur).

[These BAT conclusions are based on information given in Section 3.1.5.2.2.1. and 3.1.5.2.2.2.]

1.4 Emissions to water

1.4.1 Waste water collection and segregation

1.4.1.1 Stream inventory

Location in D2:	**Section 4.2, page 664 (BAT 2 V.)**
Current text in D2:	**2. BAT is to reduce the environmental risks and impacts by applying all of the following management techniques:** … V. establishing and maintaining a stream inventory/register in order to ensure the proper functioning of the central waste water pretreatment and/or central waste water treatment plants and central waste gas treatment plants by identifying the parameters that can have an influence on the performance of these treatment plants (see Section 4.9.1); … *[This BAT conclusion is based on information given in Section 3.1.2.]*
Summary of comments:	[DE 33; DE(LAWA) 14; FR 36]: The purpose of a stream inventory/register is mainly to optimise pollutant abatement. The protection of the WWTP is only one of several aspects. [FR 36; SARP 6]: The stream inventory should ensure that pollutants that cannot be treated in the central WWTP (e.g. metals) are not diluted. [DE(LAWA) 15]: Provide more details on the stream inventory as was done in the OFC BREF (Section 5.2.1.1 – 5.2.1.3).
EIPPCB assessment:	- Stream inventories are key tools for reducing emissions to water by optimising the treatment architecture. - Pollutants that cannot be adequately dealt with only during final waste water treatment (e.g. metals in a biological WWTP) should be treated close to the source to avoid dilution. This aspect might be better mentioned in the respective BAT conclusion on pretreatment. - The stream inventory as described in the OFC BREF includes mass balances as well as information on the origin and characteristics of a waste water stream. While mass balances with input/output data are not strictly needed for a stream inventory, information on production processes and stream characteristics is essential.
EIPPCB proposal:	- Add a separate BAT conclusion on the stream inventory for waste water and provide more details as given in Section 3.1.5.1.2 of D2 of the CWW BREF (i.e. information about the production processes and the individual streams). - Clarify the purpose of the stream inventory (reduction of emissions). - Clarify that the stream inventory is part of an EMS and include a cross-reference in the BAT on EMS.

Text proposal:

BAT 6. In order to reduce emissions to water, BAT is to establish and to maintain an inventory of waste water streams, as part of the environmental management system (see BAT 1), that incorporates all of the following features:

I. information about the chemical production processes, including:

a. chemical reaction equations, also showing side products;
b. simplified process flow sheets that show the origin of the emissions;
c. descriptions of process-integrated techniques and waste water treatment at source including their performances;

II. information about the individual waste water streams, including:

d. average values and variability of flow, pH, temperature, and conductivity;
e. average concentration and load values of relevant pollutants/parameters and their variability (e.g. COD/TOC, nitrogen species, phosphorous, metals, salts, organic compounds);
f. data on bioeliminability (e.g. BOD, BOD/COD ratio, Zahn-Wellens test, biological inhibition potential (e.g. nitrification)).

[This BAT conclusion is based on information given in Section 3.1.5.1.2.]

1.4.1.2 Waste water segregation

Location in D2:	**Section 4.8.1, page 671 (BAT 20)** **Section 4.9.1, page 673 – 678 (BAT 27)**
Current text in D2:	**20. BAT is to reduce the volume of waste water to be treated and to increase possible material recycling and/or reuse by installing waste water collection and segregation systems designed based on the results of the stream inventory/register (see BAT 2(V)).** **Description** Waste water streams that do not need treatment (e.g. uncontaminated cooling water, uncontaminated rainwater) are segregated from waste water streams that require treatment, thus reducing the hydraulic load on the drainage system and the waste water treatment plant. **Applicability** Applicable to all new plants. Any restriction on applicability will be for existing installations only. [Please TWG provide information on restrictions for the applicability of the techniques listed encountered in your experience] *[This BAT conclusion is based on information given in Section 3.1.5.2.5.1.]* **…** **27. BAT is to reduce the amount of pollutants in the tributary waste water streams prior to their discharge to a downstream biological waste water treatment plant by applying all of the following techniques:** I. Assessing the possible positive (e.g. neutralisation, stabilisation) and/or negative (e.g. formation of chlorinated organics) synergistic effects upon mixture of different waste water streams based on the stream inventory/register as stipulated by BAT 2(V). II. Identifying waste water streams carrying pollutants at levels that could adversely affect the downstream biological waste water treatment. **If more than one tributary waste water stream generated on the chemical site is to be separately collected and pre-treated at a central waste water pretreatment plant prior to a downstream biological waste water treatment as stipulated in BAT 26, BAT is to apply one or more of the techniques cited in BAT 28 to BAT 38 depending on the identified pollutant(s) to be removed.**
Summary of comments:	BAT 20: [DE(LAWA) 17, 18]: Include the segregation for different pretreatment techniques: inorganic versus organic waste water, organic waste water streams with different treatment techniques (see Section 5.2.4.2.1 – 5.2.4.2.3 of the OFC BREF). [SARP 7]: Clarify that BAT is to avoid any dilution of waste water by efficient segregation of waste water streams depending on their contaminant composition [CEFIC 159]: Delete generic restriction of applicability for existing installations. Add that in few cases uncontaminated water may be added to the central WWTP (e.g. in case of low volumes that do not justify a separate grid or when dilution improves the abatement efficiency of the final WWTP). [CEFIC 160]: Recycling/reuse of cooling water is not applicable in the case of plants located in coastal areas that use sea water in once-through systems. BAT 27: [CEFIC 170]: The amount of pollutants in tributary waste water streams may not need to be reduced if the central WWTP can handle it. [DE(LAWA) 23, 24; FR 44; SARP 9]: Add a BAT 27 III so that pollutants that are not effectively abated at the final biological WWTP (e.g. non-biodegradable organic substances) require appropriate pretreatment. [FR 44]: Specify that dilution is not an option to comply with BAT-AELs.

Location in D2:	**Section 4.8.1, page 671 (BAT 20)** **Section 4.9.1, page 673 – 678 (BAT 27)**
EIPPCB assessment:	- The segregation of organic/inorganic streams depends on the result of the stream inventory and is installation-specific. - Dilution is not allowed according to Article 15(1) IED.
EIPPCB proposal:	- Clarify the purpose of waste water segregation (reduction of emissions to water). - Shorten BAT 20 and concentrate on the essentials: Waste water that does not require treatment (e.g. cooling water, uncontaminated rainwater) should be segregated from other waste water. - Add an applicability restriction that the segregation of rainwater may not be applicable at existing installations. - Delete BAT 27, but include the aspect of protecting the biological WWTP in a new, merged BAT conclusion on pretreatment. - Address the fact that pollutants that cannot be adequately dealt with during final treatment should be treated close to the source in the new BAT conclusion on pretreatment.

Text proposal:

BAT 8. In order to reduce emissions to water, BAT is to segregate waste water streams that do not require treatment (e.g. uncontaminated cooling water, uncontaminated rainwater) from those that require treatment.

Applicability

The segregation of uncontaminated rainwater may not be applicable in existing installations, in particular in the case of minor contributions of rainwater to the total waste water volume.

[This BAT conclusion is based on information given in Section 3.1.5.2.5.1.]

1.4.2 Waste water treatment

1.4.2.1 Pretreatment

1.4.2.1.1 Organic loads

<table>
<tr><td>Location in D2:</td><td>Section 4.9.1, page 673 – 674 (BAT 28)</td></tr>
<tr><td>Current text in D2:</td><td>
Tributary waste water streams containing
organics at a level
that could adversely affect the downstream biological waste water treatment

When the organic load in a segregated tributary waste water stream, as stipulated by BAT 27, before a downstream biological waste water treatment is at a level that could adversely affect the biological system, then BAT 28 shall apply.

28. BAT is to reduce the amount of organic load in the tributary waste water streams prior to their discharge to a downstream biological waste water treatment plant by applying one of the following techniques:
<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I. Anaerobic treatment</td><td>Applicable to the pretreatment of high organic loaded (> 2 g/l) waste water streams.</td></tr>
<tr><td>II. Chemical oxidation</td><td>Restrictions may exist due to the risk of generating organic halides with the use of chlorine, hypochlorite and chlorite (or the respective halogen compounds) as the oxidising agent.</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 4.12.1.</td></tr>
</table>
[This BAT conclusion is based on information given in Section 3.2.3.4.4.1 (anaerobic treatment) and Section 3.2.3.4.3.3 (chemical oxidation).]
</td></tr>
<tr><td>Summary of comments:</td><td>
[CEFIC 171]: The reduction of organic load is only necessary in a few cases. The applicability of anaerobic treatment and chemical oxidation is limited to special cases.
[DE(LAWA) 27]: Separate BAT 28 into two BAT conclusions. One for biodegradable substances and another for non-biodegradable substances. For non-biodegradable substances, remove anaerobic treatment but add activated carbon adsorption and waste water incineration.
[DE(LAWA) 26]: Anaerobic treatment is a valuable option under energetic aspects, but a stable process is often not possible and easily biodegradable substances are often needed for denitrification.
[DE(LAWA) 26]: Delete chemical oxidation. For biodegradable substances, this is usually not an economic option.
[AT 49]: Electrochemical treatment is missing.
</td></tr>
<tr><td>EIPPCB assessment:</td><td>
- As stipulated in the 'General considerations', the list of techniques is non-prescriptive and non-exhaustive.
- Anaerobic pretreatment is an option to reduce high concentrations of biodegradable organic compounds, while increasing energy efficiency.
- Chemical oxidation is usually not used for biodegradable organic compounds but rather for low-/non-biodegradable, toxic organic compounds or oxidisable inorganic compounds.
- Waste water incineration is sometimes used on chemical sites, in particular for segregated waste water streams derived from the production of organic fine chemicals.
- 'Electrochemical treatment' is usually not used for waste water streams with high concentrations of organic compounds.
</td></tr>
</table>

Location in D2:	**Section 4.9.1, page 673 – 674 (BAT 28)**
EIPPCB proposal:	- Merge BAT 28, 29, 31, 32, 33, 35, 36 and 38 into one BAT conclusion on pretreatment and add a new column with the heading on 'typical pollutants abated'. - In the new BAT conclusion on pretreatment, make a distinction between biodegradable and low-/non-biodegradable pollutants. - Specify that anaerobic treatment is applicable if inlet COD > 2 g/l. Add that the applicability may be restricted due to the high sensitivity with respect to toxic compounds. - Remove 'high organic load' as pollutant abated by chemical oxidation. - Do not add 'electrochemical treatment' to the list of pretreatment techniques. - Add 'waste water incineration' to the list of pretreatment techniques. - Delete introductory text before BAT 28.

Text proposal: See Section 1.4.2.1.4 of this BP.

1.4.2.1.2 Metals

<table>
<tr><td>Location in D2:</td><td>Section 4.9.1, page 674 (BAT 29)</td></tr>
<tr><td>Current text in D2:</td><td>
Tributary waste water streams containing
heavy metals at a level
that could adversely affect the downstream biological waste water treatment

When the heavy metal concentration in a segregated tributary waste water stream, as stipulated by BAT 27, before a downstream biological waste water treatment is at a level that could adversely affect the biological system, then BAT 29 shall apply.

29. BAT is to reduce the amount of heavy metals in the tributary waste water streams prior to their discharge to a downstream biological waste water treatment plant by applying one or more of the following techniques:

<table>
<tr><th colspan="2">Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I.</td><td>Chemical precipitation</td><td>Complex-forming substances can prevent the precipitation of heavy metals such as copper and nickel.</td></tr>
<tr><td>II.</td><td>Crystallisation</td><td>Generally applicable.</td></tr>
<tr><td>III.</td><td>Ion exchange</td><td>Suspended particles in the feed should be less than 50 mg/l to avoid plugging, pre-filtration is required.</td></tr>
<tr><td>IV.</td><td>Adsorption with zeolites</td><td>Total suspended solids concentration should be less than 20 mg/l for fixed-bed adsorbers and less than 10 mg/l for moving bed adsorbers. Pollutant concentration should be less than 100 mg/l without adsorbent recovery and less than 500 g/l with adsorbent recovery.</td></tr>
<tr><td>V.</td><td>Nanofiltration</td><td>Suspended particles in the feed should be low.</td></tr>
<tr><td>VI.</td><td>Reverse osmosis</td><td>Suspended particles in the feed should be low.</td></tr>
<tr><td>VII.</td><td>Extraction</td><td>Applicable to recycling of zinc. Waste water should be almost free of suspended solids and/or emulsions.</td></tr>
<tr><td colspan="3">([1]) The descriptions of the techniques are given in Section 4.12.1.</td></tr>
</table>

[Please TWG provide concrete information on the suspended particle concentration for the feed to nanofiltration and reverse osmosis that restricts their applicability based on your experience]
</td></tr>
<tr><td>Summary of comments:</td><td>
Techniques:
[DE(LAWA) 8]: Clarify that the most common way of reducing metal emissions is usually the treatment near the source.
[DE(LAWA) 9]: Add flocculation as technique.
[DE(LAWA) 10]: Delete crystallisation (Are there any examples?).
[DE(LAWA) 11]: Delete reverse osmosis (Are there any examples?).
</td></tr>
<tr><td>EIPPCB assessment:</td><td>
- As stipulated in the 'General considerations', the list of techniques is non-prescriptive and non-exhaustive.
- Coagulation/flocculation are commonly used to remove suspended solids, but much less to abate (dissolved) metals. Flocculation is included in these BAT conclusions as a final waste water treatment.
- Examples of plants using crystallisation are given in the BREF and in the survey (#05).
- During the survey, three plants (i.e. #05, #58 and #68) reported using reverse osmosis for pretreatment, but none of them for metals.
- The applicability formulations of 'ion exchange' and 'adsorption with zeolites' with respect to suspended solids seem to refer more to engineering requirements than to actual restrictions.
- The applicability formulation of 'adsorption with zeolites' with respect to the pollutant concentration seems to refer more to economic optimisation than to actual restrictions.
- Extraction is not very commonly used to abate metals.
</td></tr>
</table>

Location in D2:	**Section 4.9.1, page 674 (BAT 29)**
EIPPCB proposal:	- Merge BAT 28, 29, 31, 32, 33, 35, 36 and 38 into one BAT conclusion on pretreatment and add a new column with the heading on 'typical pollutants abated'. - Clarify in the description of this combined BAT conclusion that pretreatment is generally carried out as close as possible to the source to avoid dilution. - Do not add coagulation/flocculation to the list of pretreatment techniques. - Keep crystallisation in the list of techniques, for the abatement of metals and inorganic salts. - Keep nanofiltration and reverse osmosis in the list of techniques, but do not mention metals. - Modify the applicability of the techniques 'ion exchange' and 'adsorption with zeolites' to 'generally applicable'. - Rename the technique 'adsorption with zeolites' to 'adsorption'. - Keep 'extraction' in the list of techniques, but do not mention metals. - Update the applicability of 'crystallisation' and 'chemical precipitation' in line with the information contained in Chapter 3.

Text proposal: See Section 1.4.2.1.4 of this BP.

1.4.2.1.3 Low-/non-biodegradable or toxic organic compounds

<table>
<tr><td>Location in D2:</td><td>Section 4.9.1, page 677 (BAT 36)</td></tr>
<tr><td>Current text in D2:</td><td>
Tributary waste water streams containing low-biodegradable and/or non-biodegradable organic pollutants (refractory organics) and toxic substances at a level that could adversely affect the downstream biological waste water treatment

When low-biodegradable and/or non-biodegradable organic pollutants (refractory organics) and toxic substances in a segregated tributary waste water stream, as stipulated by BAT 27, before a downstream biological waste water treatment are at a level that could adversely affect the biological system, then BAT 36 shall apply.

36. BAT is to reduce the low- and/or non-biodegradable organic pollutants (refractory organics) and/or toxic substances in the tributary waste water streams prior to their discharge to a downstream biological waste water treatment plant by applying one or more of the following techniques:
<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I. Chemical oxidation</td><td>Restrictions may exist due to the risk of generating organic halides with the use of chlorine, hypochlorite and chlorite (or the respective halogen compounds) as the oxidising agent.</td></tr>
<tr><td>II. Chemical reduction</td><td>Applicable to a limited number of inorganic compounds.</td></tr>
<tr><td>III. Chemical hydrolysis</td><td>Low solubility in aqueous media may restrict the applicability.</td></tr>
<tr><td>IV. Adsorption with activated carbon</td><td>Total suspended solids concentration should be less than 20 mg/l for fixed-bed adsorbers and less than 10 mg/l for moving bed adsorbers. Pollutant concentration should be less than 100 mg/l without adsorbent recovery and less than 500 g/l with adsorbent recovery.</td></tr>
<tr><td>V. Extraction</td><td>Waste water should be almost free of suspended solids and/or emulsions.</td></tr>
<tr><td>VI. Wet air oxidation</td><td>Dilution required for COD concentrations above 100 000 mg/l. Fluoride concentration should be less than 10 mg/l for low-pressure oxidation and less than 5 mg/l for high-pressure oxidation. To avoid corrosion, chloride concentration should be less than 50 g/l.</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 4.12.1.</td></tr>
</table>
Description
Refractory organics are compounds resistant to microbial degradation in conventional biological treatment processes and the natural environment.
</td></tr>
<tr><td>Current text in D2:</td><td>
Biodegradability of a waste water stream can be estimated by its BOD/COD ratio (before treatment):

BOD/COD < 0.2 relatively non-biodegradable waste water
0.2 < BOD/COD < 0.4 moderately to highly biodegradable waste water
BOD/COD > 0.4 highly biodegradable waste water.

[This BAT conclusion is based on information given in Section 3.2.3.4.3.3 (chemical oxidation), Section 3.2.3.4.3.6 (chemical reduction), Section 3.2.3.4.3.7 (chemical hydrolysis), Section 3.2.3.4.3.10 (adsorption), Section 3.2.3.4.3.12 (extraction) and Section 3.2.3.4.3.4 (wet air oxidation).]
</td></tr>
</table>

Location in D2:	Section 4.9.1, page 677 (BAT 36)
Summary of comments:	[CEFIC 181]: There may be no need for pretreatment of refractory/toxic substances if the bacteria in the central WWTP are adapted. [DE(LAWA) 32, 35]: Separate BAT 36 in two BAT conclusions. One for refractory substances and another for toxic substances. [DE(LAWA) 37]: Remove 'Chemical reduction' from the list of techniques. This is of little relevance for organic compounds. [DE(LAWA) 36,] Add distillation and stripping as techniques. [DE(LAWA) 36, FR 45] Add waste water incineration as technique. [AT 53]: Electrochemical treatment is missing. [DE(LAWA) 33, 34; AT 54]: Define 'refractory substances' by means of biodegradability/bioeliminability tests. The BOD/COD ratio is only a rough indication. The Zahn-Wellens test usually gives better results.
EIPPCB assessment:	- As stipulated in the 'General considerations', the list of techniques is non-prescriptive and non-exhaustive. - Chemical reduction is of little relevance for organic compounds. - The applicability formulation of 'adsorption with activated carbon' with respect to suspended solids refers more to engineering requirements than to actual restrictions while the formulation with respect to the pollutant concentration seems to refer more to economic optimisation than to actual restrictions. - The applicability formulation of 'extraction' with respect to suspended solids refers more to engineering requirements than to actual restrictions. - Distillation/rectification is often used to recover solvents after waste water extraction. - Stripping is often used to remove volatile contaminants such as: chlorinated hydrocarbons, ammonia, hydrogen sulphide, and organic solvents. - Waste water incineration is sometimes used on chemical sites, in particular for segregated waste water streams derived from the production of organic fine chemicals. - Electrochemical treatment is usually not used for waste water streams with high concentrations of organic compounds. - A definition of 'refractory organics' is not deemed necessary.
EIPPCB proposal:	- Merge BAT 28, 29, 31, 32, 33, 35, 36 and 38 into one BAT conclusion on pretreatment and add a new column with the heading on 'typical pollutants abated'. - Change the applicability restriction of 'Chemical oxidation' and 'Extraction' to 'generally applicable'. Mention in the description that the use of chlorine, hypochlorite and chlorine dioxide is restricted to cases where it does not lead to the formation of halogenated organic compounds (i.e. AOX). - Keep chemical reduction in the list of pretreatment techniques, but only for inorganic compounds that can be reduced. - Modify the applicability of the technique 'adsorption with activated carbon' to 'generally applicable'. - Rename the technique 'adsorption with activated carbon' to 'adsorption'. - Formulate the applicability restriction of 'wet air oxidation' in a more general way (corrosion of equipment). - Do not add 'electrochemical treatment' to the list of pretreatment techniques. - Add 'distillation/rectification', 'stripping', and 'waste water incineration' to the list of pretreatment techniques. - Remove the definition of 'refractory organics'. - Delete introductory text before BAT 36.

Text proposal: See Section 1.4.2.1.4 of this BP.

1.4.2.1.4 Text proposal for new BAT conclusion on waste water pretreatment

BAT 11. In order to reduce emissions to water, BAT is to pretreat waste water that contains pollutants which cannot be adequately dealt with during final waste water treatment.

Description

Waste water pretreatment is carried out as part of an integrated waste water management and treatment strategy (see BAT 10).

Pretreatment is generally necessary to:

- protect the final waste water treatment plant (e.g. protection of a biological treatment plant against inhibitory or toxic compounds);
- remove compounds that are insufficiently abated during final treatment (e.g. toxic compounds, low-/non-biodegradable organic compounds, organic compounds that are present in high concentrations, or metals during biological treatment);
- remove compounds that are otherwise stripped to air from the collection system or during final treatment;
- remove compounds that have other negative effects (e.g. corrosion of equipment; unwanted reaction with other substances; contamination of sewage sludge).

In general, pretreatment is carried out as close as possible to the source in order to avoid dilution, in particular for metals. Sometimes, waste water streams with similar characteristics undergo combined pretreatment.

Appropriate pretreatment techniques include:

	Technique ([1])	Typical pollutants abated	Applicability
a	Adsorption	Low-/non-biodegradable and/or toxic organic compounds (e.g. halogenated organic compounds), metals	Generally applicable.
b	Anaerobic treatment	Biodegradable organic compounds	Applicable to the pretreatment of waste water streams with COD > 2 g/l. The applicability may be restricted due to the high sensitivity of anaerobic microorganisms to toxic compounds.
c	Chemical hydrolysis	Low-/non-biodegradable and/or toxic organic compounds (e.g. halogenated organic compounds), hydrolysable inorganic compounds (e.g. cyanides)	Applicability may be restricted in the case of low pollutant solubility in aqueous media.
d	Chemical oxidation	Low-/non-biodegradable and/or toxic organic compounds (e.g. halogenated organic compounds), oxidisable inorganic compounds (e.g. cyanides, nitrite, sulphite, sulphide)	Generally applicable.
e	Chemical precipitation	Inorganic compounds (e.g. metals)	Applicability may be restricted due to the presence of complex-forming substances.
f	Chemical reduction	Reducible inorganic compounds (e.g. metals, chlorine, hydrogen peroxide, chromate)	Applicable to inorganic compounds that can be chemically reduced.

	Technique ([1])	Typical pollutants abated	Applicability
g	Crystallisation	Inorganic compounds (e.g. metals)	Applicable to inorganic compounds that can be crystallised.
h	Distillation/rectification	Low-/non-biodegradable and/or toxic organic compounds (e.g. halogenated organic compounds)	Applicable to organic compounds present in high concentrations and with a substantial difference of its boiling point to that of water.
i	Extraction	Low-/non-biodegradable and/or toxic organic compounds (e.g. halogenated organic compounds)	Generally applicable.
j	Ion exchange	Ionisable organic/inorganic compounds (e.g. metals)	Generally applicable.
k	Nanofiltration	Low-/non-biodegradable and/or toxic organic compounds (e.g. halogenated organic compounds), inorganic compounds	Generally applicable.
l	Oil-water separation	Free oil	Generally applicable.
m	Reverse osmosis	Low-/non-biodegradable and/or toxic organic compounds (e.g. halogenated organic compounds), inorganic compounds	Generally applicable.
n	Stripping	Volatile organic compounds (e.g. halogenated organic compounds), volatile inorganic compounds (e.g. ammonia, hydrogen sulphide)	Generally applicable.
o	Waste water incineration	Low-/non-biodegradable and/or toxic organic compounds (e.g. halogenated organic compounds)	Applicable when organic compounds are present in high concentrations.
p	Wet air oxidation	Low-/non-biodegradable and/or toxic organic compounds (e.g. halogenated organic compounds), oxidisable inorganic compounds (e.g. cyanides, nitrite, sulphite, sulphide)	Applicability may be restricted due to corrosion of equipment caused by inorganic compounds.
([1]) The descriptions of the techniques are given in Section 1.6.1.			

[This BAT conclusion is based on information given in Section 3.2.3.4.]

