

bluesign® criteria for production sites

Annex: Textile Manufacturer

Version 2.0 | April 01, 2014

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1 Scope

Comprehensive requirements for companies with production sites are determined in the *bluesign® criteria for production sites*. This document defines additional provisions for textile manufacturing.

2 Definitions

A textile manufacturer is a producer of textile products. Textile manufacturing encompasses manufacturing and processing of fibers, yarns (e.g. spinning, twisting), manufacturing of raw fabrics (e.g. weaving, knitting, non-woven, tufting, braiding) as well as textile finishing (e.g. pre-treatment, dyeing, printing, finishing, coating, laminating).

For comparison see also the definition in the *bluesign® criteria for production sites | Annex: Garment Manufacturer/Assembler*.

3 Product stewardship

3.1 Input stream management

If chemical products and materials are in use that are not supplied by bluesign® system partners, an appropriate input stream management including random testing is required (compare *bluesign® criteria for production sites*).

Common fiber-related concerns such as APEO content in fiber lubricants and sizing agents, antimony content in polyester or pesticide content in raw cotton shall be approached by means of the supply chain management (defined purchase conditions, random testing, etc.).

Non-bluesign® approved textile intermediates which are pretreated, dyed (as loose stock, yarn, or fabric), printed, finished, coated, laminated or bonded can not be tolerated. Using chlorinated wool as intermediate for bluesign® approved material or placing chlorinated wool as bluesign® approved intermediate on the market is not allowed.

At the moment and until the adequate bluesign® approved equivalents are available, the following non-bluesign® approved materials can be tolerated:

- Raw fibers, raw yarns and raw fabrics (including scoured wool)
- Dope-dyed fibers
- Membranes

3.2 Finished product

A textile manufacturer shall establish and maintain an appropriate control of finished products. Parameters such as pH and fastness properties as well as the relevant BSSL substances shall be part of a testing program especially if the BSSL compliance depends not only on the used raw materials and intermediates but also on the process conditions and control (e.g. residual solvent content in solvent coating).

4 Best available techniques

A textile manufacturer shall be aware of best available techniques that are relevant for the industry (see for example: <http://eippcb.jrc.ec.europa.eu/reference/>; textiles industry).

5 Industry specific requirements

5.1 Water emission

5.1.1 General

- The amount of residual liquors from semi-continuous or continuous dyeing, as well as from padding devices in finishing, and the amount of residual printing and coating pastes shall be minimized. Separate discharge of these liquors may be necessary to guarantee an efficient wastewater cleaning. Residual liquors from finishing processes that include fluorocarbons, flame retardants and antimicrobial active substances shall not be discharged to the wastewater; an effective and controlled disposal for these substances shall be implemented with the least possible impact on humans and environment.
- EDTA, DTPA and phosphonates shall not be used for process water softening purposes.
- Not used residual chemicals, auxiliaries and dyestuffs shall not be discharged to the wastewater.
- Cooling water should be re-used as process water. Direct discharge of cooling water has to be well-founded.
- Regarding COD/TOC elimination, efficiency of wastewater treatment steps prior to direct discharge to the aquatic body shall be 85 % or higher.
- When having an influence on type and volume of the sizing agents in use, a textile manufacturer shall apply only well bioeliminable sizing agents in the least required amounts.
- Hypochlorite is banned as bleaching agent at the whole production site. Under certain conditions it can be accepted for:
 - denim bleaching
 - machine cleaning
 - decolorization
 - fresh water purification
- The goal shall be to substitute solvent-based processes with water-based systems.
- White spirit printing is not permitted.
- Low emission pigment printing shall be installed.

5.1.2 Direct wastewater discharge

The limit values and sampling requirements for the direct wastewater discharge are compiled in Table 1.

