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WORKSHOP ON DATA ASSESSMENT

FOR THE REVIEW OF

THE BEST AVAILABLE TECHNIQUES (BAT) REFERENCE DOCUMENT FOR

THE TEXTILES INDUSTRY (TXT)

SEVILLE, 1 – 2 October 2019

BACKGROUND DOCUMENT

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ACRONYMS USED IN THIS REPORT

Acronym	Meaning
AOX	Adsorbable organically bound halogens
AP	Alkylphenol
APEO	Alkylphenol ethoxylate
BAT	Best Available Techniques (as defined in Article 3(10) of the IED)
BAT-AEL	Emission level associated with the BAT (as defined in Article 13(3) of the IED)
BAT-AEPL	BAT-associated environmental performance level (as described in Section 3.3 of Commission Implementing Decision 2012/119/EU). BAT-AEPLs include BAT-AELs.
BATC	BAT conclusions
BATIS	BAT Information System
BOD	Biochemical oxygen demand. Amount of oxygen needed for the biochemical oxidation of organic and/or inorganic matter in 5 (BOD_5) or in 7 (BOD_7) days.
BREF	BAT reference document (as defined in Article 3(11) of the IED)
CBI	Confidential business information
CHP	Combined heat and power
CMR	Carcinogenic, mutagenic or toxic for reproduction
CO	Carbon monoxide
COD	Chemical oxygen demand
DAA	Directly associated activity
EU	European Union
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).
IED	Industrial Emissions Directive (2010/75/EU)
KEI	Key Environmental Issue
KoM	Kick-off Meeting for the review of the TXT BREF, 12-15 June 2018
MS	Member State
NH_3	Ammonia
NMVOC	Non-methane volatile organic compounds
NO_x	The sum of nitrogen monoxide (NO) and nitrogen dioxide (NO_2), expressed as NO_2.
NP	Nonylphenol
O_2	Oxygen
OP	Octylphenol
PER	Perchloroethylene (tetrachloroethylene)
PFCs	Perfluorocarbons
SO_X	The sum of sulphur dioxide (SO_2) and sulphur trioxide (SO_3), expressed as SO_2.
Total N	Total nitrogen, expressed as N, includes free ammonia and ammonium nitrogen (NH_4–N), nitrite nitrogen (NO_2–N), nitrate nitrogen (NO_3–N) and organically bound nitrogen.
TOC	Total organic carbon
Total P	Total phosphorus, expressed as P, includes all inorganic and organic phosphorus compounds, dissolved or bound to particles.
TSS	Total suspended solids
TVOC	Total volatile organic carbon
TWG	Technical Working Group
TXT BREF	BAT reference document for the Textiles Industry

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1 INTRODUCTION

1.1 Data presented in this document

The main purpose of the data collection for the TXT BREF review is to provide a sound basis for setting BAT and BAT-AE(P)Ls for the KEIs identified at the Kick-off Meeting[1].

The data collection for the TXT BREF review took place from 14 February 2019, when the EIPPCB issued the final version of the questionnaire template, until 30 April 2019, the deadline set for TWG members to return the filled-in questionnaires.

The present document aims to give an overview of the first results of this data collection. More particularly, the goals of this document are:

- to check the overall quality of the collected data;
- to explain how the data collected have been compiled and how a first set of graphs and tables on emissions, consumption and waste have been prepared;
- by showing data from individual plants in the context of the whole data set, to **allow TWG members to double-check the correctness of the data**, in particular of the reported emission levels in relation to the techniques applied by the reference plants, in advance of Draft 1 of the revised TXT BREF;
- to support the discussions at the data assessment workshop (see Section 1.3).

This document DOES NOT aim to propose or discuss any potential BAT conclusions or BAT-AE(P)Ls.

The data presented in this document were extracted from the 107 non-confidential questionnaires that were posted by Member States (MSs) on BATIS by 27 May 2019.

Some sets of data were extracted using only the confidential versions of the questionnaires. This represents 83 questionnaires and concerns the data related to specific energy and water consumption at process level (see Section 7).

A list showing the plant codes is available on BATIS in BATIS >Forum>Textiles Industry>02 First TXT BREF review 2017->07 Data collection>01 List of the reference plants>01 Combined list of reference plants.

The information displayed on the graphs (legends, titles, etc.) refers to the terminology of the questionnaire, where most definitions can be found (see Endnotes worksheet in the questionnaire Excel template).

1.2 Data collection process

The data collection process followed the decisions taken at the KoM and consisted of the following steps:

- starting from 14 February 2019, the questionnaire template was distributed to the plants taking part in the data collection;
- the plants filled in the questionnaire;

[1] Report of the Kick-off Meeting dated 13.09.2018 with reference Ares(2018)4698733.

- the Member States' representatives checked the quality and the completeness of the filled-in questionnaires;
- until 30 April 2019, TWG members could post the non-confidential versions of the filled-in questionnaires on BATIS and send the versions containing confidential business information (CBI) directly to the EIPPCB by email.

In the questionnaire Excel template, all cells containing information/data considered business-sensitive or confidential (CBI) were marked with a different background colour (light red). The content of these cells could be removed in order to create a non-confidential version of the questionnaires to be posted on BATIS.

On 27 May 2019, 107 non-confidential questionnaires were posted on BATIS, for 104 plants (the following three plants have provided two questionnaires each to account for the high number of points of emission to air: ES058, PT109 and PT114).

1.3 Data assessment workshop

A data assessment workshop will be held in Seville on 1-2 October 2019 and one of the objectives of this document is to support the TWG discussions during the workshop. The aim of the workshop is not to discuss the factual correctness of the data but to reach a common understanding of the collected data, especially in terms of overall quality.

2 OVERVIEW OF THE DATA COLLECTED

2.1 Number of questionnaires received

As mentioned in Section 1.2, 107 non-confidential questionnaires were available on BATIS as of 27 May 2019 for 104 plants.

The distribution of plants per country is shown in the graph below.

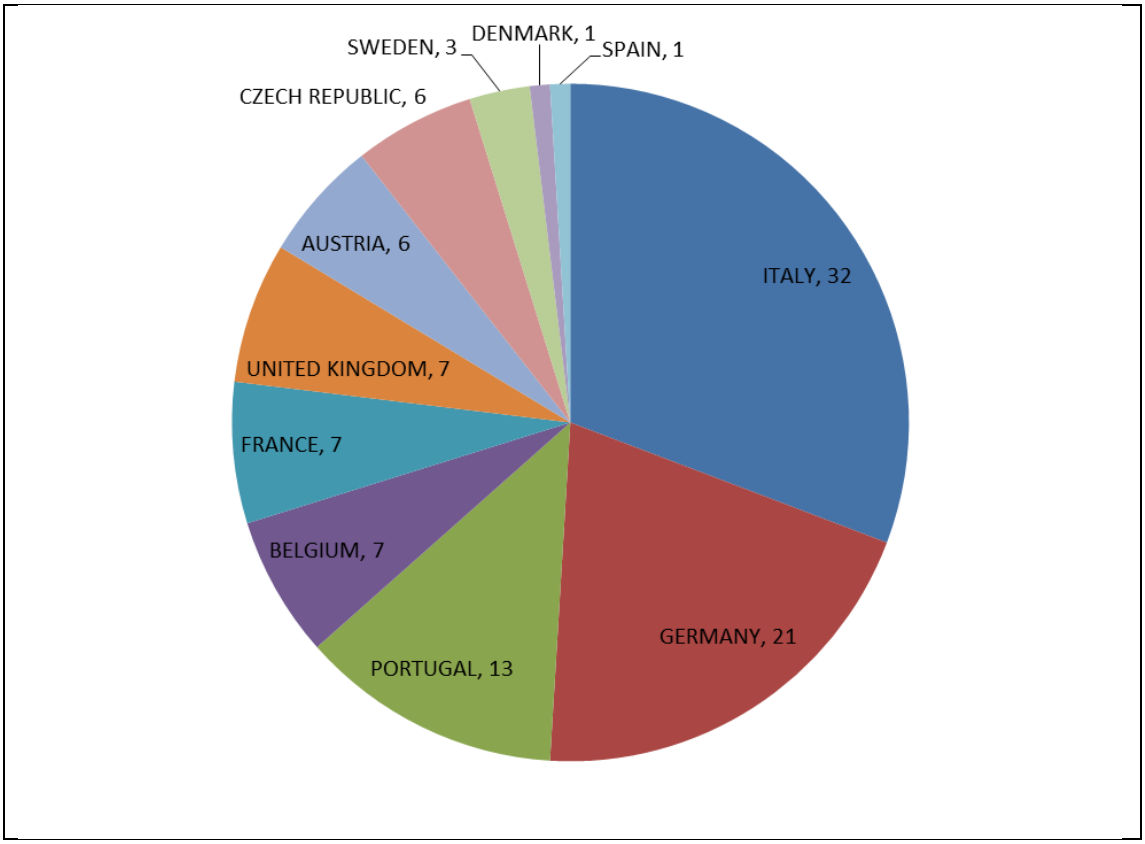
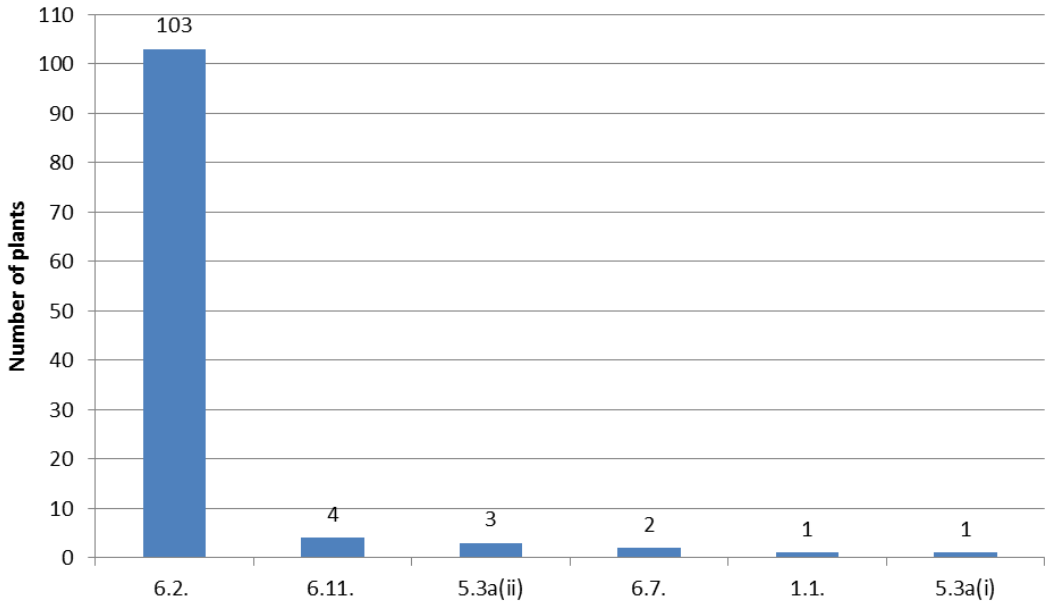


Figure 2-1: Geographical distribution of the reference plants

2.2 Processes

The graph below shows the IED activities carried out in the reference plants.



Notes:
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 and discharged by an installation covered by Chapter II
5.3a(ii): Disposal of non-hazardous waste - Physico-chemical treatment
6.7: Other – Surface treatment of substances, objects or products using organic solvents
1.1: Energy – Combustion
5.3a(i): Disposal of non-hazardous waste - Biological treatment

Figure 2-2: IED activities carried out at the reference plants

All reference plants carry out activities listed in point 6.2 of IED Annex I except one (IT060) which has reported only point 6.11. This plant has however reported processes covered by point 6.2.

The processes carried out at the reference plants are shown in Figure 2-3 and Figure 2-4 below for activities covered by point 6.2 of the IED Annex I and for the directly associated activities (DAAs), respectively.

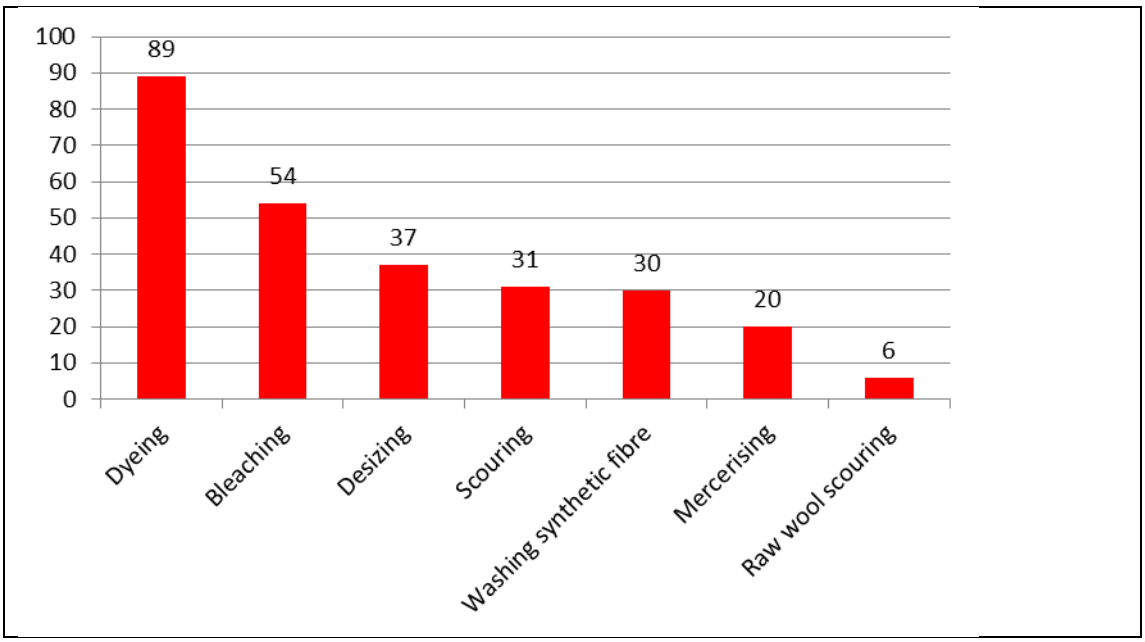


Figure 2-3: Number of plants performing 6.2 activities

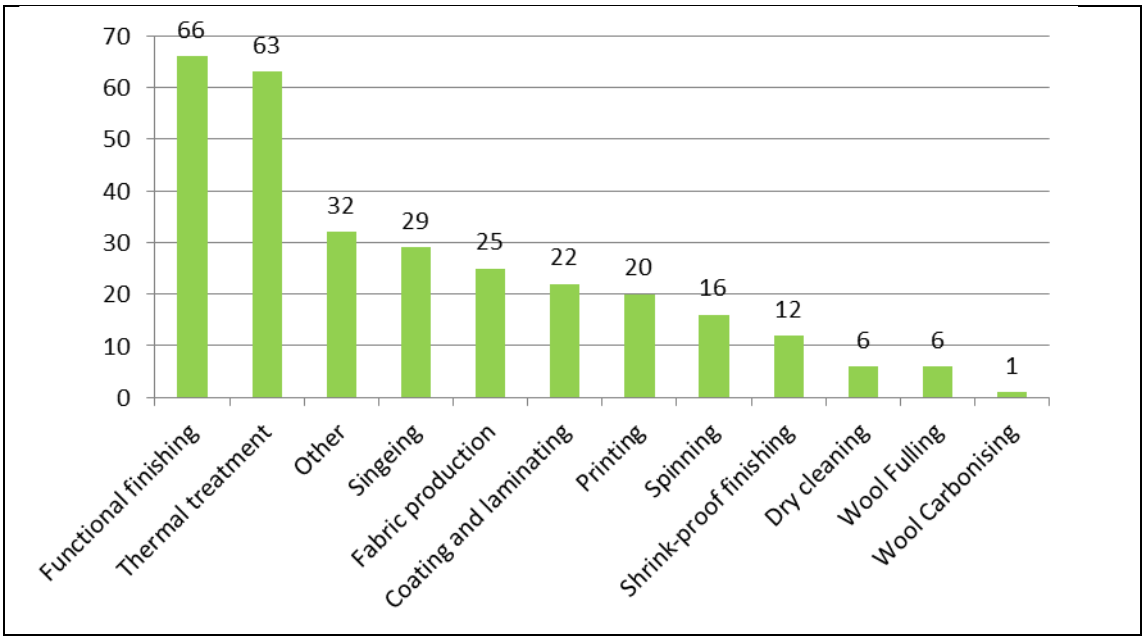


Figure 2-4: Number of plants performing directly associated activities

No plants reported silk weighting as a directly associated activity.

In more detail, concerning fabric production, 5 plants carry out knitting, 12 sizing, 4 tufting, 14 warping, 3 waxing and 19 weaving. No plant reported carrying out needle-felting or production of non-woven fabric.

