



Environmental baseline requirements for textiles

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June 2004

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Summary

In 2003, ANEC - the European Association for Consumer Participation in Standardisation - commissioned a research project on "The suitability of eco-label criteria to derive environmental baseline requirements applicable to all products on the market" (AEAT, 2003). The project demonstrated the usefulness of eco-label information in developing environmental specifications for products. However, it was concluded that some additional work was needed to elaborate clear-cut proposals for environmental minimum requirements for products.

This report, commissioned by the Consumer Council at the Austrian Standards Institute (supervised by Dr. Franz Fiala), follows up on the conclusions made in the ANEC report on textile products, and develops specific environmental baseline requirements for textiles. Environmental baseline requirements have been developed on the basis of eco-label criteria, for which reason a comparison and review of different eco-labelling schemes have been carried out. The following eco-labelling schemes or other relevant organisations setting criteria for textiles have been included in the review, as these eco-labelling schemes have set criteria for textiles, which are available on the Internet:

- The EU Flower
- The Nordic Swan
- The Swedish Good Environmental Choice
- Eco Mark of Japan
- The Environmental label of Croatia
- The Thai Green Label
- The European private label Oeko-Tex
- The German Organic Guarantee System – IFOAM
- The International Natural Textiles Association – IVN in Germany (former Naturtextil)
- The inspection body for organic production in the Netherlands – Skal
- The Swedish organisation for development of organic production and consumption – KRAV
- TOXPROOF – a label issued by a German testing organization

It is, however, not enough to use eco-label criteria as the only source when developing environmental baseline requirements, as these criteria often are set with the goal to exclude a larger part of the market. Some eco-label criteria will therefore be too strict for use as environmental baseline requirements. It is therefore necessary to include other information such as surveys of chemicals in textiles and information on BAT (Best Available Technique) for the textile industry.

This study has shown that it is possible to develop environmental baseline requirements for textiles with a combined use of eco-label criteria, surveys of chemicals in textiles, and information on BAT of the textile industry. It was not possible within this project to use test reports of textiles as background material, which of course would provide a better background material for establishing the environmental baseline requirements. Test reports are confidential material and it was not possible within the frame of this project to include the expertise from testing facilities for textiles either.

Environmental baseline requirements have been set for

- Carcinogenic and mutagenic substances in general, and substances toxic to reproduction

- Flame-retardants.
- Finishing substances.
- Sensitising dyes in the finished textile product.
- Heavy metal residues in the finished textile product (for Sb, As, Cd, Co, Cr, Cu, Hg, Ni, Pb, and Sn).
- Pentachlorophenol in the finished textile product
- Phthalates in baby clothes.
- Chlorinated carriers and the carrier orthophenylphenol (OPP) in the finished textile product.
- Formaldehyde content in the finished textile product.
- Pesticide residues in the finished textile product.
- pH value of the aqueous extract of textiles with direct skin contact
- Dimensional change of the finished textile product.
- Colour fastness to washing, to perspiration, to wet and dry rubbing, and to light for the finished textile product.

1 Introduction

The European Commission has initiated a discussion on Integrated Product Policy (IPP) aimed at the reduction of environmental burdens caused by products taking into account all stages of the life cycle. A Green Paper on IPP was published in early 2001 followed by a Commission Communication in June 2003.

In August 2003 a draft directive on establishing a framework for the setting of eco-design requirements for Energy Using Products (EUP) was presented by the Commission. It is considered to be a first concrete implementation measure.

ANEC, the European Association for Consumer Participation in Standardisation commissioned a research project on "The suitability of eco-label criteria to derive environmental baseline requirements applicable to all products on the market" (AEAT, 2003), which could demonstrate the usefulness of eco-label information in developing environmental specifications for products. The study attracted a lot of interest and was welcomed by several parties including the Commission. However, some additional work is needed to elaborate clear-cut proposals for environmental minimum requirements for products.

Textiles were one of five products investigated in some depth. The ANEC report concentrated on the eco-criteria used in the EU eco-labelling for textiles, but also included some of the chemical criteria set by Oeko-Tox, TOXPROOF and the Nordic Swan. When proposing environmental baseline requirements the ANEC report concentrated on the criteria for chemicals and fitness for use, as production related requirements is more difficult to handle, because these are incompatible with WTO¹ rules at present. Exact environmental baseline requirements were proposed for some chemicals, and for other chemicals and for fitness for use aspects suggestions were made for the type of baseline requirements, but no exact proposals/values were given.

The question is, therefore, if the proposed baseline requirements in the ANEC report are complete and appropriate. And furthermore, if other existing standards/guidelines set other relevant eco-criteria for textiles, which can be used for proposing suitable environmental baseline requirements?

This present project was therefore initiated by the Consumer Council at the Austrian Standards Institute to review other relevant existing standards/guidelines containing eco-criteria for textiles in order to identify suitable baseline requirements for textiles.

1.1 Purpose

The purpose of this project was to identify suitable baseline requirements for textiles on the basis of the existing standards/guidelines containing eco-criteria. The starting point was the mentioned ANEC research project on "The suitability of eco-label criteria to derive environmental baseline requirements applicable to all products on the market".

The primary object of this project was thus to develop a set of environmental baseline requirements for textiles by taking into account the results of the ANEC research project described above. The environmental requirements is established so that the criteria are less stringent than the eco-label criteria but sufficiently stringent to lead to an improvement of the

¹ World Trade Organisation.

environmental situation, e.g. a significant percentage of the products on the market cannot comply with them (10-20%).

Furthermore, this project has different sub-purposes:

- To review the existing standards/guidelines containing eco-criteria for textiles and other relevant information with a view to identifying suitable baseline criteria for textiles.
- To review the minimum requirements for a number of chemicals given in the ANEC report with respect to completeness and appropriateness.
- To review the minimum requirements for the fitness for use provisions given in the ANEC report with respect to completeness and appropriateness.

2 Review of existing eco-criteria for textiles

In a review of existing eco-labelling criteria for textiles it is primarily relevant to look upon the criteria set by eco-labelling organisations, which are members of GEN – the Global Ecolabelling Network². GEN is a non-profit association of third-party environmental performance labelling organisations. GEN was founded in 1994 to improve, promote, and develop eco-labelling of products and services. At present (December 2003) GEN has 26 members from 24 different countries around the world.

Of the GEN members, 12 countries have set criteria for textiles (see Table 2.1).

Table 2.1: List of relevant criteria for textiles set by GEN members

GEN member organisation	Country	Name of criteria	Criteria included in this review	
The Flower	EU	• Textile products	Yes	
The Swan	Nordic countries	• Textiles	Yes	
Good environmental choice	Sweden	• Textiles	Yes	
Eco Mark	Japan	• Clothes • Textile products for home use • Textile products for industrial use	Yes Yes Yes	
Environmental Labelling	Korea	• Clothing • Bags		No ¹ No ¹
Environmental Choice Program	Canada	• Clothing made from certified organic cotton		No ¹
China Ecolabelling Center ²	China	• Ecotypic textile • Moth resistant woollens		No ¹ No ¹
National ecolabelling Program	Czech Rep.	• Textile products		No ¹
Environmental label	Croatia	• Textile floor coverings	Yes	
Ecomark	India	• Textiles		No ¹
Thai Green Label	Thailand	• Products made from cloth	Yes	
Green Mark	Rep. of China - Taiwan	• Recycled fabric and its products • Textile products made from recycled PET plastic • Reusable shopping bags • Cloth diapers		No ³ No ³ No ³ No ³

¹ The criteria were not possible to download or to achieve from the organisation.

² China is not a GEN member but a GEN participant.

³ It was not possible to download the more detailed criteria or to achieve them from the organisation. A very rough description of the criteria is available on their website.

Some of the criteria was found by use of the GEN website, and others were achieved by contacting the relevant organisations. However, it was not possible to achieve the eco-label criteria from all organisations. All organisations were contacted by email, but not all responded. This review of the existing eco-label criteria for textiles is therefore only a review of the criteria it was possible to get a hold of (see Table 2.1).

² www.gen.gr.jp

Of other relevant criteria – e.g. other eco-label organisations, which are not members of GEN or e.g. organisations for organic production, which also set standards for textile processing – the following can be mentioned (see Table 2.2).

Table 2.2: List of relevant criteria for textiles set by other organisations

Organisation	Country	Name of criteria	Criteria included in this review	
Milieukeur	Netherlands	<ul style="list-style-type: none"> Flax 		No ¹
Hungarian Eco-label programme	Hungary	<ul style="list-style-type: none"> Woolen-flax bed clothes Auxiliary criteria for woollen-flax bed clothes 		No ² No ²
National programme of Ecolabelling, Slovak Republic	Slovak Republic	<ul style="list-style-type: none"> 100% cotton bed linen Textile products (under development) 		No ³ No ³
Blue Angel	Germany	<ul style="list-style-type: none"> Fabric towel rolls 		No ⁴
Öeko-Tex	European	<ul style="list-style-type: none"> Textiles and leather 	Yes	
IFOAM ³ – Organic Guarantee System	Germany	<ul style="list-style-type: none"> Processing of textiles 	Yes	
IVN (former Naturtextil)	Germany	<ul style="list-style-type: none"> Textile manufacturing 	Yes	
Skal	Netherlands	<ul style="list-style-type: none"> Sustainable textile production 	(Yes) ⁵	
KRAV	Sweden	<ul style="list-style-type: none"> Textiles 	Yes	
TOXPROOF	German	<ul style="list-style-type: none"> Textiles and garments 	Yes	
OTA ⁴	USA	<ul style="list-style-type: none"> Fibre processing 		No ⁶
TDA ⁵	USA	<ul style="list-style-type: none"> Fibre processing 		No ⁷

¹ The criteria are only available in Dutch.

² The criteria have been suspended.

³ The website is not available in English.

⁴ The criteria are not included in this review as they primarily refer to cleaning of the towel rolls. No criteria are set for the textile of the towel roll.

⁵ Skal uses a different approach when setting criteria. All substances, which are allowed in the processing of textiles is listed instead of banned substances as all other labelling schemes use as their approach. This makes it difficult to compare with the criteria set by other organisation. Therefore, only the criteria where specific limit values are set are included.

⁶ The document of fibre processing has still draft status, and has been removed from their website (February, 2004) during the project period. However, the criteria regarding chemicals are very similar to the criteria set by IFOAM, IVN and KRAV.

⁷ The criteria are not included in this review as the fibre processing standards have draft status, and as the document has been removed from their website during the preparation of this report. However, the criteria regarding chemicals are very similar to the criteria set by IFOAM, IVN and KRAV.

In Appendix A the criteria set by the different eco-labelling schemes are described. Table 2.1 and Table 2.2 show the eco-labelling schemes that are described in details in Appendix A. On the basis of the description of the criteria set by the different eco-labelling schemes, a comparison of the different criteria for chemicals has been made in Appendix B. Appendix B is a list of chemicals which are either not allowed to be used in the processing of the textiles or

³ IFOAM – International Federation of Organic Agriculture Movements

⁴ OTA – Organic Trade Association (www.ota.com)

⁵ TDA – Texas Department of Agriculture (www.agr.state.tx.us)

are restricted in their use. The list shows, which eco-labelling schemes that set the most chemical criteria and the strictest chemical criteria for textiles or for textile processing.

Appendix A also contains a short description of the different eco-labelling schemes. These descriptions are summarised shortly in Table 2.3.

Table 2.3: Dissemination of the different eco-labelling schemes.

Eco-label	Description	No. of licenses	Extent of criteria
EU Flower	European eco-label	53 companies	Extensive
Swan	Nordic eco-label	2 companies	Extensive
Good Environmental Choice	Swedish eco-label	10 companies	Extensive
Eco Mark	Japanese eco-label	No info available	Limited amount of criteria
Environmental labelling	Korean eco-label	12 products	No info available
Environmental Choice Program	Canadian eco-label	No info available	Very few criteria
China Ecolabelling Center	Chinese eco-label	No info available	No info available
National Ecolabelling Program	Eco-label of the Czech Republic	0	No info available
Environmental label	Croatian eco-label	1 company	Limited amount of criteria
Ecomark	Indian eco-label	No info available	No info available
Thai Green Label	Eco-label of Thailand	No info available	Limited amount of criteria
Green Mark	Eco-label of Taiwan	9	Limited amount of criteria – sparse info available
IFOAM	International umbrella organisation for organic production	No info available	Extensive
IVN	International textile association that promotes research on natural textiles	No info available	Extensive
Skal	Dutch inspection body for organic production	40	Extensive
KRAV	Swedish organisation for organic production	55 products 10 companies	Extensive
Oeko-Tex 100	European private label for textiles	4900 companies	Extensive, but only criteria for the finished product
Oeko-Tex 1000	European private label for textile companies	24 companies	Extensive
TOXPROOF	German safety label	No info available	Extensive, but only criteria for the finished product

Appendix B shows that the EU Flower and the Swan has set most criteria regarding chemicals used for textile production. In fact, the review (Appendix A) shows that these eco-labelling schemes are the most extensive with regard to the number of relevant environmental criteria for textiles. Good Environmental Choice is also known to be an eco-label with an extensive range of environmental criteria.

Eco Mark (Japan) and the Thai Green Label have set a more limited amount of criteria for textiles compared to the European eco-labelling schemes.

Of organisations that promote organic production, IFOAM and KRAV (which have very similar criteria) together with IVN, have also set an extensive amount of criteria in line with the criteria set by the EU Flower and the Swan. The Dutch inspection body for organic production – Skal, which also has set criteria for textile processing differs from the other eco-labelling schemes by setting criteria for the substances allowed in the processing of textiles instead of using negative lists.

Oeko-Tox and TOXPROOF are special eco-labelling schemes in the sense that they only focus on chemical aspects that can be measured in the finished textile product. Oeko-Tox and TOXPROOF concentrate more on health aspects of the consumer, as the finished product is in focus.

As can be seen from Table 2.3 Oeko-Tex is by far the most wide spread eco-label of the mentioned eco-labelling schemes (from the easily accessible information used in this project). The Oeko-Tex label has existed for a long time – since 1992. In comparison, the first criteria for the EU Flower were established in 1999.

However, in the year 2000 the Eco Mark (Japan) was, according to a Danish survey on eco-labelling schemes (Danish EPA No. 12, 2000), more wide spread than Oeko-Tex. If this is still valid today, has not been investigated further in this project. Only easily accessible information on the websites of the eco-labelling schemes has been used. The Eco Mark has only set a limited amount of criteria, which can explain the wide dissemination.

2.1 Conclusions

The review of the criteria of the different eco-labelling schemes shows that it is possible to use the eco-label criteria to set environmental baseline requirements for textile products – but the criteria cannot stand alone! Even though the dissemination of the eco-labelling schemes (the number of licenses) can be used as some indication of how strict the criteria of the different eco-labels are, it is still necessary to be in possession of some knowledge about, which criteria that are difficult to comply with.

Some of the eco-labelling schemes set their criteria so that only about one third of the products on the market are able to comply with them (e.g. the EU Flower and the Swan). This means that these criteria cannot be used directly as the environmental baseline requirements. The requirements must be set so far more products on the market can comply with them. However, eco-label criteria together with e.g. some knowledge about the level of chemicals in textiles, is a very useful cocktail in the process of setting environmental baseline criteria for textiles.

3 Review of other relevant information

In this project other relevant information (than eco-labelling schemes) has also been reviewed with a view to use it to identify suitable environmental baseline requirements for textiles. However, the review has been limited to a brief examination of the recently completed BREF document⁶ by the European Commission – “Integrated Pollution Prevention and Control (IPPC), Reference Document on Best Available Techniques for the Textiles Industry” (EC IPPC, 2003).

It has been a choice of this project to focus the attention on existing standards/guidelines containing eco-criteria for textiles in stead of other relevant information, such as LCA studies etc., as other relevant information supposedly will be more process specific and therefore not especially suited for developing baseline requirements, as they could be viewed as potential trade barriers (according to WTO-rules).

However, some additional information has been used in the process of establishing environmental baseline requirements for textiles. This additional information is primarily test reports of chemicals found in textiles. These reports as well as the BREF document are summarised below.

3.1 EC BREF document: BAT for the Textile Industry

The objective of the above mentioned BREF document for the textiles industry has been to exchange information between member states on best available techniques, to promote the worldwide dissemination of limit values and techniques used in the Community, and to publish the results.

The BREF document contain a thorough description of the applied processes and techniques in the textile industry as well as a description of the environmental aspects of the different process steps in textile processing (so-called finishing processes). Furthermore, some emission levels of environmental aspects and consumption levels of energy, water and some chemicals are also presented.

The main part of the BREF document is a thorough description of different techniques to consider in the determination of the best available technique (BAT) for each textile process. Finally, the document lists the best available techniques for each step of textile processing.

In an annex to the document different textile auxiliaries are described and possible substitutes for problematic substances are suggested.

In general, it is difficult to use the BREF document in the development of suitable baseline requirements for textiles. First of all, the BREF document focuses on processes, where the developed baseline requirements mainly should focus on chemicals and fitness for use aspects of the finished textile product, as too process specific requirements may be subject to trade barriers.

Secondly, the BREF document describes the best available techniques, which needless to say cannot be used as baseline requirements where about 80 to 90% of the market has to comply

⁶ BREF – Best available techniques reference document. <http://eippcb.jrc.es/pages/FActivities.htm>

with the set requirements. BAT is the best available techniques at present, which only a few percentage of the market uses.

However, the BREF document does offer some valuable information of what is possible today. For example if more environmental friendly substitutes exist and in some cases also valuable information about levels that can be obtained. An example is formaldehyde used for easy-care finishing, where the BREF document states that low-formaldehyde or even formaldehyde-free products are an alternative and that formaldehyde residues in the textiles can be minimised to below 75 ppm or even lower than 30 ppm for consumer requirement.

In conclusion, it can be said that the BREF document cannot be used alone to develop suitable baseline requirements for textiles, but in combination with the existing eco-label criteria, which have set limit values, it is possible to develop some baseline requirements. However, in some cases, additional information is needed in order to be able to set the requirements at an appropriate level. Some of the other information used in this project is described in section 3.2 "Other relevant information".

In this section, the recommendations in the BREF document will not be described in details. Instead, the recommendations are used in the discussion about suitable baseline requirements for textiles (see section 5.3 "Discussion about suitable environmental baseline requirements for textiles").

3.2 Other relevant information

Of other relevant information the following documents can be mentioned:

- The background document for the revision of the EU eco-labelling criteria (EU Flower BD, 2002).
- A Danish report on chemicals in textiles (Danish EPA No. 534, 2000).
- A Danish survey on chemical compounds in textile fabrics (Danish EPA, 2003).
- A Danish survey on Bed Linen (Danish EPA, 2004).
- A report from the European Consumers' Organisation about the EU Eco-label (Beuc, 2004)

The background document for the revision of the EU eco-labelling criteria (EU Flower BD, 2002) describes the background for setting the new eco-labelling criteria, and the difference between the former and the new criteria document. Furthermore, in some cases any objections made against the new criteria is presented and discussed. This information can be used in the process of determining where the limit value must be set in order to reach 80-90% compliance for the products on the market.

The Danish report on chemicals in textiles discusses, which chemicals that can be found in textiles and why they are problematic. Furthermore, about 20 different textiles/fabrics have been tested for content of certain chemicals and the levels of these chemicals have been measured. Even though the report is a couple of years old (from 2000), it can give some idea of the levels of chemicals in finished textile products. Some of the results will therefore be used in the discussion about suitable environmental baseline requirements for textiles in section 5.3.

The Danish survey on chemical compounds in textile fabrics has, as the report mentioned above, tested 20 different fabrics for a content of chemical substances. The report has recently been published (November, 2003). This survey is therefore also relevant to use in the discussion about suitable environmental baseline requirements for textiles in section 5.3.

The Danish survey on bed linen has examined 19 different bed linen products purchased in Denmark. The manufacturers of the products were visited and it was investigated whether the products could comply with the European eco-label criteria. Only one product was in compliance with the criteria, and this product carried the Flower label already. Four products carried the Oeko-Tex label. The report gives some indication of, which criteria, that are more difficult to comply with and which criteria that are easier to comply with. Some of the results will therefore be used in the discussion about suitable environmental baseline requirements for textiles in section 5.3.

Common for all three Danish surveys on chemicals in textiles is that the textiles examined have been purchased, but not necessarily manufactured, in Denmark. Even though the surveys are fairly small and even though the textiles examined are not representative for the entire textile market, they may still give some indication of, which criteria that are more difficult to comply with. Other surveys (from other countries) have not been found.

The report from the European Consumers' Organisation has compared EU-legislation on chemicals with the EU Eco-label criteria for different products – including textiles. The comparison shows that the EU Eco-label for textiles sets stricter criteria compared to the EU-legislation with regard to every chemical aspect. The EU-criteria on textiles are hence ahead of EU-legislation on chemicals.

4 Review of the proposed minimum requirements

As described in the introduction ANEC, the European Association for Consumer Participation in Standardisation, has carried out a research project on "The suitability of eco-label criteria to derive environmental baseline requirements applicable to all products on the market" (AEAT, 2003). The goal of this report was to demonstrate the usefulness of eco-label information in developing environmental requirements for products.

Five product groups were chosen in order to examine if the eco-label criteria could be used for environmental baseline requirements for products. Textiles were one of the five products investigated in some depth. The research project concludes that it is possible to use eco-label criteria to develop product related baseline requirements, but other information should also be included.

For textiles, the ANEC report concentrated on the eco-criteria used in the EU eco-labelling, but also included some of the chemical criteria set by Oeko-Tox, TOXPROOF and the Nordic Swan. When proposing environmental baseline requirements the ANEC report concentrated on the criteria for chemicals and fitness for use, as production related requirements is more difficult to handle, because these are incompatible with WTO rules at present.

The eco-label criteria, which according to the ANEC report can be used for setting minimum requirements, were identified to be as listed in Table 4.1.

Table 4.1: Eco-label criteria identified by the ANEC report for setting minimum requirements (Table 5.5j; AEAT, 2003).

Issue	Eco-label criterion
Chemicals in textiles	<ul style="list-style-type: none"> • Antimony in Polyester ~ 300 ppm • PAH content in mineral oils ~ 1% • Formaldehyde – 75 ppm in-contact, 300 ppm no skin contact • Dyes that are CMR categories 1 and 2 • Potentially sensitising dyes • Pesticides – low ppm range for total amount • Heavy metals – low ppm range • Flame retardants – based on risk phrases • Shrink resistant finishes that are CMR category 1 and 2
Durability	<ul style="list-style-type: none"> • Colour fastness to washing • Colour fastness to perspiration • Colour fastness to wet rubbing • Colour fastness to dry rubbing • Colour fastness to light • Dimensional changes during washing and drying

The proposed environmental baseline requirements are appropriate as they are based on the criteria set by the EU Flower, which focus on the most interesting environmental aspects of textiles. However, as the EU Flower does not focus on measuring chemicals in the finished textile products (in contrast to Oeko-Tex and TOXPROOF), other aspects could be of interest as well, as the goal of the developed environmental baseline requirements is to focus on aspects, which can be measured by testing a textile product (see chapter 5 "Proposal for suitable environmental baseline requirements for textiles").

As can be seen from the table exact environmental baseline requirements were only proposed for a few chemicals. For other chemicals together with the fitness for use aspects suggestions were made for the type of baseline requirements, but no exact proposals/values were given. The proposals given in the ANEC report can therefore not be used directly as environmental baseline requirements. Additional information is needed in order to set the environmental baseline requirements at levels where 80-90% of the products on the market can comply with them. In contrast, the criteria for the EU Flower is set, with the goal that only about one third of the products on the market will be able to comply with the criteria, which also means that the limit values set by the EU Flower cannot be used directly as environmental baseline requirements.

In this project, in chapter 5 “Proposal for suitable environmental baseline requirements for textiles” the limit values set by different eco-labelling schemes together with additional information are used to propose more specific environmental baseline requirements in line with the goal of the ANEC report.

5 Proposal for suitable environmental baseline requirements for textiles

The primary object of this project was to develop a set of environmental baseline requirements for textiles. The environmental requirements have been established with a use of the following wishes for the environmental baseline requirements.

The environmental baseline requirements:

- Must be less stringent than the eco-label criteria but sufficiently stringent so that the implementation of the specifications leads to an improvement of the environmental situation, e.g. a significant percentage of the products on the market cannot comply with them (10-20%).
- Must be precise.
- Must be suitable for certification purposes.
- Must be accompanied by relevant test methods.
- Must focus on the aspects, which can be verified by testing a product.
- Should not include production related requirements, as these are incompatible with WTO rules at present. However, production related requirements could be covered to some extent.

The challenge in developing a set of environmental baseline requirements for textiles is to find the borderline where the requirements are sufficiently stringent to lead to an improvement of the environment, but not so stringent that only a few percent can comply with them. Therefore, Eco-labelling Denmark was contacted in order to discuss which criteria that have been found to be difficult or easy to comply with for the EU Flower criteria.

In the following, the EU Flower criteria are discussed shortly concerning the ease of compliance for the different criteria. Furthermore, a total list of areas, where eco-label criteria exists is presented. The list summarises all the aspects, which the reviewed eco-labelling schemes have set as criteria for textiles (see Appendix A). This list will be used as the basis for developing suitable environmental baseline requirements for textiles.

5.1 *EU Flower criteria which are difficult/easy to comply with*

Eco-labelling Denmark was contacted. According to Mogens Stibolt⁷, Project Manager and responsible for the textile area, some of the criteria set by the EU Flower are more difficult to live up to or comply with than others.

In general, the applicants do not have big problems with the fibre criteria. In addition, the criterion for formaldehyde content in the finished product is not that difficult to comply with, if the applicant uses modern dyes and chemicals. However, it may be a problem for the Asian countries.

The most difficult criteria for the applicants are the fitness for use criteria and the criteria for auxiliary chemicals. For the fitness for use criteria it is especially the criteria for dimensional change, colour fastness to light and colour fastness to washing that are difficult to comply with. Either the shrinkage of the product is too high or the colour is not "stable" enough, i.e. is either washed out or faded by light.

⁷ Personal conversation with Mogens Stibolt, Eco-labelling Denmark, in February 2004.

Of the fitness for use criteria, the shrinkage criterion is the most difficult criterion to comply with, which is also the reason for easing the requirements for shrinkage at the latest revision of the EU Flower criteria. With respect to the criterion for colour fastness to light it has turned out to be a problem for the light colours to live up to the requirement. The lighter the colours the bigger the problem complying with the criterion. The criterion for colour fastness to washing is normally not that difficult to comply with, except for black colours.

For the auxiliary chemicals one of the biggest problems is the criterion of no content of APEO (alkylphenoethoxylates) and EDTA (ethylene diamine tetra acetate) in any preparations or formulations used. When the applicants examine their auxiliary chemicals it often turns out that many of them contain small amounts of APEO, and they are therefore forced to replace these auxiliary chemicals.

In addition, the criterion of sufficient biodegradability of most of the chemicals used is also difficult to comply with for the applicants. Often the problem is that the chemicals that the applicants use are not sufficiently biodegradable.

Furthermore, the dye works may have some difficulty in complying with the criterion for metal complex dyes as the requirements for the degree of fixation has been tightened.

An entirely different aspect is the administrative difficulty of applying for an eco-label. The documentation needed to show that the textiles are in compliance with the criteria is exhaustive and probably prevents many companies from applying.

5.2 Total list of areas where eco-label criteria exist

In this section a total list of areas, where eco-label criteria exists is presented. The list is made on the basis of all the reviewed eco-label criteria in Appendix A – Review of existing eco-criteria for textiles.

The list is made in order to use it for developing suitable environmental baseline requirements. The mentioned areas are then addressed one by one in chapter 5.3 “Discussion about suitable environmental baseline requirements for textiles” and it is discussed whether or not an environmental baseline requirement can be set and what the limit value in that case should be.

Table 5.1: List of areas where eco-label criteria exist.

Textile fibres
<p>Acrylic fibres</p> <ul style="list-style-type: none"> - Residual acrylonitrile content in raw fibres - Emission to air of acrylonitrile
<p>Cotton and other natural cellulosic seed fibres</p> <ul style="list-style-type: none"> - Content of pesticides in fibres
<p>Elastane</p> <ul style="list-style-type: none"> - Use of organic tin compounds - Emission to air of aromatic diisocyanates
<p>Flax and other bast fibres</p> <ul style="list-style-type: none"> - Emission to water of oxygen demanding substances (TOC/COD) - Retting of flax - Use of pesticides

Greasy wool and other keratin fibres

- Content of pesticides in fibres
- Emission to water of oxygen demanding substances (TOC/COD) from wool washing
- Temperature and pH of effluent from wool washing
- Solvent based washing of wool
- Biodegradable tensides for scouring/washing of wool

Man-made cellulose fibres

- AOX (absorbable halogenated hydrocarbons) level in fibres
- Emission of sulphur to air
- Emission of zinc to water
- Emission of copper to water
- Emission to water of oxygen demanding substances (TOC/COD)
- Use of chlorine based bleaching chemicals

Polyamide

- Emission of nitrous oxide (N₂O) to air
- Solvent-free spinning methods or recycling of solvents

Polyester

- Emission of VOC (volatile organic carbons) to air
- Content of antimony in fibres
- Use of halogenated carriers
- Solvent-free spinning methods or recycling of organic solvents
- No use of halogenated monomers during manufacturing

Polypropylene

- Use of lead-based pigments

Silk

- Biodegradable tensides for de-gumming of silk
- Waste water treatment for de-gumming of silk

Processes and chemicals

Auxiliary chemicals

- Biodegradability (size, detergents, fabric softeners, complexing agents, plasticisers, antistatic agents, enzymes, thickeners)
- Ban of certain chemicals (e.g. APEO, LAS, EDTA, DTAMAC, DSDMAC, DHTDMAC)

Spinning oils and additives

- Biodegradable
- Content of PAH (polycyclic aromatic hydrocarbons) in the mineral oil proportion

Biocidal or biostatic products

- Use of chlorophenols during transportation or storage of products
- Use of PCB (polychlorated biphenyls) during transportation or storage of products
- Use of organotin compounds during transportation or storage of products

Stripping or depigmentation

- Use of heavy metal salts
- Use of formaldehyde

Weighting

- Use of cerium compounds

Bleaching

- Emission of AOX (absorbable halogenated hydrocarbons) to water
- Use of chlorine based bleaching chemicals

Dyeing

- Ionic impurities in dyes for several metals
- Use of chrome mordant dyeing
- Use of azo-based dyes
- Use of dyes that are carcinogenic, mutagenic, or toxic to reproduction

- Use of potentially sensitising dyes
- Emission to water of certain metals
- Fixation degree for use of metal complex dyes
- Use of urea

Printing

- VOC (volatile organic carbons) content in printing paste
- Water-based printing
- Use of aromatic solvents
- Plastisol-based printing
- Use of urea
- Handling of residues of printing paste (recycling or waste)

Wet-processing of textiles

- Emission of COD to water
- Temperature and pH of effluent
- Connection to waste-water treatment plant
- Emission of phosphor after waste-water treatment
- Emission of heavy metals to water

Energy and water use

- Use of water
- Use of energy

Flame-retardants

- Use of carcinogenic, mutagenic, toxic to reproduction or toxic to aquatic organisms

Finishes/finishing

- Use of carcinogenic, mutagenic, toxic to reproduction or toxic to aquatic organisms
- Use of fluorocarbons
- Use of halogenated shrink-resistant substances

Coatings, laminates and membranes

- Use of carcinogenic, mutagenic, toxic to reproduction or toxic to aquatic organisms

Chemicals in general

- Use of carcinogenic, mutagenic substances or substances toxic to reproduction
- Use of chemicals dangerous for the ozone layer
- Use of bioaccumulative chemicals

Finished textile products

- Residue of formaldehyde
- Flame-retardants
- Residue of pesticides
- Residue of organic mercury compounds
- Residue of organic tin compounds
- Emission of certain volatile compounds (not for clothing)
- pH value
- Residue of chlorinated phenols
- Residue of azo dyes
- Residue of certain heavy metals
- Residue of PVC plasticisers
- Residue of chlorinated organic carriers (chlorinated benzenes and toluenes)
- Residue of orthophenylphenol (OPP)
- Residue of carcinogenic and allergenic dyes

Fitness for use

Dimensional changes during washing and drying

Colour fastness to washing

Colour fastness to perspiration

Colour fastness to wet and dry rubbing

Colour fastness to light
Colour fastness to saliva and perspiration (for baby clothes)
Pilling resistance (for furniture fabrics)
Odour

5.3 Discussion about suitable environmental baseline requirements for textiles

In the following, suitable environmental baseline requirements for textiles are discussed and developed. The list of areas, where eco-label criteria exists is used as a basis, and the areas are discussed one by one.

