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Circular Economy and Industrial Leadership

Seville, 31 March 2021

Final meeting of the Technical Working Group (TWG)

for the review of the BAT reference document for the Textiles Industry (TXT BREF)

25 May – 11 June 2021 (tentative)

BACKGROUND PAPER (BP)

Purpose of this background paper and of the final Technical Working Group (TWG) meeting

The objective of this background paper is to outline the main issues proposed to be discussed at the final meeting of the Technical Working Group for the review of the BAT reference document for **'the Textiles Industry'** (TXT BREF) under the Industrial Emissions Directive (IED) (2010/75/EU).

The meeting is intended to be held as web-based meeting in the period 25 May to 11 June 2021 with the objective of agreeing upon the remaining work needed to finalise the review of the TXT BREF. In particular, it is proposed that the TWG meeting focuses on:

I. agreeing on the draft BAT conclusions and therefore on the actual text in Chapter 5 (and related items) of the TXT BREF;
II. agreeing on the main corresponding modifications proposed for the sections on 'Techniques to consider in the determination of BAT';
III. identifying elements that should be mentioned in Chapter 7 of the TXT BREF (i.e. Concluding remarks and recommendations for future work);
IV. agreeing upon the remaining work needed for finalising the BREF review.

This BP includes:

- background information for the final TWG meeting;
- a summary of the main TWG comments received on the first draft of the revised TXT BREF (published in December 2019) and the EIPPCB assessment of those comments;
- the proposed modifications to the draft TXT BREF resulting from the TWG members' comments, focusing on the proposed changes to the draft BAT conclusions;
- the proposals to include, when appropriate, in the Concluding remarks and recommendations for future work chapter of the BREF.

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Background information

The kick-off meeting for the review of the TXT BREF was held from 12-15 June 2018 in Seville, Spain. The data collection process was officially scheduled from mid-February to end of-April 2019.

The first draft of the revised TXT BREF was issued on 19 December 2019 and the consultation period for TWG members ended on 20 March 2020. A total of 1072 comments (750 identified as major and 322 as minor) were received by the EIPPCB and were made available to the whole TWG through BATIS. Of these 1072 comments, 639 are addressed in this document, i.e. those considered to have a bearing on the BAT conclusions.

The distribution of the comments received on the first draft of the revised TXT BREF is summarised in Table 1.

Table 1: Distribution of the total number of comments submitted on the first draft of the revised TXT BREF (version of December 2019)

BREF Chapter/Section	Comments	
	Number	Percentage (%)
Whole document	9	0.8
Preface	0	0.0
Scope (BREF)	3	0.3
Chapter 1 – General information	14	1.3
Chapter 2 – Applied processes and techniques	45	4.2
Chapter 3 – Emission and consumption levels	29	2.7
Chapter 4 – Techniques to consider in the determination of BAT	279	26.0
Chapter 5 – BAT conclusions	639	59.6
Chapter 6 – Emerging techniques	11	1.0
Chapter 7 – Concluding remarks and recommendations for future work	0	0.0
Chapter 8 – Annex I: Textile auxiliaries	40	3.7
Chapter 9 – Annex II: Dyes and pigments		
Chapter 10 – Annex III: Wet Processes: Machinery and Techniques	1	0.1
Chapter 11 – Annex IV: Typical recipes (with some associated emission factor) in the textile sector	0	0.0
Chapter 12 – Annex V: Typical pollutants (and potential sources) in air emissions from textile processes	0	0.0
Chapter 13 – Annex VI: auxiliaries classification tools	0	0.0
Chapter 14 – Advanced oxidation processes (Fenton reaction)	0	0.0
Chapter 15 – Annex VII: Plants having taken part in the data collection	0	0.0
Chapter 16 – Annex VIII: Wool carpet dyeing	0	0.0
Glossary	2	0.2
References	0	0.0
Total:	**1072**	**100**

All the comments received and the accompanying additional information have been assessed by the EIPPCB and have been used in the preparation of this BP. An updated working draft of the TXT BREF will be made available to the TWG prior to the final meeting.

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

Before coming to the meeting

As a TWG member, you should read this background paper (BP) and Chapter x 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 be advised to bring at least 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 printed copies*:

- this background paper;
- the revised proposal for the BAT conclusions (coloured version);
- the first draft of the revised TXT BREF dated December 2019 (coloured version);
- the updated graphs/figures including the emission levels and other environmental performance levels.

Aim and structure of this background paper

The aim of this background paper is to structure and enable efficient discussions at the final TWG meeting. Some items relevant to the BAT conclusions are proposed for discussion at the final TWG meeting (i.e. items under Section 1 of this BP) while other items are proposed to be discussed only if requested in advance of the meeting (i.e. items listed in Section 2 of this BP). Items are listed in Section 2 either because, based on the assessment of the TWG comments, they refer to BAT conclusions that are not considered to be controversial and therefore do not seem to require further discussion, or because they are not considered to have a specific bearing on the text of the BAT conclusions (e.g. some methodological and implementation issues that have already been discussed within the TXT TWG). Please note that the order of the discussion items in this background paper will not necessarily be the order of the discussion at the meeting.

TWG members are requested to contact the EIPPCB at least 10 working days before the TWG final meeting **(i.e. by 11 of May 2021)** if they wish **to request the discussion of any other items from Chapter 5 (i.e. BAT conclusions) at the meeting or to propose additional agenda items** for the meeting. Please note that the possibility of including additional items in the meeting agenda is extremely limited due to time restrictions.

Each item is presented in this background paper according to the following structure (see also below):

- the location in the first draft (D1) of the TXT BREF (December 2019) where the issue is presented;
- the text in the first draft (D1) of the TXT BREF (December 2019) that the issue relates to;
- a summary of the comments on the issue, made by TWG members;
- the EIPPCB assessment of the comments;
- the EIPPCB proposal to resolve the issues.

Location in D1	Section and page number (.pdf version) in the first draft (D1) of the TXT BREF (December 2019); BAT conclusion number, if applicable. Note that the numbering of the BAT conclusions may differ from that in the first draft (D1) of the revised TXT BREF (December 2019).
Current text in D1	Text of the sections from the first draft (D1) of the TXT BREF (December 2019) using the same colours (e.g. all BAT conclusions are in green).
Summary of comments	Individual comments or a summary of the main comments related to the item. This is done in the following format: reference to individual comments is made in the format "Origin of the comment followed by the comment number", e.g. EEB 168. The comments are ordered according to the text passage they refer to (e.g. comments on the introductory sentence of a BAT conclusion come first, then comments on individual techniques in order of appearance and finally comments on performance levels). The numbering of the comments corresponds to the numbering in the Excel spreadsheet that compiles all comments from all TWG members.
EIPPCB assessment	EIPPCB assessment related to the item to be discussed.
EIPPCB proposal	EIPPCB proposal that will be included in the latest version of the draft BAT conclusions for discussion at the final TWG meeting. Note that the revised BAT conclusions also include editorial corrections aimed at ensuring: 1) correct and consistent language use throughout the document; 2) consistency with the most recent BAT conclusions. Such purely editorial corrections may not be tracked in this background paper where it is evident that there are no substantive consequences.

The acronym 'D1' is used only for the purposes of this BP and will not appear in the final BREF or the BAT conclusions.

Working plan

After this final TWG meeting, the revised draft of the TXT BREF will be completed by the EIPPCB including the addition of Chapter 7 (Concluding remarks and recommendations for future work). Afterwards, the TWG will be given another commenting period of about four weeks 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 (FD) that will be submitted for opinion to the IED Article 13 Forum. In the final step, the BAT conclusions will be submitted for formal approval to the Article 75 Committee. This will be followed by the adoption of the BAT conclusions by the Commission and their publication in the Official Journal of the European Union.

Abbreviations frequently used in this background paper

Abbreviation	Meaning
AT	Austria
BAT	Best Available Techniques (as defined in Article 3(10) of the IED)
BAT-AEL	Emission levels associated with the BAT (as defined in Article 3(13) of the IED)
BAT-AEPL	Environmental performance level associated with the BAT: BAT-AELs are a subset of BAT-AEPLs (see also Commission Implementing Decision 2012/119/EU laying down rules concerning guidance on the collection of data and on the drawing up of BREFs and on their quality assurance)
BATc	BAT conclusions
BATIS	BAT Information System
BE	Belgium
BOD	Biochemical oxygen demand
BP	Background paper
BREF	BAT reference document (as defined in Article 3(11) of the IED)
CEFIC	Conseil Européen de l'Industrie Chimique (European Chemical Industry Council)
COD	Chemical oxygen demand
CWW BREF	BAT reference document for Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector
CZ	Czech Republic
D1	First draft of the TXT BREF from December 2019
DAA	Directly associated activity
DE	Germany
DK	Denmark
ECM	Reference Document on Economics and Cross-Media Effects
EEB	European Environmental Bureau
EIPPCB	European IPPC Bureau
EKPIs	Environmental Key Performance Indicators
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)
EP(s)	Emission point(s)
ES	Spain
EURATEX	The European apparel and textile confederation
FDM BREF	BAT Reference Document on Food Drink and Milk
FI	Finland
FR	France
GOTS	Global Organic Textile Standard
HOI	Hydrocarbon oil index
IE	Ireland
IED	Industrial Emissions Directive (2010/75/EU)
ISO	International Organisation for Standardisation. Also international standard adopted by this organisation.
IT	Italy
KEI	Key environmental issue
KoM	Kick-off Meeting
LCP BREF	BAT Reference Document on Large Combustion Plants
LVOC BREF	BAT Reference Document on Large Volume Organic Chemicals
MS	Member State(s)
NL	The Netherlands
OTNOC	Other than normal operating conditions
PL	Poland
PT	Portugal
REACH	Regulation EC/1907/2006 on the Registration, Evaluation and Authorisation of Chemicals
ROM	JRC Reference Report on Monitoring of emissions to air and water from IED installations

RSL	Restricted Substances List
SE	Sweden
SF BREF	Smitheries and foundries BREF
SK	Slovakia
STS BREF	BAT reference document on Surface treatment using Organic Solvents
TOC	Total organic carbon
TVOC	Total volatile organic carbon
TXT BREF	BAT reference document on Textile Industry
TWG	Technical Working Group
UK	United Kingdom
UWWTD	Urban Waste Water Treatment Directive (91/271/ECC)
VOC	Volatile organic compound
WGC BREF	
WT BREF	BAT reference document on Waste Treatment
WW	Waste water
(C)WWTP	(Common) Waste water treatment plant
ZDHC	Zero Discharge of Hazardous Chemicals
ZLD	Zero Liquid DIscharge

1 ITEMS PROPOSED FOR DISCUSSION AT THE FINAL TXT TWG MEETING

1.1 Scope

Location in D1:	**P. 713 – Chapter 5**

Current text in D1:	These BAT conclusions concern the following activities specified in Annex I to Directive 2010/75/EU, namely:
	
	• 6.2. Pre-treatment (operations such as washing, bleaching, mercerisation) or dyeing of textile fibres or textiles where the treatment capacity exceeds 10 tonnes per day.
	• 6.11. Independently operated treatment of waste water not covered by Directive 91/271/EEC provided that the main pollutant load originates from activities covered by these BAT conclusions.
	
	These BAT conclusions also cover:
	
	• The following activities when they are directly associated with activities specified in point 6.2 of Annex I to Directive 2010/75/EU:
	  ○ coating;
	  ○ dry cleaning;
	  ○ fabric production;
	  ○ finishing;
	  ○ lamination;
	  ○ printing;
	  ○ singeing;
	  ○ wool carbonising;
	  ○ wool fulling;
	  ○ yarn production.
	• The combined treatment of waste water from different origins provided that the main pollutant load originates from activities covered by these BAT conclusions and that the waste water treatment is not covered by Directive 91/271/EEC.
	• On-site combustion plants which are directly associated with the activities covered by these BAT conclusions provided that the combustion gases are put into direct contact with the textile fibres or textiles (such as direct heating, drying, heat-setting) or when radiant and/or conductive heat is transferred through a solid wall (indirect heating) without using an intermediary heat transfer fluid.
	
	These BAT conclusions do not cover:
	
	• Coating and lamination where the organic solvent consumption capacity of more than 150 kg per hour or more than 200 tonnes per year. This is covered by the BAT conclusions on surface treatment using organic solvents including preservation of wood and wood products with chemicals (STS).
	• Production of man-made fibres and yarns.
	• Unhairing of hides and skins. This may be covered by the BAT conclusions for the tanning of hides and skins (TAN).
	
	Other BAT conclusions and reference documents which could be relevant for the activities covered by these BAT conclusions include the following:
	
	• Surface Treatment Using Organic Solvents including Preservation of Wood and Wood Products with Chemicals (STS);
	• Tanning of Hides and Skins (TAN);

	• Waste Incineration (WI); • Waste Treatment (WT); • Emissions from Storage (EFS); • Energy Efficiency (ENE); • Industrial Cooling Systems (ICS); • Monitoring of Emissions to Air and Water from IED Installations (ROM); • Economics and Cross-Media Effects (ECM). These BAT conclusions apply without prejudice to other relevant legislation, e.g. on the registration, evaluation, authorisation and restriction of chemicals (REACH), on the classification, labelling and packaging (CLP) or on biocidal products (BPR).
Summary of comments:	**Directly associated activities** • To avoid ambiguities in implementation, add the condition that activities are carried out within the same installation, in addition to being directly associated with activities specified in point 6.2 of Annex I to Directive 2010/75/EU, in order to be covered by the BAT conclusions (IT 1). • Replace "yarn production" with "spinning of fibres" as production of man-made fibres and yarns are not covered by these BAT conclusions (FR_A 1). • Add the following activities to be covered in BAT conclusions: pre-treatments of cotton and cellulose fibres such as desizing and scouring, wool fulling, pre-treatments of silk such as scouring and weighting, as some of these terms are mentioned in the BAT conclusions and in BAT-AEPLs (IT 2). **Combined treatment of waste water** • Remove the condition on the origin of the pollutant load at the end of the bullet point related to the 6.11 activity and delete the bullet point about the combined treatment of waste water. This is because these two points seem redundant and for consistency with the CWW and WT BAT conclusions (ES 41). • Quantify the word "main" in the sentence "provided that the main pollutant load originates from activities covered by these BAT conclusions" (EEB 169). **On-site combustion plants** • Replace the bullet point with "On-site energy generation activities which are directly associated with the activities covered by these BAT conclusions" as otherwise it could be understood that only combustion techniques are used to generate energy (EEB 170). • Delete the second part of the sentence as all combustion plants should be covered by the BAT conclusions (EEB 170). **Interface with BAT conclusions on surface treatment using organic solvents including preservation of wood and wood products with chemicals (STS)** • Delete the exclusion from the scope of the BAT conclusions of coating and lamination where the organic solvent consumption capacity is more than 150 kg per hour or more than 200 tonnes per year as all textiles-related BAT should be covered in the TXT BAT conclusions. The STS BAT conclusions would apply in addition (EEB 168). • Add that the BAT conclusions also cover dressing, coating, degreasing and cleaning where the organic solvent consumption capacity is less than 150 kg per hour or less than 200 tonnes per year, as these activities are not covered by the STS BREF (AT 31). **Reference to other BAT conclusions** • Delete the list of relevant BAT conclusions and reference documents as it is not useful and is confusing as to why these documents are mentioned (FR_A 3). • Delete the reference to the BAT conclusions on Tanning of Hides and Skins (TAN) as they do not include conclusions which might be relevant for the activities covered by the TXT BREF (DE 94).

EIPPCB assessment:	**Directly associated activities** • The scope of the BAT conclusions does not aim to define the directly associated activities (DAAs) but to list the activities which are covered by the BAT conclusions when they are DAAs. The definition of the boundaries of an installation and the identification of DAAs within these boundaries remain in the remit of implementation[1]. Moreover, Article 3(3) of the IED specifies that installation means "a stationary technical unit within which one or more activities listed in Annex I or in Part 1 of Annex VII are carried out, and any other directly associated activities on the same site (…)". Therefore, further clarification about the location of the activities which are covered by the BAT conclusions when they are DAAs does not seem necessary. • As concluded at the Kick-off Meeting[2] by the Technical Working Group (TWG), the data and information collection informed the list of potential directly associated activities. Such data were collected about spinning but not about yarn production, which could be clarified in a definition. • Concerning desizing and scouring, as pointed out by the comment, these are processes that are part of the pretreatment of textile fibres or textiles, which is covered by point 6.2 of Annex I to Directive 2010/75/EU. A reference to these processes as activities covered by the BAT conclusions when they are DAAs may therefore be confusing. However, a clarification in the definitions of these processes could be helpful. • As concluded in the Kick-off Meeting by the Technical Working Group (TWG), the data and information collection informed the list of potential directly associated activities. No data were collected about pretreatment of silk. • Wool fulling is already listed as an activity covered by the BAT conclusions when it is a DAA. • It seems necessary to clarify in the Scope of these BAT conclusions the status of activities of "washing and rinsing" related to other activities from definition of activity 6.2 from the IED apart from pre-treatment (e.g. dyeing and finishing). **Combined treatment of waste water** • The points related to the 6.11 activity and to the combined treatment of waste water are both in line with the conclusions taken by the TWG at the Kick-off Meeting (see Section 2.1.2 of the meeting report). • Neither point is redundant: o In the first case, it concerns the combined treatment of waste water carried out at an independently operated WWTP. o In the second case, it concerns the combined treatment of waste water carried out at an installation covered by point 6.2 of the IED (for example a textile facility which also treats waste water from another origin). • The wording related to the combined treatment of waste water has evolved across the published BAT conclusions and the proposed wording is similar to the most recent BAT conclusions (FDM and STS). • Data were collected during the data collection about the share of waste water originating from textile activities. This share is however expressed in percentage in volume and not in terms of pollutant load, which makes it difficult to further specify the meaning of "main pollutant load". As an indication, the lowest share of waste water originating from textile activities is 14 % as an average over 3 years for Plant CZ020. **On-site combustion plants** • The paragraph on combustion plants aims to specify in which cases combustion plants are covered by the BAT conclusions. It does not imply that non-combustion energy generation cannot be used. • Deleting the second part of the sentence would not be in line with the conclusions taken by the TWG at the Kick-off Meeting (see Section 2.2.2 of the meeting report).

[1] See "ANSWERS GIVEN BY DG ENVIRONMENT ON THE IMPLEMENTATION OF THE INDUSTRIAL EMISSIONS DIRECTIVE – CHAPTER 1"at https://circabc.europa.eu/sd/a/cd4fc56b-cb31-4a39-bed7-166a4e33e2d2/Chapter%201%20Q%26A.pdf

[2] Kick-off Meeting report referenced Ares(2018)4698733 at https://eippcb.jrc.ec.europa.eu/sites/default/files/2019-11/TXT_KoM_meeting_report_Sept18.pdf

	<u>Interface with BAT conclusions on surface treatment using organic solvents including preservation of wood and wood products with chemicals (STS)</u> • Deleting the exclusion from the scope of the BAT conclusions of coating and lamination where the organic solvent consumption capacity is more than 150 kg per hour or more than 200 tonnes per year would not be in line with the conclusions taken by the TWG at the Kick-off Meeting as it would create an overlap with the STS BAT conclusions (see Section 2.2.3 of the meeting report). • As mentioned in the Scope, coating is covered by the BAT conclusions when it is DAA and where the organic solvent consumption capacity is less than 150 kg per hour or less than 200 tonnes per year. • Concerning degreasing and cleaning, it is not clear how these processes relate to textiles activities. Solvent-based degreasing and cleaning may be used for machines but this is the case in many industrial sectors. It is therefore not clear why these processes should be covered by the TXT BAT conclusions when they are not covered by the STS BAT conclusions. • Concerning dressing, it may refer to textiles activities but the meaning of this term is ambiguous. Depending on the sources, it refers to finishing, dyeing[3] or sizing[4]. Moreover, no information was collected about dressing during the data collection. **<u>Reference to other BAT conclusions</u>** • It is common practice in all recent BAT conclusions to list other BAT conclusions and reference documents which could be relevant for the activities covered by the BAT conclusions concerned. For example, the ENE BREF may contain useful information to improve the energy efficiency of the installation. • Concerning the reference to the TAN BAT conclusions, they do not seem relevant for the activities covered by the TXT BAT conclusions as the latter do not cover unhairing of hides and skins. • Some activities of the STS BAT conclusions could be relevant for the TXT sector (e.g. impregnation, coating). **<u>Other points</u>** • Although not addressed by any comment, the exclusion from the scope of production of man-made yarns could be confusing as yarns are always man-made and this would exclude for example the spinning of wool fibres. This expression refers in fact to the spinning of man-made fibres, which could be further clarified.
EIPPCB proposal:	• To define yarn production as spinning. • To specify that only the production of yarns made of man-made fibres is excluded from the scope of the BAT conclusions. To reflect this change to the title of the section 5.3. • To clarify that “washing and rinsing” is directly associated activity. • To clarify in the Definitions that desizing and scouring are part of the pretreatment processes. • To remove the reference to the TAN BAT conclusions.

[3] https://patents.google.com/patent/DE2715862A1/en

[4] https://www.britannica.com/topic/textile/Finishes-enhancing-tactile-qualities

1.2 Definitions

Location in D1: **P. 715 – Chapter 5**

Current text in D1:

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

General terms	
Term used	**Definition**
Cellulosic materials	Cellulosic materials include cotton and viscose.
Channelled emissions	Emissions of pollutants to air through any kind of duct, pipe, stack, etc.
Continuous measurement	Measurement using an automated measuring system permanently installed on site.
Desizing	Removal of sizing chemicals.
Diffuse emissions	Non-channelled emissions to air.
Direct discharge	Discharge to a receiving water body without further downstream waste water treatment.
Dry cleaning	Cleaning of textile materials with an organic solvent.
Existing plant	A plant that is not a new plant.
Finishing	Physical and/or chemical treatment aiming at giving the textile materials end-use properties such as visual effect, handle characteristics, waterproofing or non-flammability.
Hazardous waste	Hazardous waste as defined in point 2 of Article 3 of Directive 2008/98/EC.
Indirect discharge	Discharge which is not a direct discharge.
Liquor ratio	For a batch process, weight ratio between the dry textile materials and the process liquor used.
Major plant upgrade	A major change in the design or technology of a plant with major adjustments or replacements of the process and/or abatement technique(s) and associated equipment.
Mass flow	The mass of a given substance or parameter which is emitted over a defined period of time.
New plant	A plant first permitted at the site of the installation following the publication of these BAT conclusions or a complete replacement of a plant following the publication of these BAT conclusions.
Organic solvent	Organic solvent as defined in Article 3(46) of Directive 2010/75/EU.
Periodic measurement	Measurement at specified time intervals using manual or automated methods.
Pick-up	For a continuous process, weight ratio between the liquid taken up by the textile materials and the dry textile materials.
Process chemicals	Substances and/or mixtures as defined in Article 3 of Regulation EC/1907/2006 and used in the process(es), including sizing chemicals, bleaching chemicals, dyes, printing pastes and finishing chemicals.
Process liquor	Solution and/or suspension containing process chemicals.
Sizing	Impregnation of yarn with process chemicals aiming to protect the yarn and provide lubrication during weaving.
Synthetic materials	Synthetic materials include polyester, polyamide and acrylic.
Textile materials	Textile fibres and/or textiles.
Thermal treatment	Thermal treatment of textile materials includes drying, curing, fixing or heat-setting which is carried out as a process step of the activities covered by these BAT conclusions.

Pollutants and parameters	
Term used	**Definition**
Antimony	Antimony, expressed as Sb, includes all inorganic and organic antimony compounds, dissolved or bound to particles.

	AOX	Adsorbable organically bound halogens, expressed as Cl, include adsorbable organically bound chlorine, bromine and iodine.
	BOD_n	Biochemical oxygen demand. Amount of oxygen needed for the biochemical oxidation of the organic matter to carbon dioxide in *n* days (*n* is typically 5 or 7). BOD_n is an indicator for the mass concentration of biodegradable organic compounds.
	Chromium	Chromium, expressed as Cr, includes all inorganic and organic chromium compounds, dissolved or bound to particles.
	CO	Carbon monoxide.
	COD	Chemical oxygen demand. Amount of oxygen needed for the total chemical oxidation of the organic matter to carbon dioxide using dichromate. COD is an indicator for the mass concentration of organic compounds.
	Copper	Copper, expressed as Cu, includes all inorganic and organic copper compounds, dissolved or bound to particles.
	Dust	Total particulate matter (in air).
	HOI	Hydrocarbon oil index. The sum of compounds extractable with a hydrocarbon solvent (including long-chain or branched aliphatic, alicyclic, aromatic or alkyl-substituted aromatic hydrocarbons).
	NH_3	Ammonia.
	Nickel	Nickel, expressed as Ni, includes all inorganic and organic nickel compounds, dissolved or bound to particles.
	NO_X	The sum of nitrogen monoxide (NO) and nitrogen dioxide (NO_2), expressed as NO_2.
	SO_X	The sum of sulphur dioxide (SO_2), sulphur trioxide (SO_3), and sulphuric acid aerosols, expressed as SO_2.
	Sulphide, easily released	The sum of dissolved sulphides and of those undissolved sulphides that are easily released upon acidification, expressed as S^{2-}.
	TOC	Total organic carbon, expressed as C (in water), includes all organic compounds.
	TN	Total nitrogen, expressed as N, includes free ammonia and ammonium nitrogen (NH_4–N), nitrite nitrogen (NO_2–N), nitrate nitrogen (NO_3–N) and organically bound nitrogen.
	TP	Total phosphorus, expressed as P, includes all inorganic and organic phosphorus compounds, dissolved or bound to particles.
	TSS	Total suspended solids. Mass concentration of all suspended solids (in water), measured via filtration through glass fibre filters and gravimetry.
	TVOC	Total volatile organic carbon, expressed as C (in air).
	VOC	Volatile organic compound as defined in Article 3(45) of Directive 2010/75/EU.
	Zinc	Zinc, expressed as Zn, includes all inorganic and organic zinc compounds, dissolved or bound to particles.

Summary of comments:

Additional terms

- Add the definitions of coating, singeing, flame lamination and fabric production as these terms are mentioned in the BAT conclusions and in BAT-AEPLs (UK 2).

Hazardous waste

- For clarification and coherence, use the hazard classes and definition of the regulation on classification, labelling and packaging of substances and mixtures (CLP) (CEFIC 4).

Thermal treatment

- Change the definition as follows: "All thermal treatments where relevant air emissions can occur like drying after finishing or printing or lamination or coating, fixing or heat-setting of textiles, certain dyeing processes like thermosol or dyeing with carriers" because the definition should also cover the thermosol dyeing process and dyeing with carriers (DE 58, DE 410).

	Chromium, copper, nickel, zinc • Modify the chromium definition as follows: "Chromium, expressed as total Cr, includes all inorganic and organic chromium compounds, dissolved or bound to particles" because the monitoring standard measures all types of chromium. The same applies for copper, nickel and zinc (EURATEX 23, EURATEX 24, EURATEX 25, EURATEX 26, ES 28, ES 29, ES 30, ES 31).
EIPPCB assessment:	**Additional terms** • Coating and lamination are activities mentioned in Annex I and Annex VII to the IED and it is not the aim of the BAT conclusions to give an interpretation of the IED. These terms are not defined in the STS BAT conclusions either. • The definitions of flame lamination, singeing and fabric production could add clarity as they are used in the BAT conclusions. **Hazardous waste** • As mentioned in Article 1(3) of the CLP Directive, this Directive does not apply to waste. The definition of hazardous waste is given in Directive 2008/98/EC and the same definition has been used in a number of recently published BAT conclusions (WT, WI). **Thermal treatment** • According to Section 2.7.8 of D1, emissions to air from dyeing are generally not significant except from the thermosol process and from dyeing processes using carriers. • The thermosol process is specific for dyeing polyester or cotton/polyester blends with disperse dyestuffs. The sequence of this process is as follows: impregnation in the dyeing liquor, pre-drying in an infrared oven, drying in hot-flue, thermal fixation at 200 ºC. All steps of pre-drying, drying and thermal fixation are encompassed by the definition proposed in D1 and specific mention of the thermosol process does not seem necessary. • Concerning dyeing processes using carriers, according to Section 2.7.8.1 of D1, the carriers that remain on the fibre after dyeing and washing are partially volatilised during drying and fixing operations and can give rise to emissions to air. Both drying and fixing are covered by the definition proposed in D1 and mention of dyeing using carriers does not seem necessary. **Chromium, copper, nickel, zinc** • The monitoring standards mentioned in the BAT conclusions allow the measurement of all forms of these metals. This is underlined in the definitions proposed in D1: "(…) includes all inorganic and organic (…) compounds, dissolved or bound to particles". While adding "expressed as total Cr" (or Cu, Ni and Zn) could be an option, it would be a repetition of the definition and would not be in line with the recently published BAT conclusions (e.g. WI and WT).
EIPPCB proposal:	• To add the definitions of flame lamination, singeing and fabric production. • To add or modify the definitions of desizing, scouring and hazardous substances (see assessments of BAT 4 in Section 1.4.1.1 or BAT 13 in Section 1.4.5.1). • The definition of "substances of very high concern" was added and the one of "process chemicals" modified (assessment in 1.4.5.1). • The definition of "thermal treatment" was modified to accommodate the needs of many BATs (e.g. see assessments in section 1.4.8). • To add a definition of CMR (see assessment in 1.4.2.1).

1.3 General considerations

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

<table>
<tr><td>Location in D1:</td><td>P. 717 – Chapter 5</td></tr>
<tr><td>Current text in D1:</td><td>When a mass flow threshold is indicated, the BAT-AELs only apply if the mass flow of the given substance or parameter emitted from the emission point is above the associated mass flow threshold.

Emission levels associated with the best available techniques (BAT-AELs) for emissions to air given in these BAT conclusions refer to concentrations (mass of emitted substances per volume of waste gas) under the following standard conditions: dry gas at a temperature of 273.15 K and a pressure of 101.3 kPa, without correction for oxygen content, and expressed in mg/Nm^3.

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

<table>
<tr><th>Type of measurement</th><th>Averaging period</th><th>Definition</th></tr>
<tr><td>Periodic</td><td>Average over the sampling period</td><td>Average value of three consecutive measurements of at least 30 minutes each. ([1])</td></tr>
<tr><td colspan="3">([1]) For any parameter where, due to sampling or analytical limitations, a 30-minute sampling/measurement and/or an average of three consecutive measurements is inappropriate, a more representative sampling/measurement procedure may be employed.</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td><u>General points</u>
• Add a provision to avoid the dilution of emissions to air when waste gas streams are combined, such as “if the waste gases from several parts of the installation are combined, the requirements to reduce emissions shall be established in a way to ensure that the emissions generated do not exceed an emission level of the respective gases where they are disposed of individually” (DE 124).
• Mention that the measurements are carried out at the highest expected emission concentrations under normal operating conditions (DE 126).

<u>Mass flow thresholds</u>
• Apply the mass flow thresholds at installation level to which the sum of the mass flows of the different emission sources would be compared; otherwise, each emission point could be below the mass flow threshold if the number of emission points is increased (SE 20, DE 60, DE 75, DE 122).
• On the basis of measurements, flows that do not (significantly) contribute to the total mass flow at plant level may be left out of consideration (SE 20).

<u>Emissions to air from thermal treatment</u>
• The BAT-AELs related to emissions from all thermal treatments should refer to an air / textile weight ratio of 20 m3/kg textile to be treated. Indeed, by using a lot of air, the waste gas emission concentration will be lower. However, a large excess of drying air is not energy-efficient (DE 85, DE 381).

<u>Averaging periods</u>
• Change the definition to “average value of three consecutive individual measurements of a sampling period of at least 30 minutes each” (DE 61).

<u>Batch processes</u>
• Add provisions to ensure a homogeneous implementation, i.e. homogeneous calculation of the mass flows (e.g. sampling period, number of batches), in particular when processes are carried out in batches (UK 3).</td></tr>
</table>

	• Add a footnote for the batch processes: "For batch processes, the average of a representative number of measurements taken over the total batch time or the result of a measurement carried out over the total batch time, during which emissions occur, but with a maximum of 4 hours, can be used." (BE 36).
EIPPCB assessment:	**General points** • How to establish emission limit values for combined waste gas streams, considering the pollutant loads of the individual waste gas streams, seems to pertain to the domain of implementation. In addition, such provisions would not be in line with other recently published BAT conclusions. • Footnote (1) of BAT 8 mentions that the measurements are carried out at the highest expected emission state under normal operating conditions and it does not seem needed to repeat the text in the General considerations. **Mass flow thresholds** • Regarding the mass flow threshold preventing increased number of emissions points BAT 22 instructs to limit them. Furthermore, article 20 of the IED sets that operators should report MS about any change in the installation that may have consequences for the environment, meaning that such change would require change of permit and decision of competent authority (which would need to base their decision on BAT 22). • Following the interventions of the different TWG members during the informal meeting of 19/02/2021, it seemed that there was not a common position on whether some emission points with small mass flows are considered relevant and would need to comply with BAT-AEL, and others irrelevant (or insignificant in terms of environmental impact) and would not need to comply with BAT-AEL. Approaches to set such mass flow threshold are described in sections 1.4.8.3, 1.4.8.5 and 1.4.8.7. • However, taking into account plant configurations where the emissions to air from one source could be discharged through more than one emission point. It could be clarified in General considerations how to calculate the mass flow taking into account all the emission points related to a common source could be considered as a single emission point. **Emissions to air from thermal treatment** • Increasing the volume of extracted air leads indeed to the dilution of the pollution in the waste gas stream. This is the case across all industrial sectors and is not specific to the textile industry. How the dilution is considered for setting ELVs seems to be more an implementation issue and follows the provisions set in Article 15(1) of the IED. • Concerning energy efficiency, this is addressed by BAT 10, 11 and 12 and by the BAT-AEPL set in Table 5.2. **Averaging periods** • The wording "average value of three consecutive measurements of at least 30 minutes each" is a standard wording which has been used in all recently published BAT conclusions and any change needs to be considered carefully. • When the measurements are carried out on-line, the duration of 30 minutes refers also to the sampling as the sampling and the measurements are simultaneous. This is not the case though of off-line measurements where the sampling may last 30 minutes but the measurement itself is shorter (for example in the case of dust monitoring as per standard EN 13284-1). This could be reflected in the BAT conclusions. **Batch processes** • Concerning the homogeneity of the measurement practices when the textile materials are processed in batches, this is covered by Footnote (1) of BAT 8 mentioning that the measurements are carried out at the highest expected emission state under normal operating conditions. • Footnote (1) applies also to the cases of batch processes. It provides appropriate guidance on how to perform the sampling/measurements in implementation to the batch processes.
EIPPCB proposal:	**Averaging periods** • To specify the sampling duration in the case of off-line measurements. • To clarify that several emission points associated with the same source of emission can be considered as single emission point when to calculating the mass flows • To delete the applicability of the BAT-AELs when there is a mass flow threshold

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

Location in D1:	**P. 717 – Chapter 5**
Current text in D1:	Emission levels associated with the best available techniques (BAT-AELs) for emissions to water given in these BAT conclusions refer to concentrations (mass of emitted substances per volume of water), expressed in mg/l. Averaging periods associated with the BAT-AELs refer to either of the following two cases: • in the case of continuous discharge, daily average values, i.e. 24-hour flow-proportional composite samples; • in the case of batch discharge, average values over the release duration taken as flow-proportional composite samples, or, provided that the effluent is appropriately mixed and homogeneous, a spot sample taken before discharge. Time-proportional composite samples can be used provided that sufficient flow stability is demonstrated.
Summary of comments:	• Mention that all BAT-AELs for emissions to water apply at the point where the emission leaves the plant, as in the STS BAT conclusions (AT 35).
EIPPCB assessment:	• According to Article 15(1) of the IED, the emission limit values for polluting substances shall apply at the point where the emission leaves the installation. Although it may not be necessary to add a similar provision in the BAT conclusions, it would bring consistency with other recently published BAT conclusions.
EIPPCB proposal:	• To add a sentence to specify where the BAT-AELs for emissions to water apply. • To move the provision for time-proportional composite sampling to the case of continuous discharge.

1.3.3 Specific energy consumption levels associated with the best available techniques

Location in D1:	**P. 718 – Chapter 5**
Current text in D1:	The environmental performance levels related to specific energy consumption refer to yearly averages calculated using the following equation: $$\text{specific energy consumption} = \frac{\text{energy consumption}}{\text{activity rate}}$$ where: energy consumption: the total annual amount of heat and electricity consumed by a given process, minus the heat recovered from the process, expressed in MWh/year; activity rate: total annual amount of textile materials treated in the process, expressed in t/year.
Summary of comments:	• Clarify the definition of activity rate as the textile materials could undergo the same process several times, involving thermal treatments carried out as process steps, and/or different processes, each of which may involve thermal treatments (IT 3).
EIPPCB assessment:	• The specific energy consumption was reported through the questionnaires used in the data collection. These questionnaires specified that the specific energy consumption was calculated as the energy consumed during a reference year divided by the weight of textiles treated in this process during the same year. Therefore, counting only once the amount of textile materials processed several times would not be in line with the definition used in the questionnaires and for the derivation of BAT-AEPLs. It could be helpful however to clarify this point in the BAT conclusions. • Although no comments were made on this issue, the proposed BAT-AEPLs in Table 5.2 concern only thermal treatment and not all the processes, which could be reflected in the General considerations. • In accordance with assessments in section 1.4.4.3 the indicative levels are proposed instead of BAT-AEPLs. This can be reflected in the equation for calculating specific energy consumption.
EIPPCB proposal:	• To clarify that the amount of textile materials treated in the process includes the textile materials processed several times in the same process. • To replace “process” with “thermal treatment”. • To change from BAT-AEPLs to “indicative levels”.

1.3.4 Specific water consumption levels associated with the best available techniques

Location in D1:	**P. 718 – Chapter 5**
Current text in D1:	The environmental performance levels related to specific water consumption refer to yearly averages calculated using the following equation: $$\text{specific water consumption} = \frac{\text{water consumption}}{\text{activity rate}}$$ where: water consumption: the total annual amount of water consumed by a given process including water used for washing and rinsing the textile materials and for cleaning the equipment, minus the water reused or recycled to the process, expressed in m^3/year; activity rate: total annual amount of textile materials treated in the process, expressed in t/year.
Summary of comments:	• Clarify that specific water consumption at a process level concerns only the water consumed by the process concerned and does not contain other waste water flows (UK 4). • Clarify the definition of water consumption as follows: "the total annual amount of water consumed by a given specific process (e.g. mercerisation) (…)" as Table 5.1 refers to specific processes (IT 5). • Clarify the definition of activity rate as follows: "total annual amount of textile materials treated in the specific processes (e.g. mercerisation), expressed in t/year" as Table 5.1 refers to specific processes (IT 6).
EIPPCB assessment:	• The proposed definition of water consumption corresponds to the total annual amount of water consumed by a given process. It does not seem necessary to add that it excludes the water not consumed by this process. Moreover, BAT 5 specifies that the monitoring is broken down to the process level. • It is not entirely clear whether the addition of the word "specific" in the definitions of water consumption and activity rate would add clarity. However, examples of processes could be helpful. • In accordance with assessments in section 1.4.3.2 the indicative levels are proposed instead of BAT-AEPLs. This can be reflected in the equation for calculating specific water consumption.
EIPPCB proposal:	• To add examples of processes. • To clarify that the amount of textile materials treated in the process includes the textile materials processed several times in the same process (see Section 1.3.3). • To change from BAT-AEPLs to "indicative levels".

1.3.5 Specific wool grease recovery level associated with the best available techniques

Location in D1:	**P. 718 – Chapter 5**
Current text in D1:	The environmental performance level related to specific wool grease recovery refers to a yearly average calculated using the following equation: $$\text{specific wool grease recovery} = \frac{\text{amount of wool grease recovered}}{\text{activity rate}}$$ where: amount of wool grease recovered: the total annual amount of wool grease recovered from the pre-treatment of raw wool fibres by scouring, expressed in kg/year; activity rate: total annual amount of raw wool pre-treated by scouring, expressed in t/year.
Summary of comments:	• No comments.
EIPPCB assessment:	• Not applicable.
EIPPCB proposal:	• No change.

1.3.6 Caustic soda recovery level associated with the best available techniques

Location in D1:	**P. 719 – Chapter 5**
Current text in D1:	The environmental performance level related to caustic soda recovery refers to a yearly average calculated using the following equation: $$\text{caustic soda recovery} = \frac{\text{amount of caustic soda recovered}}{\text{amount of caustic soda before recovery}}$$ where: amount of caustic soda recovered: the total annual amount of caustic soda recovered from spent mercerisation rinsing water, expressed in kg/year; amount of caustic soda before recovery: total annual amount of caustic soda in the spent mercerisation rinsing water, expressed in kg/year.
Summary of comments:	• No comments.
EIPPCB assessment:	• Not applicable.
EIPPCB proposal:	• No change.

1.4 General BAT conclusions

1.4.1 Overall environmental performance

1.4.1.1 Techniques for improving the overall environmental performance

Location in D1:	**P. 721 – Section 5.1.1 – BAT 2**
Current text in D1:	**BAT 2. In order to improve the overall environmental performance, BAT is to establish, maintain and regularly review (including when a significant change occurs) an inventory of inputs and outputs, as part of the environmental management system (see BAT 1), that incorporates all of the following features:** (i) information about the production process(es), including: (a) simplified process flow sheets that show the origin of the emissions; (b) descriptions of process-integrated techniques and waste water/waste gas treatment techniques to prevent or reduce emissions, including their performance (e.g. abatement efficiency); (ii) information about the quantity and characteristics of materials used, including textile materials and process chemicals (see BAT 14); (iii) information about water consumption; (iv) information about energy consumption; (v) information about the quantity and characteristics of the waste water streams, such as: (a) average values and variability of flow, pH, temperature, and conductivity; (b) average concentration and mass flow values of relevant substances/parameters and their variability (e.g. COD/TOC, nitrogen species, phosphorus, metals, priority substances, microplastics); (c) data on toxicity and bioeliminability (e.g. BOD_n, BOD_n to COD ratio, Zahn-Wellens test, biological inhibition potential (e.g. inhibition of activated sludge)); (vi) information about the characteristics of the waste gas streams, such as: (a) average values and variability of flow and temperature; (b) average concentration and mass flow values of relevant substances/parameters and their variability (e.g. dust, organic compounds); (c) flammability, lower and higher explosive limits, reactivity; (d) presence of other substances that may affect the waste gas treatment system or plant safety (e.g. water vapour, dust); (vii) information about the quantity and characteristics of waste generated. **Applicability** The scope (e.g. level of detail) and nature of the inventory will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have.
Summary of comments:	**General comments** • Add a yearly based frequency for reviewing the inventory of inputs and outputs (DE 335). • Define the term "significant change" so that it could be implemented by Member States in a homogeneous way (DE 387). • Express units per year, e.g. m3/year, kg/year (DE 335). • Add at the end of the BAT statement that the inventory incorporates all of the following features, only if they are relevant (EURATEX 142). • Streamline and harmonise text (both wording and consecutive numbering) on inventory of inputs and outputs with the respective text in the FDM BREF or other BREFs (AT 33). • Add a reference to BAT 16, “Techniques for preventing or reducing emissions to water of poorly biodegradable substances”, as they are very closely aligned (UK 6). • Clarify the use of "such as" in points (v) and (vi). If operators are expected to conduct several tests on toxicity, bioeliminability. it could be expensive and time-consuming (UK 6).

	Waste water streams • Add clarification on the differences of the measurement methods (BOD5, RODTOX (biological inhibition test) and Zahn Wellens test), to help choose the appropriate method or combination of methods (BE 32). **Microplastics** • Add that testing for microplastics is done according "to an agreed test method or standard" to avoid further uncertainty when trying to compare test results from different sites in the future (UK 6). • Delete "microplastics" since there is still no valid measurement standard for microplastics (currently under development within CEN TC248), so there is no possiblity to be compliant or at least for comparing results. Furthermore, relevance is presently not scientifically confirmed (CEFIC 20, EURATEX 28 and EURATEX 143). • Keep microplastics monitoring in the proposed BAT (EEB 99). **Waste gas streams** • Delete the term "average" in points (vi) a) and (vi) b), since having information on highest emissions levels and their context (e.g. recipes, hazardous substances used) is as useful as information on average levels to prevent and reduce emissions (DE 63). • Add a bullet point on the identification of hazardous pollutants and the related emissions to air of each applied recipe for textile finishing processes, based on the emission factor concept (DE 64 and DE 413).
EIPPCB assessment:	**General comments** • It may be necessary to review the inventory more than once per year if the process conditions vary very frequently, for example in the case of companies working on commission. In contrast, if the process conditions are stable, there may be not merit in reviewing this inventory every year. The proposed wording reflects this variety of cases, offers flexibility and is in line with recently published BAT conclusions such as FDM. • The units used for the inventory are an operational detail which can be addressed at the implementation stage. • Concerning the relevance of the proposed features, it is not clear in which cases one of those features would not be relevant. Of course, if no water is used in the processes, obviously point (iii) about water consumption would indicate that no water is consumed but this case seems very specific. • The text in BAT 2 has been used in recent documents such as FMP, and presents the principles of the inventory of inputs and outputs as part of the environmental management system. The text has been adapted for the textile industry and the applicability clarifies the interpretation of this BAT, giving flexibility at local scale. It seems possible to harmonise wording and numbering with the recent text used for the FDM industry. • Otherwise, the link with the specific BAT 16 is unclear, as the scope of BAT 2 is the overall environmental performance. **Waste water streams** • More information for choosing a relevant measurement method can be found in Chapter 4 of D1 or in the Reference Document for monitoring of emissions to air and water from IED installations. Moreover, the choice of an appropriate method to refer to in order to obtain data on toxicity and bioeliminability may depend on the local situation or process parameters. • Following the assessment of comment DE 340 on BAT 8 (on biodegradability) on the usefulness of information on the biodegradability of individual waste water streams, to handle them appropriately, it seems relevant to add biodegradability to point (v)(c) as relevant information on waste water streams. **Microplastics** • As mentioned in Section 3.4.19, microplastics have been measured in several studies involving the textile industry, and a standardised European measurement method for microplastics is currently under development (see CEN/TC 248/WG 37 - Microplastics from textile sources).

	• Microplastics is only one example of relevant substances/parameters mentioned in point (v). **<u>Waste gas streams</u>** • The text in BAT 2 is used in many conclusions from the CWW BAT conclusions onward and includes average values and variability for the parameters listed, which includes data on highest emissions levels. • The variability of the characteristics of the waste gas streams may indeed be estimated by the use of emission factors, which could be reflected in BAT 2.
EIPPCB proposal:	• To make minor text adjustments on wording and numbering. • To add a reference to emission factors. • To add the biodegradability in point (v)(c).

New proposal	**BAT 2bis. In order to reduce the frequency of the occurrence of OTNOC and to reduce emissions during OTNOC, BAT is to set up and implement a risk-based OTNOC management plan as part of the EMS (see BAT 1) that includes all of the following elements:** **i. identification of potential OTNOC (e.g. failure of equipment critical to the protection of the environment ('critical equipment')), of their root causes and of their potential consequences, and regular review and update of the list of identified OTNOC following the periodic assessment below;** **ii. appropriate design of critical equipment (e.g. waste water treatment);** **iii. set-up and implementation of an inspection and preventive maintenance plan for critical equipment (see BAT 1 xii);** **iv. monitoring (i.e. estimating or, where possible, measuring) and recording of emissions during OTNOC and of associated circumstances;** **v. periodic assessment of the emissions occurring during OTNOC (e.g. frequency of events, duration, amount of pollutants emitted) and implementation of corrective actions if necessary;** **vi. regular review and update of the list of identified OTNOC under point i. following the periodic assessment of point v;** **vii. regular testing of back-up systems.**
Summary of comments:	• Not applicable
EIPPCB assessment:	• Based on the data collection there are substantial fluctuations in the reported values of emissions to air and water from some plants. The cause of these fluctuations is not known, however it seems that one of the possible reasons could be a poor operational management of the abatement techniques, resulting in other than normal operating conditions. These could be prevented by appropriate management practice.
EIPPCB proposal:	• To add BAT 2bis.

1.4.2 Monitoring

1.4.2.1 Monitoring emissions to water

<table>
<tr><td>Location in D1:</td><td colspan="6">P. 724 – Section 5.1.2– BAT 7</td></tr>
<tr><td>Current text in D1:</td><td colspan="6">BAT 7. BAT is to monitor emissions to water with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.
<table>
<tr><th colspan="2">Substance(s) / parameter</th><th>Standard(s)</th><th>Activities / processes</th><th>Minimum monitoring frequency</th><th>Monitoring associated with</th></tr>
<tr><td colspan="2">Adsorbable organically bound halogens (AOX) ([1])</td><td>EN ISO 9562</td><td rowspan="3">All activities / processes</td><td>Once every month</td><td rowspan="10">0</td></tr>
<tr><td colspan="2">Alkylphenols and alkylphenol ethoxylates ([1])</td><td>EN standards available for some alkylphenols and alkylphenol ethoxylates (i.e. EN ISO 18857-1 and EN ISO 18857-2)</td><td>Once every 3 months</td></tr>
<tr><td colspan="2">Biochemical oxygen demand (BOD_n) ([2])</td><td>EN 1899-1</td><td>Once every month</td></tr>
<tr><td colspan="2">Biodegradability</td><td>EN ISO 9888</td><td>All activities / processes</td><td>To be decided, after effluent characterisation ([5])</td></tr>
<tr><td colspan="2">Brominated flame retardants ([1])</td><td>EN standard available for some polybrominated diphenyl ethers (i.e. EN 16694)</td><td>Finishing with flame retardants</td><td>Once every 3 months</td></tr>
<tr><td colspan="2">Chemical oxygen demand (COD) ([2])([3])</td><td>No EN standard available</td><td>All activities / processes</td><td>Once every month</td></tr>
<tr><td colspan="2">Colour</td><td>EN ISO 7887</td><td>Dyeing</td><td>Once every month</td></tr>
<tr><td colspan="2">Hydrocarbon oil index (HOI)</td><td>EN ISO 9377-2</td><td>All activities / processes</td><td>Once every 3 months</td></tr>
<tr><td rowspan="2">Metals / metalloids</td><td rowspan="2">Antimony (Sb)</td><td rowspan="2">Various EN standards available (e.g. EN ISO 11885, EN ISO 17294-2 or EN ISO 15586)</td><td>Pre-treatment and/or dyeing of polyester</td><td rowspan="2">Once every month</td></tr>
<tr><td>Finishing with flame retardants using antimony trioxide</td></tr>
</table></td></tr>
</table>

	Chromium (Cr)		Dyeing with chromium - containing dyes		
	Copper (Cu)		All activities / processes		
	Nickel (Ni)				
	Zinc (Zn)				
	Hexavalent chromium (Cr(VI))	EN ISO 10304-3 or EN ISO 23913	Dyeing with dyes containing hexavalent chromium	Once every month	
Pesticides ([1])		EN standards available for some pesticides (e.g. EN 12918, EN 16693 or EN ISO 27108)	Pre-treatment of raw wool fibres by scouring	Once every 3 months	
Perfluorinated compounds ([1])		No EN standard available	All activities / processes	Once every 3 months	
Sulphide, easily released (S^{2-})		No EN standard available	Dyeing with sulphur dyes	Once every 3 months	
Surfactants		EN standard available for anionic surfactants (i.e. EN 903)	All activities / processes	Once every 3 months	
Total nitrogen (TN) ([2])		EN 12260 or EN ISO 11905-1		Once every month	
Total organic carbon (TOC) ([2]) ([3])		EN 1484		Once every month	
Total phosphorus (TP)		EN ISO 6878, EN ISO 15681-1, EN ISO 15681-2 or EN ISO 11885		Once every month	
Total suspended solids (TSS) ([2])		EN 872		Once every month	
Toxicity ([4])	Fish eggs (*Danio rerio*)	EN ISO 15088		To be decided based on a risk assessment, after effluent characterisation ([5])	
	Daphnia (*Daphnia magna Straus*)	EN ISO 6341			
	Luminescent bacteria (*Vibrio fischeri*)	EN ISO 11348-1, EN ISO 11348-2 or EN ISO 11348-3			
	Duckweed (*Lemna minor*)	EN ISO 20079 or EN ISO 20227			
	Algae	EN ISO 8692, EN ISO 10253 or EN ISO 10710			

	([1]) The monitoring only applies when the substance(s)/parameter, including groups of substances or individual substances in a group of substances, concerned is identified as relevant in the waste water stream based on the inventory of inputs and outputs mentioned in BAT 2. ([2]) The monitoring only applies in the case of a direct discharge to a receiving water body. ([3]) TOC monitoring and COD monitoring are alternatives. TOC monitoring is the preferred option because it does not rely on the use of very toxic compounds. ([4]) An appropriate combination of the toxicity parameters can be used. ([5]) The effluent characterisation is carried out before starting operation of the plant or before a permit for the plant is updated for the first time after the publication of these BAT conclusions, and after each significant change in the plant.
Summary of comments:	**BAT statement** • Amend the BAT statement as follows: "BAT is to monitor relevant emissions to water with at least …", as only pollutants at detectable concentrations should be monitored, not all the pollutants listed in the table (CZ_A 7, CZ_B 84). • Allow the possibility for self-monitoring by the operator (DE 253). • Clarify that the measurement is done at the point of release (DE 286, EURATEX 32). • Add monitoring/measurement points in raw waste water or after intermediate treatment steps to determine treatment efficiencies of WWTP (DE 142). **Standard(s)** • Allow the possibility to use the standards set in "Standard Methods for the examination of water and wastewater", when no EN or ISO standard is available (ES 35). • Allow equivalent standards to EN standards when self-monitoring (DE 254). **Activities / processes** • Modify the heading of the table as follows: "Activities / processes if relevant" (EURATEX 32). **Monitoring frequency** • Change for all parameters the minimum monitoring frequency to once every three months (EURATEX 32, EURATEX 36, EURATEX 145) to avoid additional testing costs. • Change the monitoring frequency based on a risk-based sampling frequency dependent on the amount and nature of the emission (UK 9). **Adsorbable organically bound halogens (AOX)** • Change relevant processes to "pre-treatment of synthetic knitwear" (DE 351). • Support the proposed monitoring frequency once every month. (DE 127). • Reduce the monitoring frequency from once every month to once every three months (EURATEX 146), as in most European countries the monitoring frequency is not lower than every three months. **Alkylphenols and alkylphenol ethoxylates** • Clarify which specific alkylphenol ethoxylates (mono, di or poly) are monitored and with which method(s) (BE 4). • Support the proposed monitoring frequency once every 3 months (DE 127). • Change relevant processes to "pre-treatment of synthetic knitwear" (DE 351). **Biochemical oxygen demand (BOD_n)** • Replace EN 1899-1 by EN ISO 5815-1, which is the applied standard since 2019 (BE 5, FR_A 29). • Increase monitoring frequency from once every month to once every week, as these measurements are necessary for the operation of waste water treatment plants (DE 127, SE 10). • Change relevant processes to "pre-treatment of synthetic knitwear" (DE 351).

Biodegradability

- Clarify that monitoring only applies for indirect discharges. It is not useful to monitor biodegradability of effluents that have already passed a biological treatment (BE 23).
- Include that the monitoring can apply to other monitoring points, e.g. partial streams/concentrates from relevant processes. Measurements at the point of release are not sufficient as hardly biodegradable substances might be diluted (DE 340).