Of the 89 plants performing dyeing, 39 carry out continuous dyeing and 68 batch dyeing.

Of the 66 plants performing functional finishing, 56 carry out continuous finishing and 23 batch finishing.

Concerning the 32 plants which reported processes other than those listed in the questionnaire template, the information reported in the questionnaires is given in Table 2-1 below.

Table 2-1: Additional information on the other processes carried out

Plant code	Additional information on the other processes carried out
CZ017	No information
DE023	Contract finishing - Boiler house
DE032	Sizing, calandering
DE034	No information
DE042	Laminating
DE047	Boiler house
DE051	Hydrophobieren, hydrophilieren, avivieren – FC - application
IT064	Steam generator
IT067	Steam generator, smoother, warehouse, air conditioning, cogeneration
IT068	e.g. steam generator, softeners
IT069	Physical finishing (not chemical) - Steam generator
IT071	Steam generator - irrestringible treatments - smoothing and stripping
IT072	steam generator - process and packaging
IT074	Some articles could be subject to multiple thermal treatments-e.g. Steam generator, water softeners
IT075	Steam generation – warehouse - air conditioning - cogeneration
IT076	Steam generation – warehouse - air conditioning - cogeneration
IT077	Average for three-year period 2016-2018; for some treatment, textiles have 3 separate thermal treatment-steam generators
IT078	Steam generator-Variable percentage according to annual fashion
IT079	Textile drying - Steam generator
IT082	Thermal power plant
IT084	100% drying 80% heat setting-
IT085	Steam generation – warehouse - air conditioning - smoother
IT087	Steam generator, warehouse, air conditioning
IT089	Textile drying - Steam generator
IT090	Textile drying - Steam generator
IT091	No information
IT092	Post-dyeing processes (re-winding) - Steam generator, warehouse, air conditioning
IT096	Steam generator, warehouse, air conditioning-
IT097	Steam generator, smoother, warehouse, air conditioning
SE120	No information
UK123	Effluent treatment
UK127	Flame Retardants washing and oxidation

It appears from Table 2-1 that a number of processes correspond to the production of steam and/or energy. This matters in particular for emissions to air from these processes as, according to the conclusions of the KoM, they may not be covered by the scope of the TXT BREF review (see more details in Section 3.2).

2.3 Raw material and products

The composition and form of the main raw materials treated by the plants is given in Figure 2-5 and Figure 2-6 respectively.

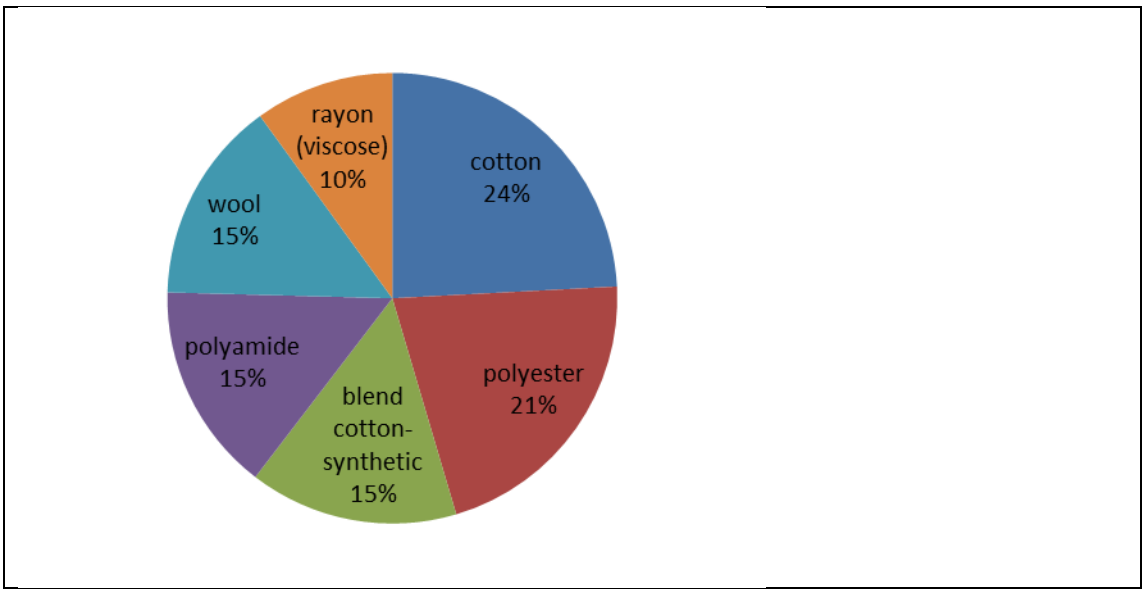


Figure 2-5: Composition of the main raw materials treated

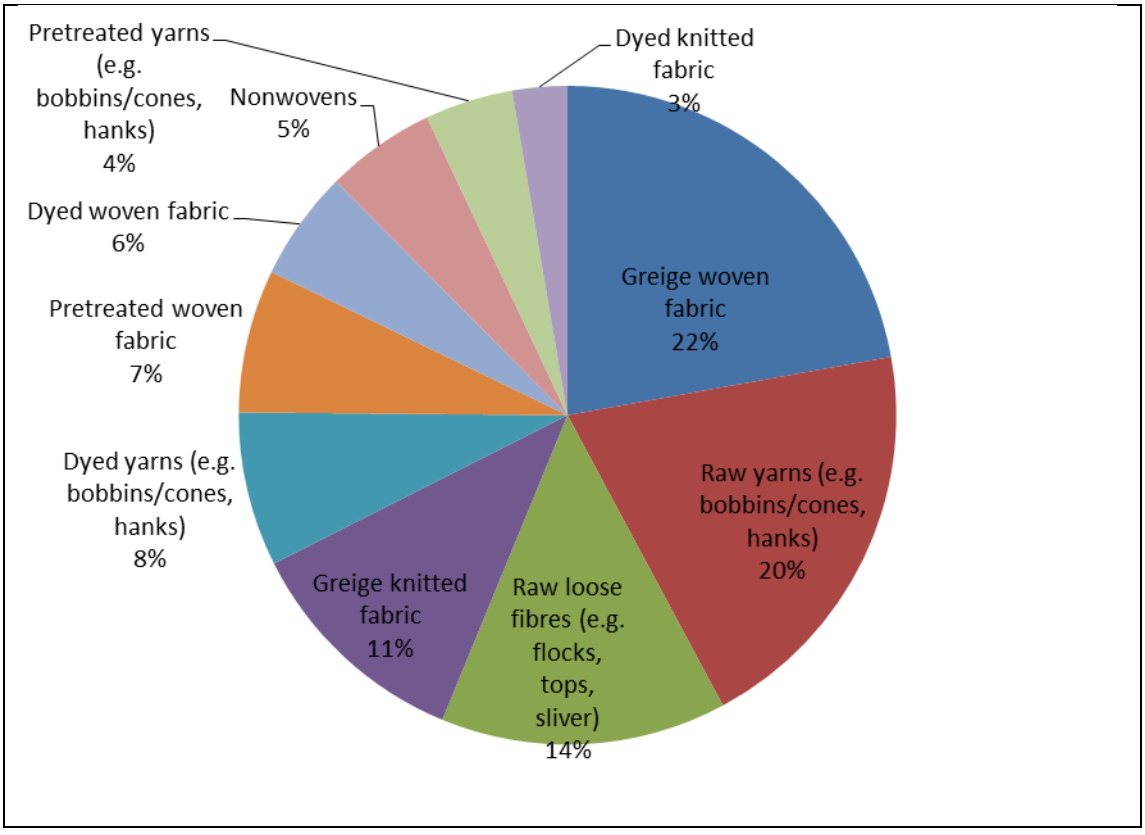


Figure 2-6: Form of the main raw materials treated

The main products of the reference plants are shown in Figure 2-7.

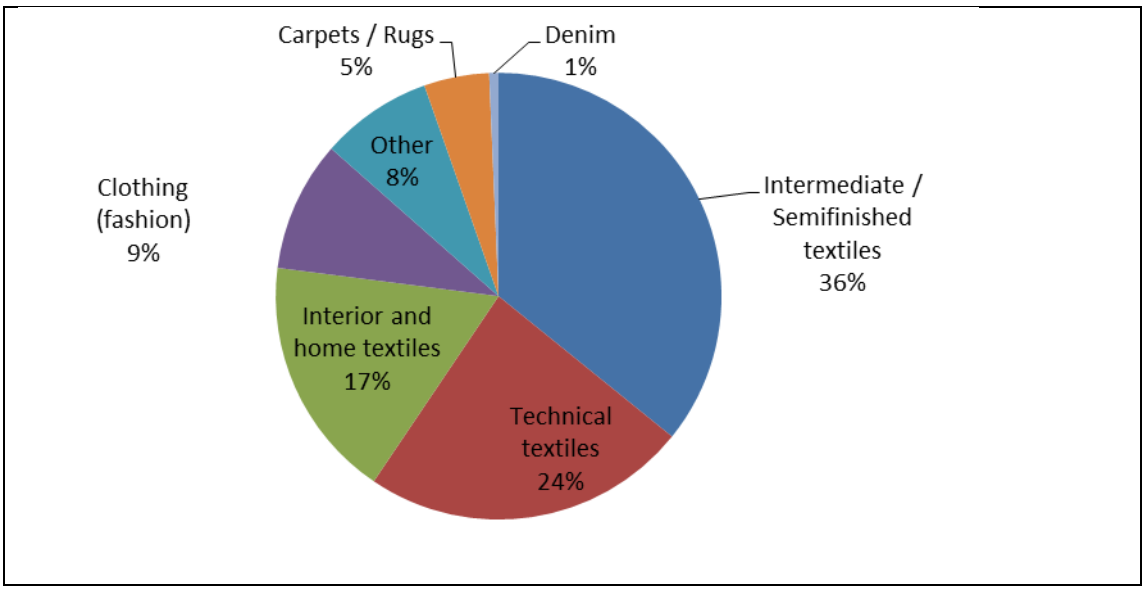


Figure 2-7: Main products of the reference plants

3 EMISSIONS TO AIR

3.1 Overview

Number of emission points
The 107 questionnaires submitted represent a total of 567 monitored points of emission to air. Most of the plants have reported between 1 and 10 monitored emission points to air. 12 plants have reported more than 10 monitored emission points, up to a maximum of 39 for plant ES058.

On the other hand, it is to be noted that 18 plants[2] have not reported any monitored point of emissions to air. The overview is given in Figure 3-2.

Naming of emission points
For emissions to air, the emission points are named according to the following nomenclature: AAXXX_{YY} where AA is the country code, XXX the plant number and YY the number of the emission point. In the case of ES058, PT109 and PT114 which reported more than 20 points of emission, the emission points are named following this example: ES058_1{YY} where YY ranges from 01 to 20 and ES058_2{ZZ} where ZZ ranges from 01 to 19 (because Plant ES058 has reported 39 points of emission in total).

Use of the emission factor
The questionnaire template was seeking information about the use of the emission factor concept as described in Section 4.3.2 of the current TXT BREF.

According to the data collection, the emission factor concept is used for about 6% of the 567 monitored points of emission to air (see Figure 3-1). The 48 emission points concerned are related to 17 plants, 16 of which are located in Germany and one in Italy (IT088).

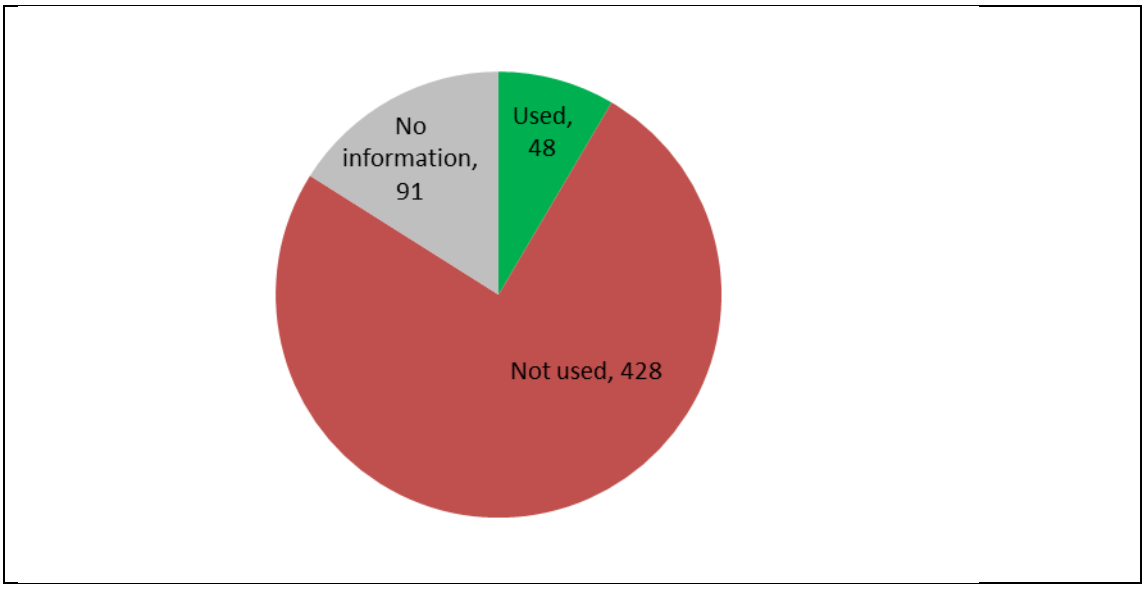


Figure 3-1: Number of emission points where the emission factor concept is used

[2] Plants AT002, AT004, AT005, CZ020, DE021, DE031, DE051, DK054, FR130, FR132, FR133, FR134, IT075, UK121, UK123, UK126, UK128 and UK129.

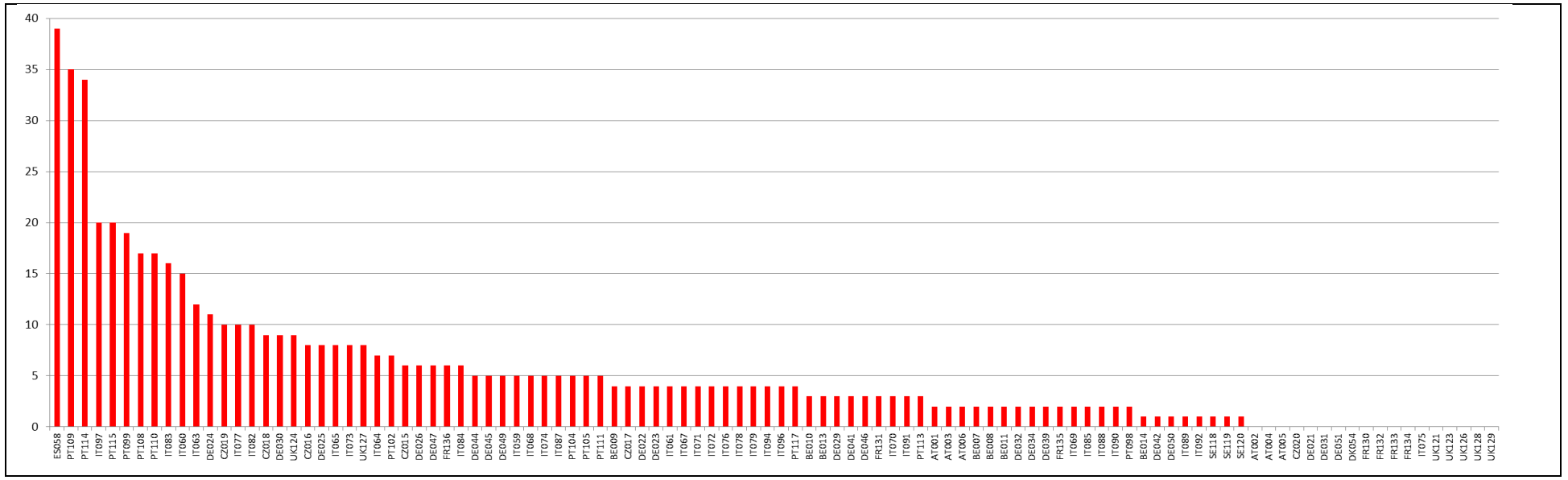


Figure 3-2: Number of monitored points of emission to air by plant

3.2 Associated processes

The details of the processes associated with each point of emission to air are given in Annex I.

It is to be noted than in 59 cases, the associated processes are reported as 'other' and in 99 cases, no information is reported at all. In another 16 cases, although the associated has been reported, it seems that the origin of emissions is in fact a boiler or a heat generator (see Table 9-1 in Annex I).