1.4.2.2 Final treatment

1.4.2.2.1 Total Suspended Solids (TSS)

<table>
<tr><td>Location in D2:</td><td>Section 4.9.2, page 679 (BAT 41)</td></tr>
<tr><td>Current text in D2:</td><td>
41. BAT is to reduce the emission of total suspended solids (TSS) from central waste water treatment plants by applying I and II below:

I. prior to a downstream biological treatment in order to ensure the proper functioning of the treatment system by applying one or more of the following techniques:
<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>a. Grit separation</td><td rowspan="4">Generally applicable.</td></tr>
<tr><td>b. Coagulation and flocculation</td></tr>
<tr><td>c. Sedimentation</td></tr>
<tr><td>d. Flotation</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 4.12.1.</td></tr>
</table>
II. after a downstream biological treatment and before the final effluent discharge by applying one or more of the following techniques:
<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>a. Sedimentation</td><td>Generally applicable.</td></tr>
<tr><td>b. Filtration</td><td>Filter aids should be used when finely dispersed solids exist to prevent the blocking of the filter medium.</td></tr>
<tr><td>c. Microfiltration</td><td>Waste water content may restrict the use due to vulnerability of the membrane material.</td></tr>
<tr><td>d. Ultrafiltration</td><td>Waste water content may restrict the use due to vulnerability of the membrane material.</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 4.12.1.</td></tr>
</table>
[This BAT conclusion is based on information given in Section 3.2.3.4.2.1 (grit separation), Section 3.2.3.4.2.2 (coagulation and flocculation), Section 3.2.3.4.2.3 (sedimentation), Section 3.2.3.4.2.4 (flotation), Section 3.2.3.4.2.5 (filtration) and Section 3.2.3.4.2.6 (microfiltration and ultrafiltration).]
</td></tr>
<tr><td>Summary of comments:</td><td>[CEFIC 189, 190]: BAT 41 I. is redundant with BAT 27. Some techniques listed under I are needed for the good functioning of the biological process. The removal of solids is anyway part of a biological process.
[CEFIC 190]: Micro- and ultrafiltration are typically used by plants that reuse the waste water after biological treatment.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- BAT 27 is proposed to be deleted (see Section 1.4.1.2 of this BP).
- Primary removal of solids and oil/grease is an integral part of a biological WWTP.
- Some plants in the survey reported the use of micro- and ultrafiltration.
- The given applicability restrictions for filtration, microfiltration, and ultrafiltration seem to refer more to engineering requirements than to actual restrictions.
- Several plants in the survey reported the use of flotation.</td></tr>
<tr><td>EIPPCB proposal:</td><td>- Merge BAT 39, 41, 42, and 43 into one BAT conclusion on final waste water treatment and add a new column with the heading on 'typical pollutants abated'.
- Keep primary treatment techniques in the list and group them. Add 'neutralisation'.
- Keep 'ultrafiltration' and 'microfiltration' in the list of final treatment techniques, group them under 'filtration' and move this under the subheading 'final solids removal'.
- Set the applicabilities of the techniques for the removal of suspended solids to 'generally applicable'.
- Add flotation to the list of techniques.</td></tr>
</table>

Text proposal: See Section 1.4.2.2.4 of this BP.

1.4.2.2.2 Biodegradable components

<table>
<tr><td>Location in D2:</td><td>Section 4.9.2, page 680 (BAT 42)</td></tr>
<tr><td>Current text in D2:</td><td>42. BAT is to reduce the emission of biodegradable components from central waste water treatment plants by applying one or more of the following techniques:

<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I. Completely mixed activated sludge system</td><td rowspan="3">Biochemical oxygen demand (BOD) to nitrogen ratio of the waste water should not exceed 32 and also BOD to phosphorus ratio of the waste water should not exceed 150 to ensure adequate operation.

For MBR systems, waste water streams should not contain silicone as it may plug the pores of the membrane.</td></tr>
<tr><td>II. Membrane bioreactor (MBR) system</td></tr>
<tr><td>III. Fixed biofilm system</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 4.12.1.</td></tr>
</table>

[This BAT conclusion is based on information given in Section 3.3.2 and Section 3.4.3.4.4.3.]</td></tr>
<tr><td>Summary of comments:</td><td>[CEFIC 193]: The list of techniques is incomplete. Biodegradable compounds may also be removed by non-biological techniques.
[CEFIC 194]: The plugging of membranes in MBR systems is not limited to silicone.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- As stipulated in the 'General considerations', the list of techniques is non-prescriptive and non-exhaustive.
- Fixed biofilm systems seem to be rarely used in the chemical industry (only installation #29 in the survey).
- The applicability restriction concerning the BOD/N/P ratio seems to refer more to engineering requirements than to actual restrictions. Nutrients could be added to the biological treatment if their levels are too low (for phosphorous, this is often the case).
- The nature and extent of fouling in MBRs depends on three factors: biomass characteristics, operating conditions, and membrane characteristics.</td></tr>
<tr><td>EIPPCB proposal:</td><td>- Merge BAT 39, 41, 42, and 43 into one BAT conclusion on final waste water treatment and add a new column with the heading on 'typical pollutants abated'.
- Delete the technique 'fixed biofilm system'.
- Delete the applicability restrictions concerning the BOD/N/P ratio and for MBRs.</td></tr>
</table>

Text proposal: See Section 1.4.2.2.4 of this BP.

1.4.2.2.3 Nitrogen

Location in D2:	**Section 4.9.2, page 680 (BAT 43)**
Current text in D2:	**43. BAT is to reduce the emission of total nitrogen from central waste water treatment plants by applying biological nitrification/denitrification.** **Description** Biological nitrification/denitrification is a two step process that is typically incorporated into central biological waste water treatment plants. The first step is the aerobic nitrification where microorganisms oxidise ammonium (NH_4^+) to the intermediate nitrite (NO_2^-) that is further converted to nitrate (NO_3^-) and the second step is the anoxic denitrification where microorganisms convert nitrate into nitrogen gas. The control of ammonium discharge is an important measure to protect the quality of the surface water, because the conversion of ammonium to ammonia, dependent on pH, results in fish toxicity. **Applicability** [Please TWG provide information on restrictions for the applicability of the technique encountered in your experience] *[This BAT conclusion is based on information given in Section 3.2.3.4.4.4.]*
Summary of comments:	[ES(A) 2]: Nitrification/denitrification is not effective when nitrogen is mainly present as dissolved salt (CAN (acrylonitrile)/MMA (methyl methacrylate) production). [DE(LAWA) 39]: Nitrification is impeded by high chloride concentrations. [CEFIC 198; DE(LAWA) 40]: Central nitrification may not be justified when the total nitrogen concentration in the influent is below a certain threshold value. [CEFIC 196; PT 20]: Other techniques can be used to remove nitrogen. [FI 5]: Nitrogen removal is not always possible in existing WWTP.
EIPPCB assessment:	- As stipulated in the 'General considerations', the list of techniques is non-prescriptive and non-exhaustive. - A high proportion of the installations with biological WWTP in the survey reported the use of nitrification/denitrification. A number of WWTP have been retrofitted. - Nitrification is impeded by high chloride concentrations (e.g. installation #10 with $\rho(Cl^-) > 10$ g/l as reported by DE). At chloride concentrations below 10 g/l, nitrification does not seem to be impeded (e.g. installation #16 with a chloride concentration of 6 g/l). - Nitrification/denitrification is effective in the case of dissolved salts (i.e. ammonia/ammonium, nitrite, nitrate). - Biological nitrification/denitrification is not used by installations with 'inorganic' waste water.
EIPPCB proposal:	- Merge BAT 39, 41, 42, and 43 into one BAT conclusion on final waste water treatment and add a new column with the heading on 'typical pollutants abated'. - Add an applicability restriction in the case of waste water with high chloride concentrations (i.e. > 10 g/l). - Add an applicability restriction in the case of installations whose final treatment does not include a biological treatment.

Text proposal: See Section 1.4.2.2.4 of this BP.

1.4.2.2.4 Text proposal for new BAT conclusion on waste water final treatment

BAT 12. In order to reduce emissions to water, BAT is to use an appropriate combination of the final waste water treatment techniques given below.

Description

Final waste water treatment is carried out as part of an integrated waste water management and treatment strategy (see BAT 10).

Appropriate final waste water treatment techniques, depending on the pollutant, include:

	Technique ([1])	Typical pollutants abated	Applicability
Preliminary and primary treatment			
a	Equalisation	Not relevant	Generally applicable.
b	Neutralisation	Acids, alkalis	Generally applicable.
c	Physical separation e.g. screens, sieves, grit separators, grease separators or primary settlement tanks	Suspended solids, oil/grease	Generally applicable.
Biological treatment (secondary treatment)			
d	Activated sludge process	Biodegradable organic compounds	Generally applicable.
e	Membrane bioreactor		Generally applicable.
Nitrogen removal			
f	Biological nitrification/denitrification	Total nitrogen, ammonia	Not applicable if the chloride concentration exceeds 10 g/l. Not applicable when the final treatment does not include a biological treatment.
Phosphorous removal			
g	Chemical precipitation	Phosphorous	Generally applicable.
Final solids removal			
h	Coagulation and flocculation	Suspended solids	Generally applicable.
i	Sedimentation		Generally applicable.
j	Filtration (e.g. sand filtration, microfiltration, ultrafiltration)		Generally applicable.
k	Flotation		Generally applicable.
([1]) The descriptions of the techniques are given in Section 1.6.1			

[This BAT conclusion is based on information given in Section 3.2.3.4.]

1.4.2.3 BAT-AELs

1.4.2.3.1 Introductory sentences and table captions

Location in D2:	**Section 4.9.2, pages 680 – 681, Table 1 and 2**
Current text in D2:	**The BAT associated emission levels (BAT-AELs) for final waste water discharge from central waste water treatment plants are given in Table 1. The values reported are emission levels without dilution with rainwater and/or uncontaminated cooling water.** **Note to the TWG Members** **The BAT-AELs reported in Table 1 are based on yearly averages (with different monitoring frequencies) reported in the questionnaires submitted to the EIPPCB.** **The TWG is asked to provide (for the questionnaires submitted to the EIPPCB that are direct dischargers):** **1. Daily average emission level values for the parameters listed in Table 1 for a longer time span (e.g. one or several years of recent data).** **2. Raw measurement data and the corresponding graphs in excel format.** **3. Background information on any 'other than normal operating condition' and/or 'non-routine operating condition' (such as start-up, shut-down) taking place on the chemical site that has an influence on the submitted waste water emission levels.** **Table 1: BAT-AELs for final waste water discharge from central waste water treatment plants** **…** **The BAT-AELs for final waste water discharge from central waste water treatment plants for polluting substances which are likely to be emitted in significant quantities from central waste water treatment plants are given in Table 2. The values reported are emission levels without dilution with rainwater and/or uncontaminated cooling water.**

Location in D2:	**Section 4.9.2, pages 680 – 681, Table 1 and 2**
	Note to the TWG Members **The BAT-AELs reported in Table 2 are based on yearly averages (with different monitoring frequencies) reported in the questionnaires submitted to the EIPPCB.** **The TWG is asked to provide (for the questionnaires submitted to the EIPPCB that are direct dischargers):** **1. Short-term (e.g. daily, weekly, monthly) average emission level values for the parameters listed in Table 2 for a longer time span (e.g. one or several years of recent data).** **2. Raw measurement data and the corresponding graphs in excel format.** **3. Background information on any 'other than normal operating condition' and/or 'non-routine operating condition' (such as start-up, shut-down) taking place on the chemical site that has an influence on the submitted waste water emission levels.** **Table 2: BAT-AELs for final waste water discharge from central waste water treatment plants for polluting substances which are likely to be emitted in significant quantities** **…**
Summary of comments:	[CEFIC 199]: Clarify to which BAT the table with the BAT-AELs refers to. [AT 60, 62; BE 24, 25; CEFIC 204, 244, 245]: Clarify that the BAT-AEL ranges refer to the point where the waste water is discharged to a receiving water body, because the discharge from the central waste water treatment plant on a chemical site could also be an indirect discharge. [CEFIC 213]: Consider that the effluent from a biological WWTP could be mixed with other process waste water streams before discharge to a receiving water body. [CEFIC 200, 201; FI 8]: Clarify statement on rain water and cooling water. Having some rainwater in the effluent is unavoidable because it will enter sewers that contain potentially contaminated streams and therefore go to the WWTP.
EIPPCB assessment:	- The BAT conclusions of the revised CAK BREF contain a generic BAT that clarifies the interface between techniques that are covered by the vertical chemical BREFs and those that are covered by the CWW BREF.
EIPPCB proposal:	- Use the generic BAT conclusion on integrated waste water management and treatment from the CAK BREF and include minor editorial changes. - Clarify that the BAT-AEL values refer to direct discharges to a receiving water body. - Clarify that the BAT-AELs apply at the point where the emission leaves the installation while disregarding any dilution with other waste water streams after the final waste water treatment.

Text proposal: See Section 1.4.2.3.12 of this BP.

1.4.2.3.2 Generic issues on tables/values

Location in D2:	**Section 4.9.2, pages 680 – 681, Table 1 and 2**
Current text in D2:	Tables 1 and 2 on page 680 – 681.
Summary of comments:	[SE 6; PT 21, 22]: Given the large differences between chemical sites, it is not possible to derive common BAT-AELs. Only guidance values should be given. [DE(LAWA) 57, 81]: Differentiate BAT-AELs between 'organic sites' that have a biological WWTP and 'inorganic sites' that do not. [FR 48]: There is no differentiation between chemical sites. Some subsectors will have more difficulties to reach the BAT-AELs because of the specificities of their effluents and processes (e.g. pharmaceutical plants with a high COD input load of. [BE 23, 38, 39; FR 49; CEFIC 197, 203; DE(LAWA) 56, 80]: Describe the basis for deriving the BAT-AEL ranges. [BE 27, 28]: Consider the Flemish study for LVOC installations when deriving BAT-AELs. [CEFIC 197]: The link between the techniques and BAT-AELs is unclear. [BE 38; FR 49; CEFIC 197]: Few sites comply with all BAT-AEL ranges at the same time. [BE 39]: BAT-AEL values seem very low, sometimes close to the detection limit. [CEFIC 197; FR 51]: BAT-AEL ranges are given only in concentrations without considering abatement efficiencies and pollutant loads. Costs may be excessive compared to the benefits in the case of low loads. [ES(A) 6]: Ranges of abatement efficiencies should be added as an alternative to BAT-AEL ranges expressed in concentrations. [CEFIC 213]: Include removal efficiencies over the complete sequence of waste water treatment (not only the final WWTP). [AT 61]: The final concentration depends on the mixing with other tributary streams (e.g. municipal waste water). [DE, 2/05/2012, comment on the scope]: Set a generic threshold value of 10 m^3 of waste water per day for all BAT-AELs (equal to 3.65×10^3 m^3/yr). [CEFIC 106, 109]: Add threshold values for each BAT-AEL. [CEFIC 205; ES(A) 2]: The contaminant load of the intake water should be reflected in the BAT-AEL ranges, i.e. these intake loads should be subtracted from the range. [BE 26]: BAT-AELs for daily averages could be estimated from the fluctuations around the average as stated in Chapter 2. [SE 7]: Do not set short-term BAT-AELs (hourly, daily, weekly). [AT 61, 63]: Set short-term BAT-AELs. [AT 48, 57, 64]: Set BAT-AELs for indirect discharges. [CEFIC 197; FR 53; SARP 13]: Specify the associated monitoring including the monitoring frequency and the method to calculate the averages.
EIPPCB assessment:	- The CWW BREF focuses on the common pollutants of the chemical sector and common end-of-pipe treatment techniques. The EIPPCB believes that it is possible to derive BAT-AEL values for the whole chemical sector. - However, some differentiation between different sites depending on their characteristics may be necessary (e.g. 'organic sites' versus 'inorganic sites'; dependence on input loads). - The performance of an installation does not only depend on the technologies used, but also on the way they are designed, maintained, and operated. - For some parameters/pollutants, the abatement efficiency essentially depends on the performance of the final waste water plant (e.g. TSS), while for others the complete sequence of waste water treatment is relevant (e.g. COD/TOC). - The combined treatment of waste water from different origins is addressed in the scope. - The IED does not contain threshold values concerning production volumes in the chemical industry sector (see Section 4 of Annex I to the IED). - The surveys included only five directly discharging installations with a waste water volume of less than 100 000 m^3/yr. These installations only used physico-chemical treatment techniques.

Location in D2:	Section 4.9.2, pages 680 – 681, Table 1 and 2
	- The smallest biological WWTPs with a direct discharge covered in the survey are, in terms of waste water volume: #52 (BE), 120 000 m^3/yr, BOD in influent 2.5 g/l (= 300 t/yr = 14 000 population equivalents); and in terms of BOD load: #62 (CZ), 125 000 m^3/yr, BOD influent 300 mg/l (= 38 t/yr = 1700 population equivalents) [1 population equivalent equals 60 g BOD/d]. - Data from WWTPs smaller than those mentioned before have not been collected. - The EIPPCB considers that threshold values expressed in pollutant loads are more appropriate than a generic threshold value for the waste water volume. - Intake loads of pollutants are only relevant for some parameters and largely depend on the local conditions. Emission data used to derive BAT-AELs have been reported without reference to any intake loads. A potential mathematical subtraction of these loads is a generic issue beyond the scope of the CWW BREF and seems more related to implementation. - Very few detailed short-term data were provided. In general, only yearly averages, minimum and maximum values are available. There is uncertainty if the provided minimum and maximum values also include other than normal operating conditions. Fluctuations around the yearly average sometimes vary widely from one installation to another (e.g. for COD from approximately 2 to more than 10). - It is difficult to set BAT-AELs for indirect discharges due to the unknown effect of downstream WWTPs. It would only make sense for those pollutants that are most effectively controlled at source or that cannot be adequately dealt with by the downstream WWTP. However, only a few emission data have been reported for indirect discharges. - Article 15(1) of the IED includes provisions for ELVs related to indirect discharges.
EIPPCB proposal:	- Set BAT-AELs for common pollutants in the CWW BREF. Analyse for each specific pollutant if differentiations due to site-specific characteristics are needed. - Do not only look at the technologies used, but also use indicators such as BOD and TSS to decide if a WWTP is well designed, maintained and operated. - Revise the BAT-AEL ranges and make sure they are compatible with the analytical methods. - Include removal efficiencies over the complete sequence of waste water treatment, where appropriate. - Do not set BAT-AELs for WWTPs that are smaller than those covered by the surveys (i.e. with a waste water volume of less than 100 000 m^3/yr). - For that purpose, set threshold values for emissions for each BAT-AEL in annual loads. Calculate these values by multiplying a reference waste water volume of 100 000 m^3/yr with the upper end of the BAT-AEL range.- Do not specify how to take into account the intake load of pollutants. - Do not set short-term BAT-AELs. - Do not set BAT-AELs for indirect discharges. - Clarify the associated monitoring in coherence with recently adopted BREFs (see Section 1.3 of this BP).

Text proposal: See Section 1.4.2.3.12 of this BP.

1.4.2.3.3 Biochemical Oxygen Demand (BOD)

<table>
<tr><td>Location in D2:</td><td>Section 4.9.2, pages 680 – 681, Table 1</td></tr>
<tr><td>Current text in D2:</td><td>Table 1: BAT-AELs for final waste water discharge from central waste water treatment plants
<table>
<tr><th rowspan="2">Parameter</th><th colspan="3">BAT-AEL</th></tr>
<tr><th>Unit</th><th>Yearly average</th><th>Daily average</th></tr>
<tr><td>Biochemical oxygen demand (BOD_5)</td><td>mg/l</td><td>2 – 20</td><td></td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>[CEFIC 197]: BOD is not a reliable parameter.
[CEFIC 212]: Increase the lower end of the BAT-AEL range because it is set at the method detection limit.
[DE(LAWA) 46]: Modify the BAT-AEL range to 2 – 18 mg/l (OFC BREF 1 – 18 mg/l).
[DE(LAWA) 45, 47]: Add information on when the lower or upper end of the BAT-AEL range can be achieved, e.g. the lower end results when special treatment techniques such as MBR and/or filters are used. The upper end results when completely-mixed activated sludge systems are used and/or in case of high BOD input.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- In the original CWW BREF, the BAT-AEL for BOD was set at ≤ 20 mg/l (no averaging period given).
- The parameter BOD can be used as a control if the organic compounds in waste water are easily biodegradable (e.g. after the final treatment).
- The measurement result depends on the analytical method and the local conditions (e.g. inoculum).
- The parameter BOD is widely used in the EU for setting permit conditions.
- However, biodegradable compounds are a subset of all organic compounds present in the waste water. BOD is therefore included in the parameter COD/TOC. Example installations from Germany show that low emission values of organic substances can be ensured without using the BOD for setting permit conditions.
- The measurement uncertainty for BOD is higher than for COD/TOC and the monitoring result is only available several days after sampling.
- Due to these reasons, no BAT-AELs for BOD were set in the final drafts of the revised REF BREF and PP BREF.
- Nevertheless, the PP BREF contains an indication of the BOD values that can be expected in effluents from biological WWTPs. Such an indication could be useful for permitting authorities when evaluating the performance of a biological WWTP.
- In the surveys, the most commonly reported frequency of BOD monitoring was weekly. Many plants have also reported a daily and monthly frequency. There does not seem to be a correlation between the monitoring frequency and the treated waste water volume.</td></tr>
<tr><td>EIPPCB proposal:</td><td>- Do not set a BAT-AEL for BOD.
- Add a footnote to the table stipulating that the BOD_5 level in effluents treated by a biological WWTP is expected to be ≤ 20 mg/l as a yearly average.
- Include a weekly monitoring requirement for BOD, when the annual average TOC emissions are higher than 40 mg/l or the annual average COD emissions are higher than 120 mg/l (see Section 1.4.2.3.4 of this BP).</td></tr>
</table>

Text proposal: See Section 1.4.2.3.12 of this BP.

1.4.2.3.4 Chemical Oxygen Demand (COD) and Total Organic Carbon (TOC)

<table>
<tr><td>Location in D2:</td><td>Section 4.9.2, pages 680 – 681, Table 1</td></tr>
<tr><td>Current text in D2:</td><td>Table 1: BAT-AELs for final waste water discharge from central waste water treatment plants
<table>
<tr><th rowspan="2">Parameter</th><th colspan="3">BAT-AEL</th></tr>
<tr><th>Unit</th><th>Yearly average</th><th>Daily average</th></tr>
<tr><td>Chemical oxygen demand (COD) ([1])</td><td>mg/l</td><td>10 – 125</td><td></td></tr>
<tr><td>Total organic carbon ([1])</td><td>mg/l</td><td>5 – 50</td><td></td></tr>
<tr><td colspan="4">([1]) Either TOC or COD is to be monitored.</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>[CEFIC 212]: Increase the lower end of the BAT-AEL ranges because they are set at the method detection limits.
[DE(LAWA) 42]: Clarify that the BAT-AEL range does not apply to OFC plants and refer instead to the OFC BREF.
[DE(LAWA) 41]: Increase the upper end of the BAT-AEL range for COD to 150 mg/l. Some organic fine chemicals (OFC) sites (Questionnaires #6 and #36) apply BAT but cannot cope with this value. The value is also not consistent with the upper end of the BAT-AEL range for TOC since the established ratio is COD/TOC = 3/1.
[SARP 11]: BAT-AELs are expressed only in concentrations. Add an abatement efficiency of 85 – 95 % to ensure appropriate treatment of organic pollutants.
[DE(LAWA) 43]: Questionnaire #16 belongs to a site producing methylcellulose. Due to a moderate biodegradability of the organic load, the site cannot comply with the BAT-AEL ranges.
[DE(LAWA) 44, 45]: Add information on when the lower or upper end of the BAT-AEL range can be achieved, e.g. the lower end in the case of easily biodegradable substances and the upper end in the case of poorly biodegradable substances.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- In the original CWW BREF, the BAT-AEL for COD was set to 30 – 250 mg/l as daily average, with a performance rate of 76 – 96 % based on raw contaminant load.
- Although the parameter COD is widely used for monitoring emissions of organic compounds, there is a tendency to replace it with the TOC which does not rely on the use of very toxic compounds (i.e. mercury and chromium(VI)).
- The COD/TOC ratio is site-specific. Theoretically it ranges from 0.67 – 5.3. At the end of the 1990s, a study carried out in Germany examined the COD/TOC ratio in a number of industry sectors. For the chemical industry, the median was 2.9. In the CWW data compilation, the median accounted for 3.0.
- No EN standard is available for COD. ISO 6060 (wet-chemical analysis) is applicable to water samples with COD values between 30 – 700 mg/l. ISO 15705 (small-scale sealed tube test) has a detection limit of 6 mg/l for photometric detection, and 15 mg/l for titrimetric detection. The proposed lower end of the range in D2 (i.e. 10 mg/l as yearly average), therefore seems to be too low.
- The data collection included a number of OFC installations. These installations should therefore be covered by the BAT-AELs.
- Very few installations reported COD emission levels below 15 mg/l, but some reported values below 20 mg/l. Similarly, a few installations reported TOC emission levels below 7 mg/l.
- The TOC/COD concentration in the final effluent does not only depend on the performance of pretreatment and final treatment, but also on the activities carried out at the site which determine the organic loads in the raw waste water. This is reflected in the BAT-AEL ranges of the LVOC BREF (COD 30 – 125 mg/l as daily average) and the OFC BREF (COD 12 – 250 mg/l as yearly average). A combination of a BAT-AEL expressed in concentration with abatement efficiency could take into account these differences in activities.
- When setting provisions for abatement efficiencies, both pretreatment and final treatment should be considered in order to give operators sufficient flexibility.
- A number of installations achieve yearly average TOC emission levels of ≤ 20 mg and yearly average COD emission levels of ≤ 60 mg/l. For these installations with relatively low TOC/COD emission levels, it does not seem necessary to combine the</td></tr>
</table>

Location in D2:	**Section 4.9.2, pages 680 – 681, Table 1**
	BAT-AEL expressed in concentration with abatement efficiency. - However, many other installations with a well operated biological WWTP show yearly average TOC emission levels of ≤ 80 mg and yearly average COD emission levels ≤ 240 mg/l. Many of these installations produce organic fine chemicals. For these installations, it seems appropriate to combine the BAT-AEL expressed in concentration with abatement efficiency. Moreover, the parameter BOD could be used for these installations to ensure that the final treatment is well operated. - Installation #16 reported a TOC value of 187 mg/l as yearly average. It is not clear why the installation could not achieve lower values. The OFC BREF does not mention that the production of methylcellulose is particularly problematic. - In the surveys, the most commonly reported frequency of COD and TOC monitoring was daily. There does not seem to be a correlation between the monitoring frequency and the treated waste water volume.
EIPPCB proposal:	- Express the BAT-AEL for organic contaminants both with the parameter COD and TOC. Clarify that either the BAT-AEL for TOC or for COD applies. Ensure consistency between the parameters by using a conversion factor of 3. Add that the TOC monitoring is the preferred option because it does not rely on the use of very toxic compounds. - Set a general BAT-AEL range of 7 – 20 mg/l for TOC and of 20 – 60 mg/l for COD, both as yearly averages. - Set an alternative, conditional BAT-AEL of 7 – 80 mg/l for TOC and of 20 – 240 mg/l for COD, both as yearly averages, provided that the following two conditions are met: A) The yearly average BOD_5 level in discharged effluents is ≤ 20 mg/l; B) The average abatement efficiency of all waste water streams is ≥ 90 % (including both pretreatment and final treatment). - Specify in the 'General considerations' on how to calculate the abatement efficiency. - Set threshold values of 2.0 t/yr for TOC (= 100 000 m^3/yr × 20 mg/l = 5.5 kg/d) and of 6.0 t/yr for COD (= 100 000 m^3/yr × 60 mg/l = 16 kg/d). - Add footnotes on when the lower or upper end of the BAT-AEL range can be achieved. - Include a daily monitoring requirement for TOC or COD. - Include a weekly monitoring requirement for BOD, when the annual average TOC emissions are higher than 40 mg/l or the annual average COD emissions are higher than 120 mg/l.

