



Flanders
State of
the Art

ECODESIGN CRITERIA FOR CONSUMER TEXTILES

WE MAKE
TOMORROW
BEAUTIFUL
OVAM



vito

This project has
received funding from
the LIFE Programme
of the European Union



ECODESIGN CRITERIA FOR CONSUMER TEXTILES

Publication date: 13.12.2021

DOCUMENT DESCRIPTION

- | | |
|--|---|
| 1 <i>Title of publication:</i>
Ecodesign criteria for consumer textiles | 2 <i>Responsible Publisher:</i>
OVAM |
| 3 <i>Legal deposit number:</i> 2016 | 4 <i>Key words:</i> textile, ecodesign, clothing, quality, circularity, circular economy, sustainable fashion |

Summary:

This research lists possible ecodesign criteria for circular fashion and textiles. The aim is to give consumer textiles a longer life span with optimal reuse potential; to make disassembly and recovery possible and to focus on upcycling and high-quality recycling.

Extending the life of textile products turned out to have the greatest impact in the short term. To extend the lifespan, quality seemed to be the most impactful ecodesign criterium to quickly improve sustainability and circularity of consumer textiles.

7 different product categories were defined: clothing (further divided into 10 subcategories), protective clothing, bath-, bed- and kitchen textiles, curtains, floor coverings, upholstery fabrics and mattress ticking. For each category a set of minimum criteria was defined. The study looked at existing labels, standards and regulations. We hope this report can help to expand the Ecodesign Directive with a textile category in addition to that of electronics. With the Textile Strategy being launched recently, the content of this report, made by experts in the field, could serve as input for further developments on EU policy level.

- | | |
|--|--|
| 5 <i>Number of pages:</i> 84 | 7 <i>Date of publication:</i> December 2021 |
| 6 <i>Author and steering committee:</i>
Edwin Maes, Stijn Devaere & Philippe Colignon (Centexbel), Jasmien Wynants (Flanders DC), Bram Soenen & Nancy Dasilva (FOD), Tom Duhoux & Evelien Dils (VITO), Bruno Eggermont (Fedustria), Arthur ten Wolde (Ecopreneur), Sofie Bouteligier (OVAM) | 8 <i>Contact person(s):</i> Evelyn Lafond (OVAM), Wouter Dujardin (OVAM) |

Information from this document may be reproduced with due acknowledgement of the source. This OVAM publication can be downloaded on OVAM's website: <http://www.ovam.be>

smartlife 



This study was conducted within the scope of the Smartlife project, action 'A3 – Ecodesign Criteria for Consumer Textiles'. The Smartlife project has received funding from the LIFE Programme of the European Union.

CONTENTS

1	INTRODUCTION.....	5
2	EXECUTIVE SUMMARY	7
3	PRODUCT GROUPS.....	10
3.1	CLOTHING	11
3.1.1	Products properties and testing	12
3.1.2	Main categories of clothing	14
3.2	PROTECTIVE CLOTHING	19
3.3	BATH, BED AND KITCHEN TEXTILES	20
3.4	CURTAINS	20
3.5	UPHOLSTERY FABRICS	21
3.6	MATTRESS TICKING	22
3.7	FLOOR COVERING	22
4	ECODESIGN CRITERIA.....	24
4.1	LIFE PROLONGATION	25
4.1.1	Quality	25
4.1.2	Repairability	57
4.1.3	Maintenance	58
4.2	CLOSING THE LOOP	61
4.2.1	Recycled content	62
4.2.2	Dismantlability	67
4.2.3	Traceability	67
4.2.4	Recyclability	68
4.3	RESPONSIBLE PRODUCTION	70
4.3.1	Environmentally friendly textiles	70
4.3.2	Labour conditions	73
4.3.3	Chemical use and content	73
4.4	LEGISLATION	75
4.4.1	EU-Ecolabel	75
4.4.2	Fibre composition	76
4.4.3	Unfair consumer practices	79
4.4.4	Organic production and labelling regulation	79
4.4.5	Ecodesign regulation	79
4.4.6	REACH	81
4.4.7	Compliance outside the EU.	82
5	BIBLIOGRAPHY	83

1 INTRODUCTION

In 2021, the European Commission proposed a textile strategy to create a momentum for policy action in the textile chain at a Flemish, Federal, European, and international level. OVAM identified the aspects on which it and other stakeholders can focus in the coming years to make the textile chain more circular. OVAM agreed upon these aspects with stakeholders during a round table meeting at the end of October 2020. One of the important actions is the formulation and implementation of European product criteria for circular textiles commercialised on the European market. This research is Action A3 within the Life IP project C-MARTLIFE (Circular Material Approach on Residual waste Targets and a Litter Free Environment) that was rolled out in early 2021. The results of this research will be brought to the attention of the European Commission by OVAM via the Textiles Leadership Group of the European Circular Economy Stakeholder Platform.

OVAM granted CENTEXBEL and VITO the assignment to research and report the findings of this study that includes product criteria/standards for circular fashion & textiles tailored to the European policy in consultation with the Steering Committee. The result of this report must provide input for:

- The new EU strategy for sustainable textiles. See chapter 3.5 of the circular economy action plan: implementing the new framework for sustainable textile products, including the development of ecodesign measures; ensuring the circularity of textile products and the use of secondary raw materials; tackling the presence of hazardous substances; and enabling businesses and consumers to choose sustainable textiles and gain easy access to reuse and repair services.
- The Ecodesign Directive. The core of the legislative initiative is to broaden the scope of the Ecodesign directive so that it applies not only energy-related products but to the widest possible range of products, thus promoting circularity. The sustainability requirements laid down in legislation are enforceable and can be enforced. Annex I of the ecodesign Directive 2009/125/EC lists the aspects that are to be regulated through the sustainability principles. Textiles are one of the priority product groups for the elaboration of a sustainable policy framework (see Chapter 2 of the Circular Economy Action Plan (CEAP)).

Product criteria defined in the report benefit longevity, reuse, disassembly, repair, upcycling and high-quality recycling and will help the transition to a transparent chain.

The study takes into account the challenges for a circular textile chain. In a circular textile chain, different business models and designs ensure the use of fewer raw materials and hazardous substances, e.g. chemicals such as per- and polyfluorinated compounds, and brominated flame retardants, and the generation of less waste. Textile products are designed to last longer, to be easily repaired and to be recycled at a high rate, in contrast to the current downcycling into insulation material and rags. A circular textile chain ensures that a local, European, manufacturing industry can be revived.

The textile producers themselves are very much aware of the challenges and are asking for the introduction of a solution-oriented European policy for the circular textile chain. The aim and potential of these standards from the announced Sustainable Products Initiative and the Textile Strategy are as follows:

- With these standards we want to strive for quality products with a long lifespan and the possibility to reuse, repair, dismantle, up-cycle and recycle high quality products.
- We define standards for safe products that do not pose a risk to human health and do not harm the environment
- Product standards are a means of moving towards a circular chain with decreasing consumption of raw materials and waste volumes
- The standards will promote transparency in the production chain
- The standards will enable the creation of a product passport. This transparency is necessary for the consumer, control bodies, and recycling activities
- These standards must increase the potential reuse/recycling of the growing amount of collected textiles as a result of the amended Waste Materials Directive from 1/01/2025 onwards
- Sorters have a large potential supply of high-quality recyclable textiles, but spinning mills have insufficient demand for recycled fibres. A standard on recycled content could increase the demand.
- The corona crisis brought the export of discarded textiles largely to a halt. We are faced with enormous quantities of discarded textiles for which there is no useful purpose. Sorters are concerned about the increasing amount of non-reusable textiles. Stricter standards will raise the quality of discarded textiles and increase the reusable and recyclable fraction.