It is necessary to clarify if all these emission points are really covered by the scope of the TXT BREF review. Indeed, the following was concluded at the KoM:

> *- To include in the scope of the revised TXT BREF emissions from combustion plants directly associated to IED 6.2 activities, only when the combustion gases are put into direct contact with the products (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.*
>
> *- To exclude from the scope of the revised TXT BREF emissions from combustion plants used in the textiles industry with a total rated thermal input below 1 MW, when the combustion gases are not put into direct contact with the products or when radiant and/or conductive heat is not transferred through a solid wall (indirect heating) without using an intermediary heat transfer fluid.*

Based on the above decisions, emissions to air from steam boilers, CHP plants, heat generators for thermal oil and generators of electricity are not necessarily within the scope of the TXT BREF review.

On the other hand, emissions from stenters, dryers are within the scope of the TXT BREF when they satisfy the conclusions of the KoM mentioned above.

Before the next data extraction, it is necessary:
- to confirm that the emission points listed in Table 9-1 **are really within the scope of the TXT BREF review;**
- for the emission points in the scope, to clearly identify the associated processes.

3.3 Monitoring frequency

The 107 questionnaires submitted represent a total of 1 188 sets of measurement data, i.e. for one given emission point and one given parameter the combination of measurements reported over the reference years of 2016, 2017 and 2018.

Of these 1 188 data sets, 1 006 data sets (corresponding to 463 emission points) have been reported as periodic monitoring values and 182 as frequent monitoring values (i.e. parameters monitored more than 12 times per year).

Frequent monitoring
In fact, it seems that almost all frequent monitoring values have been reported as such by mistake as the associated monitoring frequency and/or number of measurements clearly indicate that the measurement is periodic.

These values, reported by 22 plants[3], have not been taken into consideration for the current report and will need to be corrected before the next data extraction.

Only one plant has reported 'real' continuous monitoring: Plant BE013 for measurement of NH_3 at emission points BE013_{02} and BE013_{03} (measurements 2 minutes each, 220 days a year, 8 hours a day).

Periodic monitoring

For 62 % of the 1 006 data sets, the reported monitoring frequency was once every 3 years (which means in practice than the monitoring data sets concerned consist of only one value). The other main monitoring frequencies are once per year (about 17 %) and twice per year (about 14 %). More frequent monitoring represents a very small minority (see Figure 3-3 below).

For 15 data sets, corresponding to 7 emission points[4], no information was reported on the monitoring frequency.

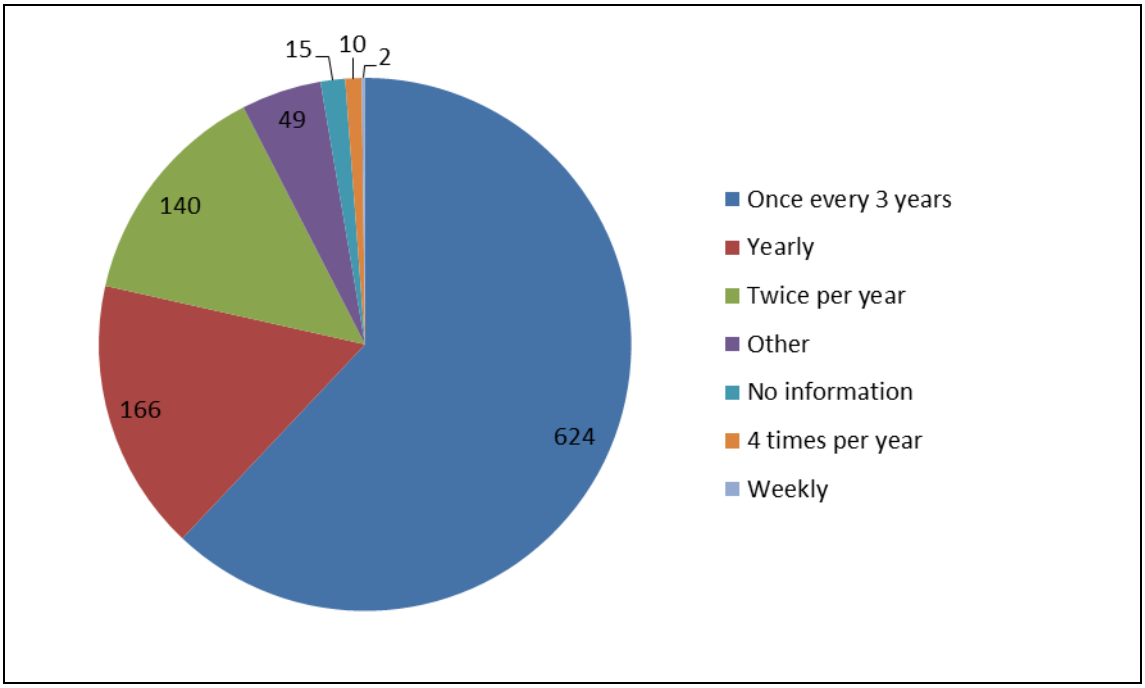


Figure 3-3: Distribution of the monitoring frequency (number of data sets concerned)

Concerning the monitoring frequency reported as "other", more details are given in Table 3-1 below.

Table 3-1: Other monitoring frequencies reported for emissions to air

Emission point	Parameter	Monitoring frequency
AT003_{1}	Dust	Once every 5 years
AT003_{1}	TVOC	Once every 5 years
AT003_{2}	TVOC	Once every 5 years
BE007_{1}	Dust	Measurements done in 2013

[3] Plants AT001, AT003, AT006, BE013, CZ018, DE023, DE024, DE030, DE034, DE045, DE046, DE047, DE050, IT060, IT065, IT073, IT083, IT084, IT088, SE119, SE120 and UK124.

[4] Emission points AT006_{1}, AT006_{2}, BE007_{2}, ES058_2{14}, IT071_{1}, PT108_{11} and PT108_{12}.

BE007_{1}	NO_X	Measurements done in 2013
BE007_{1}	CO	Measurements done in 2013
BE007_{1}	TVOC	Measurements done in 2013
BE009_{1}	NO_X	Measurements done in 2014
BE009_{1}	CO	Measurements done in 2014
BE009_{1}	TVOC	Measurements done in 2014
BE009_{2}	SO_X	Measurements done in 2012
BE009_{2}	NO_X	Measurements done in 2012
BE009_{2}	CO	Measurements done in 2012
BE009_{2}	TVOC	Measurements done in 2012
BE009_{3}	NO_X	Measurements done in 2012
BE009_{3}	CO	Measurements done in 2012
BE009_{3}	TVOC	Measurements done in 2012
BE009_{4}	SO_X	Measurements done in 2012
BE009_{4}	NO_X	Measurements done in 2012
BE009_{4}	CO	Measurements done in 2012
BE009_{4}	TVOC	Measurements done in 2012
BE010_{1}	NO_X	One measurement in 2016 for all parameters
BE010_{1}	CO	One measurement in 2016 for all parameters
BE010_{1}	TVOC	One measurement in 2016 for all parameters
BE010_{1}	NH_3	One measurement in 2016 for all parameters
BE010_{2}	NO_X	One measurement in 2016 for all parameters
BE010_{2}	CO	One measurement in 2016 for all parameters
BE010_{2}	TVOC	One measurement in 2016 for all parameters
BE010_{2}	NH_3	One measurement in 2016 for all parameters
BE010_{3}	NO_X	One measurement in 2016 for all parameters
BE010_{3}	CO	One measurement in 2016 for all parameters
BE010_{3}	TVOC	One measurement in 2016 for all parameters
DE023_{4}	NO_X	No information
DE023_{4}	CO	No information
DE047_{5}	NO_X	Every 2 years
DE047_{5}	CO	Every 2 years
IT067_{2}	NOx	Once every 2 years
IT067_{2}	CO	Once every 2 years
IT067_{3}	NO_X	Once every 2 years
IT067_{3}	CO	Once every 2 years
IT067_{4}	NO_X	Once every 2 years
IT067_{4}	CO	Once every 2 years
IT092_{1}	NO_X	Once every 2 years
IT092_{1}	CO	Once every 2 years
UK124_{3}	NO_X	Once every 4 years
UK124_{3}	CO	Once every 4 years
UK124_{8}	NO_X	Once every 4 years
UK124_{9}	NO_X	Once every 4 years
UK124_{9}	CO	Once every 4 years

Concerning the two data sets[5] with an associated weekly monitoring, this seems to be a reporting mistake as the number of measurements taken does not correspond to weekly monitoring.

3.4 Monitored pollutants

The monitored pollutants in emissions to air are shown in Figure 3-4 below.

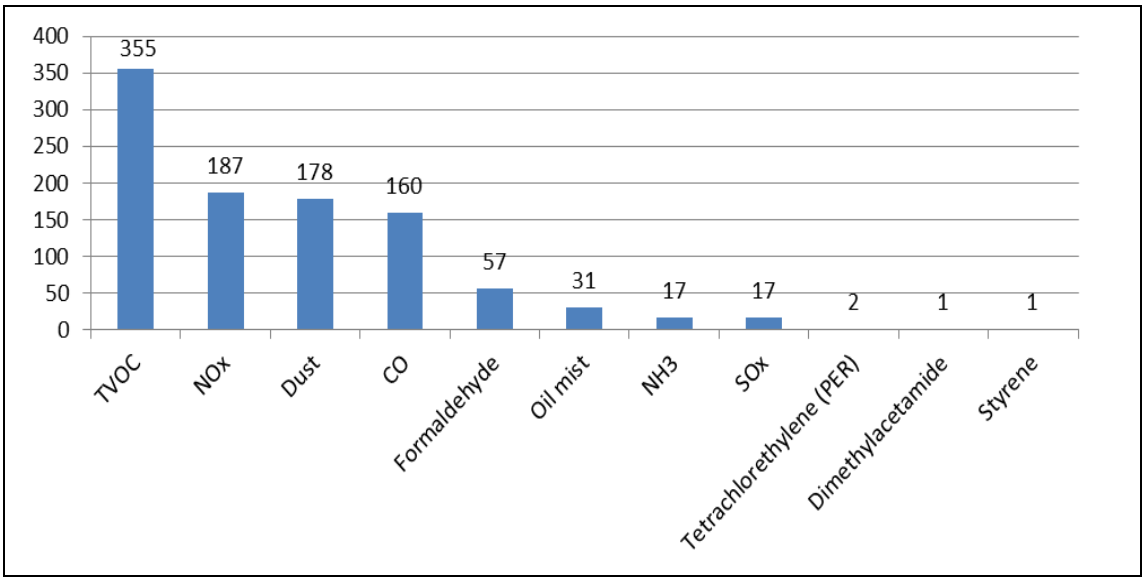


Figure 3-4: Number of data sets for a given pollutant

A total of 11 pollutants (out of the 18 listed in the questionnaire template) have been reported, with only one or two data sets available for PER, dimethylacetamide and styrene. No information has been reported for N-methyl-2-pyrrolidone, N-ethyl-2-pyrrolidone, dimethylformamide, toluene, acrylonitrile, acrylamide or 1,3-butadiene.

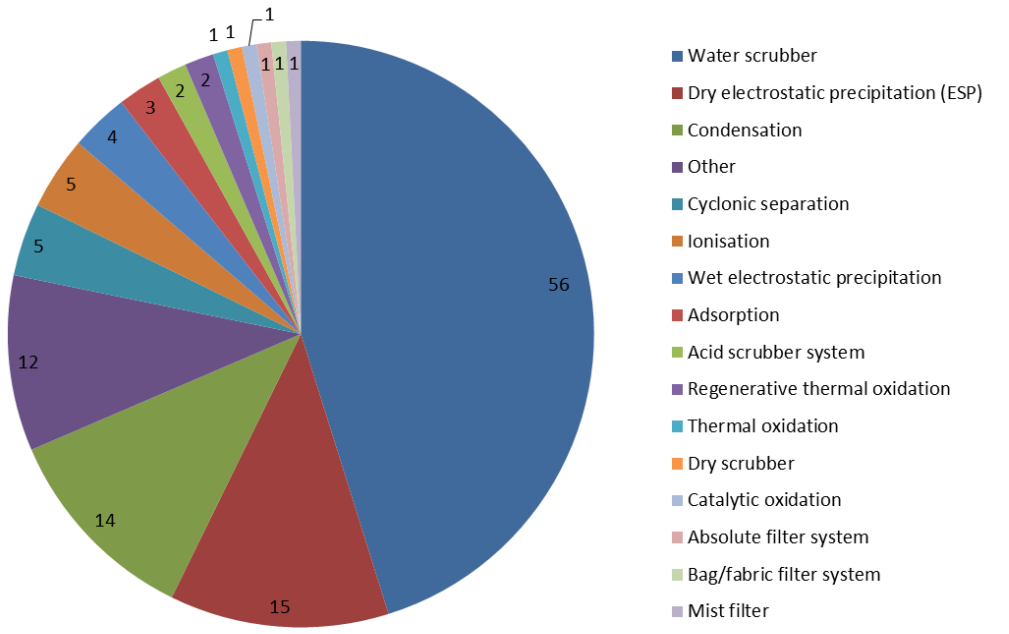
Concerning volatile organic compounds, for two emission points (AT003_{1} and AT003_{2}), NMVOC has been reported instead of TVOC.

3.5 Abatement techniques

Concerning abatement techniques, no information was reported for 393 emission points (69 % of the emission points) and for 72 emission points (13 % of the emission points), it was reported that no techniques were used.

The use of abatement techniques was reported for 102 emission points (18 % of the total number of emission points). The distribution of abatement techniques is shown in Figure 3-5 below.

[5] Emission points IT059_{02} and IT072_{04}.



Note: The total number does not add up to 102 as some emission points are equipped with more than one abatement technique.

Figure 3-5: Number of emission points equipped with a given abatement technique

Table 3-2 below gives more details as to the other techniques used. In a number of cases (IT061_{3}, IT061_{4}, IT083_{15}, IT096_{1}), the technique could be selected in the drop-down menu of the questionnaire. In the other cases, it is not clear how the techniques mentioned may abate the emissions to air.

Table 3-2: Other abatement techniques reported for emissions to air

Emission point	Combination of techniques	Information on the techniques used
IT060_{7}	Other	Self-cleaning filter to protect the mother fan
IT060_{8}	Other	Self-cleaning filter to protect the mother fan
IT061_{3}	Other	Fabric filters
IT061_{4}	Other	Fabric filters
IT083_{15}	Other	High-efficiency filtration with cartridges, BIA Class M
IT096_{1}	Other	Bubbling scrubber
PT111_{1}	Other	No information
PT111_{3}	Water scrubber system, Other	Heat exchange equipment in exhaust gases to heat the inlet air of the stenter
PT115_{2}	Other	Lint extraction system
PT115_{3}	Other	Lint extraction system
PT115_{9}	Other	Lint extraction system
PT115_{18}	Other	Lint extraction system

For the data assessment, when no information about the abatement techniques applied has been reported, it is assumed that no abatement techniques are used.

The removal efficiency of the abatement techniques was given in only 65 data sets out of the 1 006 reported.

3.6 Oxygen correction

Oxygen correction is reported to be used for 109 points of emission to air (19 % of the total number of emission points, see Figure 3-6), for a total of 214 data sets (21 % of the total number of data sets).

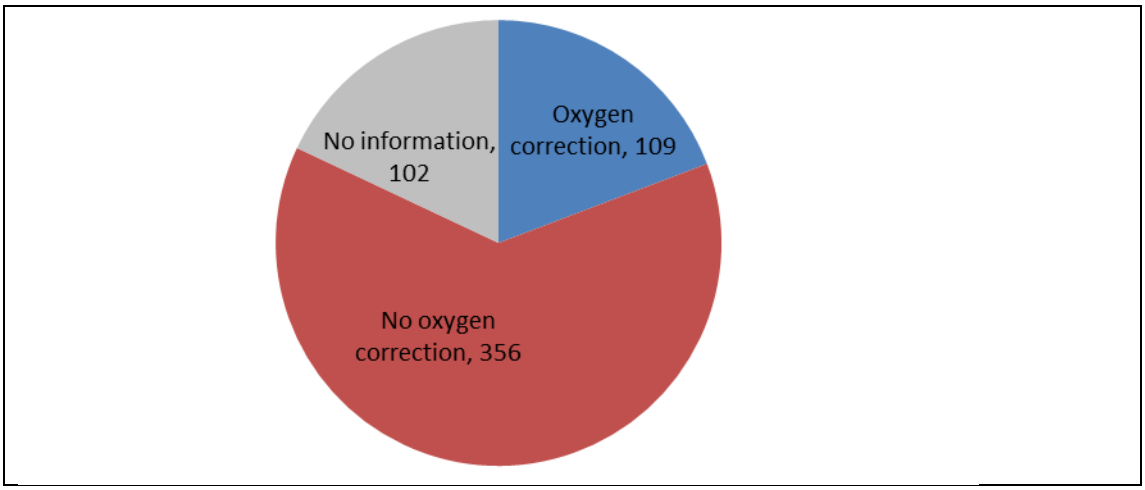


Figure 3-6: Number of emission points where oxygen correction is used

For the data assessment, when no information was reported about the use of oxygen correction (which is the case of 102 emission points), it is assumed that no oxygen correction is applied.

