

bluesign® criteria for textile manufacturers



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1 Preliminary remarks

The bluesign® standard is a comprehensive Input-Stream-Management-System that covers all Environmental, Health and Safety (EHS)-aspects along the textile manufacturing chain. The strength in this approach is that it links together suppliers, manufacturers, retailers and brands to jointly reduce the environmental footprint and to foster a healthy and responsible textile industry.

The bluesign® standard is built around five principles:

- resource productivity,
- consumer safety,
- air emission,
- water emission
- and occupational health and safety.

The document at hand specifies the relevant criteria according to the bluesign® standard for textile manufacturers. Included are other requirements concerning wastewater, off-gas management and occupational health.

In addition, the process steps of the bluesign® screening, the requirements of the implementation phase and the on-going requirements of the bluesign® standard are described.

If the EHS performance of the production site, the homologation of the components and the relevant textile product range show compliance with the bluesign® standard the certificate “bluesign approved fabric” can be granted to the whole portfolio or single product ranges of the manufacturer.

It has to be mentioned that several agreements between the manufacturer and bluesign technologies ag that are not in the focus of this report, establish the framework of cooperation within the bluesign® standard. These agreements regulate also labelling and trade name use. The more technical criteria defined in the document at hand do not replace these agreements.



1.1 Protection of human health and environment

A high level of human health and environmental protection should be ensured at the production site with the goal of achieving sustainable development.

The activities on the production site must not have harmful impact on human beings, animals, plants, soil, aquatic body and atmosphere.

The manufacturer shall be aware of Best Available Techniques that are relevant for the industry and shall implement these techniques to improve the environmental performance continuously.

1.2 Social responsibility

Social responsibility management shall be at least confirmed by a self-assessment form that contains requirements concerning

- management system, corporate policy
- abolition of child labour
- working hours
- wages and benefits
- forced and compulsory labour
- elimination of discrimination
- freedom of association and right to collective bargaining
- health and safety at work



2 Wording

2.1 Article

A textile fabric with a defined article number or article name and well-defined recipes. The article number or article name will be mentioned in the attachment to the bluesign® certificate.

2.2 bluesign® system partner

A partner of the bluesign® system bound with a contract to bluesign technologies ag.

2.3 Certification

A certificate of “bluesign® approved fabric” can be granted to a product range and the relevant product groups and articles if compliance with the bluesign® standard is achieved.

A certificate is granted for each product range manufactured on the production site that was inspected. A set of regulations concerning labelling aspects and tradename use is given in the relevant contracts between the system partner and bluesign technologies ag.

2.4 Components

All products that a manufacturer uses; e.g. fibres, yarns, raw fabrics as well as chemical components (basic chemicals, textile auxiliaries, dyestuffs).

2.5 bluesign® applications

2.5.1 bluesign® bluetool

The bluesign® bluetool is a web-based software application for chemical suppliers. It guides the supplier through the bluesign® homologation process according to the bluesign® standard and provides the necessary information.

2.5.2 bluesign® bluefinder

The bluesign® bluefinder is a web-based search engine to help textile manufacturers find bluesign® approved chemical products. The application also provides EHS information as well as guidelines to incorporate bluesign® approved chemical products into the manufacturing process.



2.5.3 bluesign® blueguide

The web-based bluesign® blueguide is a database containing bluesign® approved fabrics. In addition, comprehensive information about environment, occupational health and safety as well as consumer protection is available in the bluesign® blueguide.

2.6 bluesign® screening

The bluesign® screening includes the detailed evaluation of the environmental aspects as well as resource and occupational health situation of textile manufacturing sites according to the five principles of the bluesign® standard. The main important process steps in the screening phase are

- screening preparation
- on-site inspection
- homologation
- information of manufacturer on EHS performance and compatibility with the bluesign® standard by means of a comprehensive screening report which is the basis for further actions

The first bluesign® screening for the production site is called the initial screening.

2.7 Homologation

A procedure developed by bluesign technologies ag for the rating of components according to their EHS aspects. Homologation is performed by means of the bluesign® bluetool.

2.7.1 blue rating

Components, production processes and technologies that have been checked according to the five principles of the bluesign® standard; may be used for all applications under the bluesign® standard.

2.7.2 grey rating

Components, production processes and technologies that may be used under one or more pre-conditions following the principles of the Best Available Technology (BAT).

2.7.3 black rating

Black rating is equal to a ban under the bluesign® standard.



2.8 Implementation phase

The time frame, in which the manufacturer follows the road map prescribed in the screening report, implements the defined mandatory actions and tries to realise the recommendations. In most of the cases changes of components are necessary. To meet the requirements according to the bluesign® standard, all black components must be eliminated from the process and replaced. If implementation is completed, the certification of the whole product portfolio or single product ranges that are manufactured on the inspected production site can start.

2.9 Product group

A series of articles that are manufactured according to the same routing (similar recipes and process steps in pre-treatment, dyeing and finishing; dyestuff types may vary; similar textile technologies). As an attachment the bluesign® certificate contains a list of certified product ranges and product groups including the relevant article numbers.