A set of product groups were defined for inclusion in the study. For those product groups several legislations, general standards and standards related to textile and textile products must be investigated and mapped. This needs to bring forward an overview of standards and legislation of influence on textile and textile products regarding sustainability and the circular economy. Opportunities, obstacles and recommendations were formulated from this mapping. A steering group with relevant stakeholders monitored the progress and results of this study.

2 EXECUTIVE SUMMARY

The categories described in this study were based on the considered use, assumed expectations of the customers and existing standards and guidelines. The study defined 7 product categories:

- Clothing
- Protective clothing
- Bath, bed and kitchen textiles
- Curtains
- Upholstery fabrics
- Mattress ticking
- Floor coverings

Some of these categories contain subcategories that might require some different criteria. For example, within the clothing category, knits or woven products will mostly behave differently. This is also true for a sweater and a raincoat. Footwear, e.g. shoes and boots, was not included as category because it doesn't always contain textiles. Even if the footwear contains textiles, this weight is limited compared to the sole that is mostly made of plastics or leather.

Related to these product categories, standards were investigated that could set out a series of requirements to be used in the framework of an ecodesign regulation. The elements found were categorised in aspects related to the ecodesign of textile products. This led to the 3 main aspects: life prolongation, closing the loop and responsible production. We further divided the aspects into subcategories.

Of these 3 main categories, life prolongation was considered the most important one where, in short term, the quickest environmental gain can be created. In the subcategories quality, reparability and maintenance, the quality aspect was pointed out as predominant when it comes to life prolongation. For each product category, criteria were formulated to determine the minimum quality level that could declare the textile product fit for use. The choice to take up criteria was made according to the findings in the standards related to the product category and the experience of CENTEXBEL as testing lab. The final product group quality criteria proposed are a set of test standards and minimum test values or product standards, including test standards with a categorisation according to the quality.

This is all based on the experience of the textile industry. Little is known about the end-of-life point of a textile product and its relationship with a certain quality level. It is therefore necessary that, in all cases, a workgroup with relevant stakeholders reviews the proposed criteria to improve the quality. The workgroup will need the input of further research about the end-of-life point of textiles and textile products and the correlation with the proposed criteria. The following steps are needed to develop a solid quality standard for all product categories:

1. Identifying the end-of-life reasons of a textile product category and subcategory if needed
2. Linking those reasons to a product quality parameter
3. Identifying a test method for every parameter
4. Defining minimum limits for every test method via a correlation study on the lifetime of a textile product and the result of a test method
5. Combining the test methods and minimum limits into a requirement

Next to these minimum criteria, a further set of more strict criteria could define a superior quality level. This could push the textile industry to improve their quality over time.

For the other life prolongation aspects, several criteria were formulated such as the possible organisation of a repair service with a stock of spare parts and an improvement of the care instruction system that is linked to the quality parameters.

Recycled content, dismantlability, traceability and recyclability were defined as sub-aspects of the second main aspect: closing the loop. It seemed more difficult to set out clear criteria for these aspects. Due to the immature state of technologies and circular businesses, it is too soon for implementing multiple measures. The most important measure that is feasible in the short term is clear communication on the related aspects. It was identified that clear rules are needed to assure the stakeholders are correctly informed about the different aspects. A follow-up on the evolution of the technologies combined with further studies will determine future criteria, e.g. a chemical ban to improve the recyclability, a minimum recycled content or a product passport.

Regarding responsible production, the following sub-aspects were defined: environmentally-friendly textiles, labour conditions, and chemical use and content. Although clear criteria can be set, it is a complicated issue to assure that textile products are produced according to these criteria because of the international character of the textile production chain. The danger is to create an unfair playing field that harms the European economy. Voluntary labels were identified as valuable in this aspect. It might therefore be better to promote these labels via public procurement and to increase their trustworthiness via control systems induced by the European commission. These controls can lead to a list of labels to be used.

The current legislation impacting textile products was reviewed and recommendations were formulated to create a legislative framework. By this, a revised unfair consumer practices directive could take up greenwashing more clearly and set a framework for market surveillance officers to create a fair playing field. Another example is the uptake of recycled content claims in the regulation on textile fibre names and related labelling and marking of the fibre composition of textile products. This is vital as communication is important in aspects where criteria are currently difficult to implement for recycled content.

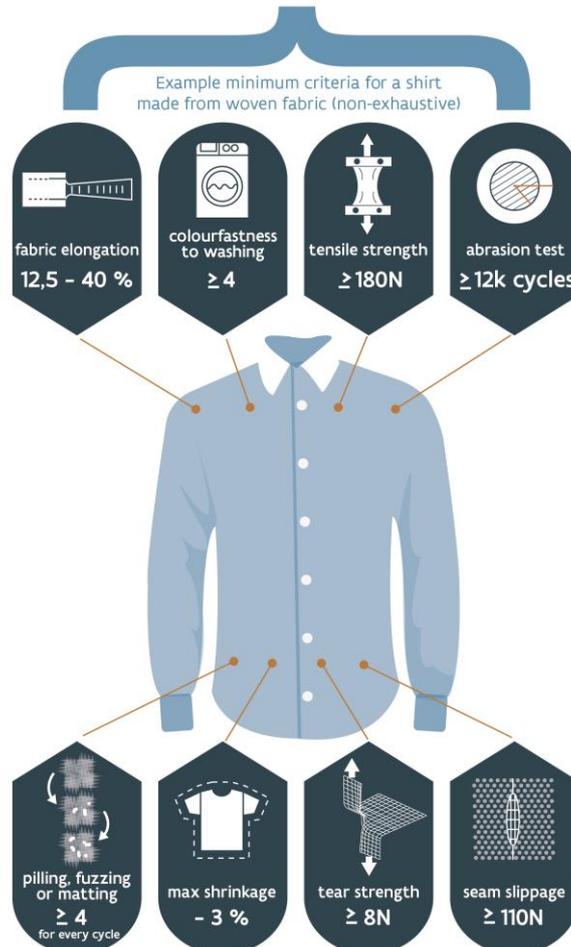
ECODESIGN CRITERIA FOR CONSUMER TEXTILES



7 CATEGORIES DEFINED



FOR EACH CATEGORY A SET OF MINIMUM CRITERIA WAS DEFINED



3 PRODUCT GROUPS

The purpose and use of textiles vary greatly depending according to the product categories considered. The same applies to existing or future standards. A T-shirt that is worn for one day before being washed has little to do with curtains that will have to withstand the aggression of light for years or carpets for which the resistance to abrasion will be decisive.

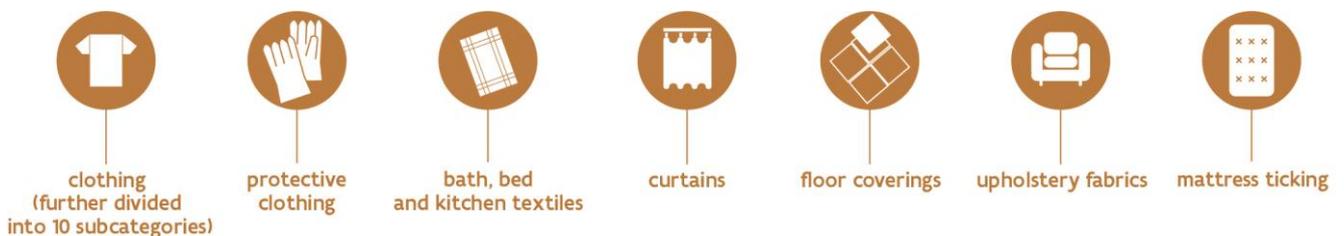
Besides the main product categories, such as clothing or curtains, we also need to consider sub-categories. For example, within the clothing category, knits or woven products will mostly behave differently. This is also true for a sweater compared to a raincoat.

For most product categories, we can also distinguish between consumers who will use and maintain all kinds of products in average domestic conditions and professional users who will have different expectations given the numerous legal requirements, the overall heavy use or the harsher maintenance conditions. The choice of categories described in this study therefore considers the use, the assumed expectations of the customers and the existing standards and guidelines.

