

Review of the TXT BREF – 2nd Data Assessment Workshop

BATIS>Forum>Textiles
Industry>02 First TXT BREF review
2017->08 Data assessment
workshop>02 Second workshop>02
- Presentations

BAT-AEL for COD – Proposal in D1 (1/1)

Table 5.3: Proposed BAT-associated emission levels (BAT-AELs) for direct discharge to a receiving water body

Substance/Parameter	Activities / processes	BAT-AEL ⁽¹⁾ (mg/l)
Chemical oxygen demand (COD) ⁽³⁾	All activities / processes	40–120 ⁽⁴⁾

⁽¹⁾ The averaging periods are defined in the general considerations.

⁽³⁾ Either the BAT-AEL for COD or the BAT-AEL for TOC applies. The BAT-AEL for TOC is the preferred option because TOC monitoring does not rely on the use of very toxic compounds.

⁽⁴⁾ The upper end of the BAT-AEL range may be up to 150 mg/l when the amount of waste water discharged is less than 25 m³/t of treated textile materials.

BAT-AEL for COD – Summary of the comments (1/3)

- 15 out of 61 comments received on Table 5.3 concern COD or Footnote (4).
- **Proposed BAT-AELs**
 - Lower the upper end of the BAT-AEL range to 100 mg/l, as with good physical, biological and chemical treatment lower concentration values can be achieved.
 - Increase the upper end of BAT-AEL range to 165 mg/l as the 85th percentile of collected data better represents the performance of the majority of plants.

BAT-AEL for COD – Summary of the comments (2/3)

- **Footnote (4)**

- Link Footnote (4) to removal efficiency instead of waste water discharged, as variation of water consumption data shows that it is not appropriate to use water consumption as the basis for an exemption.
- Decrease the upper end of the range in Footnote (4) to 130 mg/l if the removal efficiency is at least 90%.
- Increase the upper end of the BAT-AEL range in Footnote (4), (to 160 or 250 mg/l), for waste waters with high COD content in the influent if the removal efficiency is at least 90% or 95% as a yearly or monthly average.

BAT-AEL for COD – Summary of the comments (3/3)

- **Footnote (4)**

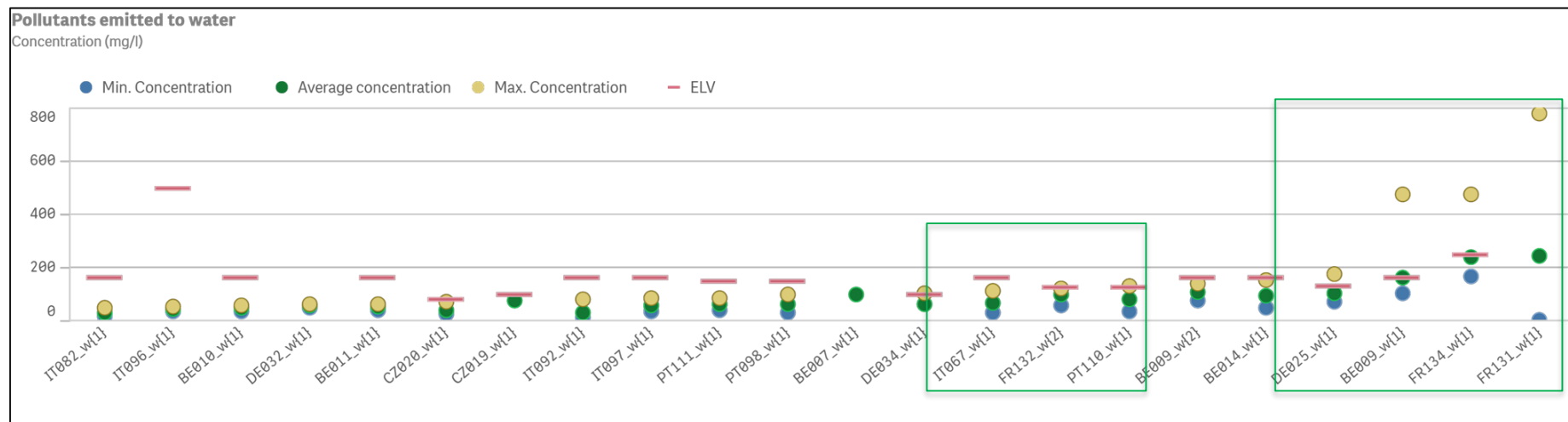
- Increase the water consumption level in Footnote (4) to the one reached by the plants/sites with multiple processes and process routes; according to the data collection only a few single-process sites reach the proposed level.
- Add BOD level equal to or less than 25 mg/l as an indicator of the biodegradability of the effluent.

BAT-AEL for COD – EIPPCB preliminary assessment (1/3)

- **Proposed BAT-AELs**
- The BAT-AELs are not derived by using a statistical approach (i.e. number or proportion of plants below/above a given level or use of a certain percentile to derive BAT-AELs).
- With an appropriate combination of techniques listed in BAT 19, emission levels lower than 120 mg/l can indeed be reached. Levels down to 40 mg/l can be reached, hence the proposed lower end of the range.
- The technical reasons as to why the proposed upper end of the BAT-AEL range could not be achieved and should be increased to 165 mg/l are not provided.

BAT-AEL for COD – EIPPCB preliminary assessment (2/3)

Proposed BAT-AELs



Filter: COD for DIR emissions and at least apply activated sludge

- 4 emission points (EPs) above 160 mg/l, with high fluctuation between the max. and average value
- 3 EPs with max. values between 100 and 120 mg/l, reporting more than 10 measurements per year

BAT-AEL for COD – EIPPCB preliminary assessment (3/3)

• Footnote (4)

- Lack of data for removal efficiency. Only CZ020_{1} reported data for removal efficiency around 95%.
- Footnote refers to waste water discharged, not to specific waste water consumption.
- In the data collection, there are EPs (e.g. BE009_w{1}, BE009_w{2} or DE025_w{1}) associated to more than one process (printing, coating, laminating, washing synthetic fibre, dyeing) and the amount of waste water discharges less than 25 m³/t of treated textile materials.
- Comments related to BOD: see slides on additional parameters.

BAT-AEL for TOC – Proposal in D1 (1/1)

Table 5.3: Proposed BAT-associated emission levels (BAT-AELs) for direct discharge to a receiving water body

Substance/Parameter	Activities / processes	BAT-AEL ⁽¹⁾ (mg/l)
Total organic carbon (TOC) ⁽³⁾	All activities / processes	13–40 ⁽⁶⁾

⁽¹⁾ The averaging periods are defined in the general considerations.

⁽³⁾ Either the BAT-AEL for COD or the BAT-AEL for TOC applies. The BAT-AEL for TOC is the preferred option because TOC monitoring does not rely on the use of very toxic compounds.

⁽⁶⁾ The upper end of the BAT-AEL range may be up to 50 mg/l when the amount of waste water discharged is less than 25 m³/t of treated textile materials.

BAT-AEL for TOC – Summary of the comments (1/2)

- 5 out of 61 comments received on Table 5.3 concern TOC or Footnote (6).
- **Proposed BAT-AELs**
 - Change the BAT-AEL range to 10-30 mg/l. The collected data show lower values and only a few plants have reported emission levels above 30 mg/l.
 - Keep the BAT AEL range as proposed.

BAT-AEL for TOC – Summary of the comments (2/2)

- **Footnote (6)**

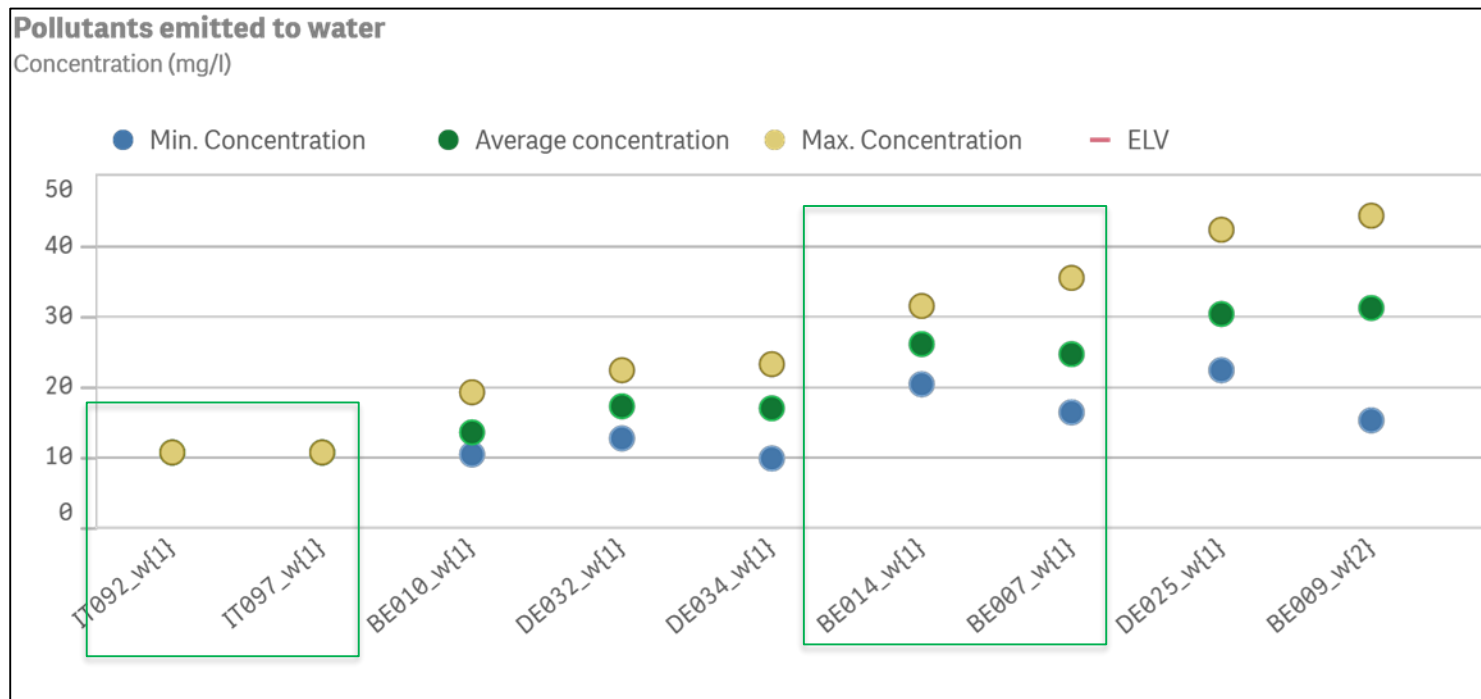
- Link Footnote (6) to removal efficiency instead of waste water discharged, as variation of water consumption data shows that it is not appropriate to use water consumption as the basis for an exemption.
- Decrease the upper end of the range in Footnote (6) to 40 mg/l if the removal efficiency is at least 90%.

BAT-AEL for TOC – EIPPCB preliminary assessment (1/4)

- **Proposed BAT-AELs**
- The BAT-AELs are not derived by using a statistical approach (i.e. number or proportion of plants below/above a given level).
- With an appropriate combination of techniques listed in BAT 19, emission levels lower than 30 mg/l can indeed be reached. Levels down to 13 mg/l can be reached, hence the proposed lower end of the range.

BAT-AEL for TOC – EIPPCB preliminary assessment (2/4)

Proposed BAT-AELs



Filter: TOC for DIR emissions and at least apply activated sludge

- 2 EPs (i.e. IT092_w{1} and IT097_w{1}) reported one measurement with concentration values close to

13 10 mg/l

BAT-AEL for TOC – EIPPCB preliminary assessment (3/4)

- 3 EPs with max. values between 30 and 40 mg/l

EPs	Observations	Techniques
BE014_w{1}	Reported 4 measurements in 2018, with a range from 20 to 31 mg/l	Equalisation/activated sludge/nitrification-denitrification
BE007_w{1}	Reported around 11-12 measurements per year max. value 35 mg/l and avg of 24.3 mg/l	Equalisation/neutralisation/activated sludge/nitrification-denitrification/sand filtration
DE025_w{1}	Reported monthly frequency, with a range from 22 to 42 mg/l	Equalisation/neutralisation/activated sludge/coagulation-flocculation/sedimentation

BAT-AEL for TOC – EIPPCB preliminary assessment (4/4)

- **Footnote (6)**

- No data for removal efficiency.
- Footnote refers to waste water discharged, not to specific waste water consumption.

BAT-AEL for TSS – Proposal in D1 (1/1)

Table 5.3: Proposed BAT-associated emission levels (BAT-AELs) for direct discharge to a receiving water body

Substance/Parameter	Activities / processes	BAT-AEL ⁽¹⁾ (mg/l)
Total suspended solids(TSS)	All activities / processes	5–45
⁽¹⁾ The averaging periods are defined in the general considerations.		

BAT-AEL for TSS – Summary of the comments (1/1)

- 3 out of 61 comments received on Table 5.3 concern TSS.
- **Proposed BAT-AELs**
 - According to the data collected and Directive on Urban Waste Water Treatment (91/271/EC), the upper end could be lowered to 35 mg/l.
 - Lower the upper end to 35 mg/l, as solids can have metals and metalloids associated with them and can therefore pose a significant threat to downstream ecology.

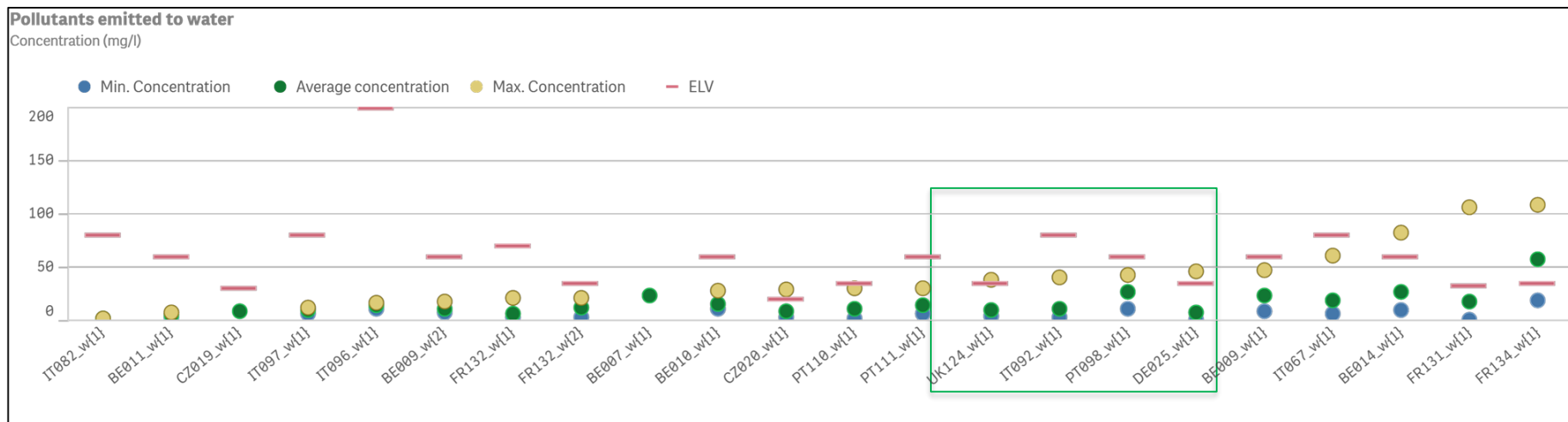
BAT-AEL for TSS – EIPPCB preliminary assessment (1/3)

- **Proposed BAT-AELs**

- The BAT-AELS are derived from the data collection, i.e. the techniques used and the emission levels reported by plants from the data collection. They are not derived from other legislation.