2.10 Product range

A series of product groups. Product ranges are defined by the marketing or sales department and characterise different application fields, such as work wear or swimwear. Alternatively, the classification of the product portfolio into ranges can also focus on the textile substrates that are used (polyamide [nylon], polyester, cotton, etc.).

2.11 Product Screening Form (PSF)

Questionnaire used to request all necessary information for the homologation procedure of components from the entire supply chain. A PSF is used only in cases where the needed information come from third parties and not from bluesign® supporters (in these cases on-line homologation is not possible). The questionnaire lists all restricted substances of the bluesign® standard and contains relevant ecological and toxicological criteria.



2.12 Production site

Production site shall mean a stationary technical unit which is under the control of one legally independent corporation and any other directly associated activities which have a technical connection with the activities carried out on that site and which could have an effect on emissions.

2.13 Re-screening

On-site revaluation of EHS situation performed at latest three years after the previous screening.

2.14 Textile manufacturer

A textile manufacturer is a producer of textile products. Included are manufacturing and processing of yarns (spinning, twisting etc.), manufacturing of raw fabrics (weaving, knitting, non-wovens, tufting, braiding, as well as textile finishing (pre-treatment, dyeing, printing, finishing, coating, laminating) sewing and other related industries.



3 Process steps on the way to certification

The process steps for a manufacturer during the screening- and the implementation phase of the bluesign® standard is to be seen in the flow chart in Figure 3.1.

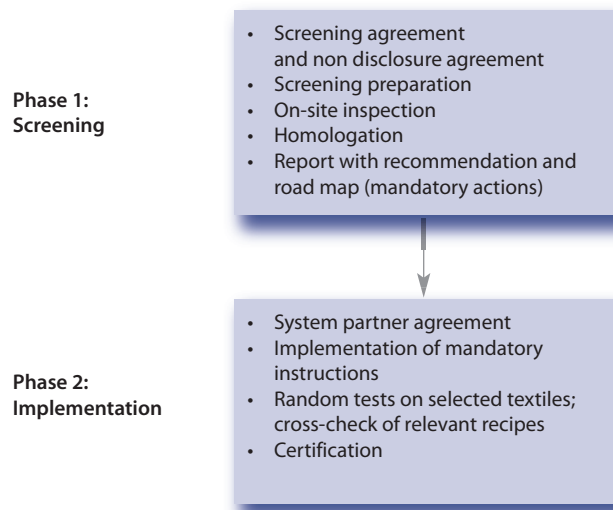


Figure 3.1:
Road map for manufacturers to achieve the bluesign® standard

Figure 3.2 shows the workflow in more detail beginning from the screening preparation and ending with the certificate for a certain product range or certain product ranges. The most important forms/questionnaires that are involved are mentioned.