Independent of the intrinsic quality of a product, it is key to recognise that many products are developed and put on the market for specific purposes. Meaning they were designed and produced to behave appropriately in specific conditions. This 'fitness for purpose' is key in ensuring a long duration for every product. Logically, misusing a product or exposing a product to constraints it was clearly not designed for, might lead to issues that would have been avoided by respecting the fact that not all products are made for all wearing occasions and conditions.

In other words, ensuring a long life for textile products is a joint responsibility and deal. That of the supplier to deliver a qualitative product, complying with key standards, and that of the customer/user to use the products in reasonable conditions and to maintain the products with proper attention and care.

The product categories defined in this report are:





3.1 CLOTHING

Clothing constitutes a major part of the consumption of textile products. All people, from the first day of their lives to the last, wear clothes on plenty of different occasions, with vastly different purposes. Several categories of clothing products must be considered, and standards will also be influenced by the end user (e.g. children vs. adults), the expected end use (e.g. dress shirt vs. leisure shirt) or claims (specific performance).

A reasonable assumption to make is that a product with a higher quality, with a higher performance, will last longer, will be more durable. It is therefore key to understand how 'good' quality will be translated into standards.

A certainty is that inferior quality will reduce the lifetime of the related clothes. It may sound straightforward, but it is nevertheless essential to stress that the lack of performance should be avoided in the first place. Moreover, consumers should be unequivocally warned of weaknesses in product's properties at the time of purchase.

This does not mean that products should always be designed for the worst-case scenarios. What matters most is that a product is being developed for a specific purpose (design for purpose) and is being used for that purpose, in reasonable conditions. Meaning both the producer and the user own some responsibilities in how long a product will or can last (durability).

One way to ensure getting the focus right is to highlight the parameters that have the biggest influence on the quality of a product, category by category, and given the expected average use.

Clothing can be divided into main categories, as suggested by ECLA (EURATEX Technical Clothing Group – Draft proposal March-August 2006):

- Trousers and shorts
- Skirts
- Jackets
- Coats/raincoats
- Knitwear
- Pyjamas and nightwear
- Shirts, Dresses and Blouses
- Lingerie and underwear
- Swimwear
- Lining (not a category as such, but a key component in many different clothing products)

3.1.1 Products properties and testing

It is important to understand that these clothing categories will have a series of testing methods and standards in common, completed by a series of specific ones related to the material, the use, the user, claims, etc. Although the standards might be similar across the range, they will generally differ in some way, based on the specificities of each product category.

A more durable product is a product that will be worn longer, that can perhaps be transferred to a different owner for reuse and be repaired if necessary. In other words, it is a product with a 'good' quality, a quality that can be assessed through a series of tests. Several categories of standards and test methods were therefore looked at and analysed.

Another element to take into consideration, especially for clothing, is the impact of repeated washes on the claimed properties. Some properties (e.g. rain protection) can decrease considerably after (home-)laundry. This maintenance should be taken into consideration for any proper testing scheme and the user should be properly informed on how permanent the performance can be.

Below are the most important properties. Related standards are listed in section 4.1.1.1.



Strength and Abrasion

The strength of apparel is an obvious element of the quality equation. Except for look and fashion reasons, nobody wants to wear torn garments or clothes with holes. Depending on the product, tear strength, tensile strength, seam strength or bursting strength tests will be carried out.



Abrasion has also an impact on the strength. A poor resistance to abrasion might lead to small holes appearing on the fabric and possibly to fabric tearing.

Visual appearance

To be able to wear a garment for a long period, it is necessary that its overall appearance remains nice, both during wearing and after repeated washing. This, of course, also applies to prints or other embellishments.

The main test to assess such properties is the washing test, followed by a series of evaluations related to shrinkage, overall visual appearance, surface, colour, etc. Especially for the knitwear such as sweaters and pullovers, fibre balls can appear at the surface of the fabric, in areas that get rubbed during wear. This can seriously affect the appearance of a garment. The pilling test enables this property to be measured.

Shape retention

The shape of garments is influenced by 2 essential characteristics: the size and the fit. These elements have a significant impact on the comfort and the appearance. The garments should keep their size and fit characteristics during wearing and after laundering.

The most obvious issue is excessive shrinkage that will alter the sizing or modify the fit. This can easily be assessed through washing/shrinkage tests.

Some fabrics tend to 'grow' during the wearing, due to the fabrics stretching when moving. If excessive, this will also alter the wearing experience and fit. As far as the impact of wearing is concerned, especially on trousers and skirts, and on woven products, it is possible to assess the elongation of the fabrics under tension or the capacity of stretch fabrics (e.g. in all stretch jeans) to recover their initial state after being pulled.



Colour

For most garments, colours are key. Depending on the category under consideration, colour can also be a leading parameter in the purchase decision process. Depending on the type and quality of the dyestuff and dyeing processes, the colour may be altered when exposed to different substances or elements. This could lead to garments no longer being wearable. For example, the sunlight can quickly damage the colour of articles being line-dried outside. The perspiration under the armpits can generate fading, or sea water can damage swimwear.

Another risk related to colour is the transfer of colour that can irremediably damage a product with high contrasted areas (stripes). An entire wash load could also be damaged by just one garment bleeding colour and colour could also be transferred through rubbing, either in dry or wet conditions.

There are several tests to assess colour. The standards are mostly linked to the expected use of the fabric/garment being assessed.

Chemical Content

Lots of chemicals are used at all stages of the manufacturing process, right from the fibre production to the final finish on garments. A strict control of their use is key for obvious health and safety reasons, as the garment is close to the body for longer periods, and for reducing their environmental impact.

Performance and claims

Especially in the sportswear and outdoor activities gear, many properties can be conferred to the product or boosted by means of different techniques. Coatings or spraying of resins can be used to offer rain or wind protection, some finishes target bad smells, etc. On fashion products, some resins can be used to reduce the tendency of certain fabrics to get wrinkled when worn, or to make ironing much easier. The accelerated loss of these properties will lower the quality perception.

Dry cleaning

Some products are hardly washable or not washable at all, due to the type of fabric (delicate), the complexity of the product (suit jackets) or other reasons. In this case, it is essential to test the complete product against dry cleaning agents to ensure the entire product can withstand the process.

3.1.2 Main categories of clothing

3.1.2.1 Trousers and shorts

Trousers and shorts are subject to many constraints, even under normal conditions of use. Sitting on a chair (tension, abrasion), walking (abrasion at the crotch) or regular washing are all activities that require a reliable performance.

For garments with a tighter fit, the shape retention during wear and after multiple washes is a key element. Failing to ensure a proper shape retention might render the garment unwearable even for reasonably demanding consumers.

Jeans are a huge contributor to this category and deserve a specific focus, especially in terms of colour fading. The dyeing of indigo denim is designed to fade out, through an industrial wash, and wash after wash in the hands of consumers. Moreover, the rubbing performance on dark and deep shades will be lower than on average non-denim pants in very dark shades. Due to the high possibility of colour change related to the fadeout effect there is the possibility of local fadeout effects causing an unwanted effect like streaks.

In jeans, but also in non-denim trousers, washed looks remain very fashionable. Unfortunately, the treatments undergone by these garments will always somehow degrade the resistance of the fabrics and seams, to a different degree based on how harsh the washing/abrasion process was. This needs to be taken into consideration right from the start. A stronger fabric might be required to ensure a proper durability of the garment when getting into consumers' hands.

Important parameters and tests to consider:

- ✓ Strength: tensile, tear, and seams
- ✓ Abrasion, especially for kids and cyclists
- ✓ Appearance after wash
- ✓ Colour fastness
- ✓ Light fastness
- ✓ Pilling for sensitive fabrics (e.g. wool mix, linen, etc)

3.1.2.2 Skirts

Skirts can be handled in a similar way to trousers. They are very similar in use conditions and are mostly made of the same types of fabrics. If a lining is used, it will require specific attention, as described in the 'lining' category.