In order to control the efficiency of the on-site wastewater treatment plant it is strongly recommended that the following parameters are measured not only in the treated (clean) stream but also in the untreated (raw) wastewater:

- Wastewater volume
- pH
- Color
- Conductivity
- Temperature
- COD
- BOD₅
- Total phosphor
- Total nitrogen
- Heavy metals content

Parameter	Method	Unit	Limit Value	Interval	Remarks
pH	DIN 38404-C5		6-9		
TSS	DIN EN 872	mg/l	30	day	
Temperature	DIN 38404-C4	°C	35		
COD	DIN 38409-41 or DIN ISO 15705	mg/l	160	day	TOC or COD; for COD cuvette tests could be sufficient, if results are reliable
TOC	DIN EN 1484	mg/l	Relationship to COD must be identified	day	TOC or COD
BOD ₅	DIN EN 1899-1	mg/l	30	week	
Color	DIN EN ISO 7887	m ⁻¹	7 (436 nm; yellow) 5 (525 nm; red) 3 (620 nm; blue)	day	values currently only monitored
Persistent foam at the point of discharge	Visual inspection	-	Must not be visible	day	
Chromium (total)	DIN EN ISO 11885-E22	mg/l	0.5	6 months	
Chromium (VI)	DIN 38405-D24	mg/l	0.1	6 months	Ban by input stream management!
Copper	DIN EN ISO 11885-E22	mg/l	1	6 months	
Nickel	DIN EN ISO 11885-E22	mg/l	0.5	6 months	
Zink	DIN EN ISO 11885-E22	mg/l	2	6 months	
Tin	DIN EN ISO 11885-E22	mg/l	2	6 months	
Phosphor (total)	DIN EN ISO 11885	mg/l	2	6 months	Flame retardants: Residual liquors from padding devices shall be discharged separately
NH ₄ -N	DIN 38406-5	mg/l	10	6 months	
Nitrogen (total)	DIN EN 12260 (TNb) or DIN EN 25663 (TKN)	mg/l	20	6 months	
Sulfite	EN-ISO 10304-3	mg/l	1	6 months	
AOX	DIN EN ISO 9562	mg/l	1	6 months	
Sulfide	DIN 38405-26	mg/l	1	6 months	

Table 1: Limit values for direct discharge to the aquatic body. Measuring point is after wastewater treatment, before discharge to aquatic body. Sampling instructions: 5 grab samples measured on-site during 2 hours (minimum interval between the samplings is 2 min.) or one mixed volume proportional sample.

National or local requirements that are stronger or more detailed than the bluesign® criteria will supersede the limit values specified above.

Measurements shall be performed in regular intervals according to the above mentioned (Table 1) or similar standard methods. Sampling interval depends on the dimensions and complexity of the plant as well as on the findings. Third party measurements must be at hand.

In addition to the measurements above the textile manufacturer shall measure 2 times per year APEO (NPEO, OPEO, NP and OP) in the raw wastewater. If concentrations in the raw wastewater exceed 10 mg/l a system partner shall search for the source and phase out APEO containing raw materials as soon as possible. For sampling instructions see Table 1; method: DIN EN ISO 18857-1, DIN EN ISO 18857-2, ASTM D7742-11 or similar alternative.

5.1.3 Indirect wastewater discharge

See *bluesign® criteria for production sites*.

5.2 Air emission

5.2.1 General

Air emissions in textile finishing can be caused by:

- A textile raw material itself, if it is thermally stressed (preparation agents, monomers (epsilon-caprolactam from polyamide 6 etc.), fiber solvents can be released)
- Auxiliaries and chemicals used in finishing and coating processes
- Auxiliaries and chemicals used in dyeing processes, which are temporarily fixed on the textile and released during thermal processes (drying, heat-setting)
- Direct heated stenters; incomplete incineration of the burning gas leads to methane and formaldehyde emissions
- Emissions from power generation (boiler house)

5.2.2 Process emissions

For finishing and heat setting processes the emission factor concept shall be applied (compare *Supplement: Emission Factor Concept*).

The aim of the concept is to minimize the air pollution potential of the applied textile auxiliaries and thus minimize emissions to air. A further aim of the concept is to obtain better transparency, knowledge, and control of the emissions associated with textile finishing.

Normally, emissions are regulated by mass concentrations (mg substance/m³ off-gas) and mass flows (g substance/h). The emission factor concept defines substance emission factors and textile substrate-based emission factors.