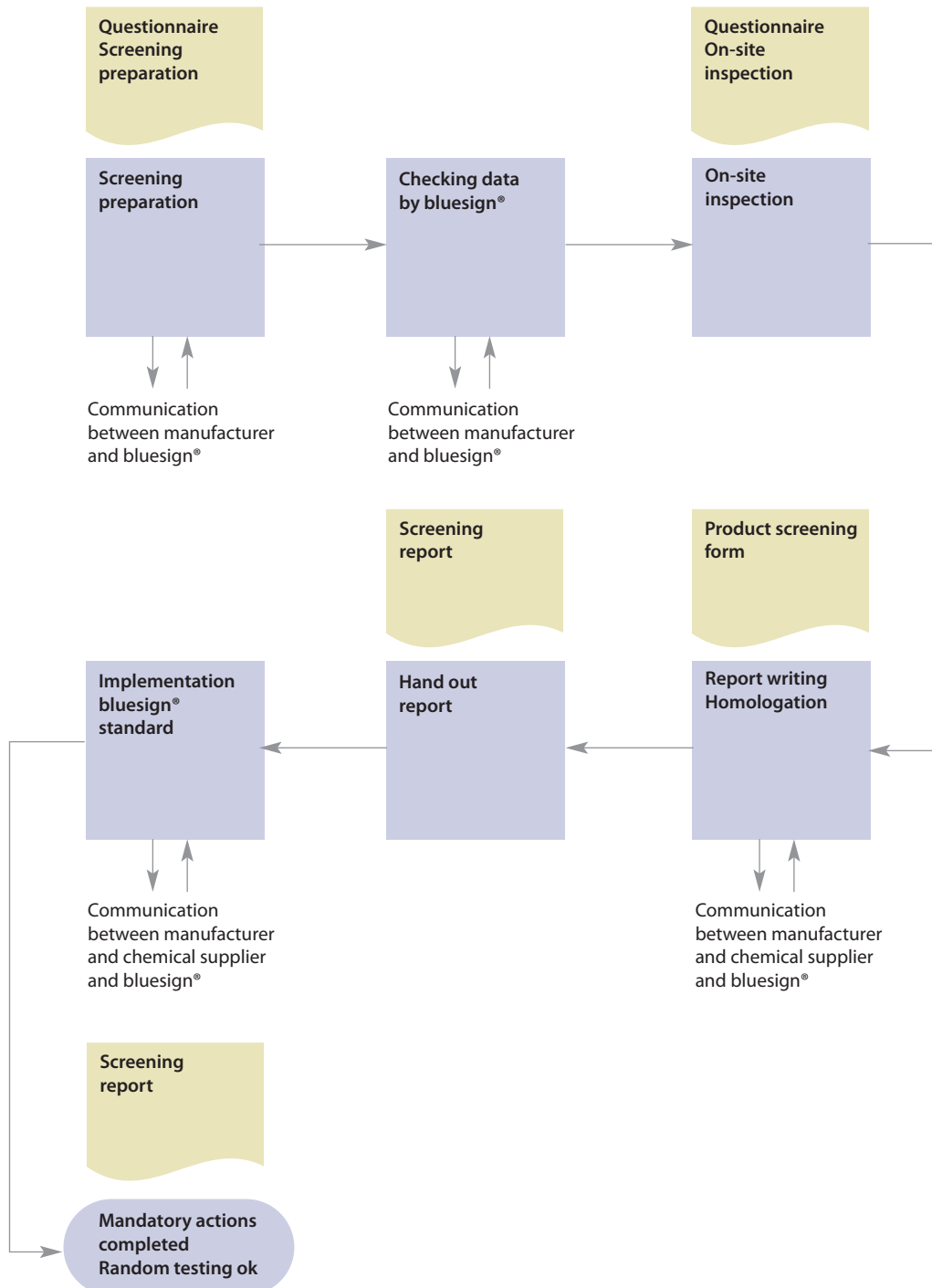


Figure 3.2:
Work flow for the screening- and
implementation phase



4 bluesign® screening

The bluesign® screening includes the detailed evaluation of the environmental aspects as well as resource and occupational health situation of textile manufacturing sites according to the five principles of the bluesign® standard. An on-site inspection of the production site is mandatory for the screening process. During the screening process all components used in the process are evaluated by means of the homologation procedure.

Besides the information on EHS performance the final report of the screening process contains a road map with recommendations and mandatory actions which are needed to achieve compliance with the bluesign® standard.

4.1 Screening preparation

The data required for the screening are collected by the manufacturer. The form “Screening Preparation” contains a detailed list of all the data that need to be provided to bluesign technologies ag.

4.2 On-site inspection

Compliance with the criteria defined by the bluesign® standard will be audited by bluesign technologies ag by means of an on-site inspection. The questionnaire “On-Site Inspection” is used as guideline for the inspection visit.

The bluesign® conformity of the components and processes that are in use at the production site are audited. Data given in the Screening Preparation Form are reviewed during the inspection.

The on-site inspection sets the focus on

- responsibilities pertaining to EHS management
- EHS management procedures
- legal compliance (check of licences, relevant limit values, measurement reports, other relevant documents and records)
- general environmental performance (in case of re-screening: improvement of environmental performance)
- current status of the EHS-situation (in case of re-screening: improvement of EHS-situation)



- control of Good Housekeeping Practices
- inspection of input streams (e.g. energy, water, textile auxiliaries, dyestuffs, basic chemicals, greige goods).
- inspection of mode of manufacturing with a focus on textile machinery and textile processes as well as supply units
- examination of output streams (esp. management of wastewater, air emission and solid waste)
- inspection of chemicals handling and storage situation
- evaluation of occupational health situation
- in case of re-screening: verification, that the bluesign® standard is implemented and maintained in an appropriate way

The extent of the on-site inspection depends on the size and complexity of the production site but also on the manufacturer's documentation.

Note: In cases where processes and/or chemical substances are involved along the supply chain that are of very high scientific concern and/or public concern bluesign technologies ag reserves the right to review not only the production site itself but also up-stream processes.

4.3 Homologation

The bluesign® standard prescribes usage bans and limit values that are legally and voluntarily based. The bluesign® standard covers usage bans and regulations for a manifold of substances and substance groups. The bluesign® classification criteria are based on the toxicological and ecological properties and risks of these substances. To be up-to-date, changes in the legal classification of substances and upcoming knowledge on the EHS-behaviour of chemicals are considered.

4.3.1 Chemical components

The whole chemical input (textile auxiliaries, basic chemicals, dyestuffs) of the production site is evaluated by means of the homologation procedure.

Each single chemical component is assessed and receives a rating based on its ecological and toxicological impact. Only chemical components that are rated blue and grey shall be in use for the production of textiles that are foreseen to be certified or are already certified. For grey rated components the instructions given in the homologation report shall be followed by the manufacturer.



4.3.2 Textile components

If textile materials such as fibres, yarns or raw fabrics are bluesign® approved no further evaluation of these intermediate products is necessary.

For most of the typical fibres that are used in textiles today, polyester, polyamide (nylon), acrylic, polypropylene, cotton, wool, or silk there are minimal consumer safety risks from fibre inherent residues. Workplace safety, wastewater and off gas quality is not or only marginally affected by fibre inherent substances, with the exception of fibre solvents used for PAC and elastane as well as caprolactam that is emitted from PA 6 (Nylon 6). If by-products do exist, they are accounted for in the calculations performed in a bluesign® screening to evaluate any possible EHS impacts.