Important parameters and tests to consider:

- ✓ Strength: tensile, tear, and seams
- ✓ Appearance after wash
- ✓ Colour fastness
- ✓ Light fastness
- ✓ Pilling for sensitive fabrics (e.g. wool mix, linen, etc)
- ✓ See 'lining' category if relevant

3.1.2.3 Jackets

This category is comparable to the one for trousers. The same fabrics and treatments can be used, sometimes intentionally (e.g. suits). The constraints can, however, be quite different. Some jackets will be rarely washed, if washed at all. On average, the stress on these garments will be much lower. These days, leisurewear/outdoor jackets often offer protection against foul weather. They can be windproof, breathable, etc. As in any other category of products, any claim must be based on a tested performance.

Important parameters and tests to consider:

- ✓ Appearance after wash/dry cleaning
- ✓ Pilling for sensitive fabrics (e.g. wool mix)
- ✓ Abrasion
- ✓ Parameters linked to claims
- ✓ See 'lining' category if relevant

3.1.2.4 Coats/Raincoats

Coats are similar to jackets in terms of construction. As far as raincoats are concerned, the protection against foul weather and rain is a focus point. Most of these products will not be frequently washed/cleaned, except maybe for those in white or light colours.

Important parameters and tests to consider:

- ✓ Protection against rain/water (for raincoats)
- ✓ Pilling for sensitive fabrics (e.g. wool mix)
- ✓ Abrasion
- ✓ Appearance after wash/dry cleaning

3.1.2.5 Knitwear

Knitwear is a major category in clothing. T-shirts, polos, and sweatshirts, on the one hand, and sweaters on the other can be found in everybody's wardrobe and are produced in huge quantities.

T-shirts are basic in terms of construction, but they offer plenty of possibilities in terms of dyeing or printing techniques. For T-shirts, the print durability and the spirality (garments twisted after washing) are potential areas of concern.

The variety in sweaters and pullovers is huge and the distinctive characteristics make it difficult to draw simple guidelines. The fibre content, the length of the fibres, the twist, the gauge, etc, will all have an impact on the quality and longevity of the product. For sweaters and pullovers, a frequent area of concern is related to the pilling performance. The balls of fibres formed on the surface of the fabric through rubbing are mostly associated with a defect and many garments will not be worn anymore because of this.

Important parameters and tests to consider:

For t-shirts, polos and sweatshirts:

- ✓ Appearance after wash: shrinkage and spirality
- ✓ Print durability
- ✓ Colour fastness
- ✓ Strength: bursting for very lightweight fabrics

For sweaters:

- ✓ Pilling resistance
- ✓ Shape retention in washing/cleaning

3.1.2.6 Pyjamas and nightwear

This category is not the most challenging, but it, too, requires proper attention. Nightwear garments will be worn for quite a few hours, but with low constraints and mostly in the dark, or at least not under the sunlight.

A key element to consider is comfort. Shrinkage is a parameter to monitor and manage well, as is the appearance of the product as it might be frequently washed. On pyjamas, especially those for the winter season, the fabric surface can be heavily brushed to improve the comfort and warm feeling of the product. This operation will always weaken the strength of the fabric. As a result, the tear strength should be closely monitored.

Important parameters and tests to consider:

- ✓ Appearance after wash
- ✓ Shrinkage
- ✓ Tear strength for brushed fabrics

3.1.2.7 Shirts, Dresses and Blouses

This is a very diverse group of products, in terms of product type and use. In this category, there will be a very wide range of fabrics, woven or knitted, with different fibre contents and weights and processed with all types of dyeing or printing techniques.

As far as shirts are concerned, it is worth mentioning that many dress shirts are offered with special finishes like 'wrinkle-free' or 'non-iron'. In this case, a factor to consider will be the resistance of such finishes to home laundering.

Important parameters and tests to consider:

- ✓ Strength: tensile and tear + seams
- ✓ Colour fastness
- ✓ Performance after multiple washes for special finishes

3.1.2.8 Lingerie and underwear

In this category, cleaning is a key parameter. A lot of these products will be washed at high frequency. Traditionally, this is a type of product (basic underwear) that some consumers still want to wash at high temperatures, which will be more demanding in terms of colour fastness to washing. As far as lingerie is concerned, some delicate materials (e.g. lace fabric) may require specific attention. It is worn close to the body and thus comes in contact with perspiration. Perspiration might change the colour and destroy the garment for some consumers. This should thus be checked as well.

Important parameters and tests to consider:

- ✓ Colour fastness to wash (higher temperature + multiple washes)
- ✓ Colour fastness to perspiration
- ✓ Appearance after wash

3.1.2.9 Swimwear

Swimwear is one of the toughest categories when it comes to colour fastness. The products might be exposed to bright sunlight and salty sea water when used as beachwear, or to chlorinated water when worn as swimwear. They will mostly get laundered after a single day of use. Moreover, the swimwear range comes with bright or so-called neon colours.

The biggest challenge to ensure a long life for the products will be to keep the colours – printed or dyed – in good condition, whatever they are exposed to and this wash after wash.

Important parameters and tests to consider:

- ✓ Colour fastness, including to seawater and to chlorinated water

3.1.2.10 Lining

Lining is not a clothing category as such, but a key component in many different clothing products. This is often a cheap and almost invisible component, mostly in jackets, but an inferior quality can ruin an entire complex and expensive piece of clothing.

The number one risk in this category is seam slippage that can be noticed in some synthetic lining fabrics. Related issues can be linked to both the material (slippery filaments or very open structure) and the manufacturing/seam parameters (the SPI count– Stitches Per Inch – is too low). The fabric strength or the resistance to abrasion should be of less concern.

Important parameters and tests to consider:

- ✓ Seam slippage
- ✓ SPI count



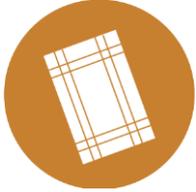
3.2 PROTECTIVE CLOTHING

In this category, it is difficult to come up with generic recommendations due to the large variety. Most recommendations made for clothing categories will apply, though with some important nuances. The type of protection claimed by the supplier should be designed in, even if the garment does not have to comply with specific norms. A claim always raises expectations! In other words, failing to deliver on those high – and potentially health and safety related – requirements could make the garments no longer wearable for the initial purpose.

Important note: in this category of clothing, products must comply with strict norms that require a specific development and testing scheme. These so-called PPE standards (personal protection equipment standards) take precedence over sustainability criteria. This is covered by legislation on PPE products.

Important parameters and tests to consider:

- ✓ Strength: tear and tensile
- ✓ Resistance to abrasion
- ✓ Resistance to industrial maintenance
- ✓ Parameters linked to claims
- ✓ See 'lining' category if relevant



3.3 BATH, BED AND KITCHEN TEXTILES

When considering this category of products, it is obvious the specific environment in which these products will be used has a key influence on the type of constraints the products will have to withstand. An apron or towel used in a kitchen might be exposed to all kinds of soiling when in direct contact with food. It is also clear they will be washed frequently, potentially at high temperatures.

As far as bath textiles are concerned, a key parameter is the resistance to multiple home launderings. The colours should remain bright after many washes, as much as the overall aspect. Some of these products will be used at the swimming pool or on the beach. The exposure to chlorinated water or sea water is yet another type of potential damage, especially to colour.

Important parameters and tests to consider:

- ✓ Colour fastness to washing
- ✓ Colour fastness to chlorinated water (bath)
- ✓ Colour fastness to sea water (bath)
- ✓ Appearance after washing



3.4 CURTAINS

Curtains are present in every house or apartment, in hotels, etc. They are exposed to light for long periods of time, potentially to bright sunny light. The resistance of the dyestuff to light is therefore an obvious key parameter, even more so as curtains can have pleats, meaning some parts might be more directly exposed than others. An issue with resistance to light could therefore lead to streaks or a spotty effect.