As mentioned in the beginning of chapter 5, the environmental baseline requirements are developed with the focus on aspects that can be verified by testing the finished textile product, and with the goal in mind that 80 to 90% of the products on the market must be able to comply with them.

In general, the environmental baseline requirement for each issue is set with the goal in mind that 80-90% of the products on the market can comply with the requirement. However, if numerous environmental baseline requirements are set, this does not necessarily mean that 80-90% of the products on the market will be able to comply with all the set requirements. Therefore, it will also be necessary to limit the amount of requirements set. The total list of baseline requirements can of course not be as comprehensive as the list of criteria for e.g. the EU Flower.

If the total list of requirements is too comprehensive, this will in it self be an obstacle, as too many requirements will lead to too much bureaucracy regarding the verification of the requirements and maybe too high expenses for carrying out tests in order to verify the compliance with the set requirements. The requirements should be set so they primarily can be verified by testing the finished textile product, as this will ease the work of determining whether the set requirements are met. Again, not too many requirements should be set in order to keep the testing expenses at a minimum.

Setting requirements that cannot be tested in the finished product can be very demanding in the verification process. An example is e.g. a requirement for the use of carcinogenic substances or chemicals that are sufficiently biodegradable in the processing of the textiles. It is not possible to test in the finished product if the chemicals are sufficiently biodegradable. The only way to verify such a requirement will be to demand a list of all the chemicals used in all the processing steps of manufacturing the textiles (can involve several companies/suppliers), and to demand test information about the degradability of the chemicals used. A similar procedure will be necessary for verifying the use of carcinogenic substances. Material safety data sheets (MSDS) will have to be collected in order to check if no chemicals have been used with a content of carcinogenic substances. In both cases, the verification process will be very complicated and extremely time-consuming, as many suppliers must be involved, but at the moment it seems to be the only way to set requirements in order to avoid an essential health problem and one of the biggest environmental problems of the textile industry – water pollution. Perhaps, in a future project, other and more suitable ways to set baseline requirements for these aspects can be developed.

In order to set environmental baseline requirements that 80-90% of the products on the market can comply with, it is therefore necessary to compromise, and lower the number of

requirements and maybe not set requirements for the largest environmental issues, as products must be able to comply with the set requirements with a reasonable effort.

Another hurdle is the discussion of the finished textile product. When is the textile product a finished textile product? The obvious answer is the piece of clothing. However, yarn manufacturers may state that their yarn is a finished textile product. The requirements set must be able to deal with this issue. This makes the setting of a requirement for e.g. antimony more difficult. The content of antimony in the textile products will be lower in a finished piece of clothing compared to e.g. in yarn, as the finished clothing piece has undergone more wet processing compared to the yarn, which means that a larger part of the antimony content has been washed out. In this project, however, what is sold as a finished textile product is used as the definition of a finished textile product. A finished textile product can thereby be yarn and fabric as well as pieces of clothing or other textile products such as carpets, curtains etc.

This means that for some requirements (e.g. antimony) it will be more difficult for some products to comply with the set requirements. Of course, it is possible to establish an environmental baseline requirement for each type of textile. This is, nevertheless, too complicated for this project, but could perhaps be further examined in a future project. This is also the reason for in general not differentiating between textile clothing for adults and for textile clothing for babies, even though it seems reasonable to set lower limit values for baby clothes, as babies are more sensitive individuals who are exposed in different ways to the chemicals in the clothing, e.g. by sucking on their clothes. On the other hand, the size and time frame of this project forces the environmental baseline requirements to be set as general as possible in order to keep it as simple as possible. In general, therefore, no difference is made between clothes for babies and clothes for adults. However, in some special cases, it may be necessary to differentiate between these types of clothes. In any case, this aspect may be useful to consider, when the environmental specifications actually are established.

Furthermore, there is the aspect of trade barriers. Production related requirements are incompatible with WTO rules at present, meaning that criteria directly related to the production process cannot be set as they may be subject to trade barriers. Consequently, no baseline requirements can be set for aspects like emissions to air and water as these in general are directly related to the production processes. The problem is, however, that in principle almost anything can be argued as a trade barrier. In the case of the EU Flower the American farmers have argued that setting criteria for which pesticides that must not be measurable in the cotton fibres after fibre production is a trade barrier. This means that possible trade barriers will rule out many possible baseline requirements. According to WTO rules it is possible to establish requirements for the final product but it is a grey area. Requirements must still be "justifiable" and when are requirements justifiable? One can for example argue that requirements are justifiable, when the EU has discussed them.

Given the current situation for trade rules (WTO rules) it therefore seems to be a better approach to eliminate requirements that are or may be subject to trade barriers. As mentioned the discussion of trade barriers is a large grey area, but in this project it has been chosen to define requirements related directly to the production process (e.g. emission to water and air), and requirements related to fibres as requirements that may be subject to trade barriers. In contrast, requirements related to the final product are not considered as possible trade barriers.

All these aspects have to be kept in mind in the process of setting environmental baseline requirements for textiles.

In the following, it is discussed whether or not it is possible to set an environmental baseline requirement for the different areas as listed in Table 5.1. For each aspect it is discussed what the requirement or the limit value in this case should be. A discussion about the difficulty in verifying the requirement suggested is also included. This means, however, that an environmental baseline requirement is suggested for each aspect if possible or reasonable. The total list of requirements is therefore long, and it will be necessary to select a limited number of requirements that will be used as environmental baseline requirements, in order to reach a verification process that is not too expensive or comprehensive, and in order to reach the goal of 80-90% of the products on the market must be able to comply with the set requirements.

The baseline requirements established in this project is set on the basis of information available in the literature (the Internet). This means that information such as eco-labelling criteria, the BREF document on best available technique for textile processing and some measurements of contents of chemicals in textiles have been used. The measurements are not representative of all textile products on the markets as the surveys are fairly small, but they can give some indication of the limit values. Of course, if it was possible to get access to test reports for textiles, this would be a better background material for establishing environmental baseline requirements. For example measurements carried out for the almost 3000 companies, that today have the Oeko-Tex label, even though one must assume that only companies, that count on being able to comply with the criteria, will apply. However, testing facilities are in possession of confidential material, which they are not allowed to distribute, and it has not been possible within the budget frame of this project to include their expertise.

5.3.1 Textile fibres

5.3.1.1 Acrylic fibres

Acrylic fibres are man-made fibres obtained by polymerisation of the polymer acrylonitrile (p.18; EC IPPC, 2003). The residue of acrylonitrile in the raw fibres and the emission to air of acrylonitrile are thus related to the specific production process and are therefore unsuitable for an environmental baseline requirement.

For acrylic fibres, the different labelling schemes have set criteria for:

- Residual acrylonitrile content in raw fibres.
- Emission to air of acrylonitrile.

The EU Flower is the only eco-labelling scheme that at present has set criteria for acrylic fibres.

No environmental baseline requirement is set for acrylic fibres.

5.3.1.2 Cotton and other natural cellulosic seed fibres

For cotton and other natural cellulosic fibres the different labelling schemes have set criteria for:

- Content of pesticides in fibres

The EU Flower has set limit values for certain pesticides in cotton fibres. The Swan bans the use of pesticides for the cultivation of cotton.

Other eco-labelling schemes, e.g. Oeko-Tex and TOXPROOF chooses instead to set limit values for the content of pesticides in the finished textile product. This is more in line with the goal to develop environmental baseline requirements that can be verified by testing a product. It is possible to set an environmental baseline requirement concerning the pesticide content in the finished textile product and in this way restrict the use of pesticides during cultivation of the fibres. This aspect is therefore discussed later on in section 5.3.2.15 “Finished textile products”.

No environmental baseline requirement is set for cotton fibres.

5.3.1.3 Elastane

Elastane is man-made fibres made out of an elastomer containing polyurethane with the use of possible catalysts like tributyl tin and toluene diisocyanates. (p.18; EC IPPC, 2003), (p.25; EU Flower BD, 2002).

For elastane the different labelling schemes have set criteria for:

- Use of organic tin compounds
- Emission to air of aromatic diisocyanates

The EU Flower is the only eco-labelling scheme that at present has set criteria for elastane. IVN mention elastane in their criteria, but do only set criteria for a limited use of elastane in textile products.

The EU Flower and the Swan ban the use of organic tin compounds in general during transportation and storage of products. However, the Eco Mark (Japan), Oeko-Tex and TOXPROOF have set limit values for the content of organic tin compounds in the finished textile product.

The criteria set for elastane are related to the specific production process and are therefore unsuitable for an environmental baseline requirement.

However, using the content of organic tin compounds in the finished textile product, as a way to set an environmental baseline requirement, is discussed later on in section 5.3.2.15 “Finished textile products”.

No environmental baseline requirement is set for elastane fibres.

5.3.1.4 Flax and other bast fibres

For flax and other bast fibres the different eco-labelling schemes have set criteria for:

- Emission to water of oxygen demanding substances (TOC/COD)
- Retting of flax
- Use of pesticides

The EU Flower, the Swan, IFOAM and KRAV have set criteria for flax and other bast fibres. Retting of flax is permitted if the COD or TOC emission to water is reduced considerably. The Swan is the only label that bans the use of pesticides (pesticides in general) for the cultivation of flax and other bast fibres.

The criteria set for flax and other bast fibres are primarily related to the specific production process and are therefore unsuitable for environmental baseline requirements.

However, it may be possible to set an environmental baseline requirement concerning the pesticide content in the finished textile product and in this way possibly restrict the use of pesticides during cultivation of the fibres. This aspect is discussed later on in section 5.3.2.15 “Finished textile products”.

The emission to water of oxygen demanding substances is a general environmental problem in the textile industry because of the use of wet processing. In fact, the discharge of water and the chemical load it carries is the biggest environmental problem in textile processing (p.ii; EC IPPC, 2003). One solution could therefore be to set an environmental baseline requirement regarding the wastewater treatment – either an appropriate wastewater treatment on site or connected to a local or public wastewater treatment plant. However, this criterion is in conflict with the goal to focus on aspects, which can be verified by testing a product. Furthermore, such a criterion is related to the specific production process. Therefore, no environmental baseline requirement is developed concerning emission to water of oxygen demanding substances for this type or other types of fibres.

No environmental baseline requirement is set for flax and other bast fibres.

5.3.1.5 Greasy wool and other keratin fibres

For greasy wool and other keratin fibres the different eco-labelling schemes have set criteria for:

- Content of pesticides in fibres
- Emission to water of oxygen demanding substances (TOC/COD) from wool washing
- Temperature and pH of effluent from wool washing
- Solvent based washing of wool.
- Biodegradable tensides for scouring/washing of wool

The EU Flower, the Swan and IVN have set limit values for certain pesticides in greasy wool and other keratin fibres. The EU Flower, the Swan, and Good Environmental Choice have set criteria for COD emission to water. Furthermore, the EU Flower has set limit values for temperature and pH of the effluent from wool washing. The Swan has banned the use of solvent based washing of wool. Good Environmental Choice, IFOAM and KRAV demands that surfactants used for wool washing must be easily biodegradable.

The criteria set for greasy wool and other keratin fibres are primarily related to the specific production process and are therefore unsuitable for environmental baseline requirements.

However, it may be possible to set an environmental baseline requirement concerning the pesticide content in the finished textile product and in this way possibly restrict the use of pesticides during processing of the fibres. This aspect is discussed later on in section 5.3.2.15 “Finished textile products”.

The use of chemicals, e.g. such as surfactants/tensides, which are not easily biodegradable is a general environmental problem in the textile industry, because of the use of wet processing. One solution could therefore be to set an environmental baseline requirement regarding the biodegradability of the chemicals used, e.g. that the chemicals must be easily biodegradable according to e.g. OECD 301 A. However, this criterion is in conflict with the goal to focus on aspects, which can be verified by testing a product. Furthermore, Eco-labelling Denmark informs that this criterion in the EU eco-labelling scheme is one of the more difficult criteria to comply with, as many chemicals used are not sufficiently biodegradable. Therefore, no

environmental baseline requirement is developed concerning the biodegradability of chemicals. This issue is also discussed in section 5.3.2.1 "Auxiliary chemicals".

No environmental baseline requirement is set for greasy wool and other keratin fibres.

5.3.1.6 Man-made cellulose fibres (viscose, cupro, etc.)

For man-made cellulose fibres the different eco-labelling schemes have set criteria for:

- AOX (absorbable halogenated hydrocarbons) level in fibres
- Emission of sulphur to air
- Emission of zinc to water
- Emission of copper to water
- Emission to water of oxygen demanding substances (TOC/COD)
- Use of chlorine based bleaching chemicals

The EU Flower and the Swan have set criteria for AOX levels in the fibre, emissions of sulphur to air and emission of zinc to water. Furthermore, the EU Flower has set criteria for the emission of copper to water. The Swan and Good Environmental Choice have banned the use of chlorine based bleaching agents for bleaching of cellulose. Finally, the Swan has set criteria for COD emissions to water.

The criteria set for man-made cellulose fibres are primarily related to the specific production process and are therefore unsuitable for environmental baseline requirements.

According to the BREF document bleaching is normally not applied for synthetic fibres (p.121; EC IPPC, 2003), and it is possible to lower the use of chlorine based bleaching chemicals. According to the BREF document it is still claimed that use of chlorinated bleaching agents (sodium hypochlorite) is necessary for high whiteness and for fabrics that are fragile and would suffer from depolymerisation. In these cases it is possible to carry out a two-step bleaching process in order to reduce the level of AOX. In the first bleaching step hydrogen peroxide is used, and finally sodium hypochlorite is used (p.vi; EC IPPC, 2003).

No environmental baseline requirement is set for man-made cellulose fibres.

5.3.1.7 Polyamide

Polyamide is a man-made fibre, where the starting polymer is made out of a polycondensation reaction between a diamine and a dicarboxylic acid (p.17; EC IPPC, 2003), which causes the emission of N₂O.

For polyamide the different eco-labelling schemes have set criteria for:

- Emission of nitrous oxide (N₂O) to air
- Solvent-free spinning methods or recycling of solvents

The EU Flower, the Swan, and Good Environmental Choice have set criteria for polyamide. The EU Flower has only set criteria for the emission of nitrous oxide, Good Environmental choice has set criteria for recycling of solvents during spinning, and the Swan has set criteria for both areas (but demands use of solvent-free spinning methods in stead of recycling of solvents).

The criteria set for polyamide are primarily related to the specific production process and are therefore unsuitable for an environmental baseline requirement.

No environmental baseline requirement is set for polyamide.

5.3.1.8 Polyester

Polyester is a man-made fibre based on a glycol (either ethylene, butyl or trimethylene glycol). Three polyester polymers are available today (PET, PBT and PTT). (p.17; EC IPPC, 2003). For the production of polyester a catalyst is needed for the polycondensation. According to the background document for the revision of the EU Flower criteria, 90% of all polyester is produced by use of antimony catalysts (e.g. antimony trioxide), because of economic reasons. (p.37; EU Flower BD, 2002).

For polyester the different ecolabelling schemes have set criteria for:

- No use of halogenated monomers during manufacturing of polyester
- Emission of VOC (volatile organic carbons) to air
- Solvent-free spinning methods or recycling of organic solvents
- Content of antimony in fibres
- Use of halogenated carriers

The EU Flower and the Swan have set criteria for the emission of VOC to air and to the content of antimony in the fibres. The Swan and Good Environmental Choice have set criteria for the spinning methods used. Furthermore, the EU Flower has set criteria for the use of halogenated carriers (banned) and Good Environmental Choice has set criteria for the use of halogenated monomers during manufacturing (banned).

The first three mentioned criteria set for polyester are primarily related to the specific production process and are therefore unsuitable for an environmental baseline requirement. Therefore, only the last two mentioned criteria for antimony and halogenated carriers are discussed.

Antimony

The primary source for antimony in the finished textiles is the use of antimony as a catalyst for polyester production. However, antimony may also be used with halogens in halogen-containing flame-retardants and some inorganic pigments are derivatives of antimony. (p.503, 534; EC IPPC, 2003).

The Flower and the Swan have set a limit value of 260 and 300 ppm respectively for the content of antimony in the polyester fibres. IVN, Skal, Oeko-Tex and TOXPROOF have all set a criterion for the content of antimony in the final textile product. The limit values set are 0.2, 20, 30 and 1 ppm respectively (see appendix B).

According to the EU Flower Background Document samples from polyester fibres all over the world show that 78% of the measured polyester fibres contain less than 300 ppm antimony. If the limit value is much lower than this, it is stated that there may be a problem for polyester fibres of recycled origin to comply with the criteria. (p.38; EU Flower BD, 2002). If an environmental baseline requirement should be set for antimony in the polyester fibre, the limit value should therefore be 300 ppm as about 80% of the products on the market should be able to comply with this criterion, including recycled fibres.

However, setting a limit value for the polyester fibres is in conflict with the goal to develop environmental baseline requirements that can be verified by testing a product. For this reason

it will be more obvious to set a limit value for the finished textile product. This will, on the other hand, be a more arbitrary limit, as it may be a question of the degree of the use of wet-processing of the fibres that determines the level of antimony being washed out, and thereby the content of antimony in the finished textile product. The content of antimony are higher in the fibres than in the finished textile product, simply because much of the antimony is emitted in the wet processing steps.

In spite of this fact, it is suggested to set an environmental baseline requirement for antimony in the finished textile product in order to fulfil the goal of being able to verify the requirements by testing a product. The antimony level in the finished textile product is discussed in section 5.3.2.15 "Finished textile products".

Halogenated carriers

Carriers are used as dyeing accelerators in the batch dyeing of synthetic fibres (especially polyester fibres) to promote the absorption and diffusion of dyes into the fibres under low-temperature conditions. Carriers are still important for dyeing of blended fibres of polyester and wool, as wool cannot withstand dyeing at high temperatures. Chlorinated carriers are toxic to humans and to aquatic organisms, and are not easily biodegradable. (p. 497; EC IPPC, 2003), (p.59; Danish EPA No. 534, 2000).

Only the EU Flower has set criteria for the use of halogenated carriers for polyester fibres. However, IFOAM and KRAV have a general ban on chlorinated carriers, and Oeko-Tox and TOXPROOF specifies that certain chlorinated carriers must be below a certain limit in the finished textile product.

Setting a general ban of the use of halogenated carriers is in conflict with the goal to develop environmental baseline requirements that can be verified by testing a product. For this reason it will be more obvious to set a limit value for the finished textile product. Such a requirement is discussed in section 5.3.2.15 "Finished textile products" instead.

5.3.1.9 Polypropylene

Polypropylene is a man-made fibre based on propylene.

For polypropylene the different eco-labelling schemes have set criteria for:

- Use of lead-based pigments

The EU Flower is the only eco-labelling schemes that have set criteria for polypropylene (or for the use of lead-based pigments).

The criterion set for polypropylene is primarily related to the specific production process and is therefore unsuitable for an environmental baseline requirement. Furthermore, it is possible to set an environmental baseline requirement for the residue of lead in the finished textile product, and thereby restrict the use of lead-based pigments.

Therefore, no environmental baseline requirement is set for polypropylene. The issue is discussed in section 5.3.2.15 "Finished textile products" instead.

5.3.1.10 Silk

For silk the different eco-labelling schemes have set criteria for:

- Biodegradable tensides for de-gumming of silk
- Emission of oxygen demanding substances (COD/TOC) for processing of silk
- Waste water treatment for de-gumming of silk
- Use of metal salts

Good Environmental Choice and IFOAM have all set criteria for use of easily biodegradable tensides for the de-gumming of silk. Furthermore, Good Environmental choice demands a reduction of the COD emission in the effluent, whereas IFOAM and KRAV demands use of acceptable wastewater treatment plants. Finally, Good Environmental Choice and KRAV ban the use of metal salts for treatment (pickling) of silk.

The criteria set for silk are primarily related to the specific production process and are therefore unsuitable for an environmental baseline requirement. Furthermore, it is possible to set environmental baseline requirements for the residues of metal in the finished textile product, and thereby restrict the use of metal salts. Finally, silk only accounts for 0.2% of the total fibre production (p.20; EC IPPC, 2003).

Therefore, no environmental baseline requirement is set for silk.

5.3.2 Processes and chemicals

5.3.2.1 Auxiliary chemicals

For auxiliary chemicals the different eco-labelling schemes have set criteria for:

- Biodegradability (size, detergents, fabric softeners, complexing agents, plasticisers, antistatic agents, enzymes, thickeners)
- Ban of certain chemicals (e.g. APEO, LAS, EDTA, DTAMAC, DSDMAC, DHTDMAC)

Biodegradability of chemicals

The EU Flower has set criteria for certain chemicals (size, detergents, fabric softeners, complexing agents, spinning oils) being easily biodegradable. The Swan has only set a similar criterion for adhesive dressing, whereas Good Environmental Choice also demands that a long list of chemicals for different purposes must be easily biodegradable (surfactants, plasticisers, antistatic agents, enzymes, thickeners, softeners, spinning and knitting oils, waxes, and size). In addition, IFOAM (for tensides, spinning oil and waxes, Skal (for detergents) and KRAV (for spinning oils and waxes, size, enzymes and thickeners) have set a similar criterion.

Furthermore, IFOAM set certain limits for the biodegradability of the chemicals. The more toxic the chemicals are to aquatic organisms the more biodegradable the chemicals must be. Only chemicals harmful or toxic to aquatic organisms (R52 or R51) must be used. Very toxic substances to aquatic organisms are not allowed (R50)). IVN and KRAV have set similar limits for chemicals harmful or toxic to aquatic organisms.

Some eco-labelling schemes (the Swan, Good Environmental Choice, IFOAM, Skal, and KRAV) even demand that e.g. size or detergents must be ultimately biodegradable or must be recycled to a certain extent.

The use of chemicals, e.g. such as surfactants/tensides and size, which are not easily biodegradable is a general environmental problem in the textile industry, because of the use of

wet processing. One solution could therefore be to set an environmental baseline requirement regarding the biodegradability of the chemicals used, e.g. that the chemicals must be easily biodegradable according to OECD 301 A, OECD 302 A or similar. Another solution could be to demand an effective reuse of some chemicals, e.g. reuse of size (of at least 75%). Finally, a requirement of appropriate wastewater treatment could be a solution even though this solution does not solve the problem of not easily or slowly biodegradable chemicals in the aquatic environment.

However, all these aspects are in conflict with the goal to focus on aspects, which can be verified by testing a product and some may be difficult to verify. In addition, the chemicals are auxiliary chemicals and therefore production related, and may not appear in the final textile product. Furthermore, Eco-labelling Denmark informs that the criterion about biodegradability of some chemicals in the EU eco-labelling is one of the more difficult criteria to comply with, as many chemicals used by the companies are not sufficiently biodegradable. Because of the difficulty to comply with this criterion, and because of such a requirement being in conflict with the goal to focus on aspects, which can be verified by testing a product, no environmental baseline requirement is developed concerning the biodegradability of chemicals.

Ban of certain chemicals

Many of the eco-labelling schemes have banned the use of certain chemicals or at least restricted the use to less than 1 or 5% as a content in chemicals. Most of them can be found in appendix B.

APEO (alkyl phenol ethoxylates) and LAS (linear alkylbenzene sulphonate) are the chemicals banned or restricted in use by most of the eco-labelling schemes (the EU Flower, the Swan, Good Environmental Choice, IFOAM, IVN, and KRAV). APEO⁸ and LAS are both substances, which are not easily biodegradable.

Surfactants and softeners like DADMAC, DTDMAC, DSDMAC, DHTDMAC⁹ are also banned or restricted by some eco-labelling schemes (EU Flower or the Swan, IFOAM, IVN and KRAV). The substances are all toxic to aquatic organisms.

Furthermore, the complex builder EDTA (ethylene diamine tetra acetate) is banned or restricted by several eco-labelling schemes (the EU Flower, the Swan, Good Environmental Choice, IFOAM, IVN, and KRAV). EDTA is harmful to aquatic organisms and is poorly biodegradable.

All the above substances are banned or at least restricted because of their environmental properties. However, setting an environmental requirement for the degradability of chemicals would automatically restrict most of them. Furthermore, use of APEO – nonylphenol ethoxylate in specific – has been banned with regard to textile processing by an EU directive (Directive 2003/53/EC, 2003).

However, as discussed above, setting such a requirement is in conflict with the goal to focus on aspects, which can be verified by testing a product. Furthermore, the companies find it difficult to comply with the existing criterion set by the EU Flower. As the environmental baseline requirement must be developed so 80-90% of the companies can comply with them, no environmental baseline requirement is set for this issue.

⁸ In the case of APEO it is a question of nonylphenolethoxylat, which APEO's are degraded to, that are not easily biodegradable.

⁹ The abbreviation DMAC stands for dimethyl ammonium chloride.

5.3.2.2 Spinning oils and additives

For spinning oils and additives the different eco-labelling schemes have set criteria for:

- Biodegradability
- Content of PAH (polycyclic aromatic hydrocarbons) in the mineral oil proportion

The issue of biodegradability of chemicals in general has been discussed above in section 5.3.2.1 “Auxiliary chemicals” and will therefore not be mentioned any further.

With regard to the content of PAH's in the mineral oil proportion of the spinning and knitting oils, it is only the EU Flower and the Swan that has set limit values for this issue. The PAH content in the mineral oil proportion of the spinning and knitting oil must be below 1%. The PAH content is restricted because PAHs are carcinogenic.

This criterion is only valid for spinning and knitting oils in the Swan, but is defined more broadly in the EU Flower – the criterion apply for auxiliaries and finishing agents for fibres and yarns.

According to the BREF document on BAT for the textile industry, mineral oil based spinning lubricants (spinning oils) have been used universally in the wool sector. Mineral oils have now largely been replaced with formulations based on glycols and it is stated that this trend continues. In the carpet sector the use of mineral oil-based lubricants is reported to have been in decline for some years, which indicates that carpet yarn of commercial quality can be produced without the use of mineral-oil based lubricants. It is stated that this also must be valid for the textile sector. (p.246,247; EC IPPC, 2003).

In the ANEC report it is stated that the criterion set by the EU Flower and the Swan is achievable, because a manufacturer of knitting oils reports that the normal content of PAH's is between 1 and 3%, but closest to 1%. (p.43; AEAT, 2003).

This information suggests that spinning oils based on mineral oils are slowly going out of use. However, the BREF document suggests that the driving force for implementation of substitutes for mineral oil-based lubricants should be environmental legislation (p.247; EC IPPC, 2003). According to the report by the European Consumers' Organisation (p.76; Beuc, 2004) PAHs are not regulated by any legislation. As the mineral oils are not easily biodegradable, the environment would benefit from a general ban on the use of mineral-oil based spinning oils, as alternatives exists. However, such a requirement may not be able to live up to the goal of 80-90% of the products on the market being able to comply with the requirement. In addition, if the principle of avoiding production related requirements, an environmental baseline requirement should not be set for use of PAH's in the mineral oil proportion of auxiliary products. It does not seem possible to define a requirement for PAH's in the finished textile products as PAH's only are used as auxiliary chemicals. Therefore no environmental baseline requirement is set for the content of PAH's in the mineral oil proportion of the chemicals.

5.3.2.3 Biocidal or biostatic products

For biocidal or biostatic products the different ecolabelling schemes have set criteria for:

- Use of chlorophenols during transportation or storage of products
- Use of PCB (polychlorated biphenyls) during transportation or storage of products
- Use of organotin compounds during transportation or storage of products

Chlorophenols

Chlorophenols are biocides that are used to preserve the textiles during transport and storage.

The EU Flower, the Swan, Good Environmental Choice (only pentachlorophenol), and IVN ban the use of chlorophenols during transportation and storage.

Environmental Label of Croatia, Thai Green Label, Oeko-Tex and TOXPROOF all sets limit values for chlorophenols in the finished textile products. The limit values set are 0.1 ppm for the Environmental Label of Croatia and 0.5 ppm (0.05 ppm for baby textiles) for the other mentioned labelling schemes.

Many of the chlorophenols (di-, tri-, tetra-, and pentachlorophenols) are classified as possibly carcinogenic to humans (IARC group 2B). The use of chlorophenols will therefore be covered by an environmental baseline requirement of banning carcinogenic substances in general during all processing steps of the textile fibres and the textile products. This may, however, be complicated to verify as the textile industry consists of a long supply chain – typically different suppliers involved for each processing step. The easiest way will therefore be to test for the content of the chlorophenols in the finished textile product, which also is more in line with the goal of the developed environmental baseline requirements.

No environmental baseline requirement is therefore set for the use of chlorophenols during production. The residue of chlorophenols in the finished textile product is discussed under section 5.3.2.15 "Finished textile products".

Polychlorinated biphenyls

The EU Flower and the Swan are the only eco-labelling schemes banning the use of polychlorinated biphenyls (PCB).

Polychlorinated biphenyls are grouped as IARC group 2A, meaning that they are probably carcinogenic to humans. The use of PCB will therefore be covered by an environmental baseline requirement of banning carcinogenic substances in general during all processing steps of the textile fibres and the textile products. This may, however, be problematic to verify. The easiest way is to test for the content of PCB in the finished textile product, but none of the reviewed eco-labelling schemes do that.

No environmental baseline requirement is therefore set for the use of PCB's.

Organic tin compounds

The EU Flower and the Swan are banning the use of organic tin compounds in general, whereas the Eco Mark of Japan, Oeko-Tex and TOXPROOF have set limit values for certain organic tin compounds in the finished textile product. The limit value set by Oeko-Tex is 1.0 ppm and 0.05 ppm for TOXPROOF.

It is suggested to set a general environmental baseline requirement for tin, instead of the specific organic tin compounds. In this way, such a requirement will restrict both the use of organic tin compounds and pigments or dyes based on tin. Such a requirement is discussed in section 5.3.2.15 "Finished textile products".