BAT-AEL for TSS – EIPPCB preliminary assessment (2/3)

Proposed BAT-AELs



- 4 EPs with max. values between 35 and 45 mg/l

EPs (2/4)	Observations	Techniques
UK124_w{1}	More than 80 measurements per year	Neut/Flot/coag-floc
IT092_w{1}	12 measurements per year (range 2-39.2 mg/l)	Equa/neut/act sludge/nitrif-denitrif/sedim/rev osm

BAT-AEL for TSS – EIPPCB preliminary assessment (3/3)

Proposed BAT-AELs

- 4 EPs with max. values between 35 and 45 mg/l

EPs (2/4)	Observations	Techniques
PT098_w{1}	Monitored twice per year	Equa/neut/act sludge/sedim/sand filtrat
DE025_w{1}	Monitored monthly frequency, and ELV of 35 mg/l	Equa/neut/act sludge/coag-floc/sedim

Abbreviations: Equa=equalisation, neut=neutralisation, act sludge = activated sludge, nitrif-denitrif = nitrification-denitrification, coag-floc = coagulation-flocculation, sedim=sedimentation, sand filtrat = sand filtration, flot = flotation

BAT-AEL for Total N – Proposal in D1 (1/1)

Table 5.3: Proposed BAT-associated emission levels (BAT-AELs) for direct discharge to a receiving water body

Substance/Parameter	Activities / processes	BAT-AEL ⁽¹⁾ (mg/l)
Total nitrogen (TN)	All activities / processes	5–20 ⁽⁵⁾
<p>⁽¹⁾ The averaging periods are defined in the general considerations.</p> <p>⁽⁵⁾ The BAT-AEL may not apply when the temperature of the waste water is low (e.g. below 12 °C) for prolonged periods.</p>		

BAT-AEL for Total N – Summary of comments (1/2)

BAT-AEL range

- The **upper end** should be lowered to 10 or 15 mg/l:
 - according to data collected, and
 - to align it with an ecosystem-dependent condition as in the Directive on Urban Waste Water Treatment (91/271/EC).

BAT-AEL for Total N – Summary of comments (2/2)

Footnote (5)

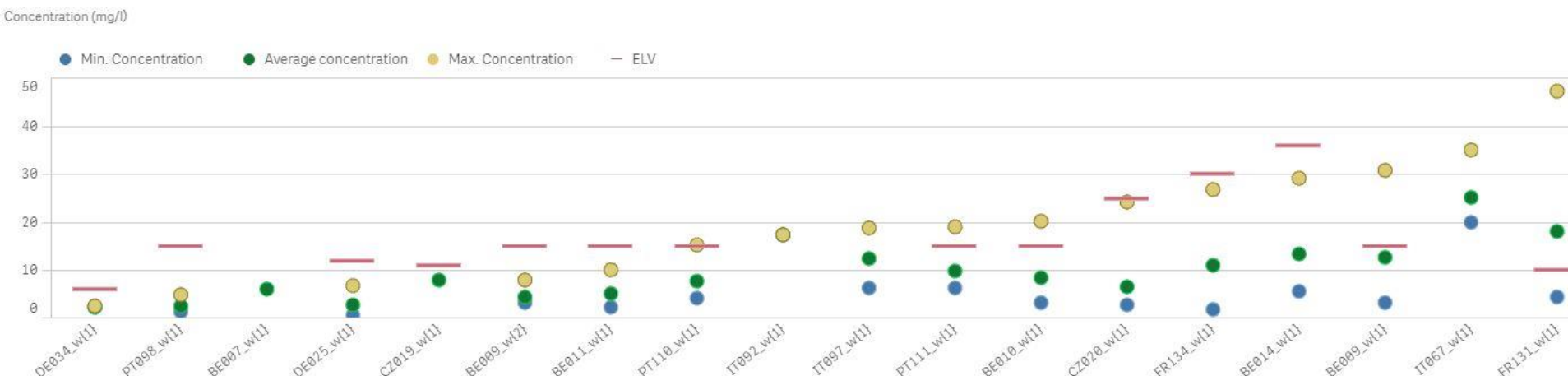
- Set an upper end of BAT-AEL range for cold conditions.
- Specify “prolonged”, because on an average day temperature of 20% of the waste water collected over one day may be equal to or below 12°C.

BAT-AEL for Total N – EIPPCB preliminary assessment (1/4)

BAT-AEL range

- **Upper end** of the range
 - There are plants (e.g. IT092, IT097 and BE010) reporting emissions between 10 and 20 mg/l – no technical reason to exclude them (see graphs).
 - These and other plants from various TXT subsectors display substantial fluctuations (max-avg, avg > 10 in some cases).
 - BAT-AELs are set without prejudice to the Directive on urban waste water treatment (91/271/EC).

BAT-AEL for Total N – EIPPCB preliminary assessment (2/4)

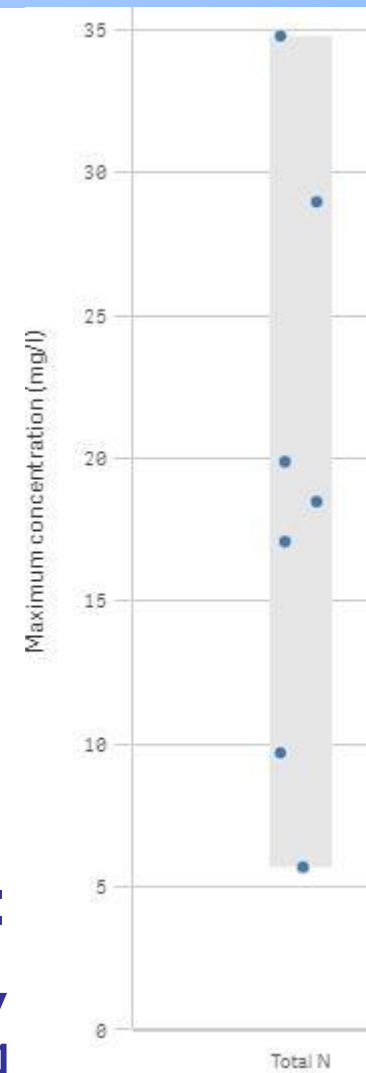
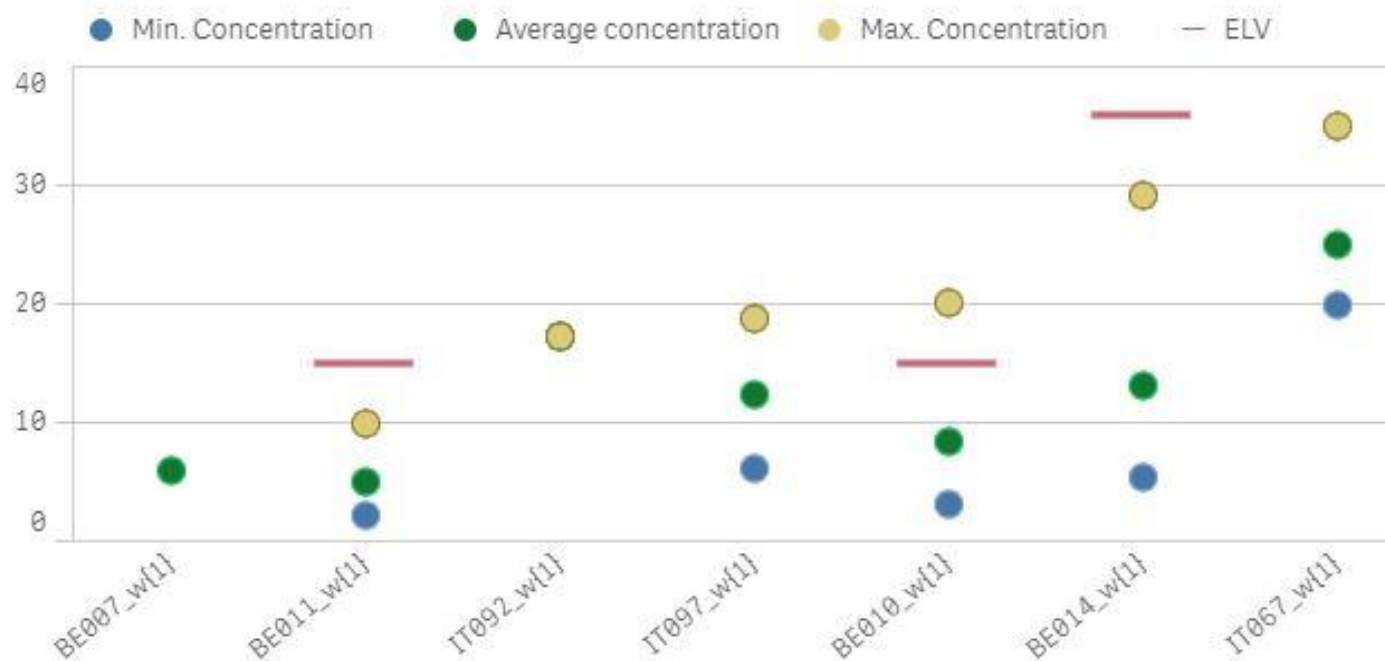


- Emission to water – 1 and 2; filters: Total N, direct discharge

BAT-AEL for Total N – EIPPCB preliminary assessment (3/4)

Pollutants emitted to water

Concentration (mg/l)



- Emission to water – 1 and 2; filters: Total N, direct discharge, nitrification/denitrification, monitoring standard

BAT-AEL for Total N – EIPPCB preliminary assessment (4/4)

Footnote (5)

- Most plants report $T > 12^{\circ}\text{C}$; only BE014 and CZ020 report some lower T values. BAT-AELs are set for normal operating conditions; cold conditions (BAT-AEL and 'prolonged') best accommodated in the implementation (case by case).

EP water name	Year	Parameter	Unit	Individual measurements (unless mentioned otherwise)
BE010_w{1}	2017	Temperature	oC	
BE011_w{1}	2016	Temperature	oC	
BE014_w{1}	2016	Temperature	oC	10-13-13-24-14-18
BE010_w{1}	2018	Temperature	oC	23---18-20-18-20-24-23-24
IT067_w{1}	2017	Temperature	oC	24.4-24.5-24.3-24.5
IT097_w{1}	2018	Temperature	oC	14.8

Waste water characteristics (same filters as in previous graph)

BAT-AEL for Total P – Proposal in D1 (1/1)

Table 5.3: Proposed BAT-associated emission levels (BAT-AELs) for direct discharge to a receiving water body

Substance/Parameter	Activities / processes	BAT-AEL ⁽¹⁾ (mg/l)
Total phosphorus (TP)	All activities / processes	0.4–5
<p>⁽¹⁾ The averaging periods are defined in the general considerations.</p>		

BAT-AEL for Total P – Summary of the comments (1/3)

BAT-AEL range

- Lower the **lower end** of the BAT-AEL range to 0.01 or 0.1 mg/l because the collected data show lower values.
- Lower the **upper end** of the BAT-AEL range to 2 or 3 mg/l because:
 - only data sets for plants with direct discharge using BATs for phosphorus removal should be used for setting a BAT-AEL;
 - for the plants discharging into eutrophication-sensitive areas the upper end of the range is 1 or 2 mg/l (depending on size) as set by the UWWTPD.

BAT-AEL for Total P – Summary of the comments (2/3)

BAT-AEL range (cont.)

- Lower the **upper end** of the BAT-AEL range to 2 or 3 mg/l:
 - the certification scheme ZDHC as well as the CWW BAT conclusions have emission limit values at 3 mg/l;
 - lower the upper end of the BAT-AEL range to 2 mg/l due to UWWD;
 - this upper end of BAT-AEL range was set in the FDM BAT conclusions.

BAT-AEL for Total P – Summary of the comments (3/3)

- Increase the **upper end** of the BAT AEL range to 10 mg/l for fire-retardant treatments using phosphorous compounds.
- Do not consider organic phosphorus when evaluating Total phosphorus. Organophosphorous flame retardants are persistent but not bioaccumulative or toxic. This organic phosphorus does not contribute to the eutrophication of surface water. Actions regarding pad liquors and highly concentrated rinsing water are taken by plants to avoid excess of discharge.

BAT-AEL for Total P – EIPPCB preliminary assessment (1/5)

Lower end of the BAT-AEL range

- It is not clear if it can be lowered further, since the lowest complete data set DE025 has max. 0.5 mg/l.

Upper end of the BAT-AEL range

- Only data sets for plants with direct discharge using BAT for phosphorus removal were indeed used for setting the BAT-AEL (see graphs).