Because some curtains might, for example, be hanging from the ceiling to the floor, and can hence measure 2 meters or more, the shrinkage or the elongation during washing and use are key parameters.

The resistance of the colour to washing is less important as the curtains will generally only be washed occasionally.

Important parameters and tests to consider:

- ✓ Colour fastness to light
- ✓ Shrinkage in wash/cleaning



3.5 UPHOLSTERY FABRICS

Lots of textile fabrics are being used in furniture. Although they are sometimes only decorative, these fabrics can be under high stress when they are used to cover chairs, sofas, etc. This is especially the case for furniture used in public spaces like offices, restaurants, or hotels. The strength of these fabrics, as much as their resistance to abrasion, will have to be taken into consideration right from the start of the development.

Beyond the expected mechanical resistance, some properties can help prolongate the lifespan of related products. Treatments that protect the fabric against stains or make the cleaning process easier, can make a difference in the lifespan of the fabric.

Upholstery fabrics can remain on the product for exceptionally lengthy periods. In these conditions, the impact of the exposure to light should also be taken into consideration.

Important parameters and tests to consider:

- ✓ Abrasion resistance (Martindale)
- ✓ Strength: tensile, tear, and seams
- ✓ Lightfastness



3.6 MATTRESS TICKING

The fabrics used to cover mattresses are amongst the most hidden ones, and yet we spend hours laying on them, every day and for several years. Practically, the first function of these fabrics is to cover all the elements a mattress can contain, from a single piece of foam to a complex mix of springs, foam, and other materials. This barrier plays its role in 2 ways. It protects the user from the internal parts of the mattress, and it also protects that content from the user (e.g. perspiration). Other functions are related to comfort and warmth. The latter will much depend on the fibre content of the fabric.

These fabrics will be distorted for lengthy periods of time or exposed to high stress. Depending on the mattress type, washing might not even be possible and generally, even if it can be removed for washing or dry cleaning, the mattress cover will not be washed/cleaned at all.

Important parameters and tests to consider:

- ✓ Colour fastness to dry/wet rubbing
- ✓ Colour fastness to perspiration
- ✓ Strength: tear, tensile and bursting (knits)
- ✓ Seam slippage



3.7 FLOOR COVERING

This category contains many extremely wide range of different products, from movable rugs to fixed carpets, from small tiles like those found in many office spaces to several meters' wide rolls, small individual rugs to huge carpets. Moreover, the wide variety of fibres used, from silk or wool to acrylic, considerably increases the range of possibilities. These products are mostly woven, knitted or needle-tufted but many other techniques can also be used (e.g. knots).

In this category, some distinctions will be made based on the destination of the products. The use of textile floor covering in public spaces (e.g. hotels, offices) will be subject to specific norms, including safety. For floor coverings, even more than for most other categories, fitness for purpose will be a key element. Developing a product for a purpose or selecting it for an intended use will be essential.

Based on the destination of the products, very different properties can be considered and designed into them.

Important parameters and tests to consider:

- ✓ Resistance to abrasion
- ✓ Resilience
- ✓ Colour fastness to light
- ✓ Resistance to soiling
- ✓ Parameters linked to claimed properties

4 ECODESIGN CRITERIA

Standard ISO 14006 (2020) – “Environmental management systems - Guidelines for incorporating ecodesign” defines ecodesign as a:

systematic approach that considers environmental aspects in design and development with the aim of reducing adverse environmental impacts throughout the life cycle of a product

According to standard ISO 14006, life cycle thinking is of key importance to ecodesign. Life cycle thinking means taking the environmental aspects relevant to a product during its entire life cycle into consideration. The life cycle is further divided into the following interlinked stages that play a role in the lifecycle of a product:

- material acquisition
- design and development
- manufacturing
- delivery and installation
- use (including reuse, maintenance, repair, remanufacturing, refurbishing, and upgrading)
- end-of-life treatment
- disposal.

This means that all these stages need to be considered when (re)designing a product or service to lower its environmental impact. Bearing this in mind, the following aspects were considered as most important when looking at the lifecycle of a textile product:

Life prolongation

Most textile products are used over a longer period. There are some specific single-use textile products like medical mouth masks and surgical gowns, but even for those products reuse might be possible when redesigning them. The study on ‘Environmental benefits from reusing clothes’ (Laura Farrant, 2010) indicated that reuse has environmental benefits. As shape, design, colour, together with the price benefit, are the main drivers for consumers to buy second-hand clothing, garments need to have a good quality level so that there is an interest in buying them even if they have already been used by someone else. We could not think of any reason why this would not be the case for other textile products.

A study on the environmental improvement potential of textiles (Adrien Beton, 2014) indicates the production stage counts for 48% on the human health impact, 72% on the ecosystem diversity impact and 54% on the resource availability impact of textile consumption in the EU. Considering this, using textiles longer would reduce these impacts but increase the impact of the use phase. The use phase (maintenance of the textile) is responsible for 48 % on the human health impact, 28% on the ecosystem diversity impact and 42 % on the resource availability impact of the textile consumption in the EU. We need to mention, however, that within the calculation of this considerable impact, between 25 to 104 washing cycles are included, depending on the textile

item. Knowing that some textile items already break down after a few use/maintenance cycles, their quality needs to be improved to a large extent until the use phase has a bigger impact than the environmental impact of the production phase. Therefore, the experts of the steering committee of this study consider life prolongation, and specifically the quality, to be the most important aspect.

Closing the loop

The use of recycled content and assuring that the textile can be recycled at the end-of-life were considered a second important aspect. This circular aspect can deliver material independency to the EU and reduce the environmental impact of the material resourcing phase. Recycled content, dismantlability, traceability, and recyclability were defined as important parameters.

Responsible production

Since previously was indicated that the production phase has the biggest environmental impact a responsible production could aid to a large extent on the improvement of the sustainability and environmental aspects of a textile product. Within this study we focused on environmentally friendly textiles, labour conditions and chemical use and content.

4.1 LIFE PROLONGATION

Life prolongation refers to measures being taken to extend the use-phase of a product. 3 main parameters were defined linked to the aspect of product life prolongation:

- **Quality:** A study on the environmental improvement by prolonging clothing use period (Klepp, 2011) has shown that the main reason to use clothes longer is a better quality level. 61% of the respondents indicate that they would use their clothes longer than they do now if the quality were better. Therefore this is considered the most important parameter when looking at life prolongation.
- **Repairability:** Without doubt repairing is prolonging the lifetime of a product that would normally be discarded because it is considered no longer fit for use by its user. For this reason the steering committee also considered this parameter important to life prolongation.
- **Maintenance** can also increase the lifetime of a piece of textile. This is very common for garments but less for other textile products that might be discarded if they are dirty. Therefore also this parameter was considered important to the life prolongation of textiles.

4.1.1 Quality

The quality of a product is defined by a set of parameters, called requirements, that are linked to the properties of a product. EN ISO 9000 (2015) Quality management systems — Fundamentals and vocabulary defines quality as the:

Degree to which a set of inherent characteristics of an object fulfils requirements

The quality level of a textile product could therefore be considered the combined level of all individual characteristics of this textile product, also named requirements, relying on specific individual criteria. Looking at life prolongation, we are interested in those quality requirements that are linked to the breakdown of a product causing the product to be considered end-of-life by its user. For some textile products there are product standards setting out quality levels or minimum requirements to define a minimum quality level.

To set out the criteria on quality, test standards are used specifying a minimum result that should be obtained. These tests are performed according to standardised test methods, e.g. EN ISO 13934-1 (2013) – “Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method”. For this test method, the result is expressed in a number of N, which stands for Newton. N is the SI-symbol (International System of Units) for derived unit of force. These test standards often use symbols from the SI-symbol system. Another used SI-symbol is kPa or kilo pascal to express a pressure force. Please note that there are - just like for weight (g or gram and kg or kilogram) – different derived symbols for a unit, e.g. kPa (kilo pascal) is 1000 Pa. It is thus important to mention the correct unit linked to a test method when setting out criteria.