5.3.2.4 Stripping or depigmentation

For stripping or depigmentation the different ecolabelling schemes have set criteria for:

- Use of heavy metal salts
- Use of formaldehyde

The EU Flower is the only eco-labelling scheme that bans the use of heavy metal salts (except for iron) for stripping or depigmentation.

The EU Flower bans the use of formaldehyde for stripping or depigmentation whereas IVN has a general ban on use of formaldehyde as a textile processing agent.

Use of heavy metal salts and formaldehyde for stripping or depigmentation is a process related criteria and is therefore not considered for development of an environmental baseline requirement. Furthermore, the survey of bed linen products (Danish EPA, 2004) shows that all the investigated products would comply with this criterion as none of the products have been produced with the use of a stripping or depigmentation step, except for one product, and in this case no heavy metal salts or formaldehyde have been used.

Therefore, no environmental baseline requirement is set for stripping or depigmentation.

5.3.2.5 Weighting

For weighting the different ecolabelling schemes have set criteria for:

- Use of cerium compounds

The EU Flower is the only eco-labelling scheme that has set a criterion for the use of cerium compounds. No cerium compounds are allowed in the weighting of yarn or fabrics. Weighting is a process step only relevant for silk.

Use of cerium for weighting of silk is a process related criteria and is therefore not considered for development of an environmental baseline requirement. Furthermore, weighting with cerium is not mentioned as a possible weighting agent in the BREF document on best available techniques in the textile industry (p.55; EC IPPC, 2003). Other weighting chemicals such as tin tetrachloride and methacrylamide are mentioned in stead. Finally, silk only accounts for 0.2% of the total fibre production (p.20; EC IPPC, 2003).

Therefore, no environmental baseline requirement is set for weighting of silk.

5.3.2.6 Bleaching

For bleaching the different ecolabelling schemes have set criteria for:

- Emission of AOX (absorbable halogenated hydrocarbons) to water
- Use of chlorine based bleaching chemicals

The EU Flower and Oeko-Tex 1000 are the only eco-labelling schemes that have set a limit value for emission of AOX in the bleaching effluent.

The Swan bans the use of chlorine based bleaching agents, but only for man-made cellulose fibres. Good Environmental Choice, the Thai Green Label, IFOAM and KRAV also ban the use of chlorinated bleaching agents in general.

Emission of AOX to water because of chlorinated bleaching is a process related criteria and is therefore not considered for development of an environmental baseline requirement. However, bleaching is normally not applied for synthetic fibres (p.121; EC IPPC, 2003), and today hydrogen peroxide is the preferred bleaching agent for cotton and cotton blends (p.293; EC IPPC, 2003). This is also indicated by the Danish survey on cotton bed linen products, where all the investigated products were bleached with hydrogen peroxide (Danish EPA, 2004). According to the BREF document it is still claimed that use of chlorinated bleaching agents (sodium hypochlorite) is necessary for high whiteness and for fabrics that are fragile and would suffer from depolymerisation. In these cases it is possible to carry out a two-step bleaching process in order to reduce the AOX emissions. In the first bleaching step hydrogen peroxide is used, and finally sodium hypochlorite is used (p.vi; EC IPPC, 2003).

Therefore, no environmental baseline requirement is set for bleaching.

5.3.2.7 Dyeing

For dyeing the different ecolabelling schemes have set criteria for:

- Ionic impurities in dyes for several metals
- Use of chrome mordant dyeing
- Use of azo-based dyes
- Use of dyes that are carcinogenic, mutagenic, or toxic to reproduction
- Use of potentially sensitising dyes
- Emission to water of certain metals
- Fixation degree for use of metal complex dyes
- Use of urea

Ionic impurities in dyes

The EU Flower, IFOAM, IVN, Skal, and KRAV have set limit values for the ionic impurities in dyes for several metals, whereas the Swan, the Thai Green Label, Oeko-Tex and TOXPROOF have set limit values for metal residues in the finished textile products in stead.

In order to fulfil the goal of focusing on aspects, which can be verified by testing a product, no environmental baseline requirement is set for the ionic impurities in dyes. In stead a requirement is set for the metal residues in the finished textile product, in line with Oeko-Tex and TOXPROOF. See section 5.3.2.15 "Finished textile products".

Use of chrome mordant dyeing

The EU Flower bans the use of chrome mordant dyeing, whereas Eco Mark (Japan) bans the use of chrome mordant dyeing except in wool. In contrast, the Swan, the Thai Green Label, IVN, Skal, Oeko-Tex and TOXPROOF set limit values for the residues of chromium in the finished textile product.

In order to fulfil the goal of focusing on aspects, which can be verified by testing a product, no environmental baseline requirement is set for chrome mordant dyeing. In stead a requirement is set for the residue of chrome in the finished textile product, which automatically will restrict the use of chrome mordant dyeing, as the chrome residue in the finished textile products will be too high. See section 5.3.2.15 "Finished textile products".

Use of azo-based dyes

Almost every eco-labelling scheme bans the use of azo-based dyes, which on decomposition gives rise to one or more carcinogenic amines. However, according to European legislation such azocolourants are not to be used in textiles and leather articles, which may come into direct and prolonged skin contact. The specific azocolourants must not be found in detectable concentrations (i.e. above 30 ppm) in the finished article. An exception is made for products of recycled fibres until 1 January 2005, where the limit value is 70 ppm.

The requirement for azocolourants is listed as an adaptation to the “Council Directive 76/769/EEC of 27 July 1976 on the approximation of the laws, regulations and administrative provisions on the Member States relating to restrictions on the marketing and use of certain dangerous substances and preparations”. The first amendment was adopted July 2002, and the most recent in February 2004. (Commission Directive 2004/21/EC), (Commission Directive 2003/3/EC), (Directive 2002/61/EC).

Oeko-Tex and TOXPROOF both demands an analysis of the content of these amines in the finished textile product. The limit value for Oeko-Tex is set at 20 ppm and at “detection limit” in TOXPROOF.

As the use of azo dyes are restricted by European legislation there is no point in developing an environmental baseline requirement for this issue.

Use of dyes that are carcinogenic, mutagenic, or toxic to reproduction

The EU Flower bans the use of dyes that are carcinogenic, mutagenic or toxic to reproduction. The Swan, Good Environmental Choice, Environmental Label Croatia, IFOAM, IVN, and KRAV ban the use of such chemicals in general. Eco Mark (Japan) and Oeko-Tex only ban the use of carcinogenic dyes.

However, this aspect falls under the general requirement of carcinogenic and mutagenic substances or substances that are toxic to reproduction, which is described under section 5.3.2.14 “Chemicals in general”.

Use of potentially sensitising dyes

The EU Flower, Eco Mark (Japan), IFOAM, and KRAV ban the use of sensitising or allergenic dyes. Good Environmental Choice, Environmental Label (Croatia), and IVN ban the use of sensitising or allergenic chemicals in general. Oeko-Tex and TOXPROOF bans the use of sensitising or allergenic dyes by setting a limit value of not detectable in the finished textile product.

Use of sensitising or allergenic substances is an important health aspect as many of the textiles are worn with direct skin contact. This may be reason enough to set an environmental baseline requirement for this issue.

There are two ways of setting an environmental baseline requirement for this issue. Either all substances with the risk phrases R42 (“May cause sensitisation by inhalation”) and R43 (“May cause sensitisation by skin contact”) are banned (or just the potentially sensitising dyes in question) in line with carcinogenic substances, or the potentially sensitising dyes in question are restricted by testing the finished textile product in line with the Oeko-Tex requirement.

To use the risk phases may be a cheaper approach and may eliminate the need for updates of which substances/dyes that are considered to be potentially sensitising. On the other hand Oeko-Tex update their criteria frequently and it is therefore possible to refer to their criteria.

The environmental baseline requirement is therefore discussed in more details in section 5.3.2.15 “Finished textile products” in stead.

Emission to water of certain metals

The EU Flower is the only eco-labelling scheme that has set limit values for the emission of copper, chromium and nickel to water after dyeing with metal complex dyes.

The emission to water of these metals is a process specific requirement and is therefore not considered for development of an environmental baseline requirement.

Fixation degree of use of metal complex dyes

The EU Flower and KRAV have set a limit value for the fixation degree of the use of metal complex dyes.

Setting criteria for the fixation degree of the dyes is also a way to set criteria for the emission of metals to water. The dyes that are not fixed to the textiles are removed by washing the textiles after the dyeing process (p.59; EC IPPC, 2003). The fixation of dyes is a process specific requirement and is therefore not considered for development of an environmental baseline requirement.

Use of urea

Good Environmental Choice and KRAV are the only eco-labelling schemes that ban the use of urea for dyeing.

Urea is added to act as a solvent for the dye during fixation process or to increase the solubility of the dye. Urea hydrolyses to ammonia in waste water and thereby contributes to eutrophication (p.62-63,181; EC IPPC, 2003). An alternative dyeing process, which is urea-free, is described in the BREF document and it is concluded that BAT is to avoid the use of urea. The alternative dyeing process does, however, require new investments (p.xvi,326-329; EC IPPC, 2003). Even though the alternative process seem to be more cost effective, it seems unreasonable to set an environmental baseline requirement for restrictions of urea at this moment, as urea free dyeing today is described as BAT.

No environmental baseline requirement is set for the use of urea for dyeing.

5.3.2.8 Printing

For printing the different ecolabelling schemes have set criteria for:

- VOC (volatile organic carbons) content in printing paste
- Water-based printing
- Use of aromatic solvents
- Plastisol-based printing
- Use of urea
- Handling of residues of printing paste (recycling or waste)

VOC content in printing paste

The EU Flower and KRAV restrict the use of VOC's in printing paste to 5%.

According to the BREF document printing pastes with low-emissions of VOC or printing pastes containing no VOC at all do exist and they can be used in existing installations. The level of dissemination is not mentioned, but BAT is described as using low emission VOC printing pastes (p. 360-362; EC IPPC, 2003). Nevertheless, no environmental baseline requirement is set as such a requirement is in conflict with the goal of focussing on aspects, which can be verified by testing the finished textile product.

Water-based printing

Good Environmental Choice has set a criteria that only allows the use of water-based printing. IFOAM and KRAV only allow water-based printing or printing methods based on natural oils.

Water-based printing is a specific production process and is therefore unsuitable for an environmental baseline requirement.

Use of aromatic solvents

IFOAM bans the use of aromatic solvents used for printing and KRAV sets a maximum limit of a content of 5% aromatic solvents in printing paste.

Aromatic solvents in printing pastes are not mentioned in the BREF document. Typical recipes for different types of printing pastes are given, but none of them indicate a content of aromatic solvents (p.561; EC IPPC, 2003). This could indicate that the use of aromatic solvents is minimal or not normally used. For this reason no environmental baseline requirement is set for this issue. Furthermore, restricting the use of aromatic solvents in printing paste is not in line with the goal of focusing on aspects, which can be verified by testing the final textile product.

Plastisol-based printing

The EU Flower is the only eco-labelling scheme that bans the use of plastisol-based printing.

Plastisol-based printing is printing with the use of a suspension of vinyl chloride polymer or copolymer in a liquid plasticiser, also called PVC printing. (EU Flower background document, 2002).

Oeko-Tex and TOXPROOF limit instead the use of certain PVC plasticisers (see Appendix B) in baby clothes, and the Swan bans the use of chemical products that contain more than 1% phthalates (plasticiser for PVC). IFOAM and KRAV restrict the use of a specific phthalate (DEHP). A maximum of 1% of DEHP is allowed in any chemical.

As it is possible to set an environmental baseline requirement for the finished textile product that will restrict the use of PVC printing, as it done for Oeko-Tex and TOXPROOF, this issue will instead be discussed in section 5.3.2.15 "Finished textile products".

Use of urea

Good Environmental Choice is the only eco-labelling scheme that sets a limit value for the use of urea per kilo textile for colour printing.

Urea is a constituent in some printing pastes. Alternative printing processes, that either eliminate or reduce the amount of urea, are available. The BREF document concludes that BAT is to avoid the use of urea. The alternative printing processes does, however, require new investments, and today it is questionable whether the technique is economically viable for smaller plants (p.xvi,357-360; EC IPPC, 2003). It therefore, seems unreasonable to set an environmental baseline requirement for restrictions of urea at this moment, as urea free printing today is described as BAT.

No environmental baseline requirement is set for the use of urea for printing.

Handling of residues of printing paste

Good Environmental Choice, IFOAM and KRAV demand that residues of printing paste must be handled as solid waste instead of e.g. being washed out with the waste-water.

Residues of printing paste is a typical emission source in the printing process, and is an environmental problem if the residue printing paste is not treated as solid waste (p.iii; EC IPPC, 2003). According to the BREF document it is common or is becoming more common to dispose the residual printing paste separately (p.225; EC IPPC, 2003). Furthermore, the use of the digital technique for printing is gaining ground in the textile industry, which means that printing paste residues are avoided at the end of each run (p.viii; EC IPPC, 2003).

Setting a requirement for handling of residual printing paste is not a requirement that can be verified by testing the final textile product, for which reason, no environmental baseline requirement is set for this issue. The local environmental authorities of the different companies should handle such a requirement.

5.3.2.9 Wet-processing of textiles

For wet-processing of textiles the different eco-labelling schemes have set criteria for:

- Emission of COD to water
- Temperature and pH of effluent
- Connection to waste-water treatment plant
- Emission of phosphor after waste-water treatment
- Emission of heavy metals to water

The EU Flower has set limit values per kilo textile for the emission of COD to water from wet-processing, as well as limit values for the temperature and pH of the effluent, if the effluent is not led to a wastewater treatment plant. The Swan requires that the emission of COD of the effluent is reduced by 90% or has a certain limit value per kilo textile. IFOAM and KRAV require that the wet-processing site is connected to a functional wastewater treatment plant (internally or externally), that pH and temperature regulation is implemented, and that COD and phosphorous emissions are reduced. IFOAM furthermore, requires that the emission of heavy metals is reduced.

As discussed earlier (in section 5.3.2.1 “Auxiliary chemicals”) under the biodegradability of chemicals, the emission of chemicals to water is the biggest environmental problem of the textile industry. It is, however, difficult to set environmental requirements for this issue, as the emissions to water is dependent on the production processes. Furthermore, the requirements set may be difficult to verify. Another way could be to restrict the chemicals used in the wet-processing of the textiles. However, this may be in conflict with the goal to focus on aspects

that can be verified by testing the finished textile product. This is discussed in the appropriate sections for the different chemicals.

Because of requirements for the emission to water is process dependant and because such issues are in conflict with the goal to focus on aspects, which can be verified by testing a product, no environmental baseline requirement is developed concerning the emission to water in wet-processing of textiles.

5.3.2.10 Energy and water use

For energy use and water the different eco-labelling schemes have set criteria for:

- Use of water
- Use of energy

The EU Flower does not require information about water and energy use, but requests the information on voluntary basis for manufacturing sites involved in spinning, knitting, weaving and wet processing. The Swan has set criteria for energy and water use. A plan for minimising electricity and heat consumption must exist for all wet processing plants, and the total energy and water consumption must be documented. IFOAM and KRAV simply demand that the water consumption for wet-processing is measured. Oeko-Tex 1000 also demands that the energy consumption must be measured. Good Environmental choice is the only eco-labelling scheme that sets criteria for the level of energy used (70 MJ/kilo textile).

The use of water and energy is a process specific requirement and is related to the specific production processes. Such requirements are therefore unsuitable for an environmental baseline requirement.

No environmental baseline requirement is set for water and energy use.

5.3.2.11 Flame-retardants

For flame-retardants the different eco-labelling schemes have set criteria for:

- Use of flame-retardants that are carcinogenic, mutagenic, toxic to reproduction or toxic to aquatic organisms

The EU Flower bans the use of flame-retardants that are carcinogenic, mutagenic, toxic to reproduction, and toxic to aquatic organisms. Good Environmental Choice, IVN and TOXPROOF ban the use of flame-retardants in general, whereas the Swan, Eco Mark (Japan), IFOAM, KRAV, and Oeko-Tex ban the use of specific flame-retardants (see Appendix B). Furthermore, several of the eco-label schemes ban the use of carcinogenic, mutagenic substances and substances toxic to reproduction in general.

IFOAM, IVN and KRAV ban the use of substances that are toxic to aquatic organisms (if these do not meet certain biodegradability requirements).

Application of some flame-retardants to the textile fabric requires washing operations after curing, which means that flame-retardants will be part of the water pollution. Especially organo-phosphorous and polybrominated organic compounds are of significant concern with regard to water pollution (p.104; EC IPPC, 2003).

Oeko-Tex restricts the use of three of these organophosphorous and polybrominated organic compounds, whereas all other flame-retardants only must be used in decoration textiles. No

test is carried out for the content of flame-retardants, for which reason it is suggested to use the risk phrases as suggested by the EU Flower as an environmental baseline requirement for flame-retardants – even though this requirement only can be verified by looking at the material safety data sheets for the used flame-retardants.

The specific flame-retardants pentabromodiphenyl ether and octabromodiphenyl ether (i.e. polybrominated organic flame-retardants) are regulated by EU legislation (Directive 2003/11/EC). The two flame-retardants are not to be used as a substance or as a constituent of substances or of preparations in concentrations higher than 0.1%. This directive applies not only to dangerous substances and preparations, but also for articles. However, as only a few (two) flame-retardants are regulated an environmental baseline requirement for flame-retardants should be established.

Flame-retardants that are carcinogenic, mutagenic or toxic to reproduction are included in the set baseline requirement for CMR substances – see section 5.3.2.14 “Chemicals in general”. These general requirements also apply for flame-retardants, but is discussed in details in section 5.3.2.14 “Chemicals in general” (and is therefore not repeated here).

This general category does, however, only cover the CMR effects. In order to avoid the use of flame-retardants that are toxic to the aquatic organisms, an environmental baseline requirement must be set on flame-retardants on this specific issue.

Using the following risk phrases, the environmental baseline requirement for substances toxic to aquatic organisms can be set:

- R50 Very toxic to aquatic organisms
- R51 Toxic to aquatic organisms
- R52 Harmful to aquatic organisms
- R53 May cause long-term adverse effects in the aquatic environment

In order to follow the general approach of setting baseline requirements for the finished textile product, the environmental baseline requirement set for substances toxic to aquatic organisms is defined, as no substances toxic to aquatic organisms must be found in the finished textile product. A limit value of 0.1% is used. It is, however, too comprehensive to test for all possible substances that are toxic to aquatic organisms (and no tests are carried out even for Oeko-Tex), for which reason it is suggested to use the material safety data sheets as a verification method.

The environmental baseline requirement set is:

Aspect	Environmental baseline requirement	Verification
Flame-retardants that are toxic to aquatic organisms	The finished textile products shall not contain substances or preparations in amounts exceeding 0.1% by weight of substances that are assigned with the risk phrases R50, R51, R52 or R53.	All flame-retardants used must be listed and material safety data sheets for all flame-retardants must be provided.

5.3.2.12 Finishes/finishing

For finishes the different eco-labelling schemes have set criteria for:

- Use of finishes that are carcinogenic, mutagenic, toxic to reproduction or toxic to aquatic organisms
- Use of fluorocarbons
- Use of halogenated shrink-resistant substances

Finishes that are carcinogenic, mutagenic, toxic to reproduction or toxic to aquatic organisms
The EU Flower bans the use of finishes substances that are carcinogenic, mutagenic, toxic to reproduction or toxic to aquatic organisms, whereas several of the eco-label schemes ban the use of carcinogenic, mutagenic substances and substances toxic to reproduction in general. IFOAM, IVN and KRAV ban the use of substances that are toxic to aquatic organisms (if these do not meet certain biodegradability requirements).

The term finishing covers all those treatments that give the textile the desired end-use properties such as easy-care treatments, water-repellent treatment, softening treatment, antistatic treatment etc. The finishing agent is applied to the textile, and washing after treatment tends to be avoided, which means that the emission to water is restricted to system losses and to the water used to clean the equipment. The potential system losses are normally in the range of 1 to 5%, but can be up to 50%. Even though the volumes involved are quite small compared to the overall wastewater volume, the emission of finishing substances is problematic. Many of the substances are poorly biodegradable or may also be toxic. (p.99-105; EC IPPC, 2003). For this reason an environmental baseline requirement is set for finishing substances in general – in line with the requirement set for flame-retardants, in order to avoid finishing agents that are toxic to aquatic organisms.

Finishing substances that are carcinogenic, mutagenic or toxic to reproduction are included in the set baseline requirement for CMR substances – see section 5.3.2.14 “Chemicals in general”. These general requirements also apply for finishes, but is discussed in details in section 5.3.2.14 “Chemicals in general” (and is therefore not repeated here).

This general category does, however, only cover the CMR effects. In order to avoid the use of finishes that are toxic to the aquatic organisms, an environmental baseline requirement must be set on finishes on this specific issue.

Using the following risk phrases, the environmental baseline requirement for substances toxic to aquatic organisms can be set:

- R50 Very toxic to aquatic organisms
- R51 Toxic to aquatic organisms
- R52 Harmful to aquatic organisms
- R53 May cause long-term adverse effects in the aquatic environment

In order to follow the general approach of setting baseline requirements for the finished textile product, the environmental baseline requirement set for substances toxic to aquatic organisms is defined, as no substances toxic to aquatic organisms must be found in the finished textile product. A limit value of 0.1% is used. It is, however, too comprehensive to test for all possible substances that are toxic to aquatic organisms, for which reason it is suggested to use the material safety data sheets as a verification method.

The environmental baseline requirement set is:

Aspect	Environmental baseline requirement	Verification
Finishing substances or preparations that are toxic to aquatic organisms	The finished textile products shall not contain substances or preparations in amounts exceeding 0.1% by weight of substances that are assigned with the risk phrases R50, R51, R52 or R53.	All finishing substances used must be listed and material safety data sheets for all finishing substances must be provided.

Use of fluorocarbons

Good Environmental Choice bans the use of treatment with fluorocarbons in the finishing process.

Fluorocarbon resins can lead to both air and water pollution (p.507,569; EC IPPC, 2003). However, as Good Environmental Choice is the only eco-labelling scheme that restricts the use of fluorocarbons no environmental baseline requirement is set for this issue.

Use of halogenated shrink-resistant substances

The EU Flower restricts the use of halogenated shrink-resistant substances to wool slivers. IVN bans the use of all shrink-proof finishes.

Halogenated shrink-resistant substances cause emission of AOX. High levels of AOX are typical for the effluent from wool-shrink treatment (p.80,155; EC IPPC, 2003). Emission of AOX to water because of chlorinated shrink-resistant substances is a process related criteria and is therefore not considered for development of an environmental baseline requirement.

5.3.2.13 Coatings, laminates and membranes

For coating, laminates and membranes the different eco-labelling schemes have set criteria for:

- Use of substances that are carcinogenic, mutagenic, toxic to reproduction or toxic to aquatic organisms
- Use of plastic coatings

Substances - carcinogenic, mutagenic, toxic to reproduction or toxic to aquatic organisms

The EU Flower bans the use of plasticisers or solvents in the production of coatings, laminates and membranes, which are carcinogenic, mutagenic, toxic to reproduction or toxic to aquatic organisms, whereas several of the eco-label schemes ban the use of carcinogenic, mutagenic substances and substances toxic to reproduction in general. IFOAM, IVN and KRAV ban the use of substances that are toxic to aquatic organisms (if these do not meet certain biodegradability requirements). Furthermore, IVN bans laminating entirely.

Substances used for the production of coatings, laminates and membranes, which are carcinogenic, mutagenic or toxic to reproduction are included in the set baseline requirement for CMR substances – see section 5.3.2.14 “Chemicals in general” (and is therefore not repeated here).

According to the BREF document the main environmental concern in coating/laminating operations relate to air emissions. For this reason, no environmental baseline requirement is

set for the aquatic toxicity of the plasticisers or solvents used in the production of coatings, laminates and membranes.

Use of plastic coatings

Good Environmental Choice bans the use of plastic coatings, such as PVC and polyurethane. However, as Good Environmental Choice is the only eco-labelling scheme that restricts the use of plastic coatings no environmental baseline requirement is set for this issue.

5.3.2.14 Chemicals in general

For chemicals in general the different eco-labelling schemes have set criteria for:

- Use of carcinogenic, mutagenic substances or substances toxic to reproduction
- Use of chemicals dangerous for the ozone layer
- Use of bioaccumulative chemicals

Chemicals that are carcinogenic, mutagenic or toxic to reproduction

Many of the eco-labelling schemes have a general criterion for chemicals that state that chemicals that are carcinogenic, mutagenic or toxic to reproduction may not be used. These eco-labelling schemes are the Swan, Good Environmental Choice, Environmental Label of Croatia, IFOAM, IVN and KRAV. The EU Flower does not have such a general criterion, but it is mentioned specifically that no finishes, dyes or flame-retardants must be carcinogenic, mutagenic or toxic to reproduction.

Use of carcinogenic, mutagenic substances and substances toxic to reproduction (CMR substances) is a very important and serious health aspect. This may be enough reason for setting an environmental baseline requirement for this issue, even though the requirement will be in conflict with the goal of focusing on the aspects, which can be verified by testing a product. It may for example be possible to test if some carcinogenic dyes has been used by testing the finished textile product as performed by Oeko-Tex, but a general requirement of all chemicals used for the production of textiles will be more comprehensive to test for.

The environmental baseline requirement for CMR chemicals can be set for group 1 and 2 substances, i.e. Carc1, Carc2, Mut1, Mut2, Rep1 and Rep2 or the corresponding R-phrases could be used:

- Carcinogenic Carc1 and Carc2: R45 and R49.
- Mutagenic Mut1 and Mut2: R46
- Toxic to reproduction Rep1 and Rep2: R60 and R61

Using group 1 and 2 will include substances with evidence of carcinogenic, mutagenic or reproductive effect. Group 3 substances are not included as only limited evidence is available for these substances. The approach of the former EU criteria has thus been used. The current EU criteria, however, also ban the use of group 3 substances.

It may be time consuming to verify the non-use of CMR chemicals. In the EU Flower the non-use of such chemicals is verified by listing the chemicals used and providing material safety data sheets for the chemicals used. In this way it is possible to check that the chemicals used are not CMR chemicals or contain substances that are CMR substances.

According to the report on the EU eco-label carried out by the European Consumers' Organisation, no European legislation that bans the use of CMR chemicals exists. Chemicals

with a content of CMR substances must be labelled as such (with the R-phrases mentioned above), but no general ban exists. A ban of azo dyes that can release carcinogenic amines exists for use in textile and leather products (Commission Directive 2004/21/EC), (Commission Directive 2003/3/EC, Directive 2002/61/EC), but the azo dyes only cover a small group of CMR problematic substances.

In order to follow the general approach of setting baseline requirements for the finished textile product, the environmental baseline requirement set for CMR substances is defined, as no CMR substances must be found in the finished textile product. A limit value of 0.1% is used as this is also the limit value used for CMR substances. It is, however, too comprehensive to test for all possible carcinogenic, mutagenic substances, and substances toxic to reproduction, for which reason it is suggested to use the material safety data sheets as a verification method.

The environmental baseline requirement set is:

Aspect	Environmental baseline requirement	Verification
Carcinogenic, mutagenic substances/preparations and substances/preparations toxic to reproduction	<p>The finished textile products shall not contain substances or preparations in amounts exceeding 0.1% by weight of substances that are assigned with the risk phrases R45, R46, R49, R60 or R61.</p> <p>Apply for all chemicals used in the production of textiles (including flame-retardants, finishing agents, coatings, laminates and membranes).</p>	All chemicals used must be listed and material safety data sheets for all chemicals must be provided.

Chemicals dangerous for the ozone layer

Good Environmental Choice is the only eco-labelling scheme that has set a criterion for the non-use of chemicals dangerous for the ozone layer (risk phrase R59).

As only one eco-labelling scheme has set such a criterion, no environmental baseline requirement is developed for this issue. In addition, this criterion is a more general criterion that is difficult to “measure”. In order to verify such a criterion use of material safety data sheets are needed. This is a demanding way to verify a criterion compared to simple measurements of products. Too many of such verification procedures should be avoided.

Bioaccumulative chemicals

Good Environmental Choice is the only eco-labelling scheme that has set a criterion for the non-use of chemicals that are bioaccumulative (risk phrase R53). However, other eco-labelling schemes have also set criteria for specific mentioned chemicals, which are bioaccumulative (e.g. the EU Flower bans the use of flame-retardants and finishes labelled with R53).

As only one eco-labelling scheme has set such a criterion, no general environmental baseline requirement is developed for this issue. In stead this issue will be discussed under the specific chemicals, where a requirement of non-use of bioaccumulative chemicals has been set, e.g. for flame-retardants and for finishing chemicals.

5.3.2.15 Finished textile products

For chemical residues in the finished textile products the different eco-labelling schemes have set criteria for:

- Residue of formaldehyde
- Flame-retardants
- Residue of pesticides
- Residue of organic mercury compounds
- Residue of organic tin compounds
- Emission of certain volatile compounds (not for clothing)
- pH value
- Residue of chlorinated phenols
- Residue of azo dyes
- Residue of certain heavy metals
- Residue of PVC plasticisers
- Residue of chlorinated organic carriers (chlorinated benzenes and toluenes)
- Residue of orthophenylphenol (OPP)
- Residue of carcinogenic and allergenic dyes

Residue of formaldehyde

Almost every eco-labelling scheme has set a limit value for the formaldehyde residue in textiles (see Appendix B). The limit value varies from 20 ppm (the detection limit) to 300 ppm depending on the different eco-labelling schemes and the type of textiles. Most eco-labelling schemes allow a higher formaldehyde residue in decoration textiles compared to baby clothes.

Appendix B – List of chemicals not allowed in eco-labelled textiles” show the different level for formaldehyde set by different eco-labelling schemes. The formaldehyde content is set below 20 ppm for baby textiles, is set at 20, 30 or 75 ppm for skin contact textiles, and is set at 20, 75, 100 or 300 ppm for outdoor clothes, and is set at 20, 100 or 300 ppm for all other textiles. The current EU Flower level on formaldehyde content is below 30 ppm for skin contact textiles and below 300 ppm for no skin contact textiles. The former level (before last revision) was 75 ppm for skin contact textiles and 300 ppm for no skin contact textiles.

Easy-care finishing agents are applied to textiles in order to increase the crease recovery and/or dimensional stability of the fabrics. The easy-care finishing agents used can release free formaldehyde, which is regarded as carcinogenic (group 2A – probably carcinogenic to humans). Easy-care finishing is mainly carried out on cellulosic fibres and their blends.

According to the BREF document (p.376; EC IPPC, 2003) low-formaldehyde or even formaldehyde-free products are an alternative today. With low-formaldehyde or formaldehyde-free products, a reduction of formaldehyde emissions in finishing is achieved. Formaldehyde residues in the textiles can be minimised to 75 ppm or even lower than 30 ppm. However, it is stated in the BREF document that in the carpet sector it is always possible to avoid formaldehyde emissions by using formaldehyde-free easy-care finishing agents, whereas in the textile sector the use of low-formaldehyde agents may be inevitable.