The 109 emission points where O_2 correction is applied correspond to 19 plants[6], mostly located in the Czech Republic and Italy. It is to be noted that 69 of the emission points where oxygen correction is used are also some of the emission points listed in Table 9-1 and for which clarification is needed. A number of these emission points may therefore be outside the scope of the TXT BREF review.

The O_2 reference level reported in submitted questionnaires is mostly 3 % (for 74 emission points, 63 of which seem to correspond to emissions from steam and heat generation and 11 to emissions from the processes). The O_2 reference level reported is 2.18 % for one emission point (CZ018_{2}, corresponding to the emissions from a boiler), around 5 % for 3 emission points (IT065_{1}, IT065_{2} and IT065_{3}, corresponding to emissions from energy production) and between 18.01 % and 20.42 % for 22 emission points (from emission points at Plants CZ015, CZ018 and CZ019 and which seem to correspond to emissions from stenters).

For two emission points[7], the O_2 reference level has not been reported and for five emission points[8], the O_2 reference level has been reported to be 21 %, which seems to mean there is no oxygen correction applied but this would need to be confirmed.

[6] Plants CZ015, CZ016, CZ017, CZ018, CZ019, DE023, DE047, DE050, FR131, IT059, IT063, IT064, IT065, IT067, IT068, IT069, IT070, IT071, IT072, IT074, IT076, IT077, IT078, IT079, IT082, IT083, IT084, IT085, IT087, IT089, IT090, IT091, IT092, IT096, IT097 and PT109.
[7] Emission points CZ016_{3} and DE023_{2}.
[8] Emission points DE047_{1}, DE047_{2}, DE047_{3}, DE047_{4}, DE047_{5}, DE047_{6}, DE050_{1}.

As a first approach and for the purpose of the discussion at the workshop, these 214 data sets are not plotted in the graphs of Annex I (but they are listed in the tables). It would be necessary to understand whether O_2 correction needs to be used for the data assessment or not and, if so, for which emission points and for which O_2 reference level.

In the event that O_2 correction needs to be used for the data assessment, calculations will need to be made to compare the emission concentrations at the same O_2 reference level. With this view, it is to be noted that:

- there are 12 emission points[9] where oxygen correction is used and the O_2 reference level has been reported but not the measured oxygen level;
- there are 247 points where no oxygen correction is used and for which the measured oxygen level has not been reported.

In those two cases, it will not be possible to make the aforementioned calculations.

Finally, it is to be noted that a reference O_2 level has been reported for three emission points[10], corresponding to emissions from steam and heat generation, where nevertheless oxygen correction is not applied. This situation would need to be clarified.

3.7 Units used

For eight emission points[11], the unit associated with the reported values is not mentioned. In addition, for 76 data sets, the unit is reported as 'other', as shown below:

- 44 data sets for TVOC. In that case, the reported values may be expressed as g carbon per kg of textile[12], as pollutant load in g/h[13], or in concentration as mg of carbon per Nm^3[14].
- 13 data sets for NO_X. In that case, the reported values are expressed in ppm[15], in mg/KW[16] or no information is given[17].
- 2 data sets for dust where the emissions are expressed a pollutant load in g/h[18].
- 11 data sets for CO. In that case, the reported values are expressed in ppm[19], in mg/kW[20] or no information is given[21].
- 4 data sets for formaldehyde (all from Plant DE022 where the emissions are expressed in g per kg of textile).

[9] Emission points CZ015_{1}, CZ015_{2}, CZ015_{3}, CZ015_{4}, CZ015_{5}, CZ015_{6}, CZ017_{1}, IT059_{3}, IT059_{4}, IT070_{1}, IT070_{2} and IT096_{3}.
[10] Emission points CZ018_{1}, IT096_{2} and IT097_{19}.
[11] Emission points ES058_2{14}, FR135_{1}, IT071_{1}, IT085_{1}, IT085_{2}, PT108_{8}, PT108_{13} and PT108_{14}.
[12] In the case of Plant DE022.
[13] Emission points DE025_{3}, DE025_{4}, DE025_{7}, DE025_{8}, IT064_{3}, IT068_{3}, IT068_{4}, IT068_{5}, IT069_{2}, IT074_{5}, IT077_{5}, IT077_{6}, IT077_{7}, IT077_{8}, IT077_{9}, IT078_{2}, IT078_{3}, IT079_{3}, IT079_{4}, IT091_{2} and IT091_{3}.
[14] PT099_{3}, PT099_{4}, PT099_{5}, PT099_{6}, PT099_{8}, PT099_{9}, PT099_{10}, PT099_{11}, PT099_{12}, PT099_{13}, PT099_{14}, PT099_{15}, PT099_{16}, PT099_{17}, PT099_{18}, PT109_1{2}, PT113_{1}, PT113_{2} and PT113_{3}.
[15] Emission points ES058_1{4}, ES058_1{5}, ES058_1{6}, ES058_1{8}, ES058_1{15} ES058_1{17} ES058_2{4}, ES058_2{11}, ES058_2{13} and ES058_2{15}.
[16] Emission point BE013_{1}.
[17] Emission points ES058_2{8}and ES058_2{19}.
[18] Emission points IT077_{10} and IT078_{4}.
[19] Emission points ES058_1{4}, ES058_1{5}, ES058_1{6}, ES058_1{8}, ES058_1{15}, ES058_1{17}, ES058_2{4}, ES058_2{15}.
[20] Emission point BE013_{1}.
[21] Emission points ES058_2{8}and ES058_2{19}.

- 1 data set for NH_3 (from emission point IT091_{3}) where the emissions are expressed as a pollutant load in g/h.
- 1 data set for PER (from emission point IT074_{4}) where the emissions are expressed as a pollutant load in g/h.

These data sets cannot be plotted directly on graphs as they are not comparable with other emission concentrations reported in mg/Nm^3. There are nevertheless shown in the tables of Annex I.

For the consideration of these data sets in the graphs, conversions or calculations of the values in concentrations expressed in mg/Nm^3 would be needed.

In particular, concerning the TVOC emissions expressed as mg C/Nm^3, the monitoring standard used is EN 12619:2013. The reported values could therefore be reported directly in mg/Nm^3 as the standard states that 'the results obtained using this standard are expressed in milligrams per cubic metre (mg/m^3) as total carbon (TVOC)'.

3.8 Presentation of data

Information about the pollutants' concentration in emissions to air is presented Annex I in the descending order of available data (see Figure 3-4). The information is presented in graphs and in tables, or only in tables if less than 10 data sets are available.

The graphs show all reported data sets except those which have been excluded as a first approach for the reasons given in Sections 3.3 to 3.7. On the other hand, the tables contain all reported data sets.

Each graph presents the minimum, average and maximum emission concentration over the 3-year reference period as well as the Emission Limit Value (ELV), the maximum emission load over the 3-year reference period and the abatement techniques applied at the emission points.

The tables contain the same information as well as information on the associated processes, the oxygen correction, the reference oxygen content, the unit, the pollutant removal efficiency, the monitoring frequency, the standard monitoring and additional information.

The data are shown in the graphs and tables in ascending order of maximum emission concentration.

It is to be noted that in the case of TVOC, NO_X, dust and CO where many data sets are plotted, the graphs are split over two or three pages.

4 EMISSIONS TO WATER

4.1 Overview

Number of emission points
The 107 questionnaires from 104 plants present a total of 110 monitored points of emissions to water. 89 plants have reported one monitored emission point, 9 plants have reported two monitored emission points, 1 plant reported three monitored emission points and 1 plant reported four monitored emission points.

4 plants reported no points of emission to water (DK054, FR130, FR133, IT060).

Naming of emission points
For emissions to water, the emission points are named according to the following nomenclature: AAXXX_w{Y} where AA is the country code, XXX the plant number and Y the number of the emission point.

4.1.1 Associated processes

The details of the processes associated with each point of emission to water are given in Annex II.

11 plants[22] have not reported processes associated with points of emission to water (14 emission points in total).

4.1.2 Waste water discharge

Type of discharge
Out of 110 emission points, 27 correspond to direct discharges to the environment and 86 indirect discharges. 3 emission points reported no emission measurements (DE021, UK123, UK124 w{3}, and 110 emission points reported emission measurements (25 direct and 85 indirect discharge).

Specific amount of waste water discharged
91 out of 110 emission points have reported data related to the specific amount of waste water discharged.

The data about specific waste water discharged is plotted in the graphs in Annex II of this document. The series of measurements are represented using a different column for each of the 3 years reported: blue for 2016, pink for 2017 and green for 2018. The graph is sorted according to the ascending maximum value of the specific amount of waste water discharge reported over 3 years.

4 plants (DE042_w{1}, PT114_w{2}, CZ019_w{1} and FR113_w{1}) reported only the proportion of waste water from textile processes but no data about the specific amount of waste water discharged. Therefore, they do not appear in the graph in Annex II.

There is a great variability in the range of reported data, from 0.01 m^3/t of textile treated to 408 000 m^3/t of textile treated. For a better visualisation of the data in the graph, different graphs have been made by applying zooms at different intervals: a first graph showing the whole range of values, a second graph with a cut at 1 000 m^3/t of textile treated and a third graph with a cut at 100 m^3/t of textile treated.

[22] AT001, AT002, AT005, FR132, IT065, IT070, IT094, PT109, PT114, PT115 and UK124.

The same values have been reported for the specific amount of waste water discharges and the proportion of waste water from textile processes, for Plants IT074 and IT077, which have two points of emissions to water IT074_w{1}, IT074_w{2}, and IT077_w{1}, IT077_w{2}, respectively.

Proportion of waste water from textile processes
Of 91 emission points that reported the amount of waste water discharge, 13 have not reported data on the proportion of waste water discharged from textile processes.

All reported values are presented in the table in Annex II, together with data on waste water discharge. Only the values of the average over 3 years are presented below the labels of corresponding emission points in the graphs of specific waste water discharge in Annex II.

Three points of emissions to water, IT079_w{1}, BE010_w{1} and CZ020_w{1}, have reported a proportion of waste water from textile processes of less than 50 %, and five points of emissions to water, (PT114_w{2}, FR132_w{1}, IT071_w{1}, IT074_w{1} and IT074_w{2}, have reported a proportion of waste water from textile processes equal to 0 %.

4.1.3 Waste water flow

31 questionnaires reported no waste water flow data. 4 plants reported no data on waste water flow, but reported emission concentrations (DE041, IT084, PT099, PT110) and 13 questionnaires reported waste water flow in different units than foreseen by the questionnaire (m^3/day): m^3 (IT061, IT064, IT068, IT069, IT074, IT078, IT091), m^3/month (DE022, DE029, DE030, FR136, PT108) or m^3/year (CZ019).

These values have not been taken into consideration for the current report (e.g. for the load calculations) and would need to be corrected and expressed in the right unit (m^3/day) in order to calculate the pollutant loads (by multiplication of waste water flows and corresponding pollutant concentrations).

4.1.4 Monitoring frequency

The 107 questionnaires present a total of 1 175 data sets related to emissions of pollutants to water (i.e. reported in Part 6_2_2 of Worksheet 6 of the questionnaire). These data sets correspond either to a combination of individual measurements, when the parameter is measured up to 12 times per year (periodic monitoring), or to a combination of minimum/average/maximum/97th percentile, when the parameter is measured more than 12 times per year (frequent monitoring).

The distribution of data sets according to the type of monitoring is as follows:

- periodic monitoring: 1 033;
- frequent monitoring: 337.

In addition, it is to be noted that for 195 data sets (reported by 24 plants[23]), both periodic and frequent monitoring have been reported, which would need to be clarified as a given parameter cannot be reported as being monitored less and more than 12 times per year at the same time.

As a first approach for this report and until the situation is clarified, these data sets have been considered as associated to periodic monitoring only, which leads to the final numbers of:

[23] AT001, AT002, AT003, AT004, AT005, BE008, BE009, CZ016, CZ018, CZ020, DE023, DE025, DE030, DE031, DE034, DE042, DE046, DE051, IT065, IT073, IT083, IT088, PT113 and UK129.

- periodic monitoring: 1 033;
- frequent monitoring: 142.

Frequent monitoring

The distribution of the monitoring frequencies of the 142 data sets that were reported as frequent measurements can be seen in Figure 4-1.

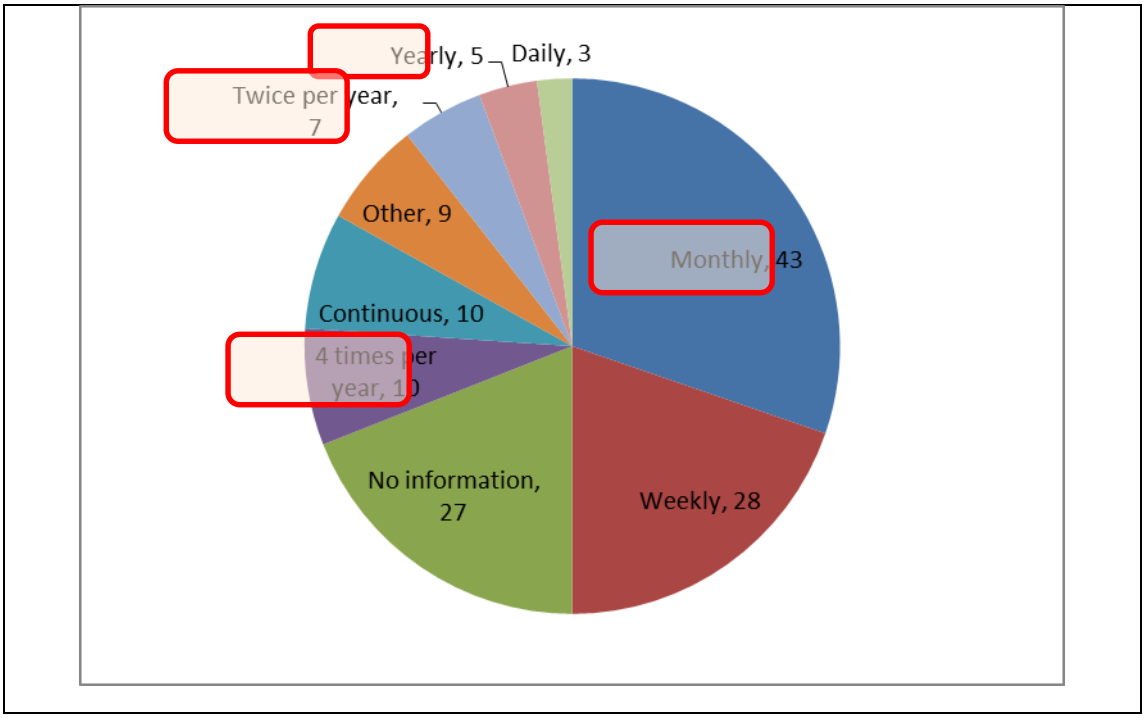


Figure 4-1: Distribution of the reported monitoring frequencies (number of data sets concerned) for the frequent measurements

It appears from this figure that 65 data sets[24] are associated with a monitoring frequency which corresponds in fact to periodic monitoring (monthly, 4 times per year, twice per year and yearly) and this would need to be corrected.

27 data sets[25] contain no information on monitoring frequency. Looking at the number of measurements reported by these data sets (e.g. in 2016) there are 2 data sets from SE119_w {1} and 2 data sets from SE120_w {1} which reported that only one measurement was done; and for one data set from SE119_w {1} the number of measurements reported was 10. According to the definitions in the questionnaire, there would need to be more than 12 measurements per year for monitoring to be considered frequent. The remaining 25 data sets reported a number of measurements higher than 12 and could be considered frequent.

9 data sets are associated with 'Other' monitoring frequency (related to emission points: IT085_w {1}, SE120_w {1}, UK126_w {1}), but the number of measurements reported is higher than 12, so indeed the monitoring can be considered frequent.

Periodic monitoring

[24] Related to emission points BE007_w{1}, CZ019_w{1}, DE041_w{1}, DE045_w{1}, ES058_w{1}, FR135_w{1}, SE118_w{1}, UK121_w{1}, UK124_w{1} and UK129_w{1}.
[25] Related to emission points: BE009_w {1}, DE034_w {1}, SE119_w {1}, SE120_w {1}, UK126_w {1} and UK128_w {1}.

The distribution of the monitoring frequencies of 1 033 data sets that were reported as periodic measurements can be seen in Figure 4-2.