The quotation of a test standard can e.g. be a strength expressed in kPa, N, etc. that is measured electronically or visually read from a scale, but the quotation might also be merely a visual assessment of the tested sample. In case of a visual assessment, one compares a tested sample against an original sample. The visual assessment is mostly expressed by a score from 5 to 1, where 5 is the best quotation or no visual change compared to the original and 1 the worst quotation. There are in-between quotations like “3-4” where the result lies between 4 and 3. Some standards have reference samples to aid with this quotation. This quotation is done by minimum 2 persons who assess the sample separately. Because it is a visual quotation it is important that the test is performed by experienced persons to avoid inconsistencies. Interlaboratory trials can help to improve the quality. A descriptive visual assessment is also possible but gives more room to interpretation.

Product standards were investigated to define a possible set of criteria for every product group mentioned in this study. Some product standards use the same specific test standards for a criterion while others use different test standards, mostly linked to the specific product properties. As mentioned, an expression of the quotation can differ between test methods depending on what is measured. Sometimes the different expressions of 2 test methods are correlated. In this case it is possible via calculations to express the results in the other test standards unit. This is mostly not the case and thus in general test results can and shall not be compared.

Even when the same test standard is used, it might still occur that some test parameters are changed according to the product that is tested. For example, to test the resistance to abrasion of a fabric, it is possible to use 2 weights depending on the type of fabric that is tested. It is important that results of tests that are performed differently are not compared. Therefore, the conditions of the test must be defined when setting the criteria in addition to the test standard itself.

Mainly ISO, EN and EN ISO test standards are considered within this study, unless they were not available for the requirement or criteria at hand. Many EN ISO, ISO or EN standards have an ASTM (American Society for

Testing and Materials) counterpart. In most cases there are differences between the EN/ISO standards and the ASTM standards. It is important to mention that in general the results cannot be compared due to these differences, even if they are expressed in the same units. However, these differences might give some directions while determining the criteria.

Whenever a standard is used, it is always best to use the latest version of the document. Therefore, requirement documents must be updated regularly to ensure they always take the latest version of the test standards into account. This needs to be considered when drafting requirements regardless whether it is a (harmonised) EN quality standard under a mandate or a legislative document defining the quality level.

As stated in chapter 3 PRODUCT GROUPS, other criteria might be of importance depending on the product, even within a single product group. The differences are related to the specific use and/or claims made on the product. Sometimes, existing product standards take this into account, and, for some product groups, specific product standards are created. In any future requirements related to quality this must be considered. The first focus should be on the general requirements with a well-defined scope.

As already mentioned, workwear and PPE garments are defined as a separate category of clothing due to the safety aspects and related product standards. Some safety-related product standards will use other test methods, or a combination of test methods, to define the quality related to the safety aspects of PPEs than for regular clothing items. The workwear industry producing PPE often implements the same requirements for normal workwear as for PPE, due to their experience with safety related standards. An alignment between normal clothing, workwear and PPE garments in test methods could be advised so that the complete clothing industry gets a better overall insight into the correlation between quality and test result. For example, in the case of a PPE garment, some tests are performed after 5 maintenance cycles while for normal garments the test is performed on the original state of the sample. Within this study for quality requirements, we merged the clothing and protective clothing product groups and chose one test standard for every criterion.

In setting out criteria, experts consider the used material, construction of the yarns and fabrics, length of the fibre, shape of the fibre, etc. as important parameters that influence the quality. In the case of a fabric with the same fabric construction made of staple-fibre yarn constructed by an open-end production process, the score of tensile strength will be probably better for a 100% polyester quality than for a 100% cotton quality. Some of the mentioned standards have a different set of requirements for the 2 fibre types because cotton is considered less strong. Nevertheless, the cotton quality can be improved by increasing the average cotton fibre length and by ring-spinning instead of open-end spinning. In this way, the 100% cotton quality can increase the score so that it is feasible to have 1 criterion for both polyester and cotton if the limit for polyester is lowered and that of cotton raised. These measures lead to a price increase for cotton-based textiles that is perhaps unwanted. Also, too strict requirements might unwantedly exclude certain fibre types or production processes that might be more environmentally friendly. It could be better to set feasible minimum requirements adapted to the use without differentiating according to the type of textile based on the requirements set out for cotton.

Some test results might differ between the warp and weft direction of a fabric. Therefore, it is important to test both directions and this will be predetermined by the test standard. Because the fabric might be used in 2 different directions, there is no need to set out different requirements according to the direction of the fabric.

It is important to mention that there is no direct link, also called correlation, between a set of criteria or requirement and how long a piece of textile will be in use. A fabric tested according to ISO 12947-2 (2016) abrasion that withstands 30000 cycles tested with a 9 kPa weight does not guarantee 20 use cycles of the textile product e.g. a pair of pants. Nonetheless, there is some correlation based on the experience in the use of well-known test methods. In the case of colour fastness to light according to EN ISO 105 B02 it is generally accepted that if the result is below a quotation of 4 there will probably be more customer complaints. If the quotation is much lower, severe problems will probably occur. For example, a quotation of 2 might mean that the lights in the shop can damage the textile even before it is sold. Many companies consider a minimum of 5 to be a good level while others stick to a level 4 with a greater risk of customer complaints. The differences in requirements are caused by the different price-quality level that companies maintain. From the experience that CENTEXBEL has as a knowledge institute performing tests and consulting on quality issues of textile products, some criteria were added to the requirements of certain product groups.

Despite these common practices to maintain a certain quality level, little is known about the reasons why consumers are inclined to throw away their textile products. A limited number of studies indicate differences depending on the type of textile. In table 5 of the study Environmental improvement by prolonging clothing use period (Klepp, 2011) an overview can be found of the seven most common reasons of disposal for different types of garments. In Table 1 an overview of the ranking of the reason 'hole or tear' can be found.

Table 1. Ranking of the reason for a hole or tear

Garment type	Ranking 'Hole or tear'
Shirt, top or sweater	3
Trousers, jeans or short	3
Skirt or dress	Not in the top 7
Jacket	Not in the top 7
Overall or body	6
Underwear	3
Socks	1
Stocking or legging	1
Nightwear or bathrobe	5
Accessories	3

The different rankings indicate the important of the relation of a criterion and the end-of-life point of a specific piece of textile or textile product.

A survey within the framework of the Interreg project ECY-TWIN (ECY-TWIN project, 2021) and another done by Le Relais (Lerelais, 2021) indicate that for a T-shirt the most important reasons, with more than 50% response, were:

- change in colour
- staining of colours
- yellowing (mostly related to white)
- hole forming, tearing of the fabric
- deformation of the garment
- degradation of personalisation items (e.g. prints, embroideries)
- breaking of the seams
- permanent stains and permanent bad smell

So, to improve the criteria a thorough investigation of end-of-life points considered by consumers must be done. Only then it will be possible to define solid criteria that will impact the lifetime of a piece of textile.

In Belgium, the “guarantee act” stipulates that every consumer product, except for water, gas and electricity, and goods sold by way of execution or by authority of law, has to be sold with a guarantee of 2 years against defects. This means that a good must provide the services and qualities that the consumer can reasonably expect, taking the characteristics into account that are mentioned on the labelling and the declarations of the seller. This is a strong tool to ensure a good quality level of a textile product. However, in most cases this leads to discussions, since no clear parameters have been established for textiles to determine whether the consumer has used the textile incorrectly or whether there is a product defect. The key question is: is the textile destroyed due to abnormal use or to a lack of quality? Moreover, there is no obligation to mention care instructions and there is no quality level linked to maintenance instructions. A minimum quality level linked to stricter rules regarding the maintenance instructions could help in this discussion.