Easy-care finishing is not the only source to the formaldehyde content in the finished textile product. Also printing pastes, melamine-formaldehyde resins used for coating and laminating, and reactive flame-retardants can release formaldehyde, and formaldehyde can be used as a preservative for sizing liquors. (p. iii, 36, 107, 199; EC IPPC, 2003). However, according to Eco-labelling Denmark, the current EU criterion on formaldehyde content in the finished

product is not that difficult to comply with, if the applicant uses modern dyes and chemicals. However, it may be a problem for the Asian countries.

A survey on textile fabrics (Danish EPA, 2003) shows that the level of 75 ppm is achievable. Ten fabrics used for different purposes (different apparel, bed linen and oilcloths) were tested. Seven of the fabrics had formaldehyde levels below 20 ppm and only one fabric had a formaldehyde level above 75 ppm (test method used: EN ISO 14184). The fabric for oilcloths had a formaldehyde level of 82 ppm.

In another survey on bed linen (Danish EPA, 2004) 10 of 15 producers document the formaldehyde level in the textiles. In two products no formaldehyde-releasing chemicals were used, which means that the formaldehyde level most likely is below 30 ppm. In other products the formaldehyde level was measured to be 18 ppm (in 3 products), below 20 ppm (in 3 products), 52 ppm and below 75 ppm (in 2 products).

As the BREF document state that it is possible to achieve formaldehyde levels below 75 ppm, and as the existing formaldehyde criterion can fairly easy be complied by the applicants for the EU Flower label (also shown by measurements in the Danish surveys), it seems reasonable to establish the environmental baseline requirement at 75 ppm for skin contact textiles and at 300 ppm for no skin contact textiles as listed below.

The content of formaldehyde can be tested by use of the test method demanded by the EU Flower and the Swan (EN ISO 14184-1) or by Oeko-Tex, Skal, KRAV and IVN (Japan Law 112).

Aspect	Environmental baseline requirement	Test method
Formaldehyde content in finished textiles with skin contact	< 75 ppm	EN ISO 14184-1
Formaldehyde content in finished textiles with no skin contact	< 300 ppm	EN ISO 14184-1

Flame-retardants

Oeko-Tex and TOXPROOF are the only two eco-labelling schemes that primarily rely on testing of the textile product in order to verify if a requirement is met. However, neither Oeko-Tex nor TOXPROOF test for the residue of flame-retardants in the finished textile product. Oeko-Tex requires that specific flame-retardants must not be used, whereas TOXPROOF uses a general ban on flame-retardants.

For this reason no environmental baseline requirement is set for flame-retardants in the finished textile product. As described in section 5.3.2.11 "Flame-retardants" and section 5.3.2.14 "Chemicals in general", an environmental baseline requirement is set using risk phrases in stead to limit the use of carcinogenic, mutagenic flame-retardants or flame-retardants that are toxic to reproduction or toxic to aquatic organisms.

Pesticide residue

The EU Flower has set limit values for certain pesticides in cotton fibres. The Swan bans the use of pesticides for the cultivation of cotton and is the only label that bans the use of pesticides (pesticides in general) for the cultivation of flax and other bast fibres. Furthermore,

the EU Flower, the Swan and IVN have set limit values for certain pesticides in greasy wool and other keratin fibres. All these restrictions are, however, requirements for the textile fibres and not the finished textile product.

The Eco Mark (Japan) and the Thai Green label have set limit values for two pesticides in the finished textile product. Skal has set a criterion of no residues of pesticides in the finished textile product. Oeko-Tex and TOXPROOF have set limit values for certain pesticides in the finished textile product.

By restricting the residue of pesticides in the finished textile product, the use of pesticides during production is still restricted, but the trade barrier issue may be avoided.

As can be seen in Appendix B Oeko-Tex is restricting the use of a larger amount of pesticides compared to TOXPROOF. The limit value set by Oeko-Tex is 1 ppm, which is a total of all pesticides listed. The limit value is 0.5 ppm for baby clothes. TOXPROOF also sets a limit value of 1 ppm for all pesticides (but a shorter list), but has also specific limit values for three specific pesticides.

According to a Danish surveys on 22 textiles, none of the pesticides, which specifically are mentioned by Oeko-Tex was found in any of the examined textiles. This indicates that it should be possible to use the Oeko-Tex limit value for the sum of pesticides as an environmental baseline requirement.

The question is which pesticides that should be restricted. The list by Oeko-Tex is the most exhaustive list (also in comparison with the list set by the EU Flower). Either the list of pesticides used by Oeko-Tex should be used or this list should be supplemented with some of the specific pesticides restricted by the EU Flower. In all, 7 pesticides are restricted by the EU Flower, which Oeko-Tex does not include in their requirement.

In order to avoid too much confusion (by referring to several sources) and in order to eliminate the need for updates, it is suggested to use the list used by Oeko-Tex, as they update their criteria frequently and it is therefore possible to refer to their criteria.

As most of the pesticides on either list are prohibited all over the World, it can be assumed that almost all textile products can fulfil the requirement. By reducing the list of pesticides to test for, testing expenses are also reduced, but they may still be significant.

No specific test is mentioned by Oeko-Tex, but it is described that the tests are performed with cleaned-up extracts by gas chromatography with selective detection (MSD or ECD).

The environmental baseline requirement set is:

Aspect	Environmental baseline requirement	Verification
Pesticide residue in finished textile product	< 1 ppm measured as a sum of all pesticides listed in appendix in Oeko-Tex 100	Tests performed with cleaned-up extracts by gas chromatography with selective detection (MSD or ECD)

Residue of organic mercury compounds

Eco Mark (Japan) is the only eco-labelling scheme that restricts the use of organic mercury compounds. These compounds must not be detectable in the finished textile product.

No environmental baseline requirement is set for this issue, as the organic mercury compounds automatically will be restricted by setting a limit value for the total residue of mercury in the finished textile products (see under the headline “Residue of certain heavy metals” in this section below).

Residue of organic tin compounds

The EU Flower and the Swan are banning the use of organic tin compounds in general, whereas the Eco Mark of Japan, Oeko-Tex and TOXPROOF have set limit values for certain organic tin compounds in the finished textile product. The limit value set by Oeko-Tex is 1.0 ppm and 0.05 ppm for TOXPROOF.

In a Danish survey on chemicals in textiles (Danish EPA, 2004), organic tin compounds were found over the level of detection in one of four textile products that were measured for a content of tin. Additional testing was performed in order to determine the type of organic tin. The results were 7.2 ppm monobutyltin (MBT) and 9.7 ppm dibutyltin (DBT). Measured as total tin the result was 4.9 ppm for this textile product.

It is suggested to set a general environmental baseline requirement for tin, instead of the specific organic tin compounds. In this way, such a requirement will restrict both the use of organic tin compounds and pigments or dyes based on tin. The level for an environmental baseline requirement for tin is discussed under the headline “Residue of certain heavy metals” in this section below.

Emission of certain volatile compounds (not for clothing)

Oeko-Tex and the Environmental Label of Croatia are the only eco-labelling schemes that set a requirement for the emission of specific volatile chemicals from a finished textile product, which is not a clothing piece. The limit values set are only valid for textiles other than clothes, i.e. floor coverings/carpets, mattresses and similar (see Appendix C).

This aspect overlap to some extent with declaration systems for the indoor climate, which also set requirements for the degassing of VOC (including formaldehyde).

As this criterion only is valid for a limited group of textile products, and as only two eco-labelling schemes have set a criterion for this issue, no environmental baseline requirement is set.

pH value

The Swan sets a requirement of a pH value of 4.8 to 7.5 for the aqueous extract from the finished textile products. The Thai Green Label, Oeko-Tex and TOXPROOF set a similar requirement: a pH value between 4.0 and 7.5 for textiles with skin contact and between 4.0 and 9.0 for decoration textiles and clothing accessories (clothing with no skin contact). The requirement set by IVN (for bleached textiles) is a pH value between 4.0 and 9.0 for wool textiles and between 4.0 and 8.0 for all other textiles. TOXPROOF sets a specific requirement for wool of the pH value being between 3.5 and 7.5.

As the pH value of the human skin is slightly acidic, it is best for the skin that the aqueous extract from clothes have a pH value close to that of the skin. It is therefore suggested to use the range set by the different eco-labelling schemes (3.5 to 8.0) for clothes with direct skin contact, and the range of 3.5 to 9.0 for all other textiles (e.g. decoration textiles). No test of the pH value of the textiles was found to verify the levels set for the environmental baseline requirement.

The test method ISO 3071 mentioned by the Swan and TOXPROOF can be used.

The environmental baseline requirement set is:

Aspect	Environmental baseline requirement	Verification
pH value of the aqueous extract of textiles with direct skin contact	pH value between 3.5 and 8.0	ISO 3071
pH value of the aqueous extract of textiles with no direct skin contact	pH value between 3.5 and 9.0	ISO 3071

Residue of chlorophenols

Chlorophenols are biocides that are used to preserve the textiles during transport and storage. Many of the chlorophenols (di-, tri-, tetra-, and pentachlorophenols) are classified as possibly carcinogenic to humans (IARC group 2B). The use of chlorophenols will therefore be covered by an environmental baseline requirement banning carcinogenic substances in general during all processing steps of the textile fibres and the textile products. This may, however, be complicated to verify as the textile industry consists of a long supply chain – typically different suppliers involved for each processing step. The easiest way will therefore be to test for the content of the chlorophenols in the finished textile product, which also is more in line with the goal of the environmental baseline requirements.

As described under section 5.3.2.3 "Biocidal or biostatic products", some of the eco-labelling schemes have set limit values for the residue of chlorophenols in the finished textile products, whereas the EU Flower, the Swan, Good Environmental Choice, and IVN ban the use of chlorophenols during transportation and storage. The eco-labelling schemes setting limit values for the residue of chlorophenols are Environmental Label of Croatia, Thai Green Label, Oeko-Tex and TOXPROOF. The limit values set are 0.1 ppm for the Environmental Label of Croatia and 0.5 ppm (0.05 ppm for baby textiles) for the other mentioned labelling schemes.

Little information is available on the level of chlorophenols in finished textile products. A Danish report on chemicals in textiles has tested 11 different textile products for content of biocides. Biocides were found in all 11 textiles, and the specific compound ortho-chlorophenol was found in all 11 textile products. In four products the level of ortho-chlorophenol was between 3.6 to 3.9 ppm, i.e. in considerably larger amounts than the limit values set by Oeko-Tex and TOXPROOF, and in the rest of the products (seven products) the level found was below 0.5 ppm (Danish EPA No. 534, 2000).

Even though the above mentioned test only covers ortho-chlorophenol, and not chlorophenols in general, the test results suggest that if chlorophenols are used the amounts found in the textiles will be about the same somewhat higher level. This information suggests that it is not possible to use the limit values set by Oeko-Tox and TOXPFOOF of 0.5 ppm as a general environmental baseline requirement for chlorophenols. It seems that such a general limit value

for chlorophenols cannot be met by 80-90% of the textile products on the market, as chlorophenols are used as a preserving agent in a higher percentage of textile products. Instead it is suggested to set an environmental baseline requirement only for pentachlorophenol. Pentachlorophenol is regulated by EU regulation, but only in preparations. However, according to IARC there is sufficient evidence in experimental animals for the carcinogenicity of pentachlorophenol, whereas other chlorophenols have limited evidence of carcinogenicity in experimental animals.

The limit value set by Oeko-Tox and TOXPROOF of 0.5 ppm is used as an environmental baseline requirement for pentachlorophenol. No specific test method is mentioned by Oeko-Tex, but it is described that the tests are performed by use of gas chromatography with mass spectrometric (MSD) or electron capture detection (ECD).

The environmental baseline requirement set is:

Aspect	Environmental baseline requirement	Verification
Content of pentachlorophenol in finished textile product	< 0.5 ppm	Use of gas chromatography with mass spectrometric (MSD) or electron capture detection (ECD).

Residue of azo dyes

Almost every eco-labelling scheme bans the use of azo-based dyes, which on decomposition gives rise to one or more carcinogenic amines. Oeko-Tex and TOXPROOF both demands an analysis of the content of these amines in the finished textile product. The limit value for Oeko-Tex is set at 20 ppm and at “detection limit” in TOXPROOF.

However, as described earlier, such azocolourants are not to be used in textiles and leather articles, which may come into direct and prolonged skin contact, according to European legislation.

As the use of azo dyes are restricted by European legislation there is no point in developing an environmental baseline requirement for this issue.

Residue of certain heavy metals

The Swan, the Thai Green Label, Oeko-Tex and TOXPROOF have set limit values for metal residues in the finished textile products. As can be seen from Appendix B, the different eco-labelling schemes use the same limit values for the different metals (with a few exceptions – the values for lead, and that the Swan do not set a limit value in the textile product for antimony).

However, the test methods used by the Swan is different from the test method used by the other eco-labelling schemes, for which reason the limit values may not be directly comparable. The Swan uses the Swedish standard SS 028150 where the textile fabric is dissolved in nitric acid. Hence the total content of metal is measured. The other eco-labelling schemes use the ISO standard 105-E04 also used for testing colour fastness to perspiration. In this method the heavy metals are extracted by use of artificial sweat solution (a weaker acid). By this method only the metals that migrate into the artificial sweat solution is measured. Therefore the criteria set by the Swan and the test method used by the Swan are stricter compared to the method used by the other eco-labelling schemes.

The heavy metals are found in the finished textile products because the metals are found as impurities in dyes and pigments or as a direct component of the dyes, e.g. chromium in chrome mordant dyes (p.76; Danish EPA, 2000). Antimony is primarily found in polyester products as antimony is used as a catalyst in the production of polyester.

In the following table the levels measured in 37 different finished textile products are presented. The table represent measurements from two different reports (p.76-79; Danish EPA, 2000), (Danish EPA, 2003). Antimony is only measured in one survey in 8 products (Danish EPA, 2003). In both surveys the metals are measured by use of nitric acid – the same method used by the Nordic Swan, where the total metal content is measured.

Table 5.2: Measured heavy metal levels in textile fabrics (Danish EPA, 2000), (Danish EPA, 2003).

Metal	Measured levels (ppm)	Limit values set by the Swan (ppm)	All values measured (ppm)
Antimony	0.63 - 200	None	8 products tested. Lowest value of 0.63 ppm found in a 100% cotton product. A value of 35 ppm found in a cotton/polyester (67%/33%) product. The remaining 6 products are all 100% polyester product with values of 7, 13, 27, 35, 48, 110 and 200 ppm.
Arsenic	< 0.3 – 14,5	0.2	6 of 22 products over 0.3 ppm. 4 of these with values between 0.3 and 0.6 ppm. 2 values of 11 and 14.5 ppm supposedly because of pesticides based on arsenic. Other 15 products all below 1 ppm (one value of 1 ppm).
Cadmium	< 0.05 – 18	0.1	10 products over d.l. of 0.05 ppm. 5 of these with values between 0.05 and 0.2 ppm. 4 products between 0.2 and 1 ppm. One value of 18 ppm supposedly because of PVC print where cadmium is used as a stabiliser.
Cobalt	< 0.1 – 110	4.0	11 of 22 products over 0.1 ppm. 5 of 15 products over 0.2 ppm. 5 of these 37 products with values between 0.1 and 1 ppm. 6 products between 1 and 10 ppm. 3 between 20 and 50 ppm. One value of 110.
Chromium	< 0.5 – 1140	2.0	16 products over 0.5 ppm. 5 of these between 0.05 and 1 ppm. 2 between 1 and 10 ppm. 5 between 10 and 100 ppm. 3 between 100 and 250 ppm. One value of 1140.
Copper	< 1.0 – 680	50.0	13 products below 1 ppm. 12 products between 1 and 10 ppm. 7 products between 10 and 100 ppm. 4 products between 170 and 320 ppm. One value of 680 ppm.
Mercury	< 0.025 – 0.05	0.02	3 of 22 products over 0.025 ppm. All 3 between 0.031 and 0.048 ppm. Other 15 products all below 0.050 ppm.
Nickel	< 0.5 – 3.6	4.0	7 of 22 products over 0.5 ppm. All values between 0.5 and 3.6 ppm. Other 15 products: 14 below 1 ppm. One value of 1.1 ppm.
Lead	< 0.3 – 90	0.8	12 of 22 products over 0.3 ppm. Of these 9 with values between 0.3 and 1 ppm. 3 values of 1.6, 5.2 and 90 ppm respectively. Other 15 products: 11 products below 0.5 ppm. 3

Metal	Measured levels (ppm)	Limit values set by the Swan (ppm)	All values measured (ppm)
			products between 0.5 and 1 ppm. One value of 1.6 ppm.
Tin	< 0.05 – 61	4.0	Only 26 measured products. 3 products below 0.05 ppm. 11 products below 0.3 ppm. 4 products between 0.3 and 1 ppm. 5 products between 1 and 10 ppm. 3 products between 10 and 61 ppm.

d.l. = detection limit

For arsenic and mercury the used level of detection in the surveys are higher than the limit values set by the Swan, which makes it difficult to assess how many of the tested textile products that will be able to live up to the set limit values.

For **antimony**, very different levels of antimony in the finished fabric are found. The high level of antimony is found in polyester products, where antimony as mentioned is used as a catalyst in the production. However, a single cotton product shows a low level of antimony, presumably from the pigments or flame-retardants used. These measurements suggest that the level set by Oeko-Tox of 30 ppm antimony in the finished textile product will be a level suitable for an environmental baseline requirement as it only will be some of the polyester products that will not be able to fulfil this requirement. The TOXPROOF limit value of 1 ppm seems too low if polyester products must be able to comply with the criterion.

For **arsenic**, tests of textile products show that the goal of 80-90% of the products complying with the requirement is not achievable with a limit value of 0.2 ppm as set by the eco-labelling schemes. In stead the limit value should be set around 0.5 to 1 ppm in order to achieve the goal. A value above 0.5 ppm can pose a health risk to babies by oral exposure when sucking on the textile (Danish EPA, 2003). It is therefore suggested to use a limit value of 0.5 ppm as the environmental baseline requirement.

For **cadmium**, tests of textile products show that the goal of 80-90% of the products complying with the requirement seems to be achievable with a limit value of 0.1 ppm as set by the eco-labelling schemes. It is therefore suggested to use this level as the environmental baseline requirement.

For **cobalt**, tests of textile products show that the goal of 80-90% of the products complying with the requirement seems to be achievable with a limit value of 4.0 ppm as set by the eco-labelling schemes. However, a value of 4 ppm may pose a health risk to babies by oral exposure when sucking on the textile (Danish EPA, 2003). According to the study (Danish EPA, 2003) an acceptable daily dose by oral intake (by sucking on the textile) is at the level of the detection limit of 0.2 ppm. This is, however, too low a limit if 80-90% of the products have to comply with it. It is therefore suggested to set two different environmental baseline requirements – one for clothes for babies and one for other textiles. The limit value of 4.0 ppm is suggested as an environmental baseline requirement for all other clothes than baby clothes, and the limit value of 0.2 ppm is suggested as an environmental baseline requirement for baby clothes. However, as this value is very low (equals the detection limit), it is suggested to carry out a more detailed health assessment for babies in order to establish the correct limit value for baby clothes.

For **chromium**, tests of textile products show that the goal of 80-90% of the products complying with the requirement seems to be achievable with a limit value of 2.0 ppm as set by the eco-labelling schemes. Either the level is below 2 ppm or is much higher (above 50 ppm), probably because of use of chrome dyes. It is therefore suggested to use the level of 2 ppm as the environmental baseline requirement.

For **copper**, tests of textile products show that the goal of 80-90% of the products complying with the requirement seems to be achievable with a limit value of 50.0 ppm as set by the eco-labelling schemes. It is therefore suggested to use this level as the environmental baseline requirement.

For **mercury**, tests of textile products show that a limit value of 0.05 ppm is achievable. One survey use this value as the detection limit and no products were found to have contents higher than this level. The other survey shows that only three products have a higher content of mercury than the used detection level of 0.025. Both surveys use a detection limit higher than the limit value set by the eco-labelling schemes. It is suggested to use the detection limit of the one survey of 0.025 ppm (round up to 0.03) as the environmental baseline requirement as 85% of the textiles had contents below this limit value.

For **nickel**, a European directive restricts the use of nickel (European Parliament and Council Directive, 1994) primarily in buttons, zippers and other metals used in garments. This does not restrict the content of nickel in the textile fabric, for which reason it is suggested to set an environmental baseline requirement for nickel anyway. Tests of textile products show that the goal of 80-90% of the products complying with the requirement seems to be achievable with a limit value of 4.0 ppm as set by the eco-labelling schemes. All the measurements carried out were below this limit. It is therefore suggested to use this level as the environmental baseline requirement.

For **lead**, tests of textile products show that the goal of 80-90% of the products complying with the requirement seems to be achievable with a limit value of 0.8 ppm as set by the eco-labelling schemes the Swan and TOXPROOF (1.0 ppm by Thai Green Label, IVN and Oeko-Tex). It is therefore suggested to use this level as the environmental baseline requirement.

For **tin**, tests of textile products show that the goal of 80-90% of the products complying with the requirement seems to be achievable with a limit value of 4.0 ppm as set by the eco-labelling schemes. It is therefore suggested to use this level as the environmental baseline requirement. As mentioned under "residue of organic tin compounds" a general limit value set for tin will also restrict the use of organic tin compounds. In a Danish survey on chemicals in textiles (Danish EPA, 2004), organic tin compounds were found over the level of detection in one of four textile products that were measured for a content of tin. Additional testing was performed in order to determine the type of organic tin. The results were 7.2 ppm monobutyltin (MBT) and 9.7 dibutyltin (DBT). Measured as total tin the result was 4.9 ppm for this textile product. This means that such a product will not meet the requirement set for the total content of tin. Hence, the use of organic tin compounds will be restricted with the set requirement.

Oeko-Tex, the Thai Green Label, and IVN sets lower limit values for baby clothes for most of the metals. It is, however, suggested generally not to differentiate between baby clothes and other textiles in order to avoid too many requirements.

The content of extractable heavy metals in the finished textile products should be tested by use of the test method demanded by the Swan as this method test the total content of the metals. In the test method used by the Swan, the metals are extracted by use of nitric acid according to the Swedish standard SS 028150.

Aspect	Environmental baseline requirement	Test method
Antimony – extractable content in finished textile products	< 30 ppm	SS 028150
Arsenic – extractable content in finished textile products	< 0.5 ppm	SS 028150
Cadmium– extractable content in finished textile products	< 0.1 ppm	SS 028150
Cobalt – extractable content in finished baby textile products	< 0.2 ppm	SS 028150
Cobalt – extractable content in all other finished textile products	< 4.0 ppm	SS 028150
Chromium – extractable content in finished textile products	< 2.0 ppm	SS 028150
Copper – extractable content in finished textile products	< 50.0 ppm	SS 028150
Mercury – extractable content in finished textile products	< 0.03 ppm	SS 028150
Nickel – extractable content in finished textile products	< 4.0 ppm	SS 028150
Lead – extractable content in finished textile products	< 0.8 ppm	SS 028150
Tin – extractable content in finished textile products	< 4.0 ppm	SS 028150

Residue of PVC plasticisers (phthalates)

Oeko-Tex and TOXPROOF limit the use of certain PVC plasticisers (see Appendix B) in baby clothes. The limit value is set at 0.1% for a sum of specific phthalates for both Oeko-Tex and TOXPROOF. The EU Flower bans the use of plastisol-based printing (PVC printing) entirely. The Swan has instead banned the use of chemical products that contains more than 1% phthalates. IFOAM and KRAV restrict the use of a specific phthalate (DEHP). A maximum of 1% of DEHP is allowed in any chemical. Phthalates are found in textiles printed with PVC, as phthalates are used as plasticisers for PVC.

In a Danish survey on chemicals in textiles (Danish EPA, 2003), 10 textile products were measured for the content of the phthalate DEHP. The levels found varied between 1.0 ppm and 8.6 ppm. DEHP was found in all 10 products. Seven of the 10 tested products were printed, and three was not. The level of DEHP is about the same in the printed and in the non-printed textiles. The levels measured are much lower than the 0.1% (which equals 1000 ppm) set as the limit value by Oeko-Tex and TOXPROOF.

In the recent publication from Greenpeace of chemicals in childrenswear, phthalates were found in all 19 products purchased all over the world. The content of phthalates ranged from 0.00014% (1.4 ppm) to 32% (320,000 ppm), (Greenpeace, 2004). The concentration are, however, given per unit mass of the printed section of the garments, and not per unit mass of the entire garment as the limit values used in Oeko-Tex and TOXPROOF, and as the measurements carried out in the Danish survey on chemicals in textiles. This means that the values are not directly comparable.

The survey carried out by Greenpeace informs that the global clothes retailer Hennes & Mauritz in 2002 entirely substituted PVC and PVC prints for all applications. In the examined

clothing piece from H&M the lowest level of phthalates was found (0.00014%) indicating that phthalates only are present due to contamination from e.g. carry-over of processing chemicals. Marks & Spencer is likewise phasing out the use of PVC in printed childrens clothing. (Greenpeace, 2004).

As phthalates are toxic, and certain phthalates are considered as toxic to reproduction, it will be reasonable for environmental and health reasons to ban the use of PVC printing as is done by the EU Flower. Certainly not all clothes are printed, which makes it possible to use a ban of PVC printing as the environmental baseline requirement. As this, however, may be too strict a requirement as PVC printing is a widespread technique, it is suggested to at least ban the use of PVC printing in baby clothes, as babies are the most exposed group as they tend to suck on their clothes. Such a requirement can be verified as already done by Oeko-Tex by testing the finished textile product for certain phthalates.

No specific test method is mentioned, but the testing procedure as described by Oeko-Tex can be used: Extraction of the testing material with an organic solvent. The extract is analysed after clean-up by gas chromatography (MS detection).

The environmental baseline requirement set is:

Aspect	Environmental baseline requirement	Test method
Phthalates in finished textile product	< 0.1% phthalates in baby clothes as a total sum of the specific phthalates mentioned by Oeko-Tex	Extraction with organic solvent. Gas chromatography (MS detection).

Residue of chlorinated organic carriers (chlorinated benzenes and toluenes)

Carriers are used as dyeing accelerators in the batch dyeing of synthetic fibres (especially polyester fibres) to promote the absorption and diffusion of dyes into the fibres under low-temperature conditions. Carriers are still important for dyeing of blended fibres of polyester and wool, as wool cannot withstand dyeing at high temperatures. Chlorinated carriers are toxic to humans and to aquatic organisms, and are not easily biodegradable. (p. 497; EC IPPC, 2003), (p.59; Danish EPA No. 534, 2000).

As described in section 5.3.1.8 “Polyester” the EU Flower has set criteria for the use of halogenated carriers for polyester fibres, whereas IFOAM and KRAV has a general ban on chlorinated carriers. Oeko-Tex and TOXPROOF specifies that certain chlorinated carriers must be below a certain limit in the finished textile product. The limit value is 1 ppm in Oeko-Tex. No distinction is made between baby clothes, skin contact clothes and other textiles.

According to a Danish report, the measurement of chlorinated carriers is often below 0.1 ppm in the finished textile products. In total, six products of polyester or with a content of polyester were tested for the content of certain chlorinated carriers (dichlorobenzene, trichlorobenzene, dichlorotoluene). Trichlorobenzene was found in four of the six tested products. In three products the level was below 0.1 ppm, and in one product the level was 1.7 ppm¹⁰. The product was made of 55% polyester. (Danish EPA No. 534, 2000).

¹⁰ Calculated as a total of 1,2,3-trichlorobenzene and 1,2,4-trichlorobenzen.

It therefore seems possible to use the limit value set by Oeko-Tex as an environmental baseline requirement, as it only will be some of the polyester products that will not be able to fulfil this requirement. No test standard was found (ISO, CEN or similar). Oeko-Tex describes that the test should be performed by extraction of the textile material with an organic solvent, and the extract should be analysed after clean up by gas chromatography (MSD or ECD detection).

Aspect	Environmental baseline requirement	Test method
Content of chlorinated carriers in finished textile product	< 1 ppm	Extraction with organic solvent. Gas chromatography (MSD or ECD detection)

Residue of orthophenylphenol (OPP)

Orthophenylphenol is a carrier as the chlorinated carriers discussed above. Phenylphenol is very toxic to aquatic organisms and potentially bioaccumulative. (p. 497; EC IPPC, 2003), (p.59; Danish EPA No. 534, 2000). However, according to the BREF document it is possible to replace phenylphenol with less harmful substances like e.g. benzylbenzoate and N-alkylphthalimide (p.vi; EC IPPC, 2003).

Oeko-Tex is the only eco-labelling scheme that has set a criterion for orthophenylphenol. A maximum limit of 50 ppm is allowed in textiles for babies and 100 ppm in all other textiles.

No information has been found of the level of orthophenylphenol in finished textile products. It is, nevertheless, suggested to use the level set by Oeko-Tex as an environmental baseline requirement as less harmful substances are available. It is suggested not to differentiate between baby textiles and other textiles as no information has been found of the level of orthophenylphenol in textile products.

No test standard was found (ISO, CEN or similar). Oeko-Tex describes that the test should be performed by extraction of the textile material with an organic solvent, and the extract should be analysed after clean up by gas chromatography (MSD or ECD detection).

The environmental baseline requirement set is:

Aspect	Environmental baseline requirement	Verification
Content of the carrier ortho-phenylphenol (OPP) residue in finished textile product	< 100 ppm	Extraction with organic solvent. Gas chromatography (MSD or ECD detection)

Residue of carcinogenic and allergenic dyes

The EU Flower bans the use of dyes that are carcinogenic, mutagenic or toxic to reproduction. The Swan, Good Environmental Choice, Environmental Label Croatia, IFOAM, IVN, and KRAV ban the use of such chemicals in general. Eco Mark (Japan) and Oeko-Tex only ban the use of carcinogenic dyes.

However, this aspect falls under the general requirement of carcinogenic and mutagenic substances or substances that are toxic to reproduction, which is discussed under section 5.3.2.14 "Chemicals in general".

The EU Flower, Eco Mark (Japan), IFOAM, and KRAV ban the use of sensitising or allergenic dyes. Good Environmental Choice, Environmental Label (Croatia), and IVN ban the use of sensitising or allergenic chemicals in general. Oeko-Tex and TOXPROOF bans the use of sensitising or allergenic dyes by setting a limit value of “not detectable” in the finished textile product.

The restriction of the use of the dyes set by the EU Flower is only valid if the colourfastness to perspiration (acid and alkaline) is less than a level 4. Oeko-Tex, however, restricts the use of the dyes in all conditions. Oeko-Tex restricts the use of three more dyes than the EU Flower, which probably is due to the fact that the Oeko-Tex criteria recently have been revised (1.1.2004), whereas the last revision for the EU Flower took place in 2002.

As already discussed in section 5.3.2.7 “Dyeing” use of sensitising or allergenic substances is an important health aspect as many of the textiles are worn with direct skin contact. This may be enough reason to set an environmental baseline requirement for this issue.

There are two ways of setting an environmental baseline requirement for this issue. Either all substances with the risk phrases R42 (“May cause sensitisation by inhalation”) and R43 (“May cause sensitisation by skin contact”) are banned (or just the potentially sensitising dyes in question) in line with carcinogenic substances, or the potentially sensitising dyes in question are restricted by testing the finished textile product in line with the Oeko-Tex requirement.