Brominated flame retardants

- Support the proposed monitoring frequency of once every 3 months (DE 127).

Chemical oxygen demand (COD)

- Increase the monitoring frequency from once every month to once every week (SE 10), or to daily (DE 127), as these measurements are necessary for the operation of waste water treatment plants.

Colour

- Increase the monitoring frequency from once every month to daily, as these measurements are necessary for the operation of waste water treatment plants (DE 127).
- Replace EN ISO 7887 by SCA blue book 103 ISBN 0117519533 Absorbance Scan - determined by scanning UV/ visible spectrometry (measured in absorbance units), as EN 7887 is suitable for colours of drinking water, not so much for the textile effluents (UK 48).

Hydrocarbon oil index (HOI)

- Increase the monitoring frequency from once every 3 months to once every month (DE 127).
- Change relevant processes to "Processing of man-made fibres and its mixtures of goods and knitwear good" (CZ_A 4, CZ_B 85).
- Change relevant processes to "pre-treatment of synthetic knitwear" (DE 351).

Metals / metalloids: Chromium (Cr)

- Change relevant processes to "Dyeing / printing" (CZ_A 5, CZ_B 86), as Cr is only present when using metal-complex dyes containing such metal.
- Support the proposed monitoring frequency of once every month (DE 127).

Metals / metalloids: Copper (Cu)

- Change relevant processes to "Dyeing" (DE 344, EURATEX 32).
- Change relevant processes to "Dyeing / printing" (CZ_A 5, CZ_B 86), as Cu is only present when using metal-complex dyes containing such metal.
- Support the proposed monitoring frequency of once every month. (DE 127).

Metals / metalloids: Nickel (Ni)

- Change relevant processes to "Dyeing" (DE 344, EURATEX 32).
- Change relevant processes to "Dyeing / printing" (CZ_A 5, CZ_B 86), as Ni is only present when using metal-complex dyes containing such metal.
- Support the proposed monitoring frequency of once every month (DE 127).

Metals / metalloids: Hexavalent chromium (Cr(VI)

- EN ISO 10304-3 is preferred as EN ISO 23913: 2009 does not allow the elimination of potential interference unless a pre-treatment step is performed (BE 6).
- Support the proposed monitoring frequency of once every month (DE 127).

Metals / metalloids: Zinc (Zn)

- Change relevant processes to "Dyeing" (EURATEX 32).
- Change relevant processes to "Dyeing / printing" (CZ_A 5, CZ_B 86), as Zn is only present when using metal-complex dyes containing such metal.
- Support the proposed monitoring frequency of once every month (DE 127).

	Pesticides • Reduce the monitoring frequency from once every three months to once every six months. In pre-treatment of raw wool fibres by scouring, pesticides might be only indirect occurrences (i.e. impurities) (IT 9). • Support the proposed monitoring frequency of once every 3 months (DE 127). **Perfluorinated compounds** • Add the following monitoring methods: ISO 25101 (PFOA and PFOS) and ISO 21675 (extensive range of PFAS) (BE 7). • Change the name of the parameter to Per- and Polyfluorinated compounds (DE 352). • Change relevant processes to "Finishing" (DE 352, EURATEX 32). **Sulphide, easily released (S^{2-})** • Increase the monitoring frequency from once every 3 months to once every month (DE 127). • Add in relevant processes "wool scouring" (UK 11). • Add the following monitoring method: methylene blue (UK 11). **Surfactants** • Clarify that the 3 groups of surfactants (anionic, cationic and non-ionic) must be monitored (BE 25). • Clarify which standard to use for monitoring non-anionic surfactants (FR_A 25). • Delete monitoring of hardly biodegradable surfactants, and address this issue in BAT 16, as hardly biodegradable surfactants should not be used (DE 143). • Delete the monitoring of surfactants. Surfactants are regulated by "EU detergents directive" (EURATEX 32), and the measurement standards are not available (EURATEX 147). **Total nitrogen (TN)** • Increase the monitoring frequency from once every month to once every week, as these measurements are necessary for the operation of waste water treatment plants (DE 127, SE 10). • Reduce the monitoring frequency from once every month to once every three months. Monthly frequency does not add value for the company or the authorities, so additional testing costs should be avoided (EURATEX 37). **Total organic carbon (TOC)** • Increase the monitoring frequency from once every month to once every week (SE 10), or to daily (DE 127), as these measurements are necessary for the operation of waste water treatment plants. **Total phosphorus (TP)** • Replace EN ISO 6878 with ICP-AES or ICP-MS techniques, as spectrophotometric methods can lead to an underestimation of the actual value (BE 8). • Increase the monitoring frequency from once every month to once every week, as these measurements are necessary for the operation of waste water treatment plants (DE 127, SE 10). • Reduce the monitoring frequency from once every month to once every three months. Monthly frequency does not add value for the company or the authorities, so additional testing costs should be avoided (EURATEX 38). **Total suspended solids (TSS)** • Increase the monitoring frequency from once every month to once every week (SE 10), or to daily (DE 127), as these measurements are necessary for the operation of waste water treatment plants. **Toxicity** • Modify the monitoring frequency to once every month. Different hazardous chemicals can be used in the textile industry (DE 127). • Modify the monitoring frequency as follows: "To be decided, after effluent characterisation" (AT 37).

	Additional parameters • Add the following parameters: NH_4-N, pH and temperature. NH_4-N has a negative impact on water bodies (toxic for fish), while pH and temperature contribute to follow the impact on water bodies (DE 148). **Footnote ([1])** • Add HOI (EURATEX 32, EURATEX 147), as HOI is only present in pretreatment of synthetic knitwear (DE 163). • Add all metalloids (EURATEX 32, EURATEX 147), except for zinc, as they are present in specific processes only (DE 164). • Add sulphides as they are not relevant in all processes (DE 390). • Add surfactants (EURATEX 147). **Footnote ([2])** • Add the following parameters: biodegradability (EURATEX 32, EURATEX 147), colour (DE 161, EURATEX 32, EURATEX 33, EURATEX 147), HOI (EURATEX 32, EURATEX 35, EURATEX 147), TP (CZ_A 6, CZ_B 88, DE 128, EURATEX 32, EURATEX 147,) and toxicity (BE 24, DE 168, EURATEX 32, EURATEX 147). • Modify the footnote to include monitoring when waste water is treated by a downstream WWTP (FR_A 64). • Delete Footnote ([2]). It is important to monitor these parameters as they affect the downstream WWTP (SE 45). **Footnote ([4])** • Amend the footnote to: "One or an appropriate combination of the toxicity parameters can be used", as one test might be sufficient (DE 353). • Add a risk assessment as a criteria to determine which combination of the toxicity parameters is appropriate (AT 37). • Amend the footnote to require monitoring toxicity only when other parameters or tests indicate that it will be useful (e.g. biodegradability), and add one flora and one fauna test as a minimum to provide more consistent and comparable results (UK 12). **Footnote ([5])** • Clarify what a significant change is (DE 388, DE 389). • Maintain the footnote but amend the wording as follows: "the effluent characterisation is carried out before starting operation of the plant or for existing plants, within 1 year after the publication of these BAT conclusions, and after each change that may negatively affect the quantity and qualitative characteristics of the waste water streams pursuant to BAT 2". This would clarify what "significant changes" mean (EEB 173, EEB 174). **Additional footnote** • Add a minimum monitoring frequency of yearly for periodical measurements, if emission levels are significantly stable (EURATEX 39). • Apply monitoring for metals only when the metal is identified as relevant in the integrated permit (in case of direct discharge) or in the agreement with the WWTP (in case of indirect discharge) (CZ_A 5, CZ_B 86). • Reduce or remove monitoring of AOX, COD and biodegradability, if toxicity tests are carried out, in order to avoid the risk of duplication or overlap of the monitoring parameters with the same degree of information (UK 10). • Amend the footnote to increase the monitoring frequency to daily when synthetic textiles or UV-treatment activities are carried out (EEB 172).
EIPPCB assessment:	**BAT statement** • Footnote ([1]) gives the flexibility to monitor only those parameters that have been identified in the inventory of inputs and outputs. It does not seem necessary to repeat this in the BAT statement, which is a standard text used in all recently published BAT conclusions. • Determining which laboratory (internal or external) carries out the monitoring is an implementation issue.

	• According to IED Article 15, "the emission limit values shall apply at the point where the emissions leaves the installation", which implies that the monitoring is carried out at the same location. This could be clarified by recalling this provision of IED Article 15 in the "General considerations". • According to the "Monitoring associated with" column of the table included in BAT 7, the aim of BAT 7 is to propose a monitoring frequency when a BAT-AEL is proposed, and for parameters considered KEIs. Therefore, the aim of BAT 7 is not to determine the treatment efficiencies of the techniques applied. **Standard(s)** • When there is no EN standard available, it is possible to use ISO standards or any other standards (e.g. "Standard Methods for the examination of water and wastewater") if they ensure the provision of data of an equivalent scientific quality. This is already mentioned in the BAT statement. **Activities / processes** • The specific processes relevant to emissions to water of each parameter have already been identified in the KoM conclusions and the data analysis and are listed in the table of BAT 7. Therefore, a general statement such as "if relevant" is not needed. **Monitoring frequency** • BAT 7 aims at setting the minimum monitoring frequency and is based on the TXT data collection and the environmental risk and performance achievable by using BAT. The data collection encompasses real cases and therefore accounts for specific conditions on the amount and nature of the emissions, and the costs of measurements. • Information on 207 monitoring frequencies were reported for 115 emission points. Because different monitoring parameters require different monitoring frequencies, on average 2 different frequencies were reported per emission point. Out of these 207 monitoring frequencies, 31 emission points reported yearly, 41 twice per year, 35 four times per year, 31 monthly, 8 weekly, 6 daily and the rest Other or No information. The most commonly set frequencies for direct discharge were monthly (14 out of 25 emission points), and for indirect discharge twice per year (36 out of 91 emission points). • The type of discharge (i.e. direct) has a strong influence on the requirement for a monthly or quarterly monitoring frequency (e.g. used 2-3 times more often for direct compared to indirect discharge). This could be reflected for the parameters with a monthly frequency (AOX, BOD, COD, colour, metals (Sb, Cr, Cu, Ni, Zn), TN, TOC, TP and TSS) or quarterly frequency (HOI, sulphide, other surfactants) in the flexibility to increase the minimum monitoring frequency for indirect discharge providing the downstream waste water treatment plant abates the pollutants concerned. **Adsorbable organically bound halogens (AOX)** • According to data collected, AOX is monitored in plants carrying out many different processes. Apart from washing the synthetic fibre or knitwear, AOX may originate from bleaching (e.g. if using sodium hypochlorite or sodium chlorite), from finishing (e.g. if using brominated flame retardants or shrink-proofing (Hercosett)) or dyeing (e.g. dyeing with some vat dyes). Therefore, limiting it only to "pre-treatment of synthetic knitwear" would potentially increase the environmental risk and impact of those plants/treatments. • Out of 60 emission points reporting AOX emissions to water, 13 are connected to direct discharge and 47 to indirect discharge.. The most common frequency reported for direct discharge is monthly (5 emission points) and for indirect discharge four times per year (15 emission points). • The monthly monitoring frequency seems reasonable due to wide fluctuations (min.-max. range) in the emissions profile. However, a footnote indicating the reduction of monitoring frequencies in the case of indirect discharge could be added.

Alkylphenols and alkylphenol ethoxylates

- The alkylphenol ethoxylates that can be monitored under this parameter are those listed in standards EN ISO 18857-1 (e.g. mixture of 4-nonylphenol isomers) and 18857-2 (OP, OP1EO, OP2EO, NP, NP1EO, NP2EO)5.
- Regarding setting "pre-treatment of knitwear" as the only relevant process, see the assessment in AOX above.
- As alkylphenols and alkylphenol ethoxylates are non-ionic surfactants, they could be moved to the section on surfactants.

Biochemical oxygen demand (BOD_n)

- There is indeed a new standard, EN ISO 5815-1, for monitoring BODn which could be mentioned.
- According to the data collection, out of 85 reported BODn data sets, 4 reported weekly and 1 daily monitoring frequency. According to the ROM and the existing TXT BREF, BOD5, COD/TOC, Colour, TN, TP or TSS are common parameters measured for controlling the operation of the biological waste water treatment in the textile sector.
- Regarding setting "pre-treatment of knitwear" as the only relevant process, see the assessment in AOX above.

Biodegradability

- The monitoring of biodegradability of the effluent could be a valuable parameter to control the environmental impact of both direct and indirect discharges. Only two data sets for indirect discharge (SE119 and SE120) were reported in the data collection.
- The characteristics of individual waste water streams are addressed in BAT 2, including their bioeliminability. Biodegradability could be another factor to consider in BAT 6.

Chemical oxygen demand (COD)

- BAT 7 aims to set the minimum monitoring frequency which can be increased in the implementation. According to the data collection, out of 97 COD data sets, 6 reported weekly monitoring and 5 a daily monitoring frequency. Therefore, the proposal does not seem to be supported by the data collection.

Colour

- BAT 7 aims to set the minimum monitoring frequency, which can be increased in the implementation. In the data collection, out of 22 plants reported data sets, only 2 reported a daily monitoring frequency. Therefore, the proposal does not seem to be supported by the data collection.
- In the scope of EN ISO 7887, it is indicated that Method B (use of (spectro)photometer) is appropriate for industrial water with little colour. Methods C and D (based on hexachloroplatinate concentration) are suitable for assessment of water colour in water treatment plants. The method in the SCA blue book seems to be similar to Method B from EN ISO 7887.

Hydrocarbon oil index (HOI)

- Based on the data collection, only 2 out of the 34 emission points that reported HOI emissions to water measure HOI monthly. Therefore, the proposal does not seem to be supported by the data collection.
- 20 plants out of the 30 plants that reported HOI emissions to water do not treat knitwear or wash synthetic fibres.
- It seems reasonable to add Footnote (1) to HOI, as indeed it may be relevant only for certain preparations, auxiliaries or incoming fibres.

Metals / metalloids: Chromium (Cr)

- Metal-complex dyes may contain chromium. This could be clarified by adding metal oxide dyes as an example of chromium-containing dyes in activity/process.

[5] 4-(1,1,3,3-tetramethylbutyl)phenol (OP), and its mono- (OP1EO) and diethoxylate (OP2EO), 4-nonylphenol (mixture of isomers) (NP), and its mono- (NP1EO) and diethoxylate (NP2EO)

	Metals / metalloids: Copper (Cu) • According to the data collection, 82 plants report 89 data sets for emissions of copper; of these, 70 data sets are for dyeing and 15 data sets for printing processes. 13 plants do both processes (e.g. BE008, DE025, DE049, ES058, FR131) and Plant BE009 only does printing. The relevant processes to monitor this parameter seem to be "Dyeing" and "Printing with dyes", due to use of dyes containing this metal. **Metals / metalloids: Nickel (Ni)** • According to the data collection, 60 plants report 65 data sets for emissions of nickel; of these, 53 data sets are for dyeing and 14 data sets for printing process. 11 plants do both processes (e.g. BE008, DE025, DE032, DE049, ES058, FR131) and Plant BE009 only does printing. The relevant processes to monitor this parameter seem to be "Dyeing" and "Printing with dyes", due to use of dyes containing this metal. **Metals / metalloids: Hexavalent chromium (Cr(VI)** • In EN ISO 23913:2009 in Section "4 Interferences", it is hinted that reducing agents, oxidising agents (like peroxacetic acid, or permanganate), strong alkalinity, colours or turbidity in the sample may lead to biases and interfere with chromium (VI) determination. The procedures (either analytic, interpretative or calculations) to accommodate for these interferences are explained in the standard. For strong alkaline samples, pretreatment with acids (HCl, H2SO4) may be needed. EN ISO 23913 is preferred over EN ISO 10304-3 because it is more specific for this pollutant, more precise (LoD), and has less uncertainty. • The same standards are used in other BAT conclusions (e.g. WT, STS). **Metals / metalloids: Zinc (Zn)** • According to the data collection, 80 plants report 88 data sets for emissions of zinc to water; of these, 71 plants report carrying out dyeing and 9 plants do not report dyeing, but other pre-treatment processes, printing (15 data sets) and coating (AT004, BE009, BE013, FR135, IT061, IT069, IT074, IT076, IT079). The relevant processes seem to be "All processes" because the source can be also raw material (viscose fibres), cationic dyes and bleaching (Zn added to start chemical reaction). **Pesticides** • BAT 4a requires the operator to control the level of ectoparasiticides on the incoming textile material (e.g. raw wool), because they can be the source of these pollutants in the effluent. • A total of 13 data sets were provided, with 5 emission points/plants (IT076, IT092, IT097, UK128, UK129). 2 plants from UK (6 data sets) measure every 3 months; IT plants report 'Other' frequency. **Perfluorinated compounds** • The list of standards is given in a similar way as in all other BAT conclusions. The use of EN standards guarantees the scientific quality and comparability of the measurements. • In addition, Table 3.2 of D1 includes the monitoring standards reported in the data collection for PFOA, PFOS and PFAS. • To provide more information about the monitoring standards for PFOA, PFOS and PFAS, ISO 25101 and ISO 21675 can be mentioned in Section 3 of the review of the TXT BREF. • Regarding the name to identify perfluorinated compounds (PFCs), the OECD refers to PFCs using the abbreviation PFASs (per and polyfluoroalkyl substances). According to the document published by the OECD[6] in 2013 named: 'Synthesis paper on Per- and Polyfluorinated Chemicals (PFCS)', in the past, PFASs (chemicals that contain one or more perfluoroalkyl moieties, –CnF2n+1) were often referred to as "PFCs" (per- and

[6] https://www.oecd.org/chemicalsafety/risk-management/synthesis-paper-on-per-and-polyfluorinated-chemicals.htm

	polyfluorinated chemicals), but this term can also be understood as perfluorocarbons. • The Stockholm Convention[7] only includes perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds. • Table 3.2 of D1 of the TXT BREF shows all the compounds reported as perfluorocarbons in the questionnaires, where more than 8 different compounds were identified, e.g. per- and polyfluoroalkyl substances, perfluorobutanoic acid, perfluorodecanoic acid. • Taking into account the above bullet points related to the different names to identify perfluorocarbons compounds, it seems appropriate to use the internationally accepted name, proposed by the OECD and which includes a wide range of chemical compounds consisting of carbon and fluorine. • Not only are finishing processes identified as a source of emissions to water of PFCs. According to the data collection, there are different associated processes where PFCs have been reported, e.g. dyeing, shrink-proof finishing, printing, washing synthetic fibre, desizing, bleaching, coating. It is not clear if they are already present in the incoming material. • In addition, footnote (1) gives the flexibility to monitor only when PFCs are identified as relevant in the inventory of inputs and outputs in BAT 2. **Sulphide, easily released (S^{2-})** • According to the data collection, 3 out of 19 emission points reported a monthly monitoring frequency. Therefore, the proposal does not seem to be supported by the data collection. • According to the KoM conclusions, it was decided that sulphides were to be considered a KEI for dyeing with sulphide dyes. • Currently there is no EN standard for monitoring sulphide in emissions to water. The ISO 10530:1992 or ISO 13358:1997 standards using methylene blue could be mentioned in the BREF. **Surfactants** • The wording of the parameter (‘Surfactants’) is generic and enables the competent authority to specify the monitoring of the group or individual surfactants, based on the inventory and relevance as related to BAT 2. • The only available EN standard at the time of drafting the document was EN 903 for anionic surfactants. The national standards reported to be used for various surfactants are given in Table 3.5 of D1. • No specific surfactants (e.g. like hardly biodegradable) are singled out in BAT 7. BAT 16a is not related to monitoring, but deals with substitution of surfactants like AP/APEO with biodegradable ones. • A total of 36 emission points reported 96 data sets, proving that monitoring of surfactants in the effluents is important in the textile sector. 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. The national standards reported to be used for various surfactants are given in Table 3.5 of D1. **Total nitrogen (TN)** • BAT 7 aims at setting the minimum monitoring frequency and is based on the data collection, which encompasses real cases. • A total of 8 out of 18 emission points with direct discharge to water are monitored once every month. On the other hand, no emission points are monitored either once every week or once every three months. This shows that the data collection does not support the proposed changes. • The aim of BAT 7 is not to set a monitoring frequency to check the maintenance operations of waste water treatment plants. **Total organic carbon (TOC)** • BAT 7 aims to set the minimum monitoring frequency, which can be increased in the implementation phase.

[7] http://www.pops.int/TheConvention/ThePOPs/AllPOPs/tabid/2509/Default.aspx

- According to the data collection, none of the 21 TOC data sets reported a weekly monitoring frequency. This shows that the data collection does not support the proposed changes.

Total phosphorus (TP)

- EN ISO 6878 is included in Annex 2 "Standards for the measurement of emissions to water" of the ROM as a Standard Method for total phosphorus (TP).
- The interferences affecting the accuracy of measurements for each standard are usually described in its annexes or in a specific section. As these interferences are clearly identified in each standard, there is no reason to exclude the standard.
- Among the standards in BAT 7 is included EN ISO 11885:2009 by ICP-OES.
- A monitoring frequency of once every week fulfils the minimum monitoring frequency proposed of once every month. It is in the domain of the competent authority to set a stricter monitoring frequency.
- The aim of BAT 7 is not to set a monitoring frequency to check the maintenance operations of waste water treatment plants.
- According to the TXT data collection, the most common monitoring frequency, for direct and indirect discharges, is monthly (14 out of 58 emission points to water), followed by four times per year (10 out of 58 emission points to water each of them) and twice a year (9 out of 58 emission points to water each of them).

Total suspended solids (TSS)

- BAT 7 aims to set the minimum monitoring frequency, which can be increased in the implementation phase.
- According to the data collection, out of 87 TSS data sets, 4 reported daily monitoring and 4 a weekly monitoring frequency. Therefore, the proposal does not seem to be supported by the data collection.

Toxicity

- According to the data collection, toxicity was reported from 3 indirect discharge emission points (10 data sets) and 10 direct discharge emission points (35 data sets). Footnote (5) requires the competent authority to decide on the monitoring frequency (relevance) based on a risk assessment, after effluent characterisation, including in this assessment the ability of the downstream waste water treatment to abate toxic compounds.
- The frequency of toxicity monitoring may be based on the information on the specific toxic chemicals whose relevance is determined in the inventory of inputs and outputs from BAT 2.
- It is not clear why the wording "based on a risk assessment" should be omitted.

Additional parameters

- The monitoring of pH and temperature as key parameters of the waste water streams is set in BAT 6. According to the ROM, NH4-N is usually measured to control the nitrification step of a biological waste water treatment plant or to control the effluent toxicity and is therefore an important parameter for the good operation of the waste water treatment plant.
- However, the TWG did not conclude at the Kick-off Meeting to consider NH4-N as a KEI. In recent BAT conclusions, there is a tendency not to define monitoring and BAT-AELs for NH4-N, but rather to use it to assess the performance of a biological waste water treatment plant. Instead, BAT-AELs and monitoring for total nitrogen (TN) were proposed, as this parameter better reflects the eutrophication potential.

Footnote ([1])

- The HOI parameter can be present in the effluents of pretreatment of synthetic knitwear or washing of synthetic fibres.
- Footnote (1) is not deemed necessary for metalloids or sulphides since the processes relevant for their monitoring are already indicated in BAT 7.
- Because surfactants are widely used in many pretreatment and washing processes or because they are added as a component to many other preparations used in textile wet treatments, adding Footnote (1) to surfactants seems unnecessary.

	Footnote ([2]) • It is not clear why biodegradability would be monitored only for direct discharges, since (only) 2 data sets were reported and they were for indirect discharge. In addition, the monitoring frequency for biodegradability and toxicity will be decided based on effluent characterisation, according to Footnote (5). Similarly, for colour (15 plants reported data, 5 of them with indirect discharge), HOI (90 plants reported data, 68 reported indirect discharge), Total P (59 plants reported data, 38 reported indirect discharge) and toxicity (13 plants reported data, 3 reported indirect discharge), plants that report indirect discharge reported monitoring these parameters. According to the data collection, these parameters (biodegradability, colour, HOI, Total P and toxicity) are monitored for indirect discharges as well. • For the issue of toxicity monitoring for indirect discharge only, see the assessment under Toxicity above. • A BAT-AEL for HOI is proposed for indirect discharge. • It is important to know whether the effluent discharged indirectly, to be treated in a downstream waste water treatment plant, contains non-biodegradable and toxic compounds (e.g. the qualitative parameter colour is often used where dyes are present in the effluent, as they can be non-biodegradable and/or toxic). It is not clear why plants discharging indirectly would not need to monitor these parameters. • Footnote (2) could be replaced by footnote (6), since it is important to monitor these parameters before they are abated in the downstream WWTP (e.g. COD/TOC, BOD, TSS and Total N) to protect its performance/operation. **Footnote ([4])** • Indeed, the competent authority may conclude that one test could be sufficient and Footnote (4) could be amended accordingly. • The decision on a combination of toxicity tests is in the domain of the competent authority due to local circumstances and national and EU legislation pertaining to the environmental quality standards of the particular water body. • The competent authority is free to decide on the method or combination of methods to be used, taking into account various aspects (e.g. the biodegradability, and flora and fauna tests). Keeping the text generic, without making a combination of flora and fauna methods compulsory, seems to give more flexibility and accommodate more possible outcomes. **Footnote ([5])** • Significant change is any change that can significantly affect the characteristics of the waste water and that would therefore require a new assessment of these characteristics. • The wording "significant change" used in the footnote may be clarified by replacing it with a description, e.g. "change that may negatively affect the quantity and qualitative characteristics of the waste water streams pursuant to BAT 2". **Additional footnote** • Effluents of the textile sector can fluctuate and change a lot, based on the production demands. This is particularly true for plants working on commission. Therefore, a footnote on decreasing the minimum monitoring frequency in the case where emission levels are stable does not seem relevant.. • Monitoring of emissions of metals to water is carried out for the processes where they have the potential to occur (e.g. dyeing), as specified in the "Activities/processes" column of the table. • Although toxicity provides similar information to AOX, COD and biodegradability, these parameters on their own give more specific information on the presence and characteristics of certain hazardous compounds or groups of compounds that are available from the toxicity test of the effluent. The information provided may 'overlap' in the sense that the parameters mentioned would all detect the same effect of the pollutants/compounds (e.g. the toxicity), but the identity and concentration of specific compounds or groups of compounds causing the toxicity (important for their abatement) would be missing. • Only one plant (CZ015) reported adding UV stabilisers in dyeing. No additional information regarding UV treatments was received in the data collection via questionnaires, to support the comment and assess the influence of UV treatment on the monitoring frequency.

	• According to the data collected, there is no significant difference in the monitoring frequency between plants treating synthetic fibres versus plants treating other fibres. The type of discharge (i.e. direct) has a much bigger influence on the requirement for a monthly monitoring frequency (e.g. used 2-3 times more often compared to indirect discharge).
EIPPCB proposal:	**BAT statement** • To add in General considerations a provision that the emission levels associated with the BAT-AELs for emissions to water apply at the point where the emission leaves the installation. **Activities / processes** • To change activities/processes for copper, nickel and zinc to "Dyeing" and "Printing with dyes". **Monitoring frequency** • To add new footnotes to clarify the adaptation of monthly monitoring frequency (for the parameters AOX, BOD, COD, colour, metals (Sb, Cr, Cu, Ni, Zn), TN, TOC, TP and TSS), and quarterly monitoring frequency (for the parameters HOI, sulphide, other surfactants) in the case of indirect discharge. **Adsorbable organically bound halogens (AOX)** • To clarify the adaptation of monitoring frequencies in the case of indirect discharge. **Biodegradability** • To add biodegradability as a factor to be considered for individual waste water streams in BAT 2. **Biochemical oxygen demand (BOD_n)** • To add a new standard, EN ISO 5815-1. **Hydrocarbon oil index (HOI)** • To add Footnote ([1]). **Metals / metalloids:** **Chromium (Cr)** • To add metal oxide dyes as an example of chromium-containing dyes in activity/process. **Copper (Cu)** • To specify dyeing/printing as concerned processes **Nickel (Ni)** • To specify dyeing/printing as concerned processes **Pesticides** • To change the frequency to be decided after effluent characterisation (same as biodegradability). **Perfluorinated compounds** • To change the name of perfluorinated compounds. **Surfactants** • To group the three different types of surfactants (anionic, cationic and non-ionic). **Footnote ([2])** • To delete the footnote. **Footnote ([4])** • To change it to accommodate for the option to have "one or a combination of monitoring standards/methods".

	Footnote ([5]) • To clarify the text by describing the meaning of significant change. **New Footnote ([6]) and Footnote ([7])** • To clarify the adaptation of monitoring frequencies in the case of indirect discharge.

1.4.2.2 Monitoring channelled emissions to air

<table>
<tr><td>Location in D1:</td><td>P. 726 – Section 5.1.2– BAT 8</td></tr>
<tr><td>Current text in D1:</td><td>
BAT 8. BAT is to monitor channelled emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.
<table>
<tr><th>Substance/parameter</th><th>Standard(s)</th><th>Activities / processes</th><th>Minimum monitoring frequency</th><th>Monitoring associated with</th></tr>
<tr><td>CO</td><td>EN 15058</td><td>Singeing
Combustion plants</td><td>Once every 3 years</td><td>—</td></tr>
<tr><td>Dust</td><td>EN 13284-1</td><td>Fabric production
Singeing
Thermal treatment</td><td>Once every year ([1]) ([2])</td><td>0</td></tr>
<tr><td>Formaldehyde</td><td>No EN standard available</td><td>Coating ([3])
Flame lamination
Printing ([3])
Singeing
Thermal treatment after finishing and after printing ([3])</td><td>Once every year ([1]) ([4])</td><td>0</td></tr>
<tr><td>NH_3</td><td>No EN standard available</td><td>Coating ([3])
Printing ([3])
Thermal treatment after finishing and after printing ([3])</td><td>Once every year ([1]) ([5])</td><td>0</td></tr>
<tr><td>NO_X</td><td>EN 14792</td><td>Singeing
Combustion plants</td><td>Once every 3 years</td><td>—</td></tr>
<tr><td>SO_X ([6])</td><td>EN 14791</td><td>Combustion plants</td><td>Once every 3 years</td><td>—</td></tr>
<tr><td>TVOC</td><td>EN 12619</td><td>Coating
Lamination
Printing
Singeing
Thermal treatment</td><td>Once every year ([1]) ([7])</td><td>0</td></tr>
</table>
</td></tr>
</table>

	([1]) The measurements are carried out at the highest expected emission state under normal operating conditions. ([2]) In the case of a dust mass flow of less than 50 g/h, the minimum monitoring frequency may be reduced to once every 3 years. ([3]) The monitoring only applies when the substance concerned is identified as relevant in the waste gas stream based on the inventory of inputs and outputs mentioned in BAT 2. ([4]) In the case of a formaldehyde mass flow of less than 2.5 g/h, the minimum monitoring frequency may be reduced to once every 3 years. ([5]) In the case of a NH_3 mass flow of less than 50 g/h, the minimum monitoring frequency may be reduced to once every 3 years. ([6]) The monitoring does not apply if natural gas only is used as fuel. ([7]) In the case of a TVOC mass flow of less than 100 g/h, the minimum monitoring frequency may be reduced to once every 3 years.
Summary of comments:	**BAT statement** • Amend the BAT statement as follows: "BAT is to monitor relevant channelled emissions to air with at least…", as only pollutants at detectable concentrations should be monitored, not all the pollutants listed in the table (CZ_A 8, CZ_B 90). **Activities / processes** • Delete for several parameters "Singeing" from the relevant processes, as those parameters are only relevant for combustion plants (EURATEX 112). **CO** • Delete "Singeing" from the relevant processes, as CO is not relevant for "Singeing" (DE 342, EURATEX 133); CO is only relevant for combustion plants (EURATEX 148). **Dust** • Delete "Fabric production and Thermal treatment" from the relevant processes, as dust is only relevant for "Singeing" (DE 170, EURATEX 149). • Delete "Fabric production and Thermal treatment" from the relevant processes, as the channelled emissions from these processes are not relevant (EURATEX 112). • Delete "Singeing" and replace "Thermal treatment" with "Finishing". Dust is only relevant for combustion plants and not for emissions to air from drying (EURATEX 133). • Add in relevant processes "Carpet cropping" or ensure that carpet cropping is included within the definition for fabric production. Carpet cropping is an inherently dusty process (UK 13). • Add a footnote to reduce the monitoring frequency from once every year to once every three years (DE 354), for thermal treatment, when there is an alternative control of emissions or stability of the process (EURATEX 40). **Formaldehyde** • Replace "Thermal treatment after finishing and after printing" with "Thermal treatment", as formaldehyde can also be formed under incomplete burning conditions. Expand the monitoring to directly heated thermal apparatus (DE 65). • Delete "Singeing" from the relevant processes and replace "Thermal treatment" with "Finishing". Formaldehyde is only relevant for combustion plants, not for emissions from drying (EURATEX 133). • Replace "Thermal treatment after finishing and after printing" with "Thermal treatment after finishing", as the source of formaldehyde emissions to air is drying (EURATEX 112). • Add a definition for coating which covers carpet back-coating with latex, or clarify that emissions of formaldehyde from carpet back-coating with latex are covered under BAT 8. This parameter is a concern from a human health and environmental perspective when there is a significant risk of it being emitted in significant quantities (UK 14). • Reduce the monitoring frequency from once every year to once every three years, when the emissions factor concept is applied every year for all recipes (DE 348).

	NH_3 • Reduce the monitoring frequency from once every year to once every three years, when the emissions factor concept is applied every year for all recipes (DE 348). **NO_X** • Delete "Singeing" from the relevant processes as NO_x is not relevant for "Singeing" (DE 343). NO_x is only relevant for combustion plants (EURATEX 112, EURATEX 133). **TVOC** • Delete "Singeing" from the relevant processes and replace "Thermal treatment" with "Finishing". TVOC is only relevant for combustion plants, not for emissions from drying. A source of TVOC emissions to air is the use of chemical products (EURATEX 112, EURATEX 133). • Add a definition for coating which covers carpet back-coating with latex, or clarify that emissions of TVOC from carpet back-coating with latex are covered under BAT 8. This parameter is a concern from a human health and environmental perspective when there is a significant risk of it being emitted in significant quantities (UK 14). • Reduce the monitoring frequency from once every year to once every three years, when the emissions factor concept is applied every year for all recipes (DE 348). **Mass flow thresholds** • Clarify that mass flow threshold refers to the total emission mass flow of the installation, not to a single stack (DE 70). **Footnote ([1])** • Add that the emission factor concept described in Section 4.1.2.4 of D1 is used to determine the highest expected emission. A reliable method is needed to predict the highest expected emission, as substances change quite often with a wide range of different recipes (DE 125). **Footnote ([3])** • Apply Footnote ([3]) to dust, as monitoring should be carried out only if relevant emissions are expected (DE 69). • Apply Footnote ([3]) to formaldehyde for the relevant processes "Singeing", according to information included in Sections 2.6.1.1 and 3.5.4 of D1 (IT 11). • Apply Footnote ([3]) to TVOC as monitoring for coating, lamination, printing and thermal treatment is only relevant when solvents are used (EURATEX 41). **Footnote ([6])** • Add LPG, as the sulphur content of LPG is similar to natural gas (IT 10), so SO_x emissions are not relevant for liquid gas in heating units (DE 68). • Apply Footnote ([6]) to dust for relevant processes "Thermal treatment", as dust emissions to air are not relevant when natural gas is used as fuel (EURATEX 40). **Footnote ([7])** • Clarify that the mass flow threshold refers to the total emission mass flow of the installation, not to a single stack (DE 67). • Add the three following points, to clarify that the footnote does not contradict requirements in Article 62, and special provisions reported in Chapter V of the IED: - organic solvent consumption for coating exceeds 5 tonnes per year; - organic solvent consumption of lamination exceeds 15 tonnes per year; - organic solvent consumption for rotary screen printing exceeds 30 tonnes per year (IT 12). **Additional footnotes** • Add a similar footnote to Footnote ([1]) in BAT 7, to monitor pollutants only when relevant emissions of these pollutants are expected. For example, ammonia is not a general pollutant for each finishing process (DE 66, DE 173, EURATEX 151) or formaldehyde emissions are only relevant when formaldehyde is used in specific processes or chemicals (DE 171, EURATEX 151).

	• Add a new footnote to allow for all parameters a monitoring frequency of once every three years if the technique described in Section 4.1.2.4 of D1 (emission factor concept) is applied or measurements with low and stable values are achieved (EURATEX 150). • Add a new footnote to increase the monitoring frequency for larger emitters and to provide more proportionate risk-based monitoring for smaller emitters, as monitoring once every three years does not provide meaningful data to assess the potential impact of the emissions to air (UK 15).
EIPPCB assessment:	**BAT statement** • Footnote ([3]) gives the flexibility to monitor only those parameters identified as relevant in the inventory of inputs and outputs mentioned in BAT 2. • For the other cases where Footnote ([3]) does not apply, the comment is not clear as to why the monitored parameters may not always be relevant for the processes concerned. **Activities / processes** • According to the data collection, singeing is a widespread process within the textile industry. Singeing is included under the scope of the BAT conclusions and was also included in the data collection (see Section 8.5 of the KoM report). It is not clear for which parameters singeing is not relevant or the reason why. **CO** • According to the KoM conclusions, data for CO emissions from singeing should be collected. The technical justification for the changes proposed in the comment submitted is not entirely clear. As stated in the scope of the BAT conclusions, when the generated hot gases are used for direct contact heating, then these processes are included in the scope of these BAT conclusions. • A total of 3 out of 31 emission points to air associated with the singeing process (i.e. ES058_{15}, ES058_{35} and SE120_{1}) have reported data for CO. The values reported for the 3 emission points were: ES058_{15} reported 74.82 mg/Nm^3 and 416 g/h, ES058_{35} reported 137.42 mg/Nm^3 and 657 g/h, and SE120_{1} reported a yearly average of 151,246 kg/year. • Singeing is a burning process where CO emissions can be generated by an incomplete combustion process when using fossil fuels. It is not clear why CO emissions to air are not relevant for singeing. **Dust** • The data collection shows that 13 emission points reported dust measurements for fabric production in a concentration range from 1 mg/Nm^3 up to 23 mg/Nm^3 and a mass load range from 8 g/h to 270 g/h. 20 emission points reported dust measurements for singeing in a concentration range from 0.2 mg/Nm^3 up to 20 mg/Nm^3 and a mass load range from 0.8 g/h to 125 g/h. 67 emission points reported dust measurements for thermal treatment in a concentration range from 0.02 mg/Nm^3 up to 112 mg/Nm^3 and a mass load range from 0.03 g/h to 461 g/h. • Based on this data, it is not clear why singeing and thermal treatment are not relevant for dust emissions. • Dust is expected to be generated in combustion processes, either due to the type of fuel or the textile materials which are in contact with the gaseous products of combustion. This can be clarified in the • Regarding fabric production, it seems that the 13 EPs are connected to thermal treatment and not to the fabric production itself (see also the assessment done for Table 5.6). • Monitoring activities were harmonized with activities in table 5.6 (with BAT-AELs) and are proposed for emissions from singeing and from thermal treatments as steps associated with pre-treatment, dyeing, printing and finishing. This has been clarified in the wording of activities/processes column. • The proposed monitoring is based on the data collection and no data were collected about emissions to air from carpet cropping. • According to the data collection, more than half of the emission points that have measured dust emissions from thermal treatment have done so with a monitoring frequency of once every 3 years. This could be reflected by applying Footnote ([2]) to thermal treatment. • Regarding the use of an emission factor to reduce the monitoring frequency, no data have been reported on applying an emission factor for dust.

Formaldehyde

- The processes it is proposed in BAT 8 to monitor are coating, flame lamination, printing, singeing, and thermal processes after finishing or printing, all of them related to the use of chemical substances and high temperatures. According to the data collection, the concentration ranges for each of these processes are: coating and flame lamination from 0.3 to 20 mg/Nm^3 and a mass load range from 1.1 g/h to 328 g/h, printing from 0.05 mg/Nm^3 to 1.9 mg/Nm^3 and a mass load range from 0.3 g/h to 36.5 g/h, singeing from 1.8 mg/Nm^3 up to 4.1 mg/Nm^3 and a mass load range from 5 g/h to 20 g/h, and thermal treatment after finishing and after printing from 0.02 mg/Nm^3 up to 20 mg/Nm$^{3.}$ and a mass load range from 0.1 g/h to 328 g/h. Based on these data, it is not clear why the processes proposed in BAT 8 are not relevant for emissions of formaldehyde to air. These emissions could originate either from a combustion process where formaldehyde is formed (e.g. singeing or flame lamination) or from thermal treatment without a combustion process (e.g. drying) where formaldehyde or formaldehyde-prone substances are contained in process chemicals (see BAT 46 and BAT 47). In the latter situation, Footnote ([3]) accounts for the cases where process chemicals do not contain formaldehyde or formaldehyde-prone substances.
- More generally, monitoring activities were harmonized with activities in BAT 23 and table 5.5. BAT-AELs are proposed for emissions from processes and from thermal treatments as steps associated with them. This has been clarified in the wording of activities/processes column.
- The proposed monitoring is based on the data collection and no data were collected about emissions to air from carpet cropping.
- Emission factors can be one tool to identify that formaldehyde emissions are low. Whether or not the emission factor concept ensures provision of data of an equivalent scientific quality than a monitoring standard method is in the remit of the competent authorities. More generally speaking, there is no EN standard available for formaldehyde. As stated in the WBP and ROM reference documents, periodic sampling of formaldehyde can be performed using two different methods with a potential for difference in the measurement results. High volume isokinetic sampling in an impinging solution tends to give higher results than low volume non-isokinetic sampling on adsorption tubes. According to the BAT statement, BAT is to use ISO, national or other internal standards that ensure provision of data of an equivalent scientific quality.

NH_3

- Regarding the comment related to the use of emission factors, see the assessment done for formaldehyde.
- Add the new monitoring standard for channeled emissions of NH_3 to air, which was published on 30.04.2020: EN ISO 21877:2019.
- Monitoring activities were harmonized with activities in table 5.7 (with BAT-AELs) and are proposed for emissions from coating, printing and finishing, and from thermal treatments associated with them. This has been clarified in the wording of activities/processes column.

NO_X

- A total of 5 out of 31 emission points to air associated with the singeing process (i.e. PT115_{10}, ES058_{35}, ES058_{15}, PT109_{3} and SE120_{1}) have reported data for NO_x. The values reported for the 5 emission points were: PT115_{10} reported 8.2 mg/Nm^3 and 28 g/h, ES058_{35} reported 18.8 mg/Nm^3 and 90 g/h, ES058_{15} reported 18.8 mg/Nm^3 and 105 g/h, PT109_{3} reported 27.1 mg/Nm^3 and 26 g/h and SE120_{1} reported a yearly average of 135.53 kg/year.
- Singeing is a burning process where NO_x emissions can be generated in the combustion process when using fossil fuels. It is not clear why NO_x emissions to air are not relevant for singeing.

TVOC

- A total of 20 out of 31 emission points to air associated with the singeing process have reported data for TVOC in a concentration range from 0.5 mg/Nm^3 to 64 mg/Nm^3, and a mass load range from 4 g/h to 353 g/h. According to the data collection, it is not clear why TVOC emissions to air are not relevant for singeing
- Drying is included in the definition of thermal treatment. According to the data collection, 162 emission points reported data for TVOC in a concentration range from

	0.2 mg/Nm^3 to 223 mg/Nm^3, and a mass load range from 0.04 g/h to 3 380 g/h. According to the data collection, it is not clear why TVOC emissions to air should only be relevant for combustion plants. • The proposed monitoring is based on the data collection and no data were collected about emissions to air from carpet cropping. • Regarding the comment related to the use of emission factors, see the assessment done for formaldehyde. • Monitoring activities were harmonized with activities in table 5.5 (with BAT-AELs) and are proposed for emissions from coating, dyeing, finishing, lamination, printing and singeing, and from thermal treatments as steps associated with them. This has been clarified in the wording of activities/processes column. • TVOC as a parameter may include CMR substances other than formaldehyde (see Kick-off meeting report), therefore it is proposed to monitor such substances with the same frequency as formaldehyde **Mass flow thresholds** • See the assessment for each parameter in Section 1.4.8 of this BP. **Footnote ([1])** • How to determine the highest expected emission state under normal operating conditions is an implementation issue. Indeed, the technique described in Section 4.1.2.4 of D1 is an option. There are, however, other alternatives such as techniques described in Sections 4.1.1.2 and 4.1.2.3 of D1. Therefore, prioritising one technique over the others does not seem necessary. • Footnote ([1]) is meant to ensure that the emissions are monitored even at the highest emission state, even if this might not have been the case for some plants in the data collection. Such a footnote was used in the latest adopted BAT conclusions (e.g. FDM, STS) and a provision to apply the measurements to the extent possible could be added also in these BAT conclusions. **Footnote ([3])** • According to the data collected, fabric production, singeing and thermal treatment are processes where relevant dust emissions have been reported (see assessment above related to dust). It is not clear in which circumstances dust may not be relevant. • Formaldehyde emissions can be generated in a combustion process (e.g. singeing). Clarification in Sections 2.6.1.1 and 3.5.4 of D1 can be included. • Footnote ([7]) gives the flexibility to monitor every 3 years, taking into account the use of a relevant quantity of solvents. Nevertheless, it could be possible to have coating, lamination, printing or thermal treatment without the use of organic substances. This could be reflected by applying Footnote ([3]) to the parameter TVOC. • For consistency with tables 5.5 and 5.7, footnote ([3]) has been specified for Finishing processes for formaldehyde and ammonia. **Footnote ([6])** • The use of LPG is expected to be related to insignificant SO_X emissions to air and this can be further specified. • Dust is not expected from combustion of natural gas; however, when using natural gas the source of dust is not in the fuel but in the product itself. For example, emission points PT109_{30}, PT109_{31}, FR135_{1}, PT109_{30}, PT114_{34} and PT109_{29} reported a dust concentration range from 17.6 mg/Nm^3 to 45.9 mg/Nm^3 and a mass load range from 14.4 g/h to 411 g/h, for processes associated with thermal treatment and using natural gas as fuel. **Footnote ([7])** • Regarding the comment about the mass flow, see the assessment in Section 1.3.1 and Section 1.4.8 of this BP. • The monitoring frequency proposed in Footnote ([7]) does not contradict the requirements of Article 62 of the IED, i.e. measuring once every year fulfils the minimum monitoring frequency of once every 3 years proposed in Footnote ([7]). • On the other hand, according to the provisions of Part 6 of Annex VII to the IED, channels to which abatement equipment is connected, and which at the final point of discharge emit more than an average of 10 kg/h of total organic carbon, shall be

	monitored continuously. According to the data collections, no plant reported a TVOC load over 10 kg/h. The maximum mass load reported in the data collection for TVOC was 3.4 kg/h (IT059_{3}). **Additional footnotes** • Adding a general footnote on all parameters that the monitoring requirement may not apply when the substance is not present in the waste would undermine the usefulness of the BAT for the permit writers. Guidance is given by the "Activities / processes" column, which already considers the expected relevance of each substance for each process. • All the parameters (except ammonia and formaldehyde) may be monitored once every 3 years, if the emissions are below a specific mass flow threshold, which could be estimated by using the emission factor concept. • In the case of higher emissions, however, it is not clear how emission factors could substitute actual measurements especially in the cases where EN standards are available. In all recently published BAT conclusions (WI, FDM, etc.), TVOC is monitored as per EN 12619. Introducing another type of monitoring would not be consistent with the other BAT conclusions and would lead to distortions in terms of a level playing field and in terms of data comparability. • The principle of proportionality is encompassed in the proposed BAT 8 as, for some parameters, the monitoring frequency is higher for larger emission sources and lower for smaller emission sources.
EIPPCB proposal:	**BAT statement** • No change. **Activities / processes** • For the proposal of comments regarding activities/processes, see the following parameter-specific points. **CO** • No change. **Dust** • To delete fabric production in the column of Activities / processes. • To add combustion in the column of Activities / processes • To clarify in the column of Activities / processes to which processes the thermal treatments are associated. **Formaldehyde** • To add Finishing Activity/Process and clarity to which processes the thermal treatments are associated. **NH_3** • To add a new EN monitoring standard. • To add Finishing Activity/Process and clarity to which processes the thermal treatments are associated. **NO_X** • No change. **SO_2** • To implement a minor editorial change in the name of the parameter, as combustion plants are the main source of emissions to air. **TVOC** • To add Finishing Activity/Process and clarity wo which processes the thermal treatments are associated. • To add monitoring of CMR compounds.

	Mass flow thresholds • To delete footnotes ([4]) and ([5]). **Footnote ([1])** • To add 'to the extent possible'. **Footnote ([3])** • Add Footnote ([3]) for emissions to air for TVOC. • To add footnote ([3]) to Finishing for formaldehyde and ammonia. **Footnote ([6])** • To amend the footnote to include LPG as fuel with insignificant SO_2 emissions to air. **Footnote ([7])** • No change. **Additional footnotes** • Not to add additional footnotes.

1.4.3 Water use and waste water generation

1.4.3.1 Techniques for reducing water consumption and waste water generation

Location in D1:	**P. 727 – Section 5.1.3 – BAT 9**
Current text in D1:	**BAT 9. In order to reduce water consumption and waste water generation, BAT is to use all of the techniques given below.**

	Technique	Description	Applicability
	Management techniques		
a	Water management plan and water audits	A water management plan is part of the EMS (see BAT 1) and includes: • flow diagrams and a water mass balance as part of the inventory of inputs and outputs mentioned in BAT 2; • establishment of water efficiency objectives; • implementation of water optimisation techniques (e.g. control of water usage, reuse/recycling, detection and repair of leaks). Water audits are carried out at least annually to ensure the objectives of the water management plan are met.	The level of detail of the water management plan and water audits will generally be related to the nature, scale and complexity of the plant

	b	Production optimisation	This includes: • optimised combination of processes (e.g. pretreatment processes are combined, bleaching of textile materials is avoided before dyeing in dark shades); • optimised scheduling of batch processes (e.g. dyeing of the textile materials in dark shades is carried out after dyeing in light shades in the same dyeing equipment).	Generally applicable
	Design and operation techniques			
	c	Water-free processes	Processes that do not use water include plasma, laser or ozone treatments.	Only applicable to new plants or major plant upgrades. The applicability may be restricted by the characteristics of the textile materials and/or product specifications
	d	Optimisation of the amount of process liquor used	Batch processes are carried out with low-liquor-ratio systems (see Section 5.9.4). Continuous processes are carried out with low-volume application systems (see Section 5.9.4).	Generally applicable
	e	Optimised cleaning of the equipment	This includes: • water-free cleaning (e.g. by wiping or brushing the tanks' inner surfaces); • multiple cleaning steps with low amounts of water; the water of the last cleaning step may be reused to clean another part of equipment.	

	f	Optimised batch processing, washing and rinsing of textile materials	This includes:
			• use of auxiliary tanks for temporary storage of:
			  ○ spent washing or rinsing water;
			  ○ fresh or spent process liquor;
			• multiple drain and fill steps for rinsing and washing with low amounts of water.	

	g	Optimised continuous processing, washing and rinsing of textile materials	This includes: • timely process liquor preparation based on online pick-up measurements; • automatic closure of the washing water inflow when the washing machine stops; • countercurrent rinsing and washing; • intermediary mechanical dewatering of textile materials (see BAT 12 b) to reduce the carry-over of process chemicals.	

<table>
<tr><td></td><td>
<table>
<tr><td colspan="4">Reuse and recycling techniques</td></tr>
<tr><td>h</td><td>Water reuse and/or recycling</td><td>Reuse and/or recycling of water streams (preceded or not by water treatment), e.g. for cleaning, rinsing, cooling or in the processing of textile materials. The degree of water reuse/recycling is limited by the content of impurities in the water streams.</td><td rowspan="2">Generally applicable</td></tr>
<tr><td>i</td><td>Reuse of process liquor</td><td>Process liquor, including the process liquor extracted from textile materials by mechanical dewatering (see BAT 12 b), is reused after analysis and make-up if needed.
The degree of reuse of process liquor is limited by the content of impurities.</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td>
<u>Whole BAT</u>

For increased clarity and simplicity, restructure the BAT conclusion into two BAT conclusions: one on water management and the other on techniques to reduce water consumption and pollutants in the effluents. Make separate techniques of the techniques not grouped under the title “optimisation/optimised” not to lose relevance (DE 418). See also the general comment (DE 396) on Chapter 5.

<u>BAT statement</u>

Adjust the applicability or change the BAT statement to use "all" of the techniques because some techniques are not applicable to all installations. For example, it is not consistent to have both techniques c and d (DE 175, FR_B 6).

<u>Management techniques</u>
<u>Technique a</u>

Specify whether the inventory of water inputs and outputs (BAT 2) is also covered by the water management plan (BAT 9) (AT 40).
Set BAT 9a as a "stand-alone" BAT conclusion because a water management plan is a prerequisite for all techniques for the reduction of water consumption. It should be implemented in all installations (DE 355). See the proposal, attached to the comment, regarding prioritising this technique in a separate BAT conclusion (DE 418).
Add a reference to BAT 5 in technique a because the monitoring results (of water consumed and waste water generated) shall be taken into account when optimising water consumption and releases (FR_A 4).
Decrease the frequency of water audits (e.g. every 3 years), provided that the measures to be implemented between audits are monitored and controlled at least annually to ensure that the objectives are met (PT 12).
Amend the applicability to also provide for a lower frequency of auditing for smaller less complex sites (e.g. single process) to once every 4 years (UK 16).

<u>Technique b</u>

Specify distinct combinations of pretreatment processes in the description, e.g. washing and bleaching or washing and desizing (DE 384). Explain in the description what "optimised processes" are in Europe (DE 418).
Specify that not all combinations of processes are possible, especially if the chemicals used are incompatible. Also, scheduling may be limited by demands of processes, e.g. if the process needs a subsequent step within a defined time (EURATEX 152).

<u>Design and operation techniques</u>
<u>Technique c</u>

Delete the technique as laser, plasma and ozone techniques are emerging techniques and not BAT. There is no information available about the implementation of the laser/plasma technique in the questionnaire of Plant DE042. As regards the ozone technique, there is only one plant mentioned which is located in Tunisia (FR_B 5).