This study indicates a possible minimum requirement for every characteristic related to the quality level when the industry has enough experience with the correlation between a test result and a good quality level. There is also a premium value indicated if possible. These premium values are also mentioned as suggestions. Both need to be further investigated and discussed, in view of the previously explained reasons, with a working group involving the industry and other stakeholders. In many CEN technical committees (TCs) the experts can be found to perform this work. For some product groups the necessary work is already done but might need improvements before it can be used as a general rule.

4.1.1.1 Product group 1 - Clothing



The investigated standards are:

Draft updated information on characteristics and faults in fabrics to be used for clothing (also known as the ECLA document for clothing textile)

Owner: Euratex technical clothing group

Scope mentioned in the document:

*This document refers to “Characteristics and faults in fabrics to be used for Clothing” and was originally prepared by the European Apparel Association - A.E.I.H. in 1983 and reviewed in 1996. During 2005, the 1996 version was revised in format and content by a working group of clothing experts, belonging to national members of Euratex, who brought to it their experience of relations between textile and clothing companies. This work was also carried out with the involvement of textile specialists. This **draft text** is intended:*

- *To be a non-binding information tool on the state of the art of discussions on how to improve the quality of EU textile and clothing production.*
- *To be a guideline for discussion between customer and supplier in order to reach together agreement on a better quality depending on the garment and the fibre used in the fabric to secure the relationship between supplier and purchaser.*
- *To be a basis to be adapted to the characteristics of each company/business. The specific information and information-sheets per garment type included in this text were designed to help managers to select the relevant ones.*
- *To provide managers with suggested levels that are to be considered as minimum levels and refers to European or internationally recognised standards.*
- *The recourse to the content of this text by companies can only take place on a voluntary basis and depending on the relationship between customer and supplier, certain specific elements may be discarded or modified in the discussions between them.*

Finally, there is no desire at the clothing end of the pipeline to influence the market through this document, but simply to make available a tool for dialogue on quality within that pipeline.

All Euratex members are invited to provide input to improve the content of this draft text.

The ECLA document is the main guideline for the clothing industry. Companies base their requirements on this document. Some retailers apply lower minimum requirements than those mentioned in this document and others higher. This depends - as mentioned previously - mostly on the price-quality level they maintain. The minimum or maximum requirements in the document are related to the use. Not every use needs the same values to ensure a certain quality level. There are different clothing types defined, and for some parameters a normal and slim fit are taken into account. In the case of a slim fit garment, the tighter fit leads to bigger forces impacting the fabric, seams, and other components of the garment.

Requirements for workwear fabrics standard

Owner: ETSA

Scope mentioned in the standard:

Workwear Fabrics: Polyester/Cotton - Cotton/Polyester (minimum 30% Polyester) 150 g/m² - 400 g/m² intended to be washed industrially (bulk business, no special requirements)

Because workwear is subject to stress more than fashion garments ETSA, the European Textile Service Association, drafted their own requirements.

EU Ecolabel (Ecoflower)

Owner: European commission

Scope mentioned on the website:

The EU Ecolabel logo makes it simple to know that a product or a service is both environmentally friendly and good quality. This life cycle approach guarantees that the products' main environmental impacts are reduced in comparison to similar products on the market.



It is a voluntary label although the use is regulated by regulation (EC) No 66/2010 of the European Parliament and of the Council of 25 November 2009 on the EU Ecolabel. The commission's decision of 5 June 2014 "establishing the ecological criteria for the award of the EU Ecolabel for textile products" sets out the criteria for the textile industry to be compliant to the regulation.

Environmental labels

The standards of the standard 100 by OEKO-TEX® and GOTS (organic textile) labels were taken into account, since both contain references to quality.



Personal protection equipment (PPE)

Two PPE standards were considered because they set requirements to some quality parameters to assure the product does not break down during the foreseeable use what would lead to the loss of protective properties:



- EN 1486 (2007) - Protective clothing for fire-fighters - Test methods and requirements for reflective clothing for specialised firefighting



- EN 343 (2019) - Protective clothing - Protection against rain

4.1.1.1.1 General physical criteria

Tensile strength (sometimes the test includes elongation)

The tensile strength is the force needed to tear a fabric into 2 pieces, by applying a longitudinal force over a pre-determined distance of fabric. This is one of the parameters indicating how strong the fabric is and thus how long the fabric will be in use.

The test result is a maximum force needed to break the fabric into 2 pieces expressed in N (Newton) and in the case of EN ISO 13934-1 the elongation at this maximum force is also expressed in %. This elongation is of importance to preserve the fit of the garment during wear. If the fabric elongates too much it might become too large.

It is tested on the fabric of a garment. The result might differ between the warp and weft direction. In the warp direction the warp yarns are broken and in the weft direction the weft yarns. The test can only be done on woven fabrics. For a knitted fabric the bursting strength is the appropriate test method (see bursting strength). The main standards used in the EU are:



- EN ISO 13934-1 (2013) - Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method.
- EN ISO 13934-2 (2014) - Textiles — Tensile properties of fabrics — Part 2: Determination of maximum force using the grab method.
- EN ISO 13934-1 is the most used standard for fabrics within the EU. A failure is when the result is below the minimum requirement.

The minimum requirements for part 1 could be the values shown in Table 2 and Table 3.

Table 2. Minimum requirements for maximum force for clothing, N

Article	Minimum *normal fit	Minimum *tight fit	Premium (proposed from experience)
Trousers and shorts	250	300	450
Skirts	250	300	450
Jackets	200	200	350
Coats	200	200	350
Anoraks, skiwear and sportswear	250	250	450
Pyjamas and nightwear	180	220	320
Shirts, dresses and blouses	180	220	320
Lingerie	180	220	320
Swimwear	220	220	320
Lining	180	220	320
Workwear and PPE workwear	450	Not defined	800

* The use of normal and slim fit is explained in 4.1.1.1 where the ECLA document is described.

Table 3. Minimum requirements for elongation for clothing; N

Article	Elongation in %
Trousers and shorts	12.5 - 55
Jackets	12.5 - 55
Coats	12,5 - 40
Anoraks, skiwear and sportswear	12.5 - 55
Pyjamas and nightwear	12.5 - 40
Shirts, dresses and blouses	12.5 - 40
Lingerie	12.5 - 40
Swimwear	12.5 - 40
Lining	7.5 – 32.5
Workwear and PPE workwear	12.5 - 55

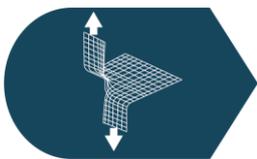
The ECLA document also mentions the minimum requirements when tested according to EN ISO 13934-2 grab method.

The minimum requirements for part 2 could be the values shown in Table 4.

Table 4. Minimum requirements for maximum force for clothing, N

Article	Minimum *normal fit	Minimum *tight fit	Premium (proposed from experience)
Trousers and shorts	180	200	300
Skirts	180	200	300
Jackets	150	150	250
Coats	150	150	250
Anoraks, skiwear and sportswear	180	180	280
Pyjamas and nightwear	120	150	250
Shirts, dresses and blouses	120	150	250
Lingerie	120	150	250
Swimwear	150	150	250
Lining	150	150	250

* The use of normal and slim fit is explained in 4.1.1.1 where the ECLA document is described.



Tear strength

The tear strength criterion is related to the appearance of tears in the fabric during use. When they appear, they can be stitched up or a piece of textile or leather is patched over the tear. This leaves a visible mark in the fabric or a visible patch. In work garment where representability of the company is less of an issue this is common practice, but most consumers or companies that keep the image of the company in mind will consider the garment end-of-life.