Text proposal: See Section 1.4.2.3.12 of this BP.

1.4.2.3.5 Total Suspended Solids (TSS)

<table>
<tr><td>Location in D2:</td><td>Section 4.9.2, pages 680 – 681, Table 1</td></tr>
<tr><td>Current text in D2:</td><td>Table 1: BAT-AELs for final waste water discharge from central waste water treatment plants
<table>
<tr><th rowspan="2">Parameter</th><th colspan="3">BAT-AEL</th></tr>
<tr><th>Unit</th><th>Yearly average</th><th>Daily average</th></tr>
<tr><td>Total Suspended Solids (TSS)</td><td>mg/l</td><td>2 – 20</td><td></td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>[CEFIC 212]: Increase the lower end of the BAT-AEL range because they are set at the method detection limit.
[CEFIC 208]: Increase the upper end of the BAT-AEL range to 50 mg/l to be consistent with performance data in Chapter 3.
[CEFIC 189]: ELVs in the Directive 91/271/EC (urban waste water) are much higher.
[DE(LAWA) 45, 48]: Add information on when the lower or upper end of the BAT-AEL range can be achieved, e.g. the lower end results when special treatment techniques such as MBR and/or filters are used.

Additional comment from Germany contained in their BAT conclusions proposal posted in BATIS in September 2013:
[DE]: A higher BAT-AEL range should be defined for the production of soda ash via the Solvay process.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- The relevant European standard EN 872 states a lower limit of determination of 2 mg/l. The proposed lower end of the range in D2 (i.e. 2 mg/l as yearly average), therefore seems to be too low.
- In the original CWW BREF, the BAT-AEL for TSS was set to 10 – 20 mg/l as monthly average.
- In Directive 91/271/EC, only an optional requirement is given for TSS, amounting to 35 mg/l in 24-h-composite samples (flow- or time-proportional). A higher value of 60 g/l applies only for WWTP with 2000 – 10 000 population equivalents in high mountain regions. A percentile approach is used for compliance assessment (between 75 % and 93 % of the samples need to be compliant depending on the sampling frequency; the failing samples should not exceed the requirement by more than 150 %).
- Considering the different averaging periods (i.e. 35 mg/l as daily value in Directive 91/271/EC versus 20 mg/l as yearly value in D2 of the CWW BREF), it can be estimated that the upper end of the proposed BAT-AEL range corresponds more or less to the requirement in Directive 91/271/EC.
- After review of the data, it seems appropriate to slightly increase the upper end of the BAT-AEL range to 25 mg/l. A number of small and large installations with different configurations and from different EU Member States achieve that level.
- The data from the survey indicate that there is neither a significant difference between 'organic' and 'inorganic' sites nor between WWTP using biological treatment and those using only physico-chemical treatment.
- Based on the information collected (including through the two surveys), the EIPPCB finds it difficult to assess if exemptions to the generic BAT-AEL range are justified.
- In the surveys, the most commonly reported frequency of TSS monitoring was daily. There does not seem to be a correlation between the monitoring frequency and the treated waste water volume.</td></tr>
<tr><td>EIPPCB proposal:</td><td>- Set a BAT-AEL range of 5 – 25 mg/l as yearly average.
- Set a threshold value of 2.5 t/yr (= 100 000 m^3/yr × 25 mg/l = 6.8 kg/d).
- Do not differentiate between organic and inorganic sites.
- Add a footnote on when the lower or upper end of the BAT-AEL range can be achieved.
- Include a daily monitoring requirement for TSS.
- Modify the performance data in Chapter 3 in order to ensure consistency with the BAT-AEL range.</td></tr>
</table>

Text proposal: See Section 1.4.2.3.12 of this BP.

1.4.2.3.6 Total Nitrogen

<table>
<tr><td>Location in D2:</td><td>Section 4.9.2, pages 680 – 681, Table 1</td></tr>
<tr><td>Current text in D2:</td><td>
Table 1: BAT-AELs for final waste water discharge from central waste water treatment plants
<table>
<tr><th rowspan="2">Parameter</th><th colspan="3">BAT-AEL</th></tr>
<tr><th>Unit</th><th>Yearly average</th><th>Daily average</th></tr>
<tr><td>Total nitrogen (2) (3) (expressed as total bound nitrogen, TN_b)</td><td>mg/l</td><td>3 – 25</td><td></td></tr>
<tr><td>Total nitrogen (2) (4) (expressed as total inorganic nitrogen)</td><td>mg/l</td><td>2 – 15</td><td></td></tr>
<tr><td colspan="4">(2) Either TN_b or total inorganic nitrogen is to be monitored.
(3) Total bound nitrogen (TN_b) is a measure of the concentration of ammonia, ammonium salts, nitrites, nitrates and organic nitrogen components (dissolved nitrogen is not detected).
(4) Total inorganic nitrogen is the sum of NH_4-N, NO_2-N and NO_3-N.</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td>[CEFIC 207]: Provide different BAT-AEL ranges for the parameters total inorganic nitrogen and total nitrogen bound.
[CEFIC 197]: Total nitrogen data from the questionnaires cannot be compared if different analytical methods have been used.
[DE(LAWA) 49, 50]: Modify the BAT-AEL range for total inorganic nitrogen to 5 – 20 mg/l or even 5 – 25 mg/l. Some well-operated WWTP cannot comply with the upper end of the BAT-AEL range due to a low nitrogen input (Questionnaires #041 and #14) or high salt content (chloride > 10 g/l, questionnaire #10). Consider if nitrification is justified in cases of low nitrogen input.
[DE(LAWA) 45, 51]: Add information on when the lower or upper end of the BAT-AEL range can be achieved.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- In the original CWW BREF, the BAT-AEL for total inorganic nitrogen (as the sum of NH_4-N, NO_2-N and NO_3-N) was set to 5 – 25 mg/l as daily average.
- The original CWW BREF stated that total nitrogen is a more recommendable parameter than total inorganic nitrogen.
- Total nitrogen (TN) seems to be a more pertinent parameter as all forms of organic and inorganic nitrogen can contribute to eutrophication. TN reflects the performance of the whole waste water treatment. In contrast, the parameter total inorganic nitrogen (N_{inorg}) is better suited to assess the performance of the final waste water treatment (nitrification/denitrification). Both TN and N_{inorg} are used for setting permit conditions in the EU. The TN data from the survey are more difficult to compare as three different types of analytical techniques were used.
- A few installations reported TN and N_{inorg} emission levels below 5 mg/l.
- The majority of installations with biological treatment achieves TN emission levels of ≤ 25 mg/l and N_{inorg} emission levels of ≤ 20 mg/l.
- However, some installations that have high nitrogen values in the influent show higher emission levels, although the final WWTP seems to be performing well (i.e. nitrogen removal efficiency of 70 % or higher).
- The use of biological nitrification/denitrification does not seem justified when the waste water contains only low concentrations of organic compounds, and therefore the installation does not operate a biological WWTP.
- Emissions of nitrogen (e.g. from the production of fertilisers) from sites without biological WWTP could be covered by the relevant vertical chemical BREFs. If appropriate, BAT-AELs could be set.
- Nitrification is inhibited by high chloride concentrations (e.g. installation #10 with $\rho(Cl^-)$ > 10 g/l as reported by DE). At chloride concentrations below 10 g/l, nitrification does not seem to be inhibited (e.g. installation #16 with $\rho(Cl^-)$ = 6 g/l).
- In the surveys, the most commonly reported frequency of TN and N_{inorg} monitoring was daily. Many plants have also reported a weekly frequency. There does not seem to be a correlation between the monitoring frequency and the treated waste water volume.</td></tr>
</table>

Location in D2:	**Section 4.9.2, pages 680 – 681, Table 1**
EIPPCB proposal:	- Express the BAT-AEL levels for nitrogen both with the parameter total nitrogen (TN) and total inorganic nitrogen (N_{inorg}). Clarify that either the BAT-AEL for TN or for N_{inorg} applies. - Set a general BAT-AEL range of 5 – 25 mg/l for total nitrogen (TN) and of 5 – 20 mg/l for total inorganic nitrogen (N_{inorg}), both as yearly averages. - Set an alternative, conditional BAT-AEL of 5 – 40 mg/l for TN and of 5 – 35 mg/l for N_{inorg}, both as yearly averages, provided that the average abatement efficiency during final treatment is ≥ 70 %. - Specify that these BAT-AEL ranges do not apply to installations without a biological WWTP. - Specify in the 'General considerations' on how to calculate the abatement efficiency. - Set threshold values of 2.5 t/yr for total nitrogen (= 100 000 m^3/yr × 25 mg/l = 6.8 kg/d) and of 2.0 t/yr for total inorganic nitrogen (= 100 000 m^3/yr × 20 mg/l = 5.5 kg/d). - Add footnotes on when the lower or upper end of the BAT-AEL range can be achieved. - Include a daily monitoring requirement for TN and N_{inorg}.

Text proposal: See Section 1.4.2.3.12 of this BP.

1.4.2.3.7 Ammoniacal Nitrogen

<table>
<tr><td>Location in D2:</td><td>Section 4.9.2, pages 680 – 681, Table 1</td></tr>
<tr><td>Current text in D2:</td><td>Table 1: BAT-AELs for final waste water discharge from central waste water treatment plants
<table>
<tr><th rowspan="2">Parameter</th><th colspan="3">BAT-AEL</th></tr>
<tr><th>Unit</th><th>Yearly average</th><th>Daily average</th></tr>
<tr><td>Ammoniacal nitrogen (as N)</td><td>mg/l</td><td>0.1 – 5</td><td></td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>[BE 27]: Is this parameter relevant?
[CEFIC 208] Delete this BAT-AEL. Ammoniacal nitrogen is covered by the parameter total nitrogen. For the toxicity, only ammonia (NH_3) is relevant, but at typical pH values in receiving waters, most of the ammoniacal nitrogen (up to 99 % or more) is in the form of ammonium (NH_4^+). Alternatively, increase the upper end of the range and make it applicable to new installations only because nitrification could be inhibited, or it could require a major retrofit of existing plants when the sludge residence time is low.
[DE(LAWA) 52]: Change BAT-AEL range to 5 – 20 mg/l. Some well-operated WWTP cannot comply with the upper end of the BAT-AEL range due to a low nitrogen input (Questionnaires #042 and #14) or high salt content (chloride > 10 g/l, questionnaire #10).
[DE(LAWA) 45, 53]: Add information on when the lower or upper end of the BAT-AEL range can be achieved.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- In the original CWW BREF, no BAT-AEL for ammoniacal nitrogen was given.
- The parameter total nitrogen is better suited to describe the eutrophicating effect of nitrogen species than the parameter ammoniacal nitrogen.
- The pKa value of ammonium (NH_4^+) is 9.25. This means that at pH 9.25, 50 % of the ammoniacal nitrogen is in the form of ammonia (NH_3), at pH 8.25 it is ~10 % and at pH 7.25 it is ~1 %. Given that ammonia (NH_3) is the toxic species, the toxicity of waste water therefore strongly depends on the local conditions (i.e. the pH value of the receiving water).</td></tr>
<tr><td>EIPPCB proposal:</td><td>- Do not set a BAT-AEL for ammoniacal nitrogen.
- Set a BAT-AEL for total nitrogen (see Section 1.4.2.3.6 of this BP).
- Do not include a monitoring requirement for ammoniacal nitrogen.</td></tr>
</table>

1.4.2.3.8 Phosphorous

Location in D2:	**Section 4.9.2, page 681, Table 1**
Current text in D2:	No BAT-AEL proposed for phosphorous.
Summary of comments:	[BE 27, DE(LAWA) 54]: Include a BAT-AEL for phosphorous. [DK 32]: Why was the BAT-AEL for phosphorous from the original BREF removed? [DE(LAWA) 54]: Set the BAT-AEL range for emissions of total phosphorous at 0.5 – 1.5 mg/l. [DE(LAWA) 55]: Include a BAT-AEL for phosphate (PO_4-P) as an alternative with ≤ 1 mg/l. [DE(LAWA) 45]: Add information on when the lower or upper end of the BAT-AEL range can be achieved.
EIPPCB assessment:	- Phosphorous is a relevant pollutant in the chemical industry sector as shown in the revised Chapter 1. - In the original CWW BREF, the BAT-AEL for total phosphorous was set to 0.5 – 1.5 mg/l as daily average. - A number of small and large installations with different configurations and from different EU Member States achieve emission levels for total phosphorous of 0.5 – 1.5 mg/l as yearly average. - The data from the survey indicate that there is no significant difference between WWTP using biological treatment and those using only physico-chemical treatment. Chemical precipitation can be applied in both cases. - The parameter total phosphorous includes ortho-phosphate (PO_4-P). Total phosphorous seems to be a more pertinent parameter as all forms of organically- and inorganically-bound phosphorous can contribute to eutrophication. - In the surveys, the most commonly reported frequency of total phosphorous monitoring was daily. Many plants have also reported a weekly and monthly frequency. There does not seem to be a correlation between the monitoring frequency and the treated waste water volume.
EIPPCB proposal:	- Set a BAT-AEL for total phosphorous of 0.5 – 1.5 mg/l as yearly average. - Set a threshold value of 150 kg/yr (= 100 000 m^3/yr × 1.5 mg/l = 0.41 kg/d). - Do not set a BAT-AEL for ortho-phosphate (PO_4-P). - Add a footnote on when the lower or upper end of the BAT-AEL range can be achieved. - Include a daily monitoring requirement for total phosphorous.

Text proposal: See Section 1.4.2.3.12 of this BP.

1.4.2.3.9 Adsorbable Organically-bound Halogens (AOX)

<table>
<tr><td>Location in D2:</td><td>Section 4.9.2, page 681, Table 2</td></tr>
<tr><td>Current text in D2:</td><td>Table 2: BAT-AELs for final waste water discharge from central waste water treatment plants for polluting substances which are likely to be emitted in significant quantities
<table>
<tr><th rowspan="2">Parameter</th><th colspan="3">BAT-AEL</th></tr>
<tr><th>Unit</th><th>Yearly average</th><th>Short-term average</th></tr>
<tr><td>Adsorbable Organically-bound Halogens (AOX) ([1])</td><td>µg/l</td><td>70 – 200</td><td></td></tr>
<tr><td colspan="4">([1]) Extractable organic halogens (EOX) can be monitored instead of AOX.</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>[DE(LAWA) 38]: Set performance levels for the inflow of the biological WWTP.
[SARP 12]: The proposed BAT-AEL range can only be achieved by dilution with uncontaminated water. Better set emission levels for each tributary stream.
[AT 63]: At some sites, AOX is not an issue. The final concentration depends on the mixing with other tributary streams.
[DE(LAWA) 58, 60, 63]: Modify the BAT-AEL range to 70 – 1 000 µg/l. E.g. questionnaire #06 belongs to a site that complies with the BAT-AEL for AOX from the OFC BREF, but not with the proposed values.
[CEFIC 211]: Increase the upper end of the BAT-AEL range. For the techniques mentioned in BAT 38 to reduce AOX emissions, only limited data are available and some of them are not cost effective.
[AT 63]: The proposed BAT-AEL range is lower than the pollutant concentration in some receiving water bodies.
[CEFIC 214; FR 52]: Clarify the meaning of 'significant quantities'. Add threshold values below which the BAT-AELs do not apply.
[DE(LAWA) 62]: Questionnaire #36 belongs to a site producing iodinated contrast agents. This site cannot comply with the proposed BAT-AEL range.
[DE(LAWA) 58, 62, 63]: Clarify that the BAT-AEL range does not apply to OFC plants and refer instead to the OFC BREF.
[BE 48; DE(LAWA) 59, 61, 83]: Add information on when the lower or upper end of the BAT-AEL range can be achieved, e.g. the lower end in the case of no or few production units releasing halogenated organic compounds.
[CEFIC 215; DE(LAWA) 64; FR 47]: EOX only covers non-polar halogenated organic compounds. The measurement results of AOX are therefore not comparable to EOX. Either delete the footnote or provide separate BAT-AEL ranges for these two parameters.
[CEFIC 197]: EOX data cannot be used to derive BAT-AELs for AOX and vice versa.

Additional comments regarding the AOX method posted in BATIS in March 2013:
[BE]: The AOX method is not sufficiently robust, not universally applicable.
[CEFIC]: Given the lack of a validated AOX method at European level, no BAT-AEL can be defined for this parameter.

Additional comment from Germany contained in their BAT conclusions proposal posted in BATIS in September 2013:
[DE]: A higher BAT-AEL range should be defined for the production of propylene oxide and epichlorohydrine via chlorohydrine processes.</td></tr>
</table>

Location in D2:	**Section 4.9.2, page 681, Table 2**
EIPPCB assessment:	- The relevant European standard EN ISO 9562 states a lower limit of determination of 10 µg/l. This standard can be used if chloride concentrations are lower than 1 g/l. Samples with higher chloride concentrations are diluted prior to analysis. Any sample dilution prior to analysis will increase the measurement uncertainty. This should be reflected in the BAT-AEL range, in particular for the lower end of the range. - The AOX method has been in use in Germany since the 1980s for permitting and for setting waste water charges. Analytical difficulties could be circumvented by sample dilution as described above or by using a modified AOX standard that is specified in the informative Annex A to EN ISO 9562. This modified AOX standard has been validated, including with technical hydrochloric acid, and is cited as analytical method in the BAT conclusions of the CAK BREF. - Performance levels for the inflow to the biological waste water treatment plant seem redundant when a BAT-AEL for the effluent is given. High levels in the influent can be acceptable if the WWTP can handle it. - AOX levels in the final effluent depend on a number of factors, including the quantity of AOX loads from individual production units, the performance of the pretreatment and the performance of the final treatment. Little information was provided on AOX sources, applied pretreatment techniques and achieved performance levels. - In the original CWW BREF, no BAT-AEL for AOX was given, but one Member State raised a split view that AOX levels between 0.16 – 1.7 mg/l were achieved. - The installations #041, #06, #10, and #22 have significant AOX contributions from tributary streams. They apply various pretreatment techniques and the final biological WWTP seems to show a good performance. Their yearly AOX emissions range from 0.08 – 0.9 mg/l. - The revised BAT-AEL range reflects the performance of the installations participating in the survey. In some cases, these levels could be lower than in the receiving water. - The removal of iodinated compounds from the production of iodinated X-ray contrast agents via a two-stage nanofiltration is given as an example in the BAT conclusions of the OFC BREF (Section 4.3.7.17). Achievable AOX levels are below 1 ppm. It is not clear why site #36 cannot use this technique. Furthermore, exemptions in BAT conclusions should not be given for single installations. - The data collection included a number of OFC installations. These installations should therefore be covered by the BAT-AEL. - Based on the information collected (including through the two surveys), the EIPPCB finds it difficult to assess if exemptions to the generic BAT-AEL range are justified. - The results of AOX and EOX measurements are not comparable. The parameter AOX covers a wider range of halogenated organic compounds. Very few sites provided EOX data. - In the surveys, the most commonly reported frequency of AOX monitoring was monthly. There does not seem to be a correlation between the monitoring frequency and the treated waste water volume.
EIPPCB proposal:	- Neither set performance levels for the inflow to the biological waste water treatment plant nor for individual tributary streams. - Set a general BAT-AEL range of 0.2 – 1.0 mg/l as yearly average. - Set a threshold value of 100 kg/yr (= 100 000 m^3/yr × 1.0 mg/l = 0.27 kg/d). - Add a footnote on when the lower or upper end of the BAT-AEL range can be achieved. - Do not set a BAT-AEL for EOX. - Include a monthly monitoring requirement for AOX.

Text proposal: See Section 1.4.2.3.12 of this BP.

1.4.2.3.10 Metals

Location in D2: Section 4.9.2, page 681, Table 2

Current text in D2:

Table 2: BAT-AELs for final waste water discharge from central waste water treatment plants for polluting substances which are likely to be emitted in significant quantities

Parameter	BAT-AEL		
	Unit	Yearly average	Short-term average
Cadmium (expressed as Cd)	µg/l	0.2 – 0.8	
Total chromium (expressed as Cr)	µg/l	2 – 10	
Copper (expressed as Cu)	µg/l	2 – 10	
Lead (expressed as Pb)	µg/l	5 – 10	
Mercury (expressed as Hg)	µg/l	0.01 – 0.8	
Nickel (expressed as Ni)	µg/l	2 – 10	
Zinc (expressed as Zn)	µg/l	4 – 60	

Summary of comments:

[DE(LAWA) 65]: Cadmium, lead, and mercury are usually not used on chemical sites and therefore not to be expected in the waste water. Cadmium and mercury are priority hazardous substances under the Water Framework Directive and their emissions should thus cease completely.
[DE(LAWA) 28]: Set performance levels for the inflow of the biological WWTP.
[CEFIC 210; ES(A) 1; FR 50]: The BAT-AEL ranges are below or close to the limits of detection/quantification of the analytical methods given in Chapter 2.
[CEFIC 202]: The proposed BAT-AEL ranges cannot be achieved with the typical techniques for the abatement of metals such as precipitation.
[SARP 12]: The proposed BAT-AEL ranges can only be achieved by dilution with uncontaminated water. Better set emission levels for each tributary stream.
[AT 63]: The proposed BAT-AEL ranges are lower than the pollutant concentration in some receiving water bodies.
[AT 63]: Some sites do not use these metals. The final concentration depends on the mixing with other tributary streams.
[DE(LAWA) 67]: Despite pretreatment, some sites in Germany cannot comply with the proposed BAT-AEL range for zinc.
[CEFIC 209]: The upper end of the BAT-AEL range for zinc is not achievable. Cooling water may be a significant contributor due to corrosion and/or use of zinc phosphate as preservative.
[DE(LAWA) 58]: Some OFC plants cannot comply with the proposed BAT-AEL ranges. Clarify that the BAT-AEL ranges do not apply to OFC plants and refer instead to the OFC BREF.
[CEFIC 214; FR 52]: Clarify the meaning of 'significant quantities'. Add threshold values below which the BAT-AELs do not apply.
[DE(LAWA) 59, 66, 82]: Add information on when the lower or upper end of the BAT-AEL range can be achieved, e.g. the upper end in the case of numerous production units releasing metals.