By using the first approach – using the risk phrases to ban the use of sensitising dyes - may eliminate the need for updates of which substances/dyes that are considered to be sensitising. On the other hand Oeko-Tex update their criteria frequently and it is therefore possible to refer to their criteria. Currently (1.1.2004), the following dyes are banned by Oeko-Tex as they are considered allergenic:

CI Disperse Blue 1	CI Disperse Blue 124	CI Disperse Red 11
CI Disperse Blue 3	CI Disperse Brown 1	CI Disperse Red 17
CI Disperse Blue 7	CI Disperse Orange 1	CI Disperse Yellow 1
CI Disperse Blue 26	CI Disperse Orange 3	CI Disperse Yellow 3
CI Disperse Blue 35	CI Disperse Orange 37	CI Disperse Yellow 9
CI Disperse Blue 102	CI Disperse Orange 76	CI Disperse Yellow 39
CI Disperse Blue 106	CI Disperse Red 1	CI Disperse Yellow 49

Furthermore, use of the risk phrases may be an easier and cheaper approach, as it will not be necessary to test for all the dyes mentioned above in the finished product.

By using the second approach - test of the finished product – and by using the Oeko-Tex standard one will ensure that the list of sensitising dyes always is updated, as Oeko-Tex update their criteria frequently. However, if more dyes are added to the list in the future, the testing expenses will also increase.

In order to lower the testing expenses, the first approach is used for the environmental baseline requirement. Furthermore, MSDS’s are used in other environmental baseline requirements as well in order to check if substances with certain risk phrases are used.

Only one of the surveys of chemicals in textiles has examined the products for content of some potentially sensitising dyes (eight of the dyes from above). None of the eight dyes was found in the examined five textiles. This is not a significant test, but still, it gives an indication that the baseline requirement seems reasonable.

The environmental baseline requirement set is:

Aspect	Environmental baseline requirement	Verification
Content of potentially sensitising dyes in the finished textile product	The final product shall not contain any sensitising or allergenic dyes that are assigned the risk phrases R42 or R43.	All dyes used must be listed and material safety data sheets for all the dyes must be provided.

5.3.3 Fitness for use

All fitness for use criteria are set by the eco-labelling schemes in order to ensure that the textile product have some quality. If the quality of a textile product is too low, i.e. the shrinkage is too high or the colour fastness is too low, the product may be thrown out and replaced by a new product too quickly, and thereby cause a larger impact on the environment.

5.3.3.1 Dimensional changes during washing and drying

The EU Flower, the Swan and IVN are the only eco-labelling schemes that have set a criterion for the dimensional changes of the textiles during washing and drying. The maximum percentage of the dimensional change is listed in the table below. The Swan and the EU Flower allow a larger dimensional change if the shrinkage percentage is clearly shown on the label of the textile product, whereas the percentages given by IVN are maximum values.

Table 5.3: Dimensional changes during washing and drying allowed by different eco-labelling schemes.

	Curtains and furniture fabrics	Matching textiles (blankets, cloths serviettes etc.)	Other woven products	Other knitted products Hosiery	Terry towelling	Other textiles
EU Flower	2%		6%	8%	8%	
The Swan	0.5%	5%				2%
IVN			3%	8%		

According to Eco-labelling Denmark the criterion of dimensional change is one of the criteria, which are difficult for the eco-label applicants to comply with. When the applicants test their textile products the shrinkage is too high for a number of the textile products. The difficultness of complying with this criterion can also be seen by the latest revision of the EU Flower criteria. The criterion for dimensional changes has been eased for some type of products (knitted and woven products) as the percentages was too difficult to comply with (EU Flower Background Document, 2002). In addition, it is now allowed to exceed the mentioned percentages for dimensional changes if the actual dimensional change is stated clearly on the product label.

A Danish survey of bed linen (Tænk+Test, 2003) also shows that the criterion of dimensional change is difficult to comply with. Of the 19 tested bed linens, 10 products are given the rating “below average” or “bad” for the dimensional change, ratings, which are worse than the one eco-labelled product (Flower), which was given the rating “average”. Only four products are given ratings of “very good” or “good”. However, the test does not mention, which dimensional change (in percentage) that is considered as “good” or “average”.

In order to fulfil the requirement of 80-90% of the products on the market must be able to comply with the environmental baseline requirements, the set requirement must therefore be above the requirements of the eco-labels. It is not possible to set a general requirement for all textiles as a dimensional change of 8% for bed linen may be acceptable, but is definitely not acceptable for e.g. curtains.

For several reasons, it is suggested not to set a fixed requirement for the dimensional change of textiles. First of all, the percentages of dimensional change set by the EU Flower are difficult to comply with. Secondly, even the EU Flower does not set a fixed limit value. A higher dimensional change is allowed if stated on the product. Finally, more test information is needed in order to find a reasonable level for different kinds of textiles. It is therefore suggested in stead to require a statement on the product of the dimensional change that can be expected by washing and drying of the product. Such a requirement could avoid that consumers throw out the textile product they have just bought, because they then would know which shrinkage level to expect.

The dimensional change can be tested as suggested by the EU Flower and the Swan by the use of the ISO 5077 test method or by use of the DIN 53920 ISO 6330 as stated by IVN.

The environmental baseline requirement set is:

Aspect	Environmental baseline requirement	Verification
Dimensional change of textile product	The dimensional change of the textile product must be labelled clearly on the product (care label)	ISO 5077

5.3.3.2 Colour fastness to washing

The EU Flower, the Swan, the Thai Green Label, IVN, Oeko-Tex and TOXPROOF have all set a criterion for the colour fastness to washing. The levels set are between 3 and 4 (see the table below), on a scale of 1 to 5 where level 1 is poor (substantial change of colour) and level 5 means excellent (no change in original colour). The levels set by the EU Flower do not apply to dry clean products or white products. The levels set by IVN do not apply to baby and children's clothes. The levels set by the Swan do not apply to furniture fabrics.

Table 5.4: Colour fastness to washing allowed by different eco-labelling schemes.

	Colour change / colour alteration	Discolouration / staining
EU Flower	3-4	3-4
The Swan	3-4	4
Thai Green Label	4	
IVN	3-4	
Oeko-Tex	3	
TOXPROOF	3	

According to Eco-labelling Denmark the criterion of colour fastness to washing is one of the criteria, which are difficult for the eco-label applicants to comply with, but mostly for black products. When the applicants test their textile products the colour is not sufficiently stable for a number of the textile products. It is also stated in the background document, that a level 4

will be too strict for many products (EU Flower Background Document, 2002). However, in order to set a meaningful environmental baseline requirement the colour fastness to washing must be at least a level 3 (average), as is also used as the requirement in Oeko-Tex and TOXPROOF. It is therefore suggested to use the level set by Oeko-Tex and TOXPROOF as the environmental baseline requirement.

As stated by the EU Flower, the requirement set should not apply to dry clean products or to white products, as colour fading when washing is not relevant for these types of textiles.

The colour fastness to washing can be tested as suggested by the EU Flower by use of the ISO 105 C06 test method, by use of the test method ISO 105-E01 as used by the Swan, Oeko-Tex and TOXPROOF or by use of the ISO 105-C03 as stated by IVN. It is suggested to use the test used by the EU Flower.

The environmental baseline requirement set is:

Aspect	Environmental baseline requirement	Verification
Colour fastness to washing for the textile product	The colour fastness to washing must be at least a level 3. Do not apply to dry clean products or to white products.	ISO 105-C06

5.3.3.3 Colour fastness to perspiration

The EU Flower, the Swan, the Thai Green Label, IVN, Oeko-Tex and TOXPROOF have all set a criterion for the colour fastness to perspiration. The levels set are all at level 3-4 (see the table below) for both acidic and alkaline perspiration, on a scale of 1 to 5 where level 1 is poor (substantial change of colour) and level 5 means excellent (no change in original colour). The levels set by the EU Flower do not apply to dry white products, to products that are neither dyed nor printed or to furniture fabrics, curtains or similar. The levels set by the Swan do not apply to curtains, carpets and furniture fabrics. The levels set by the Thai Green Label exclude curtains.

Table 5.5: Colour fastness to perspiration allowed by different eco-labelling schemes.

	Acidic perspiration	Alkaline perspiration
EU Flower¹	3-4	3-4
The Swan	3-4	3-4
Thai Green Label	3-4	3-4
IVN	3-4	3-4
Oeko-Tex	3-4	3-4
TOXPROOF	3-4	3-4

¹ A level 3 is allowed for fabrics that are both light coloured and made of more than 20% silk

According to the Danish survey (Tænk+Test, 2003) on bed linens the colour fastness to perspiration gets the highest ratings (of 19 products 15 are rated “very good” and 4 “good”), which may indicate that colour fastness to perspiration is a criterion that most of the bed linens can comply with. Oeko-Tex is a labelling scheme with a very high number of licenses, which also indicates that many products can comply with their criteria. It is therefore suggested to use the criterion set by Oeko-Tex as the environmental baseline requirement (and thereby also the criterion set by all the other mentioned eco-labelling schemes as the criterion is identical).

As stated by the EU Flower, the requirement set should not apply to white products, to products that are neither dyed nor printed or to furniture fabrics, curtains or similar as colour fading when exposed to perspiration is not relevant for these types of textiles.

The colour fastness to perspiration can be tested as suggested by all the mentioned eco-labelling schemes by the use of the ISO 105-E04 test method.

The environmental baseline requirement set is:

Aspect	Environmental baseline requirement	Verification
Colour fastness to perspiration (both acidic and alkaline) for the textile product	The colour fastness to perspiration (acidic and alkaline) must be at least a level 3-4. Do not apply to white products, to products that are neither dyed nor printed or to furniture fabrics, curtains or similar.	ISO 105-E04

5.3.3.4 Colour fastness to wet and dry rubbing

The EU Flower, the Swan, the Thai Green Label, IVN, Oeko-Tex and TOXPROOF have all set a criterion for the colour fastness to wet and dry rubbing. Except for Oeko-Tex which has not set a criterion for wet rubbing. The levels set are between 2 and 4 for wet rubbing and between 3-4 and 4 for dry rubbing (see the table below), on a scale of 1 to 5 where level 1 is poor (substantial change of colour) and level 5 means excellent (no change in original colour). The levels set by the EU Flower do not apply to dry white products, to products that are neither dyed nor printed or to furniture fabrics, curtains or similar. The levels set by the Thai Green Label exclude curtains.

Table 5.6: Colour fastness to wet and dry rubbing allowed by different eco-labelling schemes.

	Wet rubbing	Dry rubbing
EU Flower	2-3 ¹	4 ²
The Swan	2-3 ³	4
Thai Green Label	4 ⁴	3-4 ⁵
IVN	2	3-4
Oeko-Tex		4
TOXPROOF	2-3	4

¹ A level 2 is allowed for indigo dyed denim

² A level 3-4 is allowed for indigo dyed denim

³ A level 3 is allowed for furniture fabrics

⁴ A level 3-4 is allowed for curtains and furniture fabrics

⁵ A level 3 is allowed for curtains and furniture fabrics

According to the Danish survey on 19 bed linens (Tænk+Test, 2003), all products tested get a rating of “average” or higher (of 19 products 11 are rated “very good”, 3 “good”, and 5 “average” for the colour fastness to rubbing (both wet and dry rated as one). This may indicate that products may be able to comply with a requirement for wet and dry rubbing if the lower levels are used (2-3 for wet rubbing and 3-4 for dry rubbing), even though the survey only has tested bed linens. It is, however, suggested to use the same exception as used by the EU Flower for indigo dyed denim to ensure that also these products can meet the requirement.

As stated by the EU Flower, the requirement set should not apply to white products, to products that are neither dyed nor printed or to furniture fabrics, curtains or similar as colour fading when exposed to rubbing is not relevant for these types of textiles.

The colour fastness to wet and dry rubbing can be tested as suggested by all the mentioned eco-labelling schemes by the use of the ISO 105-X12 test method.

The environmental baseline requirement set is:

Aspect	Environmental baseline requirement	Verification
Colour fastness to wet rubbing for the textile product	The colour fastness to wet rubbing must be at least a level 2-3. A level of 2 is allowed for indigo dyed denim. Do not apply to white products, to products that are neither dyed nor printed or to furniture fabrics, curtains or similar.	ISO 105-X12
Colour fastness to dry rubbing for the textile product	The colour fastness to dry rubbing must be at least a level 3-4. Do not apply to white products, to products that are neither dyed nor printed or to furniture fabrics, curtains or similar.	ISO 105-X12

5.3.3.5 Colour fastness to light

The EU Flower, the Swan, the Thai Green Label, and IVN have all set a criterion for the colour fastness to light. The levels set, are between 3-4 and 6 depending on the type of textile (see the table below), on a scale of 1 to 8 where level 1 is substantial colour fading and level 8 is no colour fading. The levels set by the EU Flower do not apply to mattress ticking, mattress protection and to underwear.

Table 5.7: Colour fastness to light allowed by different eco-labelling schemes.

	Furniture fabrics and carpets	Curtains	Bed textiles	Clothes	Outdoor clothes	Other textiles
EU Flower	5 ¹	5 ¹	4	4	4	4
The Swan	5	6	3-4	3-4	4	3-4
Thai Green Label	4-5	4-5	4-5	4-5	4-5	4-5
IVN				4	4	

¹ A level 4 is allowed for fabrics that are both light coloured and made of more than 20% silk

According to Eco-labelling Denmark the criterion of colour fastness to light is one of the criteria, which are difficult for the eco-label applicants to comply with. When the applicants test their textile products the colour is not sufficiently stable and is faded by the light for a number of the textile products. No test results for colour fastness to light has been found, which makes it difficult to set an environmental baseline requirement that most products can comply with. It is therefore suggested to use the lowest levels set by the eco-labelling schemes. In order to

ease the testing procedure it is suggested only to use two categories, one for furniture fabrics, carpets and curtains, and one for clothes and other textiles. The two categories are necessary as furniture fabrics, carpets, etc. must be able to withstand light more than ordinary clothes as they are expected to last longer.

As stated by the EU Flower, the requirement set should not apply to mattress ticking, mattress protection and to underwear as colour fading when exposed to light is not relevant for these types of textiles.

The colour fastness to light can be tested as suggested by all the mentioned eco-labelling schemes by the use of the ISO 105-B02 test method.

The environmental baseline requirement set is:

Aspect	Environmental baseline requirement	Verification
Colour fastness to light for furniture fabrics, carpets and curtains	The colour fastness to light must be at least a level 4-5. Do not apply to mattress ticking, mattress protection and to underwear.	ISO 105-B02
Colour fastness to light for clothes and all other textile products	The colour fastness to light must be at least a level 3-4. Do not apply to mattress ticking, mattress protection and to underwear.	ISO 105-B02

5.3.3.6 Pilling resistance (for furniture fabrics)

The Swan is the only eco-labelling scheme that has set a criterion for the pilling resistance of furniture fabrics. The pilling resistance must be at least a level 4.

As this criterion is restricted to a limited part of textile products, and as the Swan is the only eco-labelling scheme setting a criterion for this issue, no environmental baseline requirement is set.

5.3.3.7 Odour

Oeko-Tex and TOXPROOF are the only two eco-labelling schemes that have set a criterion for the odour of the finished textile product. Oeko-Tex has set a general criterion for all textiles that no abnormal odour may occur. Furthermore, the odour level from non-clothing textiles such as carpets, mattresses and large coated articles, must be a level 3. TOXPROOF sets the odour level for all textiles at a level of 2-3.

As Oeko-Tex and TOXPROOF are the only eco-labelling schemes setting a criterion for this issue, no environmental baseline requirement is set.

5.3.3.8 Colour fastness to saliva and perspiration (for baby clothes)

Oeko-Tex and TOXPROOF are the only eco-labelling schemes that have set a criterion for the colour fastness to saliva and perspiration. In both cases the colour fastness to saliva and perspiration must be fast and in both cases the criterion does only apply for baby clothes.

As this criterion is restricted to a limited part of textile products, and as the Oeko-Tex and TOXPROOF are the only eco-labelling schemes setting a criterion for this issue, no environmental baseline requirement is set.

5.4 Summary of the suggested environmental baseline requirements for textiles

This section is a short summary of the suggested baseline requirements as discussed and listed in section 5.3 “Discussion about suitable environmental baseline requirements for textiles”. The proposed list can be used as a basis for discussion amongst stakeholders. The suggested baseline requirements are presented in the table below.

Table 5.8: Suggested baseline requirements for textiles

Aspect	Environmental baseline requirement	Test method / verification
Chemicals		
Carcinogenic, mutagenic substances/preparations and substances/preparations toxic to reproduction	The finished textile products shall not contain substances or preparations in amounts exceeding 0.1% by weight of substances that are assigned with the risk phrases R45, R46, R49, R60 or R61. Apply for all chemicals used in the production of textiles (including flame-retardants, finishing agents, coatings, laminates, and membranes).	All chemicals used must be listed and material safety data sheets for all chemicals must be provided.
Flame-retardants that are toxic to aquatic organisms	The finished textile products shall not contain substances or preparations in amounts exceeding 0.1% by weight of substances that are assigned with the risk phrases R50, R51, R52 or R53.	All flame-retardants used must be listed and material safety data sheets for all flame-retardants must be provided.
Finishing substances or preparations that are toxic to aquatic organisms	The finished textile products shall not contain substances or preparations in amounts exceeding 0.1% by weight of substances that are assigned with the risk phrases R50, R51, R52 or R53.	All finishing substances used must be listed and material safety data sheets for all finishing substances must be provided.
Content of potentially sensitising dyes in the finished textile product	The final product shall not contain any sensitising or allergenic dyes that are assigned the risk phrases R42 or R43.	All dyes used must be listed and material safety data sheets for all the dyes must be provided.
Finished textile product		
Antimony – extractable content in finished textile products	< 30 ppm	SS 028150
Arsenic – extractable content in finished textile products	< 0.5 ppm	SS 028150
Cadmium– extractable content in finished textile products	< 0.1 ppm	SS 028150
Cobalt – extractable content in finished baby textile products	< 0.2 ppm	SS 028150
Cobalt – extractable content in all other finished textile products	< 4.0 ppm	SS 028150

Aspect	Environmental baseline requirement	Test method / verification
Chromium – extractable content in finished textile products	< 2.0 ppm	SS 028150
Copper – extractable content in finished textile products	< 50.0 ppm	SS 028150
Mercury – extractable content in finished textile products	< 0.03 ppm	SS 028150
Nickel – extractable content in finished textile products	< 4.0 ppm	SS 028150
Lead – extractable content in finished textile products	< 0.8 ppm	SS 028150
Tin – extractable content in finished textile products	< 4.0 ppm	SS 028150
Content of pentachlorophenol in finished textile product	< 0.5 ppm	Use of gas chromatography with mass spectrometric (MSD) or electron capture detection (ECD).
Phthalates in finished textile product	< 0.1% phthalates in baby clothes as a total sum of the specific phthalates mentioned by Oeko-Tex	Extraction with organic solvent. Gas chromatography (MS detection).
Content of chlorinated carriers in finished textile product	< 1 ppm	Extraction with organic solvent. Gas chromatography (MSD or ECD detection)
Content of the carrier ortho-phenylphenol (OPP) residue in finished textile product	< 100 ppm	Extraction with organic solvent. Gas chromatography (MSD or ECD detection)
Formaldehyde content in finished textiles with skin contact	< 75 ppm	EN ISO 14184-1
Formaldehyde content in finished textiles with no skin contact	< 300 ppm	EN ISO 14184-1
Pesticide residue in finished textile product	< 1 ppm measured as a sum of all pesticides listed in appendix in Oeko-Tex 100	Tests are performed with cleaned-up extracts by gas chromatography with selective detection (MSD or ECD)
pH value of the aqueous extract of textiles with direct skin contact	pH value between 3.5 and 8.0	ISO 3071
pH value of the aqueous extract of textiles with no direct skin contact	pH value between 3.5 and 9.0	ISO 3071
Dimensional change of textile product	The dimensional change of the textile product must be labelled clearly on the product (care label)	ISO 5077
Colour fastness to washing for the textile product	The colour fastness to washing must be at least a level 3. Do not apply to dry clean products or to white products.	ISO 105-C06

Aspect	Environmental baseline requirement	Test method / verification
Colour fastness to perspiration (both acidic and alkaline) for the textile product	<p>The colour fastness to perspiration (acidic and alkaline) must be at least a level 3-4.</p> <p>Do not apply to white products, to products that are neither dyed nor printed or to furniture fabrics, curtains or similar.</p>	ISO 105-E04
Colour fastness to wet rubbing for the textile product	<p>The colour fastness to wet rubbing must be at least a level 2-3. A level of 2 is allowed for indigo dyed denim.</p> <p>Do not apply to white products, to products that are neither dyed nor printed or to furniture fabrics, curtains or similar.</p>	ISO 105-X12
Colour fastness to dry rubbing for the textile product	<p>The colour fastness to dry rubbing must be at least a level 3-4.</p> <p>Do not apply to white products, to products that are neither dyed nor printed or to furniture fabrics, curtains or similar.</p>	ISO 105-X12
Colour fastness to light for furniture fabrics, carpets and curtains	<p>The colour fastness to light must be at least a level 4-5.</p> <p>Do not apply to mattress ticking, mattress protection and to underwear.</p>	ISO 105-B02
Colour fastness to light for clothes and all other textile products	<p>The colour fastness to light must be at least a level 3-4.</p> <p>Do not apply to mattress ticking, mattress protection and to underwear.</p>	ISO 105-B02

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1 Appendix A – Review of existing eco-criteria for textiles

In this appendix the criteria used in the different eco-labelling programmes or other programmes are described. Each set of criteria is described individually, but by the use of the following headlines – textile fibre criteria, processes and chemical criteria, and fitness for use criteria.

1.1 The Flower (EU)

The European ecolabel – the Flower – has existed since 1992. The first criteria for textiles were established in 1999.

The present ecolabelling criteria for textiles for the EU Flower are “Commission decision of 15 May 2002 establishing the ecological criteria for the award of the Community eco-label to textile products” (the EU Commission, 2002). At present (January 2004) 53 companies hold the license for the EU Flower textiles.



Logo of the EU Flower

1.1.1 Ecolabel criteria for the EU Flower

The product group is defined as:

- Textile clothing accessories (such as handkerchiefs, scarves, bags, shopping bags, rucksacks, belts etc.) consisting of at least 90% by weight of textile fibres.
- Interior textiles: textile products for interior use consisting of at least 90% by weight of textile fibres. Wall and floor coverings are excluded.
- Fibres, yarn and fabric: intended for use in textile clothing and accessories or interior textiles.

The following criteria apply.

Textile fibre criteria

General for the textile fibre criteria:

- At least 85% (w/w) must fulfil the criteria for fibre content or be of recycled origin.
- The textile fibre criteria need not be met if the fibre contributes to less than 5% of the total weight of textile fibres in the product.
- The textile fibre criteria need not to be met if the fibres are of recycled origin (from cuttings from textile manufacturers).

Acrylic fibres:

- Residual acrylonitrile content in raw fibres leaving the fibre production plant must be less than 1.5 mg/kg.
- Emissions to air of acrylonitrile (during polymerisation and up to solution ready for spinning) expressed as an annual average must be less than 1 g/kg fibre produced.

Cotton and other natural cellulosic seed fibres:

- Maximum limit of 0.05 ppm (detection limit) of certain pesticides (see appendix B). Does not apply if more than 50% of the cotton content is organically grown or is transitional cotton. Does not apply if for at least 75% of the cotton used the farmers producing the cotton states that the pesticides in question have not been used.

Elastane:

- No use of organotin compounds.

- Emission to air of aromatic diisocyanates during polymerisation and spinning (expressed as annual average) must be less than 5 mg/kg fibre produced.

Flax/bast fibres:

- On retting: Emission of oxygen demanding substances must be reduced by 75% (measured as TOC or COD) for hemp fibres and 95% for flax and other bast fibres.

Greasy wool/keratin fibres:

- Maximum total content of certain pesticides of 0.5 ppm or 2 ppm respectively (see appendix B). Does not apply if for at least 75% of the wool or keratin fibres used the producing farmers states that the pesticides in question have not been used.
- Maximum COD emissions to the sewer of the effluent from wool washing of 60 g/kg greasy wool. Effluent from wool washing must be treated off-site to achieve at least a 75% reduction of COD content, expressed as an annual average.
- Maximum COD emissions to surface waters of the effluent from wool washing of 5 g/kg greasy wool. The pH and temperature must be between 6 and 9, and below 40°C respectively.

Man-made cellulose fibres (including viscose, lyocell, acetate, cupro, triacetate):

- The level of AOX in the fibres must not exceed 250 ppm.
- Maximum sulphur emission to air from processing during fibre production of 120 g/kg filament fibre produced and 30 g/kg staple fibre produced. A weighted average is used where both types of fibre are produced.
- Maximum zinc emission to water of 0.3 g zinc/kg for viscose fibres.
- Maximum copper content of the effluent water leaving the site of 0.1 ppm for cupro fibres.

Polyamide:

- Maximum average annual emission of nitrous oxide (N₂O) into air in production of monomers of 10 g/kg polyamide 6 fibre produced and 50 g/kg polyamide 6,6 produced.

Polyester:

- Maximum average annual emission of VOC into air during polymerisation of polyester of 1.2 g/kg of polyester resin produced
- Maximum content of antimony in polyester fibre of 260 ppm
- No use of halogenated carriers.

Polypropylene:

- No use of lead-based pigments.

Processes and chemical criteria

Size, detergents, fabric softeners and complexing agents:

- At least 95% (dry weight) of the component substances of any sizeing preparation applied to yarns must be sufficiently biodegradable or eliminable in wastewater treatment plants.
- At least 95% by weight of the detergents, fabric softeners and complexing agents used must be sufficiently biodegradable or eliminable in wastewater treatment plants.

Spinning oils and additives (for primary spinning):

- At least 90% of the component substances must be sufficiently biodegradable or eliminable in wastewater treatment plants.

- A maximum content of polycyclic aromatic hydrocarbons in the mineral oil proportion of 1% by weight.

Biocidal or biostatic products:

- No use of chlorophenols (salts and esters) during transportation or storage of products.
- No use of PCB (polychlorated biphenyles) during transportation or storage of products.
- No use of organotin compounds during transportation or storage of products.
- Biocidal or biostatic products must not be applied to products so as to be active during the use phase.

Stripping or depigmentation:

- No use of heavy metal salts (except of iron).
- No use of formaldehyde.

Weighting:

- No use of compounds of cerium in the weighting of the yarn or fabrics.

Auxilliary chemicals:

- No use of certain surfactants and complex builders (see appendix B).

Bleaching agents:

- Maximum AOX emission in the bleaching effluent of 40 mg Cl/kg. Maximum limit of 100 mg Cl/kg for linen and other bast fibres, and for cotton (polymerisation degree below 1800). Is not a requirement for man-made cellulose fibres.

Dyes and pigments:

- Ionic impurities in dyes must not exceed 100 ppm for silver (Ag).
- Ionic impurities in dyes and pigments must not exceed 50 ppm for arsenic (As).
- Ionic impurities in dyes and pigments must not exceed 100 ppm for barium (Ba).
- Ionic impurities in dyes must not exceed 20 ppm for cadmium (Cd).
- Ionic impurities in pigments must not exceed 50 ppm for cadmium (Cd).
- Ionic impurities in dyes must not exceed 500 ppm for cobalt (Co).
- Ionic impurities in dyes and pigments must not exceed 100 ppm for chrome (Cr).
- Ionic impurities in dyes must not exceed 250 ppm for copper (Cu).
- Ionic impurities in dyes must not exceed 500 ppm for iron (Fe 2).
- Ionic impurities in dyes must not exceed 4 ppm for mercury (Hg).
- Ionic impurities in pigments must not exceed 25 ppm for mercury (Hg).
- Ionic impurities in dyes must not exceed 1000 ppm for manganese (Mn).
- Ionic impurities in dyes must not exceed 200 ppm for nickel (Ni).
- Ionic impurities in dyes and pigments must not exceed 100 ppm for lead (Pb).
- Ionic impurities in dyes must not exceed 20 ppm for selenium (Se).
- Ionic impurities in pigments must not exceed 100 ppm for selenium (Se).
- Ionic impurities in dyes must not exceed 50 ppm for antimony (Sb).
- Ionic impurities in pigments must not exceed 250 ppm for antimony (Sb).
- Ionic impurities in dyes must not exceed 250 ppm for tin (Sn).
- Ionic impurities in dyes must not exceed 1500 ppm for zink (Zn).
- Ionic impurities in pigments must not exceed 1000 ppm for zink (Zn).
- Chrome mordant dyeing is not allowed.
- No use of azo-based dyes which on decomposition give rise to one or more carcinogenic amines.

- No use of dyes that are carcinogenic (assigned R40, R45, R49), mutagenic (assigned R46, R68) or toxic to reproduction (assigned R60, R61, R62, R63) – see appendix B.
- No use of potentially sensitising dyes (see appendix B). Specific dyes must only be used if the fastness to perspiration of the dyed fibres, yarn or fabric is at least a level 4.

Metal complex dyes based on copper, chromium or nickel:

- For cellulose dyeing with metal complex dyes as part of the recipes, less than 20% of each of those metal complex dyes applied must be discharged to wastewater treatment.
- For all other dyeing processes with metal complex dyes as part of the recipes, less than 7% of each of those metal complex dyes applied must be discharged to wastewater treatment.
- Maximum emission to water after treatment of 75 mg/kg copper.
- Maximum emission to water after treatment of 50 mg/kg chromium.
- Maximum emission to water after treatment of 75 mg/kg nickel.

Printing:

- Maximum content of 5% VOC in printing pastes used.
- No use of plastisol-based (PVC-based) printing.

Wastewater discharges from wet-processing:

- Maximum COD content of wastewater discharges of 25 g/kg (annual average).
- pH values must be between 6 and 9 and a maximum temperature of 40°C if the effluent is treated on site and discharge directly to surface waters.

Flame-retardants:

- No use of flame-retardants containing more than 0.1% by weight of substances that are carcinogenic (assigned R40, R45, R49), mutagenic (assigned R46, R68), toxic to reproduction (assigned R60, R61, R62, R63) or toxic to aquatic organisms (R50, R51, R52, R53).

Finishes:

- No use of finishes substances or preparations containing more than 0.1% by weight of substances that are carcinogenic (assigned R40, R45, R49), mutagenic (assigned R46, R68), toxic to reproduction (assigned R60, R61, R62, R63) or toxic to aquatic organisms (R50, R51, R52, R53).

Shrink-resistant finishes:

- Halogenated shrink-resistant substances or preparation must only be applied to wool slivers.

Coatings, laminates and membranes:

- Must not be produced using substances, which are carcinogenic (assigned R40, R45, R49), mutagenic (assigned R46, R68), toxic to reproduction (assigned R60, R61, R62, R63) or toxic to aquatic organisms (R50, R51, R52, R53).

Finished textile products:

- Maximum release of 30 ppm formaldehyde from clothes which are to be worn directly against the skin.
- Maximum release of 300 ppm of formaldehyde from all other products.