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</table>

	• Change the applicability: laser and ozone treatment are only applicable for garment treatment, and plasma only applicable for pretreatment, e.g. of wool (DE 345, EURATEX 153). • Specify the applicability restrictions for different treatments in line with the descriptions of techniques in Chapter 4 or delete them. For example, the description for laser and plasma treatment in Section 4.7.1.1 of D1 does not justify any restriction but states broad applicability. Similarly, ozone treatment is referred to in Section 4.4.7.3 of D1, which states general applicability to cellulose, keratin and synthetic fibre (see also EEB 100 and EEB 105) (EEB 106, EEB 120). Technique d • Mention water-free processes under technique d, with the same structure as technique e: with water-free processes as a first bullet and the second bullet the remaining current description because technique c and technique d cannot be applied at the same time (FR_B 6). • Split this technique into two separate techniques: i) Exhaust processing at low liquor ratio (LR 1:3–1:6) for discontinuous pretreatment and exhaust dyeing of all fibres except wool and silk; and ii) minimisation of the volume of padders and segregation of spent padding liquors for dyeing, finishing, laminating or coating for reuse or disposal and minimisation of the system volume from rotary printing and recycling of residual printing pastes (DE 418). • Change the applicability to "only applicable to new plants or major plant upgrades" because the 'liquor ratio' depends on the type of dyeing machines; existing machinery is not always equipped or adjustable for low-water processes and would therefore be reduced only by replacing the existing machines with new ones (IT 13, EURATEX 92). Technique e • Change the applicability to "only applicable to new plants or major plant upgrades" because water-free cleaning (wiping, brushing the tanks' inner surface) cannot be carried out in a safe way (safety restrictions) in an existing tank park and screen cleaning system (EURATEX 92). • Add techniques for rotary printing, i.e. mechanical pre-cleaning of squeegees and rotary screen and of drums containing printing pastes, segregation of high concentrated spent liquors (padding liquors) before washing the padder (proposal attached to the comment) (DE 418). Technique f • Change the applicability to "only applicable to new plants or major plant upgrades" because the implementation of auxiliary tanks for temporary storage requires the new piping to collect and transport the exhausted washing and rinsing waters (IT 41). The piping/tanks may also be restricted by the space available (EURATEX 92). Technique g • Delete the bullet "intermediary mechanical dewatering of textile materials" because its relevance for reducing water consumption (the purpose of BAT 9) is not clear. The technique is more relevant to reduce energy consumption and is already listed in BAT 12 (FR_A 43). • Add techniques: counter-current rinsing and washing and intermediary mechanical or vacuum dewatering of textile materials to reduce carry-over of process chemicals (proposal attached to the comment) (DE 418). • Replace "online pick-up measurements" with "the pick-up rates pre-programmed depending on the raw materials used" (FR_A 44). • Change the introductory sentence of the description to "This may include" because these are only some examples of techniques (FR_B 1). • Change the applicability to: "The applicability may be restricted by the characteristics of the textile materials and/or product specifications". Technique g is not generally applicable because the listed technologies (online pick-up, automatic closure, countercurrent rinsing, etc.) are not used simultaneously in the same equipment. The washing of textiles can be done at many stages during the production (EURATEX 7). **Reuse and recycling techniques** Technique h

	• Change the applicability to: "only applicable to new plants and major plant upgrades" because the technique requires additional piping, which can only be done during a major upgrade. Also, reduction of water consumption by recycling of process water can include high costs, energy, storage and area/spatial demands. It depends on ecological and economic efficiency (EURATEX 93, EURATEX 154). • In the description, add "On site or off site centralised" to reuse and/or recycling of water streams. Centralised waste water management/recycling systems, adopted on site or off site, proved to be highly effective, compared to (single) internal waste water treatment system, allowing all companies, even the smallest ones, to contribute in saving water resources (e.g. the Italian textile district of Prato in Tuscany) (IT 15). • Add specific examples of reuse: i) reusing the washing water from continuous bleaching of cotton woven fabric for scouring and ii) reusing the last rinsing water from mercerisation for washing after bleaching (DE 418). Technique i • Change the applicability to: "Applicability may be restricted by impurities, colour and storage life". Colour and impurities may hamper reuse. Storage life may also be a constraint, e.g. it is limited by the use of natural thickeners (CEFIC 28, EURATEX 94).
EIPPCB assessment:	**Whole BAT** • The structure of this BAT conclusion is similar to some recent BAT conclusions (e.g. STS, FMP). **BAT statement** • Several of the techniques listed are not generally applicable and consideration of the applicability restrictions could be better reflected in the statement. Furthermore, technique a as a management tool would have merit in all cases where water is consumed and/or waste water is generated. • According to the data collection on BAT used at the plant level, 'Water management' and 'Optimisation of water consumption' are used by 86 and 69 out of 106 plants, respectively, which is much more (4-5 times) than is reported for other techniques, like 'Recycling/reuse' 16 or 'Reduction of water consumption for cleaning' (17 plants). This seems to support the argument on generic use of techniques a and b, with the combination of other techniques. **Management techniques** Technique a • The inventory of water inputs and outputs (BAT 2) could indeed be implemented as an integral part of the water management plan (BAT 9a) and/or environmental management system (BAT 1). This is indicated by the cross references in the description of the technique. • Technique a could be a stand-alone conclusion. However, embedding it in the same conclusion might strengthen the link between a customised water management plan and audits and selection and implementation of the appropriate other techniques listed in the same conclusion. Finally, this structure (i.e. management technique embedded with other techniques) has already been used in BAT conclusions (e.g. WT, STS). • The reference to BAT 5 is placed after Table 5.1 which is an integral part of BAT 9 and therefore does not seem to be necessary in the description of the individual techniques. Should Table 5.1 be removed, it would be appropriate to include the reference in BAT 9a. • The yearly frequency of water audits is harmonised with the one used in other BAT conclusions (e.g. STS). According to the data collection, 80 % of plants discharge more than 180 m3 of effluent per day (i.e. at least 18 m3/t of textile treated), which demonstrates the importance of water consumption for textile plants. Regular auditing ensures compliance with water consumption objectives; therefore, yearly frequency of auditing seems reasonable. On the other hand, the level of detail of the audit is already included in the applicability clause which refers to the nature, scale and complexity of the plant. Technique b

	• The examples of combinations of processes given in brackets are not exhaustive but illustrative. Since BAT 35a refers to more specific combinations of processes for cotton fibres, it seems more prudent to add these examples there. • Production optimisation would be carried out on a case-by-case basis in each plant for its specific products and process demands. It is considered that this is a dynamic and ongoing decision-making process, reflecting the utilisation of the plant's production capacity. This technique lays out the principles of production optimisation and these principles seem to be always applicable. However, parameters to be considered when optimising the production could be added in the description in Chapter 4. Technique b1 • To better reflect the technical considerations important for recovery/recycling operations a new technique on segregation of polluted/non-polluted water streams could be added. This technique is considered management technique and could be used always. This could be reflected in BAT statement. **Design and operation techniques** Technique c • Section 2.3.7.2.9 "Example plants" of COM Decision 2012/119/EU (BREF Guidance) states: "Reference(s) to a plant(s) where the technique has been implemented and from which information has been collected and used to draft the section of the BREF concerning that technique will be listed, including an indication of the degree to which the technique is in use in the Union or worldwide." The "Example plants" sections of ozone (Section 4.4.7.3 of D1 of the TXT BREF) and laser/plasma techniques (Section 4.7.1.1 of D1 of the TXT BREF) follow this rule. Article 3(10) of the IED states that a technique is available if "developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator". According to the references listed in Sections 4.4.7.3 and 4.7.1.1 of D1 of the TXT BREF, the techniques mentioned are commercially available and implemented on the industrial scale; therefore, they are not considered emerging. • The use of these techniques is versatile and under intensive development; therefore, it seems better to keep the description very generic and brief. Moreover, the specific uses in regard to the form of the textile substrates do not seem to be the (technical) applicability restrictions but currently the most common modes of use. However, this information could be added in the descriptions of techniques in Chapter 4. • These technologies are related to the instalment of new treatment lines/machinery and the corresponding utilities, which correspond to the definition of major plant upgrade. Additionally, the currently commercialised techniques cannot universally (for all types of fibre, product, quality) replace the performance of conventional wet processing treatments. All these issues are reflected in the proposed applicability restrictions and could be further detailed in Chapter 4. • Laser and plasma treatment do not use water, while ozone treatment is typically conducted in small amounts of water (as carrying medium). Technique d • Technique c and technique d are not mutually exclusive: one plant could have a water-free production line and a second line based on wet processes. Merging both techniques could be an option but would make the understanding more difficult considering the applicability restrictions of technique c. • It is not clear why these techniques would need to be separated. The proposed more detailed descriptions are already included in BAT conclusions with other environmental objectives (e.g. BAT 28 on disposal of spent process liquors or BAT 44 for recovery of printing paste). • Existing machinery can hardly be upgraded with low-liquor-ratio or low-volume application systems and therefore needs to be replaced (i.e. major plant upgrade). This could be reflected in the applicability. Technique e • The examples of water-free cleaning given in the description are illustrative and not exhaustive. It is not clear why safety restrictions are a limitation for the use of this

	technique. The applicability of water-free cleaning may be limited by accessibility. This could be reflected in the applicability statement. • The cross-reference to BAT 43 and example of mechanical cleaning in rotary printing could be added to the description. Handling of highly concentrated spent liquors is already addressed in BAT 43. <u>Technique f</u> • The addition of auxiliary tanks and piping in the existing plants may require substantial redesign of the plant layout due to possible space restrictions, which would be undertaken as major plant upgrades. This could be reflected in the applicability. <u>Technique g</u> • To avoid the contamination of the following rinsing/washing bath, the intermediary mechanical dewatering may be relevant to enable water reuse. The same technique can fulfil multiple environmental objectives. • Vacuum dewatering is one of the mechanical dewatering techniques used in the textiles sector. This is specified in the description of BAT 12b cross-referenced in the description. • Use of pre-programmed pick-up for liquor preparation is static and not responsive or customised to momentary changes. Modern machinery with automatic online pick-up measurement feedback loops may reduce water consumption. • The list of measures given in the technique's description is neither prescriptive nor exhaustive as mentioned in the General considerations. • The list of measures given in the technique's description is illustrative and is not intended to prioritise the measures nor to stipulate that they are used on the same equipment simultaneously. In addition, it is not clear which textile materials or which product specifications limit the applicability of these techniques. **<u>Reuse and recycling techniques</u>** <u>Technique h</u> • The technological factors (like additional piping) and lack of space (e.g. for storage tanks) could be the limiting factors in implementation of this technique. These factors could be acknowledged in the applicability of this technique or related techniques (e.g. see applicability of new technique b1 on segregation of water streams, or technique f). • The textile plants may be located within bigger industrial sites (with many plants) where water management may be shared and carried out through a centralised utility, affecting the plant's reuse/recycling. The description could be amended to reflect this. • The examples of water reuse would prolong the description and add unnecessary detail. They may be added to the technique description in Chapter 4. <u>Technique i</u> • The issue of impurity content is already mentioned in the description as it is an important part of the use of this technique. The perishability of the process liquor could also be mentioned as an influencing factor (as in BAT 28c).
EIPPCB proposal:	<u>BAT statement</u> • To change the BAT statement to require the use of techniques (a), (b) and (b1) and an appropriate combination of the rest of the techniques to reflect the applicability restrictions of several techniques. <u>Technique a</u> • The water audits are added to description of the technique to mirror the applicability. • To add the integrated water management of plants on large sites to the description. <u>Technique b1</u> • Add technique on the segregation of the water streams to promote their reuse/recycling. <u>Technique c</u> • Modify the name and description to reflect that some processes use no and other little water <u>Technique d</u> • To change the applicability of the technique to "only applicable to new plants or

major plant upgrades".

Technique e

- To add examples for rotary printing (i.e. mechanical pre-cleaning of squeegees and rotary screen and of drums containing printing pastes) and a cross reference to BAT 43.
- To add the accessibility of equipment as an applicability restriction for water-free cleaning.

Technique f

- To change the applicability of the technique to reflect lack of space as a limiting factor for existing plants.

Technique h

- To reflect in the description that textile plants on the same site can have common water management (reuse/recycling/waste water treatment).
- To move high degree of reuse and/or recycling (>80%) to the description.
- To change the applicability to refer to the content of impurities and/or characteristics of the water streams.

Technique i

- To add in the description the perishability as an influencing factor for reuse of the process liquor.

BAT 35a

- In the description of technique a, add 'washing' to the treatments listed in brackets.

1.4.3.2 BAT-AEPLs for specific water consumption

Location in D1: **P. 727 – Section 5.1.3 – BAT 9 – Table 5.1**

Current text in D1:

Table 5.1: BAT-associated environmental performance levels (BAT-AEPLs) for specific water consumption

Specific process(es)		BAT-AEPL (Yearly average) (m^3/t)
Bleaching ([1])	Batch	3–48 ([2])
	Continuous	3–8
Scouring of cellulosic materials ([1])	Batch	2–43 ([3])
	Continuous	2–20
Desizing of cellulosic materials ([1])		2–20
Mercerisation		2–13 ([4])
Washing of synthetic material		5–20
Batch dyeing	Fabric	10–175 ([5])
	Yarn	3–140 ([6])
	Loose fibre	13–62
Continuous dyeing		2–16

([1]) The BAT-AEPL for the combined pre-treatment of cotton textiles by bleaching, scouring and desizing is 9–20 m^3/t. The lower end of the range is typically achieved for continuous treatment.
([2]) The lower end of the range is typically achieved with a high level of water recycling (e.g. above XX).
([3]) The lower end of the range is typically achieved with a high level of water recycling (e.g. above XX).
([4]) The lower end of the range is typically achieved with a high level of water recycling (e.g. above 85 %).
([5]) The lower end of the range is typically achieved with a high level of water recycling (e.g. above 85 %).
([6]) The lower end of the range is typically achieved with a high level of water recycling (e.g. above 95 %).

The associated monitoring is given in BAT 5.

Summary: **Whole table**

of comments:	• Develop a new table with different ranges for processes depending on parameters like product quality, textile substrate etc. in a sub-working group with several sector experts. The process-specific consumption of water depends mostly on the product type (e.g. some products need 3-4 process baths, others 15), material (cotton vs. PES), fabric weight (40-3500 g/m², lightweight curtains or nightdresses vs. heavy nonwovens for sound protection or in buildings) or purpose (highly cleaned medical or food contact textiles vs. textiles for dike stabilisation). The current presentation of BAT-AEPLs is not useful, non-transparent and misleading. If appropriate and transparent levels for water consumption could not be achieved, delete Table 5.1 (DE 356). • Replace the BAT-AEPLs by indicative values due to the high diversity in product specification in the textile industry (DE 356, EURATEX 155). • Set BAT-AEPLs in minimum recycling rates for specific processes because it would be more relevant to better environmental performance than specific water consumption ranges. Based on the analysis of the recycling levels/rates and identification of BAT to recycle water in different processes: i) narrow down the BAT-AEPL ranges and ii) set BAT on recycling levels/rates (EEB 186). • Increase the upper end of the BAT-AEPL range for specific water consumption levels of batch dyeing, i.e. for fabric to 250 m3/t, yarn to 200 m3/t and loose fibre to 100 m3/t; due to the following factors: i) type of dye used (i.e. dyeing with reactive dyes) can affect the total required rinsing steps (e.g. up to six); and similarly ii) the higher quality of textile products manufactured. See the Italian questionnaires IT067, IT082, IT096, IT097 (IT 14). • Narrow down the BAT-AEPL ranges as much as possible. For example, the ranges for batch bleaching (3-48 m3/t), scouring (2-43 m3/t) and dyeing of fabric (10-175 m3/t) yarn (3-140 m3/t) are very large and do not seem to be based on comparable data sets. One way of amending this would be to remove from the analysis the data sets for specific water consumption at process level where the figures are the same as for total water consumption at the plant level (and more than one process is in use on site). Examples are data sets from UK123 and UK124 where it was found that the data for both are the same because there is no submetering on site and the operator submitted data for both based on one total water consumption figure (UK 17). **Footnote ([1])** • Change the upper limit for combined processes in Footnote ([1]) to 45 m^3/t because it is not logical compared to values of individual processes (EURATEX 95).
EIPPCB assessment:	**Whole table** • The BAT-AEPLs are derived from the process-level consumption data collected via the questionnaires. Due to KoM decisions, these data were considered confidential, meaning that only the EIPPCB could see the related contextual information (e.g. main plant's products, fibre treated, form of textile material, etc.). • The BAT-AEPL proposals in D1 are based on comparable processes. Further detailing and classification based on type of product or treated textile material was attempted. However, due to the high variability in processes, textile materials and forms, layouts/configurations of plants, affecting the reliability of data reported, it is deemed most practical to propose indicative values instead of BAT-AEPLs. • The proportions of recycled/reused water from the data collection exercise were presented in figures and tables together with water consumption levels at plant and process level in Section 3.6.3 of D1. This information is considered when evaluating data sets to be considered for setting the BAT-AEPLs; however, there is not enough comparable data, due to various different local and technical circumstances, to propose BAT-AEPL recycling levels at the plant or process level. • Based on the data reported in the questionnaires for Plants IT067, IT082, IT096, IT097, it was established that IT082 does batch dyeing of fabric, IT082 and IT097 do batch dyeing of yarn, and they all do batch dyeing of loose wool fibre. The specific water consumption of these plants is typically within the proposed range, except for one of them, which exceeds the proposed upper ends of the corresponding BAT-AEPL levels. Therefore, only one IT plant could be considered for increasing the proposed BAT-AEPL range for batch dyeing of loose fibres or yarns. • Regarding the argument on dyeing with reactive dyes (requiring more rinsing steps),

	there are five plants, dyeing loose wool fibres or yarns with reactive dyes apart from the one IT plant mentioned, reporting water consumption below the upper end of the BAT-AEPL for batch dyeing of loose fibres or yarns. The information on the higher quality of textile products manufactured was not collected through the questionnaires, and, apart from the IT plants mentioned in the comments, it was not possible for the EIPPCB to identify other such plants. Therefore, the data and information available do not support increasing the upper ends of BAT-AEPL range for batch dyeing of loose fibres or yarns. • The data sets where the water consumption at the plant level exceeded the sum of the consumption reported at the process level were indeed excluded from the data sets used for setting the BAT-AEPL ranges. **Footnote ([1])** • The BAT-AEPL range for combined (one-step) processes is derived based on the values reported in the questionnaires. It was derived as the sums of the values reported for the individual processes in those plants that indicated using the technique of combined (one-step) pretreatment. The lower/upper ends of the water consumption levels for individual continuous processes are based on all plants, those that use one-step pretreatment and those that do not. Therefore, addition of the values of lower/upper ends does not give the performances achievable with the technique mentioned.
EIPPCB proposal:	• To propose indicative values instead of BAT-AEPLs. • To adapt ranges based on the new assessment considering TWG comments, additional explanations and information provided.

1.4.4 Energy efficiency

Location in D1:	**P. 729 – Section 5.1.4**
Current text in D1:	Entire Section 5.1.4.
Summary of comments:	• Change the applicability in the BAT conclusions of this section to "only applicable to new plants or major plant upgrades and if economically feasible" because the statements of BAT 10 to 12 say 'use all of the techniques' and not all techniques are always and in every case applicable, or feasible (e.g. cogeneration is only useful when there a constant and sufficient demand of heat) (CEFIC 30).
EIPPCB assessment:	• The selection and implementation of some of the techniques in BAT 10, BAT 11 and BAT 12 may be restricted by the substrate type, product quality requirements, type of processes (e.g. batch/continuous), thermal equipment (dryers, stenters), off-gas treatment systems are their mutual compatibility. This could be reflected in the BAT statements of the conclusions in this section.
EIPPCB proposal:	• To change the wording of the BAT statements in this section (5.1.4) to reflect that a combination of techniques is considered BAT.

1.4.4.1 Techniques for using energy efficiently

Location in D1:	**P. 729 – Section 5.1.4 – BAT 10**
Current text in D1:	**BAT 10. In order to use energy efficiently, BAT is to use all of the techniques given below.** **Technique** | **Description** | **Applicability** ***Management techniques***

	a.	Energy efficiency plan and energy audits	An energy efficiency plan is part of the EMS (see BAT 1) and includes: • energy flow diagrams as part of the inventory of inputs and outputs (see BAT 2); • setting objectives in terms of energy efficiency (e.g. MWh/t of textile materials processed); • implementing actions to achieve these objectives. • Energy audits are carried out at least annually to ensure that the objectives of energy efficiency plan are met.	The level of detail of the energy efficiency plan will generally be related to the nature, scale and complexity of the plant
	b.	Production optimisation	Optimised scheduling of fabric batches to undergo thermal treatment in order to minimise the idling time of the equipment.	Generally applicable
	Common techniques			
	c.	Use of common techniques	This includes: • burner maintenance and control; • cogeneration; • energy-efficient motors; • energy-efficient lighting; • optimising steam distribution systems, e.g. by using point-of-use boilers; • regular inspection and maintenance of the steam distribution systems to prevent or reduce steam leaks; • process control systems; • reducing heat losses by insulating equipment components and by covering tanks or bowls containing warm process liquor; • optimising the temperature of the rinsing water; • avoiding overheating of the process liquors; • variable speed drives; • optimising air conditioning and building heating.	Generally applicable
	Heat recovery techniques			
	d.	Recycling of warm cooling water	See BAT 9 h. This avoids the need for heating cold water.	Generally applicable
	e.	Reuse of warm process liquor	See BAT 9 i. This avoids the need for heating cold process liquor.	
	f.	Heat recovery from waste water	Heat from waste water is recovered by heat exchangers, e.g. to warm up process liquor.	
	g.	Reuse and/or recycling of warm air	Warm cooling air (e.g. from air-cooled air compressors) is reused and/or recycled (e.g. for drying, after dedusting if needed).	
	h.	Heat recovery from waste gases	Heat from waste gases (e.g. from thermal treatment of textile materials, steam boilers) is recovered by heat exchangers and used (e.g. to warm up process water or to preheat combustion air).	

	i. Heat recovery from steam use | Heat, e.g. from hot condensate and boiler blowdown, is recovered. |
Summary of comments:	**Management techniques** Technique a. • Make BAT 10a a "stand-alone-BAT". An energy management plan is indeed a prerequisite for all techniques for the reduction of energy consumption and should be implemented in all installations (DE 357). • Replace "energy audits" with "monitoring" because an energy efficiency plan is based on an energy audit, which is performed periodically (e.g. every 4 years). The follow-up of the energy plan is done via monitoring (EURATEX 96, CEFIC 29). • Add the following footnote in the table: "EN ISO 50001:2018 is an example of a management system compliant with BAT 10a" for easier implementation (ES 37). • Include the possibility to carry out periodic energy audits in longer periods (for instance every 6 years), as long as the measures are controlled annually (PT 13). • Amend the applicability to provide for a lesser frequency of auditing at smaller single-process sites and that demonstration of compliance with the technique may be obtained by providing the audit findings and summaries from other similar energy efficiency schemes such as ISO 50001 (UK 18). **Common techniques** Technique c. • Change the applicability for cogeneration which is applicable for all new plants and for major refurbishments of existing plants where it may additionally be limited due to the layout and available space (ES 18). • Replace "This includes" with "This includes techniques such as" because cogeneration is not generally applicable (FR_A 45). • Cogeneration is not applicable in every situation. Therefore, either delete cogeneration from the list of techniques, or move it to "Heat recovery techniques" to be applicable in combination with other techniques listed there, or change the applicability for cogeneration to "Applicable for major plant upgrades" (EURATEX 8). • Replace the applicability with "only applicable to new plants or major plant upgrades and if economically feasible". The applicability is also related to the economic feasibility and specific on-site situation (e.g. constant and sufficient heat demand for cogeneration, similarly for energy-efficient motors, energy-efficient lighting and variable-speed drives) (EURATEX 97). **Heat recovery techniques** • The techniques listed cannot be used simultaneously in the same equipment, or they require additional area (layout restrictions), or there is no process in which the warm liquor could be reused. Therefore, either change the statement to "use one or a combination of the listed techniques" (EURATEX 9) or change the applicability restriction for heat recovery techniques to "Only applicable to new plants or major plant upgrades" (IT 16, EURATEX 9). Techniques f. and h. • Change the applicability of the techniques to: "Only applicable to new plants or major plant upgrades" because the implementation of these techniques is closely linked to the configuration of the installation (spatial layout) and sufficient high thermal energy level suitable for recovery (operational conditions) (FR_A 46, IT 17, EURATEX 98, EURATEX 99). Economic feasibility should also be reflected in applicability (EURATEX 98, EURATEX 99).
EIPPCB assessment:	**BAT statement** • Several of the techniques listed are not generally applicable and consideration of the applicability restrictions could be better reflected in the statement. Furthermore, technique (a) as a management tool would have a merit in all cases where energy is consumed. **Management techniques** Technique a.

	• Technique a. is a management tool and would have merit in all processes where energy is consumed. A total of 45 plants from the data collection apply an energy-saving plan (Section 4.1.4.1 of D1). According to the data collection on BAT used at the plant level, 'Management' is used by 66 out of 106 plants, which is much more than is reported for other techniques, like 'Minimising the energy consumption of stenters' (30) or 'Combined Heat and Power' (9 plants). This seems to support the argument on generic use of technique a. and only a combination of other techniques. • Technique a. could be a stand-alone conclusion. However, embedding it in the same conclusion might strengthen the link betweena customised energy efficiency plan and audits on one side, and selection and implementation of the appropriate other techniques listed in the same conclusion on the other side. Finally, this structure (i.e. management technique embedded with other techniques) has already been used in BAT conclusions (e.g. STS). • Energy efficiency plans and regular energy audits are important tools to tap the energy-savings potential of textile installations. Relevant European or International Standards, such as EN ISO 50001 (Energy Management Systems), ISO 50002:2014 (Energy audits — Requirements with guidance for use) or the EN 16247 series (Energy Audits: e.g. Part 1 and Part 3), can be considered when establishing an energy efficiency plan and audits as part of an environmental management system (e.g. certified according to EMAS or ISO 14000). Apart from the note in BAT 1, no additional footnotes on implementation of management systems are deemed necessary. • Monitoring is usually considered as checking the change (e.g. measuring, calculating) of a variable over time so that a certain set threshold value is not exceeded. Auditing is considered a more comprehensive and structured analysis of different variables, measures and processes with the aim of acquiring the comprehensive knowledge of different aspects of a plant's operation, to discover the improvement potential and report on it. • The energy audits in the scope of these BAT conclusions can be internal or external, and it is left to the implementation stage to decide if the energy audits resulting from other regulatory requirements or conducted as part of requirements of the certified energy management systems are considered an appropriate demonstration of compliance. However, it could be reflected in the applicability that the level of detail of the energy audits will generally be related to the nature, scale and complexity of the plant. • The consumption of energy in textile plants is substantial. The monitoring of energy consumption is important information, which is checked as part of the energy audit, whose findings are used for verifying that the objectives of the energy efficiency plan are met. The yearly frequency of energy audits is harmonised with the one used in other BAT conclusions (e.g. FMP). According to EMAS Regulation (EC) No 1221/2009, Annex III, Part A, point 4, for complex activities (the IED activities could be considered as such) the audit frequency should be yearly. Finally, according to ISO 19011 or the EMAS Regulation (e.g. Article 9), internal or external audits are possible. Since the level of detail of energy audits can be relatively simple in textile plants, it is not clear why the frequency of energy audits would need to be less frequent. • 46 out of 106 plants reported using Energy saving plan within their management system, 14 reported having established certified energy management system according to ISO 50001. <u>Technique b.</u> • Production optimisation is management technique that could be used generally like technique a. This could be reflected in BAT statement. **<u>Common techniques</u>** <u>.Technique c.</u> • Implementation of cogeneration would require investment (e.g. CAPEX) in technical infrastructure (e.g. adaptation of piping and installation of new equipment (e.g. gas turbine)) and substantial operating costs (e.g. OPEX). Both could be justified if there is sufficient heat demand, making it economically feasible. This could be specified in the applicability. • Concerning the applicability of other techniques such as energy-efficient motors,

	energy-efficient lighting or variable-speed drives, these pieces of equipment can be installed during regular maintenance activities when the existing ones need to be replaced and it is not clear why the applicability may be restricted to new plants or major plant upgrades. • The name of the technique could be made more technically relevant by referring to energy-saving. Technique c1. • There is a merit to join bullets related to heating demand in a dedicated technique. Especially insulation of equipment, optimising the temperature of rinsing water and avoiding overheating process liquors. **Heat recovery techniques** • The techniques listed in this conclusion cover the whole plant and not just one piece of equipment/process. Therefore, in plants with multiple processes or equipment, it would be possible to implement all of the techniques in the same plant. However, the BAT statement gives flexibility to implement the combination of techniques which would make it possible to implement some of them despite spatial (layout) restrictions or a lack of processes with heat demands. Techniques f. and h. • According to the data collection, heat recovery from waste water and waste gases is relatively widely used in the sector (see Section 3.6.3 of D1, Figures 3.79 and 3.71). Specifically, 40 plants reported recovering heat from waste water, 27 from process waters, and 25 from waste gases. This indicates that these techniques are widely implemented in the sector. The layout of the plant and the heat demand affect the heat recovery, but many of the heat recovery loops could be implemented without a major plant upgrade. Moreover, the BAT statement gives flexibility to implement the combination of techniques, which would make it possible to implement some of them despite spatial (layout) restrictions and/or the lack of processes with heat demands. Technique g. • Technique g. would be better placed in BAT 11 which addresses specific issues related to the energy efficiency of air compressors. Technique b1. • For the assessment, see Section 1.4.4.2.
EIPPCB proposal:	BAT statement • To change the wording "to use all of the techniques" in the BAT statement to require the use of techniques a. and b. and appropriate combination of the rest of the techniques to reflect the applicability restrictions of several techniques. Technique a. • To add the applicability restrictions regarding the level of detail of energy audits. Technique b1. • To be moved from BAT 12 a. Technique c. • To reflect in the applicability that cogeneration in existing plants may be restricted by a suitable heat demand. • To amend the name of technique to reflect the energy saving objective. Technique c1. • To make new technique on heating demand from some of the examples in technique c. Technique g. • To delete in the technique from this BAT conclusion and to move it to BAT 11d.

1.4.4.2 Techniques for increasing energy efficiency of thermal treatment

Location in	**P. 731 – Section 5.1.4 – BAT 12**

D1:

Current text in D1:

BAT 12. In order to increase the energy efficiency of thermal treatment, BAT is to use all of the techniques given below.

	Technique	Description	Applicability
Techniques for reducing the use of heating			
a.	Wet-on-wet dyeing or finishing of fabric	Dyeing or finishing liquors are applied directly to the wet fabric, thus avoiding an intermediate drying step.	Generally applicable
b.	Mechanical dewatering of textile materials	The water content of textile materials is reduced by mechanical techniques (e.g. centrifugal extraction, squeezing and/or vacuum extraction).	
c.	Avoiding overdrying of textile materials	The textile materials are not dried below their natural moisture level.	
Design and operation techniques			
d.	Optimising air circulation in stenters	This includes: • the number of air injection nozzles is adapted to the width of the fabric; • the distance between the nozzles and the fabric is as short as possible; • the pressure drop caused by the stenters' internal components is as small as possible.	Only applicable to new plants or major plant upgrades
e.	Advanced process monitoring and control of drying	The following drying parameters are monitored and controlled (see BAT 3): • humidity content and temperature of the inlet air; • temperature of textile materials and air within the dryer; • humidity content and temperature of the exhaust air; drying efficiency is optimised by a high humidity content (e.g. above 0.1 kg water/kg dry air); • residual moisture content of the fabric. The exhaust airflow is adjusted to optimise drying efficiency and is reduced during idling time of drying equipment.	Generally applicable
f.	Microwave or radio-frequency dryers	Drying of textile materials with high-efficiency microwave or radio frequency dryers.	Only applicable to new plants or major plant upgrades
Heat recovery techniques			
g.	Heat recovery from waste gases	See BAT 10 h.	Generally applicable

Summary of comments:

Whole BAT

- Clarify the scope of the BAT and possibly split the techniques between several types of thermal treatments. For example, it is not clear why the techniques listed are specific only to the thermal treatment. Some techniques could be implemented even if there is no thermal treatment. It is also not clear what thermal treatments it covers (FR_B 3).

BAT statement

- Change the statement to: "BAT is to use one or more of the techniques given below", because all of the listed techniques cannot be used simultaneously (EURATEX 10).

	Techniques for reducing the use of heating Technique a. • Change the applicability to: "Not applicable to continuous processes or when the pre-treated fabric need to be stored before being dyed or finished because of operational constraints." Production scheduling (especially in commission firms) and operational restrictions may demand different sequencing and hence intermediate drying to avoid moulds. Moreover, continuous dyeing/finishing on wet fabric may require higher chemicals consumption (dosing) to ensure a homogeneous treatment and the required product specifications (e.g. up to 3 times higher use of optical brighteners, softeners or water-repellent resins) (CZ_B 5, CZ_A 9, CZ_A 12, FR_A 47, EURATEX 10). • Add that the applicability may be restricted by potential reactions between unfixed chemicals on the wet fabric (EURATEX 113). Technique b. • Add that the applicability of mechanical drying may be restricted by the textile characteristics (i.e. it can withstand it) (EURATEX 113). • Modify the applicability to: "The applicability may be restricted by the characteristics of the textile materials and/or product specifications." (IT 19). **Design and operation techniques** Technique e. • Not all parameters need to be monitored, so add "such as" after "(See BAT 3)" (FR_A 48). • The residual moisture of the fabric is more often monitored compared to the other parameters listed. Moreover, a high humidity content in the exhaust air can lead to deposits within the stack and the risk of fire and in addition it may result in condensation that causes spots on the fabric (FR_A 48). • Change technique e. as follows: delete the first bullet point and change the third bullet point to "humidity content and temperature of the exhaust air; drying efficiency is optimised". Also, change the applicability to "only applicable to new plants or major plant upgrades" (EURATEX 10). • Add that the applicability of input temperature and humidity control may be restricted by other parameters. For example, high exit air humidity is only possible if other parameters allow (EURATEX 113). Technique f. • Modify the applicability as it may be restricted by product specifications, e.g. textiles containing metallic fibres (especially in ATEX/explosive areas) (ES 16, EURATEX 12) or change it to "only applicable to new plants or major upgrades" (EURATEX 12). • Delete the technique as it is an emerging technique and not BAT, or change the applicability to "not applicable to fabric containing metallic fibres." Also, there are no example plants which apply this technique mentioned in the BREF and no data in the questionnaires (FR_A 49). **Heat recovery techniques** Technique g. • Change the applicability to reflect that the technique is generally applicable to new plants and major upgrades of plants because, depending on the configuration of existing plants, it may not be easy to install, and that it depends on heat needs and the calorific value of the off-gases (FR_A 62).
EIPPCB assessment:	**Whole BAT** • The scope of the technique is energy efficiency of thermal treatment. Splitting the techniques according to the type of thermal treatment could prove repetitive and complex. The generic table seems a very clear and understandable way of presenting the techniques. • A definition of thermal treatment is given in the Definitions. • Technique b. "Mechanical dewatering of textile materials" is not specific only to energy efficiency of thermal treatment but also to other environmental objectives, i.e. water consumption/waste water generation (see BAT 9g and BAT 9i). It is not clear

	how other techniques in this conclusion could be implemented if no thermal treatment was carried out in the plant. **BAT statement** • The techniques of this BAT conclusion cover the whole plant and not just one piece of equipment/process. Therefore, in plants with multiple processes or pieces of equipment, it would be possible to implement all of the techniques in the same plant. However, in line with the general approach adopted for BAT conclusions in this section (see Section 1.4.4 of this document), the BAT statement could reflect that a combination of techniques could be implemented to achieve its objective. **Techniques for reducing the use of heating** Technique a. • Technique a. does not increase the energy efficiency of thermal treatment, but reduces the need for a thermal treatment step, and thereby increases the energy efficiency of the plant. Therefore, it would be more appropriate to include it in BAT 10 on general (plant-level) energy efficiency techniques. • It is not clear why wet-on-wet dyeing is not applicable to continuous processes since it can be carried out on continuous ranges with the padding machines (e.g. Foulard) in various combinations (e.g. pad-pad-steam), but also with spray and foam application. It is suitable for fabrics which have the ability to retain substantial amounts of liquids (e.g. terry cloth, corduroy), e.g. with density typically above 140 g/m^2. • Production scheduling in relation to energy efficiency is addressed by technique BAT 10b. It does not seem to limit or contradict the implementation of wet-on-wet dyeing or finishing. • The note on the potential higher finishing agent consumption (up to three times more) to ensure product quality could be added in Chapter 4, but there was no specific information on which finishing processes (agents) this refers to. • No specific information on potential reactions between unfixed chemicals and textiles was provided (e.g. for which type of dyes or which fibre combinations). Technique b. • No information on potential restrictions related to mechanical drying and the textile properties (e.g. withstanding mechanical pressure from harming the substrate) was provided. **Design and operation techniques** Technique e. • The drying parameters described are indicative. This could be reflected in the description. • It is not clear why this technique is only applicable to new plants and major upgrades. • It is not clear which other parameters would limit the high humidity content of exhaust air exiting the dryer. Technique f. • Microwave or radio-frequency drying of textile materials with metallic fibres or other metallic parts (e.g. buttons) may not be possible. This could be mentioned as a technical applicability restriction of this technique. • High-frequency drying has been reported to be used by Plants BE010, IT082 and PT105 and is largely described in the existing TXT BREF as an applied process. See also the site visit reports dated 05/03/2019 and 11/04/2019. **Heat recovery techniques** Technique g. • It is not clear how installation difficulties or the calorific value of the waste gases would change with a major plant upgrade. It is hard to imagine a lack of heat demands in the textile sector, where a lot of processes require heat. Moreover, the BAT statement gives flexibility to use a combination of techniques to achieve the objective of heat efficiency in thermal treatment, so indeed satisfactory energy efficiency may be achieved without implementing this technique.
EIPPCB	BAT statement

proposal:	• To rephrase the statement to "use a combination of the techniques". <u>Technique a.</u> • To move the technique to BAT 10 on energy efficiency. <u>Technique e.</u> • To modify the introductory sentence of the description to reflect the indicative nature of the parameters listed. <u>Technique f.</u> • To add the applicability restriction for textile materials containing metallic parts.

1.4.4.3 BAT-AEPLs for specific energy consumption

<table>
<tr><td>Location in D1:</td><td>P. 727 – Section 5.1.3 – BAT 12 – Table 5.2</td></tr>
<tr><td>Current text in D1:</td><td>Table 5.2: BAT-associated environmental performance levels (BAT-AEPLs) for specific energy consumption
<table>
<tr><th>Process</th><th>Unit</th><th>BAT-AEPL (Yearly average)</th></tr>
<tr><td>Thermal treatment</td><td>MWh/t</td><td>0.5–4.4</td></tr>
</table>
The associated monitoring is given in BAT 5.</td></tr>
<tr><td>Summary of comments:</td><td><u>Whole table</u>
As for Table 5.1, develop a new table with different ranges for processes depending on parameters like product quality, textile substrate etc. in a sub-working group with several sector experts. The process-specific consumption of water depends mostly on the product type (e.g. some products need 3-4 process baths, others 15), material (cotton vs. PES), fabric weight (40-3500 g/m², lightweight curtains or nightdresses vs. heavy nonwovens for sound protection or in buildings) or purpose (highly cleaned medical or food contact textiles vs. textiles for dike stabilisation). The proposed range is not useful to be used as a BAT-AEPL (DE 262).
Remove from the analysis the data sets for specific energy consumption at process level where the figures are the same as for total energy consumption at the plant level (and more than one process is in use on site). Examples are data sets from UK124 where due to lack of sub-metering the same figure was reported for both (UK 19).</td></tr>
<tr><td>EIPPCB assessment:</td><td><u>Whole table</u>
Because it was not clear whether the values reported for the wet processes include the energy needed for drying or only the energy needed for heating liquors (water), the specific energy consumption was proposed for thermal treatments only. Limiting the water consumption of wet processes through indicative values for specific water consumption would indirectly limit their energy consumption.
Due to the high variability in processes, textile materials and forms, layouts/configurations of plants, affecting the reliability of data reported, and the limited extent of TWG participation in the data analysis (e.g. due to the CBI nature of data), it is deemed more practical to propose indicative values instead of BAT-AEPLs.
The data sets where the energy consumption at the plant level exceeded the sum of the consumption reported at the process level were indeed excluded from the data sets used for setting the BAT-AEPL ranges</td></tr>
<tr><td>EIPPCB proposal:</td><td>To propose indicative values instead of BAT-AEPLs.</td></tr>
</table>

1.4.5 Chemicals

1.4.5.1 Techniques for improving the overall environmental performance

<table>
<tr><td>Location in D1:</td><td>P. 732 – Section 5.1.5 – BAT 13</td></tr>
<tr><td>Current text in D1:</td><td>BAT 13. In order to improve the overall environmental performance, BAT is to elaborate and implement a chemicals management system (CMS) as part of the EMS (see BAT 1) that incorporates all of the following features:
I. process chemicals procurement policy to select process chemicals and their suppliers with the aim to minimise the use of hazardous chemicals such as substances of very high concern and to avoid the procurement of excess amount of process chemicals. In order to reduce emissions to air, the selection of process chemicals may be based on emission factors (see Section 5.9.1);
II. anticipatory monitoring of regulatory changes related to hazardous chemicals and safeguarding compliance with applicable legal requirements;</td></tr>
</table>

	chemicals inventory (see BAT 14); III. identification of the process chemicals pathways through the plant (from procured process chemicals to products, waste and emissions); IV. assessment of the risks associated to the chemicals, based on the chemicals' hazards, concentrations and amounts. This may include an estimation of their emissions to the environment; V. regular (e.g. annual) check aiming at identifying potentially new available and safer alternatives to the use of hazardous chemicals (e.g. changes of process(es) or use of other chemicals with no or lower environmental impacts such as enzymes); VI. goals and action plans to avoid or reduce the use of hazardous chemicals; VII. development and implementation of procedures for the handling, storage, use and return of process chemicals (see BAT 20). The criteria for selecting process chemicals and their suppliers may be based on certification schemes or standards. In that case, the compliance of the process chemicals and their suppliers with these schemes or standards is regularly verified. **Applicability** The level of detail of the CMS will generally be related to the nature, scale and complexity of the plant.
Summary of comments:	**Point I** • Replace "the use of hazardous chemicals" with "the emissions of hazardous chemicals" as the amount of hazardous chemicals used depends on the plant throughput (CEFIC 5). • Clarify what is meant by "substances of very high concern" and if relevant make a reference to the candidate list of REACH (FR_A 6). • Replace "such as substances of very high concern" with "in the meaning of IED Article 3(18)" as SVHC are only a small fraction of the hazardous substances (EEB 86). • Delete the reference to "substances of very high concern" as it is already regulated by REACH (CEFIC 6). **Point II** • Put the chemical inventory in a separate bullet point, maybe the first one as it is the starting point for the management of chemicals (FR_A 10). **Point IV** • Merge Points IV and VII as the risks associated with chemicals are the basis to identify risk management measures (FR_A 8). • Replace the word "risk" with "hazard x exposure" to ensure coherence with the REACH and CLP Regulations. How to perform a risk assessment for chemicals is described in the ECHA Guidance on Information Requirements and Chemical Safety Assessment (CEFIC 7). **Point V** • Specify that "hazardous chemicals" are "chemicals which are restricted by EU or international regulations (e.g. CMR substances in CLP-Regulation, SVHC in article 57a-f of the REACH Regulation, POPs listed in the Stockholm Convention)" (AT 43). • Remove the mention of "safer chemicals" and refer instead to alternative processes and chemicals with no or lower environmental impacts, which is the final aim (CEFIC 8). • Delete the reference to enzymes as the impact on the environment is also a question of emission, exposure and concentration and not only a property of a substance (CEFIC 9). **Point VI** • Delete Point VI as it is redundant with Point I (FR_A 7). • Replace "avoid or reduce the use of hazardous chemicals" with "avoid or reduce the emissions of hazardous chemicals", which is the real target (CEFIC 10).

	Point VII • Add procedures to collect spent bath and pastes for reuse or disposal as waste, as they contain high concentrations of chemicals (SE 13). • Clarify the return of chemicals as follows: "return of unused process chemicals to suppliers" (FR_A 9). **Criteria for selecting process chemicals and their suppliers** • Add examples of certification schemes or standards (e.g. ECO PASSPORT by OEKO-TEX®, STeP by OEKO-TEX®, DETOX TO ZERO by OEKO-TEX®) (ES 14, EURATEX 101). • Add that the selection of chemicals may be done via "positive" lists of chemicals (i.e. list of preferred chemicals that are assessed/screened and validated by neutral third parties for their toxicological and ecological profile) (DE 215). **General comment** • Restructure the BAT according to the following order of priority: o management techniques to avoid or (if not possible) minimise the use of hazardous chemicals (like SVHC); o techniques for selection of chemicals with the aim to reduce emissions (including anticipatory survey of alternatives for used substances); o identification of emission pathways of substances used; o techniques for handling, storage. The proposed wording is the following: (DE 358) *BAT 13. In order to improve the overall environmental performance, BAT is to elaborate and implement a chemicals management system (CMS) that incorporates the following features:* *I. process chemicals procurement policy to select process chemicals and their suppliers with the aim to minimise the use of hazardous chemicals such as substances of very high concern as described in Article 57 REACH as substances with CMR-properties (Category 1A and 1B), PBT or vPvB substances, or substances with an equivalent level of concern, such as endocrine disrupting chemicals;* *II. goals and action plans to avoid or reduce the use of hazardous chemicals and substances that may pass existing barriers in concentrations that may raise concern;* *III. Selection of recipes for textile finishing based on the application of the emission factor concept (see Section 5.9.1) as a tool that allows for assessing and predicting air emission released from chemical auxiliaries, e.g. during thermal treatment.* *IV. Selection of process chemicals considering their eliminability to minimize the release into water as well as their effect to the aquatic compartment (eco-toxicity).* *V. anticipatory monitoring of regulatory changes related to hazardous chemicals and safeguarding compliance with applicable legal requirements;* *VI. regular survey whether new and safer alternatives to the use of hazardous chemicals are available* *VII. identification of the process chemicals pathways through the plant (from procured process chemicals to products, waste and emissions)* *VIII. assessment of the risks associated to the chemicals based on the chemicals' hazards, concentrations and amounts. This should include an estimation of their emissions to the environment;* *IX. development and implementation of procedures for the handling, storage, use and return of process chemicals.*
EIPPCB assessment:	**Point I** • Point I is about the procurement policy, which can contribute to the reduction of emissions of hazardous chemicals by minimising the procurement and therefore the use of hazardous chemicals. This does not contradict the fact that the amount of chemicals used also depends on the plant throughput. • The criteria for determining BAT do not concern only emissions to the environment. The reduced use of hazardous chemicals also addresses the following aspects, which

	are listed in Annex III to the IED as criteria for determining BAT: o the use of less hazardous substances; o the consumption of raw materials used in the process. • It would therefore be limiting to mention only the reduction of emissions as the objective of point I. • The term "hazardous chemicals" may be unnecessary as it is the term "hazardous substances" which is defined in Article 3(18) of the IED (which refers to Article 3 of the CLP Regulation) and mentioned in Annex III to the IED. • The term "substances of very high concern" would need a definition in Definitions. **Point II** • The chemical inventory not being in a separate point is due to a formatting issue. • It is not necessarily the first point of the CMS as a management system would normally start by setting an overall objective and an associated action plan. • BAT 14 is dedicated to the chemical inventory, but its role in the CMS could be specified. **Point IV** • Procedures mentioned in point VII of the CMS consider the risks associated with the chemicals and identified in point IV but not exclusively. It can also consider for example the shelf life of the chemicals or the return of unused chemicals. It seems therefore clearer to have two separate points. This being said, the connection between both points could be clearer by having the point about risk assessment immediately before the point about the development of procedures. • Article 14 of the REACH Regulation lays out the provisions for the realisation of the chemical safety assessment. This safety assessment is based on the assessment of the hazards induced by the substance or mixture concerned and, depending on the outcomes of this assessment, is complemented by an exposure assessment and a risk characterisation[8]. The risk characterisation in turn allows the identification of risk reduction measures. A better alignment of the wording of point IV with the terminology used in the REACH regulation would improve clarity. **Point V** • The term "hazardous chemicals" is not defined in the IED or in other relevant regulations (REACH or CLP). On the other hand, the term "hazardous substances" is defined in the IED and the use of the same term in the BAT conclusions would ensure consistency, clarity and avoid possible conflicts. • The word "safer" in the expression "safer alternative to hazardous chemicals" seems redundant and it is not clear what it compares to. • The use of enzymes as substitutes for other chemicals is mentioned in a number of other BAT (BAT 15, BAT 37, BAT 39 and BAT 48) and it is therefore not necessary to repeat it here. **Point VI** • Point VI is about goals and action plans to reduce the use of hazardous chemicals whereas point I is specific to the procurement policy; these points are therefore not equivalent. This being said, both points are indeed connected as point I would be one way to reduce the use of hazardous substances (another way could be for example to change processes or process liquor) and it would bring clarity to bring both points together. • The aim of the CMS is to reduce the use of hazardous substances, which in turn reduces the emissions of hazardous substances. The use of less hazardous substances is one of the criteria listed in Annex III to the IED for determining BAT. **Point VII** • The reuse of process liquor is already mentioned in BAT 15. The disposal of spent process liquor chemicals as waste is covered by BAT 28 as is the disposal of any

[8] Guidance on Information Requirements and Chemical Safety Assessment, Part D: Framework for exposure assessment, ECHA 2016

	other waste. A cross-reference in BAT 28 could be helpful to highlight the relationship between both BAT. • Concerning the return of process chemicals, this does indeed refer to the unused process chemicals mentioned in BAT 20. **Criteria for selecting process chemicals and their suppliers** • While examples of certification schemes and standards could helpfully complement the description of BAT 13, it seems difficult to promote commercial tools in a legal text such as BAT conclusions. However, such examples are given in Chapter 4 of D1. • A 'positive list' of chemicals is indeed a tool used by some certification bodies but it does not seem necessary to detail those tools in the BAT conclusions. This being said, Chapter 4 of D1 could usefully be complemented with this information. **General comment** • Concerning the restructuration of the CMS, the proposed order brings improved logic to the order of the CMS features as these features go from management techniques to the selection of chemicals, identification of emission pathways of substances used and finally techniques for handling and storage of chemicals. The setting of goals and action plans to reduce the use of hazardous substances seems however to precede the procurement policy, which is one action for achieving the objective. • Concerning the proposed BAT statement, the deletion of the words "all of" may undermine the fact that all features are to be used and is not in line with the wording of the EMS (BAT 1). • Concerning the proposed additional point about the emission factor concept, this element is already mentioned in D1 as one possible selection criteria for process chemicals which will have reduced emissions to air. Making a separate point for this method could give the impression that only this method may be used. • Concerning the proposed additional point about the eliminability and ecotoxicity of process chemicals, these are indeed important characteristics to consider for the selection of chemicals and could be added in point I as examples of selection criteria in addition to the emission factor concept for emissions to air. Making a separate point for this could give the impression that only those characteristics are to be considered. • Concerning the proposed wording of points I, V, VI, VIII and IX, see the assessment of the corresponding points above.
EIPPCB proposal:	• To replace "hazardous chemicals" with "hazardous substances" throughout the document and to add this term in Definitions. • To define the term "substances of very high concern" in Definitions and to use this term throughout the document (e.g. in BAT 4 and BAT 13). • To restructure the bullet points indicating the main CMS elements (bullet points I, VII and VIII) and the elements of the selection of process chemicals (bullet points II, III, IV and V). • To complement the wording of points I, VI and VII. • To reformulate point IV and point V. • To add the reuse and recovery of chemicals to elements considered in selection of chemicals. • To specify the role of the chemical inventory. • To complement Chapter 4 of D1 with information about positive lists of chemicals.

Location in D1:	**P. 732 – Section 5.1.5 – BAT 14**
Current text in D1:	**BAT 14. In order to improve the overall environmental performance, BAT is to elaborate and implement a chemicals inventory and tracking system as part of the CMS (see BAT 13).** **Description** The chemicals inventory and tracking system is computer-based and contains information about: • the identity of the process chemicals;

	• the quantities and location of the process chemicals procured, recovered (see BAT 15 f), stored, used and returned to suppliers; • the characteristics of process chemicals including properties with adverse effects on the environment and/or human health.
Summary of comments:	**BAT statement** • Delete "tracking system" as the meaning is unclear and replace it with "electronic tool for the chemical inventory lists" (DE 185). • Delete "tracking system" as the meaning is unclear and replace it with "assess the partitioning of process chemicals in the environmental compartments (air, water, waste, product)" (DE 385). • Delete " tracking system" as a chemical tracking system provides no improvement of environmental performance. The chemical inventory and knowledge of chemicals that are waste-water- or air-relevant is sufficient (EURATEX 114). **Description** • Clarify the characteristics of the process chemicals by "the physical and chemical data of process chemicals (e.g. solubility, vapour pressure, log Kow), data on ecotoxicity, fate and behaviour in the environment (e.g. biodegradation, adsorption/desorption coefficient, mobility) as well as adverse effects on human health" (DE 385). • Mention that the main source of information for the process chemicals and their characteristics is the Safety Data Sheet (SDS) (ES 15, FR_A 11, CEFIC 11, EURATEX 102), in particular Section 2 and Section 9 of the SDS (CEFIC 11).
EIPPCB assessment:	**BAT statement** • The wording "tracking system" refers to the locations and quantities of process chemicals mentioned in the second bullet point. As this wording seems unclear and is in any case covered in a bullet point, it is not necessary. • The tracking of chemicals is more efficient when an electronic tool is used but the use of a computer-based system is already mentioned in the BAT description and it does not seem necessary to repeat it in the BAT statement. • The assessment of the fate of process chemicals in various environmental compartments is based on the chemicals inventory but is not part of the inventory itself. This assessment is part of BAT 13. **Description** • According to D1, information mentioned in the first and third bullet points of the BAT description is indeed to be found in the Safety Data Sheet (SDS) but also in the Technical Instruction Sheets and it could be useful for the reader to add a reference to these documents. • Concerning the proposed wording for the BAT description, some additional examples of characteristics of the process chemicals could indeed bring further guidance to the users of the BAT conclusions.
EIPPCB proposal:	• To remove "tracking system" from the BAT statement. • To add a reference to SDS and to Technical Instruction Sheets in the BAT description as well as additional examples of characteristics of the process chemicals. • To add some examples of physico-chemical and environmental properties.

1.4.5.2 Techniques for reducing the consumption of chemicals

Location in D1:	**P. 733 – Section 5.1.5 – BAT 15**
Current text in D1:	**BAT 15. In order to reduce the consumption of chemicals, BAT is to use all of the techniques given below.** **Technique** | **Description** | **Applicability**

	a.	Reduction of the need for process chemicals	This includes: • regularly reviewing the formulation of process chemicals and liquors; • using demineralised water in the processes to reduce the need for complexing agents; • production optimisation (see BAT 9 b).	Generally applicable
	b.	Treatment of textile materials with enzymes	Enzymes are selected (see BAT 13) and used to catalyse the reactions with textile materials to lower the consumption of process chemicals (e.g. in desizing, bleaching and/or washing).	The applicability may be restricted by product specifications or the availability of suitable enzymes
	c.	Automatic systems for preparation and dosing of process chemicals and process liquors	Automatic systems for weighing, dosing, dissolving, measuring and dispensing which ensures precise delivery of process chemicals and process liquors to the production machines. See BAT 3.	Generally applicable
	d.	Optimisation of the quantity of process chemicals used	See BAT 9 d.	
	e.	Reuse of process liquor	See BAT 9 i.	
	f.	Recovery and use of leftover process chemicals	Residual process chemicals are recovered (e.g. by thoroughly purging pipes or completely emptying packaging) and used in the process.	
Summary of comments:				

General comment about BAT 15

- Delete BAT 15 as it is a repetition of BAT 3, BAT 9 and BAT 28 or it should be contained in the Chemicals Management System (CMS) (DE 415).

BAT statement

- Change the environmental objective of the BAT from the reduction of use of hazardous chemicals to the reduction of emissions of hazardous chemicals as the reduction of use does not have necessarily an environmental impact (CEFIC 12).

Technique a.