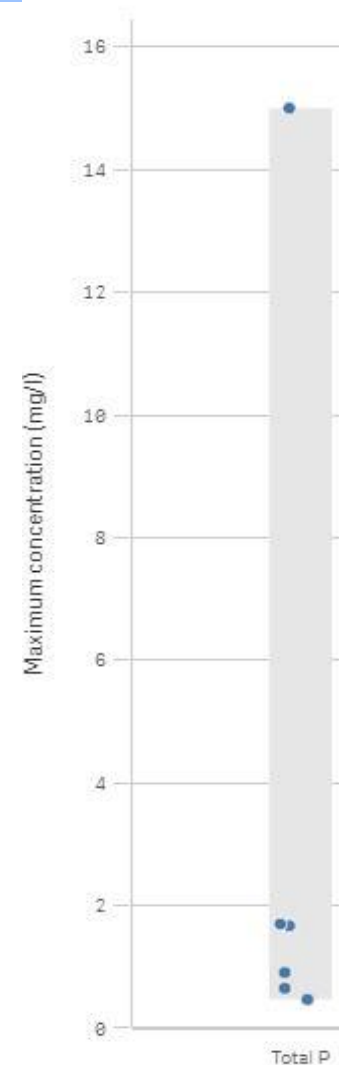
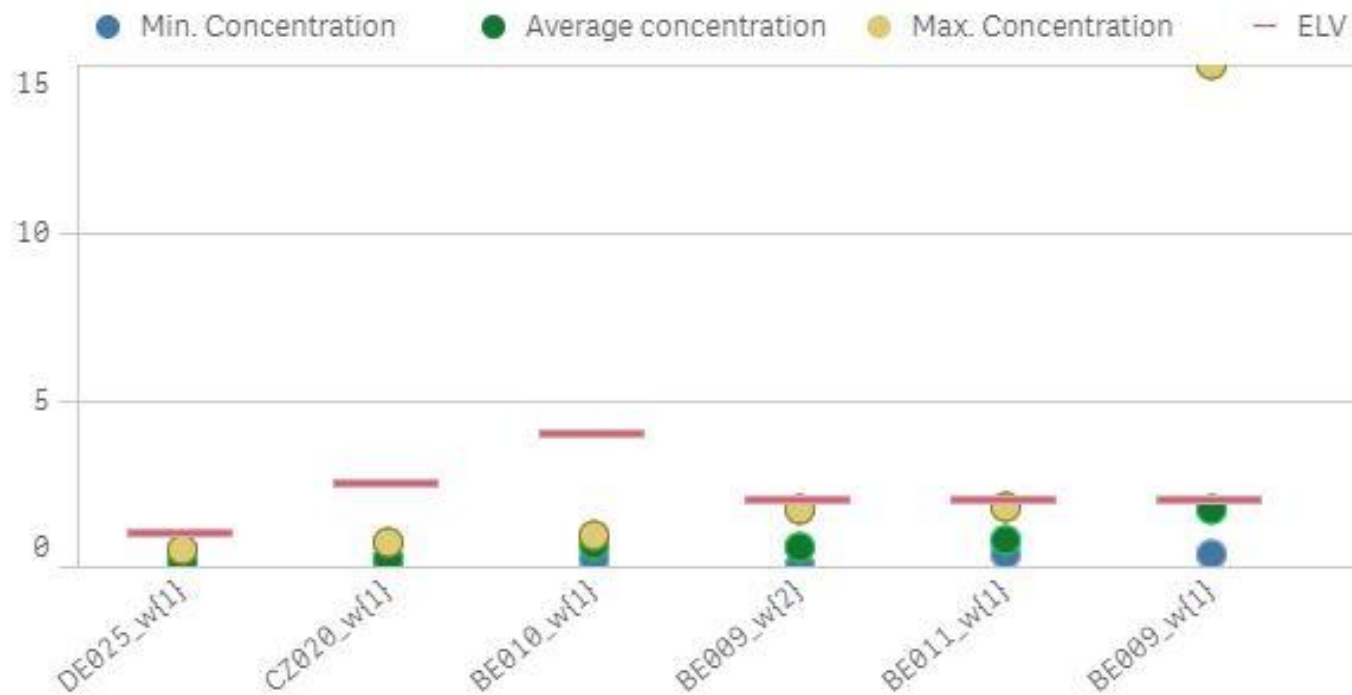
BAT-AEL for Total P – EIPPCB preliminary assessment (2/5)

Upper end of the BAT-AEL range (cont.)

- The BAT-AELs are based on data collected, and not automatically on other BAT conclusions (e.g. phosphorus in FDM effluent is not comparable to TXT effluent), on voluntary certification schemes (e.g. ZDHC) or general waste water regulations (i.e. without prejudice to UWWTP).

BAT-AEL for Total P – EIPPCB preliminary assessment (3/5)

Concentration (mg/l)



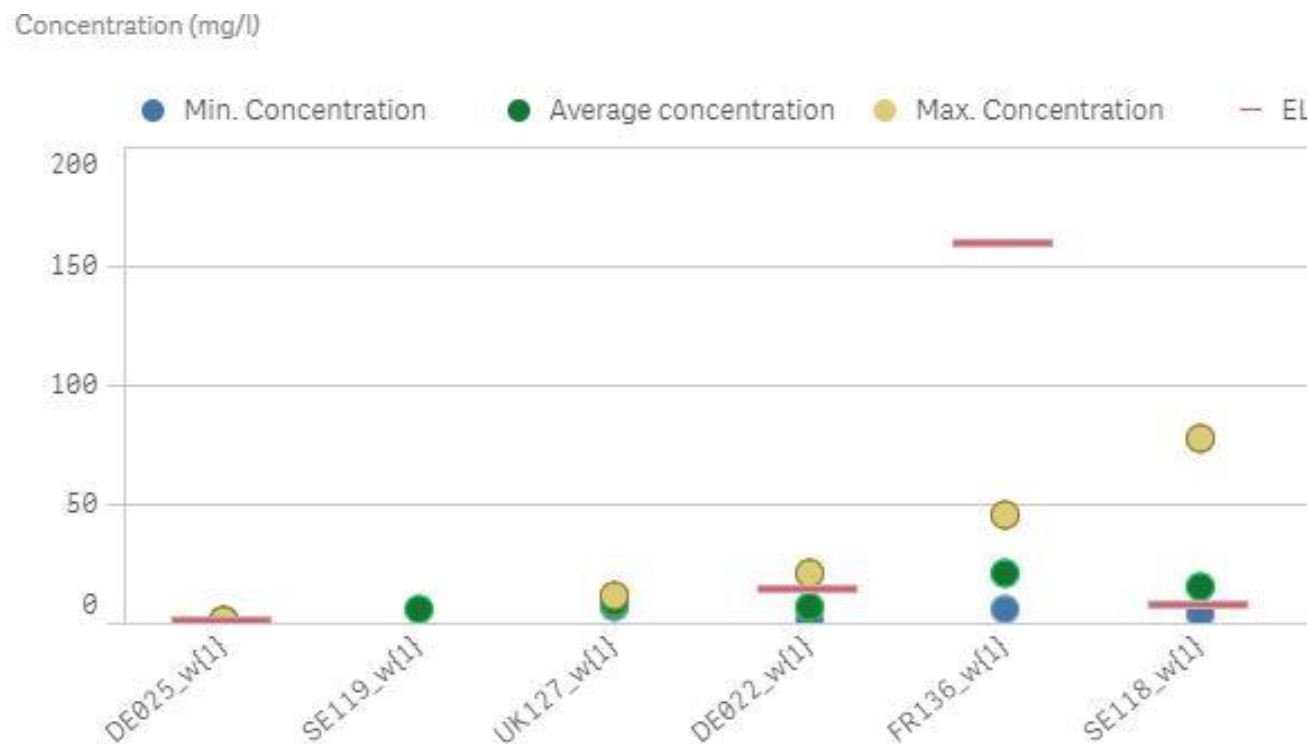
- Emission to water – 1 and 2; filters: Total P, direct discharge, coagulation/flocculation, monitoring standard

BAT-AEL for Total P – EIPPCB preliminary assessment (4/5)

Upper end of the BAT-AEL range (cont.)

- Two plants with high max. values (PT110 - no standard, and BE009), related to infrequent high fluctuations, averages ≤ 5 mg/l.
- No information whether or how organophosphorus could be excluded from the reported Total P values.
- 6 plants reported using organophosphorous flame retardants, 5 for indirect emissions, which were not considered for the BAT-AEL. DE025 reports direct emissions with the lowest values.

BAT-AEL for Total P – EIPPCB preliminary assessment (5/5)



- Finishing, filter Organo-phosphorus compounds
- Emission to water – 1 and 2, filter: Total P

BAT-AEL for sulphide - Proposal in D1 (1/2)

Table 5.3: Proposed BAT-associated emission levels (BAT-AELs) for direct discharge to a receiving water body

Substance/Parameter	Activities / processes	BAT-AEL⁽¹⁾ (mg/l)
Sulphide, easily released (S ²⁻)	Dyeing with sulphur dyes	0.3–1
<p>(¹) The averaging periods are defined in the general considerations.</p>		

BAT-AEL for sulphide - Proposal in D1 (2/2)

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

Substance/Parameter	Activities / processes	BAT-AEL (¹) (²) (mg/l)
Sulphide, easily released (S ²⁻)	Dyeing with sulphur dyes	0.3–1

(¹) The averaging periods are defined in the general considerations.

(²) The BAT-AELs may not apply if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned, provided this does not lead to a higher level of pollution in the environment.

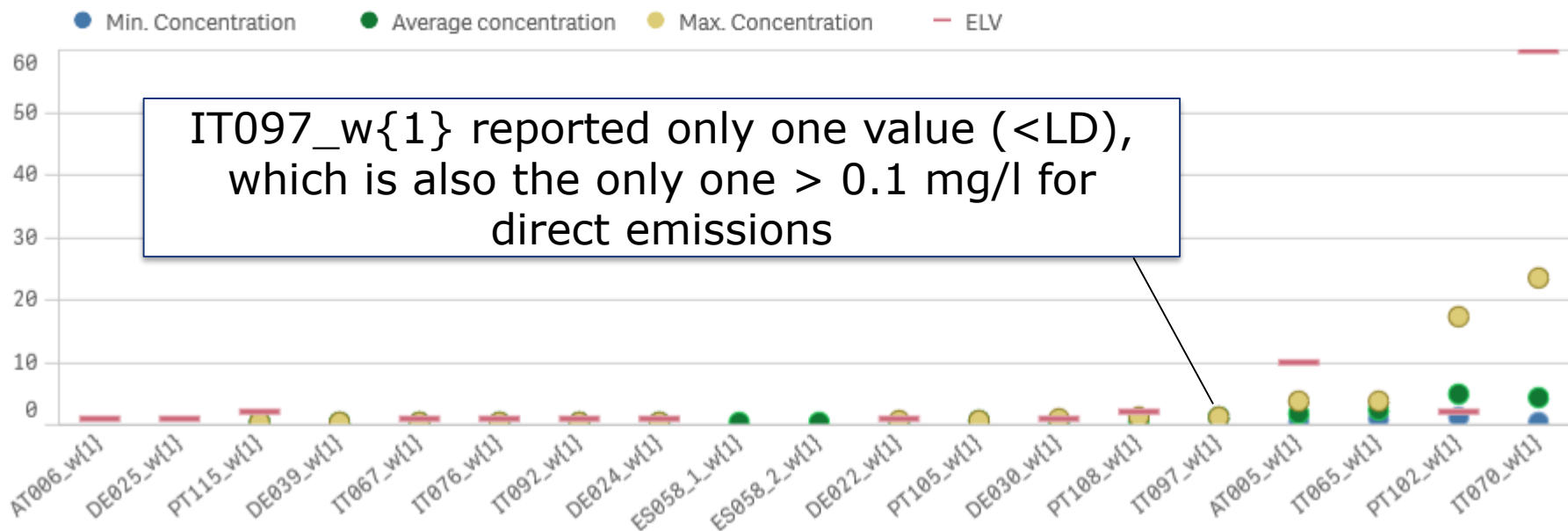
BAT-AEL for sulphide – Summary of the comments (1/1)

- **Direct** emissions: lower BAT-AEL ranges to 0.1-0.5 mg/l or to 0.05-0.2 mg/l. A lot of measurements are reported at limit of detection. The ZDHC standard requires 0.01/0.05/0.5 mg/l.
- **Indirect** emissions: change the applicability of Footnote (2) to sulphide only, as among the other parameters concerned sulphide is the only one that can be removed in activated sludge plants with adapted biomass.

BAT-AEL for sulphide - EIPPCB preliminary assessment (1/3)

Pollutants emitted to water

Concentration (mg/l)



- Emission to water – 1 and 2; filters: Sulphide, direct and indirect discharge

BAT-AEL for sulphide - EIPPCB preliminary assessment (2/3)

- 20 EPs reported data, including 5 EPs for direct emissions.
- None of the 5 EPs reporting data for direct emissions reported the use of sulphur dyes.
- 3 EPs with indirect emissions reported the use of sulphur dyes: ES058_w{1}, DE022_w{1}, DE030_w{1}, up to 0.58 mg/l.

BAT-AEL for sulphide - EIPPCB preliminary assessment (3/3)

- In addition:
 - emissions of sulphide may be connected to the processing of textiles previously dyed with sulphur dyes;
 - vat dyes could make it necessary to use hydrosulphite and as a consequence introduce sulphur into the effluent and form sulphides under certain circumstances.

BAT-AEL for Antimony (Sb) - Proposal in D1 (1/2)

Table 5.3: Proposed BAT-associated emission levels (BAT-AELs) for direct discharge to a receiving water body

Substance/Parameter	Activities / processes	BAT-AEL⁽¹⁾ (mg/l)
Antimony (Sb)	Pre-treatment and/or dyeing of polyester	0.1–0.4
	Finishing with flame retardants using antimony trioxide	
<p>(¹) The averaging periods are defined in the general considerations.</p>		

Antimony (Sb) - Proposal in D1 (2/2)

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

Substance/Parameter	Activities / processes	BAT-AEL ⁽¹⁾ (mg/l)
Antimony (Sb)	Pre-treatment and/or dyeing of polyester	0.1–0.4
	Finishing with flame retardants using antimony trioxide	

⁽¹⁾ The averaging periods are defined in the general considerations.

⁽²⁾ The BAT-AELs may not apply if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned, provided this does not lead to a higher level of pollution in the environment.

BAT-AEL for Antimony (Sb) - Summary of the comments (1/2)

- Set separate BAT-AEL ranges for each process:
 - Pretreatment and dyeing (with an upper end of the range at 1.5 mg/l) because antimony used as a catalyst for polyester production is leached out of fibre at high temperature and emissions cannot be avoided.
 - Finishing (with a BAT-AEL range of 0.1-0.4 or an upper end of the range at 0.5 mg/l) because emissions can be minimised by retention of padding liquor and contaminated rinsing water.

BAT-AEL for Antimony (Sb) - Summary of the comments (2/2)

- Increase the upper end of the BAT-AEL range:
 - to 0.6 mg/l where both pretreatment and/or dyeing of polyester and finishing with flame retardants using antimony trioxide are applied;
 - to 1.2 mg/l for plants doing polyester and modacryl/cotton dyeing.
- Lower the upper end of the range to 0.2 mg/l because lower values can be achieved by prevention, chemical and water management (separate disposal of chemicals), also with abatement techniques such as nanofiltration, microfiltration, ultrafiltration, and precipitation.

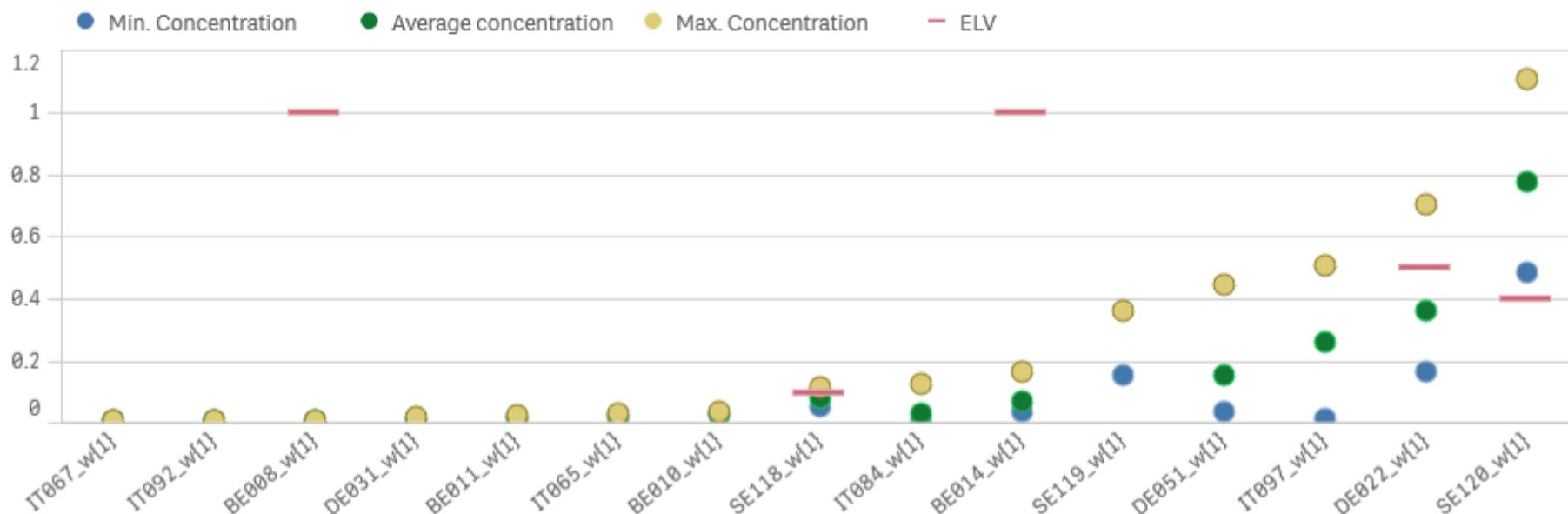
BAT-AEL for Antimony (Sb) - EIPPCB preliminary assessment (1/7)

- 15 EPs reported emissions including 6 for direct emissions and 9 for indirect emissions, up to 1.1 mg/l.