Energy and water use:

- Detailed information on water and energy use for the manufacturing sites involved in spinning, knitting, weaving and wet processing can be mentioned. It is not a requirement, but can be given voluntarily.

Fitness for use criteria

Colour fastness:

- Specific requirements for colour fastness for different product groups are set regarding colour fastness to washing, perspiration (acid alkaline), rubbing (dry and wet) and light.

Dimensional change:

- A dimensional change of more than 2% for washable curtains and furniture fabrics must be clearly shown on the product.
- A dimensional change of more than 6% for other woven products must be clearly shown on the product.
- A dimensional change of more than 8% for other knitted products must be clearly shown on the product.
- A dimensional change of more than 8% for terry towelling must be clearly shown on the product.

1.2 The Swan (Nordic Countries)

The Nordic ecolabelling – the Swan – has existed since 1989, where the Nordic Council of Ministers adopted a measure to implement a voluntary ecolabelling scheme in the Nordic countries (Denmark, Sweden, Norway, Finland, Iceland).



Logo of the Swan

The present ecolabelling criteria for textiles for the Swan are “Ecolabelling of Textiles” version 2.5 (Nordic Ecolabelling, 2001). At present (December 2003) two companies hold the license for the Swan textiles.

1.2.1 Ecolabel criteria for the Swan

The product group is defined as yarn, cloth, knitted tricot and finished textiles. This also includes furniture fabrics, curtains and carpets. The following criteria apply.

Textile fibre criteria

General for the textile fibre criteria:

- At least 95% (w/w) must fulfil the criteria for fibre content.
- No use of chlorophenols (or their salts and esters) to store or transport cotton, flax or wool. Maximum content of 20 µg/kg of fibre.

Cotton and similar:

- Grown without use of pesticides.

Flax/bast fibres:

- Cultivated without use of pesticides.
- On retting: Emission of oxygen demanding substances must be reduced by 75% (measured as TOC or COD).

Greasy wool/keratin fibres:

- Maximum content of certain pesticides of 50 µg/kg of raw fibre (see appendix B).
- Maximum COD emissions from wool washing of 60 kg/ton product.
- Solvent-based washing not permitted.

Man-made cellulose fibres:

- Maximum COD emissions from pulp and fibre production of 80 kg/ton.
- Maximum emission of process sulphur into air from pulp and fibre production of 15 kg sulphur/ton regenerated cellulose.
- No use of chlorine based bleaching chemicals.
- Maximum zinc emission of 0.5 kg zinc/ton regenerated cellulose.

Polyamide:

- Solvent-free spinning methods must be used.
- Maximum average annual emission of nitrous oxide into air in production of monomers of 1 g/kg fibre.

Polyester:

- Solvent-free spinning methods must be used
- Maximum average annual emission of VOC into air of 1.2 g/kg of polyester resin produced
- Maximum content of antimony in polyester fibre of 300 ppm

Recycled fibres:

- Maximum content of total extractable organically bound halogens (EOX) of 3 mg/kg fibre intended for recycling.

Processes and chemical criteria

General health and environmental effects of chemicals:

- No use of carcinogenic, teratogenic, mutagenic or reprotoxic chemicals (in the EU or the Nordic countries).
- No use of certain tensides, softeners (e.g. phthalates), complex builders, flame-retardants, preserving agents, polychlorinated biphenyls (PCB) etc. (see appendix B). The content must not exceed 1% by weight of the chemical product purchased.

Spinning oils and knitting oils:

- A maximum content of polycyclic aromatic hydrocarbons in the mineral oil proportion of 1% by weight.

Azo-dyes:

- No use of azo-based dyes which on decomposition give rise to one or more carcinogenic amines.

Adhesive dressing:

- Adhesive dressing must at least be inherently, ultimately biodegradable. Where exceptions apply for organic certified fibres, adhesives must be based on readily biodegradable substances.

Pickling:

- Pickling with metals is not permitted.

Emissions from textile processes:

- Total emission of oxygen demanding substances from wet textile processing must be reduced by 90% at least measured as (TOC or COD) or 25 g of COD/kg textile. Exceptions are processes involving organic fibre – reduction of 50% or 60 g/kg is sufficient.
- No emission of phosphorus-based flame-retardants into wastewater systems is permitted. They must be collected and handled separately.

Energy and water consumption:

- A plan for minimising electricity and heat consumption must exist for wet processing plants.

Finished textile products:

- Maximum limit of 0.20 mg arsenic per kg textile
- Maximum limit of 0.80 mg lead per kg textile
- Maximum limit of 0.10 mg cadmium per kg textile
- Maximum limit of 4.00 mg cobalt per kg textile
- Maximum limit of 50.00 mg copper per kg textile
- Maximum limit of 2.00 mg chromium per kg textile
- Maximum limit of 0.02 mg mercury per kg textile
- Maximum limit of 4.00 mg nickel per kg textile
- Maximum limit of 4.00 mg tin per kg textile

- Maximum limit of 60.00 mg zinc per kg textile
- Maximum release of nickel from metal alloys of 0.5µg/cm² per week.
- Aqueous extract from textile products must have a pH level between 4.8 and 7.5. Exceptions: curtains, carpets and furniture fabrics.
- Maximum release of 30 ppm formaldehyde from childrens' clothes and other clothes which are to be worn directly against the skin
- Maximum release of 100 ppm of formaldehyde from outdoor clothes
- Maximum release of 300 ppm of formaldehyde from curtains, furniture fabrics and carpets
- Maximum release of 30 ppm of formaldehyde from bed textiles (including mattress covers) and other textiles

Fitness for use criteria

Water washing:

- The products must be able to withstand water washing. Exception: not a requirement for furniture fabrics and carpets, which should be suitable for water-based washing.
- The products must be able to retain its function and be usable after washing and drying.

Colour fastness:

- Specific requirements for colour fastness for different product groups are set regarding colour fastness to water, washing (discoloration and colour alteration), perspiration, rubbing (dry and wet) and artificial light.

Dimensional change:

- A dimensional change of more than ±0.5% for furniture fabrics must be clearly shown on the product.
- A dimensional change of more than ±5% for matching textiles goods (e.g. cloths, blankets, scarves, sheets, duvet covers, serviettes, pillow slips and mats/carpets) must be clearly shown on the product.
- A dimensional change of more than ±2% for other textiles must be clearly shown on the product.

Special for furniture fabrics:

- Must have abrasion resistance corresponding to the rupture of maximum two threads at minimum 20,000 wear-revolutions for private use, and 40,000 wear-revolutions for public use.
- Must have a certain pilling resistance.

1.3 Good Environmental Choice (Sweden)

The Swedish ecolabelling – Good Environmental Choice (Bra Miljöval) – has existed since 1987, where the Swedish Nature Protection Association started the ecolabelling scheme.

The present ecolabelling criteria for textiles for Good Environmental Choice are “Good Environmental Choice for textiles” (in Swedish) (Bra Miljöval, 1996). At present (December 2003) 10 companies hold the license for Good Environmental Choice textiles.



Bra Miljöval

Logo for Good Env.
Choice



Old logo for Good
Env. Choice

1.3.1 Ecolabel criteria for Good Environmental Choice

The product group is defined as every day clothes and textiles for homes (yarn, fabric or finished textiles). Textiles for working clothes, authorities and similar can be evaluated if there is no special treatments of the fabric as dirt-repellent, flameproof finish, etc. The following criteria apply.

Textile fibre criteria

The textile fibre criteria are voluntary. If these criteria also are met the ecolabel can be used with the additional text “Good fibres”.

General for the textile fibre criteria:

- At least 90% (w/w) must fulfil the criteria for fibre content.
- At least 80% (w/w) of the total fibre material must be recycled. (Fibre waste from carding do not count as recycled fibres).
- No use of chlorated chemicals for bleaching of the recycled fibres.
- No use of pentachlorophenols (or their salts and esters) to store or transport.

Natural fibres:

- All fibres must be grown organically and must be accredited by IFOAM or EU.
- Organic fibres and conventional fibres must not be mixed (in the same yarn or fabric).
- No use of fibres from genetically modified organisms.
- Wool: the animal stock must be according to organic rules.
- Silk: the artificial crop must be organically grown.
- On retting: Emission of oxygen demanding substances must be reduced by 85% (measured as TOC or COD).

Synthetic fibres (polyester, polyamide, acryl):

- Maximum 30% (w/w) of the fibres must be of virgin synthetic raw materials.
- Synthetic fibres manufactured of recycled plastic material can be used in unlimited quantities.
- No use of halogenated monomers during manufacturing of the synthetic raw material.
- Spinning based on organic solvents is only allowed if 99% of the organic solvents are recycled.

Viscose:

- Maximum emission of sulphur to the air of 10 kg S/ton viscose fibre.
- Maximum emission of zinc to the water of 1 kg Zn/ton viscose fibre.
- Maximum emission of oxygen demanding substances of 40 kg COD/ton viscose fibre.

- No use of chlorine based bleaching chemicals.
- Spinning based on organic solvents is only allowed if 99% of the organic solvents are recycled.

Cellulose:

- No use of chlorine based bleaching chemicals.
- For cellulose the Good Environmental Choice criteria for paper apply.

Processes and chemical criteria

General health and environmental effects of chemicals:

- No use of allergenic, carcinogenic or teratogenic chemicals (chemicals marked with R40, R42, R43, R45, R46, R60-63 in its pure form).
- No use of chemicals marked with R53 (bioaccumulative chemicals) or R59 (dangerous for the ozone layer).
- Surfactants, plasticisers, antistatic agents, enzymes, thickeners, softeners etc. must be easily biodegradable.

Chemicals in general:

- No use of certain tensides, softeners, complex builders etc. (see appendix B).
- No use of flame-retardants (see appendix B).
- No use of biocides (see appendix B).
- No use of optical white (see appendix B).
- No use of halogenated solvents as stain remover (see appendix B).
- No use of plastic coatings (see appendix B).
- No use of perborate, hypochlorite or other chlorinated bleaching agents (see appendix B).
- No use of chlorinated compounds used as aid for dyeing or as noniron chemicals (see appendix B).

Washing of wool:

- Surfactants used for washing of wool must be easily biodegradable.
- Maximum emission from wool wash after waste-water treatment of 50 g COD/kg washed wool.

Processing of silk:

- Surfactants used must be easily biodegradable.
- Emission of oxygen demanding substances must be reduced by 85% (measured as TOC or COD).

Mercerising (of cotton and viscose):

- At least 50% of the sodium hydroxide or other alkali must be recycled.

Spinning oils, knitting oils and waxes:

- Spinning and knitting oils and waxes (added to the yarn) must be easily biodegradable.

Size:

- Must be easily biodegradable or reused (at least 75%).
- Maximum use of 30 g not easily biodegradable size per kg textile.

Energy use:

- Less than 70 MJ/kg textile for the average of the entire processing site.

Emissions form textile processing site:

- The production must be connected to a waste-water treatment plant.
- Maximum emission of oxygen demanding substances of 30 g COD/kg textile.
- Total emission of oxygen demanding substances must be reduced by 85% at least measured as (TOC or COD) and at least by 90% measured as BOD₇ calculated as the annual average.
- Maximum emission of phosphor after waste-water treatment of 0.5 g phosphor (P)/kg textile.

Pigments and dyes:

- No use of pigments and dyes, which on decomposition give rise to one or more carcinogenic amines.
- Pigments and dyes must follow the ETAD agreement (of ionic impurities – see Appendix B).
- Maximum amount of complex bound metals in pigments and dyes of 1 g/kg textile calculated as the added amount of pigment or dye.
- Maximum emission of 4 g pigment or dye/kg textile. Exception: not valid for natural pigments or dyes (recovered from vegetable or animal raw materials).

Dyeing:

- No use of inorganic heavy metal salts such as copper, tin and chromium salts.
- No use of urea.

Printing:

- Only use of water-based pigment printing (a low content of organic solvents in the thickeners are allowed).
- Use of water-based printing methods for transfer print.
- Maximum use of 30 g urea/kg textile for colour printing.
- Residues of printing paste must be handled as solid waste.

Finishing:

- No treatment with fluorocarbons.
- Silk must not be treated (pickling) with metal salts.
- No treatments in order to avoid moth and bacterial growth.

Finished textile products:

- Maximum release of 30 ppm formaldehyde from childrens' clothes and adults' clothes, which are to be worn directly against the skin.
- Maximum release of 100 ppm of formaldehyde from outdoor clothes.
- Maximum release of 300 ppm of formaldehyde from decoration textiles.
- Maximum release of 30 ppm of formaldehyde from bed textiles.

Fitness for use criteria

Water washing:

- The products must be able to withstand water washing. Exception: not a requirement for products, which are assumed to be washed very rare.

1.4 Eco Mark (Japan)

The Eco Mark from Japan has for textiles set criteria for

- Clothes
- Textile products for home use
- Textile products for industrial use
- Cloth diapers for infants
- Unbleached clothes, bed linen and towels
- Cloth shopping bags
- Textiles made of waste fibers¹¹.



Logo of Eco Mark Japan

The last four mentioned criteria mainly focus on the effective use of cloth products and resources that are subject to repeated use. Eco Mark in Japan was contacted personally by email in order to achieve the relevant criteria for textiles, and the first three mentioned criteria document was sent. Therefore, only the first three mentioned criteria are reviewed.

There is at the moment no information available on their website¹² with regard to information about how many companies that holds a license, as the English website currently is under construction (January 2004). However, a Danish report about eco-labels (Danish EPA No.12, 2002) state than in the year 2000, the Eco Mark could present the largest numbers of license holders (in a comparison between the EU Flower, Good Environmental Choice (Sweden), Environmental Choice (Canada), KRAV (Sweden), EKO (Holland), Oeko-Tex, and the Nordic Swan. In March 2000 a total of 643 products had an Eco Mark license. This number covers five different product groups, and not the same product group that exists today. The Danish report concludes that the Eco Mark holds the largest number of licenses for textiles (in the year 2000), but only few environmental criteria for textiles.

1.4.1 Ecolabel criteria for Eco Mark, Japan

1.4.1.1 Clothes

The product group is defined as all clothing items except leather wear and fur products. The product group do also include uniforms, outerwear, kimonos, hats and gloves. The present ecolabelling criteria for clothes are Eco Mark Product Category No. 103 – “Clothes” version 2.0 (Eco Mark No. 103, 2003). Criteria for clothes have existed since 1997. Today the following criteria apply.

Criteria for fibres

The clothes must meet one of the following conditions:

- a) The weight of waste fibres or recycled fibres in the total weight of the product must be
 - above 10% for waste fibres and recovered wool fibres
 - above 50% for recycled PET fibres and chemically recycled fibres.
- b) The fibre portion of the products must be made of 100% cotton and less than 10% polyurethane fibres (rubber thread) must be used for knitting collar, sleeve, and hem, etc. The products must be unbleached or made of hydrogen peroxide bleached cotton without using florescent whitener.
- c) The fibre portion of the products must be made of 100% natural fibres such as cotton and less than 10% polyurethane fibres (rubber thread) must be used for knitting collar, sleeve, and hem, etc. The material must be organically grown.

¹¹ The information and the criteria have been sent personally by email.

¹² Website of Eco Mark, Japan - <http://www.jeas.or.jp/ecomark/english/nintei.html>

- d) Products must be recovered and recycled after use. Portions of products that cannot be recycled must be subject to energy recovery. This does not apply for underwear, nightwear, socks and tights etc., hats and gloves.

Halogenated resins:

- No use of resins made of halogens for resin fibres and post-processes (do not apply to colouring materials and fluorine-based additives).

Processes and chemical criteria

Pigments and dyes:

- No use of pigments and dyes, which on decomposition give rise to one or more carcinogenic amines.
- Fabrics other than wool must not contain chrome dyes.
- No use of carcinogenic dyes.
- No use of skin sensitising dyes.

Finished textile products:

- No release of formaldehyde (no detection of formaldehyde, which equals 20 ppm) from baby diapers (under 24 months old)
- Maximum release of 75 ppm of formaldehyde from clothing that is likely to come into direct contact with the skin, including beddings, towels, inner wear and underwear.
- Maximum release of 300 ppm of formaldehyde from other textiles excluding products used outdoor.
- No use (no detection) of special flame-retardants (see appendix B).
- No use (no detection) of special pesticides (see appendix B).
- No use (no detection) of organic mercury compounds and organic tin compounds.

Fitness for use criteria

- Packaging material must be e.g. energy-saving, reusable, easy to recycle, easy to separate different materials, labelled. This does not apply for underwear, nightwear, kimonos, hats and gloves, and other clothing.
- A system enabling replacement of accessories (such as buttons) must exist (excluding replacement services). This does not apply for underwear, nightwear, kimonos, socks and tights etc., hats and gloves.
- Products may not be disposable. This does not apply for nightwear, kimonos, socks and tights etc.

1.4.1.2 Textile products for home use

The product group is defined as textile products for home use. The product group do also include apparel accessories (e.g. umbrellas), fabricated basic textiles, and other living and cultural supplies (tents). The present ecolabelling criteria for textile products for home use are Eco Mark Product Category No. 104 – “Textile Products for Home Use” version 2.0 (Eco Mark No. 104, 2003).

Criteria

All criteria are very similar to the criteria for clothes. There are some special criteria for floor coverings and umbrellas, otherwise the criteria are on the whole identical. The chemical criteria are identical for the two product groups.

1.4.1.3 Textile products for industrial use

The product group is defined as textile products for industrial use. The present ecolabelling criteria for textile products for industrial use are Eco Mark Product Category No. 105 – “Textile Products for Industrial Use” version 2.0 (Eco Mark No. 105, 2003).

Criteria

All criteria are very similar to the criteria for clothes. However, the weight of waste fibres or recycled fibres in the total weight of the product should be higher than for clothes – above 70% for waste fibres and recovered wool fibres, if the mentioned option a is followed. Otherwise the criteria are on the whole identical. The chemical criteria are identical for the two product groups.

1.5 Environmental Labelling (Korea)

The Environmental Labelling of Korea has existed since 1992. Korea has for textiles set criteria for

- Clothing
- Bags¹³



Logo of Korean Eco Label

At present (January, 2004) there are no certified products under the category “Bags” and 12 certified products under the category “Clothing”.

It has not been possible to achieve the criteria documents from Environmental Labelling Korea. A request has been sent by email, but no response has been received.

¹³ May also involve non textile bags. The information is not accessible on their website (www.kela.or.kr/english/cover/cover03.asp).

1.6 Environmental Choice Program (Canada)

The Environmental Choice Program (Canada) is the eco-labelling programme of Canada and has existed since 1988. The eco-labelling organisation is a member of GEN.



Logo of Environmental Choice Program, Canada

According to their website¹⁴, the following set of criteria is relevant for textiles:

- Clothing made from certified organic cotton

Only very sparse information about the criteria is available on their website. It has not been possible to achieve the criteria documents from the Environmental Choice Program. A request has been sent by email, but no response has been received.

The only information given on their website is that the clothes must be made from 100% organically grown cotton (certificate from the Organic Crop Improvement Association or the Texas Department of Agriculture), the clothes may not contain any dyes and only additives on a positive list must be used in the production.

¹⁴ Website of Environmental Choice Program, Canada - www.environmentalchoice.com

1.7 China Ecolabelling Center

China Ecolabelling Center has for textiles set criteria for

- Ecotypic textiles
- Moth resistant woollens

China Ecolabelling Center is not a direct member of GEN, but a GEN participant. It has not been possible to achieve the criteria documents from China Ecolabelling Center, as their website¹⁵ is not available in English. For the same reason it was not possible to find information about the number of certified textile products.



Logo of China Ecolabelling Center

¹⁵ Website of China Ecolabelling Center – www.cen.org.cn

1.8 National Ecolabelling Program (Czech Republic)

The National Ecolabelling Program of the Czech Republic has for textiles set criteria called

- Textile products

At present (January, 2004) there are no certified products under the category “Textile products”.

It has not been possible to achieve the criteria documents from the National Ecolabelling Program of the Czech Republic. A request has been sent by email, but no response has been received, and the criteria is not possible to download from their website¹⁶. However, they state on their website that “in their principles and goals the product category are identical with the product category of the European Union for these kinds of textiles”.



Logo of National Ecolabelling Program of the Czech Republic

¹⁶ Website of National Ecolabelling Program of the Czech Republic - www.ceu.cz/eng

1.9 Environmental Label (Croatia)

The Environmental Label Award scheme of the Republic of Croatia was established in 1993. The Environmental Label organisation from Croatia is a member of GEN. The Croatian Environmental Label has set criteria for

- Textile floor coverings.

According to their website¹⁷ one company holds a license for production of textile floor coverings.



Logo of Environmental Label Croatia

1.9.1 Ecolabel criteria for Environmental Label, Croatia

The product group refers only to textile floor coverings, and only the criteria relevant for textiles are listed here. The present ecolabelling criteria for textile floor coverings are “E1-11 Textile floor coverings” (Environmental label Croatia). The following criteria apply.

Processes and chemical criteria:

General for all chemicals:

- No use of substances that are carcinogenic, teratogenic, mutagenic, genotoxic, allergenic and toxic.
- No use of conservation agents.
- No use of substances for product ageing protection.
- No use of antistatic agents.
- No use of fire-protection agents containing tin (Sn), arsenic (As), boron (B), bromine (Br), fluorine (F) and chloroparaffine.
- Halogenated compounds may be used, but below the instrument detection limits.

Colours/dyes:

- Only use of colours, which are in compliance with the ÖKOTEX 100 standard.

Emission of volatile compounds in the finished textile floor coverings:

- Maximum emission of formaldehyde of 0.005 ppm
- Maximum emission of toluene of 0.05 mg/m³
- Maximum emission of styrene of 0.005 mg/m³
- Maximum emission of vinyl cyclohexane of 0.002 mg/m³
- Maximum emission of vinyl acetate of <0.002 mg/m³
- Maximum emission of 4-phenylcyclohexane of 0.02 mg/m³
- Maximum emission of volatile organic compounds (VOC) of 0.3 mg/m³
- Maximum emission of aromatic hydrocarbons of 0.15 mg/m³

Substances in the finished textile floor coverings:

- Maximum detection limit of pentachlorophenole of 0.1 mg/kg
- Maximum detection limit of butadiene of 0.5 mg/kg
- Maximum detection limit of vinyl chloride of 1.0 mg/kg

¹⁷ Website of Environmental Label, Croatia - www.mzopu.hr

1.10 Ecomark (India)

The Ecomark of India has for textiles set criteria called

- Textiles.

It has not been possible to achieve the criteria document from Ecomark of India. A request has been sent by email, but no response has been received. Furthermore, it was not possible to download the criteria from their website¹⁸. For the same reason it was not possible to find information about the number of certified textile products.

¹⁸ Website of Ecomark of India – www.envfor.nic.in/cpcb

1.11 Thai Green Label (Thailand)

The Thai Green Label has existed since 1994. Thailand has for textiles set criteria for

- Products made from cloth

It is not possible via their website¹⁹ to achieve information on the number of certified products.



Logo of the Thai Green Label

The present ecolabelling criteria for textiles for the Thai Green Label are "Products made from cloth" TGL-16-98 (Thai Green Label, 1998).

1.11.1 Ecolabel criteria for the Thai Green Label

The product group is defined as hats, bags, products made from cloth for babies (i.e. baby garments, diapers), clothes (i.e. shirts, trousers), clothing accessories (such as handkerchiefs, neckties), and home and household textile fabrics including curtains, table clothes, blanket, bathrobes etc. The following criteria apply.

Processes and chemical criteria

Heavy metal residues in finished textiles:

- Maximum limit of 0.20 ppm arsenic for baby textiles
- Maximum limit of 1.00 ppm arsenic for all other textiles
- Maximum limit of 0.20 ppm lead for baby textiles
- Maximum limit of 1.00 ppm lead for all other textiles
- Maximum limit of 0.10 ppm cadmium for all textiles
- Maximum limit of 1.00 ppm chromium (III) for baby textiles
- Maximum limit of 2.00 ppm chromium (III) for all other textiles
- Maximum limit of 1.00 ppm cobalt for baby textiles
- Maximum limit of 4.00 ppm cobalt for all other textiles
- Maximum limit of 25.00 ppm copper for baby textiles
- Maximum limit of 50.00 ppm copper for all other textiles
- Maximum limit of 1.00 ppm nickel for baby textiles
- Maximum limit of 4.00 ppm nickel for all other textiles
- Maximum limit of 0.02 ppm mercury for all textiles

Pesticide residues in finished textiles:

- Maximum limit of the pesticides organochlorine and organophosphate of 0.5 ppm for baby textiles
- Maximum limit of the pesticide organochlorine and organophosphate of 1.0 ppm for all other textiles

The following criteria for formaldehyde and pH-values only apply for bleached products:

Formaldehyde residues in finished textiles (which are bleached):

- Maximum release of 20 ppm formaldehyde from baby clothes
- Maximum release of 75 ppm formaldehyde from adult clothes which are to be worn directly against the skin
- Maximum release of 300 ppm of formaldehyde from other adult clothes, clothing accessories, curtains, furnishing fabrics, upholstery fabrics, table fabrics, bed linens, blankets and bath textiles

¹⁹ Website of the Thai Green Label - www.tei.or.th/bep/GL_home.htm

pH values of finished textiles (which are bleached):

- The pH value must be between 4.0 and 7.5 for baby clothes, adult clothes and for bedlinens, blankets and bath textiles. However, for wool, the pH value may be up to 9.0 for clothes with no direct skin contact.
- The pH value must be between 4.0 and 9.0 for clothing accessories, curtains, furnishing fabrics, upholstery fabrics, and table fabrics.

The following criteria for chlorine based bleaching agents, carriers for dyeing, chlorinated phenols and use of azo dyes only apply for dyed products:

- No use of chlorine based bleaching agents.
- No use of carriers for dyeing.

Chlorinated phenols in finished textiles (which are dyed):

- Maximum limit of 0.05 ppm pentachlorophenol and 2,3,5,6-tetrachlorophenol for baby textiles
- Maximum limit of 0.5 ppm pentachlorophenol and 2,3,5,6-tetrachlorophenol for all other textiles

Azo dyes in finished textiles (which are dyed):

- Maximum limit of 30 ppm of certain azo dyes for all textiles

Fitness for use criteria

Colour fastness:

- Specific requirements for colour fastness for different product groups are set regarding colour fastness to water, washing (according to label), perspiration (acid and base condition), rubbing (dry and wet) and artificial light.

The following criteria are special for hats and bags:

- Hats must be made from unbleached and undyed cloth.
- Metal decorating materials on hats must not contain lead and nickel.
- Other decorating materials on hats must not contain arsenic, lead, chromium, cobalt, copper and mercury.
- Yarn and paint must not be dyed with azo dyes, which release hazardous amines.
- Yarn and paint must have a special high colour fastness to washing.

The following criteria are special for bags:

- The bag must have a minimum capacity of 15.000 cm³ and carrying at least 10 kg and shall have at least 300 times reusability.

1.12 Green Mark (Republic of China – Taiwan)

The Green Mark from the Republic of China (Taiwan) has existed since 1992. The Republic of China has for textiles set criteria for

- Recycled fabric and its products
- Textile products made from recycled PET plastic
- Reusable shopping bags
- Cloth diapers



Logo of Green Mark,
Republic of China

According to their website²⁰, there are at present (January, 2004) eight certified products under the category “Recycled fabric and its products”, no certified products under the category “Textile products made from recycled PET plastic”, one certified product under the category “Reusable shopping bags”, and no certified products under the category “Cloth diapers”.

1.12.1 Ecolabel criteria for the Thai Green Label

From their website it is only possible to download a very rough description of the criteria. Special tables with chemical criteria are not possible to download. This applies to all four groups of criteria. The ecolabelling organisation has been contacted, but in vain. The criteria are therefore not included in this review.

²⁰ Website of the Green Mark of the Republic of China (Taiwan) - <http://greenmark.epa.gov.tw/english/index.asp>

1.13 IFOAM (international organisation for organic production)

IFOAM (International Federation of Organic Agriculture Movements) is an international umbrella organisation for agriculture, research, education and control organisations for organic production. IFOAM was established in 1972 and has about 700 members in 100 countries.



Logo of IFOAM

IFOAM sets standards for organic production and processing, but has also set standards for the processing of textiles. The criteria for processing of textiles as well as for organic production are found in the IFOAM norms (IFOAM, 2002). The website²¹ of IFOAM do not reveal any information about the number of certified companies under the category “Processing of textiles”.

1.13.1 Criteria for textile processing set by IFOAM

The standard for textile processing are applicable to all kinds of natural fibre products including (but not limited to) yarn, fabrics, ready made clothes, clothing, non woven products, rugs and furnishing textiles. The standard covers the processing of certified organic fibres and certified wild fibres. The following criteria apply:

A composed product is approved by IFOAM as “certified organic product” if the product contains at least 95% (w/w) IFOAM-approved raw materials. A composed product is approved by IFOAM as a product “made with organic ingredients” if the product contains at least 70% (w/w) IFOAM-approved raw materials. The percentage must be stated on the product.

Textile fibre criteria

Cotton:

- No use of cotton defoliants.

Flax:

- No field retting of flax and other fibres is permitted.
- For water or steam retting of flax an appropriate wastewater treatment must exist.

Silk:

- Mulberry tree plantations for silk production must be organically cultivated.
- Hormones and veterinary treatments must follow the IFOAM standards for animal standards.
- All products, including disinfectants in the silkworm cultivation, the egg cultivation, and reeling must follow the IFOAM standards for processing.
- Tensides used in de-gumming of silk must be readily biodegradable.
- Acceptable wastewater treatment must exist for de-gumming of silk.

Wool:

- Tensides used for scouring of wool must be readily biodegradable.
- Appropriate wastewater treatment must exist for scouring of wool.

The 5% or 30% fibres non-approved by IFOAM (“certified organic products” and “products made with organic ingredients” respectively):

- No mix of IFOAM certified fibres and non-certified fibres of the same kind are allowed. E.g. all cotton used must be certified by IFOAM, but the small percentage of e.g. polyester is allowed to be non-certified by IFOAM (maximum 5% or 30%).

²¹ Website of IFOAM - www.ifoam.org

Fibres, which are not allowed by IFOAM:

- Halogen containing fibres (chlorofibres, Teflon, etc.)

Processes and chemical criteria

In general:

- All processing units should follow an integrated environmental management system.

Wet processing:

- Each production unit must document the use of chemicals, water consumption, wastewater treatment, disposal of sewage sludge and relevant analyses of effluents.
- Each production unit must have either a functional internal or external sewage water treatment plant (with sedimentation, temperature and pH regulation implemented).
- Reduction of oxygen demanding substances, heavy metals and phosphorus should be made.

Spinning oils and waxes:

- Must be readily biodegradable or made from vegetable or animal origin.

Size:

- Sizes must be ultimately degradable or be recycled to a minimum of 75%.

Mercerising:

- Sodium hydroxide or other alkali is permitted for mercerising, but shall be recycled to the greatest possible extent.

Bleaching:

- Chlorinated and perborate bleaching agents are not permitted for bleaching, colour removal or stain removal.