- Change the name of technique a. to reduction of chemicals consumption per tonne of textiles (CEFIC 12).
- Delete technique a. because the first and third points are very generic and already covered. Moreover, concerning the second point, demineralised water is not widely used but instead softened water (FR_A 50).
- Delete the second point as the use of demineralised water is not needed when the incoming water is already very soft (IT 42).
- Replace the use of demineralised water with the use of water softened with an ion exchanger. Softened water is sufficient to reduce the need for complexing agents. Demineralisation produces double the amount of waste baths from the regeneration of the ion exchanger (DE 313, CZ_B 6, EURATEX 103).
- Delete the reference to demineralised water as the washing capacity of demineralised or softened water is worse than that of "hard" water due to lack of calcium and manganese (EURATEX 156).
- Change the applicability of technique a. to reflect that, depending on technical feasibility and contamination of liquors, complexing agents might still be needed (i.e. if the use of ion exchangers is not possible) (DE 313).

Technique b.

	• Specify the applicability restriction related to the product specifications by referring to Section 4.1.6.4 of D1 (EEB 107). **Technique c.** • Change the applicability to standardised processes (e.g. pretreatment processes) in new plants or major upgrades of plants because the technique is not feasible in existing plants and it is not feasible for companies using hundreds of different liquors (FR_A 51). • Change the applicability to new plants and major plant upgrades as the technique implies a new piping system from the new preparation system to every machine that uses the liquor (IT 20). • Change the applicability because the use of this technique may be restricted by the size of the company or of the process (EURATEX 104). **Technique f.** • Change the applicability because the recovery and use of leftover chemicals may be restricted by the storage life and the presence of impurities (CEFIC 32, EURATEX 105). • Add at the end of the description "whenever possible" as the collected chemicals may need to be treated as waste (SE 23).
EIPPCB assessment:	**General comment about BAT 15** • The objective of BAT 15 is to give in one place an overview of the techniques to reduce the quantity of chemicals used. BAT 15 contains cross-references to other BAT when these BAT have multiple benefits. For example, BAT 9b, BAT 9d and BAT 9i allow the reduction of water consumption and waste water generation but also the reduction of the consumption of chemicals. • Deleting BAT 15 would lead to a loss of information about the reduced use of complexing agents and about the use of enzymes which is proposed to be removed from BAT 13 (see Section 1.4.5.1 about BAT 13). **BAT statement** • The criteria for determining BAT do not concern only emissions to the environment. The reduced consumption of chemicals also addresses the following aspects, which are listed in Annex III to the IED as criteria for determining BAT: o the use of less hazardous substances; o the consumption of raw materials used in the process. • It would therefore be limiting to change the environmental objective of the BAT to the reduction of emissions only. **Technique a.** • Technique a. aims to reduce the need for process chemicals, which in turn will reduce the consumption of chemicals, be it specific consumption or overall consumption. A reference to specific consumption does not seem necessary. • It could be clarified that not only is it necessary to review the formulation of process chemicals and liquors, but also to optimise the formulation of process chemicals and liquors. • BAT 15 is structured in such a way that technique a.sets general techniques to reduce the need for process chemicals while the other techniques are more specific; this is why the first and third bullet points of technique a. are generic. In this context, the second bullet point seems too specific and could be moved into a separate technique. • The description of the technique in Section 4.4.7.2 in Chapter 4 of D1 refers to softened water and not demineralised water as a way to reduce the use of complexing agent. • No information has been made available about the lower washability of softened water. • It is not clear in which cases the use of an ion exchanger would not be possible. **Technique b.** • Section 4.1.6.4 of D1 is not explicit as to which product specifications may limit the use of enzymes. Rather than the product specifications, it seems that the limiting factor is the availability of the enzymes for the given treatment and textile material. • During the 2nd Data Assessment Workshop held on 21-23 October 2020, EURATEX

	clarified that enzymes do not bleach, they are used in pretreatment to improve the bleaching. **<u>Technique c.</u>** • According to Section 4.1.6.7 of D1, the size and the age of the plant do not seem to represent a limitation to the applicability of automated dosing and dispensing systems in general. However, the following limitations are listed and could be reflected in the BAT conclusions: o space availability in existing plants, especially for the automation of dyes; o dosing systems based on the colour-on-demand principle and automated laboratories are still very expensive and as a consequence more suitable for large installations; o high number of dyes due to lack of space and the higher investment costs required, where the plant may decide to automatise the dyes with higher consumption and leave the others for manual dosing and dispensing; o long piping length may be uneconomical and environmentally controversial for small batches (because the amount of process liquor in the pipes may be higher than the amount actually needed). **<u>Technique f.</u>** • The residual process chemicals contained in process pipes may indeed be contaminated, which could limit the degree to which they are used, as for water reuse (see BAT 9). In that case, the contaminated process chemicals may need to be treated by waste. • Concerning the shelf life of the process chemicals, this could indeed limit the degree of reuse of the chemicals, as mentioned in BAT 44.
EIPPCB proposal:	• To move the use of demineralised water from technique a. into a dedicated technique a1. • To refer to softened water instead of demineralised water. • To change the applicability restriction of technique (c). • To add a reference to the contaminated process chemicals and their perishability in technique (f).

1.4.5.3 Techniques for preventing or reducing emissions to water of poorly biodegradable substances

<table>
<tr><td>Location in D1:</td><td>P. 733 – Section 5.1.5 – BAT 16</td></tr>
<tr><td>Current text in D1:</td><td>
BAT 16. In order to prevent or reduce emissions to water of poorly biodegradable substances, BAT is to use all of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Substitution of alkylphenols and alkylphenol ethoxylates</td><td>Alkylphenols and alkylphenol ethoxylates (AP/APEO) are substituted by biodegradable surfactants, e.g. alcohol ethoxylates (AE).</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Substitution of phosphorus- or nitrogen-containing complexing agents</td><td>Complexing agents containing phosphorus (e.g. triphosphates) or nitrogen (e.g. polycarboxylic acids such as EDTA, DTPA or NTA) are substituted by biodegradable substances, e.g:
polycarboxylates (e.g. polyacrylates and copolymers of acrylic and maleic acids);
hydroxy carboxylic acids (e.g. gluconates, citrates);
sugar-based acrylic acid copolymers.</td><td>The applicability may be restricted by product specifications</td></tr>
<tr><td>c.</td><td>Substitution of mineral-oil-based antifoaming agents</td><td>Mineral-oil-based antifoaming agents are substituted by biodegradable substances, e.g. silicone-based antifoaming agents.</td><td>The applicability may be restricted by product specifications</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td>
<u>General comment about BAT 16</u>

Add techniques on chemicals with poor biodegradability and update the information on the substitutes. Include techniques from other BATs for the selection of chemicals with lower risks or chemicals which are biodegradable/bioeliminable (DE 391).

<u>Technique a.</u>

Mention in the technique description that the use of AP/APEO is restricted by REACH (DE 391).

<u>Technique b.</u>

Change the applicability to generally applicable as the restriction proposed in D1 does not seem justified (DE 391, EEB 108).
Add in the technique description the following substitutes (DE 391):

methylglycinediacetic acid (MGDA), L-glutamic acid N,N-diacetic acid (GLDA) and (N-(1,2-dicarboxyethyl)-D,L-aspartic acid (IDS) which are biodegradable;
phosphonates proven to be highly eliminable (e.g. ATMP, DTPMP and HEDP).

<u>Technique c.</u>

Add in the technique description that silicone-based antifoaming agents have a minimised content of silicone cyclic substances (D4, D5 and D6) (DE 391).
Add compounds based on synthetic ester oils as possible substitutes (DE 391).
Specify the applicability clause as follows: “For instance, silicone-based antifoaming agents cannot be applied for all kind of coating processes. The use of silicone can be restricted due to depositions in the textile finishing equipment such as dyeing machines.” (DE 391).
Delete the reference to silicone because silicone contaminates the machines and the

</td></tr>
</table>

textile and can have a negative effect on subsequent processes (EURATEX 115).

- Change the applicability to generally applicable as the restriction proposed in D1 does not seem justified (EEB 109).

Additional techniques

- Add the following techniques (DE 391):

d.	Prevention of use of brominated flame retardants	Waiving of brominated flame retardants as restricted by EU REACH Annex XVII and EU POP Regulation.	Generally applicable
e.	Prevention of use of per- and polyfluorinated alkylated substances (PFAS)	Finishing without PFAS for durable water repellency for ordinary apparel textiles and outdoor textiles except for anticipated derogations under EU law.	Not applicable for personal protection equipment where the highest levels of repellency are required to safeguard the user. and for certain technical textiles (e.g. temperature-resistant bag filter fabrics)
f.	Prevention of use of Chromium VI	Waiving of use of chromium VI compounds for dyeing of wool (after chroming process).	Generally applicable. There are alternative techniques and alternative dyes available to reach the required deep shades.
g.	Use of sizing agents and mixtures of sizing agents fulfilling an elimination rate 80 % within 28 days according to OECD 302B (EN-ISO 9888)	Mixtures of starch, starch derivatives, polyvinyl alcohol, polyacrylates, carboxymethyl cellulose and other sizing agents can fulfil the elimination rate of 80 %	Generally applicable
h.	Use of detergents and mixtures of detergents fulfilling a biodegradation rate of 70 % within 28 days according to OECD 301A-F ()		Generally applicable
i.	Prevention of use of phthalates	Waiving of the use of all esters of orthophthalic acid (phthalates), e.g. as additive to plastics to increase flexibility, to facilitate moulding of plastic by decreasing its melting temperature. In flexible plastic components (e.g. PVC), print pastes, adhesives and polymeric coatings	Generally applicable
j.	Prevention of use of specific UV absorbers	Waiving of the use of UV absorbers UV 320, UV 327, UV 328, UV 350.	Generally applicable

EIPPCB assessment:	**General comment about BAT 16** • Concerning the content of the proposed additional techniques, see the assessment below. • Concerning the grouping of all BAT related to the selection of chemicals in BAT 16, this concerns in particular the proposed technique d. which is related to BAT 49b, the proposed technique e. which is related to BAT 50, the proposed technique f. which is related to BAT 41c and the proposed technique g. which is related to BAT 32a. As BAT 16 concerns the biodegradability of the substances used, this option would narrow down the focus of BAT 49b, BAT 50 and BAT 32a which also address other aspects (toxicity, washability, etc.). Concerning the proposed technique f., the hazards related to chromium VI are not limited to its biodegradability but also concern its (eco)toxicity and its CMR properties. **Technique a.** • The scope of the proposed BAT conclusions states that the BAT conclusions apply without prejudice to other relevant legislation such as REACH, CLP and BPR. It does not seem necessary to indicate the status of the substances cited in the BAT conclusions according to this legislation. In addition, this status may evolve over the lifetime of the BAT conclusions. **Technique b.** • Concerning the applicability of this technique, indeed there is no particular limitation mentioned in Chapter 4 of D1. • Technique b. focuses on substitutes which are biodegradable and, according to Section 8.5 of D1, phosphonates are bioeliminable but not biodegradable. This can be clarified in the title of the technique. • MGDA, GLDA and IDS are readily biodegradable9. It is not clear if the compounds used in the TXT sector are in the form of acid or salt. • The compounds EDTA, DTPA or NTA can be classified under the group of amino polycarboxylic acids. • Gluconates and citrates are salts generated from the hydroxy carboxylic acids. **Technique c.** • In March 2020, SEAC (Committee for Socio-economic Analysis) adopted its final opinion[10] supporting ECHA's proposal to restrict the placing on the market of D4, D5 and D6 as substances, as constituents of other substances, or in mixtures in a concentration equal to or greater than 0.1 % weight by weight of each substance. Therefore, it does not seem necessary to mention D4, D5 and D6 in the BAT conclusions as the use of these substances will be regulated in the coming months. This could be added in the body of D1 though for information purposes. • Synthetic ester oils are mentioned in BAT 33 as a possible substitute for mineral oil used for spinning and knitting and it would be consistent to mention them here also. • According to Section 4.1.6.8.3 of D1, the use of silicone leads to a risk of silicone spots on the textile and silicone precipitates in the machinery, which could be reflected in the applicability of this technique. • No information has been made available about the impact of silicone on some coating processes. • The product specifications mentioned in the applicability restriction refer, for example, to the automotive industry where silicone cannot be used, as mentioned in Section 4.1.6.8.3 of D1. However, after verification with the automotive industry, it is not clear what the automotive-specific restrictions are. **Additional techniques** Proposed technique d. • The proposal consists of banning the use of brominated flame retardants whose use is restricted by the REACH Regulation and/or banned by the POPs Regulation. The

[9] Green Processes: Designing Safer Chemicals, John Wiley & Sons, 2014

[10] https://echa.europa.eu/fr/registry-of-restriction-intentions/-/dislist/details/0b0236e181a55ade

	added value of this technique would therefore be very limited and may not be entirely in line with the REACH Regulation as the REACH restrictions may contain exemptions. Proposed technique e. • Per- and polyfluorinated alkylated substances (PFAS) include a wide variety of more than 3 000 compounds[11]. • Perfluorooctanoic acid (PFOA) and its salts are listed in Annex XVII to the REACH Regulation and from 4 July 2020 shall not be manufactured, or placed on the market as substances on their own or be used in the production of, or placed on the market in another substance, as a constituent, a mixture, an article, in a concentration equal to or above 25 ppb by weight of PFOA including its salts or 1 000 ppb by weight of one or a combination of PFOA-related substances. • Perfluorooctane sulphonic acid and its derivatives (PFOS) are prohibited by the POPs Regulation. Some exemptions are: o concentrations of PFOS equal to or below 0.001 % by weight when it occurs in substances or in preparations; o concentrations of PFOS in semi-finished products or articles, or parts thereof, if the concentration of PFOS is lower than 0.1 % by weight calculated with reference to the mass of structurally or micro-structurally distinct parts that contain PFOS or, for textiles or other coated materials, if the amount of PFOS is lower than 1 $\mu g/m^2$ of the coated material. • Adding a technique to ban the use of substances already subject to restrictions or to prohibition does not seem necessary and may not be entirely in line with the REACH Regulation. • Concerning the other PFAS, no information has been provided as to why they are not to be used. Proposed technique f. • Sodium and potassium dichromate are "substances of very high concern" listed in Annex XIV to the REACH Regulation and the use of these substances is subject to authorisation. Therefore, adding a technique to ban their use does not seem necessary and would not be in line with the REACH Regulation. Proposed technique g. • The proposed technique g. is based on BAT 32a in D1. • It is not clear why galactomannans are proposed to be removed from the examples of sizing chemicals with improved environmental performance. • According to Section 8.3 of D1, carboxymethyl cellulose (CMC) is water-soluble. CMC is mentioned as being very difficult to degrade as only 20 % of the initial amount is eliminated after 7 days. However it can be reduced after longer periods of adaptation (> 4 weeks) and in favourable conditions (especially higher temperatures). CMC could therefore be added in the examples of sizing chemicals with improved environmental performance. • Concerning the elimination rate of 80 % within 28 days according to EN ISO 9888, see the assessment related to BAT 18 (Section 1.4.6.2). Proposed technique h. • According to Table 8.8 of D1, nearly all the types of surfactants which are used in the textiles industry have a biodegradability higher than 70 %[12] except APEO. • The substitution of APEO by biodegradable surfactants is already addressed in technique a. Proposed technique i. • Phthalates include a wide variety of different compounds. • DEHP (bis- (2-ethylhexyl) phthalate), benzyl butyl phthalate (BBP), dibutyl phthalate

[11] https://www.umweltbundesamt.de/themen/chemikalien/chemikalien-reach/stoffgruppen/per-polyfluorierte-chemikalien-pfc#was-sind-pfc

[12] According to test OECD 301E

	(DBP), dihexyl phthalate and diisobutyl phthalate (DIBP) are listed in Annex XVII to the REACH Regulation and shall not be used as substances or in mixtures, in concentrations greater than 0.1 % by weight of the plasticised material, in toys and childcare articles. • DEHP is also listed in Annex XIV to the REACH Regulation. One authorisation granted to a manufacturer may possibly concern the textile industry (PVC-based waterproof clothing and footwear). • Seven other phthalates are listed in Annex XIV to the REACH Regulation: benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), dihexyl phthalate, diisobutyl phthalate (DIBP), diisopentyl phthalate, bis(2-methoxyethyl) phthalate, dipentyl phthalate and N-pentyl-isopentylphthalate. No application for authorisation has been submitted so far for uses in the textile sector. • Adding a technique to ban the use of substances already subject to authorisation does not seem necessary and may not be entirely in line with the REACH Regulation. • D1 mentions that DEHP may be used as a dyeing auxiliary but does not mention other phthalates. • No information has been provided about the use of other phthalates and their possible substitutes. <u>Proposed technique j.</u> • UV 320 (2-benzotriazol-2-yl-4,6-di-tert-butylphenol), UV 327 (2,4-di-tert-butyl-6-(5-chlorobenzotriazol-2-yl)phenol), UV 328 (2-(2H-benzotriazol-2-yl)-4,6-ditertpentylphenol) and UV 350 (2-(2H-benzotriazol-2-yl)-4-(tert-butyl)-6-(sec-butyl)phenol) are "substances of very high concern" listed in Annex XIV to the REACH Regulation and their use is subject to authorisation. Therefore, adding a technique to ban their use does not seem necessary and would not be in line with the REACH Regulation.
EIPPCB proposal:	• To amend the title of technique b. • To add examples of possible substitutes in technique b. • To change the applicability restriction of technique b to generally applicable. • To complement the description of technique c. • To modify and complement the applicability restriction of technique c. • To add a reference to carboxymethyl cellulose (CMC) in BAT 32a.

1.4.6 Emissions to water

1.4.6.1 Techniques for reducing the waste water volume, the pollutant loads discharged to the waste water treatment plant and the emissions to water

Location in D1:	**P. 734 – Section 5.1.6 – BAT 17**
Current text in D1:	**BAT 17. In order to reduce the waste water volume, the pollutant loads discharged to the waste water treatment plant and the emissions to water, BAT is to use an integrated waste water management and treatment strategy that includes an appropriate combination of process-integrated techniques, techniques to recover and reuse process liquors, and treatment techniques (see BAT 18 and BAT 19).** **Description** The integrated waste water management and treatment strategy is based on the information provided by the inventory of inputs and outputs (see BAT 2).
Summary of comments:	**<u>Whole BAT</u>** • Integrate BAT 17 with BAT 2 and BAT 9 to avoid repetition, ease the implementation and streamline general requirements for waste water management. The relations of waste water management and treatment strategy in BAT 17, the inventory of water inputs and outputs in BAT 2, and the water management plan in BAT 9 need to be clarified. Since both BAT 2 and BAT 9 are part of the environmental management system (BAT 1), it is unclear if the waste water

	management and treatment strategy of BAT 17 is also part of the EMS. Also, it is unclear whether the inventory of water inputs and outputs (BAT 2) is not already covered by the water management plan (BAT 9) (AT 40). • Delete BAT 17 as it is part of BAT 18 (DE 267). **BAT statement** • Change the statement to highlight the need for concentrated bath and pastes to be collected, recovered/reused or handled (e.g. disposed) as waste containing hazardous chemicals (SE 15). **Description** • Clarify that external waste water treatment can be done by an external waste water treatment plant (WWTP) (EURATEX 16).
EIPPCB assessment:	**Whole BAT** • A technique can fulfil several environmental objectives in different BAT conclusions. The environmental objective of BAT 2 is to improve the overall environmental performance of the plant, of BAT 9 to reduce water consumption and waste water generation and of BAT 17 to reduce the waste water volume, the pollutant loads discharged to the waste water treatment plant and the emissions to water. These are different aspects of the plant's environmental performance. • The issues addressed by the three BAT may overlap but are approached from different perspectives and with different goals: BAT 2 aims to ensure data/information collection for all input/output streams; BAT 9 focuses mainly on reuse/recovery/reduction of consumption of waters and process liquors (and consequently on waste water reduction) and BAT 17 deals with strategy for reduction or treatment of waste waters. • An integrated waste water management and treatment strategy can be a part of a water management plan (BAT 9a). It is a decision-making tool for selection of the optimal waste water treatment, used in an ongoing decision-making process (e.g. for evaluation of the waste water treatment options and the efficiency of the techniques used) of the environmental management system in an operating installation. • Recovery/reuse of process liquors is addressed in BAT 9i. The cross-reference could be added. • BAT 2 already cross-references BAT 1 and BAT 9 to highlight its link to the environmental management system – so an additional reference in BAT 17i is not needed. • BAT 17 is generic and BAT 18 is specific. BAT 17 aims at selection of techniques to either reduce/reuse process liquor, (pre)treat it as waste water or handle it as waste (see assessment below). BAT 18 sets further criteria for the pretreatment of effluents of spent process liquors (i.e. with pollutants that cannot be adequately treated by or could harm the operation of a biological treatment). Deleting BAT 17 would reduce the flexibility of using an appropriate combination of techniques and remove the process of their selection as an important decision-making tool. **BAT statement** • If process liquors cannot be i) reduced by process-integrated techniques, ii) reused/recovered or iii) treated by a suitable waste water pretreatment, they can be handled as waste (e.g. treated or disposed of off site). The concentrated process liquors with recalcitrant and toxic pollutants are best removed, treated or disposed of from the common waste water flow (not to be diluted by mixing with other waste water streams), thereby reducing the pollutant loads to be treated and discharged. This could be mentioned in the BAT statement. • Concentrated baths and pastes that contain recalcitrant pollutants are addressed in BAT 18. **Description** • The use of off-site contractors to control the environmental impacts of the plant is an implementation decision that is not within the scope of the BAT conclusions but in the hands of the operator and the competent authority. The alternative of off-site treatment is mentioned in BAT 18.
EIPPCB proposal:	• To restructure the text indicating the order of priority and listing the techniques on separate lines.

	• To add cross references to other BAT to the techniques (e.g. BAT 9i, BAT 38 and others). • To add as one of the techniques separation and pre-treatment or handling as waste of concentrated waste water streams, which are the subject of BAT 18.

1.4.6.2 Techniques for reducing emissions to water

Location in D1:	**P. 734 – Section 5.1.6 – BAT 18**
Current text in D1:	**BAT 18. In order to reduce emissions to water, BAT is to (pre)treat waste water containing pollutants that cannot be treated adequately by a biological treatment.** **Description** The treatment is carried out as part of an integrated waste water management and treatment strategy (see BAT 17) and is generally necessary to: • protect the (downstream) biological waste water treatment against inhibitory or toxic compounds; • remove compounds that are insufficiently abated during biological waste water treatment (e.g. toxic compounds, poorly biodegradable organic compounds, organic compounds that are present in high concentrations, or metals); • remove compounds that could otherwise be stripped to air from the collection system or during biological waste water treatment (e.g. sulphide); • remove compounds that have other negative effects (e.g. corrosion of equipment; unwanted reaction with other substances; contamination of waste water sludge). The treatment is carried out on site or off site. On-site treatment is generally carried out as close as possible to the source in order to avoid dilution. The techniques used depend on the pollutants targeted and include adsorption, chemical oxidation and chemical reduction (see BAT 19). Waste water which may contain toxic or poorly biodegradable compounds includes: • spent liquors from sizing, dyeing and finishing; • spent printing pastes. The biodegradability of the COD/TOC content of the waste water sent to biological treatment is at least 80 %, monitored in accordance with the standard EN ISO 9888
Summary of comments:	**BAT statement** • Change the BAT statement to emphasise the minimisation of the amount of waste water, and to focus on retaining and reusing waste waters containing pollutants that cannot be adequately treated by biological treatment (DE 267). **Introduction** • Change in the introductory sentence "generally necessary" to "aims at" to focus more on technical features of the technique (FR_A 12). **First bullet point** • Reword the first bullet point to keep only the technical feature of technique, which is treating/removing inhibitory or toxic compounds (FR_A 13). **Second bullet point** • In the second bullet add the reference to BAT 19 and list the treatment techniques according to the pollutants they are relevant for: a) chemical oxidation, chemical reduction, filtration, adsorption or evaporation for poorly biodegradable organic

	compounds; b) adsorption, precipitation, chemical oxidation, chemical reduction for organic compounds present in high concentrations; c) precipitation for soluble metals or solid removal for metals bound to suspended solids (BE 17). • In the second bullet point indicate that the metals are present in high concentrations. Metals come from dyes but pretreatment is needed only in the case of high concentrations (EURATEX 17). • In the second bullet specify toxic/poorly biodegradable waste water streams' concentrates such as desizing liquors, residual padding liquors from continuous or cold pad-batch dyeing, residual printing pastes, residual padding liquors from final finishing. In addition, specify that they need to be pretreated. A concrete wording proposal is attached to the comment (DE 267). **On-site and off-site treatment** • Remove the sentence stating that the treatment is carried out on site or off site, because it is inconsistent, the purpose of this wording is not clear and has no added value (FR_A 15). **Treatment techniques** • Change the wording "chemical oxidation and chemical reduction" to "chemical oxidation OR chemical reduction", because they are opposite reactions (EURATEX 18). **Waste water streams concerned** • Move the paragraph listing poorly biodegradable compounds under the second bullet as it deals with toxic or poorly biodegradable compounds (FR_A 14). • Add coating pastes next to printing pastes as they can also contain toxic or poorly biodegradable compounds and are used in larger amounts then printing pastes (SE 16). • Add that individual waste water streams listed here need to be collected separately (segregated) (DE 267). • Add padding liquors from continuous or cold pad-batch dyeing and final finishing (DE 267). **Level of biodegradability** • Add bioelimination (DE 290) or elimination (EURATEX 116) to biodegradability in the last sentence of the description (DE 290, EURATEX 116). • Clarify the regulatory status of the percentage, i.e. whether it is an indicative value, BAT-AEPL or BAT-AEL, or delete it (FR_A 20). • The monitoring standard is not consistent with BAT 7 (FR_A 20). • Delete the last sentence because no information has been collected (i.e. within the questionnaires) regarding the level of biodegradability of the COD/TOC content of the waste water sent to biological treatment (IT 21). • Provide justification for how the figure of 80 % was derived (UK 20). **Additional proposals** • Add that the technique is not applicable for commission working plants, or alternatively that it is applicable only to new plants and major plant upgrades. The reasons are high costs related to the investment in (pre)treatment techniques and difficult identification and separation of polluting waste water streams in commission working plants (EURATEX 15). • Add that for the applicability of this BAT the economical/technical feasibility should be taken into account and demonstrated (EURATEX 19). • Add a BAT for on-site pretreatment of waste water streams containing organophosphorus flame retardants (FR) for both direct and indirect discharges. D1 gives confusing information: that organophosphorus FR should be collected and not discharged (p. 806), that urban WWTPs should be equipped with appropriate tertiary treatment for organophosphorus FR (p. 171). In addition, there is a general overview of techniques that can be used to remove soluble, non-biodegradable contaminants, such as organophosphorus FR (p. 425) (BE 19).
EIPPCB assessment:	**BAT statement** • BAT 9 and BAT 17 aim to reduce waste water generation or its volume by choice of

	various techniques. The focus of this conclusion is reducing emissions to water either by pre-treatment. **Introduction** • The wording was used in BAT 11 of the CWW BAT conclusions. It is not clear why rewording would be needed. **First bullet point** • The bullet expresses the important goal of the removal of inhibitory or toxic compounds. The wording was used in BAT 11 of the CWW BAT conclusions. It is not clear why rewording would be needed. **Second bullet point** • The individual waste water treatments that may abate the inhibitory or toxic compounds are listed in BAT 19. This was referenced in the description in the following paragraph (e.g. see Treatment techniques below). • The main source of metals in the spent process liquors are dyes. This is indicated by mentioning spent liquors from dyeing in the listing of the individual waste water streams in the description below the bullets (e.g. see Waste water streams concerned). • Repeating the individual waste water streams in bullets explaining the aim of the pretreatment would complicate the text. The need to pretreat at source to avoid dilution is explained in the description following the bullets. The alternative to pretreatment is handling these waste water streams as waste. **On-site and off-site treatment** • The off-site or on-site treatment are implementation options to be decided by the operator and the competent authority on a case-by-case basis to comply with BAT-AELs and local environmental constraints. Therefore, mention of these options can be avoided in the description. **Treatment techniques** • The wording should be changed to indicate that either chemical oxidation or chemical reduction is possible. **Waste water streams concerned** • The paragraph listing the waste water streams concerned could be moved to the beginning of the description. It does not seem practical to merge it with the bullets listing the aims of the treatment. • Spent coating baths could be added to the list of waste water streams similar like finishing baths. • According to the data collection, out of 106 plants, only 6 (DE024, DE030, DE039, DE049 FR130 and FR133) reported handling spent dyeing baths and padding liquors as waste and 17 reported treating them as waste waters; 10 plants (DE022, DE024, DE025, DE030, DE032, DE046, DE047, DE049, FR135 and SE119) reported handling spent finishing baths or padding liquors as wastes and 8 reported treating them as waste waters. • It could be highlighted that individual waste water streams considered in this conclusion need to be collected separately (segregated). • Padding liquors from continuous or cold pad-batch dyeing and finishing could be added to the list of waste water streams. **Level of biodegradability** • Bioeliminability seems to be an appropriate parameter in relation to the treatment techniques (adsorption, chemical oxidation and chemical reduction) proposed to remove the pollutants. The percentage of bioeliminability of the treated waste waters is part of the BAT description (efficiency of the removal) and does not have the status of a BAT-AE(P)L. The BAT-AE(P)Ls in the conclusions are clearly indicated as such according to Implementing Decision 2012/119/EU. • The monitoring standard for biodegradability and bioeliminability is EN ISO 9888 – as also indicated in the table of BAT 7. • The fact that data/information on biodegradability was not collected via questionnaires is not a reason for dismissing other sources available to the EIPPCB or

<table>
<tr><td></td><td>expert opinion.
• The bioeliminability or biodegradability of more than 80 % (e.g. after 28 days in relation to the Zahn-Wellens test (EN ISO 9888) according to the OECD 301 test) is considered a criterion for biodegradable/bioeliminable substances in several places within D1 (e.g. Figure 4.35 in Section 4.1.3.2.1. Selection of sizing agents).

<u>Additional proposals</u>
• The only economic information on costs for waste water treatment techniques was provided for a combination of techniques called Zero Liquid Discharge. No information on high costs of separation or treatment of these waste water streams in commission working plants was provided, which makes economic assessment difficult.
• The plants reporting using this technique demonstrate the technique's economic/technical feasibility. No other information enabling economic assessments was provided.
Spent finishing liquors would include the waste water streams containing organophosphorus flame retardants (FR). The waste water treatments mentioned in this conclusion would remove organophosphorus FR from the waste waters. This conclusion is valid irrespective of the type of discharge. The need to collect ant treat these waste streams separately from others could be reflected in the statement and description of the conclusion.</td></tr>
<tr><td>EIPPCB proposal:</td><td><u>BAT statement</u>
• To modify the statement to highlight the high pollutant loads of poorly biodegradable compounds.

<u>Description section</u>
• To put the list of the waste water streams considered at the beginning of the description.
• To complement the list with spent dyeing, coating and finishing liquors.
• To indicate that these streams include residual padding liquors from continuous and/or cold pad-batch processes.
• In the statement on treatment, to indicate chemical oxidation and chemical reduction techniques as alternatives (linking them with 'or), and to possibly add filtration and precipitation.
• To replace 'Biodegradability of the COD/TOC content' with 'bioeliminability' of waste water streams sent to downstream biological treatment.</td></tr>
</table>

<table>
<tr><td>Location in D1:</td><td>P. 735 – Section 5.1.6 – BAT 19</td></tr>
<tr><td>Current text in D1:</td><td>BAT 19. In order to reduce emissions to water, BAT is to use an appropriate combination of the techniques given below.

<table>
<tr><th colspan="2">Technique ([1])</th><th>Typical pollutants targeted</th><th>Applicability</th></tr>
<tr><td colspan="4">Preliminary and primary treatment, e.g.</td></tr>
<tr><td>a.</td><td>Equalisation</td><td>All pollutants</td><td rowspan="3">Generally applicable</td></tr>
<tr><td>b.</td><td>Neutralisation</td><td>Acids, alkalis</td></tr>
<tr><td>c.</td><td>Physical separation (e.g. screens, sieves, grit separators, grease separators, oil-water separation, hydrocyclones or primary settlement tanks)</td><td>Gross solids, suspended solids, oil/grease</td></tr>
<tr><td colspan="4">Physico-chemical treatment, e.g.</td></tr>
<tr><td>d.</td><td>Adsorption</td><td>Adsorbable dissolved non-biodegradable or inhibitory pollutants, e.g. AOX</td><td rowspan="2">Generally applicable</td></tr>
<tr><td>e.</td><td>Precipitation</td><td>Precipitable dissolved non-biodegradable or inhibitory pollutants, e.g. metals, phosphorus</td></tr>
</table>
</td></tr>
</table>

	f.	Chemical oxidation	Oxidisable dissolved non-biodegradable or inhibitory pollutants, e.g. AOX, sulphide	
	g.	Chemical reduction	Reducible dissolved non-biodegradable or inhibitory pollutants, e.g. hexavalent chromium (Cr(VI))	
	h.	Evaporation	Soluble contaminants	
	Biological treatment, e.g.			
	i.	Activated sludge process	Biodegradable organic compounds	Generally applicable
	j.	Membrane bioreactor		
	k.	Anaerobic treatment		
	Nitrogen removal			
	l.	Nitrification/denitrification (when the treatment includes a biological treatment)	Total nitrogen, ammonia	Nitrification may not be applicable in the case of high chloride concentrations (e.g. above 10 g/l). Nitrification may not be applicable when the temperature of the waste water is low (e.g. below 12 °C).
	Solids removal, e.g.			
	m.	Coagulation and flocculation	Suspended solids and particulate-bound metals	Generally applicable
	n.	Sedimentation		
	o.	Filtration (e.g. sand filtration, or membrane filtration)		
	p.	Flotation		
	([1]) The descriptions of the techniques are given in Section 5.9.3.			
Summary of comments:	**<u>Whole BAT</u>** • Add technique 'boiling of effluent with caustic soda to destroy the permethrin' (used in Plant UK123, see paragraph 4.1.7.3.4.1 of D1) because of its performance and permethrin's high toxicity to aquatic organisms (BE 29). • Restructure the BAT to reflect the common sequences for textile-specific waste water treatment plants (primary, secondary, tertiary treatment etc.), including textile-specific requirements and removal efficiency. Also, add examples of waste water treatment sequences. Proposals are attached to the comment[13] (DE 268). • Revise the table substantially because the currently proposed description can be misleading (i.e. some of the techniques have been assigned a false function and position in the sequence of downstream treatment operations). A proposal is attached to the comment (CZ_B 19). • Add zero liquid discharge (ZLD) to the list, together with information on its severe cross-media effects (see final report on EU project EColoRO) (DE 392). **<u>Biological treatment, e.g.</u>** <u>Technique k.</u> • Indicate that the applicability of anaerobic treatment may be restricted by the			

[13] Schönberger, H., Technique combinations to meet the ambitious ZDHC Wastewater Guidelines, Proceedings of the Colloquium on Textile Wastewater Management 2018-09-18/Integrated Best Available Wastewater Management in the Textile Industry, Vulkan-Verlag GmbH, Essen (2018) p.35 – 70

	composition of waste water (EURATEX 20). **Solids removal, e.g.** Technique o. • Add the following specific membrane filtration techniques: nanofiltration, reverse osmosis, ultrafiltration and microfiltration (BE 26).
EIPPCB assessment:	**Whole BAT** • The technique 'boiling of effluent with caustic soda to destroy the permethrin' (used in Plant UK123) is considered to be an example of chemical oxidation treatment and is mentioned in Section 4.1.7.3.4.1 of D1. Pesticides could be mentioned as an example of typical pollutants targeted by the chemical oxidation technique. • The removal efficiencies of individual techniques are given in Chapter 4 of D1; they are indicative of potential environmental performance in any sector (not just textiles). According to the data collection, only 16 out of 1 213 data sets for emissions to water reported the actual removal efficiencies in the real plants (see Section 3.4.1 of D1). The BAT-AELs are typically considered a sufficient regulatory tool to ensure appropriate removal of pollutants. High removal efficiencies are exceptionally used instead of BAT-AELs for regulating cases of high water recycling and consequently high pollutant load build-up. • The BAT statement instructs the operator and competent authority that the appropriate combination of techniques listed in the table is to be selected. The groupings of techniques (e.g. primary, secondary, tertiary treatment etc.) as proposed in the comments could be helpful for the implementation. • The textile-specific pollutants targeted related to specific waste water treatment techniques could be amended. • The Zero Liquid Discharge approach to waste water treatment and recycling is a combination of techniques already presented in the table. Many approaches using different combinations and variations of techniques from the table are presented in Section 4.1.7.4 of D1. **Biological treatment, e.g.** Technique k. • The typical pollutants removed from the effluents by the treatment techniques are indicated in the table. The choice of appropriate techniques to remove certain pollutants is not considered an applicability restriction. • As indicated in Section 4.1.7.3.5.2 of D1, the technique is typically used as a (pre)treatment for waste water which is characterised by a high organic load (> 2 g/l) and a more or less constant quality. It is therefore used mostly in the sectors with effluents with consistently high BOD loads. In the textile sector, anaerobic bioreactors are used in combination with activated sludge treatment to treat textile effluents with a high COD concentration and dyestuff pollutants. According to the data collection, Plants CZ019 and FR134 indicated using the technique. **Solids removal, e.g.** Technique o. • Specific membrane filtration techniques: nanofiltration, reverse osmosis, ultrafiltration and microfiltration are already listed in the description of the membrane filtration technique in Section 5.9.3.
EIPPCB proposal:	• To restructure the table to follow the steps (e.g. pre-treatment, primary, secondary, tertiary, advanced) in the waste water treatments typical for textile sector. • To add examples of typical pollutants targeted by specific waste water treatment techniques.

1.4.6.3 BAT-AELs for direct discharges to a receiving water body

Location in D1:	**P. 735 – Section 5.1.6 – BAT 19 – Table 5.3**
Current text in D1:	**Table 5.3: BAT-associated emission levels (BAT-AELs) for direct discharges to a receiving water body**

Substance/Parameter		Activities / processes	BAT-AEL ([1]) (mg/l)
Adsorbable organically bound halogens (AOX) ([2])		All activities / processes	0.1–0.5
Chemical oxygen demand (COD) ([3])			40–120 ([4])
Hydrocarbon oil index (HOI)			1–10
Metals / metalloids	Antimony (Sb)	Pre-treatment and/or dyeing of polyester	0.1–0.4
		Finishing with flame retardants using antimony trioxide	
	Chromium (Cr)	Dyeing with chromium-containing dyes	0.01–0.3
	Copper (Cu)	All activities / processes	0.03–0.4
	Nickel (Ni)		0.01–0.5
	Zinc (Zn)		0.04–0.5
Sulphide, easily released (S^{2-})		Dyeing with sulphur dyes	0.3–1
Total nitrogen (TN)		All activities / processes	5–20 ([5])
Total organic carbon (TOC) ([3])			13–40 ([6])
Total phosphorus (TP)			0.4–5
Total suspended solids (TSS)			5–45

([1]) The averaging periods are defined in the general considerations.
([2]) The BAT-AELs only apply when the substance/parameter concerned is identified as relevant in the waste water stream based on the inventory of inputs and outputs mentioned in 0.
([3]) Either the BAT-AEL for COD or the BAT-AEL for TOC applies. The BAT-AEL for TOC is the preferred option because TOC monitoring does not rely on the use of very toxic compounds.
([4]) The upper end of the BAT-AEL range may be up to 150 mg/l when the amount of waste water discharged is less than 25 m^3/t of treated textile materials.
([5]) The BAT-AEL may not apply when the temperature of the waste water is low (e.g. below 12 °C) for prolonged periods.
([6]) The upper end of the BAT-AEL range may be up to 50 mg/l when the amount of waste water discharged is less than 25 m^3/t of treated textile materials.

The associated monitoring is given in 0.

Summary of comments:

General comments

- Derive BAT-AELs for direct discharges to a receiving water body based on the reported emission data of the direct discharges, because indirect discharges do not implement an appropriate combination of the techniques to reduce emissions to water for direct discharge (e.g. physico-chemical treatment, biological treatment, nitrogen removal, solids removal); see also comments BE 21 and BE 22 (BE 3).
- Express BAT-AELs as specific loads in kg/ton of treated textile or add an appropriate expression/factor (× m^3/t) for all BAT AELs. Many important BATs which reduce water and energy consumption simultaneously increase the concentration of pollutants (see also comment SE 40) (SE 26).
- In the interest of transparency, explain the methodology of deriving BAT-AELs either within the BREF or in a separate document (UK 21).

Additional parameters

- Set a BAT-AEL range for BOD at 5-10 mg/l, because it shows the efficiency of the WWTP. Also, the collected data indicate that the range is valid (SE 28).
- Set an upper end of the BAT-AEL range for colour for dyeing activities as 1/30 dissolution (ES 38); or as spectral absorption coefficients at 436 nm (yellow range) 7 m-1; 525 nm (red range) 5 m-1; 620 nm (blue range) 3 m-1 (DE 273). Colour in discharge could have a negative impact on water bodies and has a high public response (ES 38, DE 273).
- Set BAT-AEL ranges for the following:
  - NH_4-N with the upper end of the range up to 10 mg/l, because it is toxic to

fish.
    - Toxicity with the option to use one or a combination of different measurement methods. For EN ISO 15088 set the upper end of the range up to 2 mg/l. It is important to control the toxicity for directly discharged waste water (DE 273).
- Set the BAT-AEL range for nonylphenol to 0.0002-0.005 mg/l (= 0.2-5 µg/l) Nonylphenol is a substance of environmental concern. There are 17 data sets for the value of NP and 13 data sets are in the proposed BAT-AEL range. Emission limit values for this parameter are set in some national regulations (e.g. in France 0.025 mg/l and in Belgium 0.00008 mg/l) (AT 15).
- Set a BAT-AEL range for DecaBDE to 0.001-0.02 mg/l because DecaBDE is a substance of environmental concern. In addition, there are 5 data sets for DecaBDE. Finally, the use and production of the substance have been prohibited by the EU POP Regulation 2019/1021 since 2019 (AT 17).
- Set a BAT-AEL range for Sum of PFOA and PFOS to 0.001-0.003 mg/l because PFOA and PFOS are substances of environmental concern. There are 8 data sets for PFOA and 7 data sets for PFOS. In 2019, PFOA and its salts were listed in category A (Elimination) in the Stockholm Convention on Persistent Organic Pollutants (entry into force: December 2020). In the EU, the production, placing on the market and use of PFOA, its salts and polymers have been restricted in Annex XVII to REACH since 2017 (AT 19).

Adsorbable organically bound halogens (AOX)

- Increase the upper end of BAT-AEL range for polyester and blends of modacryl/cotton to 1 mg/l, and change the BAT-AEL range for other fibres to 0.1-0.6 mg/l. Companies with specific processes, e.g. polyester dyeing and modacryl/cotton dyeing, have an AOX discharge of 1.9 mg/l (90th percentile) and 1.46 mg/l (80th percentile) for indirect discharges. 1 mg/l is a reasonable limit based on 10 times the environmental quality standard. A 90th percentile value for the upper limit is more representative for the well-performing plants (EURATEX 21).
- Increase the upper end of the BAT-AEL range to 0.8 mg/l for dyeing products with high lightfastness, and high quality demands (EURATEX 136).
- Lower the upper end of the BAT-AEL range to 0.3-0.4 mg/l. The upper end of the BAT-AEL range of 0.5 mg/l is in line with limits of certification schemes. Although collected data indicate that many plants are below or even consistently well below this level, contextual information (e.g. on the set-up and process conditions of the waste water treatment plants) for technically deriving a more ambitious BAT is lacking (EEB 152, EEB 165).

Chemical oxygen demand (COD)

- Lower the upper end of the BAT-AEL range to 100 mg/l because, according to the collected data, the average concentration of only 3 plants is above 100 mg/l, there are only 2 plants with a maximum concentration between 100 mg/l and 120 mg/l and 58 % of plants below 100 mg/l. With good physical, biological and chemical treatment, less than 80 mg/l COD can be achieved (AT 3, SE 25).
- Decrease the BAT-AEL range to 30-100 mg/l to align it with the CWW BAT conclusions. Collected data show that plants achieve concentrations below 100 mg/l and those above 120 mg/l are probably not applying BAT. Two plants achieve concentrations lower than the proposed BAT-AEL range (IT082 and IT092), indicating the best achievable level (EEB 153, EEB 165).
- Increase the upper end of the BAT-AEL range to 160 mg/l (FR_A 52).
- Increase the upper end of the BAT-AEL range to 160 mg/l because the 85th percentile of collected data represents the performance of the majority of plants better (EURATEX 22, EURATEX 158).

Footnote ([4])

- Decrease the upper end of the range in Footnote ([4]) to 130 mg/l if the removal efficiency is at least 90 %. Indeed, the exemption should be rather linked to the removal efficiency because Table 5.1 (BAT-AEPLs for specific water consumption) shows that for batch processes the specific water consumption ranges are above 25 m^3/t treated textile materials; and for continuous processes below 25 m^3/t treated textile materials. The strong variation of water consumption data shows that it is not

	appropriate to use water consumption as the basis for an exemption. Also, the proposed threshold is hard for the authorities to control (AT 4). • Increase the upper end of the BAT-AEL range in Footnote ([4]) to 250 mg/l (EURATEX 22, EURATEX 158), or to 150 mg/l (DE 272) or 160 mg/l (FR_A 52), for waste waters with a high COD content in the influent if the removal efficiency of the WWTP is at least 90 % (DE 272) or 95 % as a yearly or monthly average (e.g. see FR131) (FR_A 52). Such a footnote was already added in the FDM BAT conclusions. Define the high COD content in the influent (DE 272, FR_A 52). • Increase the water consumption level in Footnote ([4]) to the one reached by the plants/sites with multiple processes and process routes; according to the data collection, only a few single-process sites reach the proposed level. Add in the footnote the expected associated BOD level equal to or less than 25 mg/l as an indicator of the biodegradability of the effluent (UK 22). **Hydrocarbon oil index (HOI)** • Add Footnote ([2]) to this parameter, because it is not relevant for all processes (DE 370, CZ_B 7). • Decrease the upper end of the BAT-AEL range to 5 mg/l. From the data collection, there are 4 data sets for direct discharge applying biological treatment with activated sludge achieving concentrations below 1 mg/l (AT 14). • Keep or lower the upper end of the BAT-AEL (EEB 154, EEB 165). **Metals / metalloids** • Add a Footnote ([2]) to these parameters as they are not relevant for all processes (DE 371). Antimony (Sb) • Increase the upper end of the BAT-AEL range for the cases where both processes are applied in the plant (pretreatment and/or dyeing of polyester and finishing with flame retardants using antimony trioxide) to 0.6 mg/l. Increase the upper end of the BAT-AEL range to 1.2 mg/l for plants doing polyester and modacryl/cotton dyeing (EURATEX 42). • Increase the upper end of the BAT-AEL range for antimony to 0.5 mg/l. According to Commission Implementing Decision 2012/119/EU (Section 3.3), rounded values can be set as BAT-AELs to take into account limitations in the data collection or other technical aspects (DE 366). • Set separate BAT-AEL ranges for each process: for pretreatment and dyeing the upper end of the range should be 1.5 mg/l (because antimony used as a catalyst for polyester production is leached out of fibre at high temperature (above softening point) and emissions cannot be avoided); and for finishing 0.1-0.4 mg/l (EURATEX 135) or 0.1-0.5 mg/l (DE 196) (emissions can be minimised by retention of padding liquor and contaminated rinsing water) (EURATEX 135). • Lower the upper end of the BAT-AEL range to 0.2 mg/l. Collected data show that around 65 % of the plants are below 0.2 mg/l. Experience from Austrian plants show that lower values can be achieved by good chemical and water management (e.g. see BAT 49). Lower values can be achieved with abatement techniques nanofiltration, microfiltration, ultrafiltration, prevention measures (separate disposal of chemicals) and precipitation. According to national waste water legislation (AT Textile and AT Glass), 0.3 mg/l Sb is achieved with prevention measures (separate disposal of chemicals) and precipitation (AT 46). • Modify the BAT-AEL range (both lower and upper ends) to 0.01–0.15 mg/l. Three out of four installations that report measurements have values below 0.3 mg/l, two below 0.15 mg/l. The plant with the lowest emissions has substantial activity in polyester dyeing. ZDHC limits are 0.01 mg/l, 0.05 mg/l and 0.1 mg/l for their three performance levels (EEB 155, EEB 165). Chromium (Cr) • Increase the lower end of the BAT-AEL range to 0.05 mg/l, because the lower limit would be equal to environmental quality standards (EQS) in the Water Framework Directive. Treating waste water below EQS causes excessive costs (EURATEX 43). • Increase the upper end of the BAT-AEL range for chromium to 0.5 mg/l. According to Commission Implementing Decision 2012/119/EU (Section 3.3), rounded values

	can be set as BAT-AELs to take into account limitations in the data collection or other technical aspects (DE 366). • Lower the upper end of the BAT-AEL range to 0.1 mg/l. According to the data collected, a large number of plants can easily comply with 0.1 mg/l. The data sets from Plants PT102, PT104, PT111 should not be included in the analysis because of poor measurement quality (e.g. reporting results below the LoD, measuring the same value repeatedly, etc.). Also, data sets from Plants IT063, IT072 and SE119 cannot be considered BAT because of too high values (and fluctuations). Also, other standards are stricter than the proposed level: e.g. ZDHC requires 0.05/0.1/0.2 mg/l as maximum levels for the three performance classes; and Oeko-tex requires 0.2 mg/l (EEB 156, EEB 165). <u>Copper (Cu)</u> • Increase the lower end of the BAT-AEL range to 0.05 mg/l, because the lower limit would be equal to environmental quality standards (EQS) in the Water Framework Directive. Treating waste water below EQS causes excessive costs (EURATEX 43). • Increase the upper end of the BAT-AEL range for copper to 0.5 mg/l. According to Commission Implementing Decision 2012/119/EU (Section 3.3), rounded values can be set as BAT-AELs to take into account limitations in the data collection or other technical aspects (DE 366). • Increase the upper end of the BAT-AEL range to 0.8 mg/l for dyeing products with high lightfastness, and high quality demands (EURATEX 137). • Lower the upper end of BAT-AEL range to 0.2 mg/l. Add a footnote that in the case of increased lightfastness requirements (use of copper-containing dyes), the upper end of the BAT-AEL range is up to 0.4 mg/l. According to the collected data, around 65 % of the plants are below 0.2 mg/l. Abatement technologies reverse osmosis, nanofiltration, microfiltration could be used (AT 7). • Lower the upper end of the BAT-AEL range to 0.2 mg/l. According to the data collection, reported values are generally well below 0.2 mg/l (EEB 157, EEB 165). <u>Nickel (Ni)</u> • Increase the lower end of the BAT-AEL range to 0.05 mg/l, because the lower limit would be equal to environmental quality standards (EQS) in the Water Framework Directive. Treating waste water below EQS causes excessive costs. (EURATEX 43). • Increase the upper end of the BAT-AEL range for nickel to 0.5 mg/l. According to Commission Implementing Decision 2012/119/EU (Section 3.3), rounded values can be set as BAT-AELs to take into account limitations in the data collection or other technical aspects. (DE 366). • Lower the upper end of the BAT-AEL range to 0.08 mg/l and add a footnote mentioning that the upper end corresponds to the use of nickel-containing dyes. Indeed, according to the collected data, around 70 % of the plants are below 0.08 mg/l. In addition, nickel is a Priority Substance. Finally, experience from Austrian plants shows that 0.08 mg/l can be achieved by good chemical and water management (see BAT 39-42). The plants with emission values > 0.05 mg/l do not use abatement technologies such as reverse osmosis, ultrafiltration or microfiltration (except Plant IT092_w(1)) (AT 9). • Change the BAT-AEL range to 0.005-0.05 mg/l to align it with the CWW BAT conclusions. According to the data collected, reported values are well below 0.4 mg/l, in most cases even below 0.05 mg/l. The higher reported values show very high error bars and should not be included in the analysis (poor process control, few measurements, poor measurement quality, erroneous measurement or sampling, malfunction of the water treatment facility). Oekotex and ZDHC require maximum emission levels of 0.2 mg/l (EEB 158, EEB 165). <u>Zinc (Zn)</u> • Increase the upper end of the BAT-AEL range to 2 mg/l. The source of Zn emissions is corrosion of pipes (DE 367, EURATEX 157). • Increase the lower end of the BAT-AEL range to 0.2 mg/l, because the lower limit would be equal to environmental quality standards (EQS) in the Water Framework Directive. Treating waste water below EQS causes excessive costs (EURATEX 43). • Lower the lower end of the range to 0.02 mg/l (EEB 165). Lower the upper end of the BAT-AEL range to 0.3 mg/l to align it with the CWW BAT conclusions. According

to the data collected, few data points are between 0.3 mg/l and 0.5 mg/l (EEB 159, EEB 165).

Sulphide, easily released (S^{2-})

- Change the BAT-AEL range to 0.1-0.5 mg/l. According to the data collected, plants achieve lower values. There is only one plant (direct discharge) over 0.5 mg/l (AT 11).
- Change the BAT-AEL range to 0.05-0.2 mg/l. According to the data collected, a lot of measurements are reported at the limit of detection. The ZDHC standard requires 0.01/0.05/0.5 mg/l for their three levels (EEB 160, EEB 165).

Total nitrogen (TN)

- Lower the upper end of the BAT-AEL to 10 mg/l (EEB 161, EEB 165) or 15 mg/l (SE 28). This would align the upper end of the BAT-AEL with an ecosystem-dependent condition as in the Directive on urban waste water treatment (91/271/EC). According to the data collected, the upper end could be lowered (SE 28, EEB 161, EEB 165).

Footnote (5)

- Set an upper end of the BAT-AEL range for cold conditions.(EEB 187).
- Specify "prolonged" in Footnote ([5]), because on an average day the temperature of 20 % of the waste water collected over one day is equal to or below 12 °C (AT 41).

Total organic carbon (TOC)

- Change the BAT-AEL range to 10-30 mg/l. The collected data for TOC show lower values and only a few plants are above 30 mg/l (AT 5).
- Lower the upper end of the BAT-AEL range to 30 mg/l, because this is supported by the data collection (SE 28).
- Keep the BAT-AEL range as proposed (EEB 162, EEB 165).

Footnote (6)

- Modify the footnote allowing a higher upper end of the BAT-AEL for TOC up to 50 mg/l for waste waters with a high TOC content in the influent if the removal efficiency of the WWTP is at least 90 %. Define the high TOC content in the influent (DE 369).
- Decrease the upper end of the range in Footnote ([6]) to 40 mg/l if the removal efficiency is at least 90 %. Indeed, exemption should rather be linked to removal efficiency because Table 5.1 (BAT-AEPLs for specific water consumption) shows that for batch processes the specific water consumption ranges are above 25 m^3/t treated textile materials; and for continuous processes below 25 m^3/t treated textile materials. The strong variation of water consumption data shows that it is not appropriate to use water consumption as the basis for an exemption. Also, the proposed threshold is hard for the authorities to control (AT 6).