BAT-AEL for Antimony (Sb) - EIPPCB preliminary assessment (2/7)

Pollutants emitted to water

Concentration (mg/l)

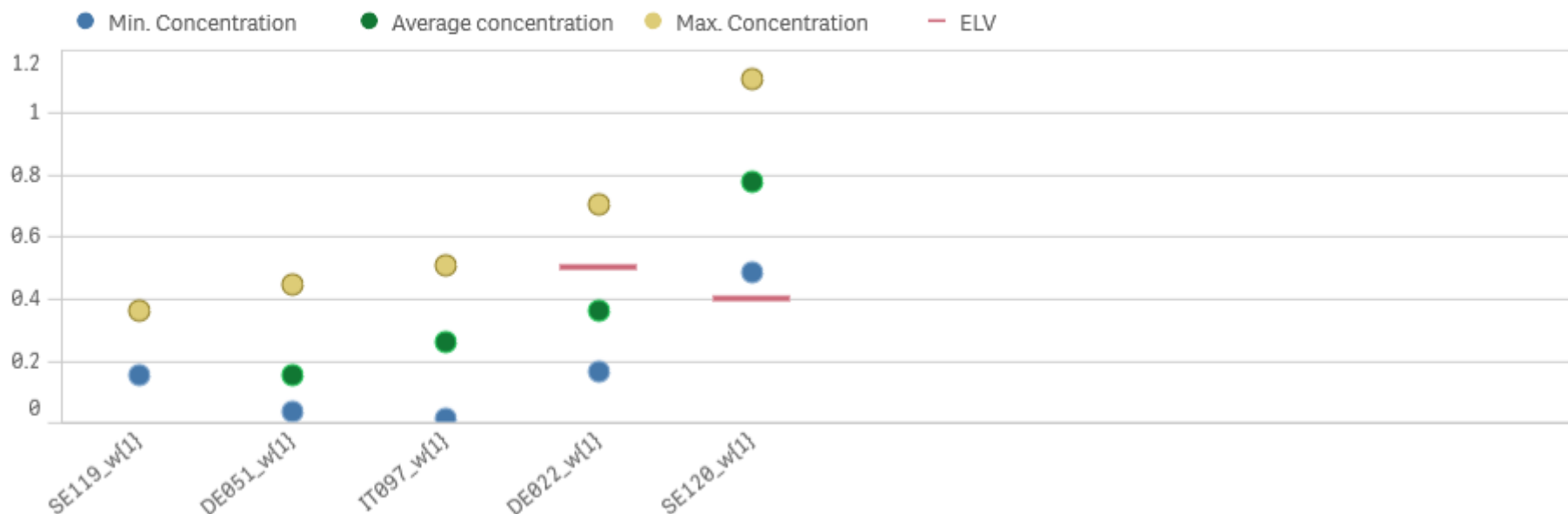


- Emission to water – 1 and 2; filters: Sb, direct and indirect discharge

BAT-AEL for Antimony (Sb) - EIPPCB preliminary assessment (3/7)

Pollutants emitted to water

Concentration (mg/l)



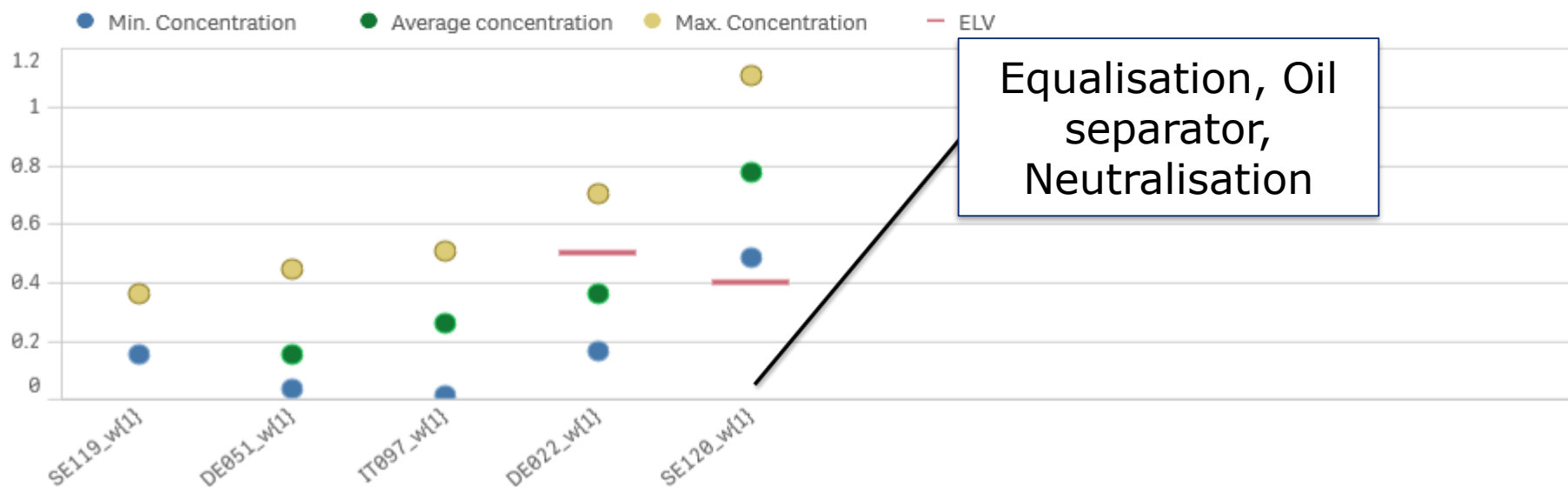
- Emission to water – 1 and 2; filters: Sb, direct and indirect discharge, focus values > 0.4 mg/l

BAT-AEL for Antimony (Sb) - EIPPCB preliminary assessment (4/7)

- New data sent by DE (attachment to DE196 in BATIS – Plant DE042 – giving two values 17/09/19 1100 µg/l and 17/11/19 1300 µg/l) with pretreatment, dyeing and functional finishing.
- 5 EPs reported emissions higher than the upper end of the range: SE119_w{1}, DE051_w{1}, IT097_w{1}, DE022_w{1} and SE120_w{1}.

BAT-AEL for Antimony (Sb) - EIPPCB preliminary assessment (5/7)

Pollutants emitted to water
Concentration (mg/l)

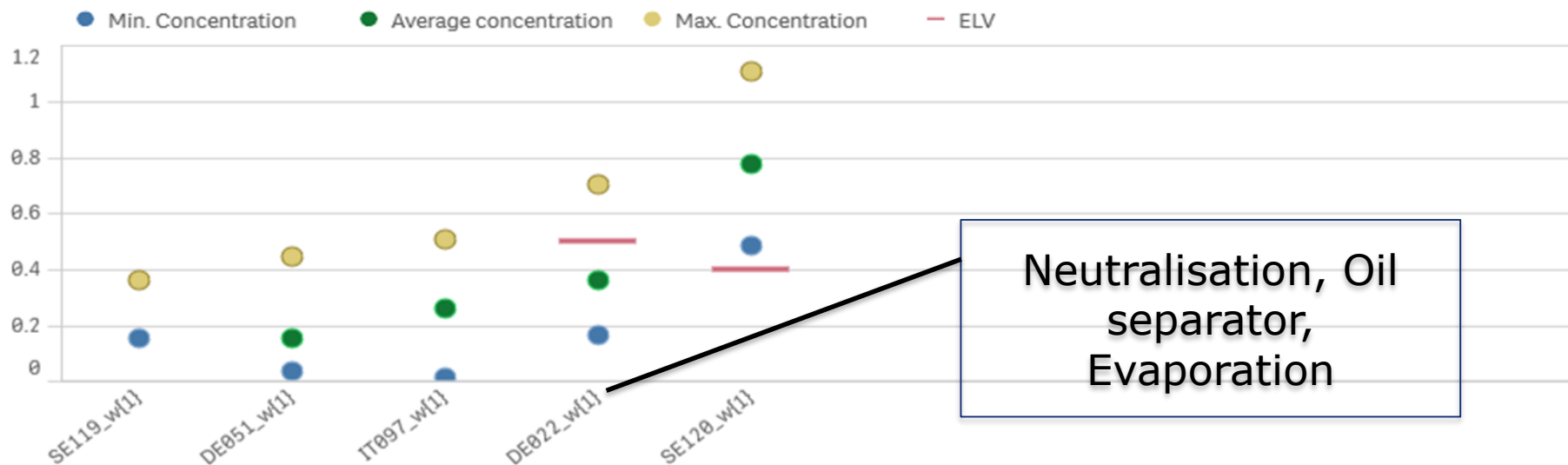


- Pre-treatment and dyeing: carried out by all 5 plants
- Finishing: carried out by all 5 plants

BAT-AEL for Antimony (Sb) - EIPPCB preliminary assessment (6/7)

Pollutants emitted to water

Concentration (mg/l)



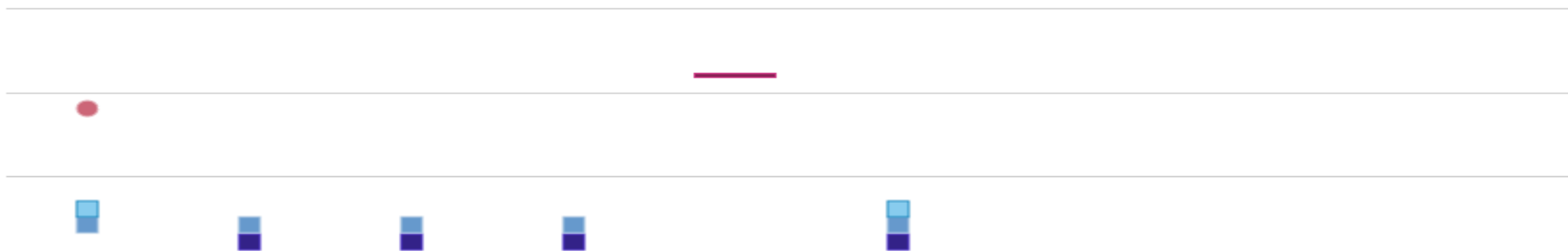
Neutralisation, Oil separator, Evaporation

- Pre-treatment and/or dyeing of polyester and finishing with flame retardants using antimony trioxide: DE022_w{1}
- Polyester and modacryl/cotton dyeing: DE022_w{1}

BAT-AEL for Antimony (Sb) - EIPPCB preliminary assessment (7/7)

Techniques applied (1 of 2)

- Equalisation
- Oil separation
- Screening
- Chemical oxidation
- Evaporation
- No tech
- Neutralisation
- Grit separators
- Adsorption
- Chemical reduction
- Distillation/rectification
- Other



Techniques applied (2 of 2)

- ◆ Activated sludge
- ◆ Anaerobic treatment
- ▲ Coagulation and flocculation
- ▲ Sand filtration
- ▲ Microfiltration
- ▲ Rev
- ◆ Membrane bioreactor
- Nitrification/denitrification
- ▲ Sedimentation
- ▲ Ultrafiltration
- ▲ Nanofiltration
- ▲ Flo



Values added in BATIS

BAT-AEL for Copper (Cu) - Proposal in D1 (1/2)

Table 5.3: Proposed BAT-associated emission levels (BAT-AELs) for direct discharge to a receiving water body

Substance/Parameter	Activities / processes	BAT-AEL⁽¹⁾ (mg/l)
Copper (Cu)	All activities / processes	0.03–0.4
⁽¹⁾ The averaging periods are defined in the general considerations.		

Copper (Cu) - Proposal in D1 (2/2)

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

Substance/Parameter	Activities / processes	BAT-AEL (¹) (²) (mg/l)
Copper (Cu)	All activities / processes	0.03–0.4
<p>(¹) The averaging periods are defined in the general considerations. (²) The BAT-AELs may not apply if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned, provided this does not lead to a higher level of pollution in the environment.</p>		

BAT-AEL for Copper (Cu) - Summary of the comments (1/1)

- Increase the upper end of the BAT-AEL range to 0.8 mg/l for dyeing products with high lightfastness, and high quality demands.
- Lower the upper end of BAT-AEL range to 0.2 mg/l and add a Footnote that in case of increased lightfastness requirements (use of copper-containing dyes) the upper end of the BAT-AEL range is up to 0.4 mg/l.

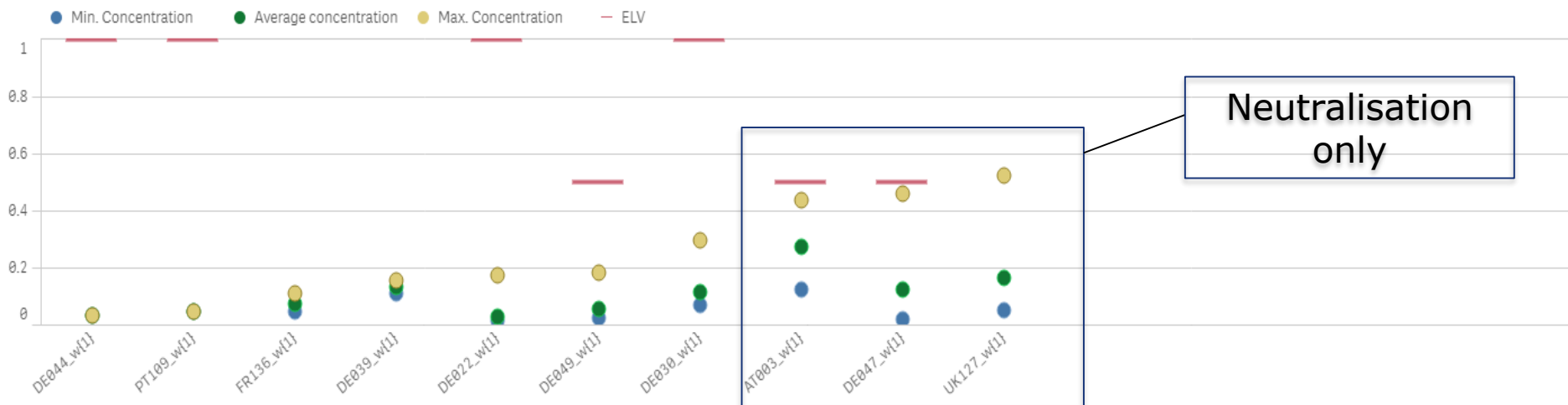
BAT-AEL for Copper (Cu) - EIPPCB preliminary assessment (1/4)

- 89 EPs reported emissions including 18 for direct emissions and 71 for indirect emissions, up to 1.74 mg/l.
- According to Sections 2.7.2 and 3.4.9.2 of D1, high lightfastness is ensured by the use of vat dyes or metal-complex dyes and reactive dyes may contain copper too.