Additional comment from Germany contained in their BAT conclusions proposal posted in BATIS in September 2013:
[DE]: BAT-AEL values for metals should not apply to 'inorganic' sites. Moreover, higher BAT-AEL ranges should be defined for specific production processes, i.e. for Cr: production of Cr-organic compounds; for Cu: production of Cu-organic compounds; for Zn: production of viscose.

Location in D2:	**Section 4.9.2, page 681, Table 2**
EIPPCB assessment:	- Cadmium, lead, and mercury are generally not used on chemical sites. The use of mercury is covered by the CAK BREF. Emissions of cadmium from the production of fertilisers (impurity in the raw material) could be covered by the LVIC-AAF BREF. If appropriate, BAT-AELs for these or other metals could be set in the vertical chemical BREFs. - Performance levels for the inflow to the biological waste water treatment plant seem redundant when a BAT-AEL for the effluent is given. - Metal levels in the final effluent depend on a number of factors, including the quantity of metal loads from individual production units, the performance of the pretreatment and the performance of the final treatment. Little information was provided on metal sources, applied pretreatment techniques and achieved performance levels. - EN ISO 11885 states the following limits of quantification (axial viewing): Cr: 2 – 5 µg/l; Cu: 2 – 3 µg/l; Ni: 2 µg/l; Zn 1 – 5 µg/l. EN ISO 17294-2 states the following lower limits of application for unpolluted water: Cr: 1 – 5 µg/l; Cu: 1 – 2 µg/l; Ni: 1 – 3 µg/l; Zn 1 – 3 µg/l. The proposed lower ends of the ranges in D2, therefore seem to be too low. - Installations with a well-designed and operated final WWTP generally show the following emission levels for metals (including installations with metal inputs from tributary streams): Cr < 20 µg/l; Cu < 50 µg/l; Ni < 50 µg/l; Zn < 300 µg/l. - The data collection included a number of OFC installations. These installations should therefore be covered by the BAT-AEL ranges. - The data from the two surveys indicate that there is neither a significant difference between 'organic' and 'inorganic' sites nor between WWTP using biological treatment and those using only physico-chemical treatment. - Based on the information collected (including through the two surveys), the EIPPCB finds it difficult to assess if exemptions to the generic BAT-AEL range are justified. - In the surveys, the most commonly reported frequency of metals monitoring was monthly. Many plants have also reported a weekly frequency. There does not seem to be a correlation between the monitoring frequency and the treated waste water volume.
EIPPCB proposal:	- Do not set BAT-AELs for cadmium, lead, and mercury. - Neither set performance levels for the inflow to the biological waste water treatment plant nor for individual tributary streams. - Set the following BAT-AELs as yearly averages: Cr: 5 – 20 µg/l; Cu: 5 – 50 µg/l; Ni: 5 – 50 µg/l; Zn: 20 – 300 mg/l. - For chromium, copper, nickel, and zinc, set threshold values by multiplying the upper end of the BAT-AEL range with the reference waste water volume of 100 000 m^3/yr. - Add footnotes on when the lower or upper end of the BAT-AEL range can be achieved. - Include a monthly monitoring requirement for Cr, Cu, Ni, Zn, and for other metals, if relevant.

Text proposal: See Section 1.4.2.3.12 of this BP.

1.4.2.3.11 Toxicity

Location in D2:	**Section 4.9.2, page 681, Table 2**
Current text in D2:	No BAT-AEL proposed for toxicity.
Summary of comments:	[DE(LAWA) 68]: Add BAT-AELs for toxicity to fish, daphnia, algae, luminescent bacteria and mutagenicity: $LID_F = 1 – 2$, $LID_D = 2 – 4$, $LID_A = 1 – 8$, $LID_L = 1 – 16$, and $LID_{EU} = 1.5$, respectively. Data were provided.
EIPPCB assessment:	- In the original CWW BREF, no BAT-AELs for toxicity were given. However, the original OFC BREF contains BAT-AELs for toxicity. - Toxicity tests allow for an integrated assessment of the properties of a waste water sample (including synergistic/antagonistic effects) that cannot be achieved by analysing single substances or other chemical sum parameters. - Due to the variety of toxic substances that are handled in the chemical industry and because sometimes their identity is unknown (e.g. side products), the toxicity of waste water effluents is an important issue for many installations of the sector. - Approximately ten toxicity tests are available as EN standards. - Toxicity tests are generally used in at least five Member States for setting ELVs: 1) Germany: Five different toxicity tests are used in combination for all chemical sites (fish egg, daphnia, algae, luminescent bacteria, genotoxicity). These tests have been in use since 1999. Toxicity tests with fish were already used since the late 1980s. 2) Ireland has mandatory ELVs in terms of toxicity units for effluents from IED plants. 3) Austria has mandatory ELVs for toxicity for several subsectors of the chemical industry. Up to four toxicity tests are used in combination (fish, daphnia, algae, and luminescent bacteria). 4) In Lithuania, effluents entering surface waters have to pass acute daphnia tests. 5) In Italy, acute toxicity tests are obligatory (e.g. with daphnia, algae or luminescent bacteria). The legal consequences of exceeding an ELV are, however, less stringent than for other parameters. - Furthermore, at least three Member States sometimes use toxicity tests in permits: Denmark, Finland and Sweden. - During the survey, approximately 15 installations provided toxicity data for fish eggs, daphnia, algae, and luminescence bacteria. However, these data were almost entirely provided for installations located in Germany. - In the surveys, the most commonly reported frequency of toxicity monitoring was quarterly. Some plants have also reported a monthly frequency. Most of the installations reporting toxicity values treated more than 1 000 000 m^3 of waste water per year. - The TWG subgroup on the analysis of data from questionnaires concluded during its 3rd meeting in April 2012 that toxicity assessment is a very valuable tool for identifying and resolving impact issues, but that setting BAT-AELs for toxicity is not considered appropriate.
EIPPCB proposal:	- Do not set BAT-AELs for toxicity. - Set a quarterly monitoring requirement for toxicity for installations treating more than 1 000 000 m^3 of waste water per year. Specify that toxicity monitoring may be carried out less frequently in the case of smaller waste water volumes (e.g. when changes in production processes occur). - Specify the monitoring methods for toxicity (five trophic levels, use of EN standards). - Add in the chapter on 'Concluding remarks and recommendations for future work' that toxicity data should be assessed during the next BREF review with the aim of setting BAT-AELs.

1.4.2.3.12 Text proposal for BAT-AELs on emissions to water

The BAT-associated emission levels (BAT-AELs) for direct discharges to a receiving water body are given in Table 3.

The BAT-AELs refer to direct discharges to a receiving water body at the point where the emission leaves the installation while disregarding any dilution with other waste water streams after the final waste water treatment. The BAT-AELs apply if the emissions exceed the threshold values for the annual pollutant load.

Table 3: BAT-AELs for direct discharges to a receiving water body

Parameter	Threshold value for emissions	BAT-AEL (yearly average)	Conditions
Biochemical oxygen demand (BOD)	Not Applicable	No BAT-AEL ([1])	Not applicable
Total organic carbon (TOC) ([2])	2.0 t/yr	7 – 20 mg/l ([3])	No conditions
		7 – 80 mg/l ([3])	A) $BOD_5 \leq 20$ mg/l as yearly average B) Abatement efficiency ≥ 90 % as yearly average (including both pretreatment and final treatment) ([10])
Chemical oxygen demand (COD) ([2])	6.0 t/yr	20 – 60 mg/l ([3])	No conditions
		20 – 240 mg/l ([3])	A) $BOD_5 \leq 20$ mg/l as yearly average B) Abatement efficiency ≥ 90 % as yearly average (including both pretreatment and final treatment) ([10])
Total suspended solids (TSS)	2.5 t/yr	5 – 25 mg/l ([4])	No conditions
Total nitrogen (TN) ([5])	2.5 t/yr	5 – 25 mg/l ([6])	No conditions
		5 – 40 mg/l ([6])	Abatement efficiency ≥ 70 % as yearly average (only final treatment) ([10])
Total inorganic nitrogen (N_{inorg}) ([5])	2.0 t/yr	5 – 20 mg/l ([6])	No conditions
		5 – 35 mg/l ([6])	Abatement efficiency ≥ 70 % as yearly average (only final treatment) ([10])
Total phosphorus	150 kg/yr	0.5 – 1.5 mg/l ([7])	No conditions
Adsorbable organically-bound halogens (AOX)	100 kg/yr	0.2 – 1.0 mg/l ([8])	No conditions
Chromium (expressed as Cr)	2.0 kg/yr	5 – 20 µg/l ([9])	No conditions
Copper (expressed as Cu)	5.0 kg/yr	5 – 50 µg/l ([9])	No conditions
Nickel (expressed as Ni)	5.0 kg/yr	5 – 50 µg/l ([9])	No conditions
Zinc (expressed as Zn)	30 kg/yr	20 – 300 µg/l ([9])	No conditions

([1]) The yearly average BOD_5 level in discharged effluents from a biological WWTP is expected to be ≤ 20 mg/l.
([2]) Either the BAT-AEL for TOC or the BAT-AEL for COD applies. TOC monitoring is the preferred option because it does not rely on the use of very toxic compounds.
([3]) Either the BAT-AEL without conditions or the BAT-AEL with conditions (both A and B) applies. The lower end of the range is typically achieved when few tributary waste water streams contain organic compounds and/or the waste water mostly contains easily biodegradable organic compounds.
([4]) The lower end of the range is typically achieved when using filtration (e.g. sand filtration, microfiltration, ultrafiltration, membrane bioreactor), while the upper end of the range is typically achieved when using sedimentation only.
([5]) Either the BAT-AEL for total nitrogen or the BAT-AEL for total inorganic nitrogen applies.
([6]) Either the BAT-AEL without condition or the BAT-AEL with condition applies. However, the BAT-AEL for TN and N_{inorg} do not apply to installations without biological treatment. The lower end of the range is typically achieved when the influent to the biological waste water treatment plant contains low levels of nitrogen and/or when biological nitrification/denitrification can be operated under optimum conditions.
([7]) The lower end of the range is typically achieved when phosphorous has to be added for the proper operation of the biological waste water treatment plant or when phosphorous mainly originates from heating or cooling systems. The upper end of the range is typically achieved when phosphorous-containing compounds are produced by the installation.
([8]) The lower end of the range is typically achieved when no, or few, halogenated organic compounds are used or produced by the installation.
([9]) The lower end of the range is typically achieved when none, or few, of the corresponding metal (compounds) are used or produced by the installation.
([10]) The abatement efficiency is calculated as indicated in the 'GENERAL CONSIDERATIONS' section of these BAT conclusions.

The associated monitoring is in BAT 3.

BAT 10. In order to reduce emissions to water, BAT is to use an integrated waste water management and treatment strategy that includes an appropriate combination of the techniques given below.

	Technique	Description
a	Process-integrated techniques ([1])	Techniques that reduce the generation of water pollutants.
b	Waste water treatment at source ([1])	Techniques to abate or recover pollutants prior to their discharge to the waste water collection system.
c	Waste water pretreatment ([2])	Techniques to abate pollutants before the final waste water treatment.
d	Final waste water treatment ([3])	Final waste water treatment by, for example, preliminary and primary treatment, biological treatment, nitrogen removal, phosphorous removal and final solids removal techniques before discharge to a receiving water body.

([1]) Within the scope of the seven vertical chemical BAT reference documents, namely: Production of Chlor-alkali (CAK), Manufacture of Large Volume Inorganic Chemicals – Ammonia, Acids and Fertilisers Industries (LVIC–AAF), Manufacture of Large Volume Inorganic Chemicals – Solids and Others Industry (LVIC–S), Production of Speciality Inorganic Chemicals (SIC); Large Volume Organic Chemical Industry (LVOC), Manufacture of Organic Fine Chemicals (OFC), and Production of Polymers (POL).
([2]) Covered by BAT 11.
([3]) Covered by BAT 12.

Description
The integrated waste water management and treatment strategy is based on the inventory of waste water streams (see BAT 6).

[This BAT conclusion is based on information given in Section 3.2.3.]

Abatement efficiencies

In the case of total organic carbon (TOC) and chemical oxygen demand (COD), the calculation of the average abatement efficiency referred to in these BAT conclusions (see Table 1) is based on TOC or COD loads, respectively, and includes both pretreatment and final treatment, but excludes any pretreatment that results in the recovery of organic compounds.

In the case of total inorganic nitrogen (N_{inorg}) and total nitrogen (TN), the calculation of the average abatement efficiency referred to in these BAT conclusions (see Table 1) is based on N_{inorg} or TN loads, respectively, and includes only the final treatment.

1.5 Waste

1.5.1 Waste management

<table>
<tr><td>Location in D2:</td><td>Section 4.4, page 666 (BAT 6 – 7)</td></tr>
<tr><td>Current text in D2:</td><td>
6. BAT is to prevent, or where that is not practicable, to reduce waste generation by adopting a waste management plan that, in order of priority, ensures that waste is prepared for reuse, recycling, recovery or disposal for all the identified waste fractions.

[This BAT conclusion is based on information given in Section 3.6.]

7. BAT is to prevent, or where that is not practicable, to reduce waste generation by using one or more of the following waste reuse/recycle techniques:

<table>
<tr><th>Technique</th><th>Applicability</th></tr>
<tr><td>I. recycling and reuse of used containers/drums</td><td>Applicable to hard packaging like drums and containers starting with a specific size (60 litres). Recycling and reuse of containers that contain hazardous and/or toxic substances are restricted.</td></tr>
<tr><td>II. recycling of used soft packaging materials</td><td>Applicable to small and soft packaging material that is not contaminated with hazardous and/or toxic substances and that cannot be cleaned for reuse.</td></tr>
<tr><td>III. recycling and reuse of solvents and by-products</td><td>May be restricted where the purity requirements of the final solvents and by-products prevent recycling and reuse from taking place.</td></tr>
</table>

[This BAT conclusion is based on information given in Section 3.6.]
</td></tr>
<tr><td>Summary of comments:</td><td>[NL 151]: Delete all BAT conclusions on waste as the topic is outside the scope of the CWW BREF.
[CEFIC 131] – BAT 6: Waste from the WWTP should be managed within the overall site's waste management plan.
[SE 5] – BAT 7: Delete BAT 7 as it is covered by BAT 6.
[AT 41, CEFIC 132; DE 37] – BAT 7: The list of techniques is incomplete.
[AT 41]: Check if BAT 7 is covered by the WT or WI BREF.
[CEFIC 132] – BAT 7: Delete BAT 7 as it only scratches the surface of what waste management means. A complete description would be too long.
[DE 37]: BAT 7 assumes that a functional returnable system is available.
[CONCAWE 119] – BAT 7: Clarify the meaning of 'restricted'.
[ES(A) 5] – BAT 7: Waste energy recovery should be considered in those cases where reuse or recycling is not technically or economically viable.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- At the kick-off meeting it was agreed that waste management should be addressed in the CWW BREF.
- Waste management is an integral part of an Environmental Management System.
- BAT 6 reflects the waste hierarchy of Article 4 of Directive 2008/98/EC on waste.
- A waste management plan on a chemical site comprises many more issues than those described in BAT 7.</td></tr>
<tr><td>EIPPCB proposal:</td><td>- Keep a generic BAT conclusion on setting up and implementing a waste management plan, as this was done in the REF BREF.
- Clarify that the waste management plan is part of an EMS and include a cross-reference in the BAT on EMS.
- Delete BAT 7.</td></tr>
</table>

Text proposal:

BAT 13. In order to prevent or, where this is not practicable, to reduce waste being sent for disposal, BAT is to set up and implement a waste management plan, as part of the environmental management system (see BAT 1), that, in order of priority, ensures that waste is prevented, prepared for reuse, recycled or otherwise recovered.

1.5.2 Sludge treatment

<table>
<tr><td>Location in D2:</td><td>Section 4.4.1, page 666 – 667 (BAT 8 – 11)</td></tr>
<tr><td>Current text in D2:</td><td>
4.4.1. Treatment of sludge at central waste water pretreatment and treatment plants on chemical sites

BAT 8, BAT 9 and BAT 10 apply as a sequence.

8. BAT is to reduce energy, chemical and handling capacity requirements of sludge for its subsequent treatment by reducing its water content by applying one of the following sludge thickening techniques:

<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I. Gravity thickening</td><td rowspan="5">Generally applicable.</td></tr>
<tr><td>II. Centrifugal thickening</td></tr>
<tr><td>III. Flotation thickening</td></tr>
<tr><td>IV. Gravity belt thickening</td></tr>
<tr><td>V. Rotary drum thickening</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 0.</td></tr>
</table>

[This BAT conclusion is based on information given in Section 3.2.4.1.]

9. BAT is to reduce the pathogenic content, to eliminate offensive odours and to reduce the putrescibility of sludge by applying one of the following sludge stabilisation techniques:

<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I. Chemical stabilisation</td><td rowspan="5">Generally applicable.</td></tr>
<tr><td>II. Thermal stabilisation</td></tr>
<tr><td>III. Aerobic digestion</td></tr>
<tr><td>IV. Anaerobic digestion</td></tr>
<tr><td>V. Dual sludge stabilisation</td></tr>
<tr><td colspan="2">(1) The descriptions of the techniques are given in Section 0.</td></tr>
</table>

[This BAT conclusion is based on information given in Section 3.2.4.2.]

10. BAT is to reduce the water content of the sludge before its final disposal in order to render it odourless and non-putrescible, to reduce its potential to produce leachate at the final disposal site, to increase its energy content if it is to be incinerated and to reduce the cost of sludge transport to the final disposal site by applying one of the following sludge dewatering techniques:

<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I. Centrifugal dewatering</td><td rowspan="3">Generally applicable.</td></tr>
<tr><td>II. Belt filter press dewatering</td></tr>
<tr><td>III. Filter press dewatering</td></tr>
<tr><td colspan="2">(1) The descriptions of the techniques are given in Section 0.</td></tr>
</table>

[This BAT conclusion is based on information given in Section 3.2.4.1.]

11. BAT is to prevent pollutant discharges from sludge treatment facilities to the environment by recirculating the liquid effluent resulting from the treatment of sludge by any of the techniques cited in BAT 8, 9 and 10 back to the central waste water treatment plant.
</td></tr>
<tr><td>Summary of comments:</td><td>[NL 151]: Delete all BAT conclusions on waste as the topic is outside the scope of the CWW BREF.
[CEFIC 136, 137, 138] – BAT 8 – 10: Sludge dewatering is common practice to reduce its volume before further treatment. Other sludge treatment is case-specific and may not be needed.
[CEFIC 133, 134, 138] – BAT 8 and 10: Merge BAT 8 and 10 as they both aim at</td></tr>
</table>

Location in D2:	Section 4.4.1, page 666 – 667 (BAT 8 – 11)
	dewatering. [CEFIC 134] – BAT 8 and 10: Sludge dewatering could be covered by the WT or WI BREFs. [CEFIC 135] – BAT 9: Sludge stabilisation is not needed for short-term handling of sludge before the final treatment. Where should the pathogenic content come from? [DE(LAWA) 16]: Clarify the applicability of the techniques. Some BAT may be suitable for inorganic sludges, others seem not to be. [DK 35] – BAT 11: Clarify how much liquid effluent from sludge treatment can be recirculated.
EIPPCB assessment:	- At the kick-off meeting it was agreed to include a section on waste management in the CWW BREF. - Applied sludge treatment techniques are site-specific. - The revised Scope of the CWW BREF stipulates that the techniques listed and described in these BAT conclusions are neither prescriptive nor exhaustive. - Different equipment is used for sludge thickening and sludge dewatering. - The quantity of liquid effluents from sludge treatment that can be recirculated is site-specific. - The treatment of liquid effluents from sludge treatment is covered by the BAT conclusions on waste water treatment.
EIPPCB proposal:	- Merge BAT 8 – 10 into one BAT conclusion. - Delete BAT 11. - Add applicability restrictions in the case of inorganic sludges. - Shorten the new BAT conclusion by categorising the techniques.

Text proposal:

BAT 14. In order to reduce the amount of waste water sludge for further treatment or disposal, and to reduce its potential environmental impact, BAT is to use one or a combination of the techniques given below.

	Technique	Description	Applicability
a	Conditioning	Chemical conditioning (i.e. adding coagulants and/or flocculants) or thermal conditioning (i.e. heating) to improve the conditions during sludge thickening/dewatering.	Not applicable to inorganic sludges. The necessity for conditioning depends on the sludge properties and the thickening/dewatering equipment.
b	Thickening/dewatering	Thickening can be carried out by sedimentation, centrifugation, flotation, gravity belts, or rotary drums. Dewatering can carried out by belt filter presses or plate filter presses.	Generally applicable.
c	Stabilisation	Sludge stabilisation includes chemical treatment, thermal treatment, aerobic digestion, or anaerobic digestion.	Not applicable to inorganic sludges. Not applicable for short-term handling before final treatment.

[This BAT conclusion is based on information given in Sections 3.2.4.1. and 3.2.4.2.]

1.6 Emissions to air

1.6.1 Waste gas management and treatment

1.6.1.1 Stream inventory

Location in D2:	**Section 4.2, page 664 (BAT 2 V.)**
Current text in D2:	**2. BAT is to reduce the environmental risks and impacts by applying all of the following management techniques:** … V. establishing and maintaining a stream inventory/register in order to ensure the proper functioning of the central waste water pretreatment and/or central waste water treatment plants and central waste gas treatment plants by identifying the parameters that can have an influence on the performance of these treatment plants (see Section 4.9.1); … *[This BAT conclusion is based on information given in Section 3.1.2.]*
Summary of comments:	No comments on the stream inventory concerning waste gases.
EIPPCB assessment:	- Stream inventories are key tools for reducing emissions to air by optimising the treatment architecture.
EIPPCB proposal:	- Add a separate BAT conclusion on the stream inventory for waste gas and provide more details as given in Section 3.1.5.1.2 of D2 of the CWW BREF (i.e. information about the production processes and the individual streams). - Clarify the purpose of the stream inventory (reduction of emissions). - Clarify that the stream inventory is part of an EMS and include a cross-reference in the BAT on EMS.

Text proposal:

BAT 15. In order to reduce emissions to air, BAT is to establish and to maintain an inventory of waste gas streams, as part of the environmental management system (see BAT 1), that incorporates all of the following features:

I. information about the chemical production processes, including:

a. chemical reaction equations, also showing side products;
b. simplified process flow sheets that show the origin of the emissions;
c. descriptions of process-integrated techniques and waste gas treatment at source including their performances;

II. information about the individual waste gas streams, including:

d. average values and variability of flow and temperature;
e. average concentration and load values of relevant pollutants/parameters and their variability (e.g. VOC, CO, NO_X, SO_X, chlorine, hydrogen chloride);
f. flammability, lower and higher explosive limits, reactivity;
g. presence of other substances that may affect the treatment system or plant safety (e.g. oxygen, nitrogen, water vapour, dust).

1.6.1.2 Generic issues

Location in D2:	**Section 4.10, page 682 – 685 (BAT 44 – 52)**
Current text in D2:	Section 4.10
Summary of comments:	[CEFIC 224]: Delete Section 4.10, as the BAT conclusions are too generic and no BAT-AELs are set. Furthermore, most of the gas streams are directed to other installations covered by other BREFs (i.e. LCP and WI BREFs). [DE 10]: The section title is not appropriate, as there is no BAT on waste gas management. [NL 174]: Add BATs to prevent waste gas emissions (i.e. primary techniques). [NL 178]: Consider including a conclusion on the reuse of VOC. [FR 56]: Add a BAT on the removal of hydrogen sulphide. [AT 65; DE 65; DK 39; NL 145, 177]: Add BAT-AELs for emissions to air, as was done in the original CWW BREF. Data are available in Chapter 3.
EIPPCB assessment:	- Not all waste gas streams are directed to plants that are covered by other BREFs (e.g. when waste gases from several production units are incinerated in a unit that does not incinerate waste). - Process-integrated techniques as well as recycling and reuse of substances are often carried out at the plant level. They should be better described in the vertical chemical BREFs where usually more information on applicability restrictions is available. This was outlined in the Commission presentation at the IED Article 13 Forum meeting in September 2012. - The original CWW BREF contained BAT-AELs for combustion exhaust gas treatment but not for waste gases from production processes. For the latter only achievable emission and performance levels were given. - Emissions from the combustion of fuel are covered by the LCP BREF. - During the course of the CWW BREF review, no installation-specific data where gathered via questionnaires. The history and rationale were summarised in the EIPPCB letter dated 18 February 2011. - The data presented in Chapter 3 are often not installation-specific. For central waste gas incineration (Section 3.3.1.1 in D2), only data from four German plants are reported. - Therefore, the EIPPCB believes that the data basis is insufficient for setting sound BAT-AELs. - If possible and appropriate, BAT-AEL for emissions to air could be set in the relevant vertical chemical BREFs as outlined in the Commission presentation at the IED Article 13 Forum meeting in September 2012. - In order to clarify the interface between techniques that are covered by the vertical chemical BREFs and those that are covered by the CWW BREF it seems useful to add a BAT conclusion on an integrated waste gas management and treatment strategy.
EIPPCB proposal:	- Keep the section and shorten it by merging BAT 45 – 49. - Rename the section to 'Emissions to air' including subsections entitled 'Waste gas collection' and 'Waste gas treatment'. - Assemble all end-of-pipe techniques in a generic table and include techniques to remove hydrogen sulphide. - Do not set BAT-AELs for emissions to air. - Add a generic BAT conclusion on integrated waste gas management and treatment with a similar structure than the one on integrated waste water management and treatment.