When there is a known concern for a fibre type such as antimony in polyester or pesticide content in raw cotton, the relevant EHS impacts are evaluated by means of random testing. In regards to by-products used as preparation agents or sizes, the goal is to maximise the information from the supply chain.

If uncommon fibre types (especially fibres with added functionalities such as biocidal fibres, UV-absorbing fibres, etc.) are processed a homologation of these types with help of the relevant Product Screening Form is essential.

For fibres or yarns that are dyed in this state, the bluesign® criteria for subcontractors have to be regarded; a bluesign® screening at the subcontractor's level may be necessary.

Figure 4.1 summarises the above described approach pertaining to the evaluation of textile components at the manufacturer level.

Note: The following fibre types are currently banned under the bluesign® standard and have to be phased out:

- chlorinated wool
- fibres which contradict the sustainability principle of the bluesign® standard esp. metal fibres for fashion textiles without functionality

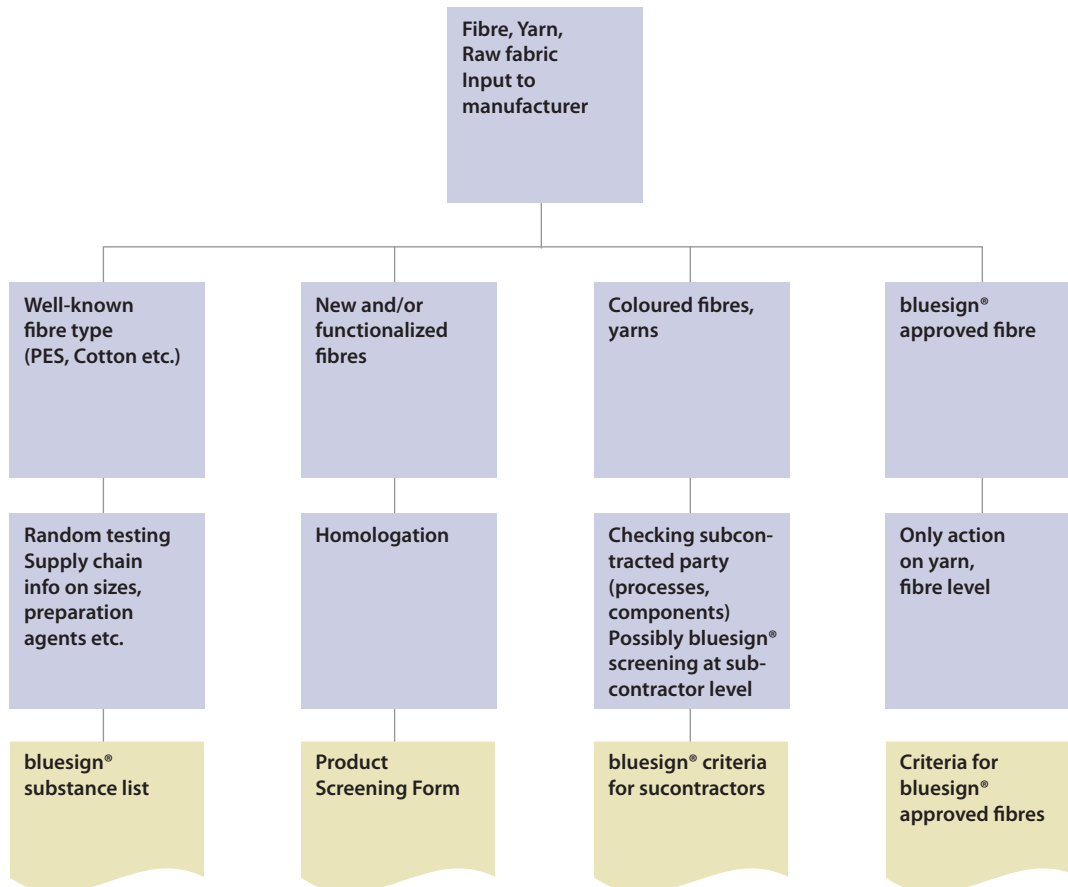


Figure 4.1:
Evaluation of textile components

4.4 Screening report

The most important input/output streams with environmental relevancy are identified and balanced in the screening report. Impacts to the wastewater as well as the off-gas are identified.

The rating according to the homologation procedure of all of the currently used textile auxiliaries, dyestuffs and chemicals is given. All the components (textile raw materials, textile auxiliaries, dyestuffs and chemicals) are evaluated against the background of the requirements given by the bluesign® standard.

The situation pertaining to occupational health aspects and possible consumer safety risks is discussed.

Another focus is the benchmarking of specific input/output data at the production site with the „Best Available Technique“ (BAT).



The resource consumption and the associated costs are assessed by means of resource inflation and cost inflation evaluation.

In addition the report gives recommendations to optimise the EHS-situation and identifies resource and cost saving potentials.

Last but not least, general and tailor made recommendations on good housekeeping are given.