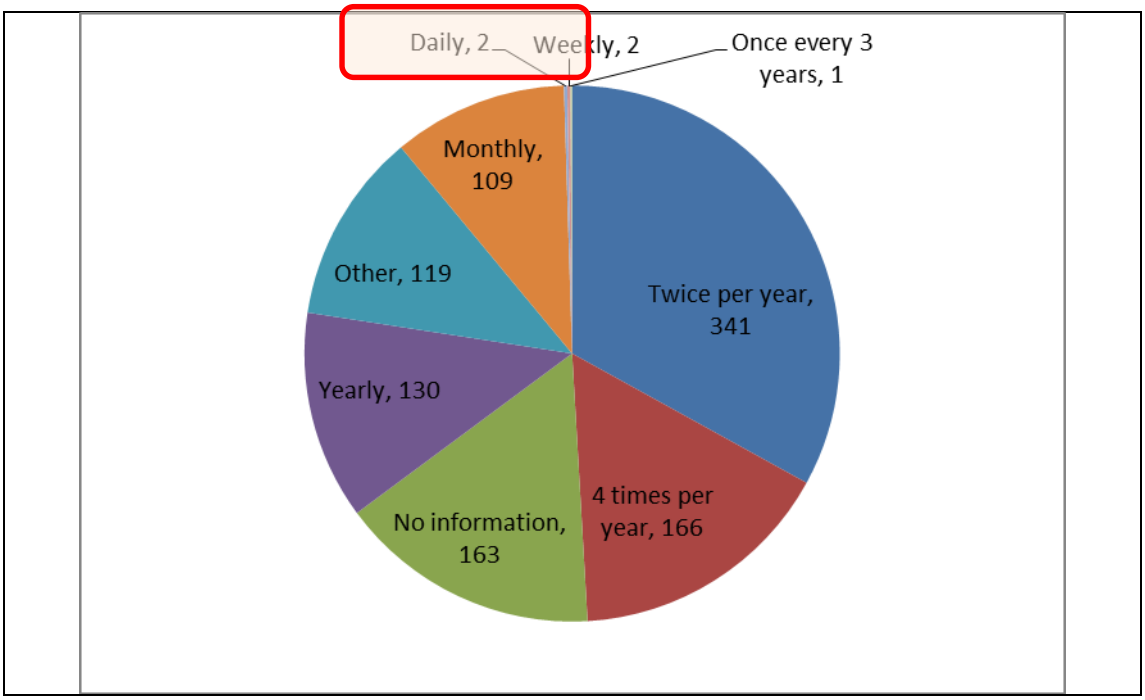


Figure 4-2: Distribution of the reported monitoring frequencies (number of data sets concerned) for the periodic measurements

119 data sets are associated with the monitoring frequency 'Other', but, apart from 2 data sets[26] which reported 23 measurements per year, all the other data sets are indeed associated with a number of measurements consistent with periodic monitoring.

163 data sets contain no information on monitoring frequency but the reported number of measurements indeed corresponds to periodic monitoring, except for 10 data sets[27].

Finally, 2 data sets[28] reported the monitoring frequency 'Weekly' and 2 data sets[29] 'Daily'; however, the reported number of measurements are very low (1, 2 or 4 measurements per year), which would indicate that the monitoring frequencies reported are not correct.

4.1.5 Monitored pollutants

Out of 1 175 reported measurement data sets, 987 were reported for the 19 pollutants or parameters listed in block 6_2_2 of Worksheet 6 of the questionnaire. The number of data sets for each of the pollutants is shown in Figure 4-3 below.

[26] Related to DE031_w{1}.
[27] Related to BE009_w{1}.
[28] Related to AT001_w{1} and AT004_w{1}.
[29] Related to AT004_w{1} and AT006_w{1}.

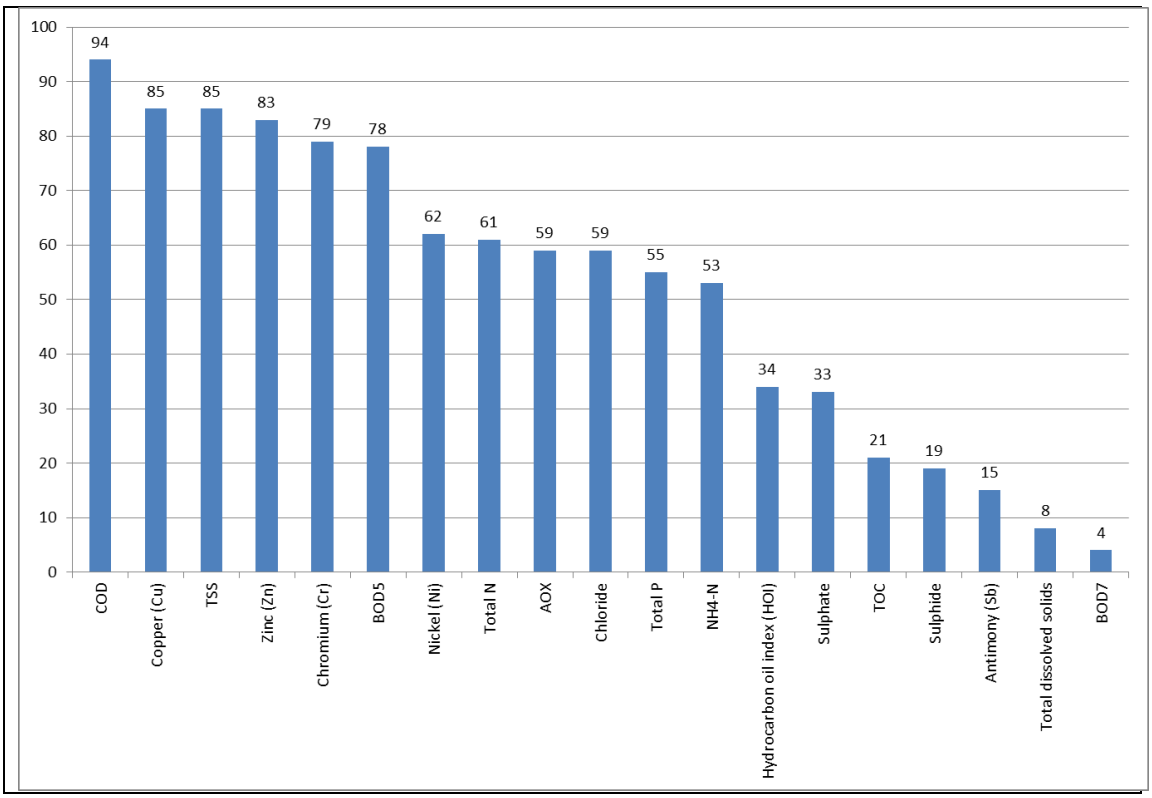


Figure 4-3: Number of data sets for a given pollutant or parameter from block 6_2_2 of the questionnaire

In addition to the 19 pollutants or parameters listed in the questionnaire, it was also possible to report pollutants or parameters in free text for the following groups of pollutants: APs (alkylphenols) and APEOs (alkylphenol ethoxylates) (block 6_2_2_1), brominated flame retardants (block 6_2_2_2), surfactants (block 6_2_2_3), perfluorocarbons (block 6_2_2_4) and pesticides (block 6_2_2_5).

APs and APEOs

34 data sets have been reported for the pollutants related to block 6_2_2_1 of the questionnaire. The number of data sets for each of the pollutants is shown in Table 4-1 below.

Table 4-1: Pollutants reported in the block 6_2_2_1 APs and APEOs

Parameter or pollutant name	Number of data sets
4-n-nolylphenol	1
4-nonylphenol diethoxylate	1
4-nonylphenols monoethoxylate	1
AP	2
NP	13
OP	4
OP, OP1EO;NP, NPEO	1
NFE or NPEO	3
APEO	5
APEO C15	1
APEO C16	1
APEO C17	1

Brominated flame retardants

10 data sets have been reported for the pollutants related to block 6_2_2_2 of the questionnaire. The number of data sets for each of the pollutants is shown in Table 4-2 below.

Table 4-2: Pollutants reported in the block 6_2_2_2 Brominated flame retardants

Parameter or pollutant name	Number of data sets
13 substances	1
Brominated and chlorinated flame retardants	1
Flame retardants: TRIS;TEPA;TCEP;PBB;BDBPT;BBP;PBDE;OctaBDE;DecaBDE;HBCDD;TSCPP; TCPP; TBB; TBPH; TPP; TMP; TBBPA; BBMP: TetraBDE; HexaBDE; HeptaBDE; NonaBDE	1
BDE 209 ([1])	1
DecaBDE	4
HpBDe	1
NonaBDE	1
([1]) This corresponds to DecaBDE.	

Surfactants

99 data sets were reported for the pollutants related to block 6_2_2_3 of the questionnaire. The number of data sets for each of the pollutants is shown in Table 4-3 below.

Table 4-3: Pollutants reported in the block 6_2_2_3 Surfactants

Parameter or pollutant name	Number of data sets
Anionic and non-ionic surfactants	1
Anionic surfactants	22
Anionic surfactants (MBAS)	9
Cationic surfactants	23
Cationic surfactants (DBAS)	1
CBAS	1
CTAB	2
Non-ionic surfactants	24
Non-ionic surfactants (BIAS) ([1])	2
TAS non-ionic ([1])	2
Total surfactants	12
([1]) Shown in this report as 'non-ionic surfactants'.	

Perfluorocarbons

30 data sets were reported for the pollutants related to block 6_2_2_4 of the questionnaire. The number of data sets for each of the pollutants is shown in Table 4-4 below.

Table 4-4: Pollutants reported in the block 6_2_2_4 Perfluorocarbons

Parameter or pollutant name	Number of data sets
Perfluoropentane acid (PFPeA)	1
PFPeH	1
PFHpA	2
PFHxA	3
PFHxS	1
PFAS	1
Perfluorooctanoic acid (PFOA)	10
PFOS	6
PFOS; PFOA	1
6 substances	1

PFC: PFBA; PFPeA; PFHxA; PFHpA; PFOA; PFNA; PFDA; PFUnA; PFDoA; PFTrA; PFTA; PFBS; PFHxS; PFHpS; PFOS; PFDS; PFOSA; PFHxO; PFOcO; PFDeO; PFOcAc; FTOH 10-2; PFHxS; N-MeFOSE; N-EtFOSE; N-MeFOSA; N-EtFOSA; FTA 10-2; H2PFDA; HPFHpA; HPFUnA; H4PFO 6-2; PFHx; PFPe; PFCB; 7H-DoFHpA; 2H-PFDeA; 1H-2H-PFOS; 8:2FTS; H2PFDeA; POSF;	1
Sum10PFT	1
Sum2PFT	1

Pesticides
15 data sets were reported for the pollutants related to block 6_2_2_5 of the questionnaire. The number of data sets for each of the pollutants is shown in Table 4-5 below.

The questionnaire was targeting primarily emissions of pesticides to water from plants scouring raw wool. 11 out of 15 data sets were reported by plants that carry out raw wool scouring (Plants IT076, UK128 and UK129), and 4 data sets have been reported by plants processing wool yarns or loose fibre (IT092 and IT 097).

Table 4-5: Pollutants reported in the block 6_2_2_5 Pesticides

Parameter or pollutant name	Number of data sets
Atrazine	1
Desetilatrazine	1
Simazine	1
Imidacloprid	2
Organochlorine pesticides	2
Organophosphorus pesticides	2
Phenylurea pesticides	1
Synthetic pyrethroid pesticides	2
277 substances	1
63 substances	1
Total pesticides	1

4.1.6 Characteristics of the waste water

The questionnaire allowed also collected relevant information related to the characteristics of the waste water, mainly toxicity, biodegradability and bioeliminability and colour.

23 data sets (from 14 plants) are available for toxicity, of these 6 can be attributed to Daphnia magna, 4 to Vibrio fisceri (bacteria), 4 to inhibition tests on microorganisms from active sludge, 3 on algae, 2 on fish, 1 on fish eggs and 1 on bacteria/daphnia magna/algae toxicity tests. For 2 data sets, it was not clear to which toxicity test (standard monitoring method) they refer.

16 data sets are available for colour, 7 reported in units of Pt-Co scale, 7 in SAC (m^{-1}), one in mg/l Pt and one reported measurements but no unit.

Only 2 data sets are available for biodegradability and bioeliminability, both according to the same standard monitoring method (OECD 301A).

Considering the variability of the measurement methods and the consequent difficulty to compare the data, the data sets have not been plotted in graphs. The information is however available in the relevant tables in Annex II.

4.1.7 Abatement techniques

Out of 110 emission points that reported 1 175 data sets of emission measurements, Figure 4-4 shows the numbers of emission points and data sets related to each of the waste water treatment techniques.

'No information' was reported for 32 emission points and 259 data sets and for 3 emission points and 40 data sets it was reported that 'No techniques' were used. When no information was reported it is assumed that no technique is used.

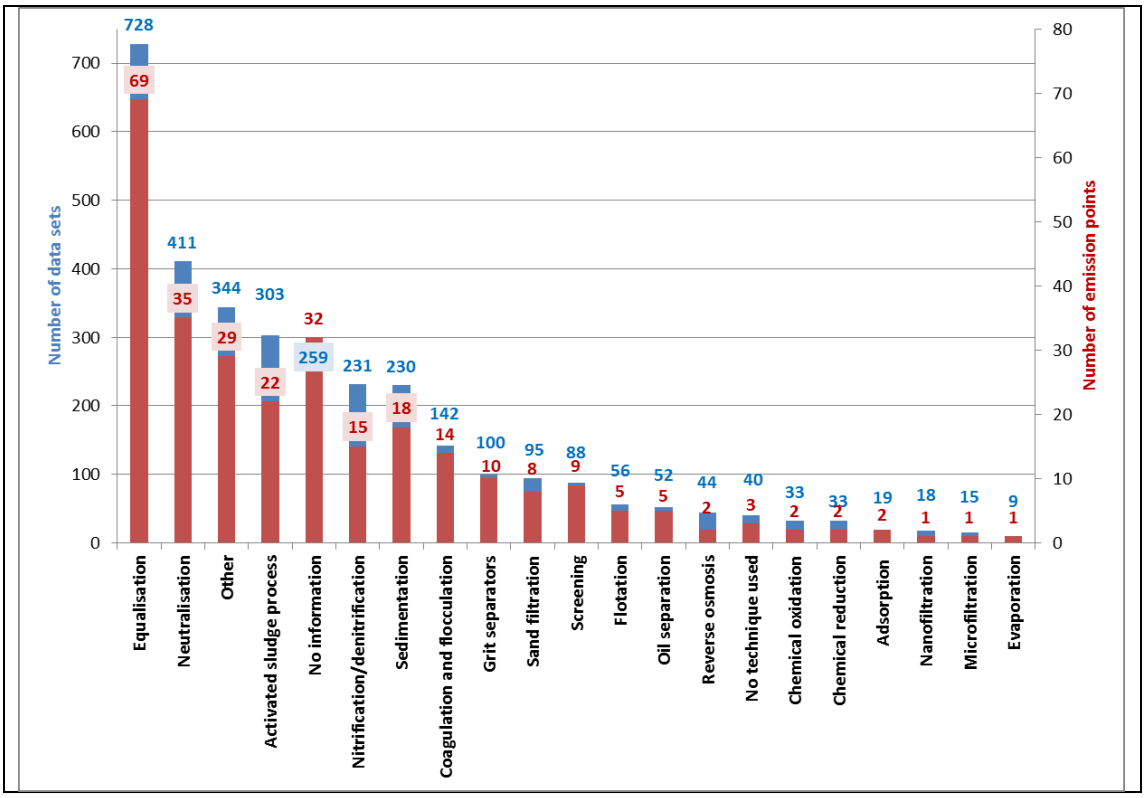


Figure 4-4: Number of emission points (red) and data sets (blue) related to a given waste water treatment technique

For 29 emission points and 344 data sets reported, 'other' techniques are applied (see Table 10-1).

Removal efficiency
Removal efficiency was reported in only 16 out of 1 175 data sets. The values are presented in Table 10-2 in Annex II.

4.1.8 Units used

Out of the 1 175 data sets reported, 34[30] are not associated with units for concentration measurements and 4 data sets[31] are associated with an 'Other' unit.
These data sets are not plotted in the graphs but are listed in the tables in Annex II.

[30] Related to emission points: BE008_w{1}, BE011_w{1}, BE013_w{1}, BE014_w{1}, DE022_w{1}, DE032_w{1}, DE039_w{1}, FR135_w{1}, IT065_w{1}, IT077_w{1}, IT077_w{2}, IT087_w{1}, PT108_w{1}, PT109_w{1}, SE119_w{1} and SE120_w{1}.
[31] From Plants SE120 and UK126.

4.1.9 Presentation of data

Information about the pollutants' concentration in emissions to water is presented Annex II in the descending order of available data (see Figure 4-3). The information is presented in graphs and in tables, or only in tables if less than 10 data sets are available.

The graphs show all reported data sets except those which have been excluded as a first approach for the reasons given in Sections 4.1.3 to 4.1.8. On the other hand, the tables contain all reported data sets.

Each graph presents the minimum, average and maximum emission concentrations over the 3-year reference period as well as the Emission Limit Value (ELV), the maximum emission load over the 3-year reference period, the type of discharge (direct or indirect), the type of monitoring (periodic or frequent) and the abatement techniques applied at the emission points.