Text proposal: See Section 1.6.1.9 of this BP.

1.6.1.3 Recycling and reuse

Location in D2:	**Section 4.10, page 682 (BAT 44)**
Current text in D2:	**44. BAT is to recycle/reuse in the original or other production processes at least the following pollutants from waste gas streams of chemical production processes:** I. volatile organic compounds (VOCs), recovered from solvent vapours or vapours of low boiling products II. VOCs used as an energy carrier in incinerators/oxidisers or boilers III. hydrogen chloride to produce hydrochloric acid IV. ammonia to recycle into the production process V. sulphur dioxide transferred into sulphuric acid, sulphur or gypsum VI. dust that contains high amounts of solid raw products or end-products. **Applicability** Applicability depends on the pollutant concentration in the waste gas stream, waste gas flow rate and variations in the pollutant concentration and flow. [Please TWG provide information on restrictions for the applicability of the techniques listed encountered in your experience] *[This BAT conclusion is based on information given in Section 3.2.5.]*
Summary of comments:	[DE 3]: BAT 44 is based on the introductory text of Section 3.2.5, but not on actual techniques. Delete BAT 44 or describe applicability restriction in Section 3.2.5. [CEFIC 216, 218]: Delete BAT 44 as recycling and reuse of pollutants are strongly dependant on the process. They may require high investment costs that are neither economically nor environmentally justifiable. [CEFIC 217, 219]: Recycling or reusing solvent vapours or dusts necessarily requires a purification step due to contamination. This is rarely carried out. [CONCAWE 122]: Clarify the term 'VOCs used as an energy carrier'. [CEFIC 220]: Hydrogen chloride may also be used to produce chloride salts. [CEFIC 221]: The transformation of sulphur dioxide is only applicable for large plants or for very high pollutant concentrations. [NL 175]: Transformation of sulphur dioxide to sulphur or sulphuric acid is preferable as the reuse of gypsum is sometimes difficult. [CONCAWE 123]: The provisions on applicability are too vague. Use for example the criterion of marginal cost of recovery exceeding a certain limit.
EIPPCB assessment:	- BAT 44 is rather generic. - Process-integrated techniques as well as recycling and reuse of substances are often carried out at the plant level. They should be better described in the vertical chemical BREFs where usually more information on applicability restrictions is available. This was outlined in the Commission presentation at the IED Article 13 Forum meeting in September 2012.
EIPPCB proposal:	- Delete BAT 44.

1.6.1.4 Particulate matter

<table>
<tr><td>Location in D2:</td><td>Section 4.10, page 682 (BAT 45)</td></tr>
<tr><td>Current text in D2:</td><td>45. BAT is to reduce the emissions of particulate matter (dust, heavy metals and their compounds, aerosols, mist and soot) in waste gas streams from chemical production processes by applying one or a combination of the following techniques:

<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I. Settling chamber/gravitational separator</td><td>Generally applicable.</td></tr>
<tr><td>II. Cyclones</td><td>Generally applicable.</td></tr>
<tr><td>III. Electrostatic precipitator</td><td></td></tr>
<tr><td>IV. Wet dust scrubber</td><td></td></tr>
<tr><td>V. Fabric filter</td><td></td></tr>
<tr><td>VI. Ceramic/metal filter</td><td>Sticky dusts need to be avoided.</td></tr>
<tr><td>VII. Catalytic filtration</td><td>Waste gas should be free of substances that can deactivate the catalyst (e.g. arsenic).</td></tr>
<tr><td>VIII. Two-stage dust filter</td><td>Generally applicable.</td></tr>
<tr><td>IX. Absolute filter</td><td>Generally applicable.</td></tr>
<tr><td>X. High efficiency air filter (HEAF)</td><td>Generally applicable.</td></tr>
<tr><td>XI. Mist filter</td><td>Dust content in the waste gas should be less than 1 mg/Nm^3.</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 0.</td></tr>
</table>

[This BAT conclusion is based on information given in Section 3.2.5.3.]</td></tr>
<tr><td>Summary of comments:</td><td>[DE 4; CONCAWE 124]: Delete BAT 45 as it is too generic. Alternatively, provide information which technique is appropriate in which case (e.g. depending on flows, input concentrations, moisture content, temperature, particle size, available space, equipment weight).
[CEFIC 222]: Keep techniques III, IV and V in the list.
[PT 23]: In existing installations, the applicability of electrostatic precipitators may be restricted by the lack of space. Fabric filters cannot be installed before ventilation equipment.
[NL 176]: Add wet electrostatic precipitators and metal filters to the list.
[AT 66]: Fabric filters represent the state of the art. Electrostatic precipitators or wet dust scrubbers may only be applied, if fabric filters are not applicable for technical reasons, e.g. due to high humidity of the waste gas stream.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- Although the list of techniques is rather generic, it provides an overview that should be useful in setting permit conditions. Detailed information on the individual techniques is available in Chapter 3 and does not need to be repeated here.
- Given that the table is generic and that no BAT-AELs are proposed for emissions to air, all end-of-pipe techniques could be merged in a single BAT conclusion.
- Metal filters are contained in the list.
- Due to the generic nature of this BAT conclusion, it is difficult to conclude which of the techniques shows the best performance under particular circumstances.</td></tr>
<tr><td>EIPPCB proposal:</td><td>- Merge BAT 45 – 49.
- Add a column with the typical pollutants abated by each technique.
- Specify that cyclones and electrostatic precipitators can be dry or wet.
- Specify that the applicability of electrostatic precipitators may be restricted due to space requirements in existing plants.
- Update the applicability of each technique in line with the information contained in Chapter 3.</td></tr>
</table>

Text proposal: See Section 1.6.1.9 of this BP.

1.6.1.5 Hydrogen chloride and sulphur dioxide

Location in D2:	**Section 4.10, page 682 – 683 (BAT 46)**
Current text in D2:	**46. BAT is to recover hydrogen chloride and sulphur dioxide in waste gas streams from chemical production processes by applying one of the following techniques:** I. wet gas scrubbing with water II. desulphurisation. **Description** The descriptions of the techniques are given in Section 0. **Applicability** The restrictions on applicability of the techniques are highly dependent on the chemical sector. [Please TWG provide information on restrictions for the applicability of the techniques listed encountered in your experience] *[This BAT conclusion is based on information given in Section 3.2.5.1.4 and Section 3.2.5.4.1.]*
Summary of comments:	[DE 5]: Delete BAT 46 as the possibility for recovery depends on the process. [CEFIC 223]: Replace the term 'recover' in the BAT statement with 'reduce'. Recovery is only applicable for large plants or very high pollutant concentrations. [FR 55]: Add hydrogen fluoride to the BAT statement. [FR 54]: Provide more details on the techniques to reduce sulphur dioxide emissions (e.g. dry/semi-dry/semi-wet/wet sorbent injection). [CONCAWE 125]: The provisions on applicability are too vague. Use for example the criterion of marginal cost of recovery exceeding a certain limit.
EIPPCB assessment:	- Process-integrated techniques as well as recycling and reuse of substances are often carried out at the plant level. They should be better described in the vertical chemical BREFs where usually more information on applicability restrictions is available. This was outlined in the Commission presentation at the IED Article 13 Forum meeting in September 2012. - However, wet scrubbers are typically used to reduce SO_X, HCl and HF emissions, while flue-gas desulphurisation is used to abate SO_X. - Given that the table is generic and that no BAT-AELs are proposed for emissions to air, all end-of-pipe techniques could be merged in a single BAT conclusion. - For such a generic list of techniques ('… BAT is to use one or a combination of …', it would be difficult to set further economic applicability restrictions).
EIPPCB proposal:	- Merge BAT 45 – 49. - Add a column with the typical pollutants abated by each technique. - Clarify that these techniques aim at **reducing** emissions to air. - Add hydrogen fluoride to the list of pollutants abated by wet scrubbers. - Modify the applicability of wet scrubbers and flue-gas desulphurisation to 'generally applicable'. - Provide more details on the techniques to reduce sulphur dioxide emissions in the description. - Do not add economic applicability restrictions.

Text proposal: See Section 1.6.1.9 of this BP.

1.6.1.6 Recovery of VOCs and inorganic compounds

<table>
<tr><td>Location in D2:</td><td>Section 4.10, page 683 (BAT 47)</td></tr>
<tr><td>Current text in D2:</td><td>
47. BAT is to recover VOCs and inorganic compounds in waste gas streams from chemical production processes and reduce their emissions by applying one of the following techniques:
<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I. Membrane separation</td><td>Very low particulate matter concentration required in the feed.
[Please TWG provide concrete information on particulate matter concentration encountered in your experience]</td></tr>
<tr><td>II. Condensation and cryogenic condensation</td><td>[Please TWG provide information on restrictions for the applicability of the technique encountered in your experience]</td></tr>
<tr><td>III. Adsorption</td><td>Adsorption with activated carbon not suitable for wet waste gas streams and for VOC concentrations higher than 50 g/Nm^3. Adsorption with zeolites not suitable for wet waste gas streams.</td></tr>
<tr><td>IV. Wet gas scrubbing</td><td>[Please TWG provide information on restrictions for the applicability of the technique encountered in your experience]</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 0.</td></tr>
</table>
[This BAT conclusion is based on information given in Section 3.2.5.1.1 (membrane separation), Section 3.2.5.1.2 (condensation and cryogenic condensation), Section 3.2.5.1.3 (adsorption) and Section 3.2.5.1.4 (wet gas scrubbing).]
</td></tr>
<tr><td>Summary of comments:</td><td>[CEFIC 225]: Delete BAT 47 and 48. Recovery and abatement cannot be considered separately. The selection of the most appropriate technique is a complex technical issue that largely depends on the process conditions. For small streams, the most appropriate technique may be flaring.
[DE 6]: Define the 'inorganic compounds' mentioned in the BAT statement.
[DE 7]: The reduction of emissions is inherently included in a recovery operation. Clarify which techniques can be used for which pollutant.
[DE 9]: Applicability restrictions for wet scrubbers are given in Table 3.197.
[CONCAWE 126]: The provisions on applicability are too vague. Use for example the criterion of marginal cost of recovery exceeding a certain limit.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- Process-integrated techniques as well as recycling and reuse of substances are often carried out at the plant level. They should be better described in the vertical chemical BREFs where usually more information on applicability restrictions is available. This was outlined in the Commission presentation at the IED Article 13 Forum meeting in September 2012.
- Flares should only be used for safety reasons or during non-routine operational conditions.
- Given that the table is generic and that no BAT-AELs are proposed for emissions to air, all end-of-pipe techniques could be merged in a single BAT conclusion.
- For such a generic list of techniques ('… BAT is to use one or a combination of …', it would be difficult to set further economic applicability restrictions).</td></tr>
<tr><td>EIPPCB proposal:</td><td>- Merge BAT 45 – 49.
- Add a column with the typical pollutants abated by each technique.
- Clarify that these techniques aim at reducing emissions to air.
- Do not add economic applicability restrictions.
- Update the applicability of each technique in line with the information contained in Chapter 3.</td></tr>
</table>

Text proposal: See Section 1.6.1.9 of this BP.

1.6.1.7 Reduction of VOC emissions

<table>
<tr><td>Location in D2:</td><td>Section 4.10, page 684 (BAT 48)</td></tr>
<tr><td>Current text in D2:</td><td>
48. BAT is to reduce emissions of VOCs in waste gas streams from chemical production processes by applying one of the following techniques:
<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I. Biofiltration</td><td>Applicable for the abatement of low concentration of water soluble readily biodegradable components.</td></tr>
<tr><td>II. Bioscrubbing</td><td>Applicable for the abatement of low concentration of readily biodegradable components. Not applicable to the abatement of aliphatic hydrocarbons, aromatic hydrocarbons except naphthalene, ethers, carbon disulphide, nitro compounds and halogenated hydrocarbons except chlorophenols.</td></tr>
<tr><td>III. Biotrickling</td><td>Applicable for the abatement of low concentration of readily biodegradable components. Not applicable to the abatement of aliphatic hydrocarbons.</td></tr>
<tr><td>IV. Moving bed trickling filter</td><td>Generally applicable.</td></tr>
<tr><td>V. Thermal oxidation</td><td>When halogenated VOCs are present, to suppress the generation of dioxins/furans (PCDD/F), oxidation conditions should be as follows: residence time > 2 seconds, temperature > 1 100 °C (850 °C when incinerating with less than 1 % of halogenated organic substances) and an oxygen content of > 3%. Some waste gas pretreatment can be necessary, such as condensing the water vapour from a wet waste gas.</td></tr>
<tr><td>VI. Catalytic oxidation</td><td>Applicable for the abatement of low waste gas volumes with slight variation in the type and concentration of VOCs and where catalyst poisons or other fouling contaminants are not present. Some waste gas pretreatment can be necessary, such as condensing the water vapour from a wet waste gas, the removal of solids and liquids and the removal of catalyst poisons.</td></tr>
<tr><td>VII. Ionisation</td><td>Applicable for the abatement of waste gas streams with low VOC concentrations and where the application of thermal/catalytic oxidation is not effective.</td></tr>
<tr><td>VIII. Photo/UV oxidation</td><td>Applicable for the abatement of waste gas streams with VOC concentrations of less than 500 mg/Nm^3 and H_2S, NH_3, amines, and mercaptans concentrations of less than 50 ppm.</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 0.</td></tr>
</table>
[Please TWG provide concrete information on the highlighted parts of the techniques listed above based on your experience]

[This BAT conclusion is based on information given in Section 3.2.5.2.]
</td></tr>
<tr><td>Summary of comments:</td><td>[CEFIC 225]: Delete BAT 47 and 48. Recovery and abatement cannot be considered separately. The selection of the most appropriate technique is a complex technical issue that largely depends on the process conditions. For small streams, the most appropriate technique may be flaring.
[NL 179]: The techniques listed in BAT 48 also apply to inorganic compounds.
[CONCAWE 127]: Include cost-effectiveness criteria in the applicability column.
[CONCAWE 128]: Remove the technical description of how to properly incinerate halogenated VOCs but be specific and more complete on the other components.
[NL 180]: Add the following techniques to the table: membrane separation, moving bed trickling filter, ionisation, metal filters and catalytic filtration.</td></tr>
</table>

Location in D2:	**Section 4.10, page 684 (BAT 48)**
EIPPCB assessment:	- Process-integrated techniques as well as recycling and reuse of substances are often carried out at the plant level. They should be better described in the vertical chemical BREFs where usually more information on applicability restrictions is available. This was outlined in the Commission presentation at the IED Article 13 Forum meeting in September 2012. - Flares should only be used for safety reasons or during non-routine operational conditions. - Given that the table is generic and that no BAT-AELs are proposed for emissions to air, all end-of-pipe techniques could be merged in a single BAT conclusion. - For such a generic list of techniques ('… BAT is to use one or a combination of …', it would be difficult to set further economic applicability restrictions). - The applicability of thermal oxidation contains many details on how to prevent the *de-novo* synthesis of dioxins/furans. - A combined list of all end-of-pipe techniques would include all techniques proposed by comment [NL 180.].
EIPPCB proposal:	- Merge BAT 45 – 49. - Add a column with the typical pollutants abated by each technique. - Clarify that these techniques aim at **reducing** emissions to air. - Modify the applicability of thermal oxidation to 'generally applicable'. - Do not add economic applicability restrictions. - Update the applicability of each technique in line with the information contained in Chapter 3.

Text proposal: See Section 1.6.1.9 of this BP.

1.6.1.8 Reduction of NO_X emissions

<table>
<tr><td>Location in D2:</td><td>Section 4.10, page 685 (BAT 49)</td></tr>
<tr><td>Current text in D2:</td><td>
49. BAT is to reduce emissions of nitrogen oxides in waste gas streams from chemical production processes by applying I and II below:

I. one or more of the primary techniques, such as:
<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>a. Substitution of raw materials/fuel</td><td>[Please TWG provide information on restrictions for the applicability of the technique encountered in your experience]</td></tr>
<tr><td>b. Low-NO_X burners</td><td>[Please TWG provide information on restrictions for the applicability of the technique encountered in your experience]</td></tr>
<tr><td>c. Reburning</td><td>[Please TWG provide information on restrictions for the applicability of the technique encountered in your experience]</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 0.</td></tr>
</table>
II. one of the secondary techniques, such as:
<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>a. Selective catalytic reduction (SCR)</td><td>At relatively high SO_3 levels, the process has to run at a high temperature to prevent condensation.</td></tr>
<tr><td>b. Selective non-catalytic reduction (SNCR)</td><td>Not suited for sources with a low NO_X level.</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 0.</td></tr>
</table>
[This BAT conclusion is based on information given in Section 3.2.5.4.3 (SCR and SNCR).]
</td></tr>
<tr><td>Summary of comments:</td><td>
[BE 40, 44; DE 11, 12]: Distinguish between NO_X emissions from chemical production processes and combustion. Combustion units should be covered by the LCP BREF.
[CEFIC 226]: Delete BAT 49. Combustion units are covered by the LCP BREF. For chemical productions, the most appropriate way to reduce NO_X emissions depends on the process and should be described in the vertical chemical BREFs.
[BE 21; CEFIC 227; 228; DE 13]: A combination of primary and secondary techniques as stipulated in the BAT statement is not always necessary, primary techniques may be sufficient.
[DE 12, 14]: Delete BAT 49 I, as the techniques are not described in Chapter 3.
[DE 12]: Define the term 'reburning'.
[BE 44]: Reburning (or fuel staging) is only one of the possible primary measures. Other techniques include flue gas recirculation and staged combustion (air staging).
[CEFIC 229]: Add 'water or steam injection' or 'flue gas recirculation' to the list of primary techniques.
[CEFIC 230]: Clarify the applicability of SNCR: high temperatures in the case of high SO_3 levels are needed to prevent condensation of aluminium salts.
[ES(C) 2]: Add 'scrubbing with hydrogen peroxide to recover nitrogen oxides as nitric acid' to the list of techniques (see Section 3.2.5.4.5 of D2 of the CWW BREF).
[CEFIC 226, 227]: NO_X reduction measures are only necessary in the case of high emission loads.
[CONCAWE 129]: Include cost-effectiveness criteria in the applicability column of the secondary techniques.
</td></tr>
</table>

Location in D2:	**Section 4.10, page 685 (BAT 49)**
EIPPCB assessment:	- Combustion processes for the production of heat and/or electricity are covered by the LCP BREF. - However, the thermal oxidation/incineration of waste gases is currently not covered by any BREF. - Process-integrated techniques as well as recycling and reuse of substances are often carried out at the plant level. They should be better described in the vertical chemical BREFs where usually more information on applicability restrictions is available. This was outlined in the Commission presentation at the IED Article 13 Forum meeting in September 2012. - However, secondary techniques for the abatement of NO_X such as SCR and SNCR fall under the scope of the CWW BREF. They might be used to reduce NO_X emissions from chemical processes or from thermal oxidisers. - Operating conditions (e.g. temperature) do not represent an applicability restriction. - Given that the table is generic and that no BAT-AELs are proposed for emissions to air, all end-of-pipe techniques could be merged in a single BAT conclusion. - A combined list of all end-of-pipe techniques would include wet scrubbing. - For such a generic list of techniques ('… BAT is to use one or a combination of …', it would be difficult to set further applicability restrictions related to economics or pollutant loads).
EIPPCB proposal:	- Merge BAT 45 – 49 - Do not include primary techniques for NO_X reduction in this merged BAT, but keep the secondary techniques (i.e. SCR and SNCR). - Do not include applicability restrictions related to the operating temperature. - Do not add applicability restrictions related to economics or pollutant loads. - Include a cross-reference to the LCP BREF in the Scope of the BAT conclusions.

Text proposal: See Section 1.6.1.9 of this BP.

1.6.1.9 Text proposal for new BAT conclusion on final waste gas treatment

BAT 17. In order to reduce emissions to air, BAT is to use an integrated waste gas management and treatment strategy that includes an appropriate combination of the techniques given below.

	Technique	Description
a	Process-integrated techniques ([1])	Techniques that reduce the generation of air pollutants.
b	Waste gas treatment at source ([1])	Techniques to abate or recover pollutants prior to their discharge to the waste gas collection system.
c	Final waste gas treatment ([2])	Final waste gas treatment by using a combination of different techniques before discharge to air.
([1]) Within the scope of the seven vertical chemical BAT reference documents, namely: Production of Chlor-alkali (CAK), Manufacture of Large Volume Inorganic Chemicals – Ammonia, Acids and Fertilisers Industries (LVIC–AAF), Manufacture of Large Volume Inorganic Chemicals – Solids and Others Industry (LVIC–S), Production of Speciality Inorganic Chemicals (SIC); Large Volume Organic Chemical Industry (LVOC), Manufacture of Organic Fine Chemicals (OFC), and Production of Polymers (POL). ([2]) Covered by BAT 18.		

Description

The integrated waste gas management and treatment strategy is based on the inventory of waste gas streams (see BAT 15).

BAT 18. In order to reduce channelled emissions to air, BAT is to use an appropriate combination of the final waste gas treatment techniques given below.

Description

Final waste gas treatment is carried out as part of an integrated waste gas management and treatment strategy (see BAT 17).

Appropriate final waste gas treatment techniques, depending on the pollutant, include:

	Technique ([1])	Typical pollutants abated	Applicability
a	Settling chamber/gravitational separator	Dust	Generally applicable.
b	Cyclones (dry or wet)	Dust	Generally applicable.
c	Electrostatic precipitator (dry or wet)	Dust	In existing plants, the applicability may be restricted by space requirements.
d	Wet scrubber	Dust, VOC, HCl, HF, NH_3, SO_2, NO_X, H_2S	Generally applicable.
e	Fabric filter	Dust, dioxins/furans	Not applicable to wet or sticky dust.
f	Ceramic/metal filter	Dust, dioxins/furans, VOC, HCl, SO_2, NO_X	Not applicable to wet or sticky dust.
g	Catalytic filtration	Dust, dioxins/furans, VOC, NO_X	Not applicable to waste gas containing substances that can deactivate the catalyst.
h	Two-stage dust filter	Dust	Generally applicable.
i	Absolute filter	Dust	Generally applicable.
j	High-efficiency air filter (HEAF)	Dust	Generally applicable.
k	Mist filter	Dust	Generally applicable.

	Technique ([1])	Typical pollutants abated	Applicability
l	Flue-gas desulphurisation	SO_X	Generally applicable.
m	Membrane separation	VOC	Generally applicable.
n	Condensation	VOC, dust, NH_3	Generally applicable.
o	Adsorption	VOC, dioxins/furans, Hg, H_2S	Not applicable in the case of high VOC concentrations.
p	Biofiltration	VOC, odour	Applicable to waste gases containing low concentrations of readily bio-eliminable compounds.
q	Bioscrubbing	VOC, odour, NH_3, H_2S	Applicable to waste gases containing low concentrations of readily bio-eliminable compounds.
r	Biotrickling	VOC, odour, NH_3, H_2S	Applicable to waste gases containing low concentrations of readily bio-eliminable compounds.
s	Moving bed trickling filter	VOC, odour, NH_3, H_2S	Applicable to waste gases containing bio-eliminable compounds.
t	Thermal oxidation	Dust, odour, VOC	Generally applicable.
u	Catalytic oxidation	Dust , VOC	Generally applicable.
v	Ionisation (non-thermal plasma)	Dust, VOC, SO_2, NO_X, Hg	Applicable to waste gases containing low pollutant concentrations.
w	Photo/UV oxidation	VOC, H_2S, NH_3	Applicable to waste gases containing low pollutant concentrations.
x	Selective catalytic reduction (SCR)	NO_X	Generally applicable.
y	Selective non-catalytic reduction (SNCR)	NO_X	Not applicable to waste gases containing low NO_X concentrations.

([1]) The descriptions of the techniques are given in Section 1.6.2.

[This BAT conclusion is based on information given in Section 3.2.5.]