A comprehensive road map gives advice for the implementation or (in case of re-screening) maintaining of the bluesign® standard. Mandatory actions are clearly defined.

The report is handed out only in a printed version to the manufacturer.

5 Implementation

During the implementation phase the manufacturer completes open points following the recommendations and mandatory actions compiled in the screening report. Mandatory actions could be:

- phase out black rated products
- replace chemical and/or textile components
- complete information on components to allow homologation
- change processes
- optimise wastewater and/or off-gas management
- optimise housekeeping

The end of the implementation phase is the selection of product ranges that are foreseen for a certification. Representative textile samples are selected from the manufacturer in cooperation with bluesign technologies ag. Textiles that are dyed in dark shades and that are finished with complex finishing recipes shall be selected.

Relevant restricted substances or substance groups shall be analyzed under supervision of bluesign technologies ag. Corresponding recipes shall be cross-checked.

The intention of random testing is a self-monitoring of the bluesign® system.



6 Actions after the bluesign® standard is established

The manufacturer (system partner) agrees to only use technologies (components, materials and additives, etc.) that fall under the "blue" or "grey" category of the bluesign® standard. The use of unapproved technologies and/or the change of existing suppliers is subject to prior examination and approval by bluesign technologies ag.

Homologated components can be found in the bluesign® bluefinder. If the manufacturer will use components that are not included in the bluesign® bluefinder, homologation of these components shall be performed by bluesign technologies ag on request of the manufacturer.

The manufacturer shall report immediately any problems regarding EHS aspects.

A follow-up screening is carried out at the latest within three years after the previous screening.

7 Certification

A certificate of «bluesign approved fabric» can be granted to a product range and the relevant product groups and articles if compliance with the bluesign® standard is achieved.

In detail:

- the system partner agreement is signed by both sides
- a "no-go" situation was not determined during the on-site inspection of the production site
- mandatory actions prescribed in the bluesign® screening report are established
- all components are homologated and only blue- and grey rated components are in use for the articles that are foreseen for certification
- random testing of selected textile fabrics and cross-check of the relevant recipes is carried out; conformity with the bluesign® standard is given

Note: In sporadic cases certification of product range can be combined with some special conditions and a time schedule to finalise these additional requirements.



7.1 Scope of certificate

The certificate is granted for one or more (all) product ranges manufactured on the production site that was audited.

7.2 Duration of certificate

The certificate is valid until the follow-up screening, or a maximum of three years.

7.3 Withdrawal of certificate

bluesign technologies ag may terminate system partner agreement with immediate effect for good cause, in particular if the manufacturer violates the basic principles of the bluesign® standard.



8 bluesign® criteria for textile manufacturers

8.1 Preliminary remarks

The requirements concerning EHS aspects, especially wastewater and off-gas emissions but also regarding occupational health aspects have to be regarded against the background of the stringent input management of the bluesign® standard that has direct and positive influence on the different emission paths. The homologation of the input streams ensures that the ecological impact of the chemical components is on a minimised level. All the restrictions and bans on chemical substances that are prescribed by the bluesign® standard are considered by means of the homologation procedure.

Note: For solvent-based coatings special requirements that amend the criteria at hand apply.

8.2 Management system

The manufacturer should have an appropriate management system that ensures that all aspects pertaining to EHS management are established and maintained. Especially the procedures that are induced by the bluesign® standard shall be documented in written form.

The manufacturer should define in written form the organization's environmental policy. The policy shall include a commitment to the sustainable and continual improvement and prevention of pollution and to continuously optimise the resource efficiency.

Following the 10 rules of the UN GLOBAL COMPACT is in every case mandatory and shall be confirmed to bluesign technologies ag.

The manufacturer shall appoint a management representative who is responsible for EHS and resource aspects. The representative shall report to top management on the environmental performance. Implementation and maintaining of the requirements according to the bluesign® standard shall be clearly defined and communicated internally as well as externally as an important overall environmental goal.

The manufacturer shall ensure the availability of human, technical, organisational and financial resource to establish, maintain and improve the EHS aspects at the production site.

All records and documents pertaining to EHS-aspects shall be kept on file and promptly made available upon request.

8.2.1 Education

The manufacturer shall educate all employees to increase competence and environmental awareness. Training shall be carried out periodically. Training records shall be kept on file.



8.3 Legal Compliance

It is a prerequisite for the compliance with the bluesign® standard that the manufacturer meets all relevant international, national and local requirements concerning environmental aspects and occupational health.

A compilation of all relevant licences and documents concerning EHS aspects shall be on hand and up to date.

Especially licences that cover the following aspects are of interest:

- general operational permits
- freshwater supply
- wastewater discharge
- off-gas emissions
- storage and transport of hazardous chemicals,
- disposal of hazardous and non-hazardous waste,
- emergency preparedness

The manufacturer has to verify legal compliance. Amongst others the following documents have to be on hand:

- national and local EHS limit values (wastewater, off-gas, occupational health) and the relevant monitoring data (internal measurements and third party measurement reports)
- documents concerning emergency preparedness
- documents on regulatory authorities visits
- reports on enforcement actions due to authorities visits
- report on education of workers concerning handling of chemicals

8.4 Good housekeeping

The manufacturer shall follow general known Good Housekeeping Principles.