The following limit values are defined by the emission factor concept:

- TOC
 - mass stream: 0.8 kg TOC/h
or
 - emission factor: 0.8 g TOC/kg textile

- Organic substances listed in Table S2 (Supplement):
 - mass stream: 0.1 kg substance/h
or
 - emission factor: 0.4 g substance/kg textile

If off-gas emissions exceed the limit values stated above or if neighborhood complaints arise or if the production site is located within a nature protection area, an appropriate off-gas cleaning has to be installed. However, process integrated optimization should always have priority. If raw fixation or fixation of polyamide 6 or polyacrylonitrile plays a significant role it is to be expected that an off-gas cleaning device is indispensable.

For all other emission-relevant processes, as for example printing or solvent coating, VOC relevancy shall be taken into consideration (compare *bluesign® criteria for production sites*).

5.2.3 Emissions from boiler house

See *bluesign® criteria for production sites*.

6 Verification of compliance

bluesign technologies verifies the compliance with the criteria at hand by means of a screening including an on-site inspection. Key-figures regarding environmental performance and chemicals management have to be reported annually to bluesign technologies. Re-screenings have to be carried out no later than every three years.

7 Validity

This document comes into effect from April 01, 2014. It replaces the *bluesign® criteria for textile manufacturers, edition 1.3* from March 2010.

For all companies that signed the screening agreement before April 01, 2014 and for all system partners the implementation of the revised sections shall take place until April 01, 2015 at the latest.

This document is subject to changes. Changes will come into effect after prior notice and defined transition time.

8 Other applicable documents

- bluesign® system (effective version)
- bluesign® criteria for production sites (effective version)
- bluesign® criteria for production sites | Annex: Garment Manufacturer/Assembler (effective version)
- bluesign® system substances list (effective version)
- Factsheet Hypochlorite

9 Supplement: Emission Factor Concept

9.1 Scope

This supplement describes and explains the emission factor concept.

9.2 Description

The emission factor concept concerns facilities for textile finishing. The aim of the concept is to minimize the air pollution potential of the applied textile auxiliaries and thus minimize emissions to air. A further aim of the concept is to obtain better transparency, knowledge, and control of the emissions associated with textile finishing.

Normally, emissions are regulated by mass concentrations (mg substance/m³ off-gas) and mass flows (g substance/h). The emission factor concept defines substance emission factors and textile substrate-based emission factors.

The following limit values are defined by the emission factor concept:

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- Organic substances listed in Table S2 (Supplement):
 - mass stream: 0.1 kg substance/h
or
 - emission factor: 0.4 g substance/kg textile

9.3 Substance emission factor

The substance emission factor is defined as the amount of organic and inorganic substances in grams which can be released under defined process parameters (curing time, temperature, textile substrate) from one kg of auxiliary.

There are two different factors as follows:

- fc: giving the total emissions of organic substances expressed as total content of carbon (TOC);
- fs: giving the emission of a specific substance in case of more toxic organic substances or in the case of particular inorganic substances like ammonia, hydrogen chloride.

The substance emission factors are either measured or calculated by a specific concept. It is important to know, that in more than 90 % of all cases the single components behave accumulative.

9.4 Textile substrate-based emission factor

A textile substrate-based emission factor is defined as the amount of organic and inorganic substance(s) in grams which can be released under defined process parameters from one kg of textile material as follows:

- WFc: g TOC/kg textile substrate
- WFs: g special substance(s)/kg textile substrate in case of more toxic or carcinogenic organic substances or in case of particular inorganic substances like ammonia, hydrogen chloride.

The emission potential of each finishing recipe can be calculated on the basis of the individual substance emission factors, the concentration of the auxiliaries in the recipe and the liquor pickup.

Substance	CAS No.	Substance	CAS No.
Acetic aldehyde	75-07-0	Formic acid	64-18-6
Acetamide	60-35-5	n-Butyl acrylate	141-32-2
Acrylic acid	79-10-7	Phenol	108-95-2
Biphenyl	92-52-4	Toluylene 2,4-diisocyanate	584-84-9
Caprolactam	105-60-2	Toluylene 2,6-diisocyanate	91-08-7
Ethanedioic acid	144-62-7	Vinyl acetate	108-05-4
Ethyl acrylate	144-88-5	1-Vinyl-2-pyrrolidone	88-12-0
Formaldehyde	50-00-0		

Table S1: Organic substances for which emission factor of 0.4 g substance/kg textile applies. Attention: list is not exhaustive.