BAT-AEL for Copper (Cu) - EIPPCB preliminary assessment (2/4)

Pollutants emitted to water

Concentration (mg/l)

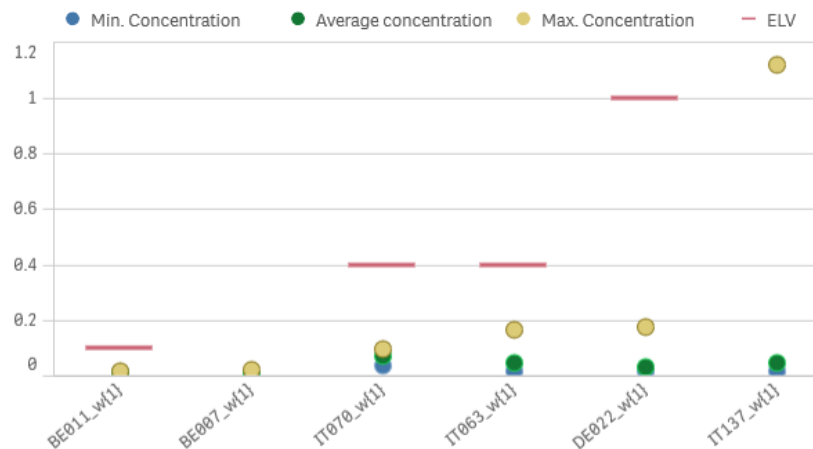


Neutralisation only

- Emission to water – 1 and 2; filters: Cu, direct and indirect discharge, vat dyes

BAT-AEL for Copper (Cu) - EIPPCB preliminary assessment (3/4)

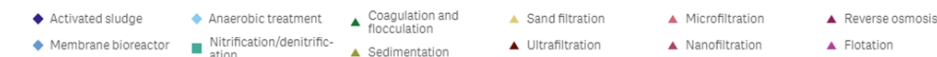
Pollutants emitted to water
Concentration (mg/l)



Techniques applied (1 of 2)



Techniques applied (2 of 2)

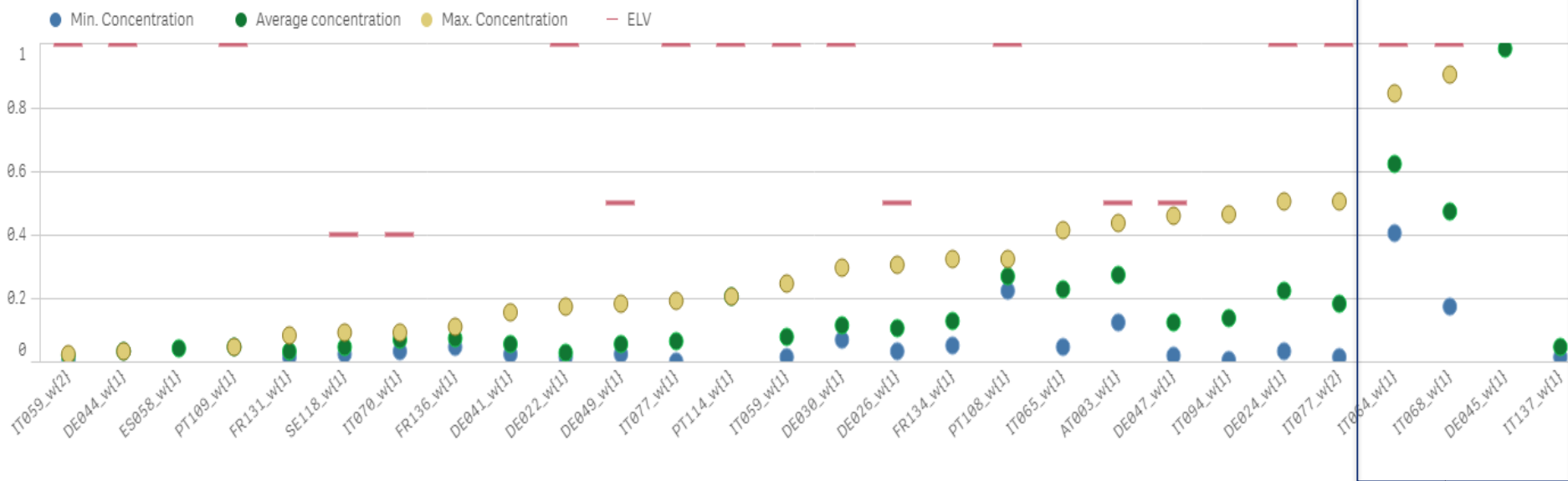


- Emission to water – 1 and 2; filters: Cu, direct and indirect discharge, metal-complex dyes 1 and 2

BAT-AEL for Copper (Cu) - EIPPCB preliminary assessment (4/4)

Pollutants emitted to water

Concentration (mg/l)



No techniques

- Emission to water – 1 and 2; filters: Cu, direct and indirect discharge, reactive dyes

BAT-AEL for Chromium (Cr) - Proposal in D1 (1/2)

Table 5.3: Proposed BAT-associated emission levels (BAT-AELs) for direct discharge to a receiving water body

Substance/Parameter	Activities / processes	BAT-AEL (1) (mg/l)
Chromium (Cr)	Dyeing with chromium-containing dyes	0.01–0.3
(1) The averaging periods are defined in the general considerations.		

BAT-AEL for Chromium (Cr) - Proposal in D1 (2/2)

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

Substance/Parameter	Activities / processes	BAT-AEL (¹) (²) (mg/l)
Chromium (Cr)	Dyeing with chromium-containing dyes	0.01–0.3

(¹) The averaging periods are defined in the general considerations.

(²) The BAT-AELs may not apply if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned, provided this does not lead to a higher level of pollution in the environment.

BAT-AEL for Chromium (Cr) - Summary of the comments (1/1)

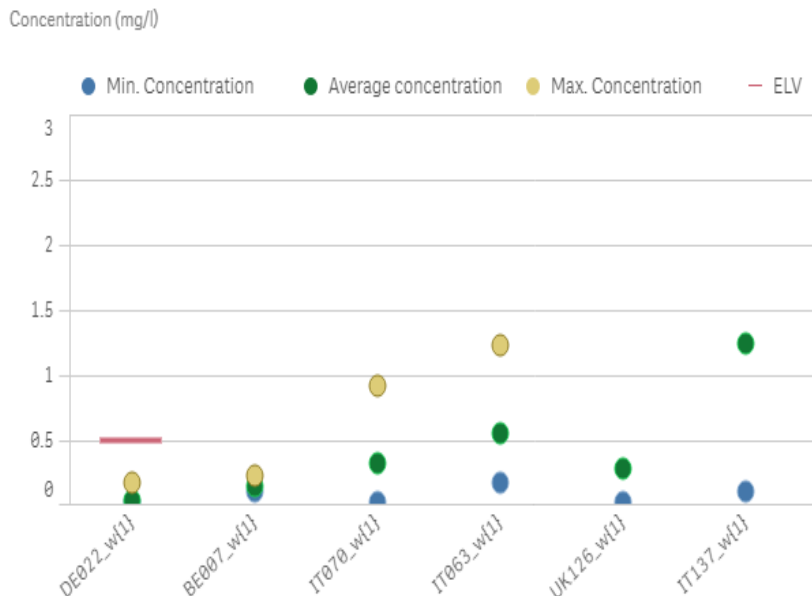
- Lower the upper end of the BAT-AEL range to 0.1 mg/l. ZDHC requires 0.05/0.1/0.2 mg/l as maximum levels for the three performance classes and Oeko-tex requires 0.2 mg/l.

BAT-AEL for Chromium (Cr) - EIPPCB preliminary assessment (1/2)

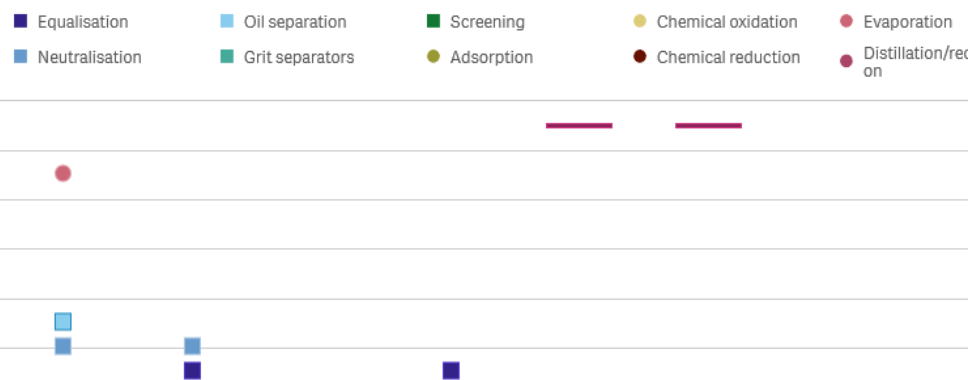
- 84 EPs reported emissions including 15 for direct emissions and 69 for indirect emissions, up to 15.78 mg/l.
- According to D1, metal-complex dyes and acid dyes could contain chromium.

BAT-AEL for Chromium (Cr) - EIPPCB preliminary assessment (2/2)

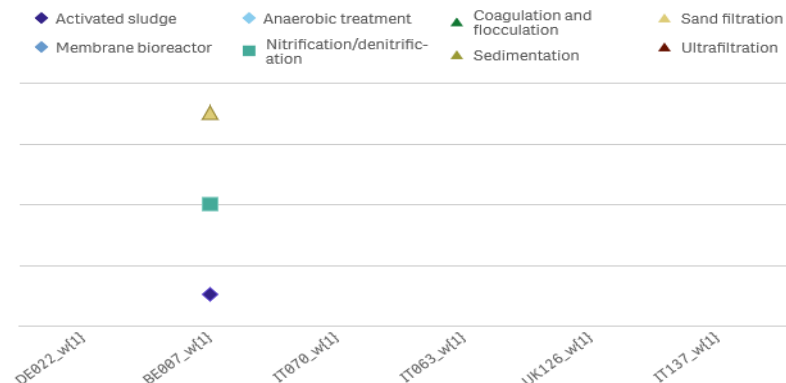
Pollutants emitted to water



Techniques applied (1 of 2)



Techniques applied (2 of 2)



- Emission to water – 1 and 2; filters: Cr, direct and indirect discharge, dyeing with metal-complex dyes 1 and 2, dyeing with acid dyes

BAT-AEL for Zinc (Zn) - Proposal in D1 (1/2)

Table 5.3: Proposed BAT-associated emission levels (BAT-AELs) for direct discharge to a receiving water body

Substance/Parameter	Activities / processes	BAT-AEL⁽¹⁾ (mg/l)
Zinc (Zn)	All activities / processes	0.04–0.5

⁽¹⁾ The averaging periods are defined in the general considerations.

BAT-AEL for Zinc (Zn) - Proposal in D1 (2/2)

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

Substance/Parameter	Activities / processes	BAT-AEL (¹) (²) (mg/l)
Zinc (Zn)	All activities / processes	0.04–0.5
<p>(¹) The averaging periods are defined in the general considerations. (²) The BAT-AELs may not apply if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned, provided this does not lead to a higher level of pollution in the environment.</p>		

BAT-AEL for Zinc (Zn) - Summary of the comments (1/1)

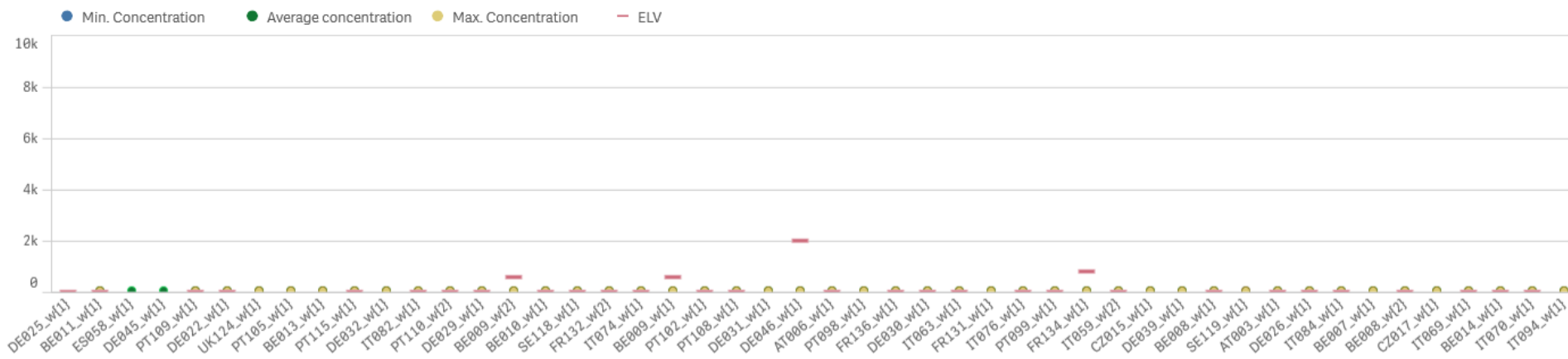
- Increase the upper end of the BAT-AEL range to 2 mg/l. A source of Zn emissions is corrosion of pipes.

BAT-AEL for Zinc (Zn) - EIPPCB preliminary assessment (1/4)

- 87 EPs reported emissions including 17 for direct emissions and 70 for indirect emissions, up to 29.9 mg/l.