Total phosphorus (TP)

- Lower the upper end of the BAT-AEL range to 2 mg/l. Only data sets for plants with direct discharge using BATs for phosphorus removal should be used for setting a BAT-AEL (BE 22, DE 368).
- Increase the upper-end of the BAT AEL range to 10 mg/l. Add another BAT-AEL range for flame-retardant treatments using phosphorus compounds (FR_B 8).
- Do not consider organophosphates when evaluating Total phosphorus. Organophosphorus flame retardants are persistent but not bioaccumulative or toxic. This organic phosphorus does not contribute to the eutrophication of surface water. Actions regarding pad liquors and highly concentrated rinsing water are taken by plants to avoid excess of discharge (EURATEX 44).
- Modify the BAT-AEL range to 0.01-2 mg/l. The collected data show lower values. Total phosphorus is easy to precipitate. Such an upper end of the BAT-AEL range was set in the FDM BAT conclusions (AT 13).
- Modify the BAT-AEL range to 0.1-3 mg/l and add a footnote that for the plants discharging into eutrophication-sensitive areas the upper end of the range is 1 mg/l or 2 mg/l (depending on size) as set by the UWWTD. Finally, the certification scheme ZDHC as well as the CWW BAT conclusions have emission limit values at 3 mg/l

	(EEB 163, EEB 165). Lower the upper end of the BAT-AEL range to 2 mg/l. According to the data collected and the UWWTD, the upper end could be lowered (SE 28). **Total suspended solids (TSS)** • Lower the upper end of the BAT-AEL range to 35 mg/l to align with the CWW BREF. These solids can have metals and metalloids associated with them and can therefore pose a significant threat to downstream ecology (EEB 164, EEB 165, UK 23). • Lower the upper end of the BAT-AEL range to 35 mg/l. According to the data collected and the UWWTD, the upper end could be lowered (SE 28).
EIPPCB assessment:	**General comments** • To derive the BAT-AELs for direct discharges, the data reported for direct discharges have been taken into consideration. However, in the case of sulphides and metals, the indirect discharges were additionally considered to confirm the assessment. For details, see the corresponding assessments for parameters below. • According to Section 8.1.1 of the KoM conclusions, the BAT-AELs for emissions to water are expressed in concentrations, and not in loads. • The proposed BAT-AELs are based on the emission data sets related to the treatment techniques applied by the different TXT installations. Additional contextual information like use of raw materials, processes, chemicals and auxiliaries used are taken into consideration. • Furthermore, a 2nd Data Assessment Workshop was organised in October 2020, in order to clarify the approach used by the EIPPCB to derive the BAT-AE(P)Ls proposed in D1, and to discuss the data situation in relation to the BAT-AE(P)Ls proposed in D1. • The comments from that workshop and additional information provided after it have been taken into account to formulate the EIPPCB assessments and proposals in this background paper. **Additional parameters** • According to the KoM conclusions, the data on BODn emissions were to be collected as contextual information, but it was decided not to propose a BAT-AEL for this parameter. However, BODn indicative emission levels related to COD/TOC BAT-AELs could be set (e.g. in a footnote to the table) to indicate the abatement efficiency of the well-performing biological waste water treatment (e.g. also for checking non-biodegradability of effluent with BOD to COD ratio). • According to the KoM conclusions, data were to be collected for the TWG to decide at a later stage, based on their availability and comparability, to potentially set a BAT-AEL for colour. In the data collection, 35 data sets (from 16 emission points, 6 direct / 10 indirect discharge) were reported for colour, 3 reported in units of Pt-Co scale, 10 in SAC (m-1), 3 in mg/l Pt and 19 reported measurements or ELVs but no unit (of these, 16 seem to be reporting a dilution factor of 1:20). Data obtained with different methods do not seem to be comparable. The colour parameter seems to be qualitative and operational parameter that is measured (e.g. daily) to control the operation of waste water treatment. Similarly to biodegradability or toxicity for example, the requirements for monitoring of this parameter are set in BAT 7; however, setting a BAT-AEL does not seem to be necessary or practical. • According to the KoM conclusions, the data on Total N emissions were to be collected to set a BAT-AEL. Ammonium nitrogen (NH4-N) was considered to be included in the Total N. In accordance with the practice of the recent BAT conclusions, BAT-AELs and monitoring for total nitrogen (TN) are proposed, as this parameter better reflects the eutrophication potential. • According to the KoM conclusions, data were to be collected for the TWG to decide at a later stage, based on their availability and comparability, to potentially set a BAT-AEL for toxicity. As presented in Section 3.4.18 of D1 of the TXT BREF, the availability and comparability of data was insufficient to set a BAT-AEL for this parameter. • Regarding nonylphenol, 8 out of 15 emission points to water reported using the standard method for nonylphenol. Except BE014_{1} who reported WAC/IV/A/01-05, UNI EN ISO 18857 is the standard method reported for the other 7 emission

points to water.
    - Of those emission points that reported using the standard method for nonylphenol, 4 emission points to water (i.e. IT064_{1}, IT071_{1}, IT089_{1} and IT090_{1}) reported the same concentration value of 0.2 µg/l, while the maximum concentration range obtained for the other 4 emission points to water goes from 1.3 µg/l to 20 µg/l.
    - The working range set for nonylphenol in UNI EN ISO 18857-2 is 0.5 µg/l to 50 µg/l.
- Taking into account the above information, it seems there are not enough comparable data available to set a BAT-AEL for nonylphenol of 0.2-5 µg/l.
- Regarding DecaBDE, 5 emission points to water reported measured values. 2 out of 5 provide information about the standard method used (i.e. AT004_{1} and BE011_{1}).
    - AT004_{1} reported EPA 8270 and BE011_{1} reported WAC/IV/A/030. Both methods use Gas Chromatography/Mass Spectrometry (GC-MS).
    - AT004_{1} reported 5 measurements, all carried out in 2015 within a range from 0.46 µg/l to 52 µg/l, while BE011_{1} reported one measurement done in 2017 of 0.18 µg/l.
- Taking into account the above information, it seems there are not enough comparable data available to set a BAT-AEL for DecaBDE of 1-20 µg/l.
- Regarding the BAT-AEL range for the sum of PFOA and PFOS, taking into account the data collection, 10 emission points to water reported measured values for PFOA, 6 emission points to water reported measured values for PFOS, and DE031_{1} reported measured values for PFOS:PFOA.
    - 4 out of 10 emission points to water reported the standard method used for PFOA. BE011_{1} and BE014_{1} use Liquid Chromatography with tandem mass spectrometry (LC-MS-MS); IT092_{1} and IT097_{1} reported MI1207 rev2:2018. The range of the maximum values reported by the 4 emission points to water mentioned goes from 13 µg/l to 41 µg/l.
    - 1 out of 6 emission points to water reported the standard method used for PFOS. BE014_{1} uses Liquid Chromatography with tandem mass spectrometry (LC-MS-MS), and reported 1 measurement, done in 2016, of 0.5 µg/l.
- Taking into account the above information, it seems there are not enough comparable data available to set a BAT-AEL for the sum of PFOA and PFOS of 1-3 µg/l.

Adsorbable organically bound halogens (AOX)

- The statistical approach (percentiles) or environmental quality standards are not used to derive BAT-AELs.
- Regarding the proposals to increase the upper end of the BAT-AEL range:
    - Due to dyeing of polyester and blends of modacryl/cotton, the relevant emission points for direct discharge are CZ020_{1}, BE014_{2}, DE025_{1}, FR131_{2} and FR134_{1}. It is not clear how the upper end could be raised to 1 mg/l, since the highest reported value is 0.86 mg/l (FR134_{1}).
    - If dyeing with vat, metal-complex and reactive dyes is assumed to represent the category of 'dyeing products with high lightfastness, and high quality demands', the emission points for direct discharge reporting dyeing with these dyes are BE011_{1}, FR131_{1} and FR134_{1}, with maximum concentrations of 0.38 mg/l, 0.41 mg/l and 0.86 mg/l. The average concentration for the one reporting the highest value (FR134_{1}) is 0.3 mg/l; therefore, it seems that the proposed upper end of the range is mostly respected by all relevant plants.
- Regarding the proposals to lower the upper end of the BAT-AEL range:
    - The BAT-AELs are not derived on the basis of certification schemes.
    - The collected data for direct discharges in some cases indicate high fluctuations in AOX concentrations. Minimal, average and maximal concentrations for BE011_{1} are 0.08 mg/l, 0.17 mg/l and 0.38 mg/l, for FR131_{1} 0.02 mg/l, 0.13 mg/l and 0.41 mg/l, for FR132_{2} 0.02 mg/l, 0.2 mg/l and 0.66 mg/l, and for FR134_{1} 0.06 mg/l, 0.3 mg/l and 0.86 mg/l. All plants use activated sludge, but only BE011 also uses sand filtration, chemical oxidation and coagulation/flocculation which would

remove AOX. These fluctuations seem to be limited to only a few measurements/events, with the majority being well below 0.4 mg/l. Therefore, the upper end of the range for direct discharge could be decreased to 0.4 mg/l.

Chemical oxygen demand (COD)

- Two emission points to water reported maximum concentration values between 100 mg/l and 120 mg/l, i.e. IT067_{1} and FR132_{2}:
  - IT067_{1} monitored COD with a monthly frequency and reported 37 values over 3 years with a range of 24 mg/l to 108 mg/l. The maximum value reported is 108 mg/l, slightly above 100 mg/l.
  - FR132_{2} monitored COD with a daily frequency and reported 12 values for 2016 in the range 52 mg/l to 105 mg/l, and 12 values for 2017 in the range 97 mg/l to 115 mg/l.
- Taking into account the values reported by IT067_{1} and FR132_{2}, there is scope for lowering the upper end of the BAT-AEL range.
- BAT-AELs set in the CWW BAT conclusions for COD refer to a yearly average, while in TXT D1 the proposed BAT-AELs refer to daily average values, in the case of continuous discharge, or, in the case of batch discharge, average values over the release duration taken as flow-proportional composite samples, or, provided that the effluent is appropriately mixed and homogeneous, a spot sample taken before discharge, as described in the definition of BAT-AELs for emissions to water in the General considerations section of the BAT conclusions. Both values are therefore not directly comparable.
- Furthermore, to decrease the lower end of the range to 30 mg/l, there are no data reported in the data collection with a maximum concentration value for COD below 30 mg/l.
- The BAT-AELs are not derived using a statistical approach. The fact that 5 out of 24 of the emission points to water reported a maximum emission level higher than the proposed higher end of the BAT-AEL range is not per se a reason for increasing the higher end of the range. Technical reasons explaining why the proposed upper end of the BAT-AEL range could not be achieved are not provided.

Footnote (4)

- In the data collection, only one emission point to water, CZ020)_w{1}, reported information about the removal efficiency for COD direct discharge. The COD content in the influent for CZ020)_w{1} is around 127 mg/l, obtained by the calculation using the maximum concentration value for COD reported (65 mg/l), and the removal efficiency (95 %).
- After the 2nd Data Assessment Workshop held on 21-23 October 2020, more information about the removal efficiency was provided by EURATEX, France and Sweden:
  - EURATEX provided information for three Belgian plants, two of them participated in the data collection (i.e. BE009 and BE010) and the third one was not included in the data collection for the TXT BREF review,
  - In the case of BE009, the range of the reported values were for COD influent from 393 mg/l to 1870 mg/l and for COD effluent from 50 mg/l to 353 mg/l, with a removal efficiency ranging from 55 % to 96 %. In the case of a removal efficiency equal to or higher than 90%, the highest COD concentration reported is 124 mg/l.
  - In the case of BE010, the range of the reported values were for COD influent from 351 mg/l to 1600 mg/l and for COD effluent from 31 mg/l to 128 mg/l, with a removal efficiency ranging from 79 % to 96 %. In the case of a removal efficiency equal to or higher than 90 %, the highest COD concentration reported is 110 mg/l.
  - In the case of the third plant which did not participate in the data collection, the values reported were: COD influent 1200 mg/l and COD effluent 49 mg/l, with a removal efficiency of 96 %.
  - France provided information about the daily removal efficiency for the emission point FR131_w{1} for a complete year from December 2019 to November 2020. The average value reported for COD influent was 3811 mg/l and for COD effluent 122 mg/l, with a removal efficiency of 97

%.

- Sweden provided information about the COD removal efficiency achieved in the waste water treatment plant called Skene. This plant received the waste water discharge from four textile-dyeing installations. The COD removal efficiency reported is in the range of 90-95 %.

- Taking into account the above information about removal efficiency, it is not possible to propose a footnote based on removal efficiency to increase the upper end of the BAT-AEL range up to 150 mg/l, 160 mg/l or 250 mg/l, as in the information provided for CZ020)_w{1}, BE010 and FR131_w{1} the COD effluent concentration corresponding to a removal efficiency of at least 90 % is below 150 mg/l.
- Footnote ([4]) refers to specific waste water discharged, not to specific waste water consumption. This can be further clarified in the footnote.
- Biodegradability of waste water is addressed in BAT 18. It does not appear necessary to repeat it in Table 5.3.

Hydrocarbon oil index (HOI)

- It is considered appropriate to add Footnote ([2]), as oils in waste water may not originate from all processes (i.e. typically from washing synthetic fibres and knitting) or fibres (i.e. typically from synthetic fibres and knitted fabrics).
- Only three emission points (IT092_{1}, IT097_{1} and BE007_{1}) reported concentration values of HOI for direct discharges, with a range from 0.03 mg/l to 0.93 mg/l. The associated processes of these emission points do not seem typical sources of emissions of oils. However, oils may enter the processes (and effluents) with incoming textile materials (e.g. for these three plants: polyamide or polyester fibres, knitted fabrics). All three plants use an appropriate combination of treatment techniques (e.g. neutralisation, equalisation, activated sludge and sedimentation); furthermore, two plants also use techniques that would effectively remove oils (i.e. sand filtration (BE007) and reverse osmosis (IT092)).
- Based on these three data sets, less than 1 mg/l seems to be an appropriate BAT-AEL. However, it seems more representative (due to more typical processes, sources and materials related to oil emissions) to also include in the BAT-AEL derivation data reported for indirect discharges (e.g. 30 data sets), especially if the plants use appropriate abatement techniques. For example, taking data from these three data sets into account would support decreasing the upper end of the BAT-AEL range for direct and indirect discharge to 7 mg/l: PT108_{1} (maximum concentration 4 mg/l; fabric production processes and knitted fabrics; using sand filtration), PT104_{1} (average/maximum concentrations 2.5 mg/l/7 mg/l; knitted fabrics, ultrafiltration) and PT114_{1} (average/maximum concentrations 6.7 mg/l/10 mg/l; washing synthetic fibre, adsorption, sedimentation, sand filtration). .

Metals / metalloids

- It is considered appropriate and consistent with BAT 2 and BAT 7 to add Footnote ([2]) to metals for which any specific process is mentioned.

Antimony (Sb)

- BAT-AELs are not derived based on a statistical approach, and, despite rounded values having already been set as BAT-AELs according to Commission Implementing Decision 2012/119/EU, it is not clear on which reported data the rounded value would be based.
- Regarding the comments received for increasing/lowering the range:
  - For direct emissions: IT097_{1} reported two values (only in 2018), 0.01 mg/l and 0.5 mg/l (which is in fact the detection limit of the monitoring method referred to). All of the other five EPs reported values < 0.2 mg/l, whatever the process or the type of textile fibre used.
  - For indirect emissions: three EPs reported values higher than the upper end of the range of the BAT-AEL proposal in D1: DE051_{1}, DE022_{1} and SE120_{1}:
    - SE120_{1} reported the highest value, 1.1 mg/l, and the monitoring is based on a continuous flow-proportional sampling and the value represents a whole month and is used together with the flow to calculate the emissions in kg/year, so this is not directly comparable.

	▪ DE022_{1}: the monitoring frequency is monthly and this EP reported a value above the BAT-AEL proposal once, 0.7 mg/l in 2016, while the emission limit value prescribed by the competent authority in the permit is 0.4 mg/l. ▪ DE051_{1}: the monitoring frequency is monthly and this EP reported a value above the BAT-AEL proposal once, 0.44 mg/l in 2016. ▪ In addition to the EPs mentioned above, SE119_{1} reported a value of 0.35 mg/l in 2018 and is not using abatement technique. • Based on this analysis for both direct and indirect emissions, there is scope to lower the upper end of the BAT-AEL range for both direct and indirect emissions. <u>Chromium (Cr)</u> • BAT-AELs are derived from the data collection; they are not based on environmental quality standards referring to the quality of water. • It is not technically clear why it is necessary to set rounded values for increasing the upper end of the BAT-AEL range. • Regarding the proposal for lowering the upper end of the range, the assessment has been done for both direct and indirect emissions: o Among the plants that have reported direct emissions of chromium to water, there are 6 emission points to water with maximum values higher than 0.1 mg/l: PT111_{1}, PT098_{1}, IT067_{1}, BE007_{1}, BE009_{1} and BE014_{1}. Taking into account the values based on a standard monitoring method and considering the number of values reported above 0.1 mg/l versus the number of all the values reported by each EP, the majority of the values are below 0.1 mg/l. o Regarding indirect emissions, IT84_{1} is applying coagulation, flocculation and sedimentation and once reported 0.13 mg/l while the 11 other values are below 0.03 mg/l. All the other emission points reporting values higher than 0.1 mg/l are not using a relevant abatement technique. o According to the above data points, there is scope to lower the upper end of BAT-AEL range. <u>Copper (Cu)</u> • BAT-AELs are derived from the data collection; they are not based on environmental quality standards referring to the quality of water. • Despite rounded values having already been set as BAT-AELs according to Commission Implementing Decision 2012/119/EU, it is not clear on which reported data the rounded value would be based. • As similar comments have been received for both direct and indirect emissions, the assessment is presented in this section. According to Section 2.7.2 of D1, high lightfastness is ensured by the use of vat dyes or metal-complex dyes. In addition, according to Section 3.4.9.2 of D1, reactive dyes may contain copper too. This could be reflected in the processes/activities concerned. • Regarding the comments received to increase the upper end of the range: o Plants using vat dyes reported data from 0.02 mg/l to 0.79 mg/l. IT071_w{2} and IT072_w{1} reported values higher than the BAT-AEL proposal in D1 but they are not applying any technique to reduce the Cu concentration. o 6 plants using metal-complex dyes reported values higher than the BAT-AEL proposal in D1 but they are not applying any technique to reduce the Cu concentration. o Among the 75 plants that have reported Cu emissions and using reactive dyes, 8 reported values higher than the BAT-AEL proposal in D1. 7 are not applying any technique to reduce the Cu concentration. SE120_{1} reported the highest value, 1.5 mg/l, and is not using techniques such as reverse osmosis, nanofiltration or microfiltration. o Based on this information, there is no scope to increase the upper end of the BAT-AEL range. • Regarding the comments received to decrease the upper end of the range, the BAT-AELs are not derived on the basis of a statistical approach and it is not technically clear why it is necessary to add a footnote for plants using the dyes listed above and

	that have reported values lower than 0.4 mg/l. Nickel (Ni) • BAT-AELs are derived from the data collection; they are not based on environmental quality standards referring to the quality of water. • Despite rounded values having already been set as BAT AELs according to Commission Implementing Decision 2012/119/EU, it is not clear on which reported data the rounded value would be based. • As similar comments have been received for both direct and indirect emissions, the assessment is presented in this section. Regarding the comments received for lowering the upper end of the range, 13 EPs reported values higher than 0.09 mg/l, for both direct and indirect emissions of Ni: o 3 EPs are not using any techniques: IT071_w{1}, PT105_w{1} and PT102_w{1}. PT113_w{1} implements only a screening technique. o PT111_w{1} reported a yearly value, 0.5 mg/l without referring to a standard monitoring method twice, and then reported 0.01 mg/l referring to a standard monitoring method. o FR134_w{1} monitored Ni 4 times a year and reported 0.19 mg/l once while 3 other values are below 0.083 mg/l and 8 values below 0.01 mg/l. o In IT092_w{1} Ni is monitored monthly, the highest value (1 mg/l) has been reported once but all the other values are below 0.1 mg/l. o BE009_w{1} reported 0.09 mg/l as the highest value, and both IT092_w{1} and BE009_w{1} use reverse osmosis. o All the other EPs use techniques that are not relevant for the abatement of Ni emissions. o According to the above points, there is scope to lower the upper end of BAT-AEL range. • According to Section 3.4.9.3 of D1, reactive dyes may contain metals such as nickel, and this could be reflected in the processes/activities concerned. It is not clear why it is necessary to add a footnote corresponding to the use of nickel-containing dyes, as most of the plants that have reported data on nickel emissions and implementing reactive dying achieve below 0.08 mg/l. • As described in the definition of BAT-AELs for emissions to water in the General considerations section of the BAT conclusions, BAT-AELs set in the CWW BAT conclusions for nickel refer to a yearly average, while in TXT D1 the proposed BAT-AELs refer to: o daily average values in the case of continuous discharge; o average values over the release duration taken as flow-proportional composite samples, or a spot sample taken before discharge (provided that the effluent is appropriately mixed and homogeneous), in the case of batch discharge. Both values (CWW and TXT) are therefore not directly comparable. Zinc (Zn) • BAT-AELs are derived from the data collection; they are not based on environmental quality standards referring to the quality of water. • Regarding the comment received on increasing the upper end of the range, the assessment has been done considering both direct and indirect discharges. Based on the inputs following the 2nd data workshop, it has not been confirmed that pipes are a source of zinc emissions to water. Instead, several sources of zinc emissions have been mentioned, e.g. yarns of mass-coloured acrylic fibres, use of cationic dyes, bleaching with the dithionite process, and cellulose fibres (regenerated cellulose fibres, and zinc salts used in the production process). o The maximum reported concentration of zinc for direct emissions to water is 0.5 mg/l whatever the process. o Regarding data reported for indirect emissions: 29 EPs reported values higher than the upper end of the BAT-AEL range proposed in D1, including 18 EPs not using any techniques to reduce water pollution. Among the 11 remaining EPs and comparing the processes and types of fibres used: ▪ DE042_w{1} and IT087_w{1} both report batch cationic dyeing and are applying only equalisation (while all EPs reporting values for direct emissions are compliant with the BAT-AEL range

proposal);
- SE120_w{1} is the only EP reporting bleaching with the dithionite process, and reported 1.7 mg/l for Zn emissions while the Emission Limit Value is 0.5 mg/l;
- IT087_w{1} reported a value of 0.7 mg/l and the use of viscose (while PT098_w{1} reported values for direct emissions compliant with the BAT-AEL range proposal).

  - It is therefore not clear why the upper end of the BAT-AEL range should be increased to 2 mg/l.
- As described in the definition of BAT-AELs for emissions to water in the General considerations section of the BAT conclusions, BAT-AELs set in the CWW BAT conclusions for zinc refer to a yearly average, while in TXT D1 the proposed BAT-AELs refer to:
  - daily average values in the case of continuous discharge;
  - average values over the release duration taken as flow-proportional composite samples, or a spot sample taken before discharge (provided that the effluent is appropriately mixed and homogeneous), in the case of batch discharge.
  - Both values (CWW and TXT) are therefore not directly comparable.

Sulphide, easily released (S^{2-})

- According to the data collection, 3 emission points to water reported values for sulphide for direct discharge (i.e. IT067_{1}, IT092_{1} and IT097_{1}). The concentration values reported by these emission points were close to or below the detection limit. Maybe these plants are not using sulphur dyes. In that case, the concentration values reported for indirect discharges were additionally considered to confirm the proposed higher end of the BAT-AEL range.
- Regarding the lower end of the range, there are not emission points to water reporting a value of 0.3 mg/l in the data collection, while there are 7 emission points to water (e.g. ES058_{1}, DE024_{1}, IT067_{1}) achieving lower concentration values than 0.3 mg/l and using similar techniques to those reported for other emission points. According to these values, there is scope for lowering the upper end of the BAT-AEL range.
- BAT-AELs are set based on emission data collected through the questionnaires from the plants using BAT. BAT-AELs are not based on other standards (e.g. ZDHC).

Total nitrogen (TN)

- There are three emission points to water (IT092_w{1}, IT097_w{1} and BE010_w{1}), using nitrification/denitrification treatment, with reported maximum values between 10 mg/l and 20 mg/l:
  - IT092_w{1} reported one concentration value for TN (17.1 mg/l), while IT097_w{1} reported two values, 6.0 mg/l and 18.5 mg/l.
  - BE010_w{1} reported a minimum of four concentration values per year, giving more representativeness to the data series reported. Figure 3.28 in D1 shows that the difference between its maximum and average concentration is more than double.
- According to the above points, and looking in detail at all the reported concentration values and using nitrification/denitrification treatment, there is scope to lower the upper end of BAT-AEL range.

Footnote (5)

- There is only one data set for direct discharge, using nitrification/denitrification and an appropriate monitoring standard, that reported the effluent temperature data (BE014). This does not seem a broad basis to set the upper end of the BAT-AEL proposal for cold conditions.
- It seems better for implementation not to specify what is meant by "prolonged" due to possible different approaches originating from local climatological and environmental conditions, which are best captured by the competent authority. Additionally, the data collection was not designed to provide any information on this issue.

Total organic carbon (TOC)

- A total of 2 out of 9 emission points to water reported maximum concentration values

between 30 mg/l and 40 mg/l, i.e. BE014_w{1} and BE007_w{1}:
  - BE014_w{1} reported 4 measurements, all done during the year 2018. The range of the values was from 20 mg/l to 31 mg/l. For the same year, the concentration of COD ranges from 44 mg/l to 74 mg/l, below the proposed BAT-AEL for COD.
  - BE007_w{1} reported 12 measurements for 2016, with two measurements above 30 mg/l (i.e. 32 mg/l and 35 mg/l), and an average value of 24 mg/l in 2016. 11 measurements were reported in 2017, with one value above 30 mg/l (i.e. 35 mg/l), and an average value of 24 mg/l. No values were reported in 2018.
  - Both emission points are equipped with equalisation, activated sludge and a membrane bioreactor, and seem to be able to achieve lower values than the maximum reported values.
- In addition to the above bullet points, taking into account the assessment done for COD, there is scope for lowering the upper end of the BAT-AEL range.
- Two emission points to water reported concentration values for TOC close to 10 mg/l, i.e. IT092_w{1} and IT097_w{1}. Both only reported one measurement.
- The proposed lower end of the range is considered appropriate in order to maintain the empirical analogy between COD and TOC of 3:1.

Footnote (6)
- No information was submitted about the removal efficiency for TOC direct discharge, and it is not possible to propose a footnote based on the removal efficiency without information.
- Footnote ([6]) refers to waste water discharged, not to specific waste water consumption. This can be further clarified in the footnote.

Total phosphorus (TP)
- Regarding the comments to decrease the upper end of the BAT-AEL range (e.g. to 2 mg/l or 3 mg/l):
  - Concentrations of Total P for direct discharge were reported for 6 emission points (DE025_{1}, CZ020_{1}, BE009_{1} and {2}, BE010_{1}, BE011_{1}). All reported using appropriate monitoring standards and abatement techniques (i.e. apart from BE010 which uses precipitation with $FeCl_3$, all others use coagulation/flocculation). Their maximal concentrations are between 0.47 mg/l and 1.7 mg/l, except for BE009_{1} which reports a maximum concentration of 15 mg/l and average of 1.67 mg/l. The data support lowering the upper end of the BAT-AEL range to 2 mg/l.
  - The BAT-AELs are set on collected data and not on other BAT conclusions (e.g. FDM), voluntary schemes (e.g. ZDHC) or other EU regulations (i.e. the IED and BAT conclusions are without prejudice to the Urban Waste Water Treatment Directive).
- Regarding the comments to increase the upper end of the BAT-AEL range (e.g. to 10 mg/l):
  - Total P concentrations were reported for 6 emission points (DE022_{1}, DE025_{1}, FR136_{1}, SE118_{1}, SE119 {1}, UK127{1}) from plants using organophosphorus flame retardants. DE022 is discharging directly, others indirectly. DE022 is also the only one reporting the use of abatement techniques that would partially remove organophosphates (activated sludge, coagulation/flocculation and sedimentation); other plants use only preliminary or primary treatment (oil/grit separation, neutralisation, equalisation) which is not appropriate for the removal of organophosphates. The maximum concentration reported from DE022 is 0.5 mg/l, while the maximum concentrations for other plants (indirect discharge and no appropriate abatement) range from 5.1 mg/l (SE119) to 45 mg/l (FR136). SE119 segregates spent finishing liquors of organophosphate flame retardants and removes them as waste, preventing them from entering common effluent.
  - It is not clear why plants using organophosphate flame retardants could not apply appropriate abatement techniques to reach the proposed BAT-AEL range (e.g. like DE022).
- Regarding the comments to decrease the lower end of the BAT-AEL range (e.g. to

	0.01 mg/l or 0.1 mg/l): the lowest complete data set (e.g. reporting using monitoring standards and abatement techniques), DE025, reported a maximum concentration of 0.5 mg/l. Therefore, the data do not support decreasing the lower end of the BAT-AEL range to 0.1 mg/l or less. **Total suspended solids (TSS)** • Among the plants that have reported emissions of TSS to water, there are four emission points to water with maximum values between 35 mg/l and 45 mg/l, i.e. UK124_w{1}, IT092_w{1}, PT098_w{1} and DE025_w{1}: o UK124_w{1} reported more than 80 measurements per year, with an average value around 8 mg/l, while the three maximum concentration values achieved in 2016, 2017 and 2018 were 21.7 mg/l, 37.7 mg/l and 30.4 mg/l, respectively. o IT092_w{1} reported 12 measurements per year within a range from 2 mg/l to 39.2 mg/l. 3 out of 36 measurements were above 30 mg/l, achieving an average value over the 3 reporting years of 10 mg/l. o PT098_w{1} monitored TSS twice per year. The range of the first measurement reported each year was from 33 mg/l to 42 mg/l, while the range of the second measurement reported each year was from 10 mg/l to 18 mg/l. o DE025_w{1} monitored TSS with a monthly frequency, and has an ELV for TSS of 35 mg/l. 2 out of 33 measurements reported are above the ELV, while the other measurements are below 24 mg/l. • Taking into account the measurements detailed in the above bullet points and that all of the named emission points to water apply at least one of the specific techniques to remove solids, e.g. coagulation/flocculation, sedimentation, filtration or flotation, it seems that the indicated emission points to water are capable of achieving low emission levels.
EIPPCB proposal:	**Additional parameters** • No change for nonylphenol, DecaBDE and Sum of PFOA and PFOS. • To add new footnote associated with indicative emissions levels for BOD related to COD and TOC BAT-AELs. **Adsorbable organically bound halogens (AOX)** • To decrease the upper end of the BAT-AEL. **Chemical oxygen demand (COD)** • To decrease the upper end of the BAT-AEL **Footnote (4)** • To amend the text to clarify which unit Footnote ([4]) refers to. **Hydrocarbon oil index (HOI)** • To add Footnote ([2]). • To decrease the upper end of the BAT-AEL. **Metals / metalloids** Antimony (Sb) • To decrease the upper end of the BAT-AEL. Chromium (Cr) • To decrease the upper end of the BAT-AEL. Copper (Cu) • To change activities/processes to dyeing/printing. Nickel (Ni) • To change activities/processes to dyeing/printing. • To decrease the upper end of the BAT-AEL.

	Zinc (Zn) • To add footnote ([2]). **Sulphide, easily released (S^{2-})** • To decrease the lower end of the BAT-AEL. **Total nitrogen (TN)** • To decrease the upper end of the BAT-AEL. **Footnote (5)** • No change. **Total organic carbon (TOC)** • To decrease the upper end of the BAT-AEL. **Footnote (6)** • To amend the text to clarify which unit Footnote ([6]) refers to. **Total phosphorus (TP)** • To decrease the upper end of the BAT-AEL. **Total suspended solids (TSS)** • To decrease the upper end of the BAT-AEL.

1.4.6.4 BAT-AELs for indirect discharges to a receiving water body

Location in D1: **P. 735 – Section 5.1.6 – BAT 19 – Table 5.4**

Current text in D1:

Table 5.4: BAT-associated emission levels (BAT-AELs) for indirect discharges to a receiving water body

Substance/Parameter		Activities / processes	BAT-AEL ([1]) ([2]) (mg/l)
Adsorbable organically bound halogens (AOX) ([3])		All processes	0.1–0.5
Hydrocarbon oil index (HOI)		All processes	1–10
Metals / metalloids	Antimony (Sb)	Pre-treatment and/or dyeing of polyester	0.1–0.4
		Finishing with flame retardants using antimony trioxide	
	Chromium (Cr)	Dyeing with chromium-containing dyes	0.01–0.3
	Copper (Cu)	All processes	0.03–0.4
	Nickel (Ni)	All processes	0.01–0.5
	Zinc (Zn)	All processes	0.04–0.5
Sulphide, easily released (S^{2-})		Dyeing with sulphur dyes	0.3–1

([1]) The averaging periods are defined in the general considerations.
([2]) The BAT-AELs may not apply if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned, provided this does not lead to a higher level of pollution in the environment.
([3]) The BAT-AELs only apply when the substance/parameter concerned is identified as relevant in the waste water stream based on the inventory of inputs and outputs mentioned in 0.

	The associated monitoring is given in 0.
Summary of comments:	**General comments** • Express BAT-AELs as specific loads in kg/ton of treated textile or add an appropriate expression/factor (× m^3/t) for all BAT-AELs. Many important BATs reduce water and energy consumption, simultaneously increasing the concentration of pollutants (see also (SE 40)) (SE 27). • Indicate that indirect discharges are not to the receiving water body but into the sewer (DE 372). • Merge Tables 5.3 and 5.4 into one and refer to Footnote ([2]), to clarify the implementation in line with the provisions of the IED (Articles 14(1), 14(3) and 15(1)) (FR_A 16). • Adapt the table in line with the proposals made for Table 5.3 in comments EEB 152-165 (EEB 188). • Add a further requirement for indirect discharges only, to design and agree a suitable randomised sampling programme with the competent authority that covers the full range of discharge conditions likely to be encountered at the installation (e.g. all of the processing scenarios used during the course of a normal year of operations) (UK 26). **Additional parameters** • Set BAT AEL ranges for: o COD < 3000 mg/l; o TSS < 200 mg/l; o Total N < 50 mg/l; o Total P < 10 mg/l; o TOC < 700 mg/l. These parameters and BODx are important to control although the water is treated in a municipal sewage treatment plant. The suggested levels are based on the data collected and presented in D1 (SE 27). • Set a BAT-AEL range for colour for dyeing activities as 1/30 dissolution. This parameter is important since it generates a high public response (ES 39). • Set a BAT-AEL range for nonylphenol to 0.0002-0.005 mg/l (= 0.2-5 µg/l). Nonylphenol is a substance of environmental concern. There are 17 data sets for the value of NP, of which 13 data sets are in the proposed BAT-AEL range. Emission limit values for this parameter are set in some national regulations (e.g. in France 0.025 mg/l and in Belgium 0.00008 mg/l) (AT 16). • Set a BAT-AEL range for DecaBDE to 0.001-0.02 mg/l because DecaBDE is a substance of environmental concern and should have an ELV where relevant. In addition, there are 5 data sets for the value of DecaBDE. Finally, the use and production of the substance has been prohibited by the EU POP Regulation 2019/1021 since 2019 (AT 18). • Set a BAT-AEL range for Sum of PFOA and PFOS to 0.001-0.003 mg/l because PFOA and PFOS are substances of environmental concern. There are 8 data sets for PFOA and 7 data sets for PFOS. In 2019, PFOA and its salts were listed in category A (Elimination) in the Stockholm Convention on Persistent Organic Pollutants (entry into force: December 2020). In the EU, the production, placing on the market and use of PFOA its salts and polymers have been restricted in Annex XVII to REACH since 2017 (AT 20). **Adsorbable organically bound halogens (AOX)** • Increase the upper end of the BAT-AEL range to 1 mg/l. The proposed upper end corresponds to the 60th percentile value of the maximum measurements According to the data collection, the companies with specific activities (dyeing of PES, PES/CO, etc.) report a 90th percentile of the average values corresponding to 1 mg/l. Moreover, 1 mg/l is also 10 times the environmental quality standard (EURATEX 45, CEFIC 22). • If Hercosett is considered BAT, add a footnote "In case of antifelting treatment of wool with the Hercosett process, the upper end of BAT-AEL 2.5 mg/l applies." There are three installations in Europe that use the Hercosett process in order to increase the

antifelting qualities of wool. The process has been approved since 60 years ago and is still demanded by customers who do not want any change in quality. If Hercosett is considered BAT, then a footnote for a BAT-AEL for indirect discharge is needed, because – unlike direct discharge – PAC and GAC filtration would not be considered BAT (AT 49).
- Some of the data sets reported are very low (near the limit of detection) and do not seem to be credible enough to be used to set BAT AELs (UK 24).

Hydrocarbon oil index (HOI)
- Add Footnote ([3]) to this parameter (DE 200).
- AT supports the proposed BAT-AEL range (AT 48).
- Some of the data sets reported are very low (near the limit of detection) and do not seem to be credible enough to be used to set BAT-AELs (UK 24).

Metals / metalloids
- Lower the upper end of the BAT-AEL range for all metals/metalloids to 0.2 mg/l. BAT for indirect discharges is to remove metals on site with suitable pretreatment (e.g. precipitation, solids removal) (BE 21).
- Add Footnote ([3]) to this group of parameters (DE 201).
- Same proposals as for parameters in Table 5.3 (DE 373).

Antimony (Sb)
- Increase the upper end of the BAT-AEL range to 0.6 mg/l. It corresponds to the 90th percentile of the values in the data collection. A higher value should be considered for the combination of both processes (EURATEX 47).
- Increase the upper end of the BAT-AEL range to 1.2 mg/l for polyester and modacryl/cotton dyeing. Companies with these processes have higher concentrations of Sb, e.g. according to the data collected 1.0 mg/l (80th percentile) and 1.2 mg/l (90th percentile). The proposed upper limit does not take into account the majority of well-performing plants (EURATEX 48).
- Lower the upper end of the BAT-AEL range to 0.2 mg/l. The collected data show that around 65 % of the plants are below 0.2 mg/l. In addition, experience from Austrian plants shows that lower values can be achieved by good chemical and water management (e.g. see BAT 49). Finally, lower values can be achieved with abatement techniques nanofiltration, microfiltration, ultrafiltration, prevention measures (separate disposal of chemicals) and precipitation. According to national waste water legislation (AT Textile and AT Glas), 0.3 mg/l Sb is achieved with prevention measures (separate disposal of chemicals) and precipitation (AT 47)
- Some of the data sets reported are very low (near the limit of detection) and do not seem to be credible enough to be used to set BAT-AELs (UK 24).

Chromium (Cr)
- Increase the lower end of the BAT-AEL range to 0.05 mg/l, because the lower limit should be equal to environmental quality standards (EQS) in the Water Framework Directive. Treating waste water below EQS would cause excessive costs (EURATEX 46).

Copper (Cu)
- Increase the lower end of the BAT-AEL range to 0.05 mg/l, because the lower limit should be equal to environmental quality standards (EQS) in the Water Framework Directive. Treating waste water below EQS would cause excessive costs (EURATEX 46).
- Lower the upper end of BAT-AEL range to 0.2 mg/l. Add a footnote that, in the case of increased lightfastness requirements (i.e. use of copper-containing dyes), the upper end of the BAT-AEL range is up to 0.4 mg/l. According to the collected data, around 65 % of the plants are below 0.2 mg/l. Abatement technologies reverse osmosis, nanofiltration, microfiltration could be used to achieve the concentration levels (AT 8).

Nickel (Ni)
- Increase the lower end of the BAT-AEL range to 0.05 mg/l, because the lower limit should be equal to environmental quality standards (EQS) in the Water Framework

	Directive. Treating waste water below EQS would cause excessive costs (EURATEX 46). • Lower the upper end of the BAT-AEL range to 0.08 mg/l. Add a footnote that the upper end applies to the use of nickel-containing dyes. According to the collected data, around 70 % of the plants are below 0.08 mg/l. Nickel is a Priority Substance. Experience from Austrian plants shows that 0.08 mg/l can be achieved with good chemical and water management (see BAT 39-42). The plants with emissions values > 0.05 mg/l do not use abatement technologies such as reverse osmosis, ultrafiltration or microfiltration (except Plant IT092_w(1)) (AT 10). <u>Zinc (Zn)</u> • Increase the lower end of the BAT-AEL range to 0.2 mg/l, because the lower limit should be equal to environmental quality standards (EQS) in the Water Framework Directive. Treating waste water below EQS would cause excessive costs (EURATEX 46). **Sulphide, easily released (S^{2-})** • Footnote (^{2}) should apply only to sulphide, because sulphide can be removed in activated sludge plants with adapted biomass. All other parameters/substances currently subject to this footnote (e.g. AOX, HOI, metals) are not removed by the biological treatment and cannot be subject to such an exemption (AT 12). **Footnote (2)** • Extend the footnote to: "This may be demonstrated by the use of actual data (influent & effluent concentrations and flows) arriving and being discharged from the downstream WWTW's or by the use of published data such as sewage treatment reduction factors that are specific to the treatment provided at the downstream WWTW's." The data on the removal efficiency of downstream WWTPs is not available to the operator (confidential business information) to demonstrate compliance to the competent authority (UK 25).
EIPPCB assessment:	**<u>General comments</u>** • Regarding the issue on how to express the BAT-AELs, see the assessment done for direct discharge in Section 1.4.6.3. • Indirect discharge is defined in the Definitions of the BAT conclusions; therefore, it is not necessary to clarify the concept of indirect discharge in Table 5.4. • The aim of having BAT-AELs for indirect discharge is to protect the environment when the downstream WWTP is not designed to treat the pollutants concerned. With this objective in mind, it makes sense to have the same levels as direct discharge. For clarity in implementation, the BAT-AELs for direct and indirect discharge are kept in separate tables. • Regarding the comments to change the proposed BAT-AELs, see the assessment of individual parameters in Section 1.4.6.3 (for direct discharge) and below (for indirect discharge). • Monitoring for direct and indirect discharges is addressed in BAT 7. **<u>Additional parameters</u>** • COD, TSS, Total N, Total P and TOC have not been included in Table 5.4 on the grounds of the understanding that a downstream treatment plant is, generally, capable of abating these pollutants, without any special provisions. In the rare cases that the downstream plant is not capable of abating these parameters, the competent authorities may apply the BAT-AELs in Table 5.3. • Regarding the comments for BOD, colour, nonylphenol, DecaBDE and Sum of PFOA and PFOS, see the assessment done for direct discharge in Section 1.4.6.3. **<u>Adsorbable organically bound halogens (AOX)</u>** • See the assessment related to direct emissions in Section 1.4.6.3 for use of a statistical approach or environmental quality standards to derive BAT-AELs. • Regarding the proposals to increase the upper end of the BAT-AEL range due to dyeing of polyester and blends of modacryl/cotton or due to dyeing with vat, metal-complex and reactive dyes (assuming it is representative of 'dyeing products with

high lightfastness, and high quality demands'), the conclusions are the same as for direct discharge (see Section 1.4.6.3). There seem to be no technical grounds (i.e. due to lack of use of appropriate treatment and many of the plants achieving values below the proposal) for increasing for upper end of BAT-AELs to a higher value.

- The "Hercosett" process is not considered BAT for shrink-proofing. BAT 51 in D1 promoted the use of chlorine-free antifelting, by using inorganic salts of peroxymonosulphuric acid. It is not clear, technically or environmentally, why the upper end of the BAT-AEL for indirect discharge should be increased to 2.5 mg/l when the "Hercosett" process is used. Only one plant using this process reported an AOX concentration higher than 2.5 mg/l, without using appropriate technique for AOX abatement.
- According to the Reference Document on Monitoring of Emissions to Air and Water from IED Installations (ROM), the measurement range of the EN Standard 9562:2004 is 10-300 µg/l and the proposed lower end of the BAT-AEL range for AOX is 100 µg/l, i.e. 10 times higher. Data sets (e.g. AT006) in this range are therefore considered credible.

Hydrocarbon oil index (HOI)

- It is considered appropriate to add Footnote ([3]), as oils in waste water may not originate from all processes (i.e. typically from washing synthetic fibres and knitting) or fibres (i.e. typically from synthetic fibres and knitted fabrics).
- For the assessment related to decreasing the upper end of the BAT-AEL range, see the assessment in Section 1.4.6.3.
- The lower limit of the measurement range set in EN ISO 9377-2:2000 for HOI is 0.1 mg/l, 10 times less than the proposed lower end of the BAT-AEL. Data sets in this range are therefore considered credible.

Metals / metalloids

- It is considered appropriate and consistent with BAT 2 and BAT 7 to add Footnote ([3]) to metals for which any specific process is mentioned.
- Depending on the parameter, EPs from well-performing plants have reported values higher or lower than 0.2 mg/l, for both direct and indirect emissions. It is not clear on which basis the upper end of the ranges should be lowered to 0.2 mg/l for all metals indistinctly. In addition, the aim is to ensure an equivalent level of performance in both cases (direct and indirect emissions), meaning that when the downstream waste water treatment plant is not designed and equipped appropriately to abate metal pollutants, then the textile plant ensures a similar level of performance as for direct emissions.
- When similar comments have been received for a given parameter, assessment of the comments has been done for both direct and indirect emissions.

Antimony (Sb)

- See the assessment related to direct emissions in the previous section.
- According to the Reference Document on Monitoring of Emissions to Air and Water from IED Installations (ROM) and the EN Standard 11885:2007, the limit of detection range for Sb is 4-100 µ/l and the proposed lower end is 100 µ/l.

Chromium (Cr)

- BAT-AELs are derived from the data collection; they are not based on environmental quality standards referring to the quality of water.
- See the assessment related to direct emissions in the previous section.

Copper (Cu)

- See the assessment related to direct emissions in the previous section.

Nickel (Ni)

- See the assessment related to direct emissions in the previous section.

Zinc (Zn)

- BAT-AELs are derived from the data collection; they are not based on environmental quality standards referring to the quality of water.
- See the assessment related to direct emissions in the previous section.

	Sulphide, easily released (S^{2-}) • The downstream waste water treatment plant mentioned in Footnote ([2]) may be an urban waste water treatment plant which indeed may not be designed or equipped to reduce a number of the pollutants targeted by this footnote. However, it may also be an industrial waste water treatment plant equipped for example with physico-chemical treatment and capable of abating AOX, metals or HOI, in addition to sulphide. • Regarding BAT-AELs, see the assessment for direct emissions in Section1.4.6.3. **Footnote (2)** • Footnote ([2]) is used in a number of recently published BAT conclusions. The verification of the actual removal efficiency of the downstream WWTP seems to be an implementation issue. **Total P** • Regarding the use of organophosphates as flame retardants and related BAT-AELs, see the assessment for direct emissions in Section1.4.6.3.
EIPPCB proposal:	**General comments** • No change. **Additional parameters** • No change for nonylphenol, DecaBDE and Sum of PFOA and PFOS. **Adsorbable organically bound halogens (AOX)** • To decrease the upper end of the BAT-AEL range. **Hydrocarbon oil index (HOI)** • To add footnote ([3]). • To decrease the upper end of the BAT-AEL range. **Metals / metalloids** Antimony (Sb) • To decrease the upper end of the BAT-AEL. Chromium (Cr) • To decrease the upper end of the BAT-AEL. Copper (Cu) • To change activities/processes to dyeing/printing. Nickel (Ni) • To change activities/processes to dyeing/printing. • To decrease the upper end of the BAT-AEL. Zinc (Zn) • To add footnote ([3]). **Sulphide, easily released (S^{2-})** • To decrease the lower end of the BAT-AEL. **Footnote (2)** • No change.

1.4.7 Emissions to soil and groundwater

1.4.7.1 Techniques to prevent or reduce emissions to soil and groundwater

<table>
<tr><td>Location in D1:</td><td>P. 737 – Section 5.1.7 – BAT 20</td></tr>
<tr><td>Current text in D1:</td><td>
BAT 20. In order to prevent or reduce emissions to soil and groundwater, BAT is to use all of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Techniques to reduce the likelihood and environmental impact of overflows and failures of process and storage tanks</td><td>This includes:
slow immersion into and withdrawal of textile materials from the process liquor to avoid spillages;
automatic level adjustment of process liquor (see BAT 3);
avoiding direct injection of water to heat or cool the process liquor;
overflow detectors;
channelling overflows to another tank;
tanks for liquids are located in a suitable secondary containment; their volume is sized to accommodate at least the complete loss of the liquid of the largest tank that is within the secondary containment;
isolation of tanks and secondary containment (e.g. by closing valves);
the surfaces of the process and storage areas are impermeable to the liquids concerned.</td><td rowspan="2">Generally applicable</td></tr>
<tr><td>b.</td><td>Regular inspection and maintenance of plant and equipment</td><td>The plant and the equipment are regularly inspected and maintained to ensure proper functioning; this includes in particular checking the integrity and/or leak-free status of valves, pumps, pipes, tanks and containments/bunds as well as the proper functioning of warning systems (e.g. overflow detectors).</td></tr>
<tr><td>c.</td><td>Optimised storage location of process chemicals</td><td>The storage areas are located in such a way to eliminate or minimise the unnecessary transport of process chemicals within the plant (e.g. the transport distances on site are minimised).</td><td>The applicability to existing plants may be restricted by space availability</td></tr>
<tr><td>d.</td><td>Dedicated area for unloading hazardous process chemicals</td><td>Hazardous process chemicals are unloaded in a bunded area connected to a dedicated drainage system.</td><td>Generally applicable</td></tr>
</table>
</td></tr>
</table>

	e.	Segregated storage of process chemicals	Incompatible process chemicals are kept separated. This segregation relies on physical separation and on the chemicals inventory and tracking system (see BAT 14).	
	f.	Return of unused process chemicals Unused process chemicals (i.e. which remain in their original containers) are returned to their suppliers.		
	g.	Handling and storage of packaging containing process chemicals	Packaging containing liquid process chemicals is completely emptied by gravity or by mechanical means (e.g. brushing, wiping) without the use of water. Packaging containing process chemicals in powder is emptied using suction. Empty packaging is stored in a dedicated area.	

Summary of comments:

BAT statement:

- Delete the words "or reduce" as the aim of this BAT is to prevent emissions (DE 374).

Whole BAT:

- Move techniques (c), (e) and (g) to BAT 13 as part of chemical management. Optimised storage of chemicals is indeed related to chemical management (DE 375 and DE 378).

Technique a:

- Add that the 9 points listed are applicable to new plants and major plant upgrades (EURATEX 50).

Technique d:

- Delete "connected to a dedicated drainage system" since drainage would be connected to the common drainage system (DE 376).
- Add in the BAT statement the possibility to "use a suitable combination of the techniques given below", or limit the applicability of technique d to new plant or major refurbishments of existing plant. Many old or historic sites could have difficulty due to space constraints caused by the evolving layout of the installation (UK 27).

Technique f:

- Delete bullet point “return of unused process chemicals”, which belongs to BAT 28 “waste handling” (DE 377).
- Add in the description that unused process chemicals can also be “properly disposed of”, as suppliers are not obliged to accept the unused process chemicals (IT 22).
- Add in the BAT Statement the possibility to "use a suitable combination of the techniques given below", or mention that the applicability of technique f may be limited. Many chemicals suppliers could be reluctant to take back used or even unused process chemicals due to quality control issues and restocking constraints (UK 27).

Technique g:

- Revise the description as follows “powder products used in small quantities are usually picked up manually with pallets and their packaging is emptied manually. The widely consumed powders are taken by suction for loading into the automatic dosing and dissolving plants” (IT 23).
- Mention that the technique is only applicable to major plant upgrades as suction is not general applicable (EURATEX 49).

Additional technique:

- Add a technique about storage of waste to protect soil and groundwater because it can cause emissions to soil and groundwater, in the same way as process chemicals (SE 29).

EIPPCB assessment:	**BAT statement:** • Not all techniques listed in BAT 20 allow complete prevention of emissions, for instance technique a only reduces the likelihood of overflows and failures, which may nevertheless still happen. **Whole BAT:** • The scope of BAT 13 is the overall environmental performance, within the general principle of the elaboration and implementation of a chemicals management system (CMS) as part of the EMS. On the other hand, techniques e., c. and g. in BAT 20 are related to process or equipment used in the plant, and consequently are directly operational. BAT 13 and BAT 20 are indeed linked and this is highlighted in feature VII of BAT 13 which points at BAT 20. The link with the overall environmental performance could be clarified in the statement in BAT 20. **Technique a:** • No rationale has been provided to explain why technically it is needed to change the applicability of technique a. The listed points are measures commonly applied. **Technique d:** • The dedicated drainage for the area for unloading hazardous process chemicals aims to avoid mixing the possible spillages with any other effluent with low level of pollution such as collected run-off water. • This being said, the focus of the techniques is not on the drainage itself but on the dedicated collection and treatment of occasional spillages and this could be reflected in technique d. • It is not clear technically why it is needed to add an applicability criteria since it is possible to share an existing area and to use temporary spillage collection devices when unloading hazardous process chemicals. **Technique f:** • Even though technique f would allow to reduce the risks associated to the storage of chemicals, the prime objective of technique f is to reduce the amount of waste sent for disposal and it would be therefore be better placed in BAT 28. • The return of unused chemicals indeed depends on the agreement of the suppliers, but it is not clear why such agreement could not be negotiated when placing the order. **Technique g:** • According to the description of the technique in Section 4.1.6.6 of D1, small packaging containing process chemicals in plastic or paper bags up to 25 kg are handled manually. **Additional technique:** • The separate collection and storage of waste contaminated with hazardous chemicals is already covered in BAT 28 b. • Technique a covers all types of liquids, including liquid waste, which could be clarified.
EIPPCB proposal:	• To specify that liquid waste are also addressed by technique a. • To reword technique d to focus on collection of spillages • To add a mention to small packaging in technique g. • To move technique f. to BAT 28 • To complement the statement

1.4.8 Emissions to air

No comments.

1.4.8.1 Techniques for reducing channelled emissions to air

Location in D1:	**P. 738 – Section 5.1.8 – BAT 22**
Current text in D1:	**BAT 22. In order to facilitate the recovery of energy and the reduction of channelled emissions to air, BAT is to limit the number of emission points.** **Description** The combined treatment of waste gases with similar characteristics ensures more effective and efficient treatment compared to the separate treatment of individual waste gas streams. The extent to which the number of emission points can be limited depends on technical (e.g. compatibility of the individual waste gas streams) and economic factors (e.g. distance between different emission points).
Summary of comments:	• In the wording of the statement, replace "to limit" with "to optimise" as limiting the number of points of emissions is not always a feasible option for existing plants, taking into account the type, nature and localisation of the channelled emissions. In addition, this would give flexibility to the competent authorities (IT 24). • Change the wording of the statement to "BAT is to collect and concentrate the waste gas streams in as few emission points as technically possible" as the mere limitation of number of emission points is not sufficient (DE 73). • Add the following provision to avoid dilution when combining waste gas streams: the emissions from the common stack do not exceed the emission level of the individual waste gas streams if they were channelled individually (DE 123). • Change the applicability to new plants and major plant upgrades because collecting all emissions is not generally applicable as it can lead to a higher concentration of pollutants and contribute to a loss of efficiency of the oven (EURATEX 53). • Change the last sentence of the description into an applicability restriction (IT 25). • Add an applicability restriction to major refurbishment programmes across the site in general, upgrading to existing abatement technologies or replacement of existing thermal treatment or other processes which result in significant emissions to air (UK 28).
EIPPCB assessment:	• BAT 22 as proposed in D1 focuses on the limitation of the number of emission points, i.e. on the non-augmentation of the number of emission points beyond a certain limit. As mentioned in the description of BAT 22, this limit is set by considering a number of technical and economic factors. In other words, this limit is as low as these factors allow, which is equivalent to the proposed wording "optimise" and partially equivalent to the proposed wording "to concentrate the waste gas streams in as few emission points as technically possible." The difference with the latter is the consideration of the economic factor, when for example two emission points are very far away from each other. In that case, even if technically feasible, it may not be economically viable to connect these two emission points. • Concerning the dilution of emissions to air, see the assessment related to the General considerations, in Section 1.3.1. • The collection of emissions is covered by BAT 21, not by BAT 22. See the related assessment in Section 1.4.8.1. • The principle of limiting the number of emission points *per se* is generally applicable, which is reflected in the proposal of D1. This principle can also be applied to existing plants and not only to plant upgrades. Of course, as mentioned in the technique description, the extent to which the number of emission points can be limited may vary and depends on technical and economic factors.
EIPPCB proposal:	• No change.