9.5 Main achieved environmental benefits

The concept can be characterised as a self-assessment integrated system to control and prevent hazardous air emissions in textile finishing. This system can be immediately applied to both product and process design.

In detail the main benefits are:

- Comparability of emission potential of auxiliaries (g emission/kg auxiliary)
- Comparability of emission potential of processes (g emission/kg textile)
- Information on and substitution of recipes with a high emission potential
- Pre-calculation of emission potential of finishing recipes
- Identification of the main sources of process emission with effective prioritization of emission reduction strategies
- Air/textile ratio (m³/kg) can be reduced (energy saving!).

9.6 Calculation example

The emission potential of each finishing recipe can be calculated on the basis of the individual substance emissions factors of the input auxiliaries, the concentration of the auxiliaries in the recipe and the liquor pick-up (see formula and Table S2 below).

The total process emissions (WF) of the finishing recipe, referred to as the sum of auxiliary inputs in a formulation, are obtained by adding up the emissions of the individual input auxiliaries within the same classes (fs and fc):

$$WF [g Y/kg \text{ throughput textile}] = \Sigma (\text{Subst. emission factor [g Y/kg aux.]} \times \text{liquor conc. [g aux./kg liquor]} \times \text{liquor pickup [kg liquor/kg textile substrate]}/1000)$$

where

WF - textile substrate-based emission factor

Y - Organic-C (sum parameter used in the case of non- or low-toxic substances) or

Y - specific emitted substance (in the case of more toxic organic substances or in the case of particular inorganic substances).

WF gives the amount of emissions in grams that can be released by the finishing process of one kg of textile goods under the defined process parameters (curing time, curing temperature, type of substrate).

Recipe	Auxiliaries	FK [g/kg]	FA [kg/kg]	Substrate	T [°C]	fs [g/g]	fc [g/g]	FK*FA*fs	FK*FA*fc	WFs [g/kg]	WFc [g/kg]
Recipe 1	Fatty acid ester	20	0.65	CO	170	-	0.0152	-	0.2	-	-
	Polysiloxane	20	0.65	CO	170	-	0.0152	-	0.07	-	-
	Reactant cross-linking agent/Cat.	100	0.65	CO	170	0.0041 FO	0.0009	0.27 FO	0.06	-	-
	Stearylurea-Derivative/Cat	20	0.65	CO	170	0.0165 FO	0.0162	0.21 FO	0.21	-	-
Total 1									0.48 FO	0.54	
Recipe 2	Softening agent	50	1	CO	150	-	0.005	-	0.25	-	-
	Easy-care crosslinking agent (formaldehyde-free)	60	1	CO	150	-	0.010	-	0.6	-	-
	Easy-care catalyst	12	1	CO	150	-	0.008	-	0.1	-	-
Total 2									-	0.95	

Table S2: Calculation example for two finishing recipes.

FK - liquor concentration in g auxiliary/kg liquor, FA - liquor pickup in kg liquor/kg textile substrate, Substrate - textile good to be finished, T - finishing temperature in °C, fs - substance emission factor of an auxiliary in g emission/g auxiliary, fc - total carbon substance emission factor of an auxiliary in g emission/g auxiliary, WFs - textile substrate-based emission factor of a recipe in g emission/kg textile substrate = $\Sigma (FK*FA*fs)$, WFc - textile substrate-based total carbon emission factor of a recipe in g emission/kg textile substrate = $\Sigma (FK*FA*fc)$, FO – formaldehyde.

Air emissions from textile finishing are not regulated in a many countries. In such cases the bluesign® system forces that the limit values according to the emission factor concept are kept. Due to the fact, that at the moment measured data on product specific emission factors are rarely available outside of Europe, the off-gas emissions (emission factors and mass streams) are calculated according to the bluesign® methodology often based on default values.