BAT-AEL for Zinc (Zn) - EIPPCB preliminary assessment (2/4)

Pollutants emitted to water
Concentration (mg/l)

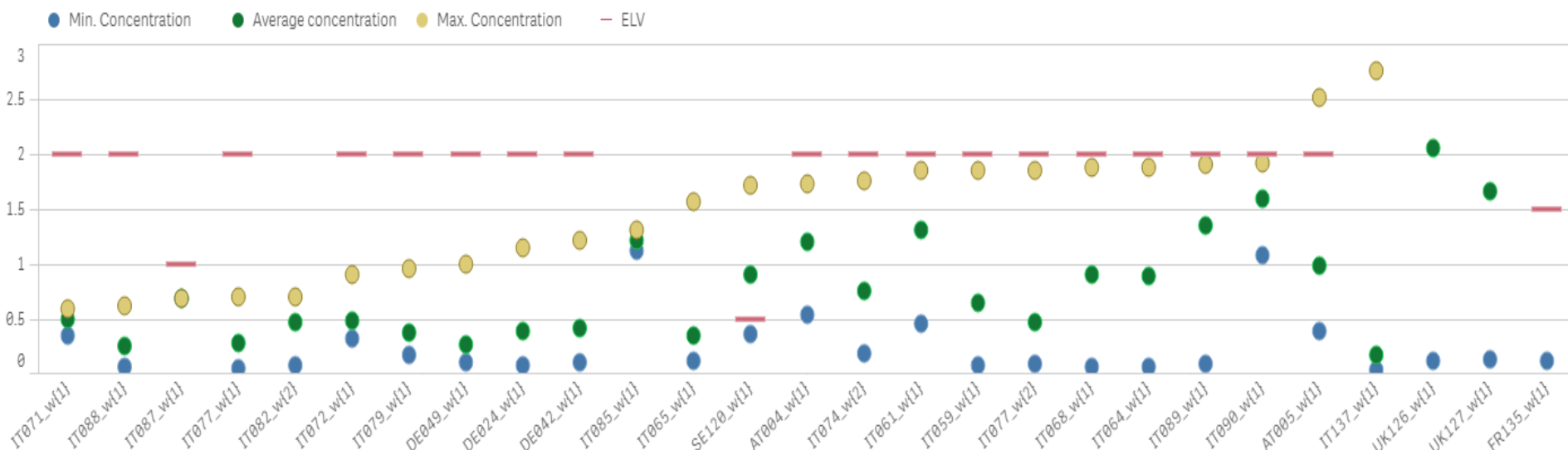


- Emission to water – 1 and 2; filters: Zn, direct and indirect discharge

BAT-AEL for Zinc (Zn) - EIPPCB preliminary assessment (3/4)

Pollutants emitted to water

Concentration (mg/l)



- Emission to water – 1 and 2; filters: Zn, direct and indirect discharge, > 0.5 mg/l

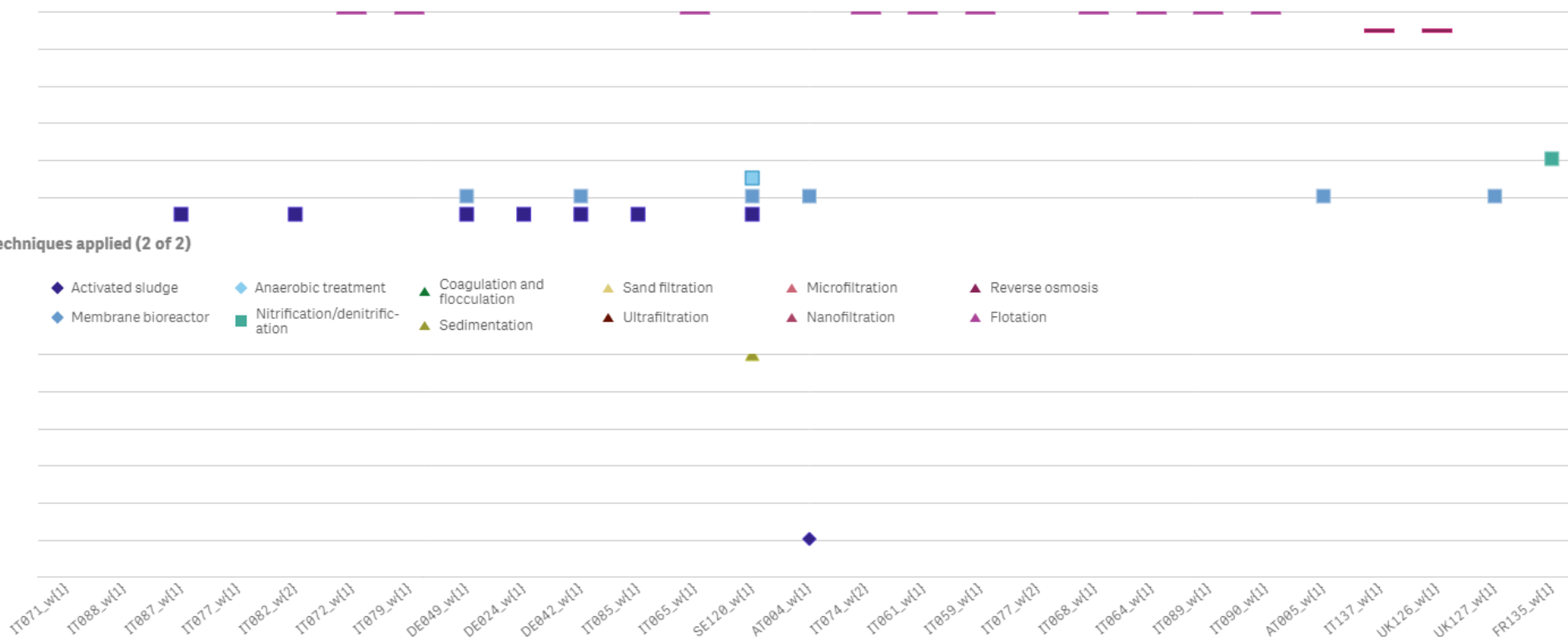
BAT-AEL for Zinc (Zn) - EIPPCB preliminary assessment (4/4)

Techniques applied (1 of 2)

- Equalisation
- Oil separation
- Screening
- Chemical oxidation
- Evaporation
- No techniques used
- Neutralisation
- Grit separators
- Adsorption
- Chemical reduction
- Distillation/rectification
- Other

Techniques applied (2 of 2)

- ◆ Activated sludge
- ◆ Anaerobic treatment
- ▲ Coagulation and flocculation
- ▲ Sand filtration
- ▲ Microfiltration
- ▲ Reverse osmosis
- ◆ Membrane bioreactor
- Nitrification/denitrification
- ▲ Sedimentation
- ▲ Ultrafiltration
- ▲ Nanofiltration
- ▲ Flotation



BAT-AEL for Nickel (Ni) - Proposal in D1 (1/2)

Table 5.3: Proposed BAT-associated emission levels (BAT-AELs) for direct discharge to a receiving water body

Substance/Parameter	Activities / processes	BAT-AEL⁽¹⁾ (mg/l)
Nickel (Ni)	All activities / processes	0.01–0.5
<p>⁽¹⁾ The averaging periods are defined in the general considerations.</p>		

BAT-AEL for Nickel (Ni) - Proposal in D1 (2/2)

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

Substance/Parameter	Activities / processes	BAT-AEL (¹) (²) (mg/l)
Nickel (Ni)	All activities / processes	0.01–0.5
<p>(¹) The averaging periods are defined in the general considerations. (²) The BAT-AELs may not apply if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned, provided this does not lead to a higher level of pollution in the environment.</p>		

BAT-AEL for Nickel (Ni) - Summary of the comments (1/1)

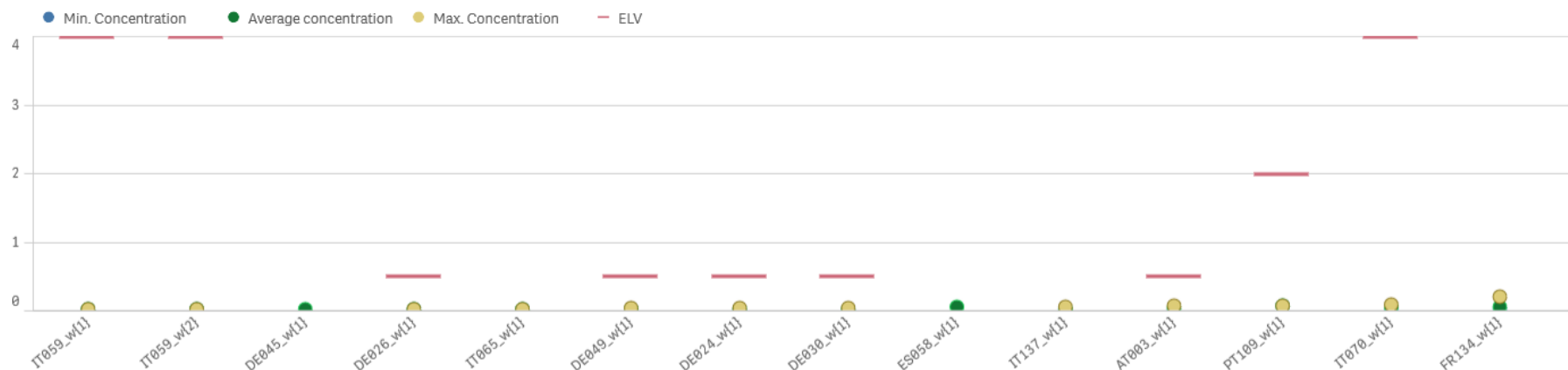
- Lower the upper end of the BAT-AEL range to 0.08 mg/l and add a Footnote mentioning that the upper end corresponds to the use of nickel-containing dyes. Experience shows that 0.08 mg/l can be achieved by good chemical and water management and using abatement technologies such as reverse osmosis, ultrafiltration or microfiltration.

BAT-AEL for Nickel (Ni) - EIPPCB preliminary assessment (1/4)

- 65 EPs reported Ni emissions including 16 for direct emissions and 49 for indirect emissions, up to 2 mg/l
- According to Section 3.4.9.3 of D1, reactive dyes may contain metals such as nickel.
- 15 EPs reported the use of reactive dyes. Only FR134_w{1} reported values higher than 0.08 mg/l.
- None of these 15 EPs are using reverse osmosis, ultrafiltration or microfiltration.

BAT-AEL for Nickel (Ni) - EIPPCB preliminary assessment (2/4)

Pollutants emitted to water
Concentration (mg/l)

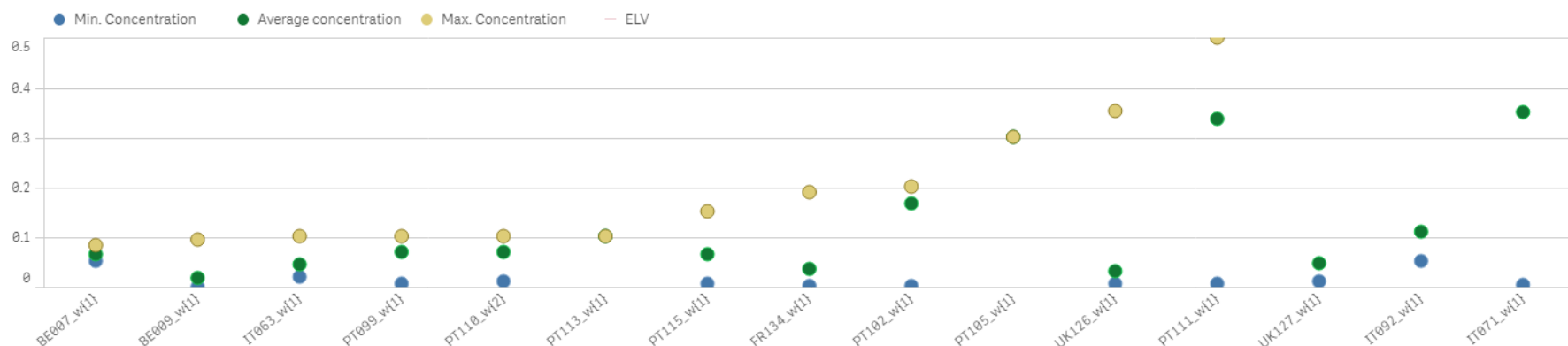


- Emission to water – 1 and 2; filters: Ni, direct and indirect discharge, dyeing with reactive dyes

BAT-AEL for Nickel (Ni) - EIPPCB preliminary assessment (3/4)

Pollutants emitted to water

Concentration (mg/l)



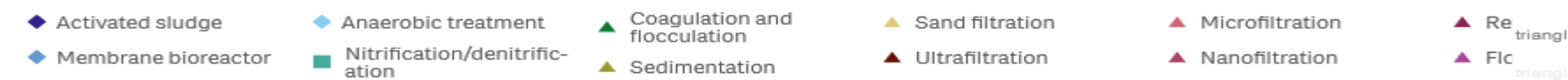
- Emission to water – 1 and 2; filters: Ni, direct and indirect discharge, focus on values > 0.08 mg/l

BAT-AEL for Nickel (Ni) - EIPPCB preliminary assessment (4/4)

Techniques applied (1 of 2)



Techniques applied (2 of 2)



BAT-AEL for Metals and Footnote - Proposal in D1 (2/2)

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

(3) The BAT-AELs only apply when the substance/parameter concerned is identified as relevant in the waste water stream based on the inventory of inputs and outputs mentioned in BAT 2.

BAT-AEL for Metals and Footnote – Summary of the comments (1/1)

- Indirect emissions:
 - Lower the upper end of the BAT-AEL range for all metals/metalloids to 0.2 mg/l. BAT for indirect discharges is to remove metals on site with suitable pretreatment (e.g. precipitation, solids removal).
 - Add Footnote (3) to this group of parameters. The BAT-AELs only apply when the substance/parameter concerned is identified as relevant in the waste water stream based on the inventory of inputs and outputs mentioned in BAT 2.

BAT-AEL for Metals and Footnote – EIPPCB preliminary assessment (1/2)

- **Copper:** 19 EPs reported values between 0.2 and 0.4 mg/l: 3 EPs carrying out sedimentation and 3 EPs carrying out filtration.
- **Nickel:** 4 EPs reported values between 0.2 and 0.5 mg/l: PT102_w{1}, PT105_w{1}, UK126_w{1}, PT111_w{1}. PT111_w{1} carrying out sedimentation.
- **Zinc:** 8 EPs reported values between 0.2 and 0.5 mg/l: 3 EPs carrying out sedimentation, 2 Eps carrying out filtration, and 2 carrying out coagulation and flocculation.

BAT-AEL for Metals and Footnote – EIPPCB preliminary assessment (2/2)

- Concerning Footnote (3):
 - BAT-AEL proposals for Sb and Cr have already been proposed for specific processes;
 - BAT-AEL proposals for Cu, Ni and Zn have already been proposed for all activities/processes.

BAT-AEL for AOX – Proposal in D1 (1/2)

Table 5.3: Proposed BAT-associated emission levels (BAT-AELs) for direct discharge to a receiving water body

Substance/Parameter	Activities / processes	BAT-AEL ⁽¹⁾ (mg/l)
Adsorbable organically bound halogens (AOX) ⁽²⁾	All activities / processes	0.1–0.5

⁽¹⁾ The averaging periods are defined in the general considerations.

⁽²⁾ The BAT-AELs only apply when the substance/parameter concerned is identified as relevant in the waste water stream based on the inventory of inputs and outputs mentioned in BAT 2.

BAT-AEL for AOX – Proposal in D1 (2/2)

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

Substance/Parameter	Activities / processes	BAT-AEL ⁽¹⁾ ⁽²⁾ (mg/l)
Adsorbable organically bound halogens (AOX) ⁽³⁾	All activities / processes	0.1–0.5

⁽¹⁾ The averaging periods are defined in the general considerations.

⁽²⁾ The BAT-AELs may not apply if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned, provided this does not lead to a higher level of pollution in the environment.