1.6.2 Flaring

Location in D2:	**Section 4.10, page 685 (BAT 50 – 52)**
Current text in D2:	**50. BAT is to minimise the need for flaring by correct plant design (e.g. using high integrity relief valves, having a gas recovery system) and good plant management (e.g. having advanced process control).** *[This BAT conclusion is based on information given in Section 3.2.5.5.]* **51. BAT is to dispose only of excess combustible gases that cannot otherwise be recovered from non-routine operational conditions (e.g. start-ups, shutdowns), emergency situations and/or upset conditions by use of flaring.** **Applicability** Uncontrolled emissions (especially VOCs) from vents and relief valves should be routed to recovery systems, with flares serving only as a backup system. Waste gases to be flared must have a heat content of at least 8 – 11 MJ/Nm^3 for complete combustion, otherwise auxiliary fuel must be added. In some cases, even flaring waste gases having the necessary heat content will also require supplemental heat. Ground flares are not suited for toxic and hazardous gases. *[This BAT conclusion is based on information given in Section 3.2.5.5.]* **52. BAT is to maximise the combustion efficiency of flares by appropriate selection and design of the flare system and closely monitoring the heat content of the flare fuel mixture, the ratio of fuel gas to assist gas (air or steam) and burner tip velocity and the crosswind velocity.** *[This BAT conclusion is based on information given in Section 3.2.5.5.]*
Summary of comments:	[CONCAWE 130]: Flares are needed for safety reasons. BAT 50 should refer to routine operations. High-integrity relief valves are not a panacea. [CONCAWE 130; PT 24]: For BAT 50, there are economic restrictions for existing plants. [PT 25]: Reverse the order of appearance of BAT 50 and BAT 51. [NL 181]: BAT 51 should be reformulated with the following options (decreasing order of preference): 1) Recovery, 2) Regenerative oxidiser, 3) Flaring. [CONCAWE 131]: The word 'only' in the BAT statement 51 implies that flare support gas cannot be used. [BE 41]: Are recovery systems as stipulated in BAT 51 applied in the chemical industry or is this specific to refineries? [BE 42; CEFIC 231]: Limit the applicability of BAT 51 (recovery) to installations where this is practicable. [CEFIC 231]: BAT 51: For existing installations, recovery systems may not be technically or economically feasible (e.g. polymer plants when changing grades). Ensuring high VOC conversion is addressed in BAT 52. Ground flares are not suited for toxic gases. [CONCAWE 132]: The need for auxiliary fuel does not restrict the applicability of BAT 51. Add specifics for sour gas flares (restricting the use of smokeless flares because steam cannot be added), conversion efficiency and the applicability for toxic gases, limiting effects of high O_2 in waste gas stream going to flare etc. [CONCAWE 133]: There are too many details in BAT 52 on how to optimise the combustion efficiency. Flares need to operate at any time during emergencies. [CEFIC 232]: Monitoring the waste gas heat as stipulated in BAT 52 is not required as long as there is a visible flare. There is no reliable technique to adjust flare operations to account for wind velocity. [FI 9]: Clarify if BAT 52 applies to existing plants. It is not always possible to build additional monitoring points in existing flares.

Location in D2:	Section 4.10, page 685 (BAT 50 – 52)
EIPPCB assessment:	- Flares are used in the chemical sector. - Flares should only be used for safety reasons or during non-routine operational conditions, but not as thermal oxidisers during normal operating conditions. - When flaring is unavoidable, techniques should aim to reduce emissions of organic compounds by ensuring high combustion efficiency. - Several monitoring techniques are applicable both to new and existing plants.
EIPPCB proposal:	- Merge BAT 50 and parts of BAT 51 in a new BAT conclusion that aims to prevent the use of flares by using correct plant design and management. - Limit the applicability of the technique 'correct plant design' to new plants. However, mention that retrofitting may be possible. - Merge BAT 52 and parts of BAT 51 in a new BAT conclusion that aims to reduce emissions when flaring is unavoidable, by using correct flare design and monitoring/recording. - Formulate the BAT conclusions on flaring in a more generic way that allows the specifics of the plant to be taken into account.

Text proposal:

BAT 19. In order to prevent emissions to air from flares, BAT is to use flaring only for safety reasons or non-routine operational conditions (e.g. start-ups, shutdowns) by using one or 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.	Applicable to new plants. Gas recovery systems may be retrofitted in existing plants.
b	Plant management	This includes balancing the fuel gas system and using advanced process control.	Generally applicable.

BAT 20. In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use one or both of the techniques given below.

	Technique	Description	Applicability
a	Correct design of flaring devices	Flare design includes the optimisation of height, pressure, assistance by steam, air or gas, type of flare tips, etc. It aims to enable smokeless and reliable operation and to ensure an efficient combustion of excess gases.	Applicable to new flares.
b	Monitoring and recording	Continuous monitoring of gas sent to flaring (measurements of gas flow and estimations of other parameters) and associated parameters of combustion (e.g. composition of flow gas, 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 of operation. The recording allows for the quantification of emissions and the potential prevention of future flaring events.	Generally applicable.

[These BAT conclusions are based on information given in Section 3.2.5.5.]

1.6.3 Diffuse VOC emissions

1.6.3.1 Plant design

Location in D2:	**Section 4.5, page 667 (BAT 12)**
Current text in D2:	**12. BAT is to prevent, or where that is not practicable, to reduce diffuse VOC emissions during the plant design phase by applying a combination of the following techniques:** I. limiting the number of potential emission sources II. maximising inherent process containment features III. selecting high integrity equipment IV. selecting appropriate materials for equipment V. facilitating monitoring and maintenance activities by ensuring good access to components that have the potential to leak VI. collecting and treating diffuse VOC emissions. **Applicability** Extent of the applicability of the techniques may be limited for existing plants. *[This BAT conclusion is based on information given in Section 3.4.1.]*
Summary of comments:	[AT 42]: The list of techniques is incomplete (e.g. German TA Luft). [BE 35]: Clarify what is meant by 'high-integrity equipment'. [DE 39]: Provide more details on the applicability restrictions. [CONCAWE 120]: BAT 12 refers to the design phase of a plant. Therefore, an applicability restriction for existing plants does not make sense. [CEFIC 139, 140]: Provide more details on applicability. BAT 12 I.: The number of valves and flanges depends on operability and maintenance requirements. BAT 12 III.: potential technical limitations. BAT 12 V.: may not be possible in large plants; not needed when using gas imaging for leak detection. BAT 12 VI.: only possible in closed buildings, which is often not possible due to safety requirements. [DE 39; NL 153]: Include a provision for continuous improvement over time for existing plants.
EIPPCB assessment:	- As stipulated in the 'General considerations', the list of techniques is non-prescriptive and non-exhaustive. - Examples of high-integrity equipment are given in the CWW BREF (See Section 3.4.1, page 580, of D2 of the CWW BREF). - BAT 12 IV. is covered in BAT 12 III. BAT 12 VI is related to plant operation. - Some of the techniques could be retrofitted in existing plants. - Provisions on continuous improvements over time would equally be relevant for all other BAT conclusions.
EIPPCB proposal:	- Merge BAT 12 – 14 and ensure consistency with the final draft of the revised REF BREF. - Shorten this new BAT conclusion by categorising the techniques related to: a) plant design, b) plant/equipment construction, assembly and commissioning, and c) plant operation. - Add examples of high-integrity equipment to the descriptions of the techniques. - Clarify that the applicability of the techniques may be restricted in the case of existing plants due to operability requirements.

Text proposal: See Section 1.6.3.4 of this BP.

1.6.3.2 Plant setup and commissioning

Location in D2:	**Section 4.5, page 667 – 668 (BAT 13)**
Current text in D2:	**13. BAT is to prevent, or where that is not practicable, to reduce diffuse VOC emissions related to plant installation and commissioning by applying all of the following techniques:** I. having strict and well-defined procedures for construction and assembly II. ensuring that gaskets are installed correctly, and that the highest possible gasket stress is used during the installation of flanged joints III. having robust commissioning and hand-over procedures to ensure that the plant is installed in line with the design requirements. *[This BAT conclusion is based on information given in Section 3.4.2.]*
Summary of comments:	[DE 52]: Clarify what is meant by 'strict and well-defined procedures for construction and assembly' or delete this part of BAT 13. [UK 9]: Replace 'strict and well-defined procedures' with 'comprehensive set of procedures'. [DE 54]: BAT 13 II. relates to fugitive emissions and should therefore be moved to BAT 14. [CEFIC 142]: The gasket stress must comply with the manufacturers' instructions. Sometimes gaskets can be used that allow for higher stresses. [CONCAWE 121]: The correct installation of gaskets implies that an appropriate torque is used. Thus there is no need to request the highest possible gasket stress. [CEFIC 143]: High gasket stress implies high costs and technical and safety problems (high-strength fasteners are brittle). [DE 51]: Clarify how the highest possible gasket stress can be achieved during installation (see Sections 3.4.2. and 7.11 of D2 of the CWW BREF). [UK 10]: For BAT 13 II., add the aim that all flanged joints should be leak-tight. [DE 53]: Clarify what is meant by 'robust commissioning and hand-over procedures' or delete this part of BAT 13.
EIPPCB assessment:	- It is difficult to define 'strict and well-defined procedures' and 'robust commissioning and hand-over procedures' more precisely. Nevertheless, well-defined procedures can contribute to the prevention/reduction of diffuse emissions. - The procedures for construction and assembly should also be comprehensive. - Fugitive emissions are a subset of diffuse emissions. - Section 7.11 of D2 of the CWW BREF contains a description on how to ensure that the highest possible gasket stress (in line with the specifications of the gasket) is used during the installation of flanged joints.
EIPPCB proposal:	- Merge BAT 12 – 14 and ensure consistency with the final draft of the revised REF BREF. - Shorten this new BAT conclusion by categorising the techniques related to: a) plant design, b) plant/equipment construction, assembly and commissioning, and c) plant operation. - Keep the BAT conclusion on the gasket stress. Add details on the procedure in the description of the techniques.

Text proposal: See Section 1.6.3.4 of this BP.

1.6.3.3 Plant operation

Location in D2:	**Section 4.5, page 668 (BAT 14)**
Current text in D2:	**14. BAT is to prevent, or where that is not practicable, to reduce fugitive VOC emissions related to plant operation by adopting a leak detection and repair (LDAR) programme in order to identify leaking components, and to repair these leaks to minimise losses.** **Description** An LDAR programme is a structured approach to reduce fugitive VOC emissions by detection and subsequent repair or replacement of leaking components. Currently, sniffing and gas imaging methods are available for the identification of the leaks. *[This BAT conclusion is based on information given in Section 3.4.3.]*
Summary of comments:	[NL 154]: Provide more details in the description as was done in the LVOC BREF (Section 6.3, p. 134). [BE 36; CEFIC 144, 146]: An LDAR programme is not always needed and should be risk-based (i.e. depending on the magnitude of the potential emissions). [CEFIC 145]: An LDAR programme cannot be applied to substances that are not sufficiently volatile. Use the applicability clause specified in EN 15446. [CEFIC 145]: An LDAR programme is not needed when high-integrity equipment is used. [NL 133, 155]: Add that fugitive emissions can also be prevented/reduced by good maintenance and timely replacement of components. [FR 38]: The use of optical gas imaging methods alone is not sufficient to detect all leaks. These methods may be used in combination with sniffing methods. [AT 43; FR 37]: Add a BAT conclusion on the assessment of the effectiveness of VOC emission reductions (e.g. by differential absorption).
EIPPCB assessment:	- An LDAR programme is generally applicable for diffuse VOC emissions, even in the case of low emissions. It can be risk-based in order to tailor it to the site characteristics/specifications. - There is no absolute guarantee that high integrity-equipment will never leak. - Differential absorption light detection and ranging (DIAL) or Solar Occultation Flux (SOF) are currently not carried out at chemical sites. The use of these methods in a complementary way can be considered. - Only sniffing methods are currently standardised (EN 15446). However, they are time- and cost-intensive and some emission sources may be difficult to access. - At CEN level, work is on-going to define further methods for the quantification of VOC emissions from diffuse and fugitive sources, including Optical Gas Imaging (OGI), DIAL, SOF, Flux chambers and calculations.
EIPPCB proposal:	- Merge BAT 12 – 14 and ensure consistency with the final draft of the revised REF BREF. - Shorten this new BAT conclusion by categorising the techniques related to: a) plant design, b) plant/equipment construction, assembly and commissioning, and c) plant operation. - Describe the LDAR programme in more detail following the REF BREF. - Add the techniques 'good maintenance and timely replacement of components'. - Describe the monitoring of diffuse VOC emissions in a separate BAT conclusion following the approach of the REF BREF: use of sniffing methods, optical gas imaging and calculations. - Add provisions for potential complementary monitoring techniques (DIAL/SOF).

Text proposal: See Section 1.6.3.4 of this BP.

1.6.3.4 Text proposal for new BAT conclusion on diffuse VOC emissions

BAT 21. In order to prevent or, where that is not practicable, to reduce diffuse VOC emissions to air from relevant sources, BAT is to use a combination of the techniques given below.

	Technique	Applicability
Techniques related to plant design		
a	Limit the number of potential emission sources	Applicability of the techniques may be restricted in the case of existing plants due to operability requirements.
b	Maximise inherent process containment features	
c	Select high-integrity equipment (see the description in Section 1.6.2.)	
d	Facilitate monitoring and maintenance activities by ensuring access to potentially leaking equipment	
Techniques related to plant/equipment construction, assembly and commissioning		
e	Ensure well-defined and comprehensive procedures for plant/equipment construction and assembly	Generally applicable.
f	Ensure robust plant/equipment commissioning and handover procedures in line with the design requirements	
g	Ensure that the highest possible gasket stress is used during the assembly of flanged joints (see the description in Section 1.6.2.)	
Techniques related to plant operation		
h	Ensure good maintenance and timely replacement of equipment	Generally applicable.
i	Use a risk-based leak detection and repair (LDAR) programme (see the description in Section 1.6.2.)	
j	Collect and treat diffuse VOC emissions	

The associated monitoring is in BAT 4.

[This BAT conclusion is based on information given in Sections 3.4.1, 3.4.2 and 3.4.3]

BAT 4. BAT is to periodically monitor diffuse VOC emissions to air from relevant sources by using all of the techniques given below:

I. sniffing methods (e.g. with portable instruments according to EN 15446) associated with correlation curves for key equipment;
II. optical gas imaging techniques;
III. calculation of emissions based on emissions factors, periodically validated (e.g. once every two years) by measurements.

The screening and quantification of emissions from the installation by periodic campaigns with optical absorption based techniques, such as Differential absorption light detection and ranging (DIAL) or Solar occultation flux (SOF) is a useful complementary technique.

Description: See Section 1.6.2.

[This BAT conclusion is based on information given in Section 3.4.3 and 3.4.4]

1.6.4 Odour emissions

1.6.4.1 Odour management

Location in D2:	**Section 4.6, page 668 (BAT 15)**
Current text in D2 (1):	**15. BAT is to prevent, or where that is not practicable, to reduce odour emissions by applying I and II below:** **I. setting up and implementing an odour management plan, as part of the environmental management system, that includes all of the following elements:** a. an odour management strategy b. a protocol for conducting odour monitoring c. a protocol for response to identified odour events d. an odour prevention and elimination programme designed to identify the source, nature, emission and dispersion of odours generated on site, to characterise them and to implement elimination and/or reduction measures e. a reporting programme to regularly advise management on the results of the odour management plan f. a review programme to regularly update the odour management plan; **II. using a combination of the following management techniques:** a. training of staff on odour minimisation b. implementing an odour monitoring programme c. reviewing historical odour incidents and remedies and disseminating odour incident knowledge. **Description** Odour monitoring is carried out using analytical methods (i.e. physical and chemical) or sensorial approaches (based on human sensors). Analytical techniques for the assessment of odours include emission isolation flux chambers, portable wind tunnels and electronic noses. Sensorial techniques are dynamic olfactometry with human assessors, odour surveys, odour wheels and odour intensity mapping. *[This BAT conclusion is based on information given in Section 3.5.]*
Summary of comments:	[CEFIC 147; 153; NL 156]: Prevention/reduction of odour emissions is only necessary when odour emissions are likely to occur or in case of significant public complaints. [DE 60]: BAT 15 is based on limited information from a pulp mill and an odour guidance for waste. Are there any examples of chemical sites? [CEFIC 147; NL 159]: An odour management plan is usually part of an EMS. [NL 157]: Add management techniques from Section 3.5.3 (p.587) to BAT 15 II. [AT 44]: Add a technique to BAT 15 II: 'Minimise the storage period or organic waste.' [NL 158]: The information on odour monitoring should be moved to the MON REF. [AT 45]: Electronic noses are no longer state of the art for odour monitoring. [FR 39]: The current wording presents sampling methods as analytical methods and mixes analytical and sensorial methods. [CEFIC 148, 149, 150]: Odour monitoring is only necessary in case of significant public complaints and when the sources are unknown. Not all monitoring methods are appropriate for all sites, odours or cases.

Location in D2:	**Section 4.6, page 668 (BAT 15)**
EIPPCB assessment:	- An odour management plan (standalone or as part of an EMS) is usually set up at chemical sites. - Although the references in BREF Section 3.5.3 on page 588 refer to a kraft pulp plant and waste management facilities, the proposed elements of the odour management plant are commonly applied in many industry sectors. - The most important organic waste generated at chemical sites derives from biological waste water treatment. This is covered by the next BAT conclusion. - The standard method for odour emission measurements is given by EN 13725 (dynamic olfactometry). - Complementary monitoring methods may be applied in individual cases (e.g. measurement/estimation of odour exposure, estimation of odour impact by using surveys or complaint registers). - Training of staff and information of management are already included in the BAT conclusion on EMS.
EIPPCB proposal:	- Keep a separate BAT on odour management, stipulating that it is part of an EMS. - Add management techniques to the plan (i.e. actions and timelines). - Merge the items under I. and II. and streamline/shorten the descriptions. - Delete BAT 15.I.e and BAT 15.II.a - Restrict the applicability of techniques to prevent or reduce odour emissions to cases where a significant odour exposure in residential or other sensitive areas is likely to occur. - Describe the monitoring of odour emissions in a separate BAT conclusion. Add provisions for potential complementary monitoring techniques. - Specify that EN standards such as EN 13725 should be used for monitoring of odour emissions on a periodic basis, but limited to cases where a significant odour exposure in residential or other sensitive areas is likely to occur. - Clarify that the odour management plan is part of an EMS and include a cross-reference in the BAT on EMS.

Text proposal: See Section 1.6.4.4 of this BP.

1.6.4.2 Odour emissions from waste water and sludge treatment

Location in D2:	**Section 4.6, page 668 – 669 (BAT 16)**
Current text in D2:	**16. BAT is to prevent, or where that is not practicable, to reduce odour emissions from waste water collection systems, central waste water pretreatment and/or treatment plants and sludge treatment facilities by applying a combination of the following techniques:** I. use of tools such as odour emissions factors for predicting the odorous impact of changes in the waste water quality or quantity or in the nature and duration of the waste water treatment and taking necessary measures to minimise this impact; II. use of closed waste water collection systems with controlled vents; III. use of chemicals to reduce the formation of and to oxidise hydrogen sulphide in waste water collection systems and waste water pretreatment/treatment plants; IV. quick emptying and cleaning of storm water tanks; V. prevention of the storage of waste water in the emergency storage basin for longer than necessary; VI. use of floating covers on open tanks, basins and lagoons (e.g. grit chambers, sedimentation/clarification tanks, oil separators, aeration tanks, sludge treatment equipment such as the sludge holding tank and filter presses) and collecting the waste gas by an exhaust system to be further treated (see BAT 17); VII. minimisation of the number of waste water pumping stations and the length of pipes; VIII. prevention of over-aeration in equalisation basins whilst maintaining sufficient mixing; IX. frequent removal of surface scums and skimmings in waste water treatment tanks; X. ensuring sufficient aeration capacity and mixing properties in aeration tanks and revising the aeration system regularly; XI. use of pure oxygen instead of atmospheric air in the aeration tanks; XII. prevention or minimisation of anaerobic conditions (that can occur during peak loading) in trickling filters and rotating biological contactors; XIII. carrying out denitrification operations in such a way that anoxic treatment does not take too long; XIV. maintaining proper operation of secondary clarifier sludge collection and return sludge pumping; XV. minimisation of effluent residence time under anaerobic conditions; XVI. avoiding mixing sludge formed before biological treatment (i.e. primary sludge) and sludge from biological treatment when they are sent for further treatment; XVII. minimisation of retention time of sludge in sludge storages by sending the sludge continuously to the sludge treatment units. *[This BAT conclusion is based on information given in Section 3.5.5.1]* **Applicability** **BAT 16(VII)** may have restrictions on applicability for existing installations. [Please TWG provide information on concrete restrictions for the applicability of the techniques listed encountered in your experience]

Location in D2:	**Section 4.6, page 668 – 669 (BAT 16)**
Summary of comments:	[CEFIC 151]: BAT 16 is covered by the odour management plant in BAT 15 and can therefore be deleted. [CEFIC 151, 152]: The list of techniques is incomplete. It should be non-exhaustive. [FR 40]: Delete BAT 16 I because there is no recognised standard on such emission factors. Such methods do not take into account the variability and the characteristics of the effluents and the potential synergistic or inhibiting effects between substances. [NL 161]: BAT 16 III: hydrogen sulphide can also be removed via precipitation. [NL 162]: Add the technique 'Registration of odour complaints…'. [NL 163]: Add to the applicability restriction of BAT 16 VII, that continuous improvements over time should be made.
EIPPCB assessment:	- BAT 15 covers the whole chemical site whereas BAT 16 specifically addresses waste water collection and treatment as well as sludge treatment. - As stipulated in the 'General considerations', the list of techniques is non-prescriptive and non-exhaustive. - Registration of odour complaints is related to the monitoring of odour emissions. - Continuous improvements over time do not represent a restriction of the applicability of a technique.
EIPPCB proposal:	- Keep BAT 16 and merge it with BAT 17. - Shorten the new BAT conclusion by categorising the techniques. - Remove odour emission factors from the list of techniques. - Formulate the chemical treatment for the removal of odorous compounds more openly.

Text proposal: See Section 1.6.4.4 of this BP.

1.6.4.3 End-of-pipe techniques

<table>
<tr><td>Location in D2:</td><td>Section 4.6, page 670 (BAT 17)</td></tr>
<tr><td>Current text in D2:</td><td>
17. BAT is to reduce odour emissions by using one of the following end-of-pipe odour treatment techniques:
<table>
<tr><th colspan="2">Technique ([1])</th><th>Applicability</th></tr>
<tr><td colspan="2">I. Adsorption</td><td>Adsorption with activated carbon is not suitable for wet waste gas streams and for VOC concentrations higher than 50 g/Nm^3. Adsorption with zeolites is not suitable for wet waste gas streams.</td></tr>
<tr><td colspan="2">II. Wet gas scrubbing</td><td>For alkaline oxidative scrubbers the particulate matter content should be less than 10 mg/Nm^3. [Please TWG provide information on restrictions for the applicability of the technique encountered in your experience]</td></tr>
<tr><td colspan="2">III. Coolant condensation</td><td>Applicable for (odour) components easily dissolvable in water and to odour concentration of higher than 50 000 ou$_E$/Nm^3.</td></tr>
<tr><td>IV.</td><td>Thermal oxidation</td><td rowspan="9">See BAT 48.</td></tr>
<tr><td>V.</td><td>Catalytic oxidation</td></tr>
<tr><td>VI.</td><td>Biofiltration</td></tr>
<tr><td>VII.</td><td>Bioscrubbing</td></tr>
<tr><td>VIII.</td><td>Biotrickling</td></tr>
<tr><td>IX.</td><td>Moving bed trickling filter</td></tr>
<tr><td>X.</td><td>Ionisation</td></tr>
<tr><td>XI.</td><td>Photo/UV oxidation</td></tr>
<tr><td colspan="3">([1]) The descriptions of the techniques are given in Section 0.</td></tr>
</table>
[Please TWG provide information on restrictions for the applicability of the techniques listed encountered in your experience]

[This BAT conclusion is based on information given in Section 3.2.5.2 and Section 3.5.5.2.1 (alkaline oxidative scrubbers).]
</td></tr>
<tr><td>Summary of comments:</td><td>[NL 167]: BAT 17 is outside the scope and should be deleted.
[CEFIC 154]: BAT 17 is covered by the odour management plant in BAT 15 and can therefore be deleted.
[CEFIC 154]: The list of techniques is incomplete.
[FR 41]: The choice of the most appropriate treatment technique(s) depends on the substance.
[NL 164]: Wet gas scrubbing is less suitable for non-polar compounds.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- BAT 15 covers the odour management whereas BAT 17 specifically addresses end-of-pipe treatment techniques. These techniques can be used to treat odour emissions from waste water collection and treatment as well as from sludge treatment.
- As stipulated in the 'General considerations', the list of techniques is non-prescriptive and non-exhaustive.</td></tr>
<tr><td>EIPPCB proposal:</td><td>- Merge BAT 16 and 17.
- Give a few examples of the most commonly used end-of-pipe techniques for the treatment of odour emissions.</td></tr>
</table>

Text proposal: See Section 1.6.4.4 of this BP.

1.6.4.4 Text proposal for new BAT conclusions on odour emissions

BAT 22. In order to prevent or, where that is not practicable, to reduce odour emissions from the installation, 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:

I. a table containing actions and timelines;
II. a protocol for conducting odour monitoring (e.g. sniffing) in the installation;
III. a protocol for response to identified odour events;
IV. an odour elimination programme designed to identify the source(s), to measure odour emissions, to measure/estimate odour exposure (see BAT 5), to characterise the contributions of the sources and to implement elimination and/or reduction measures;
V. a review of historical odour incidents and remedies and the dissemination of odour incident knowledge.

The associated monitoring is in BAT 5.