Dyes:

- Dyes derived from plants (CI 75000 – 75999) are allowed.
- Mineral dyes not containing heavy metals are allowed.
- No use of heavy metal dyes.
- No use of complex bonded metals in excess of 1 g metal/kg textile (calculated on the applied quantity of dyestuff) – exceptions may be made for pigments containing copper.
- No use of dyes capable of releasing aromatic amines, which are known or suspected to be carcinogens.
- No use of dyes that are or are suspected of being allergenic or carcinogenic.
- Impurities in dyes must not exceed 50 ppm for antimony (Sb).
- Impurities in dyes must not exceed 50 ppm for arsenic (As).
- Impurities in dyes must not exceed 100 ppm for barium (Ba).
- Impurities in dyes must not exceed 100 ppm for lead (Pb).
- Impurities in dyes must not exceed 20 ppm for cadmium (Cd).
- Impurities in dyes must not exceed 100 ppm for chrome (Cr).
- Impurities in dyes must not exceed 2500 ppm for iron (Fe).
- Impurities in dyes must not exceed 250 ppm for copper (Cu).
- Impurities in dyes must not exceed 1000 ppm for manganese (Mn).
- Impurities in dyes must not exceed 200 ppm for nickel (Ni).
- Impurities in dyes must not exceed 4 ppm for mercury (Hg).
- Impurities in dyes must not exceed 20 ppm for selenium (Se).

- Impurities in dyes must not exceed 100 ppm for silver (Ag).
- Impurities in dyes must not exceed 1500 ppm for zinc (Zn).
- Impurities in dyes must not exceed 250 ppm for tin (Sn).

Printing:

- No use of aromatic solvents.
- Only printing methods based on water or natural oils are allowed.
- Colour residues must be recycled or disposed of in an environmentally safe way.

Toxic chemicals:

- Chemicals labelled with R52 "Harmful to aquatic organisms" must be more than 70% biodegradable.
- Chemicals labelled with R51 "Toxic to aquatic organisms" must be more than 95% biodegradable.
- No use of chemicals labelled with R50 "Very toxic to aquatic organisms".
- No use of carcinogenic chemicals (labelled with R45).
- No use of mutagenic chemicals (labelled with R46).
- No use of teratogenic chemicals (labelled with R60-63).
- No use of chemicals toxic to mammals (labelled with R20-28).
- No use of bio-accumulative chemicals, which are not biodegradable (<70% 28d OECD 302A).

Substances allowed in max. 1% of any chemical:

- α -MES
- Antimony
- AOX (Absorbable halogenated hydrocarbons) and substances that can cause their formation.
- APEO
- DEHP
- DTPA
- EDTA
- Halogenated flame proof agents
- Heavy metals
- LAS
- Organo-chloride carriers
- Quarternary ammonium compounds (DTDMAC etc.)

Finished textile products:

- Maximum limit of 0.1 mg/kg cadmium in non-textile accessories on the products.
- Non-textile accessories on the product must not be a large part of the product.

1.14 IVN (Germany)

IVN is a German organisation that stands for Internationaler Verband der Naturtextilwirtschaft – in English: International Natural Textiles Association

International Natural Textile Association promotes research and development in relation to natural textiles, and provides information about natural textiles from the source of fibres to final production. Furthermore IVN, draws up, enforces and safeguards guidelines (standards of quality), certifying natural textiles.



Logo of IVN

IVN has set guidelines for textile manufacturing. The guidelines can be found in the IVN Guidelines Version 1.1-1999 (IVN, 2000). The website of IVN²² is currently under development, for which reason there is no information available on the number of certifications under IVN.

1.14.1 Criteria for textile processing set by IVN

IVN operates with two label-grades: “Best” and “Better”. “Best” shows the maximum standard currently achievable and “Better” is technically superior natural textiles of a high ecological standard. For some areas the criteria for “Best” and “Better” are the same. However, when they differ, the difference is shown. The following criteria apply:

Textile fibre criteria

In general:

- Substances obtained or altered by the use of genetically modified organisms (GMO's should be avoided).
- Cellulose may not be used.
- No use of synthetic fibres.
- No use of pesticides, formaldehyde, and mothproofing agents during storage.
- Use of pesticides and biocides for preservation during storage and transportation only according to EEC 2092/91 and IFOAM.

Cotton:

- Only use of fibres from certified ecological (organic) cultivation (certified by IFOAM or via EEC 2092/91²³).

Fine hair (camel, yak, cashmere, alpaca, mohair etc.), hemp and linen:

- Best: Only use of fibres from certified ecological cultivation (IFOAM or EEC 2092/91).
- Better: Use of fibres from conventional cultivation forms with pesticide residue analysis (see appendix B).

Sheep's wool and silk:

- Best: Only use of fibres from certified ecological cultivation (IFOAM or EEC 2092/91).
- Better: Use of fibres from conventional animal rearing forms with pesticide residue analysis (see appendix B).
- Maximum total content of pesticides of 1.0 mg/kg textile for conventional wool, 0.5 mg/kg for certified organic wool and 0.1 mg/kg textile for silk.

Elastane:

²² Website of IVN – www.naturtextil.de

²³ European Council regulation of June 24, 1991 on organic production of agricultural products.

- Best: Must not be used for surface of the textile products, but in up to 5% in cuffs and edgings.
- Better: Must not be used for surface of the textile products, but in up to 10% in cuffs and edgings.

Processes and chemical criteria

In general:

- At least a two-stage waste-water treatment plant must exist for all companies of pretreatment, dyeing and finishing processing stages.

Toxic chemicals:

- Chemicals labelled with R52 "Harmful to aquatic organisms" must be more than 70% biodegradable.
- Chemicals which have a biodegradability of 20-70% must not be labelled with R50, R51 or R52 "Very toxic/toxic/harmful to aquatic organisms".
- No use of chemicals toxic to mammals (labelled with R22, R25, and R28).
- No use of chemicals labelled with R51 "Toxic to aquatic organisms" or with R50 "Very toxic to aquatic organisms"
- No use of chemicals with an eliminability lower than 20%.
- However, substances, which are used in circulation systems with a recovery rate of more than 70%, are excepted from these rules.

Chemicals and processing agents not permitted in any processing steps:

- No use of carcinogenic chemicals (labelled with R45).
- No use of mutagenic chemicals (labelled with R46).
- No use of teratogenic chemicals (labelled with R60-63).
- No use of sensitising chemicals (labelled with R42, R43).
- No use of quaternary ammonium compounds (except for dyeing).
- No use of phenols and chloro phenols.
- No use of EDTA, DTPA, APEO's, LAS, α -MES.
- No use of halogenated solvents.
- No use of optical brighteners.

Ammonia treatment:

- No use of ammonia treatment – except for pre-washing of wool.

Desizing and chlorination of wools:

- No use of chlorine compounds.

Dyes/pigments and processing agents:

- No use of dyes labelled with R50, R51 or R52 "Very toxic/toxic/harmful to aquatic organisms".
- No use of dyes toxic to mammals (labelled with R22, R25, and R28).
- Best: No use of metal complex dyes. Better: No use of metal complex dyes, except for blue, green and turquoise dyes where the copper content must be below 5%.
- No chromium must be added to dyes.
- Best: AOX <5%. Better: AOX < 10%.
- No use of formaldehyde as a textile processing agent.
- Maximum sulphide content of 1% for sulphur dyes.
- No use of dyes capable of releasing aromatic amines that are known or suspected to be carcinogens.

- No use of dyes that are or are suspected of being allergenic or carcinogenic.
- Dyeing or printing auxiliary agents must be free of heavy metals (according to the list below). AOX < 1%.

Impurities in dyes:

- Impurities in dyes must not exceed 50 ppm for antimony (Sb).
- Impurities in dyes must not exceed 50 ppm for arsenic (As).
- Impurities in dyes must not exceed 100 ppm for barium (Ba).
- Impurities in dyes must not exceed 100 ppm for lead (Pb).
- Impurities in dyes must not exceed 20 ppm for cadmium (Cd).
- Impurities in dyes must not exceed 100 ppm for chrome (Cr).
- Impurities in dyes must not exceed 2500 ppm for iron (Fe).
- Impurities in dyes must not exceed 250 ppm for copper (Cu).
- Impurities in dyes must not exceed 1000 ppm for manganese (Mn).
- Impurities in dyes must not exceed 200 ppm for nickel (Ni).
- Impurities in dyes must not exceed 4 ppm for mercury (Hg).
- Impurities in dyes must not exceed 20 ppm for selenium (Se).
- Impurities in dyes must not exceed 100 ppm for silver (Ag).
- Impurities in dyes must not exceed 1500 ppm for zinc (Zn).
- Impurities in dyes must not exceed 250 ppm for tin (Sn).

Finishing:

- No anti-microbial finishing.
- No anti-pickling.
- No anti-pilling.
- No anti-statics.
- No weighting agents.
- No flameproofing.
- No stain release.
- No formaldehydes.
- No insecticides.
- No laminating.
- No storage protection means.
- No mothproofing.
- No optical brighteners.
- No perfuming/deodorization.
- No antislip finish.
- No shrinkproof finishing.
- No silk weighting.

Accessories:

- Must be of 100% natural fibres, natural materials or renewable raw materials.

Fitness for use criteria

Colour fastness:

- Specific requirements for colour fastness for different product groups are set regarding colour fastness to washing, perspiration (acid and alkaline), rubbing (dry and wet) and light.

Dimensional change:

- Maximum shrinkage value when wet of 8% for knitted textiles and hosiery.
- Maximum shrinkage value when wet of 8% for woven textiles.
- Maximum shrinkage value when dry of 3%.

Finished textile products:

- Maximum release of 20 ppm formaldehyde from all clothes.
- Maximum release of 300 ppm formaldehyde from accessories if no skin contact.
- Maximum release of 75 ppm formaldehyde from accessories if skin contact.
- Maximum release of 20 ppm formaldehyde from accessories if they are for babies.
- Maximum content of amines in all textiles of 30 ppm.
- Maximum content of disperse dyes in all textiles of 30 ppm.
- Maximum content of 0.2 ppm of antimony (Sb) in all textiles.
- Maximum content of 0.2 ppm of arsenic (As) in all textiles.
- Maximum content of 1.0 ppm of lead (Pb) in outer wear textiles.
- Maximum content of 0.2 ppm of lead (Pb) in baby wear and clothes with skin contact.
- Maximum content of 0.1 ppm of cadmium (Cd) in all textiles.
- Maximum content of 2.0 ppm of chrome (Cr) in outer wear textiles.
- Maximum content of 1.0 ppm of chrome (Cr) in baby wear and clothes with skin contact.
- Maximum content of 0.5 ppm of chromium VI (Cr VI) in all textiles.
- Maximum content of 4.0 ppm of cobalt (Co) in outer wear textiles.
- Maximum content of 1.0 ppm of cobalt (Co) in baby wear and clothes with skin contact.
- Maximum content of 50 ppm of copper (Cu) in outer wear textiles.
- Maximum content of 25 ppm of copper (Cu) in baby wear and clothes with skin contact.
- Maximum content of 4.0 ppm of nickel (Ni) in outer wear textiles.
- Maximum content of 1.0 ppm of nickel (Ni) in baby wear and clothes with skin contact.
- Maximum content of 0.02 ppm of mercury (Hg) in all clothes.
- Maximum content of 0.2 ppm of selenium (Se) in all clothes.

pH values of finished textiles (which are bleached):

- The pH value must be between 4.0 and 9.0 for wool textiles.
- The pH value must be between 4.0 and 8.0 for other textiles.

1.15 Skal (the Netherlands)

Skal is the inspection body for organic production in the Netherlands. Skal is an independent international organisation, which inspects and certifies organic and sustainable production methods in accordance with the public law based on EU-Regulation (EEC) nr. 2092/91. Skal was established in 1985 as S.E.C. (Foundation for Inspection of EKO-Quality symbol) and has since 1992 operated as Skal. Skal is working in more than 25 countries.



It has not been possible to achieve information about how many companies that are certified according to the textile criteria of Skal²⁴. However, in 1999 40 textile companies had licenses.

The criteria set by Skal is explained in the document "Skal standards for sustainable textile production – Standards for the processing of natural fibres" (Skal, 1999).

1.15.1 Criteria for textiles set by Skal

The standard for textile processing only relate to the processing of natural fibres such as cotton, flax, China grass, silk and wool.

Skal uses the practice of listing the chemicals allowed for different processing steps instead of listing the chemicals that are not allowed/banned. The criteria of Skal are therefore difficult to compare to all other textile criteria. In the following, only the few criteria where a limit value is set are listed. For the remaining criteria, please, see the document "Skal standards for sustainable textile production – Standards for the processing of natural fibres" (Skal, 1999).

Textile fibre criteria

In general:

- All agricultural fibres used as raw materials (except sewing thread) must originate from an organic production method that is recognised by Skal.

Processing and chemical criteria

Detergents:

- Detergents used must be fully biodegradable.

Dyes and other processing aids:

- No use of dyes capable of releasing aromatic amines that are possible carcinogens.
- Maximum content of 2 ppm for antimony (Sb).
- Maximum content of 2 ppm for arsenic (As).
- Maximum content of 4 ppm for barium (Ba).
- Maximum content of 4 ppm for lead (Pb).
- Maximum content of 0.8 ppm for cadmium (Cd).
- Maximum content of 4 ppm for chrome (Cr).
- Maximum content of 100 ppm for iron (Fe).
- Maximum content of 10 ppm for copper (Cu).
- Maximum content of 40 ppm for manganese (Mn).
- Maximum content of 8 ppm for nickel (Ni).
- Maximum content of 0.16 ppm for mercury (Hg).

²⁴ Website of Skal – www.skal.com/english.htm

Finished textile products:

- No residues of heavy metals (including arsenic) in the finished products. Detection limit is 2 ppm.
- No residues of pesticides in the finished products. Detection limit for organo-chlorine pesticides is 0.5 ppm.
- No residues of formaldehyde in the finished products. Detection limit 20 ppm.

1.16 KRAV – Sweden

KRAV is a Swedish organisation for development of organic production and consumption. KRAV has existed since 1985. KRAV sets criteria for and certifies organic production in Sweden. However, KRAV has also set criteria for textiles.



Logo of KRAV, Sweden

KRAV is a member of the international organisation for organic production IFOAM²⁵. IFOAM is an international umbrella organisation for agriculture, research, education and control organisations for organic production. Hence, the criteria set by KRAV for textiles are very close to the IFOAM standards for textile processing.

According to the website²⁶ of KRAV, there are at present (January, 2004) 55 certified products under the category “Textiles” by a total of ten textile manufacturers. The criteria set by KRAV is explained in the document “The KRAV mark stands for a good environment, good animal husbandry, good health and social responsibility” (KRAV, 2004).

1.16.1 Criteria for textiles set by KRAV

The product group is defined as all types of products made of natural fibres including yarn, fabrics, clothes, cloths, mats, decoration textiles, and non-woven products. The following criteria apply:

A composed product is approved by KRAV as an A-product if the product contains at least 95% (w/w) KRAV-approved raw materials. A composed product is approved by KRAV as an B-product if the product contains at least 70% (w/w) KRAV-approved raw materials.

Textile fibre criteria

Flax:

- For water or steam retting of flax an appropriate wastewater treatment must exist.

Silk:

- Mulberry tree plantations for silk production must be approved by KRAV.
- Hormones and veterinary treatments must follow the KRAV standards for animal stock.
- All products, including disinfectants, in the silkworm cultivation, the egg production, reeling and de-gumming must follow the KRAV standards for processing and handling.
- Acceptable wastewater treatment must exist for de-gumming of silk.
- Silk must not be treated (pickling) with metal salts.

Wool:

- Chemicals used for scouring and degreasing of wool must be readily biodegradable.
- Appropriate wastewater treatment must exist.

The 5% or 30% fibres non-approved by KRAV (A- and B-products respectively):

- No mix of KRAV certified fibres and non-certified fibres of the same kind are allowed. E.g. all cotton used must be certified by KRAV, but the small percentage of e.g. polyester is allowed to be non-certified by KRAV (maximum 5% or 30% for A- and B-products respectively).

²⁵ IFOAM – International Federation of Organic Agriculture Movements.

²⁶ Website of KRAV (Sweden) - <http://www.krav.se>

Fibres approved without further examination:

- Natural fibres which are not available in KRAV-certified quality
- Polyester
- Viscose
- Polyurethane (Lycra, Elastan)

Fibres, which are not allowed in KRAV certified products:

- Acrylic fibres
- Asbestos
- Cuprammonium rayon
- Flourinated fibres
- Fiberglas
- Chlorofibres
- Modakrylic fibres
- Modal fibres

Processes and chemical criteria

Wet processing:

- Each production unit must document the use of chemicals, water consumption, wastewater treatment, disposal of sewage sludge and relevant analyses of effluents.
- Each production unit must have either an internal or external sewage water treatment plant.
- Temperature and pH regulation must be implemented.
- Reduction of oxygen demanding substances and phosphorus must be made.

Spinning oils and waxes:

- Must be readily biodegradable or made from plant or animal origin. Paraffin is approved for waxing of yarn.

Size:

- Sizes must be ultimately degradable or be recycled to a minimum of 75%.

Mercerising:

- Sodium hydroxide or other alkali is permitted for mercerising, but shall be recycled to the greatest possible extent.

Bleaching:

- Chlorinated and perborate bleaching agents are not permitted for bleaching, colour removal or stain removal.

Anti-matting:

- Anti-matting (superwash) with hypochlorite or other chloride-based compounds is not allowed.

Enzymes:

- Enzymes must be readily biodegradable.

Dyeing:

- Urea may not be used in dyeing.
- The fixation degree for dyeing should be at least 70% at a colour shade of 2%. Do not apply for dyestuffs and pigments derived from plant or animal source material.

Dyes:

- Dyes derived from plants (CI 75000 – 75999) are allowed.
- Mineral dyes not containing heavy metals are allowed.
- No use of heavy metal dyes (except for iron).
- No use of complex bonded metals in excess of 1 g metal/kg textile (calculated on the applied quantity of dyestuff).
- No use of complex bonded dyestuffs with copper in excess of 1 g/kg textile.
- No use of dyes capable of releasing aromatic amines that are known or suspected to be carcinogens.
- No use of dyes that are or are suspected of being allergenic or carcinogenic.
- Dyes which toxicity for aquatic organisms LC50 is less than 10 mg/L (labelled with R50 or R51).
- Impurities in dyes must not exceed 50 ppm for antimony (Sb).
- Impurities in dyes must not exceed 50 ppm for arsenic (As).
- Impurities in dyes must not exceed 100 ppm for barium (Ba).
- Impurities in dyes must not exceed 100 ppm for lead (Pb).
- Impurities in dyes must not exceed 20 ppm for cadmium (Cd).
- Impurities in dyes must not exceed 100 ppm for chrome (Cr).
- Impurities in dyes must not exceed 2500 ppm for iron (Fe).
- Impurities in dyes must not exceed 250 ppm for copper (Cu).
- Impurities in dyes must not exceed 1000 ppm for manganese (Mn).
- Impurities in dyes must not exceed 200 ppm for nickel (Ni).
- Impurities in dyes must not exceed 4 ppm for mercury (Hg).
- Impurities in dyes must not exceed 20 ppm for selenium (Se).
- Impurities in dyes must not exceed 100 ppm for silver (Ag).
- Impurities in dyes must not exceed 1500 ppm for zinc (Zn).
- Impurities in dyes must not exceed 250 ppm for tin (Sn).
- Impurities in dyes must not exceed 500 ppm for cobalt (Co).

Printing:

- Maximum of 5% aromatic solvents in printing pastes.
- Only printing methods based on water or natural oils are allowed.
- Colour residues must be recycled or disposed of in an environmentally safe way. Surplus paste must be handled as solid waste.
- Only readily biodegradable thickeners may be used in dyestuff printing.
- A product must be printed even if the printing methods do not comply with the standards if the product is printed on less than 30% of the surface. However, this is only allowed if a satisfactory print cannot be offered by a KRAV certified operator.

Toxic chemicals:

- Chemicals labelled with R52 "Harmful to aquatic organisms" must be more than 70% biodegradable.
- Chemicals labelled with R51 "Toxic to aquatic organisms" must be more than 95% biodegradable.
- No use of chemicals labelled with R50 "Very toxic to aquatic organisms".
- No use of carcinogenic chemicals (labelled with R45).
- No use of mutagenic chemicals (labelled with R46).
- No use of teratogenic chemicals (labelled with R60-63).
- No use of chemicals toxic to mammals (labelled with R20-28).

- No use of bio-accumulative chemicals, which are not biodegradable (<70% 28d OECD 302A).

Chemicals not allowed:

- APEO
- Biocides
- Fluorocarbons
- Halogenated flame proof agents
- Halogenated anti-moth agents
- Heavy metals (iron excluded)
- Organo-chloride carriers
- Other chlorinated compounds
- Other halogenated compounds
- Chemical pesticides or biocides (such as TCP and PCP and their salts and esters) – also during transport and storage.

Substances allowed in max. 1% of any chemical:

- α -MES
- Antimony
- AOX (Absorbable halogenated hydrocarbons) and substances that can cause their formation.
- DEHP
- DTPA
- EDTA
- LAS
- NTA
- Quarternary ammonium compounds (DTDMAC etc.)
- Phosphonates

Finished textile products:

- Maximum limit of 0.1 mg/kg cadmium in non-textile accessories on the products.
- Non-textile accessories on the product must not be a large part of the product.
- Maximum release of 20 ppm formaldehyde from childrens' clothes and other clothes which are to be worn directly against the skin.
- Maximum release of 20 ppm formaldehyde from bed textiles.
- Maximum release of 75 ppm of formaldehyde from other clothing and outdoor clothes.
- Maximum release of 100 ppm of formaldehyde from interior decoration textiles.

1.17 Oeko-Tex (European)

Oeko-Tex (Öko-Tex) is a European private label that was developed in 1992. Oeko-Tex is a private label especially made for textiles.

Different Oeko-Tex standards exist:

- Oeko-Tex Standard 100 – which only contain criteria for the finished textile product. The criteria only include health aspects.
- Oeko-Tex Standard 200 – is a description of the testing procedures.
- Oeko-Tex Standard 1000 – is a standard for the environmental performance for the production site (Part A) as well as the textile products (Part B). The Oeko-Tex 1000 label cannot stand alone for textile products (only for production sites). Textile products can only be labelled with Oeko-Tex 1000 if they also have an Oeko-Tex 100 label. Then the Oeko-Tex 100+ logo can be used.
- Oeko-Tex Standard 100+ – is a label for the combination of Standard 100 and Standard 1000 for textile products.



Logo of Oeko-Tex 100



Logo of Oeko-Tex 100+

According to their website²⁷ about 2800 companies in Europe (February, 2004) holds a license for the Oeko-Tex Standard 100. The label is thus the most widespread label for textiles. The label is available most European languages, and also in Japanese and Chinese, in order to address the different national markets. About 2100 companies hold a license for the Oeko-Tex Standard 100 outside of Europe (February, 2004). The main part of these licenses is in the Far East (68%) and in the Middle East (27%). The rest is divided between African and American countries and Australia.

24 companies hold a license for the Oeko-Tex Standard 1000 (February, 2004).

In the following the standards for Oeko-Tex 100 and Oeko-Tex 1000 are described, as these are the most relevant. However, the Oeko-Tex 1000 standard is presented shortly as it mainly contains process specific requirements.

1.17.1 Ecolabel criteria for Oeko-Tex Standard 100

The standard is applicable for textile and leather products and articles of all levels of production, including textile and non-textile accessories. The present Oeko-Tex Standard 100 for clothes is edition 01.3/2003 (Öko-Tex 100, 2003). The Oeko-Tex Standard 100 does only include health aspects of the finished textile products. The following criteria apply.

Textile fibre criteria

Biological active properties:

- Fibre materials with biological active properties are only accepted if an assessment by Oeko-Tex reveals that these fibers may be used from a human-ecological point of view without any restrictions.

Flame-retardants:

²⁷ Website of Öko-Tex - www.oeko-tex.com/en/main.html

- Fibre materials with flame-retardant properties are only accepted if an assessment by Oeko-Tex reveals that these fibers may be used from a human-ecological point of view without any restrictions.

Processes and chemical criteria

Heavy metal residues in finished textiles:

- Maximum limit of 30.0 ppm of antimony for baby textiles and textiles with and without direct skin contact (no limit value for decoration textiles)
- Maximum limit of 0.20 ppm arsenic for baby textiles
- Maximum limit of 1.00 ppm arsenic for all other textiles
- Maximum limit of 0.20 ppm lead for baby textiles
- Maximum limit of 1.00 ppm lead for all other textiles
- Maximum limit of 0.10 ppm cadmium for all textiles
- Maximum limit of 1.00 ppm chromium for baby textiles
- Maximum limit of 2.00 ppm chromium for all other textiles
- Maximum limit of 0.05 ppm (under detection limit) chromium (VI) for all textiles
- Maximum limit of 1.00 ppm cobalt for baby textiles
- Maximum limit of 4.00 ppm cobalt for all other textiles
- Maximum limit of 25.00 ppm copper for baby textiles (no requirements for accessories made from inorganic materials)
- Maximum limit of 50.00 ppm copper for all other textiles (no requirements for accessories made from inorganic materials)
- Maximum limit of 1.00 ppm nickel for baby textiles
- Maximum limit of 4.00 ppm nickel for all other textiles
- Maximum limit of 0.02 ppm mercury for all textiles (for natural fibres only)

Pesticide residues in finished textiles:

- Maximum total sum of pesticides (including the biocides PCP and TeCP) of 0.50 ppm in baby textiles (see appendix B)
- Maximum total sum of pesticides (including the biocides PCP and TeCP) of 1.00 ppm in all other textiles (see appendix B)

Chlorinated phenols in finished textiles:

- Maximum limit of 0.05 ppm pentachlorophenol (PCP) and 2,3,5,6-tetrachlorophenol (TeCP) for baby textiles
- Maximum limit of 0.5 ppm pentachlorophenol (PCP) and 2,3,5,6-tetrachlorophenol (TeCP) for all other textiles

PVC plasticisers (phthalates) in finished textiles:

- Maximum total sum of certain PVC plasticisers (see appendix B) of 0.1% in baby textiles (no limit value for other textiles)

Organic tin compounds in finished textiles:

- Maximum limit of 0.50 ppm TBT (tributyltin) in baby textiles
- Maximum limit of 1.00 ppm TBT in all other textiles
- Maximum limit of 1.00 ppm DBT (dibutyltin) in baby textiles (no limit value for all other textiles)

Other chemical residues in finished textiles:

- Maximum limit of 50.0 ppm orthophenylphenol (OPP) in baby textiles
- Maximum limit of 100.0 ppm orthophenylphenol (OPP) in all other textiles

Formaldehyde residues in finished textiles:

- Maximum release of 20 ppm formaldehyde from baby clothes
- Maximum release of 75 ppm formaldehyde from adult clothes which are to be worn directly against the skin
- Maximum release of 300 ppm of formaldehyde from other adult clothes (with no direct skin contact) and decoration materials

pH values of finished textiles:

- The pH value must be between 4.0 and 7.5 for baby clothes and clothes in direct contact with skin.
- The pH value must be between 4.0 and 9.0 for clothes not in direct contact with skin and decoration materials.

Dyes:

- No use of carcinogenic and allergenic colorants (detection limit for allergenic dyes are 0.006%). (See appendix B).

Azo-dyes:

- No use of azo-based dyes which on decomposition give rise to one or more carcinogenic amines (the detection limit is 20 ppm).

Chlorinated benzenes and toluenes:

- Maximum limit of 1 ppm chlorinated benzenes in all textiles
- Maximum limit of 1 ppm chlorinated toluenes in all textiles

Flame-retardants:

- No use of certain flame-retardants (see appendix B).

Emission of volatile compounds (not valid for clothes):

- Maximum emission of formaldehyde of 0.1 mg/m³
- Maximum emission of toluol of 0.1 mg/m³
- Maximum emission of styrol of 0.005 mg/m³
- Maximum emission of vinylcyclohexen of 0.002 mg/m³
- Maximum emission of 4-phenylcyclohexen of 0.03 mg/m³
- Maximum emission of butadiene of 0.002 mg/m³
- Maximum emission of vinychloride of 0.002 mg/m³
- Maximum emission of aromatic hydrocarbons of 0.3 mg/m³
- Maximum emission of organic volatiles of 0.5 mg/m³

Biological active properties:

- Finishes with biological active products are only accepted if a thorough assessment by Oeko-Tex from a human-ecological point of view show that the product are harmless to the human health.

Flame-retardants:

- Finishes with flame-retardant products are only accepted if a thorough assessment by Oeko-Tex from a human-ecological point of view show that the product are harmless to the human health.

Fitness for use criteria

Colour fastness:

- Specific requirements for colour fastness for different product groups are set regarding colour fastness to water, perspiration (alkaline and acidic), dry rubbing, and to saliva and perspiration.

Odours:

- Specific requirement for odours for textiles in general. No abnormal odour is allowed.

1.17.2 Ecolabel criteria for Oeko-Tex Standard 1000

The present Oeko-Tex Standard 1000 is edition 01/2004 (Öko-Tex 1000, 2004). This standard contains two parts. Part A for the labelling of the production site and Part B for labelling of textile products. Part B do not contain any extra requirements, but states that textiles already certified according to the Oeko-Tex standard 100 can be labelled with the label Oeko-Tex Standard 100+ if the production site, where the textiles have been produced, are certified according to Oeko-Tex 1000.

Part A will not be described in details, as this is only relevant for the production of textiles. However, some of the criteria demanded for a labelling of a textile production site are:

- Operating and maintaining an effective quality assurance system.
- An environmental management system must be implemented.
- At least 30% of the textile products produced must be certified according to Oeko-Tex Standard 100.
- Certain chemicals are prohibited (azo-dyes that can be reduced to carcinogenic arylamines, allergenous dyestuffs and pigments, certain pesticides, flame-retardants and other chemicals – in general the same requirements as listed in Oeko-Tex 100). The difference from the requirements from the Oeko-Tex Standard 100 is that as the Oeko-Tex Standard 1000 sets criteria for production processes, criteria are also set for the use of tensides and complex builders. Use of APEO, EDTA and DTPA is therefore not allowed.
- Limit values are set for effluents to water concerning pH, temperature, colour, certain heavy metals, TOC/COD, and AOX.
- Limit values are set for exhaust to air concerning CO, dust, SO₂, and NO_x.
- Limit values are set for noise.
- Energy consumption must be measured.

1.18 TOXPROOF (German)

The TÜV Rheinland Group is a German testing organization that operates worldwide. TOXPROOF is a label issued by TÜV Rheinland. The TOXPROOF label is a safety label, especially for testing the quantities of toxins in different products. The TOXPROOF label can be issued to a wide variety of finished products, like textiles, furniture, construction materials, paints etc.



Logo of TOXPROOF

There is no information available on their website²⁸ with regard to information about how many companies or products that holds a license.

1.18.1 Ecolabel criteria for TOXPROOF

The criteria are applicable for all textiles and garments including clothing, home furnishings, car-seat covers, mattresses and floor coverings. The present criteria for textiles and garments are from 2000 (TÜV Produkt und Umwelt GmbH, 2000). All criteria for TOXPROOF relate to the finished textile products and is based on testing for limit values of the different substances/criteria in the finished textile products.

The following criteria apply.