⁽³⁾ The BAT-AELs only apply when the substance/parameter concerned is identified as relevant in the waste water stream based on the inventory of inputs and outputs mentioned in BAT 2.

BAT-AEL for AOX – Summary of the comments (1/3)

BAT-AEL range (direct discharge)

- Increase the **upper end** of the BAT-AEL range:
 - for dyeing polyester and blend of modacryl/cotton to 1 mg/l; such companies have an AOX discharge of 1.9 mg/l (90th percentile) and 1.46 mg/l (80th percentile) for indirect discharges;
 - to 1 mg/l based on 10 times the environmental quality standard; a 90th percentile value for the upper limit is more representative of the well-performing plants;
 - to 0.8 mg/l for dyeing products with high lightfastness, and high quality demands.

BAT-AEL for AOX – Summary of the comments (2/3)

BAT-AEL range (direct discharge)

- Lower the **upper end** of the BAT-AEL range to 0.3-0.4 mg/l.
 - The upper end of the BAT-AEL should be lower than limits of certification schemes.
 - Some plants are below or even consistently well below this level.
 - The contextual information (e.g. on the set-up and process conditions of the waste water treatment plants) to technically derive a more ambitious BAT is lacking.

BAT-AEL for AOX – Summary of the comments (3/3)

BAT-AEL range (indirect discharge)

- Increase the **upper end** of the BAT-AEL range to 1 mg/l; the plants dyeing PES, PES/CO report a 90th percentile above 1 mg/l.
- Add a Footnote to increase the upper end to 2.5 mg/l for plants carrying out wool anti-felting with the Hercosett process, because plants with indirect discharge would not use PAC and GAC filtration.

BAT-AEL for AOX – EIPPCB preliminary assessment (1/7)

Upper end of the BAT-AEL range (direct discharge)

- For dyeing polyester and blend of modacryl/cotton to 1 mg/l. It is not clear how to raise it, since the highest value of complete data sets is 0.86 mg/l (FR134 see graph below).
- The BAT-AELs are not derived on the basis of a statistical approach (e.g. 90th percentile), nor are they based on environmental quality standards.
- It is not clear which criteria to choose for lightfastness and high quality.
- Some plants with indirect discharge report values ≥ 0.8 mg/l – but no appropriate treatment (see following graph).

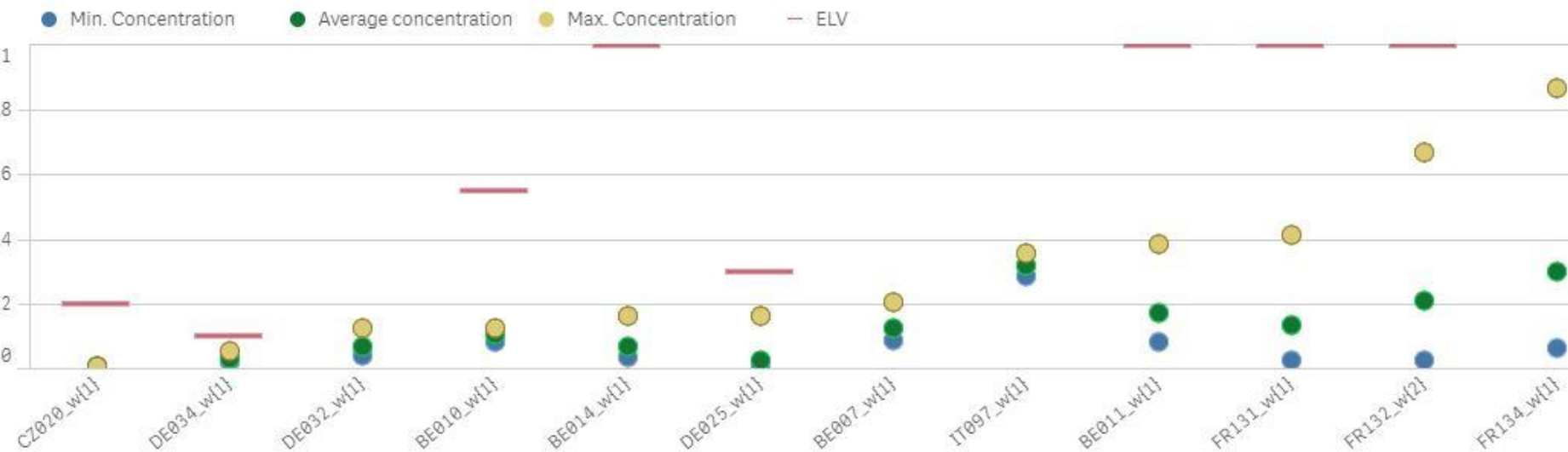
BAT-AEL for AOX – EIPPCB preliminary assessment (2/7)

Upper end of the BAT-AEL range (direct discharge) (cont.)

- The BAT-AELs are not derived on the basis of certification schemes.
- Many plants have average values below the upper end of proposed range, but maximums ≥ 0.8 mg/l – high fluctuations (see following graphs).

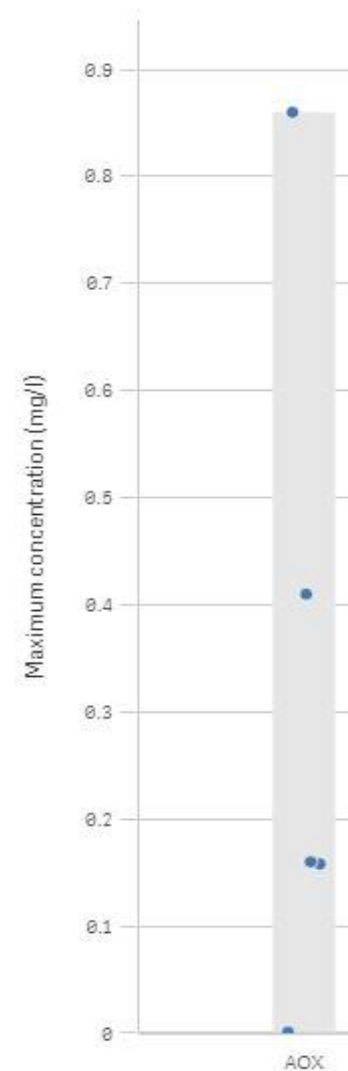
BAT-AEL for AOX – EIPPCB preliminary assessment (3/7)

Concentration (mg/l)



- Emission to water – 1 and 2, filters: AOX, **direct discharge**

BAT-AEL for AOX – EIPPCB preliminary assessment (4/7)



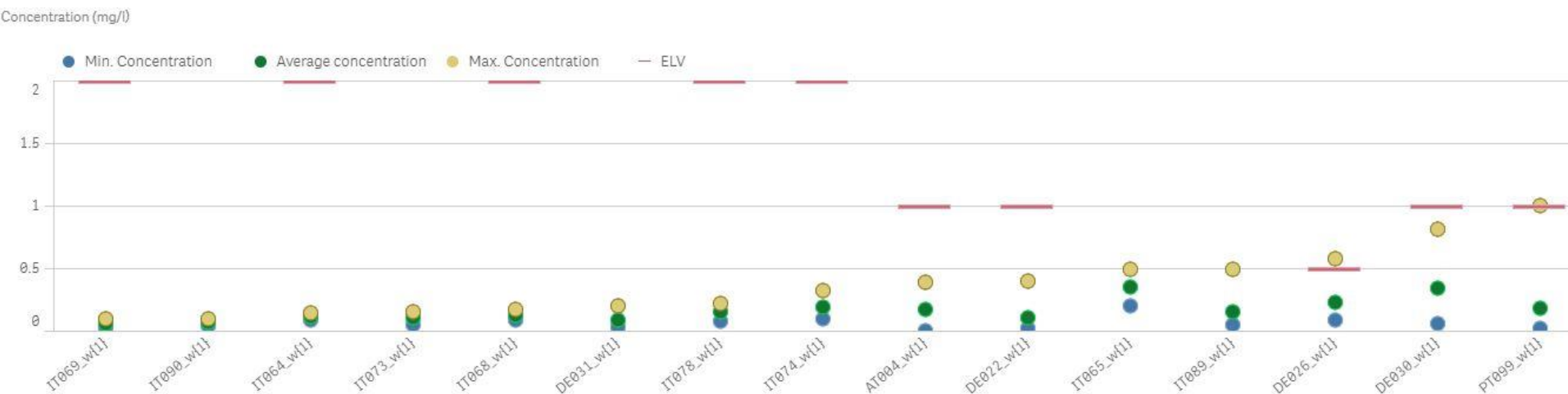
- Emission to water – 1 and 2, filters: AOX, **direct** discharge, monitoring standard
- Raw material, products and processes, filter: acrylic, blend cotton-synthetic, polyester, cotton

BAT-AEL for AOX – EIPPCB preliminary assessment (5/7)

Upper end of the BAT-AEL range (indirect discharge)

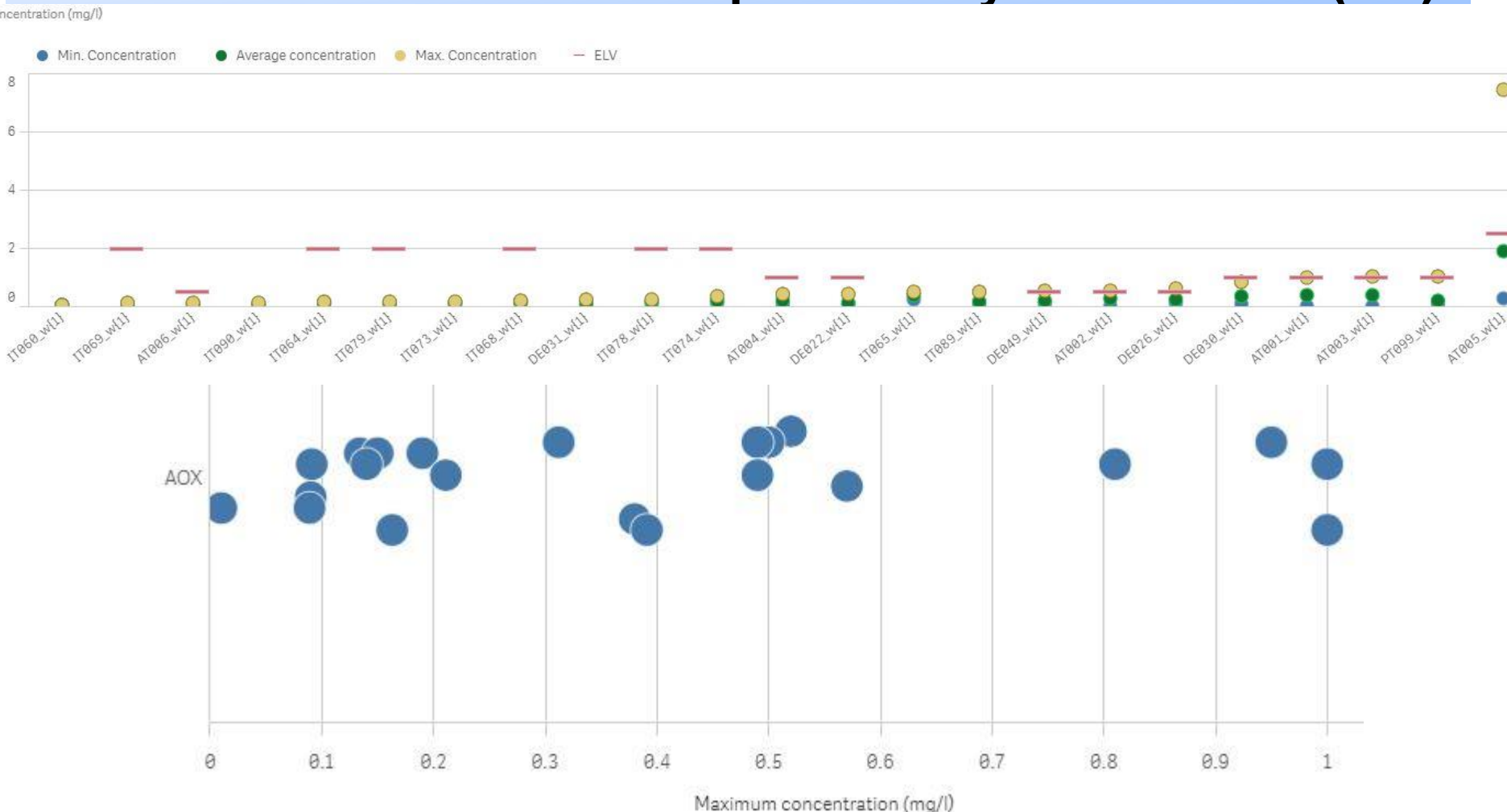
- Concerning plants dyeing PES or PES/CO, only two plants use relevant pretreatment techniques, AT004 and AT006; the rest use Other or Primary treatments.
- It is not clear how to technically justify 2.5 mg/l for the Hercosett process for indirect discharge.

BAT-AEL for AOX – EIPPCB preliminary assessment (6/7)



- Emission to water – 1 and 2, filters: AOX, **indirect** discharge, monitoring standard
- Raw material, products and processes, filter: acrylic, blend cotton-synthetic, polyester

BAT-AEL for AOX – EIPPCB preliminary assessment (7/7)



- Emission to water – 1 and 2, filters: AOX, **indirect** discharge, monitoring standard

BAT-AEL for HOI – Proposal in D1 (1/2)

Table 5.3: Proposed BAT-associated emission levels (BAT-AELs) for direct discharge to a receiving water body

Substance/Parameter	Activities / processes	BAT-AEL ⁽¹⁾ (mg/l)
Hydrocarbon oil index (HOI)	All activities / processes	1–10
<p>(¹) The averaging periods are defined in the general considerations.</p> <p>(²) The BAT-AELs only apply when the substance/parameter concerned is identified as relevant in the waste water stream based on the inventory of inputs and outputs mentioned in BAT 2.</p>		

BAT-AEL for HOI – Proposal in D1 (2/2)

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

Substance/Parameter	Activities / processes	BAT-AEL ⁽¹⁾ ⁽²⁾ (mg/l)
Hydrocarbon oil index (HOI)	All activities / processes	1–10

⁽¹⁾ The averaging periods are defined in the general considerations.

⁽²⁾ The BAT-AELs may not apply if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned, provided this does not lead to a higher level of pollution in the environment.