1.4.8.2 Techniques for reducing channelled emissions of organic compounds (e.g. formaldehyde) to air

<table>
<tr><td>Location in D1:</td><td>P. 738 – Section 5.1.8 – BAT 23</td></tr>
<tr><td>Current text in D1:</td><td>BAT 23. In order to reduce channelled emissions of organic compounds (e.g. formaldehyde) to air, BAT is to use one or a combination of the techniques given below.

<table>
<tr><th colspan="2">Technique</th><th>Description</th></tr>
<tr><td>a.</td><td>Condensation</td><td rowspan="4">See Section 5.9.2.</td></tr>
<tr><td>b.</td><td>Ionisation</td></tr>
<tr><td>c.</td><td>Thermal oxidation</td></tr>
<tr><td>d.</td><td>Wet scrubbing</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td><u>General comment about BAT 23</u>
• Add additional information about the abatement techniques such as typical pollutants targeted, removal efficiency and applicability (DE 274).

<u>BAT statement</u>
• Delete the reference to formaldehyde as only technique c. is relevant for this pollutant (DE 206, EURATEX 117).

<u>Technique b.</u>
• Delete technique b. as it is not a technique suitable for the removal of volatile organic compounds because there is a risk of explosion during use (CZ_B 8).

<u>Additional techniques</u>
• Add electrostatic precipitator (ESP) as it is an efficient abatement technique for oil mist (SE 46).
• Add catalytic oxidation which is used for singeing (DE 74).
• Add adsorption which is a well-recognised technique for minimising emissions of organic solvents to air (UK 29).</td></tr>
<tr><td>EIPPCB assessment:</td><td><u>General comment about BAT 23</u>
• The format of the table used in BAT 23 is consistent with the format used in the recently published BAT conclusions where abatement techniques for emissions to air are presented. In the standard format, removal efficiency is not mentioned but this information may be found in other documents such as the CWW BREF.
• Concerning the typical target pollutants, they are mentioned in the BAT statement (i.e. organic compounds including formaldehyde).
• As mentioned in the General considerations, the BAT conclusions are generally applicable unless otherwise stated.

<u>BAT statement</u>
• According to the CWW BREF, scrubbing is widely used as a raw material and/or product recovery technique for the separation and purification of gaseous streams which contain high concentrations of VOCs, especially compounds soluble in water such as alcohols, acetone or formaldehyde (Section 3.5.1.2.4 of the CWW BREF). It is also a technique used to abate formaldehyde in the WBP and the GLS BAT conclusions.
• According to the first draft of the WGC BREF (see Section 2.3.2.10.2 of the WGC BREF), the techniques most commonly applied to abate formaldehyde in the chemical sector are:
o absorption (wet scrubbing);
o adsorption;
o condensation;
o thermal or catalytic oxidation.
• Wet scrubbing and condensation are therefore techniques used to abate formaldehyde.
• Concerning ionisation, no clear evidence has been found that ionisation was used to</td></tr>
</table>

	abate channelled emissions of formaldehyde to air. • The BAT statement has been clarified with activities/processes mentioned in table 5.5. **Technique b.** • According to the CWW BREF (Section 3.5.1.3.7), ionisation targets the abatement of VOCs. No specific risk of explosion is mentioned. • However, ionisation is used only for one EP (IT083_{14}) in combination with condensation. **Additional techniques** • Oil mist is not addressed by BAT 23 as it was concluded at the KoM that oil mist was not a KEI (see Section 4.2 of the KoM report). • Adsorption is used by two plants of the data collection (CZ015 uses adsorption to abate emissions from lamination and IT074 to abate emissions from dry cleaning) and catalytic oxidation is used only by Plant DE047 to abate emissions from singeing. CZ015 is the only plant reporting emission values for TVOC, and none of the three plants have reported values for formaldehyde. • In any case, even if a technique is not mentioned in BAT 23, it can be used if it ensures at least an equivalent level of environmental protection.
EIPPCB proposal:	• To delete ionisation. • To introduce adsorption. • To harmonize the BAT statement with table 5.5.

1.4.8.3 BAT-AELs for channelled emissions of organic compounds (e.g. formaldehyde) to air

Location in D1: **P. 738 – Section 5.1.8 – BAT 23 – Table 5.5**

Current text in D1:

Table 5.5: BAT-associated emission levels (BAT-AELs) for channelled emissions of organic compounds (e.g. formaldehyde) to air

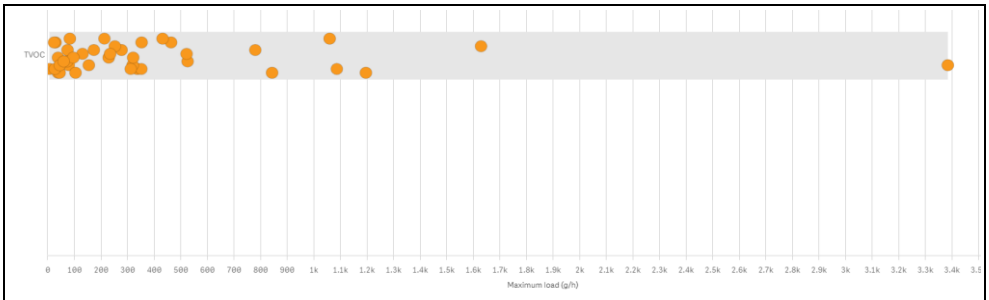
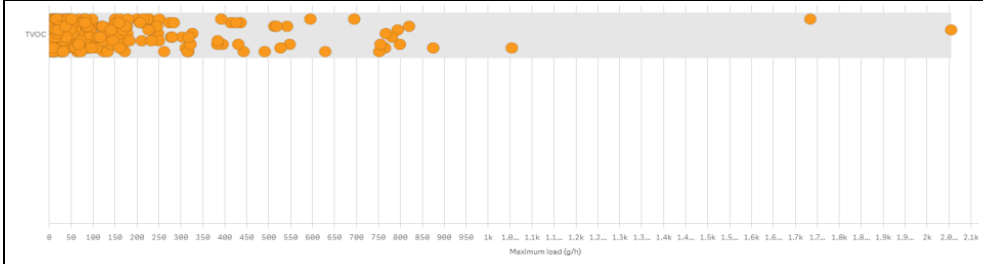
Substance/Parameter	Activities / Processes	BAT-AEL (Average over the sampling period) (mg/Nm^3)	Mass flow threshold (g/h)
Formaldehyde	Coating ([1]) ([2])	1–5	2.5
	Flame lamination ([3])		
	Printing ([1]) ([4])		
	Singeing		
	Thermal treatment in finishing ([1])		
	Thermal treatment in printing ([1]) ([4])		
TVOC	Coating	3–40 ([5])	100
	Lamination		
	Printing		
	Singeing		
	Thermal treatment		

	([1]) The BAT-AEL only applies when formaldehyde is identified as relevant in the waste gas stream based on the inventory of inputs and outputs mentioned in BAT 2. ([2]) The BAT-AEL does not apply where the organic solvent consumption for coating exceeds 5 tonnes per year. ([3]) The BAT-AEL does not apply where the organic solvent consumption for lamination exceeds 15 tonnes per year. ([4]) The BAT-AEL does not apply where the organic solvent consumption for rotary screen printing exceeds 30 tonnes per year. ([5]) The lower end of the BAT-AEL range is typically achieved when using thermal oxidation. The associated monitoring is given in 0.

Summary of comments:	**General comments on the mass flow thresholds**
	• Clarify the approach for setting the mass flow thresholds (BE 10).
	• Delete the mass flow thresholds for all air emission because they are very low and almost no installation reports emissions below the thresholds (DE 379).
	
	Processes concerned
	• Add "Thermal treatment with direct heating" as a process concerned for formaldehyde. Indeed formaldehyde is generally relevant for all direct heating treatments like fixation, heat setting, drying as well as the thermosol dyeing process, dyeing with carriers, etc. and not only for finishing or printing (DE 77).
	• Add finishing as a process concerned for formaldehyde and TVOC as these pollutants may be emitted during finishing (DE 382).
	
	TVOC
	• Delete the mass flow threshold, as there are many plants with emissions below 100 g/h using BAT (e.g. thermal oxidation). In addition, the data show that the proposed mass flow threshold would exclude 63 % of the emission points from the BAT'AELs (AT 26).
	• Delete the mass flow threshold because it is uncommon in BREFs and creates unnecessary complication. If an air stream is channelled and is linked to any of these activities, it is likely to have loads higher than this (EEB 197).
	• Change the BAT-AEL range to 3-20 mg/Nm^3 as about two thirds of the reported data are below 20 mg/Nm^3 and techniques are available to achieve this level (AT 25). In addition, some installations reporting high TVOC emissions (e.g. Plants IT074{5} and IT079{3}) use poor measurement techniques, as shown by the reported measurement uncertainties of the order of 30-50 % of the measured value. Other measurement data with high TVOC concentrations (Plants DE026 and DE048) have uncertainties of 2 mg/Nm^3, which indicates good quality measurements (EEB 184).
	• The lower end of the range may be difficult to monitor with handheld devices which are proven for use at ELVs of greater than or equal to 6 mg/Nm^3 (UK 32).
	
	Formaldehyde
	• Check the correctness of the mass flow threshold (2.5 g/h) for formaldehyde (BE 11).
	• Delete the mass flow threshold because it is uncommon in BREFs and creates unnecessary complication. If an air stream is channelled and is linked to any of these activities, it is likely to have loads higher than this (EEB 196).
	• Delete the mass flow threshold because emission points below the proposed mass flow threshold are within the BAT-AEL range. In addition, formaldehyde is a CMR substance (AT 24).
	• Change the mass flow threshold to 25 g/h in line with the WGC BAT conclusions (CEFIC 23) and because the mass flow of 25 g/h in correlation with the proposed upper end of the range of 5 mg/Nm^3 would mean an air flow of 50 000 Nm^3/h, which is more in line with the usual values (EURATEX 51).
	• Modify the upper end of the range as follows:
	  ○ 10 mg/Nm^3 for finishing processes (coating, starching - including combustion processes in thermal aggregates with direct heating) and for easy-care finishing, water and soil repellent finishing, thermosol process;
	  ○ 15 mg/Nm^3 for thermo-fixation;

	○ 20 mg/Nm^3 for wrinkle-free finishing and flame-retardant finishing. German LAI[14] recommendations are attached to the comment (EURATEX 132, DE 209). • Increase the upper end of the range to 20 mg/Nm^3 for fire retardants applications, easy-care and water repellence applications. Measurement results are attached to the comment (EURATEX 54). • Change the BAT-AEL range to 1-3 mg/Nm^3 because plants with emissions between 3 and 5 mg/Nm^3 do not apply BAT (EEB 185). • Monitoring data support the application of such a low end of the range for formaldehyde based on a limit of detection that is 1/20 of the proposed 1 mg/Nm^3 value. However, the extended sample time required to achieve such a low level of detection may result in additional costs to operators (UK 31). **Oil mist** • Add a BAT-AEL for emissions of oil mist from thermal treatment, with a range of 1-8 mg/Nm^3 and a mass flow threshold of 100 g/h (SE 30). **Footnote ([1])** • Apply Footnote ([1]) to singeing also because formaldehyde is not mentioned as a relevant pollutant for singeing in Section 2.6.1.1 of D1 and because it cannot be deduced from Figure 3.56 in D1 if data on emissions of formaldehyde also refer to waste gases from singeing (IT 26). **Footnotes ([2]), ([3]) and ([4])** • In order to ensure consistency with the IED, add the following text at the end of Footnotes ([2]), ([3]) and ([4]): "(…) and the mass flow of formaldehyde is greater than, or equal to, 10 g/h, an emission limit value of 2 mg/Nm^3 shall be complied with (IED, Annex VII, Part 4)" (AT 21, AT 22, AT 23). • In order to ensure consistency with the IED, add the following text at the end of Footnotes ([2]), ([3]) and ([4]): " (…) technical provisions of Part 4, Annex VII to Directive 2010/75/UE apply" (IT 27). • Delete these footnotes because they are not substantiated. Indeed, these footnotes are not useful to avoid overlaps between the TXT and the STS BAT conclusions. The final draft of the STS BAT conclusions covers consumption of organic solvent over 200 t/year, leaving an unregulated gap between the values proposed here and the 200 t/year of the STS BAT conclusions (EEB 194). • Move the application of these footnotes from formaldehyde to TVOC because formaldehyde is not considered to be an organic solvent (CZ_B 9). • For the sake of clarity, delete Footnotes ([2]), ([3]) and ([4]) and replace them with one unique footnote that would apply for all processes, for both formaldehyde and TVOC: "the BAT-AEL does not apply for installations falling under Chapter V of the IED" (DE 76). **Additional footnotes** • Add the following footnote to TVOC emissions in order to clarify that legislative provisions apply even when the mass flow is below the threshold of 100 g/h: "In the case of a TVOC mass flow of less than 100 g/h, the provisions laid down by the Directive 2010/75/UE for activities using organic solvents (Chapter V) apply to TVOC emissions to air from coating, lamination and printing processes where the organic solvent consumptions exceed the thresholds set out in the Part 2 of the Annex VII to IED" (IT 28). • Add a similar footnote to Footnote ([1]) for TVOC emissions from coating, lamination, printing and thermal treatment as the BAT-AELs are only relevant if TVOC is present in the waste gas streams from these processes, i.e. if organic solvents are used (CEFIC 24, EURATEX 56). • Add a similar footnote to Footnote ([1]) for TVOC emissions from thermal treatment because the BAT conclusions also consider drying to be a thermal treatment where VOCs cannot be present in the waste gases (CZ_B 10)

[14] Vollzugsempfehlung Formaldehyd, Bund/Länder-Arbeitsgemeinschaft Immissionsschutz, 2015 at https://www.lai-immissionsschutz.de/documents/2015-12-09_vollzugsempfehlung_formaldehyd_1503573754.pdf

	• Add the following footnote to TVOC emissions: "an additional mass concentration of no more than 20 mg/Nm^3, to be indicated as total carbon, may be emitted from carry-overs and residues of preparations. The additional mass concentration only applies when using an air-textile goods ratio of 20 m^3/kg is used" (DE 380). • Add the following footnote to TVOC emissions: "after deduction of measured emissions of unavoidable unburnt methane, carryover and residual preparations, based on air- textile- ratio of 20:1 for energy efficiency" (EURATEX 159). • Add the following footnote to TVOC emissions: "For existing direct heated thermal apparatus, up to a maximum emission concentration of 20 mg C/Nm^3 can be discounted if it is proven from the unburnt fuel and all possibilities for a reduction have been carried out (e.g. like optimisation of burning process, minimum annual maintenance of the burners)". This is to account for cases where e.g. unburnt methane contributes to TVOC emissions (DE 349).
EIPPCB assessment:	**General comments on the mass flow thresholds** • As mentioned in Section 3.5.1 of D1, abatement techniques are used by only 120 emission points out of 567: ○ Concerning TVOC, only 43 emission points (EPs) out of the 344 EPs that reported TVOC emissions are equipped with techniques to abate emissions of organic compounds to air, as listed in BAT 23. ○ Concerning formaldehyde, only 19 EPs out of the 60 EPs that reported formaldehyde emissions are equipped with techniques to abate emissions of formaldehyde to air, as listed in BAT 23. ○ Concerning dust, 26 EPs out of the 180 EPs that reported dust emissions are equipped with techniques to abate emissions of dust to air, as listed in BAT 24. ○ Concerning NH_3, 4 EPs out of the 27 EPs that reported NH_3 emissions are equipped with techniques to abate emissions of NH_3 to air, as listed in BAT 25. • This situation where only a minority of EPs are equipped with abatement techniques (12-15 % for dust, TVOC and NH_3 and 32 % for formaldehyde) may be explained by the significance of the emission, which is best appreciated by looking at the emission mass flows. • One could note in particular that a number of unabated emission sources are even smaller in terms of mass flow than abated emission sources, as shown in the graphs below for TVOC:  TVOC emissions to air from EPs equipped with relevant abatement techniques, expressed in mass flow (g/h)  TVOC emissions to air from EPs not equipped with relevant abatement techniques, expressed in mass flow (g/h) The mass flow thresholds proposed in D1 attempt to reflect those cases where unabated emissions are already smaller than abated emissions and for which abatement techniques

would therefore not necessarily be needed.

- The proposed mass flows thresholds are indeed low but a significant number of EPs have reported emissions even lower than the mass flow thresholds:
  - TVOC: 209 out of the 344 emission points that reported TVOC emissions have a mass flow below 100 g/h.
  - Formaldehyde: 11 out of the 60 emission points that reported formaldehyde emissions have a mass flow below 2.5 g/h.
  - Dust: 132 out of the 180 emission points that reported dust emissions have a mass flow below 50 g/h.
  - NH_3: 16 out of the 27 emission points that reported NH_3 emissions have a mass flow below 50 g/h.

Processes concerned

- Formaldehyde may be a product of combustion of natural gas (in particular methane) and indeed the data collection shows formaldehyde emissions from thermal treatment which is not connected to finishing or printing (EP DE029_{1}) and this could be better reflected in Table 5.5.
- When natural gas is burnt, formaldehyde emissions may be generated whatever the type of heating (direct or indirect). Considering that the scope of the BAT conclusions covers both cases, it does not appear necessary to restrict the application of the BAT-AEL to direct heating only. This would also be in line with the BAT-AEL on TVOC which applies to both direct and indirect heating.
- According to the definition, thermal treatment includes fixing and heat-setting, and process steps of other processes such as pretreatment, dyeing, finishing or printing.
- Based on the data collection, it is not clear whether any emission point that reported formaldehyde or TVOC emissions to air is connected directly to the wet finishing process and/or associated with emissions from other processes (coating or lamination). It is not clear either how emissions to air would arise from the wet process itself. It is considered these must be related to the thermal treatment step and it could be clarified that finishing is a process concerned for both formaldehyde and TVOC, and that thermal treatment is included as part of the other activities and processes mentioned.

TVOC

- Concerning the mass flow threshold, see the general remarks above.
- When abatement techniques for TVOC removal are applied, the lowest mass flows reported from EPs are around 40 – 50 g/h. Assuming a moderate abatement efficiency of 80%, gives a conservative unabated (raw) mass flow of 200 g/h, which is considered an appropriate mass flow threshold for the relevant EPs from the textile processes.
- For emission points without abatement which have:
  - the emission mass flow is below the proposed value, and
  - the emission concentration is between 3 mg/Nm^3 and 40 mg/Nm^3.

  around 71% of the EPs fulfil both conditions. It is considered that these EPs are not significant. This could be reflected by adding a footnote to acknowledge when the BAT-AEL applies.
- Concerning the upper end of the range, the derivation of the BAT-AELs is not based on a statistical approach. Even though two thirds of the plants have reported emission levels below 20 mg/Nm^3, it is not clear why 20 mg/Nm^3 should be the upper end of the range.
- The values reported by emission points IT074{5} and IT079{3} do not correspond to concentrations but to mass flows expressed in g/h. Plant DE026 has reported maximal emission concentrations between 30 mg/Nm^3 and 70 mg/Nm^3 so it is not clear how this supports the lowering of the upper end of the range to 20 mg/Nm^3. Plant DE048 did not take part in the data collection.
- More generally speaking, out of the 326 EPs which have reported a monitoring standard for TVOC, 216 have reported using the standard EN 12619. The use of the same standard ensures an equivalent measurement quality level.
- Concerning the lower end of the range, the standard used for monitoring TVOC is EN 12619:2013, which is done by sample extraction and sample filtration followed by flame ionisation detection. The measurement is not carried out with a handheld device.

Formaldehyde

- Concerning the mass flow threshold, see the general remarks above. While consistency

with other BAT conclusions is an element to consider, the mass flow threshold in D1 has been proposed on the basis of the data collection for the TXT BREF review, which differs from the data collection carried out for the drawing up of the WGC BREF.

- Following the interventions of the different TWG members during the informal meeting of 19/02/2021, it seemed that there was not a common position on how to determine which of the emission points reporting formaldehyde emissions are considered relevant and would need to comply with BAT-AEL, and which are irrelevant (or insignificant in terms of environmental impact) and would not need to comply with BAT-AEL. Therefore, the mass flow threshold for this parameter will not be proposed.
- The air flow reported by the emission points where formaldehyde is measured ranges from 470 m^3/h to 38 100 m^3/h, with an average of 12 900 m^3/h. It is not clear whether there is a correlation between the upper end of the range and the mass flow threshold.
- Concerning the upper end of the range, the BAT-AELs are not based on national legislation or guidelines but on the data collection. According to the data collection, none of the plants that reported a maximum formaldehyde concentration above 5 mg/Nm^3 use a technique to abate formaldehyde emissions, except Plant UK127.
- No information has been collected about wrinkle-free finishing during the data collection; however, the following is available:
    - EPs IT094_a{3}, IT094_a{4}, IT094_a{1}, DE042_a{1}, DE032_a{1}, UK127_a{6}, UK127_a{1}, DE050_a{1}, DE023_a{2}, UK127_a{2} and UK127_a{4} apply flame retardants and have reported achieving formaldehyde emissions below 5 mg/Nm^3 by using one or a combination of techniques mentioned in BAT 23;
    - EPs IT094_a{3}, IT094_a{4}, IT094_a{1}, DE042_a{1}, DE032_a{1}, UK127_a{6}, DE049_a{3}, UK127_a{1}, UK127_a{2}, UK127_a{4} apply easy-care finishing and have reported achieving formaldehyde emissions below 5 mg/Nm^3 by using one or a combination of techniques mentioned in BAT 23;
    - EPs IT083_a{14}, IT094_a{3}, IT094_a{4}, IT094_a{1}, DE042_a{1}, DE032_a{1}, UK127_a{6}, UK127_a{1}, DE050_a{1}, DE023_a{2}, UK127_a{2} and UK127_a{4} apply water repellents and have reported achieving formaldehyde emissions below 5 mg/Nm^3 by using one or a combination of techniques mentioned in BAT 23;
    - EPs UK124_a{1}, UK124_a{6}, UK127_a{6}, UK127_a{1}, UK127_a{2} and UK127_a{4} apply thermosol dyeing and have reported achieving formaldehyde emissions below 5 mg/Nm^3 by using one or a combination of techniques mentioned in BAT 23;
    - EPs IT094_a{3}, IT094_a{4}, IT094_a{1}, DE042_a{1}, UK124_a{1}, DE032_a{1}, UK124_a{6}, UK127_a{6}, DE050_a{1}, DE023_a{2} and UK127_a{4} apply thermofixation and have reported achieving formaldehyde emissions below 5 mg/Nm^3 by using one or a combination of techniques mentioned in BAT 23.
- No conclusive evidence was found in the data collection for plants using abatement techniques to support the different upper ends for different finishing processes (e.g. 10, 15 or 20 mg/m^3). However, many plants (particularly from DE) not using abatement techniques did report values around 10 or 20 mg/m^3, respecting such emission limit values. The pollution reduction and control in these plants is potentially ensured by process-integrated techniques.
- Plants DE023 and DE050 report emission levels between 3 mg/Nm^3 and 5 mg/Nm^3 and apply wet scrubbing which is a technique to reduce formaldehyde emissions to air.
- Concerning the lower end of the range, the sampling duration reported by the plants of the data collection which monitor formaldehyde ranges from 0.3 to 6 hours. One of the plants that reported the shortest sampling period is UK124 which has reported formaldehyde emissions below or close to 1 mg/Nm^3. Therefore it does not seem necessary to mention a longer sampling time for formaldehyde.

Oil mist

- Oil mist is not a KEI as concluded by the TWG at the Kick-off Meeting (see Section 4.2 - Table 1 of the Kick-off Meeting report).

Footnote ([1])

	• Footnote ([1]) as proposed in D1 targets the emissions of formaldehyde due to the formaldehyde or formaldehyde precursors that may be present in the process chemicals used in coating, printing or finishing. These formaldehyde emissions can be identified in the inventory of inputs and outputs, based on the inventory of the process chemicals used. • In addition, formaldehyde emissions are also generated by the combustion of methane[15], which is relevant for singeing, flame lamination and thermal treatment (for the latter, see the assessment above). In these cases, formaldehyde emissions will always be relevant and Footnote ([1]) is not necessary. **Footnotes ([2]), ([3]) and ([4])** • The objective of Footnotes ([2]), ([3]) and ([4]) is to avoid conflict with the provisions of the IED (mainly Part 4 of Annex VII). The BAT conclusions do not aim to repeat or interpret the IED provisions such as those laid down in Part 4 of Annex VII and in particular in its point 1. • The footnotes do not aim to avoid overlaps or gaps with the STS BAT conclusions but to avoid conflict with the provisions of the IED. • The footnotes are not linked to formaldehyde being used as organic solvent but to processes using organic solvent as listed in Annex VII to the IED and generating emissions of formaldehyde. • Point 1 in Part 4 of Annex VII states for the processes concerned that "for emissions of the volatile organic compounds referred to in Article 58 where the mass flow of the sum of the compounds causing the labelling referred to in that Article is greater than, or equal to, 10 g/h, an emission limit value of 2 mg/Nm^3 shall be complied with. The emission limit value refers to the mass sum of the individual compounds". As formaldehyde is classified as CMR, this means that there could be a conflict with the IED as the proposed upper end of the BAT-AEL range is 5 mg/Nm^3. The same may be valid for any other CMR substance, which could be clarified in the footnote. • The justification for the footnotes as proposed in D1 could be unclear to the reader, which could be clarified by simply referring to the activities covered by Chapter V of the IED instead of referring to the activities and solvent consumption thresholds. **Additional footnotes** • Concerning the reference to Annex VII to the IED, as mentioned above, the BAT conclusions do not aim to repeat or interpret the IED and it does not seem necessary to mention that the IED applies, which it does in any case, even if the TVOC mass flow is greater than the proposed value. • When establishing the inventory of waste gas streams (BAT 2), the use of organic solvent in a process can be an element of consideration when evaluating whether organic compounds are present in the waste gas from this process (for instance in the case of printing). The use of organic solvent may however not be a determining factor as far as thermal treatment is concerned, because organic compounds may also be generated by the evaporation or degradation of residues or of substances previously applied on the textile fibres and it seems difficult to exclude this situation *a priori* in the inventory of waste gas streams. Concerning coating and lamination, according to Section 2.10.3 of D1, the emissions of organic compounds to air are not necessarily linked to the use of solvent-based formulations, but also to the use of water-based formulations (where dispersing agents and residues may be responsible for the emissions) as well as to the use of coating pastes and melamine resins. • No data have been collected on the emissions due to the carry-over and residues of preparation. In addition, it is not clear why this would lead to an additional emission concentration of 20 mg/Nm^3. • A number of pieces of data have been collected on TVOC emissions from directly heated systems. In these cases, the reported emissions include emissions from the process itself and from the combustion and have been the basis for proposing BAT-AELs in D1. It is not clear why 20 mg/Nm^3 should be deducted in these cases. • Concerning the air-textile ratio of 20, see the assessment of the General considerations in Section 1.3.1.

[15] CIMAC Position Paper 04-2014 "Methane and formaldehyde emissions of gas engines"

EIPPCB proposal:	• To add finishing as a process for formaldehyde and TVOC. • To delete "thermal treatment in finishing" and "thermal treatment in printing" for formaldehyde. • To mention in the BAT statement the processes from which the emissions originate. • To delete the proposed mass flow for formaldehyde. • To add a new footnote to restrict the applicability of the BAT-AEL based on the TVOC mass flow without CMR substances. • To replace Footnotes ([2]), ([3]) and ([4]) with a new footnote and refer to activities covered by Chapter V of the IED.

1.4.8.4 Techniques for reducing channelled dust emissions to air

Location in D1:	**P. 739 – Section 5.1.8 – BAT 24**
Current text in D1:	**BAT 24. In order to reduce channelled dust emissions to air, BAT is to use one or a combination of the techniques given below.** **Technique** / **Description** a. Cyclone b. Electrostatic precipitator (ESP) c. Wet scrubbing Description: See Section 5.9.2.
Summary of comments:	• Change the BAT statement to state that cyclones can only be used in combination with other abatement techniques, as the upper end of the range of the proposed BAT-AELs cannot be achieved with a cyclone alone (UK 30). • Add fabric filters to the list of techniques as they can achieve low levels of emissions, are used for mechanical processes in textile processing or dye handling and have been reported by various plants (IT061 and IT096) (DE 79, IT 29, EEB 195). • Add absolute filters to the list of techniques as dust filtration systems allowing the achievement of the dust emissions at the lower end of the proposed BAT-AEL range. In addition, those techniques are efficiently being used, e.g. by IT061, IT072, IT083 and IT094 (IT 29).
EIPPCB assessment:	• According to the data collection, 4 EPs are equipped with cyclones as the only abatement technique and have reported dust emissions to air up to 6.1 mg/Nm^3 (IT078_a{4}, PT115_a{4}, IT069_a{1} and PT115_a{11}). These EPs are related to singeing and thermal treatment in finishing. • However, cyclones are generally used as pre-treatment, as is mentioned for example in the WT BAT conclusions. • Two EPs are equipped with bag filters (IT061_{3} and IT061_{4}), with dust emissions to air of 8.5 mg/Nm^3 and 2.5 mg/Nm^3 respectively. The dust emissions originate from beating and folding of wool. • Two EPs are equipped with absolute filters (IT083_{15} and IT072_{4}), with dust emissions to air of 0.4 mg/Nm^3 and 6.8 mg/Nm^3 respectively. EP IT083_{15} is associated with weighing of hydrosulphite and EP IT072_{4} is associated with pressing and packaging. • EP IT094_{02} reported the use of a bag filter but did not report dust emissions. • Bag filters and absolute filters are therefore used to abate dust emissions from handling textile material or process chemicals but, according to the data collection, they are not used to abate dust emissions from the processes addressed in Table 5.6, i.e. singeing, fabric production or thermal treatment. This could be clarified in the BAT statement. • In any case, the techniques listed in BAT 24 are neither prescriptive nor exhaustive. Other techniques may be used that ensure at least an equivalent level of environmental protection.
EIPPCB proposal:	• To mention that cyclones are generally used as pre-treatment. • To mention in the BAT statement the processes from which the dust emissions originate (see the assessment in Section 1.4.8.5).

1.4.8.5 BAT-AEL for channelled dust emissions to air

<table>
<tr><td>Location in D1:</td><td>P. 739 – Section 5.1.8 – BAT 24 – Table 5.6</td></tr>
<tr><td>Current text in D1:</td><td>Table 5.6: BAT-associated emission level (BAT-AEL) for channelled dust emissions to air
<table>
<tr><th>Substance/Parameter</th><th>Activities / Processes</th><th>BAT-AEL (Average over the sampling period) (mg/Nm^3)</th><th>Mass flow threshold (g/h)</th></tr>
<tr><td rowspan="3">Dust</td><td>Fabric production</td><td rowspan="3">< 1–10</td><td rowspan="3">50</td></tr>
<tr><td>Singeing</td></tr>
<tr><td>Thermal treatment</td></tr>
</table>
The associated monitoring is given in 0.</td></tr>
<tr><td>Summary of comments:</td><td><u>Processes concerned</u>
• Delete thermal treatment because normally there is no dust emission from thermal treatment (however dust may be relevant for combustion process for heat production or directly heated stenters if other fuel besides LPG or natural gas is used) (DE 80).
• Delete fabric production and thermal treatment because dust emissions are only relevant for singeing (DE 383).
• Add "handling processes with solids like dyes" as another activity concerned (DE 80).

<u>Threshold</u>
• Delete the mass flow threshold because it is uncommon in BREFs and creates unnecessary complication. If an air stream is channelled and is linked to any of these activities, it is likely to have loads higher than this (EEB 198).
• Delete the mass flow threshold because many emission points below the proposed mass flow threshold are within the BAT-AEL range and therefore BAT. In addition, there are many plants below 50 g/h using abatement techniques and about 75 % of the emission points are below 50 g/h and excluded from the BAT-AEL (AT 27).

<u>BAT-AEL range</u>
• Lower the upper end of the range to 5 mg/Nm^3 and consider lowering the lower end to take into account the good performance of fabric filters (EEB 199).
• Increase the upper end of the range to 20 mg/Nm^3 to account for emissions due to the quality of the textile and not to the burning of fuel (e.g. if cotton is singed with medium- and low-quality cotton and organic cotton, because this might cause higher emissions of burnt cotton dust, e.g. due to low staple length, increased hairiness) (EURATEX 160).
• Increase the upper end of the range to 50 mg/Nm^3 and the mass flow threshold to 250 g/h because these values cannot be reached by using only BAT. To do so, it would be necessary to install abatement techniques at all stacks, which may not be possible due to product quality (CZ_B 78).
• Increase the lower end of the range to 5 mg/Nm^3 because demonstrating compliance at such low levels is likely to prove extremely challenging for operators and their monitoring contractors and will likely result in additional costs for the monitoring programme. In particular:
  o it is not clear how many of the collected data are from results reported as less than values, which will have an associated high level of uncertainty attached to them;
  o the scope of the standard EN 13284-1:2017 is stated as being “up to 50 mg/Nm^3 and typically 5 mg/Nm^3”;
  o the standard EN 13284-1:2017 specifies that the overall field blank must be < 10 % of the ELV; an ELV of 1 mg/Nm^3 would require a field blank of < 0.1 mg/Nm^3, which may not be possible to achieve;</td></tr>
</table>

	○ the standard specifies that the expanded uncertainty of the result should not exceed 20 % of the ELV;for an ELV of 1 mg/Nm^3 this means that the maximum allowable uncertainty should not exceed 0.2 mg/Nm^3; this is less than the limit of detection of the standard (UK 33). **Additional footnotes** • Add a footnote to emissions from singeing mentioning that the upper end of the range could be 20 mg/Nm^3 if cotton is singed with medium- and low-quality cotton and organic cotton, because this might cause higher emissions of burnt cotton dust, e.g. due to low staple length, increased hairiness (DE 214). • Add a footnote to emissions from thermal treatment mentioning that the BAT-AEL does not apply if natural gas is used as fuel (EURATEX 57).
EIPPCB assessment:	**Processes concerned** • Dust emissions have been reported for 83 EPs associated with thermal treatment. This does not concern heat production, which is not in the scope of the BAT conclusions. Of these 83 EPs, 77 are connected to direct heating (i.e. the flue-gas is in contact with the textile) and 64 of these 77 EPs are connected to direct heating with natural gas. The dust emissions from these 64 EPs range from 0 mg/Nm^3 to 24.1 mg/Nm^3. • Of the 83 EPs associated with thermal treatment, 4 are connected to indirect heating and report dust emissions from 0.5 mg/Nm^3 to 4 mg/Nm^3. • This shows that dust emissions are also relevant in those cases, possibly coming from the textile material itself. • Dust emissions from fabric production have been reported from 13 EPs and range from 1.1 mg/Nm^3 to 23 mg/Nm^3. However, after further analysis, it appears that these 13 EPs are all connected to thermal treatment (e.g. to dryers or stenters) and not to the fabric production itself (e.g. knitting or weaving). • Dust may also be generated from handling process chemicals in the form of powder but little data were reported about such emissions (the EPs concerned are IT072_{3}, IT072_{4} and IT_96_{1}). • Besides singeing, dust emissions seems to be generated as a thermal treatment step in processes such as dyeing (e.g. PT109_{5}, ES058_{24}, IT137_{6}), printing (e.g. PT108_{10}, ES058_{28}) or finishing (e.g. CZ015_{4}, CZ015_{3}, PT117_{4}). This could be reflected in the title of the table. **Threshold** • Regarding the deletion of mass flow thresholds in the TXT sector, see the assessment of comments related to Table 5.5 in Section 1.4.8.3. • When abatement techniques for dust removal are applied, the lowest mass flows reported from EPs are around 10-15 g/h. Assuming a moderate abatement efficiency of 80%, gives an unabated (raw) mass flow of 50 g/h, which is considered an appropriate mass flow threshold for the relevant EPs from the textile processes. • For the emission points without abatement which have: ○ either an emission mass flow below 50 g/h; ○ or an emission concentration below 10 mg/Nm^3 (proposed upper end of BAT-AEL). the average gas flow is 4 800 Nm^3/h and the median is 3 100 Nm^3/h. • Based on the small mass flows emitted, around 63% of the EPs without abatement fulfil both conditions, it is considered that these EPs are not significant. This could be reflected by adding a footnote to acknowledge when the BAT-AEL applies. • CMR substances could be bound on particulate matter (dust). Such dust emissions could have significant environmental impact, therefore, the emission point would need to comply with BAT-AEL. **BAT-AEL range** • According to the data collection, fabric filters are not used for the processes targeted in Table 5.6. • The BAT-AELs proposed in D1 are based on the values reported via the data collection. The reported values are values measured at the emission points, therefore including dust from the combustion and from the textile itself and it is not clear why the upper end of the range should be increased to 20 mg/Nm^3. • The proposed upper end of the range is based on the data collection and reflects the

	emission levels which are achieved by plants of the data collection when applying one or a combination of the techniques listed in BAT 24. If an unabated emission point cannot achieve this level, it may be necessary to install an abatement technique but it is not clear why it would not be possible due to product quality. • Concerning the lower end of the range, while the measurement uncertainty could increase as a percentage at lower emission levels, it should be noted that 17 EPs have reported dust emission levels below 1 mg/Nm^3. • It is also stated in EN 13284-1 that increasing the "sampling time to 60 min or to 90 min would naturally improve significantly the reproducibility of measurements". • The proposed lower end of the range is also consistent with the levels that have been considered appropriate for other BAT conclusions (e.g. STS). **Additional footnotes** • No information has been collected via the data collection or made available about the dust emissions to air from singeing of medium- and low-quality cotton or organic cotton. • As mentioned above, dust emissions to air have also been reported from thermal treatment burning natural gas, possibly coming from the textile material itself.
EIPPCB proposal:	• To amend the title of Table 5.6 to identify the processes for which the BAT-AEL applies. • To add a new footnote to restrict the applicability of the BAT-AEL based on the dust mass flow.

1.4.8.6 Techniques for reducing channelled ammonia emissions to air

Location in D1:	**P. 739 – Section 5.1.8 – BAT 25**
Current text in D1:	**BAT 25. In order to reduce channelled ammonia emissions to air, BAT is to use wet scrubbing.** **Description** See Section 5.9.2.
Summary of comments:	• Add adsorption as an additional technique because otherwise the BAT is prescriptive. In addition, the applicability of the BAT may be limited by the waste water treatment plant capacity (CEFIC 13).
EIPPCB assessment:	• As mentioned in the General considerations, these BAT are neither prescriptive nor exhaustive. Other techniques may be used that ensure at least an equivalent level of environmental protection.
EIPPCB proposal:	• To mention in the BAT statement the processes from which the emissions originate (see the assessment of BAT 24 in Section 1.4.8.4).

1.4.8.7 BAT-AEL for channelled ammonia emissions to air

Location in D1:	**P. 739 – Section 5.1.8 – BAT 25 –Table 5.7**
Current text in D1:	**Table 5.7: BAT-associated emission level (BAT-AEL) for channelled ammonia emissions to air**

Substance/Parameter	Activities / Processes	BAT-AEL ([1]) (Average over the sampling period) (mg/Nm^3)	Mass flow threshold (g/h)
NH_3	Coating Printing	3–10	50

	Thermal treatment in finishing Thermal treatment in printing ([1]) The BAT-AEL only applies when NH_3 is identified as relevant in the waste gas stream based on the inventory of inputs and outputs mentioned in BAT 2. The associated monitoring is given in 0.
Summary of comments:	• Delete the mass flow threshold as many emission points below the proposed mass flow threshold are within the BAT-AEL range and therefore BAT. There are many plants below 50 g/h using abatement techniques and about 64 % (16 emission points out of 25) of the emission points are below 50 g/h and excluded from the BAT-AEL (AT 28). • Increase the upper end of the range to 20 mg/Nm^3 for fire retardant processes as the proposed upper and of the range is not achievable for such processes (e.g. when using ammonium sulphamate) (FR_B 7, EURATEX 59). • Add a footnote mentioning that the upper end of the range is 30 mg/Nm^3 for plants producing technical textiles, PPE (personal protection equipment) or other textiles which need to comply with safety standards such as flame retardance. This is because flame retardant finishing of technical textiles and PPE leads to higher NH_3 emissions and wet scrubbing is not applicable as a low waste gas temperature leads to adverse conditions of the waste gas (DE 347, EURATEX 161). • Concerning the lower end of the range, the value proposed of 3 mg/Nm^3 is likely to lead to additional monitoring costs for the operator associated with monitoring for longer periods in order to achieve the stated limit of detection required (UK 34).
EIPPCB assessment:	• Regarding the deletion of mass flow thresholds in the TXT sector, see the assessment of comments related to Table 5.5 in Section 1.4.8.3. • Only 4 our if 34 plants reporting ammonia emissions use appropriate abatement technique (i.e. wet scrubbing). They report mass flows from 21 g/h to 168 g/h. 27 EPs that report not using the abatement techniques have mass flows from 0.1 g/h to 666 g/h. The related processes included coating, printing and finishing (same as the plants using abatement), but also others like dyeing and shrink-proofing. It is not clear why they do not use abatement techniques, since none of them reported using process integrated techniques e.g. to reduce urea use in printing. • Following the interventions of the different TWG members during the informal meeting of 19/02/2021, it seemed that there was not a common position on how to determine which of these emission points are considered relevant and would need to comply with BAT-AEL, and which are irrelevant (or insignificant in terms of environmental impact) and would not need to comply with BAT-AEL. Therefore, the mass flow threshold for this parameter will not be proposed. • Based on the data collection many of the emission points related to Functional finishing. It was not clear whether they are originating from the wet treatment or the following thermal treatment step. Therefore, it was considered best to specify that BAT-AELs relate to thermal treatment associated with finishing (and other processes included in Table 5.7 like coating and printing). • Concerning the upper end of the range, Plant BE010 uses ammonium sulphamate for flame-retardance finishing, which could explain the level of NH_3 emissions (up to a concentration of 16 mg/Nm^3 and a mass flow of 264 g/h). However, this plant does not use wet scrubbing to abate the ammonia emissions to air and it is not clear why the upper end of the range should be increased to 20 mg/Nm^3 or 30 mg/Nm^3. Since this substance is alternative to using brominated flame-retardants the footnote for increased upper end of the BAT-AEL range could accommodate the plants using it. • It is not clear how a low waste gas temperature would prevent the use of wet scrubbing. In addition, the waste gas temperature reported by Plant BE010 is between 64 °C and 95 °C. • Concerning the lower end of the range, it may indeed be necessary to extend the sampling duration according to standard EN ISO 21877. In D1, this is reflected in Footnote ([1]) of the table for emissions to air in the General considerations.
EIPPCB proposal:	• To add that all Activities/Processes concerned include associated thermal treatment. • Delete the mass flow threshold.

	• To add footnote for upper end of the range in case of using ammonia-based substances in flame retardant finishing.

1.4.8.8 Techniques for reducing emissions of organic compounds to air from thermal treatment of synthetic textile materials

Location in D1:	**P. 740 – Section 5.1.8 – BAT 27**
Current text in D1:	**BAT 27. In order to reduce emissions of organic compounds to air from the thermal treatment of synthetic textile materials, BAT is to wash them.** **Description** Synthetic textile materials are washed prior to thermal treatment. If needed, the washing water is sent to treatment (see BAT 19).

Summary of comments:	• Link this BAT to BAT 23 as it also concerns emissions of organic compounds to air (FR_A 17).
	• Add the following words at the end of the BAT statement "(…) or use techniques to reduce the emissions to air" because in certain applications it is necessary to apply thermofixation to thin synthetic textiles before washing them (SE 31).
	• Add the possibility of treatment of emissions to air as an alternative to washing (EURATEX 60).
	• Add other techniques or open the formulation, because otherwise the BAT would be prescriptive as it mentions only one technique (CEFIC 15).
	• Add an applicability clause to consider that:
	  ○ depending on product specifications, such a washing is not applied;
	  ○ depending on the pace of production, washing the fabric may lead to mould development (FR_A 17).
	• Clarify when a treatment is needed for the washing water because it is not obvious why the washing water would not need any treatment. (FR_A 18).

EIPPCB assessment:	• BAT 27 is about emissions of organic compounds. As it is a primary technique (i.e. process-integrated technique) and not a secondary technique (i.e. abatement technique), it would be clearer and more logical to have this BAT placed immediately before BAT 23. The same applies for BAT 26. • Section 4.4.6 of D1 mentions that some synthetic knitted fabrics need to be thermofixed before washing; however, no further details are available. • This being said, Section 4.4.6 of D1 focuses on synthetic knitted fabrics and not on synthetic fibres because knitted fabrics may contain more residual preparation agents than woven fabrics, in particular knitting oil, which may end up in emissions to air if the fabrics are not washed before thermal treatment. This could be reflected in BAT 27. • The thermal treatment which is referred to here is thermofixation. As mentioned in Section 2.6.4.1 of D1, thermofixation is a step of the pretreatment of synthetic textile material. This could be reflected in BAT 27. • Concerning the applicability restriction due to textile characteristics such as thin fabrics or due to product specifications, no information has been made available as to why the textile material concerned needs to undergo thermofixation before washing. • As mentioned in the General considerations, BAT are neither prescriptive nor exhaustive. Other techniques may be used that ensure at least an equivalent level of environmental protection. • Concerning the development of mould on wet textile materials, this seems rather to be an operational consideration which can be addressed when planning the production operations. • The washing water contains the preparation agents removed from the textile materials (e.g. knitting oil) but could in principle be reused without treatment if the content of impurities allows (see BAT 9). In any case, the reuse and treatment of water is already covered by other BAT and it does not seem necessary to repeat it in BAT 27, the focus of which is emissions to air.
EIPPCB proposal:	• To move BAT 27 before BAT 23. • To focus BAT 27 on the washing of knitted synthetic fabrics prior to thermofixation. • To delete the reference to water treatment.

1.5 BAT conclusions for the pre-treatment of raw wool fibres by scouring

1.5.1 Techniques for using resources efficiently and for reducing water consumption and waste generation

Location in D1:	**P. 742 – Section 5.2 – BAT 29**
Current text in D1:	The BAT conclusions in this section apply to the pre-treatment of raw wool fibres by scouring and apply in addition to the general BAT conclusions in Section 5.1. **BAT 29. In order to use resources efficiently as well as to reduce water consumption and waste water generation, BAT is to recover wool grease and recycle waste water.** **Description** Waste water from wool scouring is treated (e.g. by a combination of centrifugation and sedimentation) to separate grease, dirt and water. Grease is recovered, water is partially recycled to scouring and dirt is sent to further treatment.
Summary of comments:	• No comments.
EIPPCB assessment:	• Not applicable.
EIPPCB proposal:	• No change.

1.5.2 BAT-AEPLs for the recovery of wool grease from the pre-treatment of raw wool fibres by scouring

Location in D1:	**P. 742 – Section 5.2 – BAT 29 – Table 5.8**
Current text in D1:	**Table 5.8: BAT-associated environmental performance levels (BAT-AEPLs) for the recovery of wool grease from the pre-treatment of raw wool fibres by scouring**

Type of wool	Unit	BAT-AEPL (Yearly average)
Coarse wool (i.e. wool fibre diameter typically higher than 35 µm)	kg of recovered grease per tonne of raw wool pre-treated by scouring	11–15
Extra and super fine wool (i.e. wool fibre diameter typically lower than 20 µm)		50–60

	The associated monitoring is given in BAT 5.
Summary of comments:	• Amend the proposed BAT-AEPL range for kg of wool grease recovered from coarse wool to 10-15 kg/t. The data submitted from the 2 UK plants show that the average achieved over the last 3 years would fit a range of 10-15 kg/t of raw wool processed and not a range of 11-15 kg/t (UK 36). • Change the BAT-AEPL range for "Extra and super fine wool" to 40-60 kg of recovered grease per tonne of raw wool pretreated by scouring. Indeed, due to global warming and worse conditions for sheep breeding in general, the lower value of 50 kg/t has shifted to 40 kg/t for some wool (CZ_B 75).

EIPPCB assessment:	• The BAT-AEPLs have been determined on the basis of the data collection. According to the data reported by UK128 and UK129 for quantity of wool grease recovered from coarse wool, there is scope to decrease the lower end of the range to 10 kg/t. • Regarding the range for "Extra and super fine wool", it is not clear on exactly which data the modified range values could be based.
EIPPCB proposal:	• To decrease the lower end of the range for quantity of wool grease recovered from coarse wool.

1.6 BAT conclusions for the production of yarn and fabric

1.6.1 Techniques for reducing emissions to water

<table>
<tr><td>Location in D1:</td><td>P. 744 – Section 5.3 – BAT 32</td></tr>
<tr><td>Current text in D1:</td><td>The BAT conclusions presented in this section apply to the production of yarn and fabric and apply in addition to the general BAT conclusions in Section 5.1.

BAT 32. In order to reduce emissions to water from the use of sizing chemicals, BAT is to use all of the techniques given below.

<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Selection of sizing chemicals</td><td>Sizing chemicals with improved environmental performance in terms of quantity needed, washability, recoverability and/or biodegradability (e.g. modified starches, certain galactomannans, polyvinyl alcohol and certain polyacrylates) are used.</td><td rowspan="2">Generally applicable</td></tr>
<tr><td>b.</td><td>Pre-wetting of the cotton yarns</td><td>The cotton yarns are dipped into hot water prior to sizing. This allows a reduction of the amount of sizing chemicals.</td></tr>
<tr><td>c.</td><td>Compact spinning</td><td>The fibre strands are compressed by suction or by mechanical or magnetic compacting. This allows a reduction of the amount of sizing chemicals.</td><td>The applicability may be restricted by product specifications</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td><u>Technique a.</u>
• Delete “polyvinyl alcohol and certain polyacrylates” which have a worse environmental performance, and polyvinyl alcohol is biodegradable only under certain conditions. In the current Austrian waste water ordinance on textiles, there is one BAT conclusion recommending the replacement of polyvinyl alcohol (AT 45, EURATEX 118).
• Add that yarns and fabrics with such sizing chemicals are purchased at the end of the description. This is to clarify that the correct choice of size applies not only to the choice of the sizing chemical but also to the choice of yarn or fabric purchased (EEB 42).Add a reference to BAT 36 below the table. Indeed, selecting based on recoverability is BAT, but so is actually recovering which is described in BAT 36 (EEB 42).
• Replace generally applicable with “applicability may be restricted by product specifications”. Product specifications sometimes require specific sizing chemicals which cannot be recovered or are not biodegradable (e.g. sizing of PES yarns) (EURATEX 63).

<u>Technique b.</u>
• Restrict the applicability as follows: "Generally applicable if it does not lead to a higher energy consumption and if compatible with operational constraints, sizing equipment or product specifications”. This technique may not be compatible with high-speed weavers. This can lead to bad "sizing" performance and the cotton fibres have to be dried for longer; this will increase the energy consumption and need a big investment for one material only (FR_A 55, EURATEX 58).

<u>Technique c.</u>
• Replace "by product specifications" with "in line with the descriptions in Section 4.3.1.2.3" (EEB 110).</td></tr>
<tr><td>EIPPCB assessment:</td><td><u>Technique a.</u>
• According to Sections 4.3.1.2.1, 4.1.7.3.5.4.1 and 4.1.7.4.3 of D1, polyvinyl alcohol and certain polyacrylates are indeed only biodegradable under certain conditions, but are widely used. These substances are mentioned in brackets as examples and could be deleted from the description of technique a.</td></tr>
</table>

	• This BAT refers to the sizing process, while the choice of yarn or fabric purchased is covered in BAT 4 (a). • Although sizing chemicals are part of BAT 36 b, a link between both BAT would apply only when sizing and desizing are done in the same plant. • It is not clear why biodegradable sizing agents could not be used on the polyester yarns. **Technique b.** • According to Section 4.3.1.2.2 of D1, there are no technical restrictions to the applicability restriction of this technique, and in particular there is no information about a poorer performance of the sizing step and no reference to the product specifications or operational constraints. Concerning sizing, existing sizing machines with two sizing boxes can be upgraded by using the first sizing box for pre-wetting and the second one for sizing and it is not clear why it could not technically be done. Finally, concerning the energy consumption, more energy may indeed be needed to dry the cotton yarns but on the other hand this technique leads to an increase in sizing machine speed of about 22 %. **Technique c.** • Examples from Section 4.3.1.2.3 of D1such as hairiness of the yarns would facilitate the understanding of the applicability of technique c.
EIPPCB proposal:	• To delete "polyvinyl alcohol and certain polyacrylates" in technique a. • To add an example in the applicability restriction of technique c.

1.6.2 Techniques for using energy efficiently

Location in D1:	**P. 745 – Section 5.3 – BAT 34**
Current text in D1:	**BAT 34. In order to use energy efficiently, BAT is to use technique a and one or both of techniques b and c given below.**

	Technique	Description
a.	Use of common techniques	This includes: • reducing the volume of the production area to reduce the amount of energy needed for humidifying the ambient air; • using advanced sensors that detect thread breaks to stop the spinning or weaving machines.
b.	Use of common techniques in spinning	This includes: • using lighter spindles and bobbins in ring frames; • using spindle oil with optimal viscosity; • maintaining an optimal oiling level of the yarn; • optimising the ring diameter with respect to the yarn diameter in ring frames; • gradual start-up of the ring spinning machines; • using vortex spinning; • optimised movement of empty bobbin conveyors in cone winding machines.
c.	Use of common techniques in weaving	This includes: • avoiding excessive air pressure for air-jet weaving; • using a double-width loom for large-volume batches.

Summary of comments:	**Technique a.** • Change the applicability of technique a. to "applicable to new plants or major upgrades of plants", as a reduction of the volume of the production area requires a change of the configuration of the installation (FR_A 56, UK 39, CEFIC 25, EURATEX 62, EURATEX 162). **Technique c.** • Change the applicability of technique c. to "Applicable to new plants or major upgrades of plants". Changing the whole configuration of the production area is not always possible (UK 39).
EIPPCB assessment:	**Technique a.** • According to Section 4.3.2.1 of D1, one way to reduce the volume of the production area is to install a suspended ceiling, which does not seem to be a major plant upgrade which is defined as "a major change in the design or technology of a plant with major adjustments or replacements of the process." This example could however bring clarity to the technique description. **Technique c.** • Replacing an existing loom with a double-width loom would indeed be a major plant upgrade according to the definition mentioned above. • The names of the techniques a, b and c could be related to energy savings to make them technically more relevant.
EIPPCB proposal:	• To add the example of suspended ceiling in technique a. • To add an applicability criteria related to the double-width loom in technique c. • To amend the name of the techniques a, b and c.