Processes and chemical criteria

pH values of finished textiles (aqueous extract):

- The pH value must be between 4.0 and 7.5 for clothes for babies, children and textiles with permanent contact to skin.
- The pH value must be between 4.0 and 9.0 for textiles without permanent contact to skin (e.g. outer clothing, insert materials, tablecloths, decorative fabrics, furniture fabrics, curtains).
- For wool the pH value must be between 3.5 and 7.5.

Dyes in finished textile products:

- The banned azo-dyes must not be detectable in finished textile products.
- The sensitising dyes must not be detectable in finished textile products.

Chlorinated organic carriers in finished textile products:

- Specific chlorinated organic carriers must not be detectable in finished textile products (see appendix B).

Formaldehyde in finished textile products:

- Maximum release of 20 ppm formaldehyde from textiles for infants and children.
- Maximum release of 75 ppm formaldehyde from textiles with permanent contact to skin.
- Maximum release of 300 ppm of formaldehyde from textiles without permanent contact to skin.

Softeners/phtalates in PVC

- Maximum limit of 0.1% in textiles for infants and children. No limit value in all other textiles.

Organotin compounds in finished textile products:

²⁸ Website of TOXPROOF and TÜV Rheinland - <http://www.chn.tuv.com/tuvchina/eng/services/prodtesting/our/toxproof.html>

- Maximum total sum of organotin compounds of 0.05 ppm in all textiles (see appendix B).
- Maximum of 0.025 ppm for the organotin compound TBT in all textiles.

Banned substances:

- No use of flame-retardants.
- No use of biocide finishing.

Heavy metals in finished textile products:

- Maximum limit of 0.20 mg arsenic per kg textile
- Maximum limit of 1.00 mg antimony per kg textile
- Maximum limit of 0.80 mg lead per kg textile
- Maximum limit of 0.10 mg cadmium per kg textile
- Maximum limit of 1.00 mg chromium in total per kg textile
- No detection of chromium VI.
- Maximum limit of 0.02 mg mercury per kg textile
- Maximum limit of 1.00 mg nickel per kg textile
- Maximum limit of 20.00 mg copper per kg textile
- Maximum limit of 1.00 mg cobalt per kg textile
- Maximum release of nickel from metal alloys of $0.5\mu\text{g}/\text{cm}^2$ per week.

Pesticides in finished textile products (see appendix B):

- Maximum limit value for the total sum of insecticides of 1 ppm.
- Maximum limit values are set for some specific pesticides. See appendix B.

Chlorinated phenols in finished textile products (see appendix B):

- Maximum limit of 0.05 ppm in textiles for infants and children.
- Maximum limit of 0.5 ppm in all other textiles.

Fitness for use criteria

Odours:

- Specific requirement for odours for textiles in general. The same limit value for all textiles.

Colour fastness:

- Specific requirements for colour fastness for different product groups are set regarding colour fastness to water, perspiration (acid alkaline), rubbing (dry and wet) and to saliva and perspiration.

1.19 OTA – Organic Trade Association (USA)

The Organic Trade Association (OTA) is the member-ship based business association for the organic industry in North America. OTA has existed since 1985.

According to their website²⁹ OTA is in the process of setting standards for fibre processing. The criteria for fibre processing available is “Draft – American Organic Standards – Fiber: Post Harvest Handling, Processing, Record Keeping & Labelling”, Version 6.10, June 2003 (OTA, 2003).

1.19.1 Criteria for fibre processing set by OTA

The criteria for fibre processing set by OTA will not be described in details here as the American Organic Standards for fibre processing still has draft status, and as the document has been removed from their website (February, 2004). However, the criteria regarding chemicals are very similar to the criteria set by IFOAM, IVN and KRAV.

²⁹ Website of OTA (USA) - <http://www.ota.com/index.html>

1.20 Organic growing of fibres

Different systems exist to ensure that demands for organic growth of fibres is met. These are however, not discussed in this report, as the criteria for textile processing are in focus.

Some of the systems to ensure organic growing of fibres are:

- Organic Guarantee System - IFOAM (Germany)
 - IFOAM is an umbrella organisation for e.g. KRAV in Sweden. IFOAM has set specific criteria for textile processing, which are mentioned in this appendix.
- KRAV (Sweden)
 - KRAV has set specific criteria for textile processing, which are mentioned in this appendix.
- Texas Department of Agriculture - TDA (USA)
- The European Union Regulation on organic production – EEC 2092/91 on organic production of agricultural products.
- Organic Crop Improvement Association (USA)

Chemical	EU Flower	The Swan	Good Env. Choice	Eco Mark Japan	Thai Green Label	IFOAM	IVN	Skal	KRAV	Oeko-Tex 100	TOX-PROOF
Chlorpyriphos	< 2 ppm ¹⁰										
Coumaphos							< 0.01 ppm			(< 1 ppm)	
Cyfluthrin							< 0.1 ppm			(< 1 ppm)	
Cyhalothrin	< 0.5 ppm ¹¹	< 0.05 ppm					< 0.1 ppm			(< 1 ppm)	
Cypermethrin	< 0.5 ppm ¹²	< 0.05 ppm					< 0.1 ppm			(< 1 ppm)	
DEF							< 0.01 ppm			(< 1 ppm)	
Deltamethrin	< 0.5 ppm ¹³	< 0.05 ppm					< 0.1 ppm			(< 1 ppm)	
p,p'-DDD	< 0.5 ppm ¹⁴	< 0.05 ppm					< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
DDE							< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
p,p'-DDT	< 0.05 ppm ¹⁵	< 0.05 ppm					< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
Diazinon	< 2 ppm ¹⁶	< 0.05 ppm					< 0.01 ppm			(< 1 ppm)	
Dichlorfenthion	< 2 ppm ¹⁷	< 0.05 ppm									
Dichlorprop							< 0.05 ppm			(< 1 ppm)	
Dicrotophos							< 0.01 ppm			(< 1 ppm)	
Dieldrine	< 0.05 ppm ¹⁸	< 0.05 ppm		< 30 ppm			< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
Diflubenzuron	< 2 ppm ¹⁹										
Dimethoate							< 0.01 ppm			(< 1 ppm)	
Dinoseb and its salts	< 0.05 ppm									(< 1 ppm)	

Chemical	EU Flower	The Swan	Good Env. Choice	Eco Mark Japan	Thai Green Label	IFOAM	IVN	Skal	KRAV	Oeko-Tex 100	TOX-PROOF
DTTB				< 30 ppm							
α -Endosulfan							< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
β -Endosulfan							< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
Endrine	< 0.05 ppm ²⁰	< 0.05 ppm					< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
Esfenvalerate										(< 1 ppm)	
Ethyl parathion							< 0.01 ppm				
Fenchlorphos	< 2 ppm ²¹	< 0.05 ppm									
Fenvalerate	< 0.5 ppm ²²	< 0.05 ppm					< 0.1 ppm			(< 1 ppm)	
Flumethrin	< 0.5 ppm ²³										
Heptachlor	< 0.05 ppm						< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
Heptachloroepoxide							< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
Hexachlorobenzene (in general)	< 0.05 ppm ²⁴						< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
α -hexachlorocyclohexane	< 0.05 ppm ²⁵	< 0.05 ppm					< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
β -hexachlorocyclohexane	< 0.05 ppm ²⁶	< 0.05 ppm					< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
γ -hexachlorocyclohexane (lindane)	< 0.05 ppm ²⁷	< 0.05 ppm					< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
δ -hexachlorocyclohexane	< 0.05 ppm ²⁸	< 0.05 ppm								(< 1 ppm)	(< 1 ppm)
Malathion							< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
MCPA							< 0.05 ppm			(< 1 ppm)	

Chemical	EU Flower	The Swan	Good Env. Choice	Eco Mark Japan	Thai Green Label	IFOAM	IVN	Skal	KRAV	Oeko-Tex 100	TOX-PROOF
MCPB							< 0.05 ppm			(< 1 ppm)	
Mecoprop							< 0.05 ppm			(< 1 ppm)	
Methamidophos	< 0.05 ppm						< 0.01 ppm			(< 1 ppm)	
Methoxychlor							< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
Methylparathion	< 0.05 ppm						< 0.01 ppm				
Mirex							< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
Monocrotophos	< 0.05 ppm						< 0.05 ppm			(< 1 ppm)	
Organochlorine					1.0 ppm ²⁹						
Organophosphate					1.0 ppm ³⁰						
Parathion	< 0.05 ppm									(< 1 ppm)	
Parathion-ethyl											(< 1 ppm)
Parathion-methyl										(< 1 ppm)	
Pentachlorophenol	< 0.05 ppm										
Permethrin							< 0.1 ppm				<1 ppm
Phosdrin/Mevinphos										(< 1 ppm)	
Phosphamidon	< 0.05 ppm										
Phoxim							< 0.05 ppm				
Propethamphos	< 2 ppm ³¹	< 0.05 ppm					< 0.01 ppm			(< 1 ppm)	

Chemical	EU Flower	The Swan	Good Env. Choice	Eco Mark Japan	Thai Green Label	IFOAM	IVN	Skal	KRAV	Oeko-Tex 100	TOX-PROOF
Profenophos							< 0.01 ppm			(< 1 ppm)	
Quinalphos							< 0.01 ppm			(< 1 ppm)	
TDE							< 0.01 ppm				
Toxaphene	< 0.05 ppm						< 0.1 ppm			(< 1 ppm)	(< 1 ppm)
Triflumuron	< 2 ppm ³²										
Trifluralin							< 0.01 ppm			(< 1 ppm)	(< 1 ppm)
Biocides / biostatics											
Chlorophenols in general	X ³³	X ³⁴					X		X ³⁵		
Pentachlorophenol (PCP) (salts and esters)			X				< 0.5 ppm ³⁶			< 0.5 ppm ³⁷	< 0.5 ppm
2,3,5,6-tetrachlorophenol (TeCP)							< 0.5 ppm ³⁸			< 0.5 ppm ³⁹	< 0.5 ppm
Trichlorophenol											< 0.5 ppm
PCB (polychlorated biphenyls)	X	X									
Organic tin compounds											
Organic tin compounds in general	X	X									0.05 ppm
Monobutyltin (MBT)											(0.05 ppm) ⁴⁰
Dibutyltin (DBT)										< 1.0 ppm ⁴¹	(0.05 ppm)
Tributyltin (TBT) compounds					< d.l.					< 1.0 ppm ⁴²	0.025 ppm
Tetrabutyltin (TeBT)											(0.05 ppm)
Monooctyltin (MOT)											(0.05 ppm)

Chemical	EU Flower	The Swan	Good Env. Choice	Eco Mark Japan	Thai Green Label	IFOAM	IVN	Skal	KRAV	Oeko-Tex 100	TOX-PROOF
Dioctyltin (DOT)											(0.05 ppm)
Triphenyltin compounds				< d.l.							
Preserving agents											
Chlorophenyls							X ⁴³				
Organochlorine carriers											
Halogenated carriers in general	X ⁴⁴					X			X		
Chlorinated organic carriers in general						<1% ⁴⁵			X		
Dichlorobenzene										< 1 ppm ⁴⁶	< d.l. ⁴⁷
Trichlorobenzene										< 1 ppm	< d.l.
Tetrachlorobenzene										< 1 ppm	< d.l.
Pentachlorobenzene										< 1 ppm	< d.l.
Hexachlorobenzene ⁴⁸										< 1 ppm	< d.l.
Chlorotoluene										< 1 ppm	
Dichlorotoluene										< 1 ppm	< d.l.
Trichlorotoluene										< 1 ppm	< d.l.
Tetrachlorotoluene										< 1 ppm	< d.l.
Pentachlorotoluene										< 1 ppm	< d.l.
Other carriers											
Orthophenylphenol (OPP)										< 100 ppm ⁴⁹	

Chemical	EU Flower	The Swan	Good Env. Choice	Eco Mark Japan	Thai Green Label	IFOAM	IVN	Skal	KRAV	Oeko-Tex 100	TOX-PROOF
Flame-retardants	⁵⁰		X				X ⁵¹				
Bromo- and chloro-organic flame-retardants		X	X			<1%			X		X
Polybrominated biphenyles						<1%			X	X	
TDBPP (tris-(2,3-dibromopropyl)phosphate)				< d.l.		<1%			X	X	
Bis-(2,3-dibromopropyl) phosphate				< d.l.		<1%			X		
APO (tris (1-aziridinyl) phosphate)				< d.l.							
TEPA (tris-(aziridinyl)-phosphin oxide)										X	
Bleaching agents											
Chlorine based bleach		X	X		X	X			X		
Hypochlorite			X			X			X		
Perborat based bleach			X			X			X		
Tensides/softeners											
APEO (alkylphenol ethoxylates)	X	< 1%	(X) ⁵²			<1%	X		X		
LAS (linear alkylbenzene sulphonates)	X	< 1%	< 5%			<1%	X		<1%		
DADMAC (dialkyl dimethyl ammonium chloride)		< 1%				<1%	X ⁵³		<1%		
DTDMAC (ditallow dimethyl ammonium chloride)	X					<1%	X		<1%		
DSDMAC (distearyl dimethyl ammonium chloride)	X					<1%	X		<1%		
DHTDMAC (ditallow dimethyl ammonium chloride – hardened)	X					<1%	X		<1%		
α-MES (α-methyl ester sulphonate)						<1%	X		<1%		

Chemical	EU Flower	The Swan	Good Env. Choice	Eco Mark Japan	Thai Green Label	IFOAM	IVN	Skal	KRAV	Oeko-Tex 100	TOX-PROOF
Complex builders											
EDTA (ethylene diamine tetra acetate)	X	< 1%	< 1%			<1%	X		<1%		
DTPA (diethylene triamine penta acetate)						<1%	X		<1%		
NTA			< 1%						<1%		
Phosphon acid			< 1%								
Phosphonates			< 1%						<1%		
PVC plasticisers (phthalates)											
Phthalates in general		< 1%								< 0.1 % ⁵⁴	
DINP (di-iso-nonylphthalate)										< 0.1%	0.1% ⁵⁵
DNOP (di-n-octylphthalate)										< 0.1%	0.1%
DEHP (di-(2-ethylhexyl)-phthalate)						<1%			<1%	< 0.1%	0.1%
DIDP (di-isodecylphthalate)										< 0.1%	0.1%
BBP (butylbezyolphthalate)										< 0.1%	0.1%
DBP (dibutylphthalate)										< 0.1%	0.1%
Formaldehyde											
Baby textiles				< 20 ppm ⁵⁶			< 20 ppm	< 20 ppm	< 20 ppm	< 20 ppm	< 20 ppm
Skin contact textiles (incl. bed textiles)	< 30 ppm	< 30 ppm	< 30 ppm	< 75 ppm			< 20 ppm	< 20 ppm	< 20 ppm	< 75 ppm	< 75 ppm
Outdoor clothes		< 100 ppm	< 100 ppm				< 20 ppm	< 20 ppm	< 75 ppm		< 300 ppm
Other textiles, e.g. decoration textiles	< 300 ppm	< 300 ppm	< 300 ppm	< 300 ppm			< 300 ppm ⁵⁷	< 20 ppm	< 100 ppm	< 300 ppm	< 300 ppm

Chemical	EU Flower	The Swan	Good Env. Choice	Eco Mark Japan	Thai Green Label	IFOAM	IVN	Skal	KRAV	Oeko-Tex 100	TOX-PROOF
Printing											
VOC's (volatile organic carbons)	<5%								<5%		
Aromatic solvents						X			<5%		
Dyes – carc., mut., repr.		58	59								
CI Basic Red 9	X	(X)	(X)			X	X		X	X	
CI Disperse Blue 1	X	(X)	(X)			X	X		X	X	
CI Acid Red 26	X	(X)	(X)			X	X		X	X	
CI Basic Violet 14	X	(X)	(X)			X			X	X	
CI Disperse Orange 11	X	(X)	(X)			X			X	X	
CI Direct Black 38	X	(X)	(X)			X			X	X	
CI Direct Blue 6	X	(X)	(X)			X			X	X	
CI Direct Red 28	X	(X)	(X)			X			X	X	
CI Disperse Yellow 3	X	(X)	(X)			X			X	X	
Dyes – sensitising	60						61				
CI Disperse Blue 1										X	< d.l.
CI Disperse Blue 3	X					X			X	X	
CI Disperse Blue 7	X					X			X	X	
CI Disperse Blue 26	X					X			X	X	
CI Disperse Blue 35	X					X	X		X	X	< d.l.
CI Disperse Blue 102	X					X			X	X	
CI Disperse Blue 106	X					X	X		X	X	< d.l.
CI Disperse Blue 124	X					X	X		X	X	< d.l.
CI Disperse Brown 1										X	
CI Disperse Orange 1	X					X			X	X	
CI Disperse Orange 3	X					X	X		X	X	< d.l.
CI Disperse Orange 37	X					X	X		X	X	< d.l.
CI Disperse Orange 76	X					X	X		X	X	< d.l.
CI Disperse Red 1	X					X	X		X	X	< d.l.
CI Disperse Red 11	X					X			X	X	
CI Disperse Red 17	X					X			X	X	
CI Disperse Yellow 1	X					X			X	X	
CI Disperse Yellow 3										X	< d.l.
CI Disperse Yellow 9	X					X			X	X	

Chemical	EU Flower	The Swan	Good Env. Choice	Eco Mark Japan	Thai Green Label	IFOAM	IVN	Skal	KRAV	Oeko-Tex 100	TOX-PROOF
CI Disperse Yellow 39	X					X			X	X	
CI Disperse Yellow 49	X					X			X	X	
Ionic impurities in dyes											
Antimony (Sb)	50 ppm		50 ppm			50 ppm	50 ppm	2 ppm	50 ppm		
Arsenic (As)	50 ppm		50 ppm			50 ppm	50 ppm	2 ppm	50 ppm		
Barium (Ba)	100 ppm		100 ppm			100 ppm	100 ppm	4 ppm	100 ppm		
Cadmium (Cd)	20 ppm		20 ppm			20 ppm	20 ppm	0.8 ppm	20 ppm		
Chromium (Cr) – total	100 ppm		100 ppm			100 ppm	100 ppm	4 ppm	100 ppm		
Cobalt (Co)	500 ppm								500 ppm		
Copper (Cu)	250 ppm		250 ppm			250 ppm	250 ppm	10 ppm	250 ppm		
Iron (Fe)			2500 ppm			2500 ppm	2500 ppm	100 ppm	2500 ppm		
Iron (II)	500 ppm										
Lead (Pb)	100 ppm		100 ppm			100 ppm	100 ppm	4 ppm	100 ppm		
Manganese (Mn)	1000 ppm		1000 ppm			1000 ppm	1000 ppm	40 ppm	1000 ppm		
Mercury (Hg)	4 ppm		4 ppm			4 ppm	4 ppm	0.16 ppm	4 ppm		
Nickel (Ni)	200 ppm		200 ppm			200 ppm	200 ppm	8 ppm	200 ppm		
Selenium (Se)	20 ppm		20 ppm			20 ppm	20 ppm		20 ppm		
Silver (Ag)	100 ppm		100 ppm			100 ppm	100 ppm		100 ppm		
Tin (Sn)	250 ppm		250 ppm			250 ppm	250 ppm		250 ppm		
Zink (Zn)	1500		1500			1500	1500		1500		

Chemical	EU Flower	The Swan	Good Env. Choice	Eco Mark Japan	Thai Green Label	IFOAM	IVN	Skal	KRAV	Oeko-Tex 100	TOX-PROOF
	ppm		ppm			ppm	ppm		ppm		
Ionic impurities in pigments											
Antimony (Sb)	250 ppm										
Arsenic (As)	50 ppm										
Barium (Ba)	100 ppm										
Cadmium (Cd)	50 ppm										
Chromium (Cr) – total	100 ppm										
Lead (Pb)	100 ppm										
Mercury (Hg)	25 ppm										
Selenium (Se)	100 ppm										
Zink (Zn)	1000ppm										
Heavy metal residues in finished text. product⁶²		Metals soluble in acid (HNO ₃)			Artificial acid sweat solution		Artificial acid sweat solution	Test method not mentioned		Artificial acid sweat solution ⁶³	Artificial acid sweat solution
Antimony (Sb)							0.2 ppm	< 20 ppm ⁶⁴		30 ppm ⁶⁵	1.00 ppm
Arsenic (As)		0.2 ppm			(0.20 ppm) 1.0 ppm		0.2 ppm	< 20 ppm		(0.20 ppm) 1.0 ppm	0.20 ppm
Cadmium (Cd)		0.10 ppm			0.10 ppm	0.10 ppm ⁶⁶	0.1 ppm	< 20 ppm	0.10 ppm ⁶⁷	0.10 ppm	0.10 ppm
Chromium (Cr) – total		2.0 ppm					(1.0 ppm) 2.0 ppm ⁶⁸	< 20 ppm		(1.0 ppm) 2.0 ppm	1.00 ppm
Chromium (III)					(1.0 ppm) 2.0 ppm						
Chromium (IV)							0.5 ppm			< 0.05 ppm	< d.l.
Cobalt (Co)		4.0 ppm			(1.0 ppm) 4.0 ppm		(1.0 ppm) 4.0 ppm	< 20 ppm		(1.0 ppm) 4.0 ppm	1.0 ppm
Copper (Cu)		50.0 ppm			(25.0 ppm)		(25.0 ppm)	< 20 ppm		(25.0 ppm)	20 ppm

Chemical	EU Flower	The Swan	Good Env. Choice	Eco Mark Japan	Thai Green Label	IFOAM	IVN	Skal	KRAV	Oeko-Tex 100	TOX-PROOF
					50.0 ppm		50.0 ppm			50.0 ppm	
Lead (Pb)		0.8 ppm			(0.20 ppm) 1.0 ppm		(0.2 ppm) 1.0 ppm	< 20 ppm		(0.20 ppm) 1.0 ppm	0.8 ppm
Nickel (Ni)		4.0 ppm			(1.0 ppm) 4.0 ppm		(1.0 ppm) 4.0 ppm	< 20 ppm		(1.0 ppm) 4.0 ppm	1.0 ppm
Mercury (Hg)		0.02 ppm			0.02 ppm		0.02 ppm	< 20 ppm		0.02 ppm	0.02 ppm
Selenium (Se)							0.2 ppm	< 20 ppm			
Tin (Sn)		4.0 ppm									
Zinc (Zn)		60 ppm									
Others											
Chlorinated compounds in general									X		
Halogenated compounds in general									X		
Halogen-based anti matting agents		X									
Halogen-based moth proofing agents		X					X ⁶⁹		X		
Organic mercury compounds				< d.l.							
PVC		X	X								
Polyurethane			X								
Halogenated solvents		< 1%	X				X				
Optical white/brighteners			X				X				
Urea (dyeing)			X						X		
Antimony (Sb) – content in any chemical						<1%			<1%		
Heavy metals in general						<1%			X		
Flouorocarbons			X						X		
AOX ⁷⁰	250 ppm ⁷¹					<1% ⁷²			<1% ⁷³		

Chemical	EU Flower	The Swan	Good Env. Choice	Eco Mark Japan	Thai Green Label	IFOAM	IVN	Skal	KRAV	Oeko-Tex 100	TOX-PROOF
Inorganic heavy metal salts (Cu, Sn, Cr salts)			X								

Footnote explanations for Appendix B:

- ¹ The pesticides mentioned are only banned with respect to cotton and greasy wool/keratin fibres.
- ² The limit values set for pesticides are valid for the content in the finished textile product.
- ³ The limit values set for pesticides are valid for the content in the finished textile product.
- ⁴ The pesticide values listed are only valid for fine hair (mohair, cashmere, etc.), hemp, linen, sheep's wool and silk.
- ⁵ Cotton and bast (flax, hemp, jute, ramie) fibres must be grown without the use of pesticides. For raw wool the limit values mentioned apply.
- ⁶ The total sum of pesticides (including the biocides PCP and TeCP) must not exceed 1.0 ppm in the finished textile product. The limit value is 0.5 ppm for baby clothes in the finished textile product.
- ⁷ The total sum is only valid for the mentioned pesticides marked (<1 ppm). Some specific pesticides have specific limit values. All values refer to the content in the finished textile product.
- ⁸ For greasy wool and other keratin fibres the sum of certain pesticides must be max. 0.5 ppm.
- ⁹ Is only a restriction for greasy wool and other keratin fibres. Is a total sum of several pesticides.
- ¹⁰ Is only a restriction for greasy wool and other keratin fibres. Is a total sum of several pesticides.
- ¹¹ Is only a restriction for greasy wool and other keratin fibres. Is a total sum of several pesticides.
- ¹² Is only a restriction for greasy wool and other keratin fibres. Is a total sum of several pesticides.
- ¹³ Is only a restriction for greasy wool and other keratin fibres. Is a total sum of several pesticides.
- ¹⁴ Is only a restriction for greasy wool and other keratin fibres. Is a total sum of several pesticides.
- ¹⁵ For greasy wool and other keratin fibres the sum of certain pesticides must be max. 0.5 ppm.
- ¹⁶ Is only a restriction for greasy wool and other keratin fibres. Is a total sum of several pesticides.
- ¹⁷ Is only a restriction for greasy wool and other keratin fibres. Is a total sum of several pesticides.
- ¹⁸ For greasy wool and other keratin fibres the sum of certain pesticides must be max. 0.5 ppm.
- ¹⁹ Is only a restriction for greasy wool and other keratin fibres. Is a total sum of several pesticides.
- ²⁰ For greasy wool and other keratin fibres the sum of certain pesticides must be max. 0.5 ppm.
- ²¹ Is only a restriction for greasy wool and other keratin fibres. Is a total sum of several pesticides.
- ²² Is only a restriction for greasy wool and other keratin fibres. Is a total sum of several pesticides.
- ²³ Is only a restriction for greasy wool and other keratin fibres. Is a total sum of several pesticides.
- ²⁴ The limit value is for the total isomer content. Hexachlorobenzene is also listed under Organochlorine carriers.
- ²⁵ For greasy wool and other keratin fibres the sum of certain pesticides must be max. 0.5 ppm.
- ²⁶ For greasy wool and other keratin fibres the sum of certain pesticides must be max. 0.5 ppm.
- ²⁷ For greasy wool and other keratin fibres the sum of certain pesticides must be max. 0.5 ppm.

28 For greasy wool and other keratin fibres the sum of certain pesticides must be max. 0.5 ppm.
29 The limit value is 0.5 ppm for baby textiles. The limit values set are valid for the content in the finished textile product.
30 The limit value is 0.5 ppm for baby textiles. The limit values set are valid for the content in the finished textile product.
31 Is only a restriction for greasy wool and other keratin fibres. Is a total sum of several pesticides.
32 Is only a restriction for greasy wool and other keratin fibres. Is a total sum of several pesticides.
33 The specific substances are not mentioned. Chlorophenols must not be used during transportation or storage.
34 Chlorophenols must not be used during transportation or storage.
35 Biocides in general are not allowed.
36 The limit is 0.05 for baby clothes.
37 The limit is 0.05 for baby clothes.
38 The limit is 0.05 for baby clothes.
39 The limit is 0.05 for baby clothes.
40 The limit value is a total value for the sum of the listed organic tin compounds. The limit value apply to the finished textile product.
41 The limit value is only valid for baby textiles. No limit value in all other textiles.
42 The limit value is 0.5 ppm for baby textiles.
43 No preserving in general.
44 The criterion is only valid for polyester.
45 Maximum percentage allowed in any chemical.
46 The value given are as a sum of chlorinated benzenes and chlorinated toluenes. Measured in the finished textile product.
47 d.l. = detection limit. Measured in the finished textile product.
48 Hexachlorobenzene is also a pesticide and is listed under Pesticides.
49 The limit value is 50 ppm for baby textiles.
50 The Flower bans the use of flame retardants that are carcinogenic, mutagenic, toxic to reproduction or toxic to aquatic organisms.
51 No use of flame retardants in general.
52 Must be easily biodegradable.
53 Quaternary ammonium compounds are banned in general.
54 The limit value is for the total sum of the six mentioned phthalates. The limit value is restricted to baby textiles.
55 The limit value for all the mentioned softeners (phthalates) is only valid for textiles for infants and children.
56 Below detection limit, which equals 20 ppm.
57 300 ppm is the limit value for accessories if no skin contact, but 75 ppm for accessories with skin contact, and 20 ppm for accessories if they are for babies.
58 The dyes are not mentioned specifically in the criteria document. However, all carcinogenic, mutagenic substances or substances toxic to reproduction are banned.
59 The dyes are not mentioned specifically in the criteria document. However, all carcinogenic, mutagenic substances or substances toxic to reproduction are banned.
60 The mentioned sensitising dyes are only allowed if the fastness to perspiration is of at least a level 4.
61 Only a selection of the sensitising dyes is mentioned, which means that all the sensitising dyes mentioned in this appendix B in principle is banned.
62 The limit value mentioned in brackets is for baby textiles (if a specific value exists for baby textiles).
63 According to ISO 105-E04 also used for colour fastness to perspiration.

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- ⁶⁴ No residues of heavy metals are allowed in finished textile products. The detection limit is 20 ppm.
- ⁶⁵ No limit value for decoration textiles. The value mentioned apply for clothes only.
- ⁶⁶ The mentioned limit value is only valid for the non-textile accessories on the products, and is not a limit value of the textile products it-self.
- ⁶⁷ The mentioned limit value is only valid for the non-textile accessories on the products, and is not a limit value of the textile products it-self.
- ⁶⁸ The limit value mentioned in brackets if for baby textiles and for clothes with skin contact.
- ⁶⁹ No mothproofing in general.
- ⁷⁰ AOX = Absorbable halogenated hydrocarbons.
- ⁷¹ Only relevant for man-made cellulose fibres.
- ⁷² The level of AOX allowed in any chemical.
- ⁷³ The level of AOX allowed in any chemical.

3 Appendix C – List of chemicals not allowed to emit from textiles

The following is a list of chemicals not allowed to emit over a certain limit from textiles according to different ecolabelling schemes. The emission concentration allowed for the different substances is indicated in the table. The emission concentration is **measured in mg/m³** – if not otherwise mentioned.

Only Croatia Environmental Label and Oeko-Tex 100 set limit values for the emission of chemicals from textiles.

Please notice that the mentioned limit values are only valid for textiles other than clothes, i.e. floor coverings, mattresses and similar.

	Croatia Env. label¹	Oeko-Tex 100²
Volatile chemical		
Formaldehyde	0.005 ppm ³	0.1
Toluene/Toluol	0.05	0.1
Styrene/Styrol	0.005	0.0005
Vinylcyclohexen		0.002
4-phenylcyclohexen	0.02 ⁴	0.03
Butadien	0.5 ppm	0.002
Vinylchloride	1.0 ppm	0.002
Vinylacetate	<0.002	
Pentachlorophenole	0.1 ppm	
Aromatic hydrocarbons	0.15	0.3
Organic volatiles (VOC)	0.3	0.5

Footnote explanations for Appendix C:

¹ These emission criteria are only valid for textile floor coverings.

² These emission criteria are only valid for textile carpets, mattresses, foams and large coated articles not being used for clothing.

³ Please notice, that this concentration is given in ppm (parts per million).

⁴ This limit value is for 4-phenyl cyclohexane.