BAT-AEL for HOI – Summary of the comments (1/1)

BAT-AEL range (direct discharge)

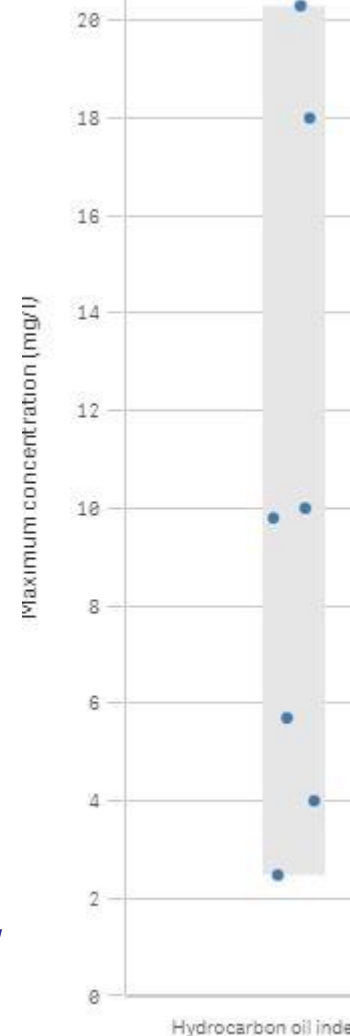
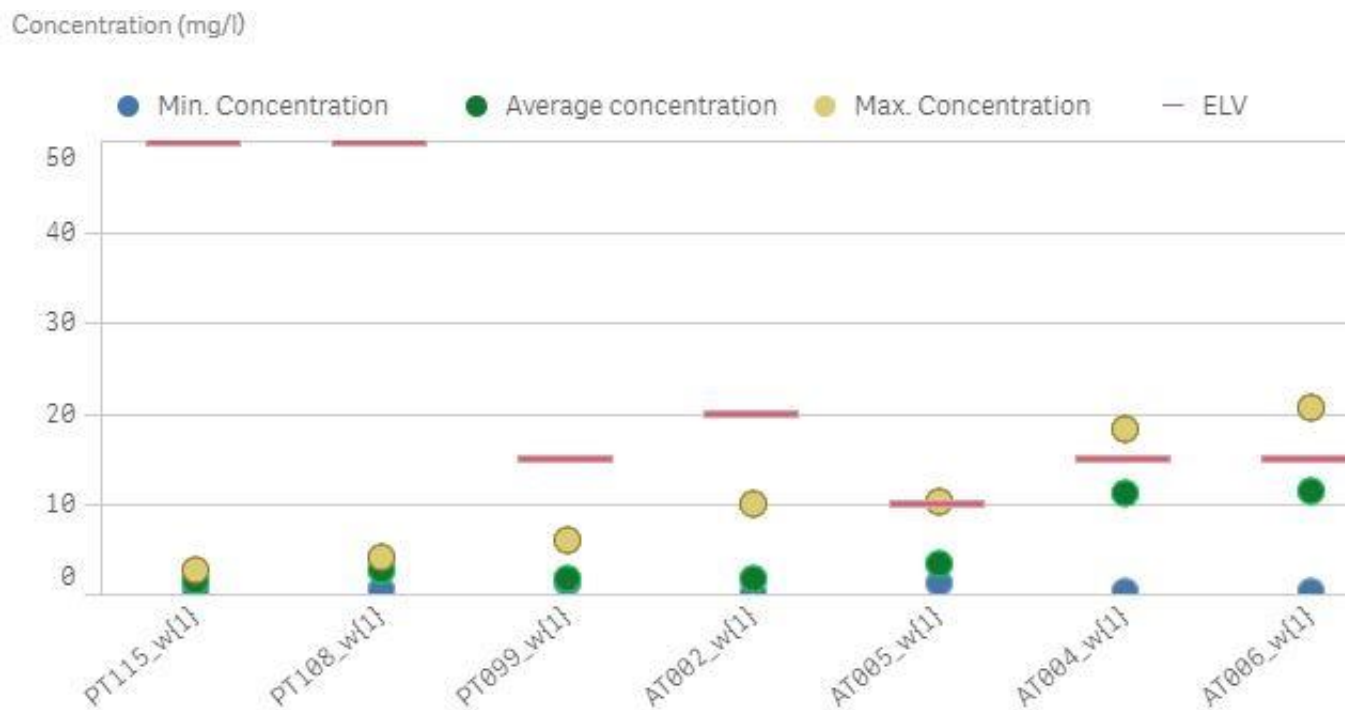
- Lower the upper end of the BAT-AEL range to 5 mg/l. From the data collection there are 4 data sets for direct discharge applying biological treatment with activated sludge achieving concentrations below 1 mg/l.
- Add Footnote (2) to this parameter, because it is not relevant for all processes.

BAT-AEL for HOI – EIPPCB preliminary assessment (1/3)

BAT-AEL range (direct discharge)

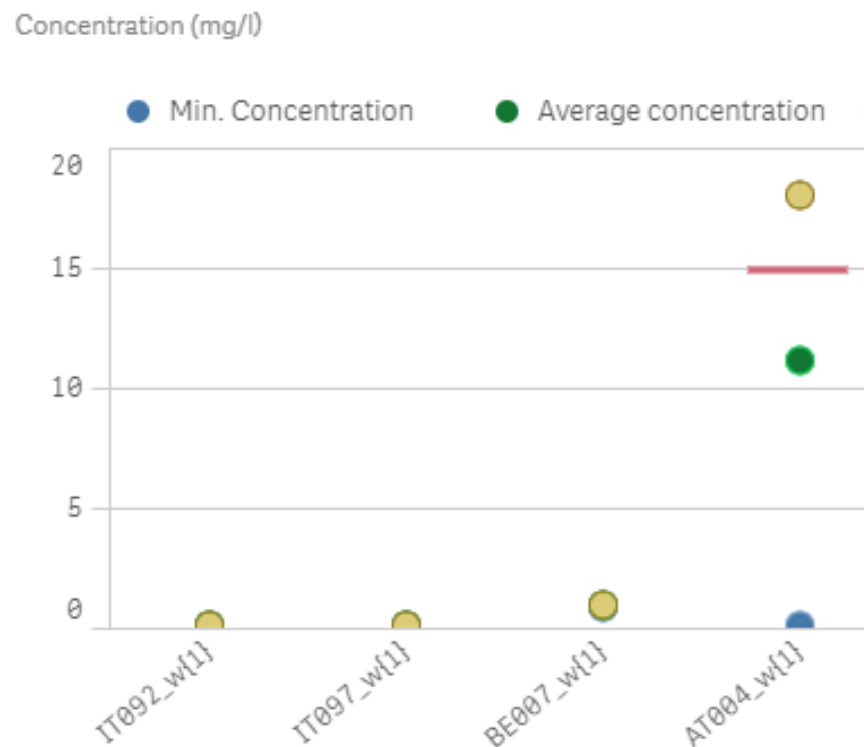
- Out of 7 plants reporting emissions, techniques and monitoring standards (see graph) the most representative seem PT108 and AT004:
 - PT104 (process Fabric production, technique Sand filtration, low fluctuations, also reports low metal emissions): max. 4 mg/l, avg. 2.6 mg/l.
 - AT004 (process Washing synthetic fibre, technique Activated sludge, high fluctuations, reports high Zn emissions): max. 18 mg/l, avg. 11.1 mg/l.
- Oil in effluent may not originate from all processes (or fibres)(same comment also for indirect discharge).

BAT-AEL for HOI – EIPPCB preliminary assessment (2/3)



- Emission to water – 1 and 2, filters: HOI, **direct and indirect** discharge, reporting monitoring standard and using some WW treatment (except only Other)

BAT-AEL for HOI – EIPPCB preliminary assessment (3/3)



- Emission to water – 1 and 2, filters: HOI, **direct and indirect** discharge, activated sludge WW treatment

Additional parameters (1/15)

NH₄-N

Summary of comments

- Set BAT-AEL range for NH₄-N.

EIPPCB preliminary assessment

- KoM conclusions:
 - Data on NH₄-N to be collected as contextual information.
 - NH₄-N was not concluded to be a KEI.

Additional parameters (2/15)

BOD_n

Summary of comments

- Set the BAT-AEL range for BOD at 5-10 mg/l, because it shows the efficiency of the WWTP. Also, collected data indicate that the range is valid.

EIPPCB preliminary assessment

- KoM conclusions:
 - Data on BOD to be collected as contextual information.
 - BOD was not concluded to be a KEI.
- In several BAT conclusions, indicative emission levels for BOD related to COD/TOC BAT-AELs were set, to indicate proper operation of biological WW treatment (e.g. abatement efficiency).

Additional parameters (3/15)

Colour

Summary of comments

- Set (upper end of the) BAT-AEL range for colour for dyeing activities.

EIPPCB preliminary assessment

- Based on low availability (16 emission points) and comparability (data sets reported in incomparable units Pt-Co scale, SAC and mg/l Pt) no BAT-AELs were proposed in D1.
- The data situation has not changed.

Additional parameters (4/15)

Toxicity

Summary of comments

- Set BAT-AEL ranges for toxicity.

EIPPCB preliminary assessment

- As presented in Section 3.4.18 of D1, the availability and comparability of data were insufficient to set a BAT-AEL for this parameter.
- The data situation has not changed.

Additional parameters (5/15)

- **Nonylphenol (NP)**

Summary of the comments

- Set BAT-AEL range from 0.2 µg/l to 5 µg/l. There are 17 data sets available for NP.
- France and Belgium have ELVs in their regulations (France 25 µg/l and Belgium 0.08 µg/l).

EIPPCB preliminary assessment

- FR134_w{1} reported monitoring standard used by email: GC/MS/M [liquid / liquid extraction, Derivation].

Additional parameters (6/15)

- **Nonylphenol (NP)**

EIPPCB preliminary assessment

- 4 EPs (i.e. AT002_w{1}, BE007_w{1}, FR134_w{1}, AT004_w{1}) reported concentration values of Nonylphenol, in a range from 1.3 to 3.6 µg/l.
- 6 EPs reported concentration values of 4-Nonylphenol, in a range from 0.2 to 0.4 µg/l. 5 out of 6 (i.e. IT064_w{1}, IT071_w{1}, IT089_w{1}, IT090_w{1}, IT078_w{1}) did not report information about the techniques applied and the other EPs (SE118_w{1}) did not report the monitoring standard applied.

Additional parameters (7/15)

- **Nonylphenol (NP)**

EIPPCB preliminary assessment

- BE010_w{1}, BE014_w{1} reported concentration values for NP: Max. values reported 1.1 and 1.4 µg/l respectively. UK127_w{1} reported a max. concentration value for NP of 20 µg/l, but without information about the monitoring standard applied.
- SE118_w{1} reported concentration values for 4-Nonylphenol-di-etoxylat (max. value 0.11 µg/l) and 4-Nonylphenol-mono-etoxylat (max. value 1.1 µg/l).
- IT092_w{1}, IT097_w{1} reported concentration values for Nonylphenol etoxylat (NPEO): Max. values reported 0.18 and 0.36 µg/l respectively.

Additional parameters (8/15)

- **Nonylphenol (NP)**

EIPPCB preliminary assessment

- The monitoring standards for the above-mentioned parameters have been ISO 18857, WAC/IV/A/01-05 or UPLC/MS/MS.
- No techniques reported for the abatement of nonylphenol, e.g. activated carbon, chemical oxidation, nanofiltration or reverse osmosis.
- The availability and comparability of data were insufficient to propose a BAT-AEL for nonylphenol of 0.2-5 µg/l.

Additional parameters (9/15)

- **DecaBDE**

Summary of comments

- Set a BAT-AEL range from 0.001 to 0.02 mg/l. There are 5 data sets available for DecaBDE.
- The use and production of DecaBDE is prohibited by the EU POP Regulation 2019/1021 since 2019.

Additional parameters (10/15)

- **DecaBDE:** EIPPCB preliminary assessment
 - 2 out of 4 EPs (i.e. BE011_w{1}, BE010_w{1}) reported emission values for DecaBDE, techniques applied (e.g. equalisation, activated sludge, nitrification/denitrification) and monitoring standard (e.g. WAC/IV/A/30).
 - No techniques reported for the abatement of DecaBDE, e.g. activated carbon, chemical precipitation.
 - Installations face problems of historical pollution.
 - The availability and comparability of data were insufficient to propose a BAT-AEL for DecaBDE of 1-20 µg/l.

Additional parameters (11/15)

- **PFOS and PFOA**

Summary of comments

- Set a BAT-AEL range for Sum of PFOS and PFOA from 1 to 3 µg/l. There are 8 data sets available for PFOA and 7 data sets available for PFOS.
- Change relevant processes in the table for monitoring frequency from “All activities/processes” to “Finishing”.

EIPPCB preliminary assessment

- IT092_w{1} and IT097_w{1} reported monitored standard used by email: GC-MM for FTOS and FTAF; analysis with LC-MM o LC-TOF for the other PFOA compounds.

Additional parameters (12/15)

- **PFOS and PFOA**

EIPPCB preliminary assessment

- 3 out of 7 EPs reported data for PFOS with concentration values, techniques and monitoring standard.

EPs	Values	Technique	Monitoring standard
DE039_w{1}	1 measurement 0.009 µg/l	Equalisation/neutralisation	DIN 38407-42
BE010_w{1}	7 measurements 0.002-0.04 µg/l	Equalisation/activated sludge/ nitrification-denitrification	WAC/IV/A/025
BE014_w{1}	1 measurement 0.5 µg/l	Equalisation/activated sludge/ nitrification-denitrification	WAC/IV/A/025

Additional parameters (13/15)

- **PFOS and PFOA**

EIPPCB preliminary assessment

- 7 out 10 EPs reported data for PFOA with concentration values, techniques and monitoring standard.

EPs (3 of 7)	Values	Technique	Monitoring standard
IT097_w{1}	1 measurement 0.001 µg/l	Equa/Neut/Act sludge/ Nitrif-denitrif/Sedim	MI1207 Rev.2:2018
DE034_w{1}	1 measurement 0.08 µg/l	Act sludge/ Nitrif-denitrif	DIN 38407-42
IT092_w{1}	1 measurement 0.1 µg/l	Equa/Neut/Act sludge/ Nitrif-denitrif/Sedim Reverse osmosis	MI1207 rev2:2018

Additional parameters (14/15)

- PFOS and PFOA**

EPs (4 of 7)	Values	Technique	Monitoring standard
BE010_w{1}	6 measurements 0.06-0.1 µg/l	Equa/act sludge/nitrif-denitrif	WAC/IV/A/025
DE039_w{1}	1 measurement 0.16 µg/l	Equalisation/neutralisation	DIN 38407-42
BE011_w{1}	7 measurements 6-41 µg/l	Equa/neut/coag-floc/act sludge/nitrif-denitrif/sand filt/nanofilt/chem oxid	WAC/IV/A/025
BE014_w{1}	5 measurements 6-41 µg/l	Equa/neut/act sludge/nitrif-denitrif	WAC/IV/A/025

Abbreviations: Equa=equalisation, neut=neutralisation, act sludge = activated sludge, nitrif-denitrif = nitrification-denitrification, coag-floc = coagulation-flocculation, sedim=sedimentation, sand filtrat = sand filtration, chem oxid = chemical oxidation

Additional parameters (15/15)

- **PFOS and PFOA**

EIPPCB preliminary assessment

- No techniques reported for the abatement of PFOS and PFOA, e.g. activated carbon, membrane bio-reactor (MBR).
- The availability and comparability of data were insufficient to propose a BAT-AEL for the sum of PFOA and PFOS of 1-3 µg/l .
- According to the data collection there are different associated processes where PFOS and PFOA have been reported, e.g. dyeing, shrink-proof finishing, printing, washing synthetic fibre, desizing, bleaching, coating.