1.7 BAT conclusions for the pretreatment of textile materials other than raw wool fibres

1.7.1 Techniques for using energy efficiently and reducing water consumption and waste water generation

<table>
<tr><td>Location in D1:</td><td>P. 746 – Section 5.4 – BAT 35</td></tr>
<tr><td>Current text in D1:</td><td>The BAT conclusions in this section apply to the pre-treatment of textile materials other than raw wool fibres and apply in addition to the general BAT conclusions in Section 5.1.

BAT 35. In order to use energy efficiently as well as to reduce water consumption and waste water generation, BAT is to use both of the techniques given below.

<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Combined pre-treatment of cotton textiles</td><td>Various pre-treatment operations of cotton textiles (e.g. desizing, scouring and bleaching) are carried out simultaneously.</td><td rowspan="2">Only applicable to new plants or major plant upgrades</td></tr>
<tr><td>b.</td><td>Cold pad-batch treatment of cotton textiles</td><td>Desizing and/or bleaching are carried out with the cold-pad batch technique (see Section 5.9.4).</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>• Delete technique a. or link it to BAT 15 since it contradicts enzymatic pretreatment (EURATEX 119).
• Amend the applicability so that both techniques a. and b. are generally applicable. The proposed techniques may be implemented even at the occasion of minor upgrades (SE 33, UK 40).</td></tr>
<tr><td>EIPPCB assessment:</td><td>• It is not clear how technique a. contradicts enzymatic pretreatment described in BAT 15.
• According to the information in Section 4.4.3 in D1, existing plants with new machinery suitable for this process could apply this technique. In addition, 20 plants from the data collection have reported using technique a.
• Regarding an applicability restriction for technique b., according to Section 4.5.1.8 in D1, there are no technical restrictions to the applicability of this technique.
• Taking into account that techniques a. and b. of BAT 35 can also be applied to use resources efficiently, there is justification for merging BAT 35 with BAT 36, as both have the same environmental objectives.</td></tr>
<tr><td>EIPPCB proposal:</td><td>• To provide more examples in the description of technique a. (see assessment done in Section 1.4.3.1 for technique b.).
• To change the applicability of techniques a. and b.
• To merge BAT 36 with BAT 35.</td></tr>
</table>

1.7.2 Techniques for using resources and energy efficiently and reducing water consumption and waste water generation

<table>
<tr><td>Location in D1:</td><td>P. 746 – Section 5.4 – BAT 36</td></tr>
<tr><td>Current text in D1:</td><td>BAT 36. In order to use resources and energy efficiently as well as to reduce water consumption and waste water generation, BAT is to use one of the techniques given below.

<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Single desizing liquor</td><td>A single desizing liquor is used to remove different types of sizing chemicals. This solution is strongly alkaline (pH higher than 13) and contains hydrogen peroxide.</td><td>Generally applicable</td></tr>
</table></td></tr>
</table>

	b. | Recovery and reuse of water-soluble sizing chemicals | When desizing is carried out by washing with hot water, water-soluble sizing chemicals (e.g. polyvinyl alcohol and polyacrylates) are recovered from the washing water by ultrafiltration. The concentrate is reused for sizing, whereas the permeate is reused for washing. | Only applicable in plants where sizing and desizing are carried out at the same plant
Summary of comments:	**Technique a.** • Delete technique a. The desizing method depends on the sizing agent used and a single desizing liquor for all sizing agents is not reasonable (DE 319). • Delete "This solution is strongly alkaline (pH higher than 13) and contains hydrogen peroxide". Some sizing agents like polyvinyl alcohol precipitate in alkaline solutions, so the formulation of the single desizing liquor needs to be adapted (FR_A 60, EURATEX 64). • Add that applicability may be restricted by product specifications. The conditions of desizing are not always as mentioned in the technique description, e.g. PES warm washing is carried out without hydrogen peroxide (EURATEX 65). **Technique b.** • Add that applicability may be restricted by product specifications; not all sizing chemicals can be recovered from the washing water by ultrafiltration e.g. PES sizing (EURATEX 66). • Add a reference to BAT 32 (EEB 45).
EIPPCB assessment:	**Technique a.** • According to Section 4.4.1 of D1, there are no technical restrictions to the use of the same desizing liquor for various sizing chemicals. On the contrary, Section 4.4.1 mentions that the use of a single desizing liquor is particularly suitable when several products are used. • As for the exact characteristics of the desizing solution, this may indeed change to take into account the specificities related to the sizing chemicals used. **Technique b.** • The technique aims to recover water-soluble chemicals from the washing water by ultrafiltration. According to Section 4.4.8.1 of D1, this technique is suitable for water-soluble chemicals, as stated in the BAT description. • According to Section 4.4.8.1 of D1, more examples of water-soluble sizing chemicals could be added. • Although sizing chemicals are part of BAT 32, a link between both BAT would apply only when sizing and desizing are done in the same plant.
EIPPCB proposal:	• To merge BAT 36 with BAT 35 (see assessment in Section 1.7.1). • To remove the second sentence in the description of technique a. • To add carboxymethyl cellulose as an example of water-soluble sizing chemicals.

1.7.3 Techniques for preventing or reducing emissions to water of chlorine-containing compounds and complexing agents

Location in D1:	**P. 746 – Section 5.4 – BAT 37**
Current text in D1:	**BAT 37. In order to prevent or reduce emissions to water of chlorine-containing compounds and complexing agents, BAT is to use one or both of the techniques given below.** **Technique** | **Description**

	a.	Chlorine-free bleaching	Bleaching is carried out with chlorine-free bleaching chemicals (e.g. hydrogen peroxide, peracetic acid or ozone), possibly catalysed with enzymes.
	b.	Optimised hydrogen peroxide bleaching	The use of complexing agents can be completely avoided or minimised by reducing the concentration of hydroxyl radicals during bleaching. This is achieved by: • using demineralised water; • prior removal of metal impurities from textile materials (e.g. by magnetic separation or chemical extraction); • controlling the pH and the peroxide concentration during bleaching.

Summary of comments:	**Technique a.** • Delete "possibly catalysed with enzymes" as enzymes are not stable in combination with peroxide (EURATEX 120). • Add the following applicability clause "the applicability may be restricted by the characteristics of the textile materials and/or product specifications" (IT 31). • Hypochlorite bleaching is needed for some specific fabrics (EURATEX 67). **Technique b.** • Replace "demineralised water" with "softened water". Demineralised water is not necessary to reduce the need for complexing agents, and will increase the amount of waste baths (CZ_B 12, FR_A 58, EURATEX 67). • Add information on applicability or delete "magnetic separation"; magnetic separation works with magnetisable elements (DE 320, EURATEX 121). • Delete "chemical extraction" because it is unclear and may imply the use of solvent (DE 320). • Add an additional bullet point: "pretreatment of textile fabrics (removal of Mn and Fe residues)" (EURATEX 67).
EIPPCB assessment:	**Technique a.** • During the 2nd Data Assessment Workshop held on 21-23 October 2020, EURATEX clarified that enzymes are used as a pretreatment, before bleaching. This can be clarified in the description of technique a. • According to the data collection, several plants reported using enzymes in combination with peroxide for bleaching (DE034, DE040, FR131, IT097 and PT108). • Although this technique seems widely used, examples have been reported where this technique may not apply, and this could be reflected in the applicability. **Technique b.** • The replacement of "demineralised water" by "softened water" would be in line with the EIPPCB proposal for BAT 15 (see Section **1.4.5.3**). • Obviously, magnetic separation will function only with ferromagnetic metals and it does not seem necessary to mention it in the BAT conclusions. • The term "chemical extraction" refers in fact to two methods which are mentioned in Section 4.4.7.2 of D1: acid demineralisation and reductive treatment. This term can indeed be misleading as it could be understood from it that solvent is used. This could be clarified by replacing "extraction" with "treatment". • Pre-washing of textiles could also be used to reduce the presence of metal impurities. • According to Section 4.4.7 of D1, it is relevant to check the decomposition of hydrogen peroxide. This could be clarified in the description.
EIPPCB proposal:	• To clarify the use of enzymes in the description of technique a. • To add an applicability restriction to technique a. • To replace the terms "demineralised" and "chemical extraction" and to add a reference to pre-washing in technique b. • To clarify the need to control of the hydrogen peroxide concentration.

1.7.4 Technique for using resources efficiently and for reducing the amount of alkali discharged to the waste water treatment

Location in D1:	**P. 747 – Section 5.4 – BAT 38**
Current text in D1:	**BAT 38. In order to use resources efficiently and to reduce the amount of alkali discharged to waste water treatment, BAT is to recover caustic soda used for mercerisation.** **Description** Caustic soda is recovered from the rinsing water by evaporation and further purified, if needed.
Summary of comments:	• Modify the applicability as it may be restricted by product specifications, or add an applicability criteria to new plants or plants with major upgrade. Difficulties to reconcentrate the soda can occur (EURATEX 76). • Add an applicability restriction as when distillation process recovers alkali from mercerising, the alkali rinsing water is heated up and the water is evaporated and condensed. Distillation needs a lot of energy to heat the liquor and evaporate the water (EURATEX 122).
EIPPCB assessment:	• It is not clear technically which difficulties can restrict the applicability of this technique. According to the data collection, several plants that have different products achieve the proposed BAT-AEPL. • According to the data collection, several plants (e.g. FR134, DE030, PT108, UK127 ES058 and BE013) are using this technique and did not report more energy consumption than other plants not using evaporation to recover caustic soda from the rinsing water.
EIPPCB proposal:	• No change.

1.7.5 BAT-AEPL for the recovery of caustic soda used for mercerisation

Location in D1:	**P. 747 – Section 5.4 – BAT 38 – Table 5.9**
Current text in D1:	**Table 5.9: BAT-associated environmental performance level (BAT-AEPL) for the recovery of caustic soda used for mercerisation** **Parameter** / **Unit** / **BAT-AEPL (Yearly average)** Recovery of caustic soda used for mercerisation / % / 75–95 The associated monitoring is given in BAT 5.
Summary of comments:	• No comments.
EIPPCB assessment:	• Not applicable.
EIPPCB	• To simplify the table.

proposal:	

1.8 BAT conclusions for dyeing

<table>
<tr><td>Location in D1:</td><td>P. 748 – Section 5.5.</td></tr>
<tr><td>Current text in D1:</td><td>Entire Section 5.5.</td></tr>
<tr><td>Summary of comments:</td><td>

Shorten and simplify the techniques, just including the major ones with proven environmental impact and proven applicability. Indeed a lot of BATs include extensive lists of techniques, which are extremely detailed for different sub-processes, types of dyes, raw materials etc. This degree of detail leads to an unnecessary complexity, which might complicate the implementation of the BAT conclusions via permits and/or national binding rules. In addition, a number of BATs might contradict each other, are common practice (e.g. pH control), are just dyeing processes without any reference to a specific BAT (e.g. cold pad-batch dyeing), are not applicable at all (e.g. vat dyeing without steaming), are wrong interpretations of BAT candidates in Chapter 4 (e.g. printing carried out without urea) (DE 393).
Specify the techniques called "optimised process" (or using similar expressions). The added value of the BAT conclusions would be higher if there was a common picture in Europe on what "optimised processes" are. In the descriptions of the BAT conclusions there are examples of those processes, but the relevance of the descriptions is quite low in comparison with the technique itself (DE 393).
Add in BAT 39 and BAT 40 a missing technique which is described in Section 4.5.1.4 of D1 (optimised removal of unfixed dyestuff in reactive dyeing) (CZ_B 13):

<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td></td><td>Optimised removal of unfixed dyestuff in reactive dyeing</td><td>Unfixed dyestuff is removed from the textile materials by using enzymes and/or vinyl polymers. This reduces the number of rinsing steps needed.</td><td>Generally applicable</td></tr>
</table>
</td></tr>
<tr><td>EIPPCB assessment:</td><td>

Concerning the comments about the complexity of the BAT conclusions related to dyeing and the use of the wording “optimised process”, they are relatively general and are not specific as to why exactly they would need to be changed. See the BAT-specific assessments below for the assessment of specific proposals for modifications.
Concerning the additional technique proposed, it is already proposed in BAT 39c in D1. The proposed addition about the reduction of rinsing steps could bring further clarity though.
It is not clear why this technique would need to be repeated in BAT 40 which is specific to cellulosic fibres.

</td></tr>
<tr><td>EIPPCB proposal:</td><td>

To add a reference to the reduction of rinsing steps in BAT 39c.

</td></tr>
</table>

1.8.1 Techniques for using resources efficiently and reducing emissions to water

<table>
<tr><td>Location in D1:</td><td>P. 748 – Section 5.5 – BAT 39</td></tr>
<tr><td>Current text in D1:</td><td>
The BAT conclusions in this section apply to dyeing and apply in addition to the general BAT conclusions in Section 5.1.

BAT 39. In order to use resources efficiently and to reduce emissions to water from dyeing, BAT is to use one or a combination of the techniques given below.

<table>
<tr><th>Technique</th><th>Description</th></tr>
</table>
</td></tr>
</table>

	Technique for batch and continuous dyeing		
	a.	Selection of dyes	Dyes without dispersing agents are used or, where this is not possible, with dispersing agents that are biodegradable (e.g. based on fatty acid esters).
	Techniques for batch dyeing		
	b.	pH-controlled dyeing	For textile materials with zwitterionic characteristics, dyeing is carried out at constant temperature and controlled by gradually lowering the pH of the dyeing liquor below the isoelectric point of the textile materials.
	c.	Optimised removal of unfixed dyestuff in reactive dyeing	Unfixed dyestuff is removed from the textile materials by using enzymes (see BAT 15 b) and/or vinyl polymers.

Summary of comments:	**Technique a.** • Delete the use of dyes without dispersing agent because disperse dyes cannot be formulated and applied in water-based systems without dispersing agents. Indeed, disperse dyes are only in a metastable state and will precipitate quickly without dispersing agents (DE 236, EURATEX 123). • Expand technique a. to a more general technique on the selection of dyes because technique a. is too restrictive and move the use of biodegradable dispersing agents to BAT 42 (UK 41). **Technique b.** • Add that the pH for wool dyeing depends on the dyestuff class and is normally selected in a manner so that exhaustion of the dye is maximal and wool damage kept at a minimum (DE 321). • Move technique b to BAT 40 and BAT 41 because it is also relevant for continuous dyeing and expand it as follows because it is too restrictive: "dye profiles and chemical additions are optimised and controlled, i.e. amounts of dye and chemical, temperatures and pH control to the material being dyed." (UK 41). **Technique c.** • Delete technique c. because there is no known application (DE 237). • Delete technique c. because it is in contradiction with BAT 40f (EURATEX 69). • Add that the applicability of this technique is restricted by the characteristics of the textile materials and/or product specifications (IT 32). • Move technique c. as worded to BAT 40 and expand technique BAT 39c. as follows: "Unfixed dye removal is optimised to reduce water and surfactant use while maintaining the required fastness specifications" (UK 41).
EIPPCB assessment:	**Technique a.** • Section 4.5.1.1 of D1 mentions that pre-reduced liquid sulphur dyes without dispersing agents are provided for all kinds of fabric. Nothing similar is mentioned for other types of dyes. After further investigation, no clear evidence has been found that dispersant-free dyes were used on an industrial scale, for any type of dyes. • The selection of dyes is already addressed in BAT 13 as all other process chemicals. • According to Section 8.6.3 of D1, dispersing agents are contained in vat, sulphur and disperse dyes and may be added in other classes of dyes. The technique therefore fits better in BAT 39 which concerns all types of dyes than in BAT 42 which concerns only disperse dyes. **Technique a1.** • New information was submitted to EIPPCB by the TWG (supporting document to comment DE 408). The technique promotes dyeing with levelling agents from recycled vegetable oil. These agents can be used in batch or continuous processes. **Technique b.** • This technique is used for fibres with zwitterionic behaviour such as wool, polyamide, silk, etc. Section 4.5.1.5 of D1 does not contain specific information about the pH selection for wool dyeing and no information has been made available about this. Moreover, the technique does not concern the selection of pH as such but

	describes the principle of controlling the dyeing process by progressively lowering the pH. • pH is indeed not the only parameter to be controlled for dyeing. Amounts of dye and auxiliary chemicals, temperature and amount of textile materials are also important parameters that need to be controlled and monitored. This is covered by BAT 3. BAT 39 does not refer to the monitoring and control of dyeing parameters in general but to a specific technique, only applicable to textile material with zwitterionic characteristics, which consists of keeping the temperature constant and changing the pH instead of keeping the pH stable and changing the temperature, which allows energy savings. It is not clear whether this technique can be used for continuous dyeing. **<u>Technique c.</u>** • Technique c. has been reported by Plants IT089 and IT090. • Both BAT 39 and BAT 40 state that BAT is to use one or a combination of the techniques described in these BAT. It means that technique BAT 39c and BAT 40f are not necessarily used at the same time. Moreover, deleting technique BAT 39c would result in a loss of information as it does not concern only dyeing of cellulosic materials (which is the case of BAT 40). • It is not clear which characteristics of the textile materials and/or product specifications may limit the applicability of this technique. • The optimised removal of unfixed dyestuff does not concern only dyeing of cellulosic fibres and seems therefore better placed in BAT 39 than in BAT 40. • Concerning the proposed wording, the objective of the technique is indeed to have an optimal removal of unfixed dyestuff, in the sense that it reduces water and surfactant use while maintaining the required fastness specifications. However this does not describe the technique, i.e. how it is done.
EIPPCB proposal:	• To remove the reference to dispersant-free dyes from the description of technique a. • To add new technique a1 on dyeing with levelling agents made from recycled vegetable oil.

Location in D1:	**P. 748 – Section 5.5 – BAT 40**
Current text in D1:	**BAT 40. In order to use resources efficiently and to reduce emissions to water from the dyeing of cellulosic materials, BAT is to use one or a combination of the techniques given below.**

	Technique	Description	Applicability
	Technique for dyeing with sulphur dyes		
a.	Minimised use of sulphur-based reducing agents	Dyeing is carried out without sodium sulphide or hydrosulphite as reducing agents. Where this is not possible, partially chemically pre-reduced dyes (e.g. indigo dyes) are used so that less sodium sulphide or hydrosulphite is added for dyeing.	The applicability may be restricted by product specifications
	Technique for continuous dyeing with vat dyes		
b.	Selection of vat dyes	Vat dyes are selected to enable dyeing without subsequent steaming, oxidising and washing.	May not be applicable to dyeing with dark shades
	Techniques for dyeing with reactive dyes		
c.	Use of high-fixation reactive dyes	Use of poly-functional reactive dyes with more than one reactive functional group.	Generally applicable
d.	Use of cationic cotton	Dyeing is carried out on cationic cotton, which does not require the use of salts.	

	e.	Cold pad-batch dyeing	Dyeing is carried out with the cold pad-batch technique (see Section 5.9.4).	Only applicable to new plants or major plant upgrades
	f.	Optimised rinsing	Rinsing after dyeing with reactive dyes is carried out at a high temperature (e.g. up to 95 °C) and without using detergents. The heat of the rinsing water is recovered (see BAT 10 f).	Generally applicable
	Techniques for continuous dyeing with reactive dyes			
	g.	Use of concentrated alkali solution	In cold pad-batch dyeing (see Section 5.9.4.), concentrated aqueous alkali solutions without sodium silicate are used for the fixation of dyes.	May not be applicable to dyeing with dark shades
	h.	Steam fixation of reactive dyes	The reactive dyes are fixed with steam, which avoids the use of chemicals for fixation.	The applicability may be restricted by the characteristics of the textile materials and by product specifications

Summary of comments:

Technique a.

- Change the applicability restriction to "generally applicable" as the only restriction mentioned in Chapter 4 of D1 is that some colours may not be available. The restriction based on product specifications is too wide (EEB 111).
- Make reference to sulphur and vat dyes (as should Section 4.5.2.1 of D1) to put this technique into context. In addition, specify the use of alternative reducing agents as given in Section 4.5.2.1 especially the use of glucose which has been widely adopted (UK 42).

Technique b.

- Delete technique b. because vat dyeing cannot be carried out without steaming and oxidising (DE 322, EURATEX 124).

Technique c.

- Change the applicability of the technique to reflect that it may be restricted by the characteristics of the textile materials and/or product specifications (IT 33, UK 42).
- Mention that the degree of fixation not only depends on the number of reactive groups but also on the affinity and build-up behaviour of a dye molecule (DE 322).

Technique d.

- Delete technique d. because the chemicals to produce cationic cotton are carcinogenic and skin-sensitive (DE 239, DE 322).
- Change the applicability of the technique to reflect that it may be restricted by the product specifications (EURATEX 68) and/or characteristics of the textile materials (UK 42).

Technique e.

- Delete technique e. because it does not have added value: cold pad-batch is one of the most simple applications and is widely used (DE 322).

Technique f.

- Change the applicability of the technique to reflect that it may be restricted by the characteristics of the textile materials and/or product specifications (IT 34).
- Change the applicability of the technique to new plants or major plant upgrades and if it is economically feasible. Indeed the thermal energy needs to be sufficiently high for recovery and there needs to be a use for the recovered heat (EURATEX 70).
- Combine technique f. with BAT 39c. as they are both about the same technique but cover different aspects (UK 42).
- In view of energy use, this BAT is questionable. There are new generation dyes available which offer the opportunity to wash off at lower temperature, with less

	water and reduced washing off agents (DE 322). **Technique g.** • There are different application processes: processes with no sodium silicate (processes using caustic soda or a combination of caustic soda and soda ash) are more popular (DE 322). **Technique h.** • Specify the applicability restrictions with information from Chapter 4 of D1 as it is too vague (EEB 112). • Pad steam dyeing is a normal application process (DE 322).
EIPPCB assessment:	**Technique a.** • Section 4.5.2.1 of D1 explains that the use of alternative reducing agents may lead to differences of shade compared to common sulphur dyeing. The shade required by the product specifications may therefore limit the applicability of this technique and this could be reflected in the BAT conclusions. • Section 2.7.3.3 of D1 mentions that the reducing agents used for vat dyes are mainly hydrosulphite and sulphoxylic acid derivatives (zinc sulphoxylate), the latter being used when the pad-steam process is applied. It is mentioned that sulphur-free organic reducing agents such as hydroxyacetone are also available for some applications. • According to Section 9.1 of D1, indigo dyes are a kind of vat dye. **Technique b.** • Section 4.5.1.2. of D1 mentions that in some cases vat dyeing can be carried out without steaming and subsequent washing (pad-dry process). No comments were made on Section 4.5.1.2 and it is not clear why this technique is not feasible. Furthermore, no conclusion was taken at the Kick-off meeting to remove this technique. • This technique was reported by plant PT 105. **Technique c.** • Concerning the applicability of this technique, the comments are not specific as to which textile materials and/or product specifications would limit its applicability. • The degree of fixation of a dye depends indeed on its substantivity for the fibre. Technique c however is specific to use of polyfunctional reactive dyes, not to the high-fixation dyes in general, which could be clarified in the name of the technique. **Technique d.** • It is not clear which product specifications or textile materials may limit the use of cationic cotton. • According to one comment received on Section 4.1.5.3.2 of D1, cationisation solution is produced and distributed by INOTEX (CZ). Cationisation is therefore a technique which is used. • The cationisation agent is 3-chloro-2-hydroxypropyltrimethylammonium chloride (CHPTAC) which is suspected to be carcinogenic. In the waste water from the cationisation process, CHPTAC goes through an intermediate reactive stage and forms 2,3-epoxypropyltrimethylammonium chloride (EPTAC), which is carcinogenic and a skin sensitiser. Section 4.1.5.3.2 of D1 mentions alternative eco-friendly substances to CHPTAC based on chitosan but these are still under development. **Technique e.** • A total of 7 of the 105 plants from the data collection have reported using cold pad-batch dyeing (DE026, IT059, IT064, IT065, IT068, IT094 and PT114). This shows that, although well-known, this technique is not overwhelmingly used. **Technique f.** • It is not clear which product specifications or textile materials may limit the applicability of this technique. • BAT 39c and BAT 40f present two options for optimal rinsing, which are not necessarily carried out at the same time. In that sense, both techniques could be merged. However, BAT 39c is relevant for all types of dyes while BAT 40f concerns only reactive dyes; it seems therefore clearer to keep them separated.

	• No information has been provided about the new generation of dyes which offer the opportunity to wash off at lower temperature, with less water and reduced washing off agents. **<u>Technique g.</u>** • It is not clear what changes are proposed by the comment. **<u>Technique h.</u>** • Section 4.5.2.6 of D1 mentions that this technique is not applicable, for example, for high-grade dyeing of PES/CO working clothes, which could usefully specify the applicability restriction. • Concerning pad-steam dyeing, it is indeed a current process but it is not clear what changes are proposed by the comment.
EIPPCB proposal:	• To extend the relevance of technique a to vat dyes. • To specify the applicability restriction of technique a. • To clarify that technique c is about the use of polyfunctional reactive dyes. • To delete technique d. • To specify the applicability restriction of technique h.

<table>
<tr><td>Location in D1:</td><td>P. 749 – Section 5.5 – BAT 41</td></tr>
<tr><td>Current text in D1:</td><td>
BAT 41. In order to reduce emissions to water from the dyeing of wool, BAT is to use one of the techniques given below in the following order of priority.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Chromium-free dyeing</td><td>Wool dyeing is carried out with reactive or acid dyes.</td><td>The applicability may be restricted by product specifications</td></tr>
<tr><td>b.</td><td>Optimised metal-complex dyeing</td><td>Dyeing is carried out with metal-complex dyes under optimised conditions in terms of pH, auxiliaries and acid used, in order to increase the exhaustion of the dyeing liquor and the fixation of the dyes.</td><td>The applicability may be restricted by product specifications</td></tr>
<tr><td>c.</td><td>Minimised use of chromates</td><td>When the use of chromates is authorised, chromates are dosed as a function of the amount of dye taken up by the wool. Dyeing parameters (e.g. pH and temperature of the dyeing liquor) are optimised to ensure that the dyeing liquor is exhausted as much as possible.</td><td>Generally applicable</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td>
<u>Technique a.</u>

Specify and justify the applicability restriction, considering the technical information given in Chapter 4 of D1 or, if not possible, delete the applicability restriction (EEB 100, EEB 113).
Specify the applicability restriction as follows: “the applicability may be restricted by product specifications, e.g. where black or very dark shades are essential and cannot be produced by other reactive or acid dyes.” Indeed chromium-free dyeing should be widely practised by now across the wool industry and any continuing use should require detailed justification (UK 43).
Specify the content below which a dye would be chromium-free (0.1 %/kg in dye) and quote the relevant standard as chemical analytical methods are limited by their limit of detection and limit of quantification (CEFIC 16).

<u>Technique b.</u>

Change the applicability restriction to generally applicable because no technically meaningful explanation for possible restriction is given in Section 4.5.3.2 of D1 (EEB 114).

<u>Technique c.</u>

Delete technique c. because the use of chromates is not BAT and chromates can always be substituted (there are chromium-free alternatives for wool and PA dyeing) (DE 323).
Replace “chromates” with “dichromates”, which is technically the correct term (EURATEX 71).

</td></tr>
<tr><td>EIPPCB assessment:</td><td>
<u>Technique a.</u>

According to Section 4.5.3.1 of D1, the use of technique a may be limited by the required fastness and shade, which could usefully specify the applicability restriction.
The BAT statement is clear about the order of priority of the three techniques: technique a is prioritised over the other two except when product specifications (e.g. fastness or shade) limit its application.
The wording “chromium-free” does not refer to the absence of chromium as an impurity but to the use of dyes with formulations which are not based on chromium, i.e. not metal-complex or do not require chromium mordant i.e. chrome dyes. Some reactive dyes do not require chromium mordant as is reflected by the description of the technique but could be clarified in the technique name.

<u>Technique b.</u>

Metal-complex dyes are brighter than chrome dyes but duller than acid dyes; therefore metal-complex dyes may not be applicable when very dark shades are

</td></tr>
</table>

	needed. **<u>Technique c.</u>** • Technique c is not about the use of dichromates but about the minimised use of dichromates when this use has been authorised as per Article 60 of the REACH Regulation. • The analysis of alternatives to the use of dichromates is part of the authorisation procedure (see Article 62 of the REACH Regulation) and is done on a case-by-case basis. • Sodium or potassium dichromate is used for chrome dyeing, which could be better reflected in technique description.
EIPPCB proposal:	• To specify the applicability restriction of technique a and modify the technique name. • To specify the applicability restriction of technique b. • To change the wording of technique c to reflect the use of dichromates.

Location in D1:	**P. 749 – Section 5.5 – BAT 42**
Current text in D1:	**BAT 42. In order to reduce emissions to water from the dyeing of polyester with disperse dyes, BAT is to use one or a combination of the techniques given below.**

	Technique	Description	Applicability
a.	Batch dyeing without dyestuff carriers	Batch dyeing of polyester and wool-free polyester blends is carried out at high temperature (e.g. 130 °C) without the use of dyestuff carriers.	Generally applicable
b.	Optimised use of dyestuff carriers in batch dyeing	Batch dyeing of polyester-wool blends is carried out with chlorine-free and biodegradable dyestuff carriers.	
c.	Optimised desorption of unfixed dye in batch dyeing	This includes: • using a desorption accelerator based on carboxylic acid derivatives; • using a reducing agent that can be used in the acidic conditions of the spent dyeing liquor; • using disperse dyes that can be desorbed in alkaline conditions by hydrolysis instead of reduction.	The use of a reducing agent that can be used in acidic conditions may not be applicable to polyester-elastane blends. The use of dyes desorbable in alkaline conditions may be restricted by product specifications
d.	Supercritical CO_2 dyeing	Supercritical CO_2 is used as a dyeing medium instead of water in a closed loop process to transport disperse dye into the polyester fibres.	Only applicable to new plants or major plant upgrades

Summary of comments:	**<u>Technique b.</u>** • Mention that technique b. is only relevant for PES-wool blends or alternatively that the applicability is restricted by product specifications (EURATEX 87). **<u>Technique c.</u>** • Specify the wording of the applicability restriction under alkaline conditions in line with the information given in Section 4.5.4.2 of D1, as it is too vague (EEB 115). • To improve clarity, make the following changes: o change the technique name to: "Optimised reduction of unfixed dye in batch dyeing"; o change first line of description of technique to read: "This includes: using a reducing agent";

	○ change the last sentence of the applicability to read: "The use of alkali reducable disperse dyes may be restricted by product specification." (UK 44). **<u>Technique d.</u>** • Delete technique d. because this technique is not used in Europe (only one site in Thailand uses it). In addition, there are concerns in terms of costs, security due to high pressure, energy consumption, result of the dyeing process and emissions of CO_2 to air (AT 44, FR_A 36, CZ_B 14, EURATEX 125).
EIPPCB assessment:	**<u>Technique b.</u>** • The relevance of technique to PES-wool blends is already mentioned in the description. • The name of the technique could reflect the concern to use the environmentally friendly carriers. **<u>Technique c.</u>** • Section 4.4.4.2 of D1 mentions that dyes that are desorbable in alkaline conditions do not cover all shades and that it may not be applicable for disperse dyes with very high fastness requirements. This could usefully specify the applicability restriction. • Technique c is not only about the reduction of unfixed dye but also about the desorption of the dye which can be done without reduction (see the third bullet point). • The use of reducing agents is mentioned in the second bullet point. **<u>Technique d.</u>** • According to Section 2.3.7.2.9 of the BREF Guidance (Commission Implementing Decision 2012/119/EU), an example plant can be located in the EU or the rest of the world. Not having an example plant in the EU does therefore not impede the derivation of BAT. However, in the present case, it has limited the available information. • Concerning the costs, Section 4.5.4.3 of D1 mentions lower operational costs than conventional dyeing but high investment costs. No information is available about the investment costs. • Concerning the energy consumption, Section 4.5.4.3 od D1 mentions that it is 20-50 % lower compared to other water-based dyeing. • No information has been made available about safety issues or the efficiency of the CO_2-based dyeing process. • Concerning CO_2 emissions, Section 4.5.4.3 of D1 mentions that 5 % of the CO_2 is not recovered and is therefore emitted. This does not bring useful information about the environmental impact of this technique as it would be necessary to compare these emissions with the CO_2 emitted from the combustion plant which generates heat for a water-based process (and expressed for example in kg of CO_2 per kg of textiles treated).
EIPPCB proposal:	• To specify the type of cariers to be used in the name of technique b • To specify the applicability restriction of technique c. • To delete technique d. • To add the research of information about the supercritical CO_2 dyeing in the "Recommendations for future work" in Chapter 7 of the BREF.

1.9 BAT conclusions for finishing

1.9.1 Finishing with flame-retardants

<table>
<tr><td>Location in D1:</td><td>P. 752– Section 5.7.3 – BAT 49</td></tr>
<tr><td>Current text in D1:</td><td>
BAT 49. In order to improve the overall environmental performance of finishing with flame retardants, BAT is to use one or both of the techniques given below, giving priority to technique a.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Use of textiles with inherent flame retardance properties</td><td>Textiles are used that do not require finishing with flame retardants.</td><td>The applicability may be restricted by product specifications</td></tr>
<tr><td>b.</td><td>Selection of flame retardants</td><td>Flame retardants are selected by considering:
the risks associated with them (see BAT 13 v), in particular in terms of persistence and toxicity;
the composition and form of the textile materials to be treated;
the product specifications.</td><td>Generally applicable</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td>
<u>BAT statement</u>

Justify the priority of technique a. over technique b., as textiles with inherent flame retardance properties do not necessarily have less impact on the environment at global level (more chemicals are used in the fibre prior to the weaving or the knitting), they are more expensive and need to be imported (EURATEX 91).

<u>Technique a.</u>

Change the description as follows: “(…) that require a lesser amount of flame retardants for finishing” because a treatment is still needed to reach an equivalent level of performance (FR_A 59).
Change the description as follows: “use of fibres with inherent flame retardance properties including where this is achieved by combination with flame retardant polymers or by integrating durable flame retardants into the fibre, e.g. by spin doping”. This is to avoid a too narrow understanding of the technique (CEFIC 59).
Add in the applicability restriction safety considerations and costs because the text proposed in D1 is not specific enough (UK 46).
Change the applicability to generally applicable as it is obvious that technique a. applies only if such a textile exists for a given application. On the other hand, it is important that such textiles are used where they do exist. This has to remain clear in this BAT (EEB 116).

<u>Technique b.</u>

Replace the word “risks associated” with “risks and hazards associated” because risk assessment is difficult to carry out and may exceed many companies' (eco)toxicological expertise. In addition, a risk is not associated with a substance alone, but also with its use and with exposure. Finally, the IED requires substitution of chemicals on the basis of their hazard profile, not associated risks (EEB 117).
Remove the word “persistence” from the technique description because chemical stability is an important property of flame retardants (for product processing and flame retardancy) (CEFIC 36).
Organophosphorus does not need to be taken into account when evaluating the phosphorus content of waste water because organophosphorus compounds used for fire retardant treatment are persistent but not bioaccumulative or toxic and they do not contribute to the eutrophication of surface water (EURATEX 74, EURATEX 127).
Add durability as a characteristic to consider in the selection of flame retardants, both in order to ensure lasting fire safety, and because this means that loss of the flame

</td></tr>
</table>

	retardant into the environment is reduced (CEFIC 60). • Replace the words "product specifications" with "technical performance requirements, taking into account legal obligations and restrictions", which is less vague (EEB 117). • Change the applicability restriction to underline that the applicability may be restricted by product specifications defined, e.g. by standards or other regulatory requirements (EURATEX 91, EURATEX 127).
EIPPCB assessment:	**BAT statement** • The production of textiles with inherent flame retardance properties is not in the scope of the TXT BAT conclusions as it relates to a chemical process (manufacturing of some man-made fibres are described in the POL BREF). The environmental impact of this production may be addressed in the CWW BREF and WGC BREF for emissions to water and emissions to air respectively, while the environmental impact of finishing with flame retardants is addressed in the TXT BREF. From the point of view of the finishing with flame retardants, the environmental impact will be lessened by using technique a. rather than technique b. • Concerning the costs, no information has been made available about the costs of textiles with inherent flame retardance properties and about their comparative costs with the use of flame retardants. • Concerning the import of such textiles into the EU, this issue is not in the remit of BAT conclusions. **Technique a.** • Technique a. is about the use of textiles that do not require finishing with flame retardants. If flame retardants are needed to satisfy product specifications, even to a lesser extent, technique b is used. • The manufacturing of man-made fibres with inherent flame retardance properties is not in the scope of the BAT conclusions. Giving more details about how this is done seems therefore unnecessary. Some information may be found however in Section 4.1.5.3.3 of D1. • No information has been made available about the costs of textiles with inherent flame retardance properties and about their comparative costs with the use of flame retardants. • One of main drivers in the selection of a solution for flame retardance is of course the specifications in terms of fire resistance. If textiles with inherent flame retardance properties do not allow compliance with the fire-resistance standards requested by the customers, the use of flame retardants may be needed. This could be clarified in the applicability restriction. • It is indeed clear that not all applications authorise the use of textiles with inherent flame retardance properties. If the applicability restriction were to be changed to generally applicable, this clarity would be lost. In addition, considering the order of priority given in the BAT statement, technique b. would no longer be needed. • When a textile with inherent flame retardance properties is available for a given application, the priority is given to this solution by the BAT statement. **Technique b.** • The risk is characterised as explained in point V of BAT 13, which is cross-referenced in the description of technique b. It is proposed to change the wording of point V (see the assessment of BAT 13 in Section 1.4.5.1) and, following this new wording, no changes seem necessary in technique b of BAT 49. • Chemical stability is indeed a characteristic which may be wanted for the production of flame retardants. However, a substance which is chemically stable will also be persistent in the environment and this is an element which needs to be considered for the characterisation of the risks associated with this substance. • Concerning the comments about organophosphorus, they are not clear as to what exactly needs to be changed in technique b. • Durability for washing is an important criteria of technical performance for the fire retardants, in addition to the fire resistance, and could usefully be mentioned as an example of product specifications. • The technical performance of the fire retardants needs of course to consider the existing regulations but mentioning this does not seem necessary. • Technique b is about the selection of flame retardants. This selection is guided by the

	elements mentioned in the description of technique b, including the product specifications. However, the principle of selection is not restricted by the product specifications: it is always possible to select a flame retardant.
EIPPCB proposal:	• To specify the applicability restriction of technique a. • To specify the product specifications mentioned in the third bullet point of the description of technique b.

1.9.2 Finishing with oil-, water- and soil-repellents

Location in D1:	**P. 753– Section 5.7.4 – BAT 50**
Current text in D1:	**BAT 50. In order to improve the overall environmental performance of finishing with oil-, water- and soil-repellents, BAT is to use oil-, water- and soil-repellents with improved environmental performance.** **Description** Oil-, water- and soil-repellents are selected by considering: • the risks associated with them (see BAT 13), in particular in terms of persistence and toxicity; • the composition and form of the textile materials to be treated; • the product specifications.
Summary of comments:	• Add a bullet point: "Fluorinated compounds are only used in production of workwear and protective clothing" in order to clarify when fluorinated compounds have to be used and when they are not needed (SE 35). • Add a bullet point: "For textiles requiring only a water-repellent finish, use fluorine-free compounds" in order to decrease the emissions of fluorine compounds (SE 36). • Add the term "waterproofing" in the statement and/or the description of BAT 50 for reasons of consistency as this term is used in the scope and in the cross-reference between STS and TXT (AT 32). • Replace "product specifications" with "the need for combined water- and oil-repellence in applications for PPE (personal protective equipment)" because the term used in D1 is too vague (EEB 118).

EIPPCB assessment:	• BAT 50 gives the principle of selection of the oil-, water- and soil-repellents and follows exactly the same structure as BAT 49b for the flame retardants. These two BAT do not name substances (such as fluorinated compounds) to be used or not to be used for two reasons:
	  ○ Such substances may already be addressed by other regulations (for example the REACH or POPs Regulations) and in that case there would be no added value in mentioning them in the BAT conclusions.
	  ○ Some substances may not be addressed by other regulations but their regulatory status may change over the lifetime of the BAT conclusions and thus may render the BAT conclusions obsolete or even in contradiction with other regulations.
	• Waterproofing of textiles is given as an example in the definition of finishing and it is therefore clear that it is covered by these BAT conclusions. This is further highlighted in BAT 50 by the wording "finishing with water repellents".
	• The need for combined water- and oil-repellence is mentioned in Section 4.7.5 of D1 as a case where fluorine-based water-repellents may need to be used and could be added as an example of product specifications.

EIPPCB proposal:	• To add an example of product specifications in the description.

1.9.3 Shrink-proof finishing of wool

Location in D1:	**P. 753– Section 5.7.5 – BAT 51**
Current text in D1:	**BAT 51. In order to reduce emissions to water from shrink-proof finishing of wool, BAT is to use chlorine-free antifelting.** **Description** Inorganic salts of peroxymonosulphuric acid are used for shrink-proof finishing of wool.
Summary of comments:	• Add that the applicability may be restricted by product specifications as this process does not always allow to reach the required technical and qualitative characteristics (IT 37). • Define a threshold for chlorine concentration (< 0.1 %/kg) and mention the analytic method for determination of the content. It is not possible to measure a value of zero; chemical analytical methods are limited by their limit of detection and limit of quantification (CEFIC 17).
EIPPCB assessment:	• Based on the information given by CZ, the shrinkage performance of wool treated with the chlorine-free antifelting process may be affected after washings, which is an undesired effect under the Woolmark quality standard. It would make sense to consider it in the applicability. • The term "chlorine-free" does not refer to the absence of chlorine impurities in the product chemicals but to the fact that the active substance of the anti-felting solution is not based on chlorine.
EIPPCB proposal:	• To modify the applicability.

1.9.4 Mothproofing

Location in D1:	**P. 753– Section 5.7.6 – BAT 52**
Current text in D1:	**BAT 52. In order to reduce the consumption of mothproofing agents, BAT is to use one or a combination of the techniques given below.**

	Technique	Description	Applicability
a.	Selection of dyeing auxiliaries	When mothproofing agents are added directly in the dyeing liquor, dyeing auxiliaries (e.g. levelling agents) that do not hinder the uptake of mothproofing agents are selected.	Generally applicable
b.	Mothproofing in acidic conditions	Mothproofing agents are added in acidic conditions to improve their uptake, either directly in the exhausted dyeing liquor or in a separate step.	The applicability may be restricted by product specifications
c.	Blending of treated and untreated loose fibres	A fraction of the fibres (e.g. 5–20 % of the total blend weight) is treated with an excess amount of mothproofing agents and subsequently blended with untreated fibres.	Only applicable to new plants or major plant upgrades
d.	Low-volume application of mothproofing agents	See Section 5.9.4. In the case of spraying, the excess mothproofing solution is recovered from the textile materials by centrifugation and reused.	Generally applicable

Summary	**General comment**

of comments:	• Add the waste water treatment techniques listed in Section 4.7.7.3.1 of D1 and used in order to prevent and reduce emissions of mothproofing agents to water (UK 47). **Technique b.** • Replace the applicability of technique b. with "Generally applicable". The term "Products specification" is vague and not justified by the text in Sections 4.7.7.1 and 4.7.7.2 of D1 (EEB 119). **Technique d.** • Delete "by centrifugation" in technique d. since centrifugation is not generally applicable (EURATEX 75).
EIPPCB assessment:	**General comment** • It is not clear which waste water treatment techniques are referred to. In any case, the type of mothproofing agents need to be considered for the WWTP management, as it is mentioned in BAT 18 and BAT 19 to establish what is relevant (e.g. adsorption). **Technique b.** • According to Section 4.7.7.3.1 of D1, it is reported that the use of this technique may affect the quality of the product. However, this is based on a comment from the existing TXT BREF, which is not recent. Considering that only 3 plants have reported finishing/mothproofing activities in the data collection (BE014, DE026, DE045), without referring to the use of technique (b) or (c), and considering the lack of the evidence on their use (the discussions during the 2nd data workshop and the information provided by industry), it seems that techniques (b) and (c) are no longer applied. Therefore, it is proposed to remove techniques (b) and (c). **Technique d.** • No information has been made available as to why centrifugation is not generally applicable.
EIPPCB proposal:	• To delete techniques (b) and (c).

2 ITEMS CONSIDERED TO BE LARGELY AGREED AND NOT REQUIRING DISCUSSION AT THE FINAL TXT TWG MEETING

2.1 Entire BAT conclusions

Location in D1:	**P. 713 – Chapter 5**
Current text in D1:	Entire Chapter 5.
Summary of comments:	• There is a lack of consistency between the Industrial Emissions Directive (IED) and the regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Indeed, in the IED, emissions are defined as the direct or indirect release of substances, vibrations, heat or noise from individual or diffuse sources in the installation into air, water or land whereas in REACH risks are defined as a function of hazards and exposure. This means hazardous substances can be handled in unlimited amounts as long as no relevant exposure in the environment can be detected (CEFIC 2). • Shorten the list of techniques to just include the major ones with proven environmental impact and proven applicability. Indeed, BAT conclusions should focus on the most relevant techniques which makes a difference. A too detailed presentation of techniques creates an additional burden both for authorities and operators to justify whether a measure has not been implemented. The level of detail for many techniques and measures in D1 exceeds by far what is considered as necessary and appropriate. In addition, a number of BATs might contradict each other, are common practice (e.g. pH control), are just dyeing processes without any reference to a specific BAT (e.g. cold pad-batch dyeing), are not applicable at all (e.g. vat dyeing without steaming), are wrong interpretations of BAT candidates in Chapter 4 (e.g. printing carried out without urea) (DE 396). • Specify the techniques called "optimised process" (or using similar expressions). The added value of the BAT conclusions would be higher if there was a common picture in Europe on what "optimised processes" are. In the descriptions of the BAT conclusions there are examples of those processes, but the relevance of the descriptions is quite low in comparison with the technique itself (DE 396). • These comments refer especially to BAT 9, BAT 10, BAT 12, BAT 15, BAT 34, BAT 39, BAT 40, BAT 42, BAT 44, BAT 45 and BAT 52 (DE 396).
EIPPCB assessment:	• Concerning the interface between the IED and REACH, the comment is not clear as to what should be changed in the BAT conclusions. Moreover, the BAT conclusions cannot give an interpretation of legislative or regulatory text. • Concerning the other comments, please refer to the sections about the BAT conclusions concerned.
EIPPCB proposal:	• No change.

2.2 Acronyms

<table>
<tr><td>Location in D1:</td><td>P. 716 – Chapter 5</td></tr>
<tr><td>Current text in D1:</td><td>For the purposes of these BAT conclusions, the following acronyms apply:
<table><tr><th>Acronym</th><th>Definition</th></tr><tr><td>CMS</td><td>Chemicals management system</td></tr><tr><td>DTPA</td><td>Diethylenetriaminepentaacetic acid</td></tr><tr><td>EDTA</td><td>Ethylenediaminetetraacetic acid</td></tr><tr><td>EMS</td><td>Environmental management system</td></tr><tr><td>ESP</td><td>Electrostatic precipitator</td></tr><tr><td>NTA</td><td>Nitrilotriacetic acid</td></tr></table></td></tr>
<tr><td>Summary of comments:</td><td>• Add the explanation of “<Y” as the limit of quantification for the method used, sampling time and substance as per the definition of Commission Implementing Decision 2012/119/EU (CEFIC 3).</td></tr>
<tr><td>EIPPCB assessment:</td><td>• According to Commission Implementing Decision 2012/119/EU, it is acceptable to use an expression of the type ‘< X to Y’ where the lower end of the range cannot be accurately defined, e.g. when the data reported in the information exchange is close to the detection limit. As this explanation is given in this text, it does not seem necessary to repeat it in the BAT conclusions, which is also in line with other recently published BAT conclusions.</td></tr>
<tr><td>EIPPCB proposal:</td><td>• No change.</td></tr>
</table>

2.3 General considerations

2.3.1 Best Available Techniques

Location in D1:	**P. 717 – Chapter 5**
Current text in D1:	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.
Summary of comments:	• Be more specific in the second paragraph by mentioning that the BAT conclusions are generally applicable unless the applicability is restricted by product specifications (EURATEX 141).
EIPPCB assessment:	• The text addressed by the comment is a standard text which appears in all recently published BAT conclusions and meaning that when a technique is not generally applicable, this is specified together with the technique. It is not clear why the applicability of all the BAT in these BAT conclusions would be restricted by product specifications.
EIPPCB proposal:	• No change.

2.4 General BAT conclusions

Location in D1:	**P. 720 – Section 5.1.**
Current text in D1:	Entire Section 5.1.
Summary of comments:	• This section contains clear and unequivocal BATs; however, the references to specific sections of D1 could be clarified (EEB 151).
EIPPCB assessment:	• The cross-references to other parts of D1 are provided in order to aid the work of the TWG and will not be included in the final BAT conclusions themselves, which are a stand-alone document.
EIPPCB proposal:	• No change.

2.4.1 Overall environmental performance

Location in D1:	**P. 720 – Section 5.1.1**
Current text in D1:	Entire Section 5.1.1.
Summary of comments:	• In order to improve the implementation, name as precisely as possible applicability and limitation of techniques (DE 386). • Justify the use of the wording "generally applicable", especially in cases where BAT is to use all techniques "given below" (DE 386).
EIPPCB assessment:	• Unless otherwise stated, techniques mentioned in the BAT conclusions are generally applicable for the activity concerned. Where there are restrictions on applicability for a certain technique, this is explicitly mentioned and based on the information included in the chapter of the BREF entitled 'Techniques to consider in the determination of BAT'.
EIPPCB proposal:	• No change.

2.4.1.1 Techniques for improving the overall environmental performance

Location in D1:	**P. 720 – Section 5.1.1 – BAT 1**
Current text in D1:	**BAT 1. In order to improve the overall environmental performance, BAT is to elaborate and implement an environmental management system (EMS) that incorporates all of the following features:** i. commitment, leadership, and accountability of the management, including senior management, to the implementation of an effective EMS; ii. an analysis that includes the determination of the organisation's context, the identification of the needs and expectations of interested parties, the identification of characteristics of the installation that are associated with possible risks for the environment (or human health) as well as of the applicable legal requirements relating to the environment; iii. development of an environmental policy that includes the continuous improvement of the environmental performance of the installation; iv. establishing objectives and performance indicators in relation to significant environmental aspects, including safeguarding compliance with applicable legal requirements; v. planning, and implementing the necessary procedures and actions (including corrective and preventive actions where needed), to achieve the environmental

	objectives and avoid environmental risks; vi. determination of structures, roles and responsibilities in relation to environmental aspects and objectives and provision of the financial and human resources needed; vii. ensuring the necessary competence and awareness of staff whose work may affect the environmental performance of the installation (e.g. by providing information and training); viii. internal and external communication; ix. fostering employee involvement in good environmental management practices; x. establishing and maintaining a management manual and written procedures to control activities with significant environmental impact as well as relevant records; xi. effective operational planning and process control; xii. implementation of appropriate maintenance programmes; xiii. emergency preparedness and response protocols, including the prevention and/or mitigation of the adverse (environmental) impacts of emergency situations; xiv. when (re)designing a (new) installation or a part thereof, consideration of its environmental impacts throughout its life, which includes construction, maintenance, operation and decommissioning; xv. implementation of a monitoring and measurement programme; if necessary, information can be found in the Reference Report on Monitoring of Emissions to Air and Water from IED Installations; xvi. application of sectoral benchmarking on a regular basis; xvii. periodic independent (as far as practicable), internal auditing and periodic, independent external auditing in order to assess the environmental performance and to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; xviii. evaluation of causes for nonconformities, implementation of corrective actions in response to nonconformities, review of the effectiveness of corrective actions, and determination of whether similar nonconformities exist or could potentially occur; xix. periodic review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness; xx. following and taking into account the development of cleaner techniques. Specifically for the textile industry, BAT is also to incorporate the following features in the EMS: xxi. an inventory of inputs and outputs (see BAT 2); xxii. a water management plan (see BAT 9); xxiii. an energy efficiency plan (see BAT 10); xxiv. a chemicals management system (see BAT 13); xxv. a waste management plan (see BAT 28). **Note** Regulation (EC) No 1221/2009 establishes the European Union eco-management and audit scheme (EMAS), which is an example of an EMS compliant with this BAT. **Applicability** The level of detail and the degree of formalisation of the EMS will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have.
Summary of comments:	• Add a reference to BAT 4 which also describes techniques for the improvement of the overall environmental performance (DE 62). • Add in the note that other standards (e.g. ISO 50001) are also examples of EMS compliant with BAT 1 (UK 5). • Add that other certified or non-certified systems already used by industry are also examples of EMS compliant with BAT 1 (EURATEX 27).
EIPPCB assessment:	• The points xxi. to xxv. refer to other BAT where management plans are described, in order to highlight that these management plans are integrated into the EMS. They do

	not aim to list all BAT like BAT 3 or BAT 4, the objective of which is to improve the overall environmental performance. • The description of the general EMS features, including the note, is based on standard text agreed at the level of the IED Article 13 Forum and used in recent documents such as the BAT conclusions for CWW, IRPP, NFM, REF and STS. • Due to new BAT on OTNOC a reference to OTNOC management plan should be added.
EIPPCB proposal:	• Add OTNOC management plan to the list of special features

Location in D1:	**P. 722 – Section 5.1.1 – BAT 3**
Current text in D1:	**BAT 3. In order to improve the overall environmental performance, BAT is to use advanced process monitoring and control systems.** **Description** The monitoring and control of processes is carried out with on-line automated systems equipped with sensors and controllers using feedback connections to rapidly analyse and adapt key process parameters to reach optimal process conditions (e.g. optimal uptake of process chemicals). Key process parameters include: • level, pH, temperature and conductivity of the process liquor; • amount of textile materials treated; • dosage of process chemicals; • drying parameters (see also 0 e).
Summary of comments:	**Description** • Specify the parameter "level" or delete it (DE 336). • Delete the parameter "conductivity" which is not a relevant parameter for the textile industry, due to too high concentrations of the inorganic salts meaning that their changes cannot be measured by conductivity (CZ_A 2, CZ_B 82, FR_A 42, EURATEX 5 and EURATEX 29). • Allow flexibility to choose on a case-by-case basis the most suitable set of key parameters to be monitored and controlled for this BAT. Key process parameters to be monitored and controlled might vary according to the type of process/treatment to be performed on the textile materials and related characteristics. (IT 7). **Applicability** • Change the applicability of this BAT to standardised processes in new plants or major upgrades of plants, since compliance may be difficult in particular for existing plants working on commission using lots of recipes or batch-based operations using smaller equipment (FR_A 41, UK 7). • Specify that the advanced process monitoring and control systems apply at a process level or at a specific plant level (UK 7).
EIPPCB assessment:	**Description** • The level refers to the volume of process liquor. • BAT 3 presents standard parameters for general monitoring, to be used as a minimum. According to Section 4.1.1.3 of D1, the monitoring of conductivity is used only for specific process steps such as the rinsing process, so it could be deleted in BAT 3. • Concerning the list of key parameters to be monitored, it is not clear in which case one of these parameters would not be relevant. Of course, if no drying is carried out, obviously no drying parameters are monitored. **Applicability** • BAT 3 mentions the key parameters to be monitored but the way these parameters are monitored (with permanent sensors or not) depends on the local situations (e.g. batch sizes) and it is not clear in which cases such monitoring would not be applicable.