8.5 Resource efficiency, benchmarking

The bluesign® resource criteria primarily describe the resource saving potential expressed with the bluesign® resource inflation factor. The bluesign® resource inflation factor is based on the benchmarking with best practices in manufacturing with state of the art technology (BAT). Information on resource consumption, resource efficiency and resource benchmarking is given in the screening report.

The manufacturer shall use the resource inflation factor and benchmarking given in the screening report for a continuous improvement of the environmental performance. A mass stream balance following the methodology of the screening report of the most important input- and output streams shall be carried out every year. The manufacturer shall strive for a reduction/optimization of the most important resource relevant key figures.

8.6 Freshwater

Freshwater shall be used in a responsible way. Ethical as well as environmental aspects must be taken into account.

8.7 Wastewater

Freshwater shall be used in a responsible way. Ethical as well as environmental aspects must be taken into account.

8.7.1 General directives and restrictions

Besides other restricted or banned components compiled in the bluesign® substance list, the usage ban on the following components that are of significant relevancy concerning water quality have to be respected in every case:

- Chlorinated carriers
- Hypochlorite as bleaching agent
- Chlorite (exception extra white polyester for home textiles)
- Alkylphenolethoxylates (APEO)
- Cr (VI) as oxidizing agent
- Permanganate and periodate as bleaching or oxidizing agent

It is not allowed to discharge non-used residual amounts of chemical components to the wastewater.



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 minimised. Separate discharge of these liquors may be necessary to guarantee an efficient wastewater cleaning.

It is not allowed to discharge domestic sewage without purification to the aquatic body.

Cooling water shall be re-used as process water. Cases of direct discharge of cooling water have to be well-founded.

In regards of COD elimination, the efficiency of the wastewater treatment prior to direct discharge to the aquatic body shall be 85 % or higher.

The operator of the wastewater treatment (manufacturer or third party) has to have appropriate knowledge and technical equipment (for example measurement instruments) on wastewater treatment processes.

The mode of operation of the wastewater treatment plant must be made available as a flowchart.

8.7.2 Wastewater quality

8.7.2.1 Limit values (direct discharge)

The limit values and restrictions according to the bluesign® standard for direct discharge of the wastewater to the water body (river, lake, sea) are compiled in Table 8.1.

National or local requirements that are stronger or more detailed than the bluesign® criteria will supersede the limit values that are given in Table 8.1.

The parameters given in Table 8.1 provide reference to

- evaluate the water situation in textile finishing in general
- set priorities for optimisation steps
- control the efficiency of the wastewater treatment
- check conformity with national and local regulations
- check conformity with the bluesign® standard

The interval for the measurement of wastewater parameters in the input and the output of the wastewater treatment depends to some extent on the size of the plant. It is evident, that large scale plants with a complex multistage treatment need a more intensive control than smaller plants. The intervals given in Table 8.1 are therefore only to be used as a recommendation.



To control efficiency of the wastewater treatment it is strongly recommended to measure the following parameters not only in the treated (clean) stream but also in the untreated (raw) wastewater:

- wastewater volume
- pH
- conductivity
- temperature
- COD
- BOD
- colour

In every case the selection of input/output parameters shall ensure that the wastewater treatment is under sufficient control, efficiency is on a high level and ecological impact is minimised.

Note: If limits are regularly exceeded, a well-founded explanation must be given; point 1.1 of this manual is obligatory in every case.



| Parameter | Method | Unit | Limit value | Sampling | Sampling interval | Remarks |
|--|---|-----------------|---|----------|-------------------|--|
| pH | DIN 38404-C5 | | 6 - 9 | cont. | | |
| TSS | DIN EN 872 | mg/l | 30 | 1 | day | |
| Temperature | DIN 38404-C4 | °C | 35 | cont. | | |
| COD | DIN 38409-41 or DIN ISO 15705 | mg/l | 160 | 1 | 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 | 1 | day | TOC or COD |
| BOD ₅ | DIN EN 1899-1 | mg/l | 30 | 1 | week | |
| Colour | DIN EN ISO 7887 | m ⁻¹ | 7 (436 nm; yellow) 5 (525 nm; red) 3 (620 nm; blue) | 1 | day | Plants shall phase out hypochlorite for decolourisation; values currently only monitored |
| Persistent foam at the point of discharge | Visual inspection | - | Must not be visible | - | day | |
| Chrome total | DIN EN ISO 11885-E22 | mg/l | 0.5 | 1 | 6 month | |
| Chrome VI | DIN 38405-D24 | mg/l | 0.1 | 2 | 6 month | Ban by input stream management! |
| Copper | DIN EN ISO 11885-E22 | mg/l | 1 | 1 | 6 month | |
| Nickel | DIN EN ISO 11885-E22 | mg/l | 0.5 | 1 | 6 month | |
| Zinc | DIN EN ISO 11885-E22 | mg/l | 2 | 1 | 6 month | |
| Tin | DIN EN ISO 11885-E22 | mg/l | 2 | 1 | 6 month | |
| P total | DIN EN ISO 11885 | mg/l | 2 (with exception if flame retardants on P- basis are used) | 1 | 6 month | Flame retardants: Residual liquors from padding devices shall be discharged separately |
| NH ₄ -N | DIN 38406-5 | mg/l | 10 | 1 | 6 month | |
| N total | DIN EN 12260 (TNb) or DIN EN 25663 (TKN) | mg/l | 20 | 1 | 6 month | |
| Sulphite | EN-ISO 10304-3 | mg/l | 1 | 1 | 6 month | |
| AOX | DIN EN ISO 9562 | mg/l | 1 | 1 | 6 month | |
| Sulphide | DIN 38405-26 | mg/l | 1 | 1 | 6 month | |