Concerning the type of discharge and in accordance with the KoM conclusions, only direct discharge data sets are plotted in the graphs for some parameters (e.g. COD, TOC, TSS and Total N). However, both indirect and direct discharge data sets are presented in the tables.

In the case of frequent monitoring, the minimum emission concentration corresponds to the maximum of the three minima reported. Likewise, the average and maximum concentrations correspond to the maximum of the three averages and three maxima reported, respectively. The maximum emission load corresponds to the maximum emission concentration multiplied by the average water flow.

The tables and graphs have been sorted in ascending order of the maximum emission concentration of all reported values (minimum, average and maximum).

5 WATER CONSUMPTION AT PLANT LEVEL

5.1 Overview

Of the 104 plants that participated in the data collection, 14[32] plants have not filled in data related to the water consumption of the entire plant, either related to specific water consumption, or the proportion of recycled/reused water in the total water consumption.

The range of the reported values for the average specific water consumption goes from 0 m^3 to 732 m^3 water consumed/t of textiles processed.

5.2 Recycled/reused water in the total water consumption

A total of 60 questionnaires contain data on the proportion of recycled/reused water consumption. Out of the 60 plants that have reported information, 35 plants have reported a percentage of 0 %.
There are 3 plants that have reported 100 % recycled/reused water consumption, but in the case of PT111, an average specific water consumption of around 258 m^3/t has also been reported, while for the other two plants (IT061 and IT088) the average specific water consumption reported is 0 m^3/t.

PT109 has reported the proportion of recycled/reused water consumption but has not reported the specific water consumption.

5.3 Monitoring water consumption

Figure 5-1 gives the distribution of the different types of monitoring which have been reported for water consumption.

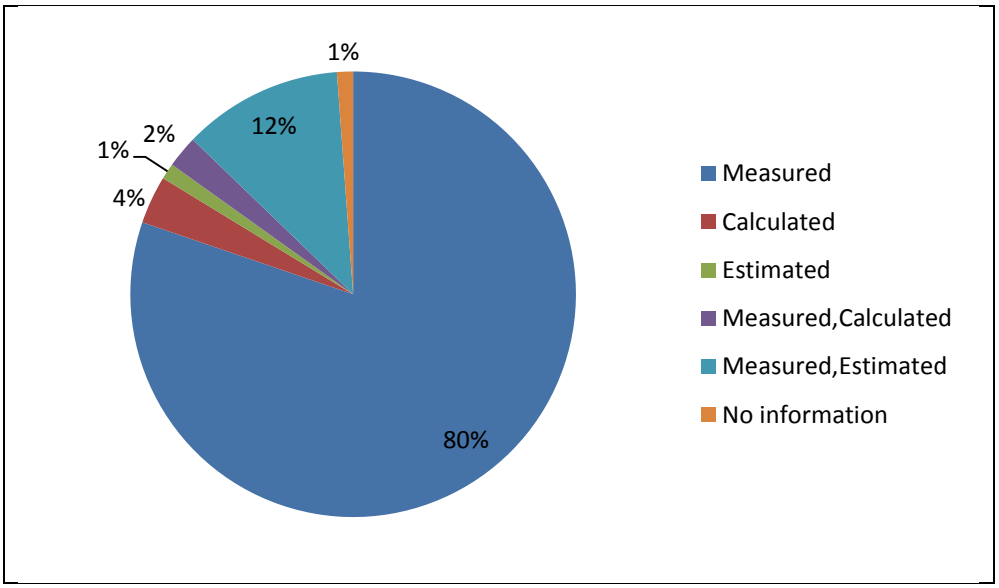


Figure 5-1: Types of monitoring of water consumption

[32] Plants that do not report data about water consumption: AT001, AT002, AT006, CZ016, CZ018, CZ019, DE026, DK054, IT060, PT104, PT105, UK127, UK128 and UK129.

5.4 BAT candidates

A total of 21 BAT candidates have been reported in the questionnaire for reducing water consumption. The techniques reported are listed in Table 5-1 below

Table 5-1: List of BAT candidates reported for reducing water consumption

Technique code	Technique name
BAT1	4.1.1 Management and good housekeeping
BAT2	4.1.4 Optimising water consumption in textile operations
BAT3	4.6.22 Water re-use/recycling in batch dyeing processes
BAT4	4.7.7 Reduction of water consumption in cleaning operations
BAT5	4.9.1 Water & energy conservation in batch washing and rinsing
BAT6	4.9.2 Water & energy conservation in continuous washing and rinsing
BAT7	Procedures to avoid spillages and overfilling
BAT8	Adjustment of scheduling in production
BAT9	Automatic controllers of fill volume and liquor temperature
BAT10	Drain and fill method for rinsing
BAT11	Smart rinsing systems
BAT12	Overflow or "flood" rinsing
BAT13	Automatic stop valves
BAT14	Counter-current washing
BAT15	Reduction of carry-over
BAT16	Dry cleaning of process baths before rinsing
BAT17	Reuse rinse waters
BAT18	Reuse cooling water
BAT19	Reuse cleaning waters
BAT20	On-line monitoring
BAT21	Other

5.5 Presentation of data

When a plant has reported data referring to the minimum, average or maximum specific water consumption, the value reported for the average specific water consumption has been used in the graph.

Plants DE029, DE039, PT104, PT109 and UK127 are not plotted in the graphs because the data provided in the questionnaire refer to the minimum or maximum specific water consumption and not to the average specific water consumption.

The graph in Annex III consists of three parts. The upper part shows the average specific water consumption reported per plant and for the 3-year period (2016-2018). The second part shows the percentage of recycled/reused water for each year. The third part shows the combination of BAT candidates reported in the questionnaires.

All the graphs are sorted by ascending order of average specific water consumption over the 3-year period.

The data table is sorted in the same way as the graphs, by minimum to maximum average specific water consumption over the 3-year period. At the end of the table, the plants for which there are no values for the specific water consumption, but for which there is information about the proportion of recycled/reused water, are shown.

6 ENERGY CONSUMPTION AT PLANT LEVEL

6.1 Overview

Out of the 104 plants that participated in the data collection, 15[33] plants have not filled in data related to energy consumption of the entire plant, either related to specific net energy consumption, electricity consumption, heat consumption or recovered heat in the heat consumption.

The range of the reported values for the average specific energy consumption goes from 0 kw/t to 74 900 kw/t of textiles treated.

6.2 Electricity and heat specific energy consumption

It is expected that the sum of the specific electricity consumption and specific heat consumption will be equal to the specific energy consumption. This situation occurs in most of the plants, but in 37 plants one of the following situations has been noted:

- The sum of the electricity- and heat-specific energy consumption is greater than the specific energy consumption: IT061, IT088, PT102, PT117, SE120.
- The sum of the electricity- and heat-specific energy consumption is less than the specific energy consumption: BE007, BE008, BE009, BE010, BE011, BE013, BE014, DE021, DE022, DE051, FR131, FR134, FR135, IT059, PT099, PT114, SE118, UK124 and UK126.

6.3 Recovered heat in the heat consumed

A total of 19 questionnaires contained data on the recovered heat in the heat consumed. Of the 19 plants that have reported information, 4[34] plants have not reported data about the specific heat consumption.

6.4 Monitoring energy consumption

Figure 6-1 gives the distribution of the different types of monitoring for specific energy consumption.

[33] Plants that do not report data about energy consumption: AT001, AT002, AT004, AT006, CZ016, CZ018, CZ019, CZ020, DE026, DE044, DK054, IT060, PT115, UK128 and UK128.
[34] Plants that reported proportion of recovered heat in the heat consumption but not reported data about the heat consumption: BE011, CZ015, DE021 and DE051.

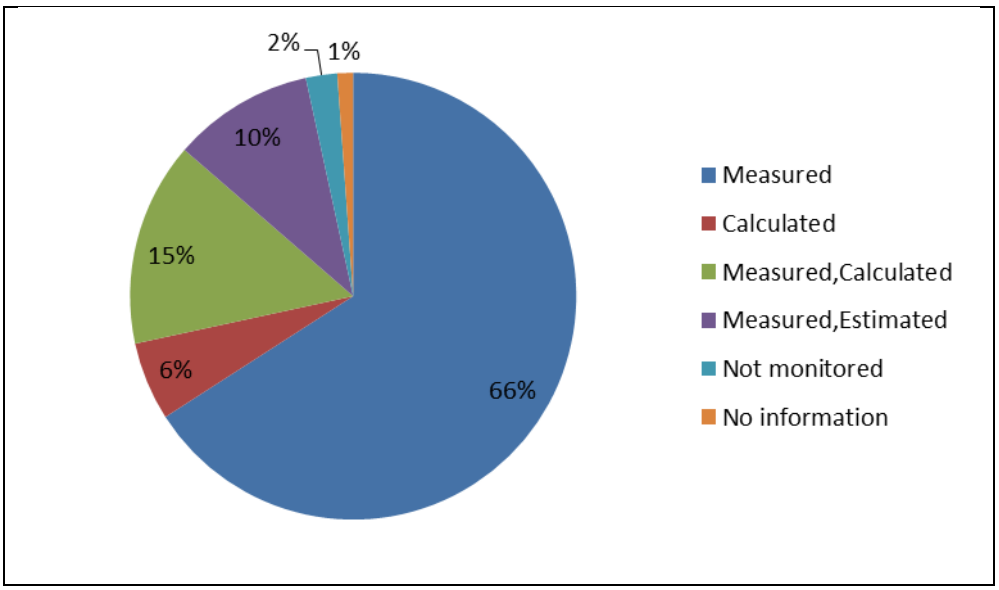


Figure 6-1: Types of monitoring of energy consumption

6.5 BAT candidates

A total of 12 BAT candidates have been reported in the questionnaire for lowering the energy consumption. The techniques reported are listed in Table 6-1 below

Table 6-1: List of BAT candidates reported for lowering the energy consumption

Technique code	Technique name
BAT1	4.1.1 Management and good housekeeping
BAT2	4.4.3 Minimising energy consumption in wool scouring installations
BAT3	4.8.1 Minimisation of energy consumption of stenter frames
BAT4	4.9.1 Water & energy conservation in batch washing and rinsing
BAT5	4.9.2 Water & energy conservation in continuous washing and rinsing
BAT6	Heat recovery from warm process water
BAT7	Heat recovery from waste water
BAT8	Heat recovery from waste gases
BAT9	Optimisation of energy consumed by the compressed air system
BAT10	Combined Heat and Power
BAT11	On-line monitoring
BAT12	Other

6.6 Presentation of data

When a plant has reported data referring to the minimum, average or maximum specific energy consumption, the value reported for the average specific energy consumption has been used.

Plant PT104 has not been plotted in the graphs because all the data provided in the questionnaire refer to the minimum specific energy consumption and not to the average specific energy consumption.

The first graph consists of two sections. The upper part shows the average specific energy consumption for the 3-year period (2016-2018) as for the first graph. The second part shows the combination of BAT candidates reported in the questionnaires. The graph is sorted by ascending order of the average specific energy consumption.

The second graph in Annex IV consists of four parts. The first part shows the average specific energy consumption for the 3-year period (2016-2018). The second and third parts show the average specific electricity consumption and average specific heat consumption respectively. The last part shows the proportion of recovered heat in the heat consumed. The graph is sorted by ascending order of the average specific energy consumption.

The data table is sorted in the same way as the graphs, by ascending order of specific average energy consumption over the 3-year period. At the end of the table, plants which have not reported specific average energy consumption but have reported information about the electricity consumption, heat consumption or recovered heat in the heat consumption are shown.

7 SPECIFIC WATER AND ENERGY CONSUMPTION AT PROCESS LEVEL

7.1 Level of reporting

Information about the specific water and energy consumption at process level could be reported in two ways in the questionnaires:

- in an agglomerated manner where the minimum, average and maximum consumption could be reported for the given process;
- in a detailed manner where the minimum, average and maximum consumption could be reported for a number of particular configurations (i.e. combination of process parameters and raw material characteristics).

Table 7-1 below gives the overview, process by process, of the data reported about specific water and energy consumption at process level. From this table, it is clear that little information has been reported at detailed level, except for dyeing.

Table 7-1: Overview of the number of plants having reported data about specific water and energy consumption at process level

Process	Number of plants carrying out the process	Agglomerated level		Detailed level	
		Specific water consumption	Specific energy consumption	Specific water consumption	Specific energy consumption
Raw wool scouring	6	6	6	0	0
Spinning	16	Not relevant	10	Not relevant	1 (for a total of 1 configuration)
Washing synthetic fibres	30	16	16	2 (for a total of 5 configurations)	1 (for a total of 2 configurations)
Fabric production, including:	25	Not relevant	6	Not relevant	0
Knitting	*5*	*Not relevant*	*1*	*Not relevant*	*0*
Sizing	*12*	*Not relevant*	*3*	*Not relevant*	*0*
Tufting	*4*	*Not relevant*	*2*	*Not relevant*	*0*
Warping	*14*	*Not relevant*	*3*	*Not relevant*	*0*
Waxing	*3*	*Not relevant*	*0*	*Not relevant*	*0*
Weaving	*19*	*Not relevant*	*5*	*Not relevant*	*0*
Singeing	29	Not relevant	11	Not relevant	1 (for a total of 1 configuration)
Desizing	37	21	13	3 (for a total of 6 configurations)	3 (for a total of 5 configurations)
Mercerising	20	10	9	0	0
Scouring	31	22	21	2 (for a total of 3 configurations)	2 (for a total of 3 configurations)
Bleaching	54	24	19	2 (for a total of 4 configurations)	2 (for a total of 4 configurations)
Wool carbonising	1	1	1	0	0
Wool fulling	6	3	3	0	0

Dyeing, including: *Continuous dyeing* *Batch dyeing*	89 *39* *68*	49 *15* *24*	46 *13* *25*	Not relevant *1 (for a total of 3 configurations)* *11 (for a total of 108 configurations)*	Not relevant *1 (for a total of 3 configurations)* *3 (for a total of 23 configurations)*
Printing	20	6	6	1 (for a total of 3 configurations)	1 (for a total of 3 configurations)
Finishing, including: *Continuous finishing* *Batch finishing*	66 *56* *23*	24 *11* *5*	25 *11* *6*	Not relevant *3 (for a total of 10 configurations)* *0*	Not relevant *3 (for a total of 10 configurations)* *0*
Shrink-proof finishing	12	4	5	0	0
Coating	19	Not relevant	9	Not relevant	2 (for a total of 5 configurations)
Laminating	4	Not relevant	0	Not relevant	1
Dry cleaning	6	Not relevant	3	Not relevant	0
Thermal treatment	63	Not relevant	33	Not relevant	4 (for a total of 5 configurations)

Considering the small amount of available data at detailed level (except for dyeing), only data at agglomerated level are shown in graphs and tables.

7.2 Data quality

7.2.1 General points

As for specific water and energy consumption at plant level, some plants have reported the minimum and/or the maximum consumption but not the average, which would need to be completed. This is brought to the attention of the MSs concerned via the dedicated Excel file.

Likewise, in some cases, the sum of the electricity- and heat-specific energy consumption does not add up to the specific energy consumption. This is brought to the attention of the MSs concerned via the dedicated Excel file.

7.2.2 Dyeing

It is to be noted that, for dyeing, the questionnaires offered the possibility to report the agglomerated data of all dyeing activities, of continuous dyeing only or of batch dyeing only. The data reported under 'all dyeing' only make sense if both continuous and batch dyeing are carried out (which is the case of 23 plants). **However, some plants which carry out only one of the two types of dyeing have reported data on specific consumption as 'all dyeing', which hinders the automatic extraction of data (5 plants performing continuous dyeing only and 11 plants performing batch dyeing only), and this would need to be corrected.**

7.2.3 Finishing

The situation is the same for finishing as for dyeing, i.e. the questionnaires offered the possibility to report the agglomerated data of all finishing activities, of continuous finishing

only or of batch finishing only. **Like for dyeing, 13 plants which carry out only one continuous finishing have reported data on specific consumption as 'all finishing', which hinders the automatic extraction of data, and this would need to be corrected**.

7.3 Presentation of CBI data

In the process-specific worksheets of the questionnaire (Worksheets 2.1 to 2.19), information was sought, when relevant, about the specific water consumption of the processes (i.e. cubic metre of water consumed per tonne of textile treated) or the specific energy consumption (i.e. kWh of energy consumed per tonne of textile treated).

This information was considered **confidential business information (CBI)** by the TWG during the questionnaire development and was identified as such in the questionnaires by a specific colour (red cells). In order to maintain the confidentiality of this information throughout the data assessment, **the plant name is not mentioned in graphs and tables where the CBI information is used but is replaced by randomly attributed CBI codes for each individual process**.