Applicability
The applicability of BAT 22.IV. is restricted to cases where the results of BAT 22 II. and III. show that odour emissions are likely to cause significant odour exposure in residential or other sensitive areas (e.g. recreational areas).

[This BAT conclusion is based on information given in Section 3.5.]

BAT 23. In order to prevent or, where that is not practicable, to reduce odour emissions from waste water collection and treatment and from sludge treatment, BAT is to use one or a combination of the techniques given below.

	Technique	Description	Applicability
a	Minimise residence times	Minimise the residence time of waste water and sludge in collection and storage systems, in particular under anaerobic conditions.	Applicability may be restricted in the case of existing installations.
b	Chemical treatment	Use chemicals to destroy or to reduce the formation of odorous compounds (e.g. oxidation or precipitation of hydrogen sulphide).	Generally applicable.
c	Optimise aerobic treatment	This can include: i. controlling the oxygen content; ii. frequent maintenance of the aeration system; iii. use of pure oxygen; iv. removal of scums in tanks.	Generally applicable.
d	Enclosure	Cover or enclose facilities for collecting and treating waste water and sludge to collect the odorous waste gas for further treatment.	Generally applicable.
e	End-of-pipe treatment	This can include (see BAT 18): i. biofiltration; ii. bioscrubbing; iii. biotrickling; iv. moving bed trickling filter; v. thermal oxidation.	See BAT 18.

[This BAT conclusion is based on information given in Section 3.5.5.1, Section 3.2.5.1, Section 3.2.5.2 and Section 3.5.5.2.1 (alkaline oxidative scrubbers)]

BAT 5. BAT is to periodically monitor odour emissions to air in accordance with EN standards (e.g. by using dynamic olfactometry according to EN 13725). When applying complementary methods for which no EN standards are available (e.g. measurement/estimation of odour exposure, estimation of odour impact), BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.

Applicability

The applicability of BAT 5 is restricted to cases where the results of BAT 22.II and III. show that odour emissions are likely to cause significant odour exposure in residential or other sensitive areas (e.g. recreational areas).

[This BAT conclusion is based on information given in Section 3.5.4]

1.6.5 Noise emissions

Location in D2:	Section 4.7, page 670 (BAT 18 – 19)
Current text in D2:	**18. BAT is to prevent, or where that is not practicable, to reduce noise emissions from central waste water pretreatment and/or treatment plants and sludge treatment facilities by enclosing noisy equipments such as pumps and compressors.** **19. BAT is to reduce noise emissions from flaring by applying a combination of the following techniques:** I. using air-blown flares or enclosed ground flares II. reduction or attenuation of the high-frequency steam jet noise by using multiport steam injectors and installing the injectors in a way that the jet streams can interact and reduce the mixing noise III. using a silencer around the steam injector as an acoustic shield for the injectors IV. increasing the efficiency of the suppressant with better and more responsive forms of control V. restricting the steam pressure to <0.7 MPa gauge. **Applicability** **BAT 19(II)** can lead to increased coke formation under low flow conditions, therefore, careful orifice design to cope with this drawback is essential.
Summary of comments:	[CEFIC 155, 156, 158] – BAT 18/19: Techniques to reduce noise emissions are only necessary if regulatory noise levels outside the site are exceeded or if neighbours complain. [CEFIC 155] – BAT 18: Noise from the WWTP is managed together with other sources of noise from the site. [ES(A) 4] – BAT 18: Pumps and compressors cannot always be enclosed (e.g. due to limited space or due to the need to cool equipment). [CEFIC 155] – BAT 18: Air blowers are often enclosed, but pumps are not. [CEFIC 157, 158] – BAT 19: While noise emissions from flaring during normal and normal non-routine operations can be reduced, safety considerations should prevail during emergency situations. BAT 19 I and III are not applicable during emergencies. [CEFIC 158] – BAT 19: Retrofitting of flares is mostly unfeasible. [DK 36] – BAT 19: Add achievable performance levels to the techniques.
EIPPCB assessment:	- According to Article 3(4) of the IED, noise emissions are covered by the IED. - The prevention/reduction of noise emissions is a generic issue that cuts across the chemical sector. It should be covered by the CWW BREF as outlined in the Commission presentation at the IED Article 13 Forum meeting in September 2012. - Techniques to reduce noise emissions are generally applied at chemical sites. - As stipulated in the 'General considerations', the list of techniques is non-prescriptive and non-exhaustive. - Pumps, compressors and flares are only some of the equipment generating noise emissions. - The performance levels that need to be achieved depend on local conditions (e.g. distance to residential or other sensitive areas).
EIPPCB proposal:	- Include a new BAT conclusion on noise management with a structure similar to the one for odour emissions. - Merge BAT 18 and 19 into a new BAT that describes techniques to prevent/reduce noise emissions in a more general way. - Use a modified version of the draft BAT conclusion on noise emissions that was proposed in Draft 1 of the revised CAK BREF. - Address the applicability restrictions of the aforementioned comments. - Do not set performance levels. - Clarify that the noise management plan is part of an EMS and include a cross-reference in the BAT on EMS.

Text proposal:

BAT 24. In order to prevent or, where that is not practicable, to reduce noise emissions, BAT is to set up and implement a noise management plan, as part of the environmental management system (see BAT 1), that includes all of the following elements:

I. a table containing actions and timelines;
II. a protocol for conducting noise monitoring in the installation;
III. a protocol for response to identified noise events;
IV. a noise reduction programme designed to identify the source(s), to measure noise emissions, to measure/estimate noise exposure, to characterise the contributions of the sources and to implement elimination and/or reduction measures;
V. a reporting programme to regularly inform management on the results of the noise management plan;
VI. a review of historical noise incidents and remedies and the dissemination of noise incident knowledge.

Applicability
The applicability of BAT 24 IV. is restricted to cases where the results of BAT 24 II. and III. show that noise emissions are likely to cause significant noise exposure in residential or other sensitive areas (e.g. recreational areas).

BAT 25. In order to prevent or, where that is not practicable, to reduce noise emissions, BAT is to use a combination of the techniques given below.

	Technique	Description	Applicability
a	Appropriate location of equipment and buildings	Noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screens.	Applicable to new plants. In the case of existing plants, the relocation of equipment may be restricted by a lack of space or excessive costs.
b	Operational measures	This includes: 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 activities.	Generally applicable.
c	Low-noise equipment	This includes compressors, pumps and flares.	Applicable to new equipment.
d	Noise-control equipment	This includes: i. noise-reducers; ii. vibration insulation; iii. enclosure of noisy equipment; iv. soundproofing of buildings.	Applicability may be restricted due to space requirements, health, and safety issues.
e	Noise abatement	Noise propagation can be reduced by inserting obstacles between emitters and receivers. Appropriate obstacles include protection walls, embankments and buildings.	Applicable to new plants. In the case of existing plants, the insertion of obstacles may be restricted by a lack of space.

2 ITEMS CONSIDERED TO BE NON-CONTROVERSIAL AND NOT REQUIRING DISCUSSION AT THE FINAL CWW TWG MEETING

2.1 General comments on Chapter 4

Location in D2:	**Chapter 4, page 661 – 694**
Current text in D2:	Chapter 4
Summary of comments:	[AT 26; PT 16]: Rearrange the structure of Chapter 4 so that issues related to the same subject can be found under the same heading (e.g. waste water, waste gas). Use the same structure in Chapters 3 and 4. [NL 143]: Use uniform roman numerals/letters within Chapter 4 so as not to suggest a preference order. [BE 22; NL 146] Clarify the process of determining BAT, for example by using the VITO methodology. [DE(D-LAWA) 13]: Replace the word 'reduce' in BAT statements with 'minimise'. [PT 3]: Restrict the applicability of techniques, depending on the subsector. [CEFIC 106, 109]: Add threshold values in the applicability section of each BAT. Otherwise, costs could become disproportionate. [AT 32]: Mention waste incineration as a technique, even if it is covered by the WI BREF.
EIPPCB assessment:	- Both Roman numerals and Latin letters have been used for BAT in previously adopted BAT conclusions. They do not represent an order of preference. - The BAT conclusions including the BAT-AELs have been established through an iterative process as described in the Preface of the BREF. - The IED uses the terminology 'to prevent, or where that is not practicable, to **reduce** emissions'. - Each technique in the BAT conclusions contains applicability restrictions, if deemed appropriate. - It does not seem to be necessary to add threshold values to each BAT conclusion given that the techniques are non-prescriptive and non-exhaustive. - Techniques that fall outside the scope of the CWW BREF do not need to be mentioned.
EIPPCB proposal:	- Restructure the BAT conclusions according to topics (Environmental Management Systems, Monitoring, Emissions to water, Waste, Emissions to air, Descriptions of techniques).

2.2 Soil and groundwater protection

Location in D2:	**Section 4.2, page 664 – 665 (BAT 3)**
Current text in D2:	**3. BAT is to prevent soil and groundwater contamination by applying a combination of the following operational techniques:** I. Testing and demonstrating the integrity and tightness of all structural boundaries and their resistance to penetration by water or other substances. II. The loading and unloading of materials only in designated areas protected against leakage run-off and whilst awaiting disposal, collecting and storing all materials in designated areas protected against leakage run-off. III. Equipping all pump sumps or other treatment plant chambers from which spillages might occur with alarms activated by high levels of liquid. IV. Establishing and carrying out of a programme for the testing and inspection of tanks and pipelines. V. Carrying out of inspections to identify possible leaks on all flanges and valves on pipes used to transport materials other than water; maintaining a log of these inspections. VI. Providing a catchment system to collect any leaks from flanges and valves on pipes used to transport materials other than water, except when the construction of flanges or valves is technically tight. VII. Providing an adequate supply of containment booms and suitable absorbent material. VIII. Testing of all bunds at least once every three to five years. IX. Avoiding or protecting underground piping and installing leak detection systems. X. Taking appropriate measures during normal operation, turn-around or major revamping to ensure that underground piping and sewers are not damaged during the intervention of heavy equipment on site (such as trucks and cranes). If necessary, this can include temporarily protecting the underground structures. XI. Regular inspection of underground pipe work visually and/or by means of a remote operated camera to detect damages and possible leaks. *[This BAT conclusion is based on information given in Section 3.1.2.2.]* **Applicability** **BAT 3(IX)** may have restrictions on applicability for existing installations. [Please TWG provide information on concrete restrictions for the applicability of the techniques listed encountered in your experience]
Summary of comments:	[CEFIC 119; NL 149]: Delete the BAT conclusion on soil and groundwater protection as the topic is outside the scope of the CWW BREF. [FR 35]: Replace 'a combination of the following operational techniques' with 'all of the following techniques' as all of the techniques seem relevant. [CEFIC 120]: Not all listed techniques used are applicable in all cases, and other techniques that are not listed may be more effective. [CEFIC 121] – BAT 3 I.: Clarify what is meant by 'testing and demonstrating' and 'all structural boundaries'. [UK 5] – BAT 3 I.: Provide more details on the type and frequency of testing. [CEFIC 123] – BAT 3 III.: Equipping pump sumps and treatment chambers with alarms should be subject to a risk assessment. [CEFIC 122] – BAT 3 VI.: Delete this BAT as it is totally unpractical. [UK 6] – BAT 3 VI.: Replace 'technically tight' with 'leak-tight'. [UK 7] – BAT 3 VIII.: Provide more details on the type of testing. [CEFIC 124] – BAT 3 IX.: Not applicable to underground sewers, only to process piping. Retrofit of leak detection in existing plants is extremely difficult. [CEFIC 125] – BAT 3 IX.: Gravity underground sewers have a number of advantages: higher buffer capacity, no spillage by backflow possible, no need for

Location in D2:	Section 4.2, page 664 – 665 (BAT 3)
	pumps and no freezing during cold weather. [SE 4] – BAT 3 IX.: In northern countries, over ground piping may be restricted due to potential freezing. [DE 35] – BAT 3 X.: Delete this BAT as it is self-evident. [CEFIC 126] – BAT 3 XI.: This is only applicable to underground sewers, but not to process piping. Camera inspection is expensive and requires diversion of the flow, so it is only carried out when damage is suspected. Pressure testing can be used to check sewer integrity, but this also is not carried out on a regular basis. [FR 34]: Add groundwater monitoring to the list of techniques. [CEFIC 127]: Retrofitting of existing installations can be prohibitively expensive and should be justified by a risk assessment.
EIPPCB assessment:	- The BREF on Emissions from Storage (EFS BREF) covers the storage, transfer and handling of liquids and solids. It addresses basically all items listed in BAT 3, but with a much higher level of detail. - A cross-reference to the EFS BREF is given in the Scope. - BAT 3 is rather generic and has no specific features related to chemical sites.
EIPPCB proposal:	- Delete BAT 3.

2.3 Energy efficiency

2.3.1 Energy efficiency at site level

Location in D2:	**Section 4.3, page 665 (BAT 4)**
Current text in D2:	The BAT conclusions on energy efficiency at the installation level and energy efficiency in energy-using systems, processes, activities or equipment presented in the Reference Document on the Best Available Techniques for Energy Efficiency apply to all chemical installations. **4. BAT is to reduce energy consumption by applying one or more of the following techniques:** I. use of excess steam II. recovery of exothermic reaction heat through the generation of low-pressure steam III. energetically coupled distillation. *[This BAT conclusion is based on information given in Section 3.7.2.]* **Applicability** The applicability of the techniques is site-specific. Any restriction on applicability will be for existing installations only. [Please TWG provide information on concrete restrictions for the applicability of the techniques listed encountered in your experience]
Summary of comments:	[NL 150]: Delete all BAT conclusions on energy consumption as the topic is outside the scope of the CWW BREF. [DK 33, 34]: Add a cross-reference to the BREFs on Energy Efficiency (ENE BREF) and Industrial Cooling Systems (ICS BREF). [CEFIC 128]: BAT 4 relates to the energy management of the production units and is therefore outside the scope of the CWW BREF. Delete BAT 4 as it only scratches the surface of what energy management means. A complete description would be far too long and is inappropriate as a BAT conclusion. [DE 36]: The list of techniques is incomplete. More techniques can be found in Section 3.7 of the BREF. There are sites where none of the techniques can be applied. [AT 38]: List only techniques that are not covered by the ENE BREF. [CEFIC 130; CONCAWE 114]: Excess steam that is used, is no longer in excess. Modify to 'minimise excess steam' or 'optimise steam use'. [CONCAWE 115]: It makes no sense to generate low-pressure steam if it is not needed. High-pressure steam or hot water could also be generated. The recovery of exothermic reaction heat may not always lead to net energy savings. [CONCAWE 116]: Applicability restrictions also apply to new installations due to considerations on operability and cost effectiveness.
EIPPCB assessment:	- The ENE BREF covers steam systems (e.g. Section 4.3.2, BAT 18) and heat recovery (e.g. Sections 4.2.2, BAT 6, and 4.3.3, BAT 19). These are generic issues. - Energetically-coupled distillation is a process-specific issue that is better covered in relevant vertical chemical BREFs. - A cross-reference to the ENE BREF is already given in the scope.
EIPPCB proposal:	- Delete BAT 4. - Add a cross-reference to the ICS BREF in the scope.

2.3.2 Energy efficiency at the waste water treatment plant

Location in D2:	**Section 4.3, page 665 (BAT 5)**
Current text in D2:	**5. BAT is to reduce energy consumption at central waste water pretreatment and/or treatment plants by adopting an energy management plan. The key components of an energy management plan are:** I. to create a system to track energy usage and costs II. to perform energy audits of major operations III. to upgrade equipment, systems and controls, including facility and collection system improvements to increase energy efficiency IV. to develop a cost-effective electric supply purchasing strategy V. to optimise load profiles by shifting operations to store waste water during periods of highest load rather than operating pumps, where possible VI. to develop in-house energy management training for operators. *[This BAT conclusion is based on information given in Section 3.7.3.]*
Summary of comments:	[NL 150]: Delete all BAT conclusions on energy consumption as the topic is outside the scope of the CWW BREF. [DE 49]: Delete BAT 5 as an energy management plan is described in the ENE BREF. [AT 40; CEFIC 129]: The energy consumption of the WWTP must be managed within the overall site energy management plan. [AT 39]: Clarify whether the components of BAT 5 are minimum requirements or possible key components. [CONCAWE 117]: BAT 5 III. could require changes of perfectly working equipment. Energy efficiency should instead be considered when upgrading equipment. [CONCAWE 113; UK 8] – BAT 5 IV.: A cost-effective purchasing strategy does not reduce energy consumption. [DK 28] – BAT 5 V.: Storage of rainwater to minimise the use of pumps can lead to odour problems.
EIPPCB assessment:	- Although it was agreed at the kick-off meeting that energy efficiency of waste water and waste gas treatment plants should be addressed in the CWW BREF, limited specific information was provided. - The ENE BREF covers energy efficiency management systems (e.g. Section 4.2.1, BAT 1). This covers most of the items described above, such as monitoring (Section 4.2.9, BAT 16), energy audits (Section 4.2.2.2, BAT 3 and 4), upgrades (Section 4.2.3, BAT 10 and the whole Section 4.3), and training (Section 4.2.6, BAT 13). - BAT 5 is rather generic and has almost no specific features related to the WWTP (except for the load optimisation).
EIPPCB proposal:	- Delete BAT 5. - Add in the chapter on 'Concluding remarks and recommendations for future work' that the issue should be addressed during the next BREF review.

2.4 Emissions to water

2.4.1 Waste water collection and segregation

2.4.1.1 Prevention of run-off rainwater contamination

Location in D2:	**Section 4.8.1, page 671 (BAT 21)**
Current text in D2:	**21. BAT is to avoid the contamination of rainwater from production-related activities by applying a combination of the following techniques:** I. installing roofs over production areas II. installing roofs over storage areas III. avoiding overpressure/safety venting discharges (e.g. from relief valves of tanks) to roofed areas and protecting the discharge port of the venting devices from rainwater. **Applicability** Applicable to all new plants. **BAT 21(II)** is subject to safety constraints. Any restriction on applicability will be for existing installations only. [Please TWG provide information on restrictions for the applicability of the techniques listed encountered in your experience] *[This BAT conclusion is based on information given in Section 3.2.3.4.5.]*
Summary of comments:	[NL 170]: Change wording of BAT statement to 'prevent contamination', because complete avoidance is impossible. [FI 3]: Installing roofs over production and storage areas may be restricted due to safety reasons. [CEFIC 161, 162]: Although installing roofs is appropriate in many cases, this is not always technically feasible or useful. In some cases, it would require some km^2 of roof area. [FR 42; PT 17]: Installing roofs over storage areas may be limited due to safety concerns (e.g. less effective firefighting possible). The applicability restriction of BAT 21(II) should also apply to new plants. [CEFIC 162]: Safety devices need to be placed outside roofed areas.
EIPPCB assessment:	- The complete prevention of run-off rainwater contamination is not always feasible. - The applicability of BAT 21 I. and II. may be restricted due to safety reasons or due to a large surface area. This applies to new and existing plants. - BAT 21. III. stipulates that discharges from safety devices should not be directed to roofed areas.
EIPPCB proposal:	- Modify the BAT statement: 'In order to prevent or, where this is not practicable, to reduce the contamination of rainwater run-off, … '. - Merge BAT 21. I. and II and modify their applicability.

Text proposal:

BAT 7. In order to prevent or, where this is not practicable, to reduce the contamination of run-off rainwater, BAT is to use both of the techniques given below.

	Technique/Description	Applicability
a	Install roofs over production and storage areas.	Applicability may be restricted due to safety reasons or in the case of large surface areas.
b	Avoid overpressure/safety vent discharges (e.g. from tank relief valves) to roofed areas and protect the discharge port of the venting devices from rainwater.	Generally applicable.

2.4.1.2 Temporary storage of rainwater/firefighting water

Location in D2:	**- Section 4.2, page 664 (BAT 2 VI.)** **- Section 4.8.1, page 671 (BAT 22)** **- Section 4.9.2, page 679 (BAT 40)**
Current text in D2:	**2. BAT is to reduce the environmental risks and impacts by applying all of the following management techniques:** … VI. having an emergency storage capacity at the chemical site in order to allow the storage of any spillage into the waste water collection system at the site and/or fire-fighting water for its further recovery, treatment and/or safe disposal. *[This BAT conclusion is based on information given in Section 3.1.2.]* … **22. BAT is to prevent uncontrolled discharge of potentially contaminated rainwater from production areas and fire-fighting water from a chemical site by collecting them in a storage tank for their further control, treatment and/or disposal.** **The parameters to be monitored and the frequency of monitoring need to be adopted to the frequency and duration of the expected rainfall episodes, the size of the chemical site, the activities carried out at the site and their potential impact to the receiving water body.** **If the monitoring results demonstrate that the rainwater is not contaminated, BAT is to apply one or more of the following techniques:** I. reuse of the rainwater as process water at the chemical site II. direct discharge to the receiving water body III. discharge to the municipal sewerage system. *[This BAT conclusion is based on information given in Section 3.2.3.4.5.]* … **40. BAT is to reduce the emission of pollutants to the receiving environment due to operational failures, equipment leakages and any accidental spills by having a buffer storage capacity available in order to store waste waters for their further recovery, treatment and/or disposal.** *[This BAT conclusion is based on information given in Section 3.2.3.3.]*
Summary of comments:	BAT 2 VI.: [ES(C) 5]: At sites where explosives are manufactured, there is no firefighting due to safety issues. Storage capacities for firefighting water are thus obsolete. [DK 27]: Collection of firefighting water may be difficult since it is hard to assess amounts from the external contingency. Sometimes foam is used. [UK 4]: Specify the storage capacity for firefighting water (e.g. for two hours). BAT 22: [DE(LAWA) 19; CEFIC 163]: Firefighting water has different characteristics to potentially contaminated rainwater (e.g. it may contain perfluorinated compounds) and should be treated differently. [DK 29]: Collection of firefighting water may be difficult since it is hard to assess amounts from the external contingency. Sometimes foam is used. [CEFIC 163]: On-site monitoring of rainwater is not necessary when the waste water is monitored at the discharge point.

Location in D2:	**- Section 4.2, page 664 (BAT 2 VI.)** **- Section 4.8.1, page 671 (BAT 22)** **- Section 4.9.2, page 679 (BAT 40)**
	[CEFIC 163]: The reuse of rainwater as process water is usually not possible due to the limited quantity and quality. [NL 168]: Uncontaminated rainwater may be reused for other purposes. [NL 169]: The discharge of uncontaminated rainwater to the sewerage system reduces the efficiency of the municipal WWTP. [CEFIC 163]: The storage of potentially contaminated rainwater requires its segregation which cannot be retrofitted to existing plants. BAT 40: [CEFIC 186]: BAT 40 is a repetition of BAT 2 VI. [AT 58] For BAT 40, it is not clear where the storage of the waste water should be located (prior to pretreatment, prior to final treatment, after final treatment). [CEFIC 186; ES(A) 3]: For BAT 40, the need for additional storage capacity should be subject to the results of a risk assessment. [FI 11, 12]: Building additional containers/pools is not always possible at existing facilities.
EIPPCB assessment:	- BAT 2 VI., BAT 22, and BAT 40 address the interim storage of waste water to prevent uncontrolled discharges. - The nature of such storage tanks and their capacities are site-specific.
EIPPCB proposal:	- Merge BAT 2 VI., BAT 22, and BAT 40 and concentrate on the essential: the provision of appropriate buffer storage capacity for waste water incurred during other than normal operating conditions (e.g. fire event). - Add an applicability restriction that the temporary storage of contaminated rainwater requires its segregation which may not be applicable at existing installations.

Text proposal:

BAT 9. In order to prevent uncontrolled emissions to water, BAT is to provide appropriate buffer storage capacity for waste water incurred during 'other than normal' operating conditions (e.g. for off-specification waste water, firefighting water, and contaminated rainwater) for its further control, treatment and discharge.

Applicability

The interim storage of contaminated rainwater requires segregation, which may not be applicable at existing installations, in particular in the case of minor contributions of rainwater to the total waste water volume.

[This BAT conclusion is based on information given in Section 3.2.3.4.5.]