Table 8.1:

Limit values for direct discharge to the aquatic body

Sampling

1: 5 grab samples measured on-site during 2 hours (min. interval between the samplings: 2 min)
or mixed volume proportional sample (2 hours)

2: Grab sample

Alternative evaluated standard methods are allowed (as for example US- or British Standard methods).



8.7.2.2 Limit values (indirect discharge)

In cases where the manufacturer discharge the wastewater to a wastewater treatment plant that is managed by a third party (e.g. a municipal sewage plant) it has to be checked that the external treatment is in good order and compliant to national and local regulations as well as to the limits given in Table 8.1. In this case the wastewater of the textile finishing plant must not have negative influence on the external wastewater treatment and must fulfil in quantity and quality the requirements of the third party.

8.8 Off-gas

8.8.1 General aspects

Air emissions in textile finishing can be caused by

- the textile raw material itself, if it is thermally stressed (preparation agents, monomers; epsilon-caprolactam from polyamide 6 etc.), fibre solvents can be released.
- the auxiliaries and chemicals used in finishing and coating processes
- the auxiliaries and chemicals used in dyeing processes that 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)

National or local regulations that are stronger or more detailed than the bluesign® criteria defined below will supersede the limit values that are.

8.8.2 Power generation (boiler house)

Requirements prescribed in national and/or local regulations shall be kept.

Environmental friendly fuel types should be used. Renewable energy sources shall be preferred.

If feasible residual thermal energy of the off-gas shall be re-used; economizers (air/air heat exchangers) shall be installed.

Condensate from steam generation shall be re-used.



8.8.3 Process emissions

Air emissions from the textile processes (stenters, dryers, singeing machines, flame lamination machines, etc.) are not regulated in a multitude of countries.

For these process emissions, the bluesign® standard requires that the limit values according to the emission factor concept are met (see Annex in Chapter 10).

Due to the fact, that at the moment measured data on product specific emission factors are seldom available outside Europe, the off-gas emissions (emission factors and mass streams) are calculated in the screening reports according to the bluesign® methodology.

If off-gas emissions exceed the above mentioned limit values continuously in a relevant amount, neighbourhood complaints are made, or the production site is situated in a protected nature reserve an appropriate off-gas abatement system has to be installed. However, integrated process optimisations should have priority. If raw fixation or fixation of polyamide 6 or polyacrylonitrile plays a significant role, it is in every case to be expected that an off-gas cleaning device is indispensable.

8.9 Hazardous components; working place atmosphere

Compliance with national and/or local regulations concerning transport, storage and handling of hazardous materials as well as workplace atmosphere is a prerequisite for compliance with the bluesign® standard.

If calculations/estimation done in the screening report for critical components indicate that relevant limit values may be exceeded, measurements shall be performed to ensure compliance. German limit values (TRGS 900) have to be kept.

Chemical components shall be stored and handled according to the instruction of the Material Safety Data Sheet. Special storage areas shall be available for toxic chemicals and flammable chemicals as well as for reducing and oxidising agents and acids and strong alkalis. Sodium dithionite shall be stored also separately in a dry atmosphere.

Double walled containers, secure bunded tanks, and/or other devices (retention ponds) to prevent contamination of the soil with liquid chemicals shall be installed.

Safety instructions concerning the safe handling of chemical substances shall be available for all workers.



Many components used in textile finishing have a risk component concerning environmental aspects, consumer safety and occupational health. This is the normal case if chemicals are used. The manufacturer shall take the following general recommendations into account:

- workers that have contact with chemicals shall be educated upon engagement with the company, periodically ongoing (e.g. once a year), and always updated when new processes and/or chemicals shall be used in order to maintain and improve the awareness concerning handling of hazardous substances (including hazardous waste). Training records shall be kept on file.
- appropriate personal protective equipment (PPE) shall be available (ear protection, rubber gloves, safety glasses, dust filters etc.)
- if solid substances in powder form are decanted (dyestuffs, reducing agents etc.), appropriate precautions to minimise the dust content at the working place shall be installed
- if sensitizing substances are handled, skin contact and inhalation of the substances shall be strictly avoided
- areas and processes with a relatively high exposure rate are normally the storage of chemicals, dyestuff kitchens, the preparation of finishing liquors, open dyeing machines with hot dyeing liquors, and the „open“ zone between foulard and stenter. The company has to ensure that appropriate air ventilation is installed in these areas.
- whenever possible, all containers (also containers for storage of hazardous waste) shall be stored with a coverage
- each chemical shall be stored according to the instructions given from the manufacturer in the Material Safety Data Sheet. Toxic substances should be stored separately
- separate storage of acids and alkalis as well as reducing and oxidizing agents (installation of retention basins to avoid accidents if containers are leaky is recommended)
- spills during dosing and dispensing of chemicals shall be avoided; leak control is necessary