The EIPPCB will send to each MS a list of all the plant names and CBI codes for the installations in that MS; this will allow the MS' representatives to check the performance of their installations.

The principles for presenting the data in graphs and tables which are shown in Annex V are the same as for specific water and energy consumption at plant level (see Sections 5 and 6, respectively). However, as the data at process level is considered CBI, the following approach has been used to present the CBI data in the present document:

> **- not to show in the graphs and tables any contextual information (e.g. process parameters or techniques applied) as this could give clues as to the plants' identity;**
>
> **- to present CBI data for a given process only when at least 10 plants of the data collection carry out this process, as a smaller sample may also facilitate the identification of the plants concerned.**

According to Table 7-1, this means that the present document does not contains graphs and tables about specific water and energy consumption of raw wool scouring, knitting, tufting, waxing, wool carbonising, wool fulling, laminating and dry cleaning as less than 10 plants submitted information.

8 WASTE

Generally speaking, little information has been reported about the generated and recycled waste.

8.1 Raw wool scouring

Table 8-1 below contains the information reported by four plants about the recovery of grease and the amount of waste sent off site for recovery or disposal.

Table 8-1: Grease recovered and waste sent off site in raw wool scouring

Plant code	Combination of techniques	Specific amount of grease recovered (kg/kg of raw wool)			Specific amount of waste with code 04 02 10 sent off site (kg/kg of raw wool)		
		2016	2017	2018	2016	2017	2018
IT075	4.4.1 Use of integral dirt removal/grease recovery loops, 4.10.11 Disposal of wool scouring sludge to agricultural land, 4.4.3 Minimising energy consumption in wool scouring installations, On-line monitoring.	0.05	0.06	0.05	NI	NI	NI
IT076	4.4.1 Use of integral dirt removal/grease recovery loops, 4.10.11 Disposal of wool scouring sludge to agricultural land, 4.4.3 Minimising energy consumption in wool scouring installations, On-line monitoring.	0.06	0.05	0.05	NI	NI	NI
UK128	4.4.1 Use of integral dirt removal/grease recovery loops, 4.10.11 Disposal of wool scouring sludge to agricultural land, 4.4.3 Minimising energy consumption in wool scouring installations.	0.01	0.011	0.013	0.0043	0.007	0.0093
UK129	4.4.1 Use of integral dirt removal/grease recovery loops, 4.4.3 Minimising energy consumption in wool scouring installations, 4.10.11 Disposal of wool scouring sludge to agricultural land, On-line monitoring.	0.015	0.0135	0.0106	0	0	0
Note: NI = No information.							

8.2 Desizing

Only one plant (PT108) reported information about the percentage of sizing agent recovered during desizing. This percentage is reported to be 0 %.

8.3 Mercerising

6 plants have reported information about the percentage of alkali recovered from mercerising (see Table 8-2 below).

Table 8-2: Alkali recovered from mercerising

Plant code	% of alkali recovered (concentration before - concentration after treatment)		
	2016	2017	2018
BE013	99	99	99
DE030	75	75	75
ES058	95	76	99
FR134	35	37	37
PT108	75	80	85
UK127	95	95	95

8.4 Dyeing

24 plants have reported data about the fate of spent dyeing baths and padding liquors, for a total of 65 date sets. This information is summarised in Annex VI, for each year where information was reported.

In 51 occurrences (corresponding to 18 plants), no spent dyeing baths or padding liquor has been reported as waste (i.e. sent off site for disposal and recovery). In those cases, the spent dyeing baths or padding liquor is mostly considered as waste water.

In the 14 other occurrences (corresponding to 6 plants[35]), spent dyeing baths or padding liquor have been reported as waste and no waste water has been reported. The case of Plant FR133 in particular is of note; all spent dyeing baths are said to be recycled with evaporation-concentration. The treatment sludge is the only remaining waste.

Spent dyeing baths or padding liquor are recycled in only three plants[36], including FR133 mentioned above. In the case of FR130, the specific amount of recycled of spent dyeing baths or padding liquor is particularly high and would need to be checked.

In addition to the 24 plants having reporting data, 6 plants reported that the spent dye bath is sent to waste water treatment.

[35] Plants DE024, DE030, DE039, DE049, FR130 and FR133.
[36] Plants DE047, FR130 and FR133.

8.5 Printing

Four plants have reported data about the fate of printing residues, for a total of 10 data sets. This information is summarised in Annex VI.

In two other cases (BE009 and FR131), printing paste residues are said to be treated as waste water and in one case (PT099), it is reported that no printing residues are produced.

One plant (UK127) reports 100 t of recycled printing paste residues per tonne of textile treated, which is most probably a mistake.

8.6 Finishing

16 plants have reported data about the fate of spent dyeing baths and padding liquors, for a total of 51 data sets. This information is summarised in Annex VI, for each year where information was reported.

In 30 occurrences (corresponding to 10 plants), no spent finishing baths or padding liquor has been reported as waste (i.e. sent off site for disposal and recovery). In those cases, the spent finishing baths or padding liquor are mostly considered as waste water.

In 21 occurrences (corresponding to 10 plants also), spent finishing baths or padding liquor have been reported as waste and no waste water has been reported (except in two cases).

Concerning waste water, Plant DE022 reports that waste water from some processes (like coating and finishing) is evaporated.

8.7 Shrink-proof finishing

4 plants have reported information about the fate of spent finishing baths and padding liquors, for a total of 11 data sets. This information is summarised in Annex VI, for each year where information was reported.

Spent finishing baths or padding liquor are reported to be treated as waste water in all cases. Plant CZ016 has reported that some spent finishing baths or padding liquor are recycled or reused.

8.8 Leftover chemicals

Worksheet 10 of the questionnaire aimed to collect data about the specific amount of chemicals disposed of as waste at plant level.

Information has been reported by 58 plants for a total of 177 data sets.

The specific amount of chemicals was reported in kg/t of textile by 12 plants[37]; in three cases[38] the data were reported in kg/year and in one case (UK121) the unit used is not clear.

[37] Plants IT061, IT064, IT068, IT069, IT071, IT072, IT074, IT078, IT079, IT089, IT090 and IT091.
[38] CZ020, IT063 and PT114.

Although it seems clear that the unit mentioned in the questionnaire (kg/kg of textile) was not the most appropriate one, the variety of units used impairs the automatic extraction of data and the data concerned will need to be converted in the relevant questionnaires.

For the same reason, the data are not plotted in a graph but only listed in a table in Annex VI.

Concerning the type of waste reported, 34 data sets correspond to the pre-identified EU waste code in the questionnaire, which allows a reasonable comparison. 137 other data sets refer to other waste codes (44 different codes in total[39]).

It will be necessary to evaluate whether some of the reported waste types could be added or grouped to allow a meaningful and useful comparison.

[39] Waste codes 04 02 14, 04 02 15, 04 02 19, 04 02 20, 04 02 22, 07 01 08*, 07 02 01*, 07 02 99, 08 01 11, 08 01 16, 08 03 18, 08 04 11, 13 02 05, 13 02 08, 13 02 08*, 13 03 07, 14 06 03*, 15 01 01, 15 01 02, 15 01 03, 15 01 04, 15 01 06, 15 01 10, 15 01 10*, 15 02 02, 15 02 02*, 15 02 03, 16 01 04, 16 02 14, 16 02 16, 16 03 06, 16 05 06*, 16 06 01, 16 07 08, 16 10 03, 17 04 05, 17 04 11, 17 06 03, 17 06 03*, 19 08 12, 19 08 14, 19 09 05, 20 01 21 and 20 03 04.

9 ANNEX I – EMISSIONS TO AIR

The table below lists the 173 emission points mentioned in Section 3.2 and for which clarification is needed.

Table 9-1: Points of emission to air with 'other' or unclear associated processes

Emission point	Usual name of the point of release	Associated processes	Additional information	Measurements reported?
AT001_{1}	Stenter "Brückner 5"	No information		yes
AT001_{2}	Stenter "Brückner 4"	No information		yes
AT006_{2}	Stenter 2	No information		yes
CZ016_{1}	Boiler K1	Raw wool scouring		yes
CZ016_{2}	Boiler K2	Raw wool scouring		yes
CZ016_{3}	Boiler K3	Raw wool scouring		yes
CZ017_{2}	Boiler 1	Other	Boiler - naturgas	yes
CZ017_{3}	Boiler 2	Other	Boiler - naturgas	yes
CZ017_{4}	Boiler 3	Other	Boiler - naturgas	yes
CZ018_{1}	Boiler 1	No information		yes
CZ018_{2}	Boiler 2	No information		yes
DE023_{4}	boiler house	Other		yes
DE042_{1}	RNV	Functional finishing - Coating and laminating - Thermal treatment - Other		yes
DE047_{5}	Boiler house - boiler 2	Other		yes
FR135_{1}	Rejet thermal treatment cheminée 1	Thermal treatment (e.g. drying, thermofixation, curing)	steam boiler	yes
IT059_{3}	BOILER/STEAM GENERATOR-A1	Scouring - Mercerising - Bleaching - Dyeing - Dyeing - Functional finishing		yes
IT059_{4}	BOILER/STEAM GENERATOR-A4	Scouring - Mercerising - Bleaching - Dyeing - Functional finishing		yes
IT060_{1}	E178	No information	Rameuse E Bruckner with Thermo-fixing> 150 °C and drying Finishing	yes
IT060_{2}	E179	No information	Sanfor 5 Bruckner Finishing	no
IT060_{3}	E182	No information	Dimensa Line: Cylinder Dryer - Finishing	no
IT060_{4}	E183	No information	Extracta Line: Finishing cylinder dryer	no
IT060_{5}	E211	No information		yes

IT060_{6}	E213	No information	Rameuse F Bruckner - Thermo fixing > 150 °C and drying Finishing	yes
IT060_{7}	E219	No information	Tumbler finishing department for cotton warehouse - Finishing	yes
IT060_{8}	E220	No information	Tumbler 2 finishing department for cotton warehouse - Finishing	yes
IT060_{9}	E222	No information	Finishing- burner and brushing	yes
IT060_{10}	No information	No information		no
IT060_{11}	No information	No information		no
IT060_{12}	No information	No information		no
IT060_{13}	No information	No information		no
IT060_{14}	No information	No information		no
IT060_{15}	No information	No information		no
IT063_{10}	E3	No information	thermal power	no
IT063_{11}	E2 and E2A in 2019	No information	thermal power	no
IT063_{12}	E2B in 2019	No information	thermal power	no
IT064_{1}	A4	No information	steam generator	yes
IT064_{2}	A5	No information	steam generator	yes
IT064_{3}	B1	No information	STENTER FRAMES	yes
IT064_{4}	C1	No information	JIGGER DYEING MACHINE	yes
IT064_{5}	C2	No information	JIGGER DYEING MACHINE	yes
IT064_{6}	F1	No information	SINGEING	yes
IT064_{7}	A6	Other	steam generator	yes
IT065_{1}	A1	No information		yes
IT065_{2}	A4	No information		yes
IT065_{3}	A2	No information		yes
IT065_{4}	D4	No information		yes
IT065_{5}	D4'	No information		yes
IT065_{6}	D5	No information		yes
IT065_{7}	D5'	No information		yes
IT065_{8}	C1	No information		yes
IT067_{2}	29-CT1:Generatore di vapore Ferroli 1 (pot. termica di combustione kw 5815)	Other		yes
IT067_{3}	30-CT2:Generatore di vapore Ferroli 2 (Pot. termica di combustione kw 5232)	Other		yes
IT067_{4}	31-CT3: Generatore di vapore Ferroli 3 (Pot. termica di combustione kw 5234)	Other		yes
IT068_{1}	A4	Other	steam generator	yes
IT068_{2}	A6	Other	steam generator	yes
IT069_{1}	A2	No information	steam generator (second steam generator - A1 - is spare)	yes
IT070_{1}	A1	No information		yes

IT070_{2}	A2	No information		yes
IT070_{3}	C7	No information		yes
IT071_{1}	B1	Other	STEAM GENERATOR	yes
IT071_{2}	B2	Other	STEAM GENERATOR	yes
IT071_{4}	C2	Other	DRYING	yes
IT072_{1}	A1	Other	STEAM GENERATOR	yes
IT072_{2}	A3	Other	STEAM GENERATOR	yes
IT072_{4}	C1	Other	THICKENERS	yes
IT073_{1}	A3	Dyeing - Functional finishing	Steam generator	yes
IT073_{2}	A4	Dyeing - Functional finishing	Steam generator	yes
IT074_{1}	L4	Other	STEAM GENERATOR	yes
IT074_{2}	L5	Other	STEAM GENERATOR	yes
IT074_{3}	L6	Other	STEAM GENERATOR	yes
IT076_{1}	E23	Other	heat generator	yes
IT076_{2}	E24	Other	heat generator	yes
IT076_{3}	E66	Other	cogeneration plant	yes
IT076_{4}	E67	Other	cogeneration plant	yes
IT077_{1}	L4	No information		yes
IT077_{2}	L3	No information		yes
IT077_{3}	L1	No information		yes
IT077_{4}	L2	No information	The scheduled monitoring is programmed for year 2019	yes
IT077_{5}	B7	No information		yes
IT077_{6}	b8	No information		yes
IT077_{7}	b9	No information		yes
IT077_{8}	c1	No information		yes
IT077_{9}	c2	No information		yes
IT078_{1}	A1+A3	No information	steam generator	yes
IT078_{3}	B2	No information	STENTER (natural gas powered)	yes
IT079_{1}	A4	Other	STEAM GENERATOR 5,99 MW	yes
IT079_{2}	A3	Other	STEAM GENERATOR 8,36 MW	yes
IT082_{5}	E52 - Generatore di calore 1	Other		yes
IT082_{6}	E53 - Generatore di calore 2	Other		yes
IT082_{7}	E55- generatore di calore 3	Other		yes
IT082_{8}	E56 - Generatore 4	Other		yes
IT082_{9}	E57 - generatore 5	Other		yes

IT083_{9}	E28	Scouring - Dyeing - Functional finishing - Thermal treatment (e.g. drying, thermofixation, curing)	STEAM GENERATOR	yes
IT083_{10}	E29	Scouring - Dyeing - Functional finishing - Thermal treatment (e.g. drying, thermofixation, curing)	Diathermic oil heat generator	yes
IT083_{13}	E33	Scouring - Dyeing - Washing synthetic fibre - Functional finishing - Thermal treatment (e.g. drying, thermofixation, curing)	Diathermic oil heat generator	yes
IT084_{5}	E10	Other	Heat generator, burning natural gas for heating thermal oil	yes
IT084_{6}	E11	Other	Heat generator, burning natural gas for heating thermal oil	yes
IT085_{1}	7	Other	Heat generator	no
IT085_{2}	8	Other	Heat generator	no
IT087_{1}	14a	Other	Steam generator SIAT (4 900 kW)	yes
IT087_{2}	14b	Other	Steam generator CARIMATI (5 600 kW)	yes
IT087_{3}	14c	Other	Steam generator CARIMATI (3 500 kW)	yes
IT088_{2}	A2	Dyeing - Bleaching - Thermal treatment (e.g. drying, thermofixation, curing)	the heating system is stopped since 5 years ago	no
IT089_{1}	A1	Other	STEAM GENERATOR 3,6 MW	yes
IT090_{1}	A3	Other	STEAM GENERATOR 7,7 MW	yes
IT090_{2}	A1	Other	STEAM GENERATOR 4,6 MW	yes
IT091_{1}	A2	Other	THERMAL ENERGY	yes
IT092_{1}	C1a	Other	Steam generator [4522 kW]	yes
IT094_{1}	B	No information	Processes associated: thermal treatments	yes
IT094_{2}	B4	No information	Thermal treatments	yes