2.4.1.3 Treatment of contaminated rainwater

<table>
<tr><td>Location in D2:</td><td>Section 4.8.1, page 672 (BAT 23)</td></tr>
<tr><td>Current text in D2 (2):</td><td>23. BAT is to remove the pollutants from the contaminated rainwater collected at chemical sites by a combination of physical, chemical and/or biological treatment techniques. The following techniques can be applied for the treatment of contaminated rainwater:

<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I. retention ponds</td><td>Applicable where it can be accommodated within the available space at the chemical site.</td></tr>
<tr><td>II. sand filters</td><td>Typically applicable to contaminated rainwater with a solids content of 50 – 100 mg/l.</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 4.12.1.</td></tr>
</table>

[This BAT conclusion is based on information given in Section 3.2.3.4.5.]</td></tr>
<tr><td>Summary of comments:</td><td>[CEFIC 164; DE(LAWA) 20]: If a site has a biological WWTP, then contaminated rainwater will usually be treated there.
[CEFIC 164]: Delete BAT 23.
[AT 46; DE(LAWA) 20; NL 171]: Other techniques exist.
[AT 46]: Reformulate BAT 23: '23. BAT is to remove the pollutants from the contaminated rainwater collected at chemical sites by a combination of physical, chemical and/or biological treatment techniques.'
[CEFIC 164]: Retention ponds require a large space that is often not available at existing or even new sites.
[DK 30; NL 171]: The described techniques only target suspended solids. They do not abate dissolved substances.
[DK 37]: Add achievable performance levels to the techniques.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- For contaminated rainwater, there is usually no separate WWTP. Instead, it is treated together with other process waste water.</td></tr>
<tr><td>EIPPCB proposal:</td><td>- Delete BAT 23.</td></tr>
</table>

2.4.1.4 Water consumption and waste water generation

Location in D2:	**Section 4.9, page 672 – 673 (BAT 25)**
Current text in D2:	**25. BAT is to reduce the consumption of fresh water, to reduce the volume and/or load of waste water streams, to enhance the reuse of waste water within the production processes and/or to recover and reuse raw materials by applying one or more of the following process-integrated techniques:** I. countercurrent extraction II. reactive extraction III. multiple use and recirculation of waste water effluents IV. indirect cooling with vapour phases V. water-free vacuum generation VI. liquid ring vacuum pumps using solvents as the ring medium VII. closed cycle liquid ring vacuum pumps VIII. water-free processes for waste gas treatment IX. substance recovery from mother liquors and substance retention by optimised processes X. use of low contaminated raw materials and auxiliaries XI. countercurrent product washing. **Description** The descriptions of the techniques are given in Section 4.12.3. [Please TWG provide information on restrictions for the applicability of the techniques listed encountered in your experience] *[This BAT conclusion is based on information given in Section 3.2.3.1.]*
Summary of comments:	[AT 47]: Depending on the local abundance/scarcity of water resources, cross-media effects may offset the benefits of reduced water consumption. [AT 47, CEFIC 166]: The list should be non-exhaustive. The applicability of individual techniques depends on the characteristics of the production process. [CEFIC 166]: The best solution to reduce water consumption depends on local conditions. The term 'fresh water' should be defined (Is brackish water included?). The term 'water consumption' should be defined (Is water taken from a river and returned to the same river consumed?). [CEFIC 167]: Differentiate between new and existing facilities. Opportunities for retrofitting are generally limited.
EIPPCB assessment:	- BAT 25 is rather generic. - The recycling and reuse of substances is often carried out at the plant level and depends on operating conditions. - Recycling and reuse options should be better described in the vertical chemical BREFs where usually more information on applicability restrictions is available. - Process-integrated techniques should fall under the scope of the vertical chemical BREFs as outlined in the Commission presentation at the IED Article 13 Forum meeting in September 2012.
EIPPCB proposal:	- Delete BAT 25.

2.4.1.5 Waste water collection

Location in D2:	**Section 4.9, page 672 – 673 (BAT 26)**
Current text in D2:	**26. BAT is to remove the pollutants from waste waters generated at chemical sites before their discharge to a receiving water body by applying one of the following techniques.** I. Collection of waste waters and their treatment at a central waste water treatment plant on the chemical site, with or without an on-site central pretreatment of the tributary streams. II. Collection of waste waters and their treatment at a waste water treatment plant outside the chemical site, provided that an equivalent level of protection of the environment as a whole is guaranteed and provided this does not lead to higher levels of pollution in the environment compared with the application of **BAT 26(I)**. Waste waters generated at the chemical site might be subject to an on-site central pretreatment prior to their discharge to an off-site waste water treatment plant.
Summary of comments:	[NL 173]: The BAT statement should refer to the collection and treatment of waste water instead of referring to the removal of pollutants. [CEFIC 169; FR 43; PT 18]: Central treatment may not be necessary. Decentralised treatment may ensure an equivalent level of environmental protection. [FI 10]: For BAT 26 I., clarify if it applies to new or existing sites. To build additional tributary treatments in existing facilities is not always possible. [DE(LAWA) 22]: Add criteria when the treatment in a WWTP outside the chemical site can be considered equivalent. [SARP 8]: Add performance levels to avoid dilution, in particular to BAT 26 II. [AT 48, 57, 64]: Set BAT-AELs for indirect discharges.
EIPPCB assessment:	- A central WWTP may not always be necessary. - Outside treatment of waste water in independently operated WWTP (activity 6.11 of Annex I to IED) is clarified in the scope. - BAT 26 is covered by the new BAT conclusion on 'integrated waste water management' that refers to an appropriate combination of process-integrated techniques, waste water treatment at source, waste water pretreatment and final waste water treatment.
EIPPCB proposal:	- Delete BAT 26.

2.4.2 Waste water treatment

2.4.2.1 Pretreatment

2.4.2.1.1 Generic issues

Location in D2:	**Section 4.9.1, page 673 – 678 (BAT 28 – 38)**
Current text in D2:	Section 4.9.1
Summary of comments:	[BE 19]: Add an overview of parameters versus pretreatment techniques. [DE(LAWA) 8, 25, 31, 38, 79; FR 44; SARP 10]: '… at a level that could adversely affect the downstream biological waste water treatment': The aim of the techniques described in BAT 28 – 38 is more to reduce emissions than to protect the biological WWTP. [DE(LAWA) 21; NL 172]: The downstream WWTP will in most cases be biological, but not in all. [CEFIC 168, 171, 172, 175, 176, 177, 180, 181, 182, 183]: Merge BAT 28 – 29, 31 – 33, 35 – 38 into one recommendation. [DK 38]: Add performance levels which can be achieved by the different pretreatment techniques. [CEFIC 167]: Differentiate between new and existing facilities. Opportunities for retrofitting are generally limited.
EIPPCB assessment:	- Pretreatment is part of integrated waste water management and treatment strategy. It is largely installation-specific. - Some techniques can abate more than one pollutant. - The abatement efficiencies of many of the techniques are strongly dependant on the substance and the waste water composition. - Applicability restrictions are described for each technique.
EIPPCB proposal:	- Merge all pretreatment techniques into one BAT conclusion and add a new column with the heading 'typical pollutants abated'. - Clarify that pretreatment aims to reduce emissions to water when the waste water contains pollutants which cannot be adequately dealt with during final treatment. Include provisions in the description when pretreatment is necessary. - Clarify that pretreatment is part of an integrated waste water management and treatment strategy. - Specify that pretreatment is generally carried out as close as possible to the source to avoid dilution, but that combined pretreatment of waste water streams with similar characteristics is sometimes also used.

Text proposal: See Section 1.4.2.1.4 of this BP.

2.4.2.1.2 Recovery/disposal of removed heavy metals

Location in D2:	**Section 4.9.1, page 674 (BAT 30)**
Current text in D2:	**30. BAT is to avoid any subsequent risk to the environment upon the removal of heavy metals when applying any of the techniques cited in BAT 29 by recovering of the removed heavy metals and/or safely disposing of any residue formed containing heavy metals.**
Summary of comments:	[CEFIC 173, 174]: Delete BAT 30, as it is covered by BAT 6 (waste management plan). In addition, waste treatment is outside the scope of the CWW BREF.
EIPPCB assessment:	- Waste management is an integral part of an Environmental Management System. - BAT 30 is rather generic and reflects the waste hierarchy of Article 4 of Directive 2008/98/EC on waste. - The recycling and reuse of substances is often carried out at the plant level and depends on operating conditions. - Recycling and reuse options should be better described in the vertical chemical BREFs where usually more information on applicability restrictions is available. - Process-integrated techniques should fall under the scope of the vertical chemical BREFs as outlined in the Commission presentation at the IED Article 13 Forum meeting in September 2012. - The disposal of waste is outside the scope of the CWW BREF. - The treatment of waste water treatment sludges is addressed in a merged BAT conclusion described in Section 1.5.2.
EIPPCB proposal:	- Delete BAT 30.

2.4.2.1.3 Cyanides

<table>
<tr><td>Location in D2:</td><td>Section 4.9.1, page 675 (BAT 31)</td></tr>
<tr><td>Current text in D2:</td><td>
Tributary waste water streams containing
cyanides at a level
that could adversely affect the downstream biological waste water treatment

When the cyanide concentration in a segregated tributary waste water stream, as stipulated by BAT 27, is above 4 mg/l before a downstream biological waste water treatment then BAT 31 shall apply.

31. BAT is to reduce the cyanide concentration in the tributary waste water streams prior to their discharge to a downstream biological waste water treatment plant by applying one of the following techniques:
<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I. Chemical oxidation</td><td>Restrictions may exist due to the risk of generating organic halides with the use of chlorine, hypochlorite and chlorite (or the respective halogen compounds) as the oxidising agent.</td></tr>
<tr><td>II. Chemical hydrolysis</td><td>Applicable for the removal of organically bound cyanides. Low solubility in aqueous media may restrict the applicability.</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 4.12.1.</td></tr>
</table>
[This BAT conclusion is based on information given in Section 3.2.3.4.3.3 (chemical oxidation) and Section 3.2.3.4.3.7 (chemical hydrolysis).]
</td></tr>
<tr><td>Summary of comments:</td><td>[DE(LAWA) 29] – BAT 31: Other techniques may be used to destroy cyanides. Use the BAT conclusion from the OFC BREF.
[CEFIC 175] – BAT 31: Clarify the basis for the threshold value of 4 mg/l of cyanide. The application point is unclear (tributary stream or influent to WWTP).</td></tr>
<tr><td>EIPPCB assessment:</td><td>- The OFC BREF describes several techniques to destroy cyanides: oxidation with NaOCl, H_2O_2 or O_2; hydrolysis; biological degradation (either directly or after reaction with formaldehyde to cyanhydrine).
- In the OFC BREF, oxidation of cyanides with NaOCl is not considered BAT due to the potential for AOX formation.
- The OFC BREF reports that chemical hydrolysis can also be used for inorganic cyanides.
- It does not seem to be necessary to specifically mention nitriles (i.e. organically-bound cyanides).
- The threshold values of cyanides in tributary waste water streams upstream of a biological WWTP are site-specific.</td></tr>
<tr><td>EIPPCB proposal:</td><td>- Merge BAT 28, 29, 31, 32, 33, 35, 36 and 38 into one BAT conclusion on pretreatment and add a new column with the heading 'typical pollutants abated'.
- Add cyanides as typical pollutants that can be abated by oxidation, wet air oxidation and hydrolysis.
- Mention in the description of 'Chemical oxidation' that the use of chlorine, hypochlorite and chlorine dioxide is restricted to cases where it does not lead to the formation of halogenated organic compounds (i.e. AOX).
- Delete introductory text on cyanides before BAT 31.</td></tr>
</table>

Text proposal: See Section 1.4.2.1.4 of this BP.

2.4.2.1.4 Oils, hydrocarbons and/or emulsions

<table>
<tr><td>Location in D2:</td><td>Section 4.9.1, page 675 – 676 (BAT 32 – 34)</td></tr>
<tr><td>Current text in D2:</td><td>
Tributary waste water streams containing
free oils, hydrocarbons and/or emulsions at a level
that could adversely affect the downstream biological waste water treatment

When the free oils, hydrocarbons and/or emulsions in a segregated tributary waste water stream, as stipulated by BAT 27, before a downstream biological waste water treatment is at a level that could adversely affect the biological system, then BAT 32 and/or BAT 33 and BAT 34 shall apply.

32. BAT is to break emulsions and avoid their release to the environment by use of emulsion-breaking chemicals prior to their discharge to a downstream biological waste water treatment plant.

[This BAT conclusion is based on information given in Section 3.2.3.4.2.7.]

33. BAT is to remove free oil, grease, de-emulsified oil (from BAT 32) and other non-soluble light liquids that tend to build up on top of the waste waters prior to their discharge to a downstream biological waste water treatment plant by applying one of the following techniques:

<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I. API separator</td><td>Applicable to large slugs of free oil.</td></tr>
<tr><td>II. Parallel plate interceptor</td><td>Applicable to small oil droplets.</td></tr>
<tr><td>III. Corrugated plate interceptor</td><td>Applicable to small oil droplets.</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 4.12.1.</td></tr>
</table>
[This BAT conclusion is based on information given in Section 3.2.3.4.2.7.]

34. BAT is to avoid any subsequent risk to the receiving environment by recovering and reusing the skimmed oil (from BAT 33) in the process units and/or safely disposing of the skimmed oil.

[This BAT conclusion is based on information given in Section 3.2.3.4.2.7.]
</td></tr>
<tr><td>Summary of comments:</td><td>
[CEFIC 176] – BAT 32: BAT 32 is an operating instruction, not a verifiable permit condition. At most plants it is not necessary.
[AT 51] – BAT 33: Oil and grease can also be removed by adsorption on activated carbon and textiles.
[CEFIC 178, 179] – BAT 34: Delete 34, as it is covered by BAT 6 (waste management plan). In addition, waste treatment is outside the scope of the CWW BREF.
</td></tr>
<tr><td>EIPPCB assessment:</td><td>
- Emulsion-breaking is often not necessary at chemical sites. It requires a subsequent oil-water separation.
- The three techniques described in BAT 33 can be grouped under oil-water separation (see Section 3.2.3.4.2.7 of D2 CWW BREF). The same grouping is used in the REF BREF.
- Waste management is an integral part of an Environmental Management System.
- BAT 34 is rather generic and reflects the waste hierarchy of Article 4 of Directive 2008/98/EC on waste.
- The recycling and reuse of substances is often carried out at the plant level and depends on operating conditions.
- Recycling and reuse options should be better described in the vertical chemical BREFs where usually more information on applicability restrictions is available.
- Process-integrated techniques should fall under the scope of the vertical chemical BREFs as outlined in the Commission presentation at the IED Article 13 Forum meeting in September 2012.
</td></tr>
</table>

Location in D2:	**Section 4.9.1, page 675 – 676 (BAT 32 – 34)**
EIPPCB proposal:	- Merge BAT 28, 29, 31, 32, 33, 35, 36 and 38 into one BAT conclusion on pretreatment and add a new column with the heading 'typical pollutants abated'. - Merge techniques from BAT 33 into one technique 'oil-water separation'. - Delete BAT 34, but include emulsion-breaking in the description of the technique 'oil-water separation'. - Delete introductory text before BAT 32.

Text proposal: See Section 1.4.2.1.4 of this BP.

2.4.2.1.5 Inorganic salts

<table>
<tr><td>Location in D2:</td><td>Section 4.9.1, page 676 (BAT 35)</td></tr>
<tr><td>Current text in D2:</td><td>
Tributary waste water streams containing
inorganic salts (mainly chlorides and sulphates) at a level
that could adversely affect the downstream biological waste water treatment

When the inorganic salt concentration in a segregated tributary waste water stream, as stipulated by BAT 27, before a downstream biological waste water treatment is at a level that could adversely affect the biological system, then BAT 35 shall apply.

35. BAT is to reduce the inorganic salts (mainly chlorides and sulphates) in the tributary waste water streams prior to their discharge to a downstream biological waste water treatment plant by applying one of the following techniques:
<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I. Nanofiltration</td><td>Suspended particles in the feed should be low.</td></tr>
<tr><td>II. Reverse osmosis</td><td>Suspended particles in the feed should be low.</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 4.12.1.</td></tr>
</table>
[Please TWG provide concrete information on the suspended particle concentration for the feed to nanofiltration and reverse osmosis that restricts their applicability based on your experience]

[This BAT conclusion is based on information given in Section 3.2.3.4.3.8.]
</td></tr>
<tr><td>Summary of comments:</td><td>[DE(LAWA) 30] – BAT 35: The removal of salts is restricted to special cases. BAT 35 should be deleted.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- During the survey, two plants (i.e. #06 an #11) reported using nanofiltration for the pretreatment of organic waste water streams and three plants reported using reverse osmosis for the pretreatment of organic (i.e. #68) and inorganic waste water streams (i.e. #05, #58).
- As stipulated in the 'General considerations', the list of techniques is non-prescriptive and non-exhaustive.
- The applicability formulations refer more to engineering requirements than to actual restrictions.</td></tr>
<tr><td>EIPPCB proposal:</td><td>- Merge BAT 28, 29, 31, 32, 33, 35, 36 and 38 into one BAT conclusion on pretreatment and add a new column with the heading 'typical pollutants abated'.
- Keep 'nanofiltration' and 'reverse osmosis' in the list of pretreatment techniques.
- Add low-/non-biodegradable or toxic organic compounds (e.g. halogenated organic compounds) and inorganic compounds as typical pollutants that can be abated by nanofiltration or reverse osmosis.
- Modify the applicability restrictions to 'Generally applicable'.
- Delete introductory text before BAT 35.</td></tr>
</table>

Text proposal: See Section 1.4.2.1.4 of this BP.

2.4.2.1.6 Phenols

<table>
<tr><td>Location in D2:</td><td>Section 4.9.1, page 677 – 678 (BAT 37)</td></tr>
<tr><td>Current text in D2:</td><td>
Tributary waste water streams containing
phenols at a level
that could adversely affect the downstream biological waste water treatment

When the phenol concentration in a segregated tributary waste water stream, as stipulated by BAT 27, before a downstream biological waste water treatment is at a level that could adversely affect the biological system, then BAT 37 shall apply.

37. BAT is to reduce the phenols in the tributary waste water streams prior to their discharge to a downstream biological waste water treatment plant by applying one of the following techniques:
<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>I. Extraction</td><td>Waste water should be almost free of suspended solids and/or emulsions.</td></tr>
<tr><td>II. Adsorption with activated carbon</td><td>Total suspended solids concentration should be less than 20 mg/l for fixed-bed adsorbers and less than 10 mg/l for moving bed adsorbers. Pollutant concentration should be less than 100 mg/l without adsorbent recovery and less than 500 g/l with adsorbent recovery.</td></tr>
<tr><td>III. Wet oxidation with hydrogen peroxide</td><td>Dilution or a multi-reactor system is required for TOC concentrations above 10 000 mg/l.</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 4.12.1.</td></tr>
</table>

[This BAT conclusion is based on information given in Section 3.2.3.4.3.12 (extraction), Section 3.2.3.4.3.10 (adsorption) and Section 3.2.3.4.3.3.1 (oxidation with hydrogen peroxide)]
</td></tr>
<tr><td>Summary of comments:</td><td>[CEFIC 182] – BAT 37: Phenols are easily biodegradable and no pretreatment is necessary.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- Phenols are generally highly biodegradable.
- The technique 'Wet oxidation with hydrogen peroxide' is a specific application of the technique 'Chemical oxidation'.</td></tr>
<tr><td>EIPPCB proposal:</td><td>- Delete BAT 37 and the introductory text.</td></tr>
</table>

2.4.2.1.7 Adsorbable organically-bound halogens (AOX)

<table>
<tr><td>Location in D2:</td><td>Section 4.9.1, page 678 (BAT 38)</td></tr>
<tr><td>Current text in D2:</td><td>
Tributary waste water streams containing adsorbable organically bound halogens (AOX) at a level that could adversely affect the downstream biological waste water treatment

When the adsorbable organically bound halogens (AOX) in a segregated tributary waste water stream, as stipulated by BAT 27, before a downstream biological waste water treatment are at a level that could adversely affect the biological system, then BAT 38 shall apply.

38. BAT is to reduce the adsorbable organically bound halogens (AOX) prior to their discharge to a downstream biological waste water treatment plant by using one of the following techniques:
<table>
<tr><th>Technique ([1])</th><th>Applicability</th></tr>
<tr><td>▪ Wet air oxidation</td><td>Dilution required for COD concentrations above 100 000 mg/l. Fluoride concentration should be less than 10 mg/l for low-pressure oxidation and less than 5 mg/l for high-pressure oxidation. To avoid corrosion, chloride concentration should be less than 50 g/l.</td></tr>
<tr><td>▪ Adsorption</td><td>Total suspended solids concentration should be less than 20 mg/l for fixed-bed adsorbers and less than 10 mg/l for moving bed adsorbers. Pollutant concentration should be less than 100 mg/l without adsorbent recovery and less than 500 g/l with adsorbent recovery.</td></tr>
<tr><td>▪ Extraction</td><td>Waste water should be almost free of suspended solids and/or emulsions.</td></tr>
<tr><td>▪ Chemical hydrolysis</td><td>Low solubility in aqueous media may restrict the applicability.</td></tr>
<tr><td colspan="2">([1]) The descriptions of the techniques are given in Section 4.12.1.</td></tr>
</table>
[This BAT conclusion is based on information given in Section 3.2.3.4.3.4 (wet air oxidation), Section 3.2.3.4.3.10 (adsorption), Section 3.2.3.4.3.12 (extraction) and Section 3.2.3.4.3.7 (chemical hydrolysis).]
</td></tr>
<tr><td>Summary of comments:</td><td>No specific comments on this BAT conclusion.</td></tr>
<tr><td>EIPPCB assessment:</td><td>- See Section 1.4.2.1.3 of this BP.</td></tr>
<tr><td>EIPPCB proposal:</td><td>- Merge BAT 28, 29, 31, 32, 33, 35, 36 and 38 into one BAT conclusion on pretreatment and add a new column with the heading 'typical pollutants abated'.
- Delete introductory text before BAT 38.</td></tr>
</table>

Text proposal: See Section 1.4.2.1.4 of this BP.

2.4.2.2 Final treatment

2.4.2.2.1 Generic BAT conclusions

Location in D2:	**Section 4.9.2, page 679 (BAT 39)**
Current text in D2:	Once all the required measures to reduce the generation of waste waters are taken at all the installations at the chemical site and tributary waste water streams have been treated either individually at the chemical installations and/or at a central waste water pretreatment plant (BAT 28 to BAT 38), the final resulting waste water is treated according to BAT 26. The BAT conclusions presented in this section are applicable to central waste water treatment plants at chemical sites. The treatment of waste waters in urban waste water treatment plants is not within the scope of this document. **39. BAT is to prevent fluctuations in the effluent waste water quality and to lower effluent emissions by balancing of flows and pollution loads/concentrations at the inlet to the central waste water treatment plant by using an equalisation tank.** *[This BAT conclusion is based on information given in Section 3.2.3.2.]*
Summary of comments:	[AT 55]: BAT 27 should be mentioned in the paragraph before BAT 39 ('BAT 27 to BAT 38'). [AT 56; FR 46; PT 19]: Clarify the scope with respect to the (co-)treatment of urban waste water. [CEFIC 191]: Combine BAT 39 – 43. [CEFIC 184, CEFIC 185]: Equalisation tanks at the central WWTP are not always necessary. Equalisation may be decentralised or carried out using other management techniques. Central equalisation tanks can have disadvantages such as solids precipitation, odour formation, chemical reactions etc.
EIPPCB assessment:	- It is proposed to delete BAT 27 (see Section 1.4.1.2 of this BP). - Further scope clarifications are not needed here (see Section 1.1.1 of this BP). - Equalisation tanks are typically part of the final waste water treatment, but they are not always necessary.
EIPPCB proposal:	- Merge BAT 39, 41, 42, and 43 into one BAT conclusion on final waste water treatment and add a new column with the heading 'typical pollutants abated'. - Specify in the description that 'equalisation' may also be decentralised or carried out using other management techniques.

Text proposal: See Section 1.4.2.2.4 of this BP.

2.4.2.2.2 Phosphorous

Location in D2:	**Section 4.9.2**
Current text in D2:	No techniques proposed for the removal of phosphorous.
Summary of comments:	No comments submitted.
EIPPCB assessment:	- Phosphorous is a relevant pollutant in the chemical industry sector as shown in the revised Chapter 1. - Phosphorous removal via chemical precipitation is carried out by a number of installations in the survey.
EIPPCB proposal:	- Add the technique 'chemical precipitation' to the list of techniques.

Text proposal: See Section 1.4.2.2.4 of this BP.

2.5 Emissions to air

2.5.1 Waste gas collection

Location in D2:	**Section 4.8.2, page 672 (BAT 24)**
Current text in D2:	**24. BAT is to reduce the volume of waste gas to be treated by minimising the gas flow rate to the control unit by enclosing the emission sources as much as possible by means of separating the sources of emission from their surroundings.** **Applicability** The applicability is restricted due to concerns related to operability (access to equipment), safety (avoiding concentrations too close to the lower explosive limit, LEL) and hygiene (where operator access is required inside the enclosure). *[This BAT conclusion is based on information given in Section 3.1.5.2.5.2.]*
Summary of comments:	[CEFIC 165]: Operability issues can also impose a minimum air flow rate, e.g. when spraying to ensure that overspray droplets are entrained out of the spray booth.
EIPPCB assessment:	- Operability issues are already addressed under applicability.
EIPPCB proposal:	- Keep the proposed BAT. - Clarify that the purpose of this BAT is to reduce emissions to air. - Include minor editorial changes.

Text proposal:

BAT 16. In order to reduce emissions to air, BAT is to enclose the emission sources, where possible.

Applicability
The applicability may be restricted by concerns on operability (access to equipment), safety (avoiding concentrations close to the lower explosive limit, LEL) and health (where operator access is required inside the enclosure).

[This BAT conclusion is based on information given in Section 3.1.5.2.5.2.]