8.10 Noise protection

The manufacturer has to determine potential noise areas (for example weaving or knitting departments)

Above a noise level of 85 dB(A) ear protection is mandatory. Above a noise level of 80 dB(A) an appropriate ear protection must be available.

Noise protection areas shall be marked in an appropriate way.

8.11 Solid waste

Compliance with national and/or local regulations pertaining to solid waste storage and transport of solid waste shall be ensured. Only licensed subcontractors shall be contracted for transport and discharge of hazardous waste.

The company shall establish standard operating procedures for the waste management.

The manufacturer shall prevent solid waste wherever possible. Unavoidable solid waste shall be collected separately to enable re-use/recycling or to ensure a safe disposal. Packing material shall be reduced, the use of returnable containers is strongly recommended.

Hazardous waste shall be stored separately from non-hazardous waste. The Good Housekeeping Principles at the storage place shall be followed.

Textile waste shall be avoided by an optimised process control; unavoidable textile waste shall be recycled.

Sludge from the wastewater treatment shall not be used in agriculture.

Workers shall be informed on waste management. The documents and reports including the third party protocols from waste management companies shall be filed.

8.12 Floorings, underground pipes and tanks

Floorings as well as underground pipes and tanks shall be regularly checked for possible leakages.

8.13 Emergency preparedness and response

Compliance with national and/or local regulations is a prerequisite.

The manufacturer shall establish, implement and maintain procedures to identify potential emergency situations and potential accidents that can have an impact on the environment and employees and how it will respond to them.



The manufacturer shall periodically test such procedures where practicable. Employees shall be periodically trained on all aspects concerning potential emergency cases.

The following equipment and organisational demands shall be established:

- Well-educated person trained in first aid
- first aid equipment
- appropriate fire extinguisher (regularly maintained)
- emergency exits (unblocked, unlocked)
- emergency lights
- fire alarms
- fire protection plans

8.14 Storage and transport of textiles

Textile raw materials and finished textiles shall be stored and transported in an appropriate manner to avoid any cross-contamination.

8.15 Brown field areas

Knowledge on brown field areas should be given. In case of contamination restoration plans shall be at hand.



9 Textile limit values

The textile limit values defined by the bluesign® standard (see bluesign® standard substances list – BSSL) have to be kept.

Compliance with the prescribed limits and bans is ensured by the input stream management and homologation procedure. If chemical components are in use that are not supplied by bluesign® system partners, random testing is especially recommended.



10 Annex

10.1 Emission factor concept

10.1.1 Description

The emission factor concept concerns facilities for textile finishing (heat-setting, thermosol processes, coating, impregnation, and finishing). The aim of the concept is to minimise the air pollution potential of the applied textile auxiliaries and thus minimising emissions to air. A further aim of the concept is to have better transparency, knowledge, and control of the emissions of textile auxiliaries used in finishing.

Normally, emissions are regulated by mass concentrations (mg substances/m³ off-gas) and mass flows (g substances/h).

The emission factor-concept defines substance emission factors and textile substrate-based emissions factors

10.1.2 Substance emission factors

The substance emission factor is defined as the amount of organic and inorganic substances in gram 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:

- f_c giving the total emissions of organic substances expressed as total content of Carbon;
- f_s : giving the emission of a specific substance in case of more toxic or carcinogenic organic substances or in the case of particular inorganic substances like ammonia, hydrogen chloride.

These 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.

10.1.3 Textile substrate-based emission factor

The textile material based emission factor is defined as the amount of organic and inorganic substances in grams which can be released under defined process parameters from one kg of textile material as follows;

- W_{Fc} : g Total-C/kg textile substrate
- W_{Fs} : g special substances/kg textile substrate in case of more toxic or carcinogenic organic substances or in the 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.

10.1.4 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 the 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!).

10.1.5 Example for a calculation

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 below).

The total process emissions of the finishing recipe WF, 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):

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

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 is called textile substrate-based emission factor and 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 | - | 0.0052 | - | 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 |

| | |
|------------|---|
| 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 |



10.1.6 Limit values

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

| | | |
|---------------------|---------------------|--------------------|
| Organic substances: | mass stream: | 0.8 kg Total-C/h |
| | or emission factor: | 0.8 g C/kg textile |

Organic substances that are grouped in the same class as formaldehyde:

| | | |
|--|---------------------|----------------------------|
| | mass stream: | 0.1 kg substance/h |
| | or emission factor: | 0.4 g substance/kg textile |