IT094_{3}	E8e	No information	Thermal treatments. This point of emission has been indicated to be monitored in the second part of 2018	yes
IT094_{4}	E8f	No information	Thermal treatments. This point of emission has been indicated to be monitored in the second part of 2018	yes
IT096_{1}	E7	Other	Kitchen colours	yes
IT096_{2}	E8	Other	Steam generator 2260 kW	yes
IT096_{3}	E9	Other	Steam generator 2260 kW	yes
IT096_{4}	E10	Dyeing	Steam generator 2260 kW	yes
IT097_{10}	69-(T2) Essiccatoio tops T<150°C (lisciatrice 2)	Other	Smoothers - Dryer heated with steam	yes
IT097_{11}	70-(T2) Essiccatoio tops T<150°C (lisciatrice 2)	Other	Smoothers - Dryer heated with steam	yes
IT097_{12}	71-(T2) Essiccatoio tops T<150°C (lisciatrice 1)	Other	Smoothers - Dryer heated with steam	yes
IT097_{13}	72-(T2) Essiccatoio tops T<150°C (lisciatrice 1)	Other	Smoothers - Dryer heated with steam	yes
IT097_{14}	161-Essiccatoio tops T<150°C (lisciatrice 1)	Other	Smoothers - Dryer heated with steam	yes
IT097_{15}	162-Essiccatoio tops T<150°C (lisciatrice 2)	Other	Smoothers - Dryer heated with steam	yes
IT097_{16}	140-(T1) Vasche lisciatrice 1	Other	Smoothers - hood on treatments bowl	yes
IT097_{17}	141-(T1) Vasche lisciatrice 2	Other	Smoother - hood on treatments bowl	yes
IT097_{18}	97-(CT)Generatore di calore (Pot.12,6 MW)	Other	Steam generator	yes
IT097_{19}	98-(CT) Generatore di calore (Pot. 12,6 MW)	Other	Steam generator	yes
IT097_{20}	99-(CT) Generatore di calore (Pot.11 MW)	Other	Steam generator	yes
PT099_{1}	Boiler – emission point not in the scope	No information		no
PT099_{2}	Boiler – emission point not in the scope	No information		no
PT104_{1}	Boiler – emission point not in the scope	No information		no
PT104_{2}	Boiler – emission point not in the scope	No information		no
PT104_{3}	FF3-Sizing machine	No information		yes
PT104_{4}	FF6-Stenter	No information		yes
PT104_{5}	FF7- Tumbler	No information		yes
PT108_{15}	Boiler – emission point not in the scope	Fabric production		no
PT108_{16}	Boiler – emission point not in the scope	Fabric production		no
PT108_{17}	Boiler – emission point not in the scope	Fabric production		no
PT109_1{9}	FF33 - LP3/I (Dryer)	No information	In the last three years, the machine worked less than 500h/year so it is not monitored	no

PT109_1{14}	FF45 - ML6 (washing machine)	No information	used to wash the woven fabric after the dyeing	yes
PT111_{1}	Boiler – emission point not in the scope	No information		no
PT111_{2}	Boiler – emission point not in the scope	No information		no
PT114_1{1}	Boiler – emission point not in the scope	No information		no
PT114_2{7}	Boiler - Not in the scope	No information		no
PT114_2{8}	Boiler - Not in the scope	No information		no
PT115_{1}	FF01 - Thread dryer	No information		yes
PT115_{2}	FF07 - Gasser	No information	Belongs to Group A (FF5 and FF7). Monitoring twice a year, to one of the points of release	yes
PT115_{3}	FF15- Biancalani 1	No information	Belongs to GroupB (FF15- FF16 and FF17). Monitoring twice a year, to one of the points of release	yes
PT115_{4}	FF31 - Biancalani 3	No information		yes
PT115_{5}	FF18 - Stenter 1	No information	Belongs to Group C (FF18- FF19 and FF22-FF23 and FF24-FF25). Monitoring twice a year, to two of the points of release	yes
PT115_{6}	FF21 - Stenter 2	No information	Belongs to Group D (FF20 and FF21). Monitoring twice a year, to one of the points of release	yes
PT115_{7}	FF22 - Stenter 3	No information	Belongs to Group C (FF18- FF19 and FF22-FF23 and FF24-FF25). Monitoring twice a year, to two of the point of release	yes
PT115_{8}	FF02- Thread dryer	No information		yes
PT115_{9}	FF05 - Gasser	No information	Belongs to Group A (FF5 and FF7). Monitoring twice a year, to one of the points of release	yes
PT115_{10}	FF6 - Gasser	No information		yes
PT115_{11}	FF17 - Biancalani 2	No information	Belongs to GroupB (FF15- FF16 and FF17). Monitoring twice a year, to one of the points of release	yes
PT115_{12}	FF19 - Stenter 1	No information	Belongs to Group C (FF18- FF19 and FF22-FF23 and FF24-FF25). Monitoring twice a year, to two of the points of release	yes
PT115_{13}	FF24 - Stenter 4	No information	Belongs to Group C (FF18- FF19 and FF22-FF23 and FF24-FF25). Monitoring twice a year, to two of the points of release	yes

PT115_{14}	FF20 - Stenter 2	No information	Belongs to Group D (FF20 and FF21). Monitoring twice a year, to one of the points of release	yes
PT115_{15}	FF 25 - Polymerizer	No information		yes
PT115_{16}	FF3 - Thread dryer	No information		yes
PT115_{17}	FF04 - Thread dryer	No information		yes
PT115_{18}	FF16 - Biancalani 1	No information	Belongs to GroupB (FF15- FF16 and FF17). Monitoring twice a year, to one of the points of release	yes
PT115_{19}	FF23 - Stenter 3	No information	Belongs to Group C (FF18- FF19 and FF22-FF23 and FF24-FF25). Monitoring twice a year, to two of the points of release	yes
PT115_{20}	FF25 - Stenter 5	No information	Belongs to Group C (FF18- FF19 and FF22-FF23 and FF24-FF25). Monitoring twice a year, to two of the points of release	yes
UK124_{1}	A2 Krantz Stenter	No information		yes
UK124_{2}	A3 - L Stenter	No information		yes
UK124_{3}	A9 - Boiler	No information		yes
UK124_{4}	A11 - Gas Fired Burner	No information		no
UK124_{5}	A12 - Dipping Unit	No information		no
UK124_{6}	A13 - Wide Stenter	No information		yes
UK124_{7}	A14 - Tumbler	No information		yes
UK124_{8}	A16- CHP	No information		yes
UK124_{9}	A1 CHP (old)	No information		yes
UK127_{7}	A7	Other		yes

Empty cells in the other tables of this Annex mean that no information was provided in the questionnaires for those cells.

10 ANNEX II – EMISSIONS TO WATER

Empty cells in the tables of this Annex mean that no information was provided in the questionnaires for those cells.

The table below lists the 29 emission points mentioned in Section 4.1.7. For common waste water treatment plants, an appropriate combination of techniques should be selected in the questionnaires to enable the comparison and use of extracted concentration data for setting BAT AELs.

Table 10-1: Emission points that reported 'other' techniques

Emission point	Combination of techniques	Information on techniques used
AT003_w {1}	Other	Flue-gas neutralization
BE008_w {1}	Equalisation, Grit separators, Other	aeration and mixing process in equalisation tank (avoiding odour problems)
BE010_w {1}	Equalisation, Activated sludge process, Nitrification/denitrification, Other	, fecl3 for phosphorous removal
FR131_w {1}	Other	chemical discoloration
FR132_w {2}	Other	biological
IT059_w {1}	Other	ph neutralization with co2
IT061_w {1}	Other	the wastewater are subjected to a mechanical filtering and a ph neutralization treatment (automatic controlled dosage of sodium hydroxide)., prato has been among the first districts to organize a centralized treatment system, ensuring wastewater treatment for the population and over 300 companies in the area. today, 5 district wastewater treatment plants, operated by gida s.p.a., depurate 45 ml of mc year. prato is equipped with the largest industrial aqueduct for the distribution of purified water (over 60 km of network which distributes about 5 ml of recycled water)
IT064_w {1}	Other	mechanical filtering before discharge in the public sewage. prato has been among the first districts to organize a centralized treatment system, ensuring wastewater treatment for the population and over 300 companies in the area. today, 5 district wastewater treatment plants, operated by gida s.p.a., depurate 45 ml of mc year. prato is equipped with the largest industrial aqueduct for the distribution of purified water (over 60 km of network which distributes about 5 ml of recycled water)
IT065_w {1}	Other	waste water flows is treated into the centralized treatment system of the prato district. prato has been among the first districts to organize centralized sewage treatment that has guaranteed wastewater treatment for the population and over 300 companies in the area. today, 45ml of mc year is purified through a system of 5 district purifiers operated by gida). more info: https://www.gida-spa.it/index.php?l=eng
IT068_w {1}	Other	the wastewater are subjected to a mechanical filtering and a ph neutralization treatment (first step: insufflation of carbon dioxide, produced by steam generators with the combustion of methane gas; second step: automatic controlled dosage of sulfuric acid)., prato has been among the first districts to organize a centralized treatment system, ensuring wastewater treatment for the population and over 300 companies in the area. today, 5 district wastewater treatment plants, operated by gida s.p.a., depurate 45 ml of mc year. prato is equipped with the largest industrial aqueduct for the distribution of purified water (over 60 km of network which distributes about 5 ml of recycled water)

IT069_w {1}	Other	the wastewater are subjected to a mechanical filtering and a ph neutralization treatment (first step: insufflation of carbon dioxide, produced by steam generators with the combustion of methane gas; second step: automatic controlled dosage of sulfuric acid)., prato has been among the first districts to organize a centralized treatment system, ensuring wastewater treatment for the population and over 300 companies in the area. today, 5 district wastewater treatment plants, operated by gida s.p.a., depurate 45 ml of mc year. prato is equipped with the largest industrial aqueduct for the distribution of purified water (over 60 km of network which distributes about 5 ml of recycled water)
IT071_w {2}	Other	mechanical filtering before discharge in the public sewage. prato has been among the first districts to organize a centralized treatment system, ensuring wastewater treatment for the population and over 300 companies in the area. today, 5 district wastewater treatment plants, operated by gida s.p.a., depurate 45 ml of mc year. prato is equipped with the largest industrial aqueduct for the distribution of purified water (over 60 km of network which distributes about 5 ml of recycled water)
IT072_w {1}	Other	mechanical filtering before discharge
IT074_w {1}	Other, Other,	before the discharge with the other wastewaters, the condensation water generated from dry cleaning is treated by static separation, stripping (with recovery of the solvent) and adsorption on active carbons. before the discharge in the public sewage the wastewater as a whole is treated by mechanical filtering., prato has been among the first districts to organize a centralized treatment system, ensuring wastewater treatment for the population and over 300 companies in the area. today, 5 district wastewater treatment plants, operated by gida s.p.a., depurate 45 ml of mc year. prato is equipped with the largest industrial aqueduct for the distribution of purified water (over 60 km of network which distributes about 5 ml of recycled water)
IT074_w {2}	Other, Other,	before the discharge with the other wastewaters, the condensation water generated from dry cleaning is treated by static separation, stripping (with recovery of the solvent) and adsorption on active carbons. before the discharge in the public sewage the wastewater as a whole is treated by mechanical filtering., prato has been among the first districts to organize a centralized treatment system, ensuring wastewater treatment for the population and over 300 companies in the area. today, 5 district wastewater treatment plants, operated by gida s.p.a., depurate 45 ml of mc year. prato is equipped with the largest industrial aqueduct for the distribution of purified water (over 60 km of network which distributes about 5 ml of recycled water)
IT078_w {1}	Other	mechanical filtering before discharge in the public sewage. prato has been among the first districts to organize a centralized treatment system, ensuring wastewater treatment for the population and over 300 companies in the area. today, 5 district wastewater treatment plants, operated by gida s.p.a., depurate 45 ml of mc year. prato is equipped with the largest industrial aqueduct for the distribution of purified water (over 60 km of network which distributes about 5 ml of recycled water)
IT079_w {1}	Other	mechanical filtering before discharge in the public sewage. prato has been among the first districts to organize a centralized treatment system, ensuring wastewater treatment for the population and over 300 companies in the area. today, 5 district wastewater treatment plants, operated by gida s.p.a., depurate 45 ml of mc year. prato is equipped with the largest industrial aqueduct for the distribution of purified water (over 60 km of network which distributes about 5 ml of recycled water)
IT082_w {1}	Equalisation, Neutralisation, Activated sludge process, Nitrification/denitrification, Sedimentation, Adsorption (e.g. powdered/granular activated carbon, lignite coke, etc.), Other	ozonization

IT083_w {1}	Other, Other,	mixing and oxygenation, macrofiltration
IT089_w {1}	Other	mechanical filtering before discharge in the public sewage. prato has been among the first districts to organize a centralized treatment system, ensuring wastewater treatment for the population and over 300 companies in the area. today, 5 district wastewater treatment plants, operated by gida s.p.a., depurate 45 ml of mc year. prato is equipped with the largest industrial aqueduct for the distribution of purified water (over 60 km of network which distributes about 5 ml of recycled water)
IT090_w {1}	Other	mechanical filtering before discharge in the public sewage. prato has been among the first districts to organize a centralized treatment system, ensuring wastewater treatment for the population and over 300 companies in the area. today, 5 district wastewater treatment plants, operated by gida s.p.a., depurate 45 ml of mc year. prato is equipped with the largest industrial aqueduct for the distribution of purified water (over 60 km of network which distributes about 5 ml of recycled water)
IT094_w {1}	Other	waste water flows into the centralized treatment system of the prato district. prato has been among the first districts to organize centralized sewage treatment that has guaranteed wastewater treatment for the population and over 300 companies in the area. today, 45ml of mc year is purified through a system of 5 district purifiers operated by gida). prato it's equipped with the largest industrial aqueduct for the distribution of purified water.
IT096_w {1}	Equalisation, Neutralisation, Activated sludge process, Nitrification/denitrification, Sedimentation, Other	only nitrification, , ozonization
PT098_w {1}	Equalisation, Neutralisation, Sedimentation, Sand filtration, Activated sludge process, Other	on-line monitoring
PT099_w {1}	Screening, Oil separation, Other	ph control with the use of the co2 gas resulting from the combustion in the boiler
PT102_w {1}	Other	discharge in our effluent in the sidva intermunicipal collector for biological treatment
PT110_w {1}	Equalisation, Grit separators, Screening, Coagulation and flocculation, Sedimentation, Activated sludge process, Other	ozone
PT111_w {1}	Equalisation, Neutralisation, Activated sludge process, Sedimentation, Sand filtration, Other	o-line monitoring
UK124_w {1}	Neutralisation, Coagulation and flocculation, Flotation, Other	biological filter treatment (aerobic)

The table below lists the 16 data sets that reported average removal efficiencies for various KEIs, as mentioned in Section 4.1.7.

Table 10-2: Removal efficiencies by KEI reported in 16 data sets

EP water name	Combination of techniques	Average removal efficiency (%) - 2016	Average removal efficiency (%) - 2017	Average removal efficiency (%) - 2018	KEI
CZ020_w {1}	Sedimentation, Nitrification/denitrification, Neutralisation, Coagulation and flocculation, Activated sludge process	52.38	65.72	83.75	AOX
CZ020_w {1}	Sedimentation, Nitrification/denitrification, Neutralisation, Coagulation and flocculation, Activated sludge process	98.19	98.75	99.07	BOD5
PT117_w {1}	Neutralisation	3.14	3.31	3.53	BOD5
CZ020_w {1}	Sedimentation, Nitrification/denitrification, Neutralisation, Coagulation and flocculation, Activated sludge process	95.31	95.66	96.29	COD
PT117_w {1}	Neutralisation	4.405	4.66	4.75	COD
UK128_w {1}	Coagulation and flocculation	77.6	77.55	78.5	COD
UK129_w {1}	Grit separators, Screening, Oil separation, Coagulation and flocculation, Ultrafiltration, Flotation	95.1	95.5	95.6	COD
CZ020_w {1}	Sedimentation, Nitrification/denitrification, Neutralisation, Coagulation and flocculation, Activated sludge process	96.78	94.88	94.84	NH4-N
UK129_w {1}	Grit separators, Screening, Oil separation, Coagulation and flocculation, Ultrafiltration, Flotation	99	99	99	Organochlorine pesticides
UK129_w {1}	Grit separators, Screening, Oil separation, Coagulation and flocculation, Ultrafiltration, Flotation	95	95	95	Organophosphorus pesticides
UK129_w {1}	Grit separators, Screening, Oil separation, Coagulation and flocculation, Ultrafiltration, Flotation	99	99	99	Synthetic pyrethroid pesticides
CZ020_w {1}	Sedimentation, Nitrification/denitrification, Neutralisation, Coagulation and flocculation, Activated sludge process	92.51	88.25	90.84	Total N

CZ020_w {1}	Sedimentation, Nitrification/denitrification, Neutralisation, Coagulation and flocculation, Activated sludge process	96.18	96.88	96.43	Total P
CZ020_w {1}	Sedimentation, Nitrification/denitrification, Neutralisation, Coagulation and flocculation, Activated sludge process	94.48	95.33	98.16	TSS
PT117_w {1}	Neutralisation	9.15	9.01	9.12	TSS
UK128_w {1}	Coagulation and flocculation	98.81	98.1	96	TSS

11 ANNEX III – WATER CONSUMPTION AT PLANT LEVEL

Empty cells in the tables of this Annex mean that no information was provided in the questionnaires for those cells.

12 ANNEX IV – ENERGY CONSUMPTION AT PLANT LEVEL

Empty cells in the tables of this Annex mean that no information was provided in the questionnaires for those cells.

13 ANNEX V - WATER AND ENERGY CONSUMPTION AT PROCESS LEVEL

Empty cells in the tables of this Annex mean that no information was provided in the questionnaires for those cells.

14 ANNEX VI – WASTE

Empty cells in the tables of this Annex mean that no information was provided in the questionnaires for those cells.