	• As mentioned in the statement of BAT 3, this BAT targets the process monitoring and control.
EIPPCB proposal:	• To replace “level” with “volume” of liquor in the list of parameters. • To delete conductivity.

<table>
<tr><td>Location in D1:</td><td>P. 723 – Section 5.1.1 – BAT 4</td></tr>
<tr><td>Current text in D1:</td><td>
BAT 4. In order to improve the overall environmental performance, BAT is to use both of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Use of textile materials with low contents of contaminants</td><td>Criteria for the selection of incoming textile materials are defined to minimise the content of contaminants including toxic substances, poorly biodegradable substances and substances of very high concern. These criteria may be based on certification schemes or standards.

Controls are carried out to verify that incoming textile materials fulfil the predefined criteria. These controls may consist of measurements and/or verification of information provided by suppliers and/or producers of textile materials.
These controls may address the content of:
ectoparasiticides (veterinary drugs) and biocides in the incoming raw (or semi-processed) wool fibres;
biocides in the incoming cotton fibres;
manufacturing residues in the incoming synthetic fibres (e.g. monomers, side products of polymer synthesis, catalysts, solvents, antistatic agents, lubricants);
mineral oils (e.g. used for coning, spooling, spinning or knitting) in the incoming textile materials;
sizing chemicals in the incoming textile materials.</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Use of textile materials with reduced processing needs</td><td>Use of textile materials with inherent characteristics that reduce the need for processing. These materials may include:
predyed man-made fibres;
cationic cotton;
fibres with inherent flame retardance properties;
elastane fibres or blends of elastane fibres with other polymer fibres that contain reduced amounts of silicone oils and residual solvents;
polyester fibres dyeable without carriers.</td><td>The applicability may be restricted by product specifications</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td><u>Technique a.</u>
Change technique from “Use of textile materials with low contents of contaminants” to "Use of textile materials free of contaminants" because the objective of the technique should be using the input materials without contaminants (EEB 171).
Add that in cases of using the certification schemes criteria for incoming textile material, the compliance with these schemes needs to be verified regularly (ES 22, EURATEX 106).</td></tr>
</table>

	• Give the compliance with RSL (Restricted Substances List) as an example of measurements and/or verification of information provided by suppliers and/or producers of textile materials (EURATEX 30). • The term "hazardous" should be used instead of "toxic" or "very high concern" for substances because it is more in line with the IED (e.g. Art. 3(18)) and its scope (see also comment EEB 86) (EEB 87). • Change "antistatic agents, lubricants" to "(spin) finishes" or "auxiliaries" as those terms are more general (DE 311). • Add a bullet point to state that operators should test for residues that may come from re-processing fabrics and yarns – important due to increasing trends of circular economy (UK 8). • Specify that this technique is not applicable to non-integrated installations (i.e. commission companies) because of the lack of valid information provided by the upstream suppliers (FR_A 61). • Add thresholds under which the contamination in the textile materials is acceptable (e.g. thresholds according to common eco-label standards), to give guidance to the permitting authorities (AT 36). • Add the sentence "Procurement of controlled raw materials from carefully selected suppliers that fulfil environmental performance criteria." (from Section 4.1.5.1 of D1) at the beginning of the description to clarify that technique a. is applicable in particular in the case of vertically integrated installations, where there is the overall control of the textile supply chain, from raw material to the final product (IT 8). **<u>Technique b.</u>** • Use spin-dyed, spun-dyed or dope-dyed instead of the term "predyed". The environmental impact (e.g. emissions) is transferred and not avoided/reduced when "predyeing" is done somewhere else (e.g. outside the EU) (DE 138, FR_A 63, EURATEX 6). • Delete cationic cotton as it is still in the research phase. Also, in the production of cationic cotton several hazardous (CMR) chemicals are used (DE 138, EURATEX 6). • Add synthetic fibres with thermoplastic elastomers as they also have reduced processing needs (DE 138). • Polyester dyeing without carriers in high-temperature (HT) dyeing is already state of the art since many years ago. Consider polyester HT dyeing a standard technique (DE 138). **<u>Applicability</u>** • Specify "product specification" since it would be different for different materials mentioned in technique b. – see the applicability restrictions as described in Section 4.1.5.3 of D1, (see also EEB 100) (DE 121, EEB 105). • Due to possible emissions of contaminants from processing of pre-dyed man-made fibres or fibres with inherent flame retardance properties, add that the applicability may be restricted by the increased risk of leaching of other contaminants (e.g. Nonylphenol/Nonylphenol Ethoxylates (NP/NPEs) or N-Methyl-Pyrrolidone (NMP) can be leached from aramid fibres) (UK 8).
EIPPCB assessment:	**<u>Technique a.</u>** • Contaminants from the upstream growing/processing/production are present on the textile materials, regardless of the fibre type. If not reduced/removed below the acceptable thresholds, they can enter the effluent. The appropriate content thresholds are defined by various certification schemes and standards. "Free" does not seem to be a technically or scientifically accurate (appropriate) expression. The most fitting adjective seems to be "minimised". • The technique consists of carrying out controls of the incoming textile materials. The frequency, scope and details of these controls are left to the implementation (i.e. the operator and competent authority). They may rely on compliance of incoming materials with requirements of certification schemes. These schemes require regular verifications of compliance for the operators participating in them (both suppliers and processors); this could be indicated in the description. • The examples of standards (e.g. RSL) are mentioned in Section 4.1.5.1 of D1. • The term "hazardous" could replace "toxic". The term "hazardous substances" is defined in the IED and the use of the same term in the BAT conclusions would ensure

	consistency and clarity and avoid possible conflicts. The definition of term "substances of very high concern" would be useful to clarity its relation to the chemical regulation. • The term "spin finishes" is too vague; spinning oils are already included under point mineral oils. The term "auxiliaries" is too generic and is, in the most important aspects, covered by the last three bullet points. • Recycled fibre/textile materials could be mentioned as incoming textile materials. • Defining the acceptability thresholds would exceed the scope of the BREF review. Also, this is already done by other schemes or regulatory settings (e.g. Eco-label, OEKO-TEX, bluesign, ZDHC). It would not be appropriate to regulate these thresholds in BAT conclusions (i.e. double regulation should be avoided). The examples of standards are mentioned in Section 4.1.5.1 of D1. • If the information on contaminants is not provided by the upstream supplier of the material, it would be the responsibility of the operator to do the testing and/or removal of contaminants. It is not possible to ascertain that the plants that reported using such selection and control measures are only vertically integrated installations. Information on the degree of their supply chain integration was not collected through the questionnaires. Therefore the technique is deemed applicable to all installations. **Technique b.** • More accurate technical terms referring to fibres dyed during production with techniques other than conventional wet dyeing could be used to avoid confusion. Conventional wet dyeing outside the installation does not reduce the environmental impact. • A life-cycle assessment study comparing the environmental impacts of deep-dyed cotton using the cationisation dyeing procedure with conventionally dyed cotton was considered. No firm conclusion on which dyeing system is more environmentally beneficial was generated. For conventional reactive dyeing, modified reactive dyes with higher fixation rates should be applied to lower the environmental impacts. For cationisation dyeing, the toxicity impacts of cationisation agents remain a major concern. • Blends of synthetic fibres with thermoplastic elastomers could be added as an example of multicomponent polymeric strands. • More techniques on HT dyeing are provided in BAT 42. **Applicability** • The performance achieved by using these fibres may not be of sufficient quality compared to those achieved by conventional wet processing. The product specifications may be the limiting factor in dissemination of this technique. More information can be found in Section 4.1.5.3 of D1. • Textile materials with reduced processing needs should not be contaminated with hazardous substances (like nonylphenol/nonylphenol ethoxylates (NP/NPEs) or N-methyl-pyrrolidone (NMP)) whose leaching may cause severe environmental impacts. The same environmental restrictions as for textile materials with conventional processing needs would apply (e.g. technique a).
EIPPCB proposal:	**Technique a.** • To add/change the adjective in the name of the technique. • To clarify the description to express the regularity of controls. • To replace the terms "toxic" with the term "hazardous" in the description. • To add recycled fibre/textile materials as an incoming textile materials in the description. **Technique b.** • To use the term "spin -dyed" instead of "predyed" in the description. • To delete cationic cotton in the description. • To add "blends of synthetic fibres with thermoplastic elastomers" as an example of fibres. **Definitions** • To add the definition of "substances of very high concern".

2.4.2 Monitoring

Location in D1:	**P. 723 – Section 5.1.2**
Current text in D1:	Entire Section 5.1.2.
Summary of comments:	• Allow the possibility for self-monitoring by the operator (DE 337). • Reduce the monitoring frequency for all parameters, if processes are stable. Increased monitoring does not necessarily lead to less emissions (CEFIC 21).
EIPPCB assessment:	• Determining which laboratory (internal or external) carries out the monitoring and how to guarantee compliance with EN standards are implementation issues. • For the assessment of comments regarding exemptions from the minimum monitoring frequency, see Sections 1.4.2.1 and 1.4.2.2 of this BP for each individual parameter.
EIPPCB proposal:	• See the proposals made for each individual parameter in Sections 1.4.2.1 and 1.4.2.2 of this BP.

2.4.2.1 Monitoring resource consumption, waste generation and material recovery

Location in D1:	**P. 723 – Section 5.1.2- BAT 5**
Current text in D1:	**BAT5. BAT is to monitor at least once every year:** • the annual consumption of water, energy and materials used, including textile materials and process chemicals, • the annual amount of waste water generated, • the annual amount of materials recovered, of waste generated and of waste sent for disposal. **Description** Monitoring includes direct measurements, calculations or recording, e.g. using suitable meters or invoices. The monitoring is broken down to process level and considers any significant changes in the processes.
Summary of comments:	**BAT statement** • Specify that direct measurements is the preferred option for monitoring water consumption (BE 15). • Specify respective amounts and types of waste sent for reuse, recovery of material, recovery of energy, or sent for disposal because not only the waste sent for disposal is important information (SE 6). • Add the annual monitoring of air emissions for each recipe used in textile finishing processes (including thermal treatment) expressed as textile-related emissions factors (DE 414). • Specify that suitable eKPIs (environmental Key performance indicators) are defined based on suitable normalising factors (e.g. process volumes) to determine optimisation potentials (DE 139). **Description** • Specify that "preferably" or if "applicable" or "reasonably" monitoring is broken down to process level and considers any significant changes in the processes. It is not always possible to monitor so precisely, especially when the monitoring via calculation is difficult, or if processes change several times a day (EURATEX 31 and EURATEX 144). **Frequency** • Delete "at least once every year". Monitoring is permanent, and assessment of monitored data is at least once a year (AT 34, DE 139). • Replace monitoring with "record monitoring". Monitoring should be done more frequently with averages recorded over the year (DE 350). • Change the yearly frequency to "at least once a month". Well-managed companies

	which are generally certified ISO 9000 and ISO 14000 monitor such data constantly and assess them at least monthly. (EEB 189).
EIPPCB assessment:	**BAT statement** • Although choosing the type of monitoring method is an operational detail which can be addressed at the implementation stage, a measured value of water consumption may be more precise than a calculated value, and this could be reflected in this BAT. • Concerning waste, indeed not only waste sent for disposal is important information but also the waste sent for reuse or recovery, as it will help to implement the waste management plan (see BAT 28). As for the waste types, they are classified according to the EU List of Waste so information about the amount of waste per waste types is available, but mentioning this in BAT 5 does not seem necessary. • Emissions to air are not covered in BAT 5. • BAT 5 is about monitoring of parameters such as energy consumption or water consumption, which is usually expressed in kWh or m^3. The use of this data for benchmarking purposes (e.g. amount of energy used per amount of textile treated) is not part of BAT 5. **Description** • If the parameters mentioned in BAT 5 are not monitored at process level, it will not be possible to know for example the water or energy efficiency of these processes. • In addition, the BAT-AEPLs for water and energy consumption as proposed in D1 are expressed at process level. • Finally, the proposed wording is vague and does not bring clarity to the text. **Frequency** • The expected frequency to evaluate the annual amount of waste, water, energy, etc. is at least once a year. This evaluation is based on monitoring of these parameters (measurement or calculation) which can be done over shorter periods (daily, weekly, monthly, etc.). It can also be supported by continuous measurements.
EIPPCB proposal:	• To amend the description to provide clarity on monitoring alternatives. • To complement the text with information on the various types of waste.

2.4.2.2 Monitoring key parameters for relevant waste water streams

Location in D1:	**P. 724 – Section 5.1.2 – BAT 6**
Current text in D1:	**BAT 6. For waste water streams identified by the inventory of inputs and outputs (see BAT 2), BAT is to monitor key parameters (e.g. continuous monitoring of waste water flow, pH and temperature) at key locations (e.g. at the inlet and/or outlet of the waste water pretreatment, at the inlet to the final waste water treatment, at the point where the emission leaves the installation).**
Summary of comments:	• Add "relevant" key parameters in the BAT statement and specify that those key parameters are of two types: those needed for verifying compliance with the limits specified in the integrated permit and those needed for checking compliance with the limits pursuant to the contract on discharge of waste water into the sewer (CZ_A 3, CZ_B 83).
EIPPCB assessment:	• The description of the BAT already provides for flexibility to adapt the monitoring to key parameters and key locations. In addition, relations with the competent authorities and implementation are not specified by the BAT conclusions.
EIPPCB proposal:	• No change.

2.4.3 Water use and waste water generation

Location in D1:	**P. 727 – Section 5.1.3**
Current text in D1:	Entire Section 5.1.3.
Summary of comments:	• Harmonise (e.g. with STS BREF) recurring general conclusions in BREFs, e.g. on water management plan, to make the implementation easier in IED plants that perform several IED activities (AT 38).
EIPPCB assessment:	• The text was taken from recent BREFs, such as STS and FMP, but has been adapted for the textile industry.
EIPPCB proposal:	• No change.

2.4.4 Energy efficiency

2.4.4.1 Techniques for increasing energy efficiency when using compressed air

<table>
<tr><td>Location in D1:</td><td>P. 730 – Section 5.1.4 – BAT 11</td></tr>
<tr><td>Current text in D1:</td><td>BAT 11. In order to increase energy efficiency when using compressed air, BAT is to use all of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Optimal design of the compressed air system</td><td>Several systems are installed to supply compressed air with different pressure levels. This avoids the unnecessary production of high-pressure air.</td><td>Only applicable to new plants or major plant upgrades</td></tr>
<tr><td>b.</td><td>Optimal use of the compressed air system</td><td>Compressed air production is stopped during long shutdown or idling times of equipment, and single areas can be isolated from the rest of the system, in particular if they are associated with infrequent uses.</td><td rowspan="3">Generally applicable</td></tr>
<tr><td>c.</td><td>Control of leakages in the compressed air system</td><td>The most common sources of air leakages are regularly checked (e.g. couplings, hoses, tubes, fittings, pressure regulators).</td></tr>
<tr><td>d.</td><td>Reuse and/or recycling of warm cooling water or warm cooling air of air compressors</td><td>See BAT 10 d and BAT 10 g.</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td><u>Technique b.</u>
• Modify the applicability to: ”Generally applicable to new plants or major plant upgrades.” The implementation of this system in existing plants may require the compressed air distribution lines to be rebuilt and the associated sectioning systems introduced (IT 18).

<u>Technique d.</u>
• Delete the technique because it is a repetition of techniques BAT 10d and BAT 10g (FR_A 5).
• Modify the applicability to “only applicable to new plants or major plant upgrades” because of the potentially extensive distribution piping required to be built (CEFIC 31, EURATEX 100).</td></tr>
<tr><td>EIPPCB assessment:</td><td><u>Technique b.</u></td></tr>
</table>

	• Generally, isolation of the parts of the compressed air system not in use can be achieved by (relatively simple and cheap) installation of valves. The use of valves could be highlighted in the description of the technique. Also, synchronising the compressed air production with shutdown or idling times should not require substantial infrastructure interventions and would be generally applicable. Technique d. • Part of technique d. is a special case of generic technique BAT 10g. The technique BAT 10g is indeed specific for air compressors and would be best located in BAT 11.
EIPPCB proposal:	Technique b. • To add the term valves to the description of the technique as a means of achieving isolation in compressed air systems. Technique d. • To replace the reference to BAT 10g with an updated description of BAT 10g.

2.4.5 Emissions to air

2.4.5.1 Techniques to reduce diffuse VOC emissions to air

Location in D1:	**P. 738 – Section 5.1.8 – BAT 21**
Current text in D1:	**BAT 21. In order to reduce diffuse VOC emissions to air from the use of organic solvents, BAT is to collect diffuse emissions and send the waste gases to treatment.** **Applicability** The applicability may be restricted by safety concerns. In the case of existing plants, the applicability may be restricted by operational constraints or by the volume of air to be extracted
Summary of comments:	• Expand the BAT to all types of diffuse emissions and not only to VOC emissions (DE 72). • Change the applicability to new plants and major plant upgrades because collecting all emissions is not generally applicable as it can lead to a higher concentration of pollutants and contribute to a loss of efficiency of the oven (EURATEX 52).
EIPPCB assessment:	• While the majority of the diffuse emissions are expected to consist of organic compounds, there may also be diffuse emissions of other substances such as diffuse emissions of dust during the handling of textile material and this could be reflected in BAT 21. • Diffuse emissions being collected, channelled and grouped will indeed lead to a higher concentration of the substance concerned in the stack before the waste gas treatment but not necessarily after the waste gas treatment. In addition, a higher concentration before waste gas treatment may be beneficial in the sense that it could allow the selection of more efficient abatement techniques, for example thermal oxidation (this principle is described in BAT 22). In any case, the emission mass flow from emission sources equipped with waste gas abatement will be lower than the emission mass flow from the same emission sources if the emissions were not collected. • It is not very clear what is meant by loss of efficiency of the oven. In any case, operational constraints are mentioned in BAT 21 as an element which may restrict its applicability.
EIPPCB proposal:	• To extend BAT 21 to all types of diffuse emissions.

2.4.5.2 Techniques to prevent emissions of organic compounds to air

Location in D1:	**P. 740 – Section 5.1.8 – BAT 26**
Current text in D1:	**BAT 26. In order to prevent emissions of organic compounds to air from dry cleaning, BAT is to extract the air from dry cleaning, to treat it using adsorption**

	with activated carbon (see Section 5.9.2.) and to fully recirculate it to dry cleaning.
Summary of comments:	• Add other techniques e.g. thermal treatment, wet scrubbing, condensation - if applicable, because otherwise the BAT would be prescriptive as it mentions only one technique (CEFIC 14). • Improve the wording to clarify that: o not only is dry cleaning concerned but also washing with solvent; o closed cycle machines are used (DE 83).
EIPPCB assessment:	• As mentioned in the General considerations, BAT are neither prescriptive nor exhaustive. Other techniques may be used that ensure at least an equivalent level of environmental protection. • Solvent is indeed used not only for dry cleaning (e.g. for removal of unfixed dyestuffs or pigment after dyeing or printing) but also for scouring of greige fabrics (e.g. for removal of knitting oil). This could be reflected in BAT 26. • Concerning the use of closed cycle machines, this aspect is reflected in D1 by the full recirculation of air into the process.
EIPPCB proposal:	• To extend the BAT to scouring based on organic solvents. • To move BAT 26 before BAT 23 (see the assessment of BAT 27 in Section 1.4.8.8)

2.4.6 Waste

2.4.6.1 Techniques to prevent or reduce the quantity of waste

Location in D1: **P. 741 – Section 5.1.9 – BAT 28**

Current text in D1:

BAT 28. In order to prevent or reduce the quantity of waste, in particular of hazardous waste, sent for disposal, BAT is to use all of the techniques given below.

Technique		Description	Applicability
a.	Waste management plan	A waste management plan is part of the EMS (see BAT 1) and is a set of features aiming to: 1) minimise the generation of waste, 2) optimise the reuse, regeneration, recycling and/or recovery of waste, and 3) ensure the proper disposal of waste.	The level of detail of the waste management plan will generally be related to the nature, scale and complexity of the plant
b.	Separate collection and storage of waste contaminated with hazardous chemicals	Waste (e.g. liquid waste, paper, cloths, absorbent material, laboratory waste, sludge from waste water treatment) contaminated with hazardous chemicals (e.g. finishing chemicals such as flame retardants, oil-, water- and soil-repellents) is collected and stored separately.	Generally applicable
c.	Use of process chemicals before their expiry date	The maximum storage time of process chemicals is clearly established and is monitored to avoid the expiry date being exceeded.	

	d.	Reuse of packaging	Process chemicals packaging is selected to facilitate its complete emptying (e.g. considering the size of the packaging aperture or the nature of the packaging material). After emptying (see BAT 20), the packaging is reused.	

Summary of comments:	**BAT statement** • Delete "in particular of hazardous waste". Sometimes it is not a priority to reduce hazardous waste, and it is better to increase the amount of collected bath/pastes with hazardous chemicals, instead of sending them with the waste water (SE 32). **Technique c.** • Add that many dyes and chemicals can still be used after the expiry date, which is only an indication to check the quality at that date and chemicals should not be disposed of if they are still useable (DE 316). **Technique d.** • Remove that "process chemicals packaging is selected to facilitate its complete emptying" and add it as an additional bullet point in BAT 13, the chemical management plan. Operators do not have any control over the packaging of chemicals but the easiness of reuse could be a criterion to choose suppliers (FR_A 19). • Add that reuse of packaging is not always possible (ES 9, EURATEX 61) and that the packing could be returned to suppliers (IT 30, UK 35). **Additional technique** • Add a new technique which would be generally applicable: "collection of liquid waste: In order to prevent high concentration of hazardous substances in the waste water, BAT is to collect waste water and liquid waste separately (e.g. unused residues of chemical agents or auxiliaries, either in the form of pure substances or as preparations - such as optical brightening preparations or sizing agents, printing paste, finishing agents, finishing and dyestuff preparations from the colour kitchen as well as residual liquor and residual vat dyes)". This is to reflect Section 5.3 of the existing BREF (AT 29).
EIPPCB assessment:	**BAT statement** • Indeed, it may be an option to handle some spent process liquors as waste instead of treating them as waste water (see BAT 18). In that case, the amount of hazardous waste would increase. The BAT statement does not indicate that BAT is to reduce the amount of hazardous waste as such but to apply a number of techniques, the result of which is to reduce the amount of waste, including hazardous waste. This may however cause confusion and could be reworded. **Technique c.** • It may be possible to use the process chemicals after the expiry date if it is found that the process chemicals have unchanged characteristics, which could be reflected in technique c. by focusing on the perishability of the process chemicals. **Technique d.** • The selection of chemicals packaging can be addressed when placing the order for the chemical. In addition, BAT 13 states general techniques for chemical management, while technique c. of BAT 28 is specific. • Changing the description of technique d. will give the flexibility to reuse or return the packaging to suppliers, knowing that both possibilities fulfil the aim of the technique. **Additional technique** • The collection of liquid waste is already covered by technique (b) of BAT 28 and complemented within BAT 17 and BAT 18.
EIPPCB	• To remove the reference to hazardous waste in the BAT statement.

proposal:	• To introduce the notion of perishability in technique c. • To add in technique d. that packaging is reused or returned to suppliers.

2.5 BAT conclusions for the pretreatment of raw wool fibres by scouring

2.5.1 Techniques for using energy efficiently

<table>
<tr><td>Location in D1:</td><td>P. 742 – Section 5.2 – BAT 30</td></tr>
<tr><td>Current text in D1:</td><td>BAT 30. In order to use energy efficiently, BAT is to use all of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Covered scouring bowls</td><td>Scouring bowls are fitted with covers to prevent heat losses by convection or evaporation (see BAT 10 c).</td><td>Only applicable to new plants or major plant upgrades</td></tr>
<tr><td>b.</td><td>Optimised temperature of the last scouring bowl</td><td>The temperature of the last scouring bowl is optimised to increase the efficiency of the subsequent mechanical wool dewatering (see BAT 12 b) and drying.</td><td>Generally applicable</td></tr>
<tr><td>c.</td><td>Direct heating</td><td>Scouring bowls and dryers are directly heated by gas firing in order to avoid the heat losses which occur in the generation and distribution of steam.</td><td>Only applicable to new plants or major plant upgrades</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>• Delete “by gas firing" in technique c. or change to "climate-neutral gas or electricity", to respect technology neutrality. For new plants to be able to operate for longer times the energy supply has to be carbon-neutral. This can either happen through decarbonised gas sources or through electrical heating (EEB 41).</td></tr>
<tr><td>EIPPCB assessment:</td><td>• The focus of technique c. is to avoid the heat losses in intermediary circuits by using direct heating. How bowls and dryers are directly heated is not the focus of this technique and, in principle, direct heating could be done by other means besides gas. There is therefore no merit in singling out gas firing in the technique description.</td></tr>
<tr><td>EIPPCB proposal:</td><td>• To delete “gas firing” in technique c.</td></tr>
</table>

2.5.2 Techniques for using resources efficiently and for reducing the amount of waste sent for disposal

<table>
<tr><td>Location in D1:</td><td>P. 742 – Section 5.2 – BAT 31</td></tr>
<tr><td>Current text in D1:</td><td>BAT 31. In order to use resources efficiently and to reduce the amount of waste sent for disposal, BAT is to biologically treat organic residues from the pre-treatment of wool by scouring (e.g. dirt, waste water treatment sludge).

Description
The organic residues are treated by composting or anaerobic digestion.</td></tr>
<tr><td>Summary of comments:</td><td>• Mention that the applicability of this technique may be limited by the availability of suitable composting and anaerobic digestion facilities (UK 37).
• Decide on a BAT formulation to keep “composting” or “anaerobic digestion” (with methane capture for biogas), or both, depending on the data. It is not clear why anaerobic digestion is equivalent to composting and therefore BAT (EEB 94).</td></tr>
<tr><td>EIPPCB assessment:</td><td>• According to the WT BREF, in 2007 in the EU-27 there were around 6 000 installations for the biological treatment of organic waste (about 60 % of composting installations and 40 % of anaerobic digestion installations). It is therefore not clear</td></tr>
</table>

	how the availability of such installations may be problematic. • Both composting and anaerobic digestion will decrease the amount of waste sent for disposal. This being said, Section 4.2.2.3 of D1 provides very little information about anaerobic digestion and focuses largely on composting, which could be reflected in BAT 31.
EIPPCB proposal:	• To focus the description on composting.

2.6 BAT conclusions for the production of yarn and fabric

2.6.1 Techniques for reducing emissions to air and water

Location in D1:	**P. 744 – Section 5.3 – BAT 33**
Current text in D1:	**BAT 33. In order to reduce emissions to air and to water from the use of oils, BAT is to avoid the use of mineral oils in spinning and knitting.** **Description** Mineral oils are substituted by synthetic oils and/or ester oils, with improved environmental performance in terms of washability and biodegradability.
Summary of comments:	• Add a note to the BATC to explain that demonstrating compliance with this BAT may be restricted where yarns are imported from outside the EU and the limitations of what has to be declared on any associated material safety data sheets (MSDS). This is because many yarns produced outside Europe can still contain spinning oil residues that are mineral-oil-based and are not required to be declared on any MSDS or similar (UK 38).
EIPPCB assessment:	• BAT 33 applies to the production of yarn and fabric and is relevant only when spinning or knitting is carried out at the plant. It does not concern the presence of mineral sizing oil or mineral knitting oil in the incoming textile material, which is covered by BAT 4 a.
EIPPCB proposal:	• To make environmental objective of the BAT more generic.

2.7 BAT conclusions for the pretreatment of textile materials other than raw wool fibres

Location in D1:	**P. 746 – Section 5.4**
Current text in D1:	Entire Section 5.4
Summary of comments:	• Add the technique below in BAT 35 or BAT 36 , as it is described in Section 4.4.2 of D1 (CZ_B 11):

Technique		**Description**	**Applicability**
c	Enzymatic desizing, bleaching, washing and scouring	Enzymes (e.g. amylases, pectinases and others) are used for desizing, bleaching, washing and scouring the textile fabric.	Generally applicable

EIPPCB assessment:	• As described in Section 4.4.2 of D1, enzymatic desizing, bleaching, washing and scouring is an existing pretreatment technique used to reduce water, energy and chemical consumption, and this technique is already mentioned in BAT 15 b.
EIPPCB proposal:	• No change.

2.8 BAT conclusions for printing

2.8.1 Techniques for reducing water consumption and waste water generation

Location in D1:	**P. 750 – Section 5.6 – BAT 43**
Current text in D1:	The BAT conclusions in this section apply to printing and apply in addition to the general BAT conclusions in Section 5.1. **BAT 43. In order to reduce water consumption and waste water generation, BAT is to optimise the cleaning of the printing equipment.** **Description** This includes: • mechanical removal of the printing paste; • automatic start and stop of the cleaning water supply; • reuse and/or recycling of cleaning water (see BAT 9 h).
Summary of comments:	• Replace "this includes" with "this may include". The 3 listed points cannot be done simultaneously; this depends on the equipment (EURATEX 90).
EIPPCB assessment:	• No information has been reported on the impossibility to conduct the three techniques simultaneously, especially in the part concerning the Technical considerations relevant to applicability, in Section 4.6.1.1 of D1. In any case, these three points are given as examples.
EIPPCB proposal:	• No change.

2.8.2 Techniques for using resources efficiently

Location in D1:	**P. 750 – Section 5.6 – BAT 44**
Current text in D1:	**BAT 44. In order to use resources efficiently, BAT is to use a combination of the techniques given below.**

	Technique	Description	Applicability
	Selection of printing technology		
a.	Digital jet printing	Computer-controlled injection of dye onto textile materials.	Only applicable to new plants or major plant upgrades
b.	Transfer printing on synthetic textile materials	The design is first printed on an intermediate substrate (e.g. paper) using selected disperse dyes and is subsequently transferred to the fabric by applying high temperature and pressure.	
	Design and operation technique		

	c.	Optimised use of printing paste	This includes: • minimisation of the volume of the printing paste supply system (e.g. minimising pipe lengths and diameters); • ensuring a uniform paste distribution over the whole width of the printing machine; • stopping the supply of printing paste shortly before the end of the printing; • manual addition of printing paste for small-scale usage.	Generally applicable
	Recovery and reuse of printing paste			
	d.	Recovery of residual printing paste	Residual printing paste in the supply system is pumped back or pushed back to its original container.	The push-back system is only applicable to rotary screen printing
	e.	Reuse of residual printing paste	The residual printing paste is collected, sorted by type, stored and reused. The degree of reuse of printing paste is limited by its perishability.	Generally applicable
Summary of comments:	**Technique a.** • Replace the applicability with "Generally applicable". The technique consists only of a minor upgrade and can be applied in addition to existing techniques (SE 34). **Technique b.** • Delete this technique as transfer printing is briefly mentioned in the current BREF in Section 2.8 and was discontinued after a short time. Contrary to other printing techniques, it produces too much waste that cannot be reused (i.e. waste paper). Therefore it does not meet the criteria for BAT (CZ_B 17). **Technique d.** • Add in the applicability clause a restriction to new plants and or major plant upgrades, as this technique is not possible for existing installations (EURATEX 72). **Technique e.** • Replace "generally applicable" with "the applicability may be restricted by product specifications". There are types of printing pastes that lose their usability by storage, especially because of changes in the chemical composition of the printing paste which loses the ability to colour fibres (CZ_B 18).			
EIPPCB assessment:	**Technique a.** • The installation of digital jet printing corresponds to a major plant upgrade, which is defined as "a major change in the design or technology of a plant with major adjustments or replacements of the process." **Technique b.** • This technique is described in Chapter 4 of D1 and it is not clear why it does not meet the criteria for BAT. There is indeed waste paper but the technique also allows the reduction of water and energy consumption. • Moreover, plants of the data collection (DE042 and FR131) have reported using this technique. **Technique d.** • As only certain existing machines can be retrofitted, according to the description in Section 4.6.1.6 of D1, the applicability of the push-back system could be amended. • It would make sense to add the rotary screen printing to the title of the technique to			

	make it more technically relevant. **Technique e.** • As stated for technique e., the degree of reuse of printing paste is limited by its perishability. This covers technical limitations or quality changes that could appear in printing paste.
EIPPCB proposal:	• To modify the applicability of technique (d), and specify rotary screen printing in the name of the technique.

2.8.3 Techniques for preventing ammonia emissions to air and preventing the generation of urea-containing waste water

Location in D1:	**P. 751 – Section 5.6 – BAT 45**
Current text in D1:	**BAT 45. In order to prevent ammonia emissions to air and to prevent the generation of urea-containing waste water from printing with reactive dyes on cellulosic materials, BAT is to use one of the techniques given below.** **Technique** / **Description** a. Increase of moisture content — Printing is carried out without urea by controlled addition of water to the textile materials. b. Two padding step printing — Printing is carried out without urea by two padding steps with intermediate drying and addition of fixation agents (e.g. an alkaline solution).
Summary of comments:	**Technique a.** • Change the description of technique a as urea is still needed in the printing paste. Section 4.6.2 of D1 describes a reduced urea content, not a complete absence (DE 326). **Technique b.** • Change the description of technique b. to underline that sodium metasilicate is used. Change also the applicability of the technique as the resulting printing quality is lower (DE 326). • Delete technique b which leads to higher emissions and energy consumption due to the second step (EURATEX 126).
EIPPCB assessment:	**Technique a.** • According to Section 4.6.2.1 of D1, urea can be partially substituted by controlled addition of moisture when printing cotton, viscose, or cotton blend fabrics. This could be reflected in the description of technique a. • It would make sense to reword the technique to make it more technically relevant. **Technique b.** • The intermediate drying step leads to high energy consumption but on the other hand the technique leads to reduced emissions of ammonia to water and to air. • Concerning the quality aspect, it is not clear how the technique reduces the printing quality. According to Section 4.6.2.2 of D1, there are generally no technical restrictions to the applicability of this technique and one of the driving forces of this technique is the quality of the product. • The mention of alkaline solution in the description of technique b can be misleading as it corresponds to the characteristics of the padding solution but not to fixation agents. According to Section 4.6.2.2 of D1, one of the possible fixation agents used is "water glass", i.e. sodium silicate.
EIPPCB proposal:	• To introduce the use of a reduced amount of urea in technique a., and reword the name of the technique. • To replace alkaline solution with sodium silicate as an example of fixation agents in

	technique b.

2.8.4 Techniques for reducing emissions of organic compounds (e.g. formaldehyde) as well as of ammonia to air from printing with pigments

Location in D1:	**P. 751 – Section 5.6 – BAT 46**
Current text in D1:	**BAT 46. In order to reduce emissions of organic compounds (e.g. formaldehyde) as well as of ammonia to air from printing with pigments, BAT is to use printing chemicals with improved environmental performance.** **Description** This includes: • thickeners with no or low contents of volatile organic compounds; • fixation agents with low contents of formaldehyde-containing compounds; • binders with low contents of ammonia and without formaldehyde-containing compounds.
Summary of comments:	• Replace "with no or low contents of volatile organic compounds" with "without or with less than 5% w/w of", according to the Ecolabel criterion of 5 % of VOCs given in Section 4.6.3 (EEB 191). • Replace "fixation agents with low contents of formaldehyde-containing compounds' with "fixation agents containing or potentially releasing less than 0.1 % w/w of formaldehyde", in order to avoid confusion. What counts is not the content of formaldehyde-containing compounds, but the amount of formaldehyde contained in or potentially released from the printing paste (EEB 192). • Define the upper concentration limit for ammonia. It is calculated as part of VOCs in Ecolabel, and a Specific Target Organ Toxicity (STOT) classification of the mixture applies as of 5% w/w; however, the pungent smell of ammonia would probably make the use of such mixtures very difficult in practical life (EEB 193).
EIPPCB assessment:	• The description of this technique is indeed unspecific as to the content of VOCs, formaldehyde or ammonia in the printing chemicals. However, some information may be found in voluntary schemes such as Ecolabel. In addition, some substances like formaldehyde may already be covered by other regulations, for example related to worker or consumer protection. • It seems difficult to specify the content of these substances in the printing chemicals by using voluntary schemes or other regulations as these may change over the lifetime of the BAT conclusions. For instance, formaldehyde and formaldehyde releasers are in the registry of restriction intentions according to Annex XV to the REACH Regulation. • According to Section 4.6.3.1 of D1, not only may formaldehyde itself give rise to formaldehyde emissions to air but also melamine compounds contained in the fixation agents. This could be reflected in BAT 46 in line with the wording used in BAT 47. • This seems to also be the case for binders as binders based on acrylate dispersion may also give rise to formaldehyde emissions.
EIPPCB proposal:	• To reword the second and third bullet points to consider all substances with potential for formaldehyde releases.

2.9 BAT conclusions for finishing

2.9.1 Easy-care finishing

Location in D1:	**P. 752– Section 5.7.1 – BAT 47**
Current text in D1:	**BAT 47. In order to reduce emissions of formaldehyde to air from easy-care finishing of cellulosic materials, BAT is to use cross-linking agents with no or low potential for formaldehyde releases.**
Summary of comments:	• Mention the easy-care finishing of man-made fibres in addition to cellulosic materials as this technique is applicable to more than just cellulosic materials (UK 45).
EIPPCB assessment:	• According to Section 8.8.1 of D1, easy-care finishing agents are chemical finishes which are applied to woven and knitted fabrics composed of cotton, other cellulosic fibres and their blends with synthetic fibres. This could be reflected in BAT 47.
EIPPCB proposal:	• To add a reference to blends with synthetic fibres.

2.9.2 Softening

Location in D1:	**P. 752– Section 5.7.2 – BAT 48**
Current text in D1:	**BAT 48. In order to improve the overall environmental performance of softening, BAT is to use one of the techniques given below.** **Technique** / **Description** a. Low-volume application of softening agents — See Section 5.9.4. Softening agents are not added to the dyeing liquor but applied in a separate process step by padding, spraying or foaming. b. Softening of cotton with enzymes — See BAT 15 b. Enzymes are used for softening, possibly in combination with washing or dyeing.
Summary of comments:	**Technique a.** • Modify the applicability of technique a. because it is not generally applicable due to limitations in sewability (DE 329). • Add an applicability restriction due to the characteristics of the textile materials and/or product specifications. Indeed, in the batch dyeing process softeners are normally added in dyeing machines during rinsing to reduce the number of subsequent processes and the resulting energy consumption (IT 35). **Technique b.** • Modify the applicability of technique b. which is not generally applicable as for certain product requirements, such as GMO-free for Global Organic Textile Standard (GOTS) certified textiles, enzymes are not available (DE 329). • Delete technique b. because no technical application is known (EURATEX 163).
EIPPCB assessment:	**Technique a.** • No detailed information has been provided on the limitations in sewability or due to the characteristics of the textile materials and/or product specifications. • According to Section 4.7.3.1 of D1, this technique allows the reuse of the dyeing baths or rinse bath as they are not contaminated by residual softeners, which allows water and energy savings. • According to the data collection, this technique is currently used by several plants in

	the EU (IT059, IT064, IT065, IT068, IT070, IT073, IT074, IT077, IT078, IT079, IT094, PT108 and SE119). **<u>Technique b.</u>** • Not all enzymes are produced using GMOs and, according to the Global Organic Textile Standard statement, it is possible to use naturally produced enzymes, which are available in the market. • IT064 uses cellulase and protease for softening. • It would make sense to add "textile materials" in technique b. to make it more technically relevant.
EIPPCB proposal:	• To specify the name of the technique b.

2.10 BAT conclusions for lamination

Location in D1:	**P. 754– Section 5.8. – BAT 53**
Current text in D1:	The BAT conclusions presented in this section apply to lamination and apply in addition to the general BAT conclusions in Section 5.1. **BAT 53. In order to reduce emissions of organic compounds to air from lamination, BAT is to use hot-melt lamination instead of flame lamination.** **Description** Molten polymers are applied to textiles without the use of a flame. **Applicability** May not be applicable to thin textiles.
Summary of comments:	• Add “optical effects” (like "orange peel effect") as a restriction for applicability because it may be an unwanted consequence of hot-melt lamination (DE 292, EURATEX 128). • Add that the applicability may be restricted by product specifications as from the production quality point of view, flame lamination is irreplaceable in many cases (CZ_B 76).
EIPPCB assessment:	• According to the information in Section 4.8.1 of D1, optical effects can occur when using hot-melt lamination on thin fabrics. As it is already mentioned that the technique may not be applicable to thin textiles, it does not seem necessary to elaborate further. • No specific information has been made available on other possible restrictions to the applicability of this technique.
EIPPCB proposal:	• No change.

2.11 Description of technique

2.11.1 Technique to monitor emissions to air

<table>
<tr><td>Location in D1:</td><td>P. 755– Section 5.9.2</td></tr>
<tr><td>Current text in D1:</td><td>
<table>
<tr><th>Technique</th><th>Description</th></tr>
<tr><td>Emission factors</td><td>Emission factors are representative values that attempt to relate the quantity of a substance emitted to a process associated with the emission of that substance. Emission factors are derived from emission measurements according to a predefined protocol considering the textile materials and the reference processing conditions. They are expressed as the mass of a substance emitted divided by the mass of textile materials treated at the reference gas flow (e.g. grams of organic carbon emitted per kg of textile materials treated at a waste gas flow of 20 m^3/h).</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td>• No comments.</td></tr>
<tr><td>EIPPCB assessment:</td><td>• Not applicable.</td></tr>
<tr><td>EIPPCB proposal:</td><td>• No change.</td></tr>
</table>

2.11.2 Techniques to reduce emissions to air

<table>
<tr><td>Location in D1:</td><td>P. 755 – Section 5.9.2</td></tr>
<tr><td>Current text in D1:</td><td>
<table>
<tr><th>Technique</th><th>Description</th></tr>
<tr><td>Adsorption</td><td>The removal of pollutants from a waste gas stream by retention on a solid surface (activated carbon is typically used as adsorbent). Adsorption may be regenerative or non-regenerative.
In non-regenerative adsorption, the spent adsorbent is not regenerated but disposed of.
In regenerative adsorption, the adsorbate is subsequently desorbed, e.g. with steam (often on site), for reuse or disposal and the adsorbent is reused. For continuous operation, typically more than two adsorbers are operated in parallel, one of them in desorption mode.</td></tr>
<tr><td>Condensation</td><td>Condensation is a technique that eliminates vapours of organic and inorganic compounds from a waste gas stream by reducing its temperature below its dew point.</td></tr>
<tr><td>Cyclone</td><td>Equipment for the removal of dust from a waste gas stream based on imparting centrifugal forces, usually within a conical chamber.</td></tr>
<tr><td>Electrostatic precipitator (ESP)</td><td>Electrostatic precipitators (ESPs) operate such that particles are charged and separated under the influence of an electrical field. Electrostatic precipitators are capable of operating under a wide range of conditions. Abatement efficiency may depend on the number of fields, residence time (size), and upstream particle removal devices. They generally include between two and five fields. Electrostatic precipitators can be of the dry or of the wet type depending on the technique used to collect the dust from the electrodes.</td></tr>
</table>
</td></tr>
</table>

	Ionisation	In ionisation (also referred to as direct cold plasma technique), the air or the incoming gas flow is led through a reaction chamber where it is submitted to a very strong electrical field (20–30 kV) generated by electrodes, causing ions, free electrons, radicals and other highly reactive particles to be formed. The highly reactive compounds lead to an oxidation of the pollutants present in the incoming gas.
	Thermal oxidation	The oxidation of combustible gases and odorants in a waste gas stream by heating the mixture of contaminants with air or oxygen to above its auto-ignition point in a combustion chamber and maintaining it at a high temperature long enough to complete its combustion to carbon dioxide and water.
	Wet scrubbing	The removal of gaseous or particulate pollutants from a waste gas stream via mass transfer to water or an aqueous solution. It may involve a chemical reaction (e.g. in an acid or alkaline scrubber).
Summary of comments:	• Add the descriptions of fabric filters and absolute filters in the list of techniques as these two techniques should be considered as BAT (IT 38). • In the description of ionisation, correct the unit used for the electrical field as a value expressed in kV is a tension, not an electric field (EEB 83).	
EIPPCB assessment:	• Fabric filters and absolute filters are not mentioned in the BAT conclusions (see the assessment of BAT 24 in Section 1.4.8.4). • It is proposed to remove ionisation from the list of techniques to abate organic compounds and formaldehyde in BAT 23 (see assessment in Section 1.4.8.2). The technique description is therefore no longer needed.	
EIPPCB proposal:	• To delete the description of ionisation.	

2.11.3 Techniques to reduce emissions to water

Location in D1:	**P. 756– Section 5.9.3**

Current text in D1:

Technique	Description
Activated sludge process	The biological oxidation of dissolved organic pollutants with oxygen using the metabolism of microorganisms. In the presence of dissolved oxygen (injected as air or pure oxygen), the organic components are transformed into carbon dioxide, water or other metabolites and biomass (i.e. the activated sludge). The microorganisms are maintained in suspension in the waste water and the whole mixture is mechanically aerated. The activated sludge mixture is sent to a separation facility from where the sludge is recycled to the aeration tank.
Adsorption	Separation method in which compounds in a fluid (e.g. waste water) are retained on a solid surface (typically activated carbon).
Anaerobic treatment	The biological transformation of dissolved organic and inorganic pollutants in the absence of oxygen using the metabolism of microorganisms. Transformation products include methane, carbon dioxide, and sulphide. The process is carried out in an airtight stirred reactor. The most commonly used reactor types are: • anaerobic contact reactor; • upflow anaerobic sludge blanket; • fixed-bed reactor; • expanded-bed reactor. Anaerobic bioreactors are used to treat textile effluents with high COD concentrations and containing dyestuff.

Chemical oxidation	Organic compounds are oxidised to less harmful and more easily biodegradable compounds. Techniques include wet oxidation or oxidation with ozone or hydrogen peroxide, optionally supported by catalysts or UV radiation. Chemical oxidation is also used to degrade organic compounds causing odour, taste and colour nuisances and for disinfection purposes.
Chemical reduction	Chemical reduction is the conversion of pollutants by chemical reducing agents into less harmful compounds.
Coagulation and flocculation	Coagulation and flocculation are used to separate suspended solids from waste water and are often carried out in successive steps. Coagulation is carried out by adding coagulants with charges opposite to those of the suspended solids. Flocculation is carried out by adding polymers, so that collisions of microfloc particles cause them to bond to produce larger flocs. The flocs formed are subsequently separated by sedimentation, air flotation or filtration.
Equalisation	Balancing of flows and pollutant loads by using tanks or other management techniques.
Evaporation	The use of distillation to concentrate aqueous solutions of high-boiling substances for further use, processing or disposal (e.g. waste water incineration) by transferring water to the vapour phase. It is typically carried out in multistage units with increasing vacuum, to reduce the energy demand. The water vapours are condensed, to be reused or discharged as waste water.
Filtration	The separation of solids from waste water by passing them through a porous medium, e.g. sand or membrane filtration (see Membrane filtration below).
Flotation	The separation of solid or liquid particles from waste water by attaching them to fine gas bubbles, usually air. The buoyant particles accumulate at the water surface and are collected with skimmers.
Membrane bioreactor	A combination of activated sludge treatment and membrane filtration. Two variants are used: a) an external recirculation loop between the activated sludge tank and the membrane module; and b) immersion of the membrane module in the aerated activated sludge tank, where the effluent is filtered through a hollow fibre membrane, the biomass remaining in the tank.
Membrane filtration	Microfiltration, ultrafiltration, nanofiltration and reverse osmosis are membrane filtration processes that retain and concentrate, on one side of the membrane, pollutants such as suspended particles and colloidal particles contained in waste waters. They differ for membrane pore sizes and hydrostatic pressure.
Neutralisation	The adjustment of the pH of waste water to a neutral level (approximately 7) by the addition of chemicals. Sodium hydroxide (NaOH) or calcium hydroxide ($Ca(OH)_2$) may be used to increase the pH, whereas sulphuric acid (H_2SO_4), hydrochloric acid (HCl) or carbon dioxide (CO_2) may be used to decrease the pH. Some pollutants may precipitate as insoluble compounds during neutralisation.
Nitrification/denitrification	A two-step process that is typically incorporated into biological waste water treatment plants. The first step is aerobic nitrification where microorganisms oxidise ammonium (NH_4^+) to the intermediate nitrite (NO_2^-), which is then further oxidised to nitrate (NO_3^-). In the subsequent anoxic denitrification step, microorganisms chemically reduce nitrate to nitrogen gas.

	Oil-water separation	The separation of oil and water including the subsequent oil removal by gravity separation of free oil, using separation equipment or emulsion breaking (using emulsion-breaking chemicals such as metal salts, mineral acids, adsorbents and organic polymers).
	Screening and grit separation	The separation of water and insoluble contaminants such as sand, fibre, fluff or other coarse materials from the textile effluent by filtering through screens or gravitational settling in grit chambers.
	Precipitation	The conversion of dissolved pollutants into insoluble compounds by adding precipitants. The solid precipitates formed are subsequently separated by sedimentation, air flotation or filtration.
	Sedimentation	The separation of suspended particles by gravitational settling.

Summary of comments:

Additional techniques

- Add the technique "Reuse of cooling water as process water" with the description "Not contaminated cooling water can be reused as process water." This technique can reduce consumption of water (SE 38).

Anaerobic treatment

- Complement the description of the technique with the expected effects: the degradation of hardly biodegradable pollutants to simpler compounds which are more readily decomposed in the subsequent aerobic step; also a significant denitrification and partial decoloration is achieved (CZ_B 20).

Chemical oxidation

- Complement the description by adding that the technique is preferably used in cases where waste water recirculation is required to purify pretreated waste water and to decolour it (CZ_B 21).

Coagulation and flocculation

- Complement the description of the technique by mentioning a significant cross-media effect – large amounts of sludge which is considered hazardous waste. Therefore, the applicability of the technique is limited to cases where utilisation of the produced sludge is available, e.g. in metallurgy or where the aim is to remove pollutants endangering the WW treatment technique, e.g. toxic substances, fats or mineral oils. There are more efficient techniques for textile water treatment and this technique should be used only exceptionally and in justified cases (CZ_B 22).

Evaporation

- Due to high energy consumption and emissions, this is only applicable if sufficient excessive heat is available (EURATEX 129, EURATEX 166).

Membrane bioreactor

- This technique often has a very short service life. The membranes tend to get blocked within short processing time, high expense in maintenance, only feasible in plants with stable, constant and well defined waste water conditions (EURATEX 130).

Membrane filtration

- Complement the list of pollutants the technique can remove with dyestuffs or soluble salts contained in waste waters, because the reverse osmosis removes them (CZ_B 23).

Neutralisation

- Indicate that carbon dioxide (CO_2) is preferred over sulphuric acid (H_2SO_4) as a means to decrease pH, because the sulphuric acid can be harmful to pipes, waste water treatment and the water recipient (SE 37).

Nitrification/denitrification

- Complement the description by adding that nitrification always occurs during waste water treatment by activation (aerobic treatment), denitrification during anaerobic

	treatment (CZ_B 24). **Oil-water separation** • Complement the description by mentioning oil-containing particles to be removed as pollutant besides the free oil (CZ_B 25).
EIPPCB assessment:	**Additional techniques** • BAT 9h addresses the reuse of the cooling water as rinsing, washing water or in the processing of textile materials. **Adding example pollutants removed from the textile effluents** • In many comments a proposal to add as an example pollutants that the individual technique could remove from the textile effluent is repeated. The descriptions of techniques are basic and succinct, limited only to basic principles of operation as related to the removal of pollutants. Information on pollutants removed by specific techniques are included in BAT 19. **Anaerobic treatment** • The information on partial denitrification and decolouration could be added to the description of technique in Section 4.1.7.3.5.2 of D1. **Chemical oxidation** • The information on the use of the technique in cases of waste water recirculation for additional purification and decolouratio, could be added to the description of technique in Section 4.1.7.3.4.1 of D1. **Coagulation and flocculation** • The cross-media effects of coagulation/flocculation (e.g. hazardous sludge) are described in Section 4.1.7.4.2 of D1. According to BAT 17, the appropriate combination of techniques to treat the waste water streams needs to be selected. **Evaporation** • The availability of excess heat would definitely be advantageous for using evaporation, but other important factors like pollution reduction or shortage of water may be decisive factors in the site-specific BAT. Appropriate combination of techniques for reuse, recycling or treatment of waste water streams is part of an overall water management plan (BAT 9a) and integrated waste water management and treatment strategy (BAT 17). The energy efficiency issues are addressed by an energy efficiency plan (BAT 10a). As described in Section 4.1.7.4.4 of D1, in practice, an appropriate balance or trade-off between energy and water consumption would need to be achieved. **Membrane bioreactor** • The information on short service life and the tendency for frequent fouling and blocking of the membranes (e.g. within short processing time) requiring the constant and well defined waste water conditions could be mentioned in the technique description in Section 4.1.7.3.5.4.2 of D1. And, the same for potentially high maintenance costs. **Membrane filtration** • The removal of dyestuffs or soluble salts with this technique (including reverse osmosis) is described in Section 4.1.7.4.4 of D1. **Neutralisation** • The use of carbon dioxide (CO_2) in neutralisation in textile plants is already indicated in Section 4.1.7.3.2 of D1. **Nitrification/denitrification** • The description already indicates that this technique is typically incorporated in biological waste water treatment plants. Depending on the design and operation conditions (e.g. anoxic), these processes may naturally occur in any part of the biological waste water treatment plant, but here it is emphasised that the design and

	operational conditions specifically favour these processes (often in a separate reaction basin/chamber). **Oil-water separation** • Particles attached to the oil would also be removed with this technique. This could be indicated in Section 4.1.7.3.3.4 of D1.
EIPPCB proposal:	No changes.

2.11.4 Techniques to reduce the consumption of water, energy and chemicals

Location in D1:	**P. 757– Section 5.9.4**
Current text in D1:	<table><tr><th>Technique</th><th>Description</th></tr><tr><td>Cold pad-batch treatment</td><td>In cold pad-batch treatment, the process liquor is applied by padding (e.g. with a foulard) and the impregnated fabric is slowly rotated at room temperature for a prolonged period. This technique allows a reduced consumption of chemicals and does not require subsequent steps such as thermal fixation and thereby reduces energy consumption.</td></tr><tr><td>Low-liquor-ratio systems (for batch processes)</td><td>A low liquor ratio can be achieved by improving the contact between the textile materials and the process liquor (e.g. by creating turbulence in the process liquor), by advanced process monitoring, by improved dosage and application of process liquor (e.g. by jets or spraying) and by avoiding the mixing of process liquor with washing or rinsing water.</td></tr><tr><td>Low-volume application systems (for continuous processes)</td><td>The fabric is impregnated with process liquor by spraying, vacuum suction through the fabric, foaming, padding, dipping in nips (process liquor contained in the gap between two rollers) or in reduced-volume tanks, etc.</td></tr></table>
Summary of comments:	**Cold pad-batch treatment** • Contradicts BAT 40 g. and h. (EURATEX 131).
EIPPCB assessment:	• It is not clear how a generic description of the cold pad-batch treatment could contradict BAT 40g (Use of concentrated alkali solution) described in Section 4.5.2.2 of D1 or BAT 40h (Steam fixation of reactive dyes) described in Section 4.5.2.6 of D1. These BAT specify operating conditions for fixations of dyes when using cold pad-batch treatment for dyeing cellulosic materials with reactive dyes. The former addresses the use of concentrated alkali instead of sodium silicate, and the latter addresses the use of steam instead of any chemical for fixation of the dyes.
EIPPCB proposal:	• No change.