The fabric is torn into 2 pieces in both the warp and the weft direction starting from a cut in the fabric. The big difference with tensile strength is that the force is applied sideways and not in the length direction of the fabric. Therefore, the weft yarns break when the warp is tested and vice versa. The force is expressed in N and is an indication of the resistance of the fabric when a tearing force is applied. There are several methods to test the tear strength. Each method tears the fabric over a different distance. The shape of the sample and number of tears can differ as well. The test can only be performed on woven fabrics, not on knitted fabrics.

The main standards used in the EU are:



- EN-ISO 13937-1 (2000) - Textiles - Tear properties of fabrics - Part 1: Determination of tear force using ballistic pendulum method (Elmendorf)
- EN ISO 13937-2 (2000) - Textiles — Tear properties of fabrics — Part 2: Determination of tear force of trouser-shaped test specimens (Single tear method)
- EN ISO 13937-3 (2000) - Textiles — Tear properties of fabrics — Part 3: Determination of tear force of wing-shaped test specimens (Single tear method)
- EN ISO 13937-4 (2000) Textiles — Tear properties of fabrics — Part 4: Determination of tear force of tongue-shaped test specimens (Double tear test)

The standard that is mostly used is EN-ISO 13937-1 (2000) – “Textiles - Tear properties of fabrics - Part 1: Determination of tear force using ballistic pendulum method (Elmendorf)”. However, the other standards are also used for PPE garments. Some experts are in favour of EN ISO 13937-2 (2000) – “Textiles — Tear properties of fabrics — Part 2: Determination of tear force of trouser-shaped test specimens (Single tear method)” due to the increased accuracy because of the greater length that is torn.

The presence of the required Elmendorf device is widespread, also on production sites, which is an advantage. On the other hand, the single tear method has the advantage that it is performed on a pulling device called a tensile bench that is also used to measure tensile strength, seam strength, seam slip, etc. Because of this and because of the probably increased accuracy, the method EN ISO 13937-2 (2000) - Textiles — Tear properties of fabrics — Part 2: Determination of tear force of trouser-shaped test specimens (Single tear method) could be preferable over the Elmendorf method.

The minimum requirements for tear resistance relate to the test performed according to EN ISO 13937-2 (2000) – “Textiles — Tear properties of fabrics — Part 2: Determination of tear force of trouser-shaped test specimens (Single tear method)”. A failure is when the result is below the minimum requirement.

The minimum requirements could be the values shown in Table 5.

Table 5. Minimum requirements for tear force for clothing, N

Article	Minimum *normal fit	Minimum *tight fit	Premium (not based upon a standard)
Trousers and shorts	15	16	25
Skirts	15	16	25
Jackets	12	12	20
Coats	12	12	20
Anoraks, skiwear and sportswear	12	12	20
Pyjamas and nightwear	8	10	18
Shirts, dresses and blouses	8	10	18
Lingerie	8	10	15
Swimwear	10	10	18
Lining	8	10	15
Workwear and PPE workwear	20 or 25	20 or 25	45

* The use of normal and slim fit is explained in 4.1.1.1 where the ECLA document is described.

Seam strength

This is the strength needed to break open a seam. The destruction of a seam will probably mean the end-of-life of the textile product if the fabric is ruffled out. If only the stitching yarn is broken it can be repaired. The reason for breakage is reported and is considered as useful information to improve the seam.

A piece of fabric with a seam in the middle of the sample is clamped in a tensile bench and pulled apart. The result is the maximum force needed to destroy the seam or fabric and is expressed in N. The test is normally performed on an existing seam of a garment. So, it is the actual construction that is tested, meaning the combination of yarn, fabric, and seam type. This is different from the seam slippage test where a seam is produced according to the standard. In the case of a PPE garment, only the weakest seam is tested. This method cannot be performed on knitted fabrics.

Although this is a deviation from the standard, knitted fabrics could be tested by the bursting strength test method on a sampled seam by assuring the seam is in the middle of the hole through which the knitted fabric is blown up (see Bursting strength).

The ECLA document has no requirements according to this standard. Only PPE standards have requirements regarding this criterion.

The main standards used in the EU are:



- EN ISO 13935-2:2014 - Textiles - Seam tensile properties of fabrics and made-up textile articles - Part 2: Determination of maximum force to seam rupture using the grab method
- EN ISO 13935-1:2014 - Textiles - Seam tensile properties of fabrics and made-up textile articles - Part 1: Determination of maximum force to seam rupture using the strip method

A failure is when the result is below the minimum requirement.

The minimum requirements could be:

The requirement of the PPE product standard EN 343:2019 – “Protective clothing - Protection against rain” with as requirement 200 N except for materials with an elongation of more than 50%.



Seam slippage

This is the ability of a fabric to slip out of a seam due to the sliding of the yarns in the fabric. When the fabric slides out of the seam the fabric is unravelled. To repair the seam by creating a new seam, it is necessary to provide sufficient seam allowance to ensure the fabric will not slip out again. This new seam allowance means a considerable size

change since a part of the fabric that is not unravelled is used, alongside the unravelled part. This part next to the seam was previously part of the size of the garment. So, the garment will be smaller after repairing the seam. For many textile products this will mean the end-of-life of the product since the size change is an important parameter to consider the garment’s end-of-life by its current user.

The chance that fabric will slip out of the seam decreases with increasing seam allowance. Since we want to confirm if the fabric can cause an issue, the fabric is tested with an applied seam required by the standard so that the figures are related solely to the fabric and not to the combination of the seam type and yarn used with the fabric.

The main standards used in the EU are EN ISO 13936 part 1 and part 2:



- EN ISO 13936-1 (2004) - Textiles - Determination of the slippage resistance of yarns at a seam in woven fabrics - Part 1: Fixed seam opening method
- EN ISO 13936-2 (2004) - Textiles - Determination of the slippage resistance of yarns at a seam in woven fabrics - Part 2: Fixed load method

Part 1 expresses a result in N for a seam opening at 3 mm and 5 mm.

Part 2 gives a distance of the seam opening after a pulling force was applied. The force is 60 N for fabrics below 220 g/m² and 120 N for fabrics of more than 220 g/m². Because the distance

is measured by hand, the inaccuracy is bigger than for part 1. Part 2 is needed because part 1 is not suitable for stretch fabrics (fabrics containing elastane). Neither part can be used on a knitted fabric.

Both standards are used in the ECLA document and have requirements:

The requirements linked to part one of the standard are expressed in a force (N) that is measured at 4 mm. Since the test standard requires measurements at 3 mm and 5 mm, it would be wise to investigate which force at 3 mm and/or 5 mm is advisable as a requirement. Because the ECLA document mentions 4 mm this was adopted in the proposed requirements. A failure is when the result is below the minimum requirement.

The minimum requirements for part 1 could be the values shown in Table 6.

Table 6. Minimum requirements for seam slippage for clothing, fixed seam opening method, N

Article	Minimum *normal fit at 4 mm	Minimum *tight fit at 4 mm
Trousers and shorts	140	160
Skirts	140	160
Jackets	120	120
Coats	140	140
Anoraks, skiwear and sportswear	140	140
Pyjamas and nightwear	100	120
Shirts, dresses and blouses	110	120
Lingerie	100	120
Swimwear	140	140
Lining	100	120

The minimum requirements for part 2 could be the values in Table 7.

Table 7. Minimum requirements for seam slippage for clothing, fixed load method, N

Article	Minimum *normal fit	Minimum *tight fit
Trousers and shorts	At 120 N – 3 mm opening	At 120 N – 2 mm opening
Skirts	At 120 N – 3 mm opening	At 120 N – 2 mm opening
Jackets	At 120 N – 4 mm opening	At 120 N – 3 mm opening
Coats	At 120 N – 4 mm opening	At 120 N – 3 mm opening

Anoraks, skiwear and sportswear	At 120 N – 4 mm opening	At 120 N – 3 mm opening
Pyjamas and nightwear	At 60 N – 3 mm opening	At 60 N – 2 mm opening
Shirts, dresses and blouses	At 60 N – 3 mm opening	At 60 N – 2 mm opening
Lingerie	At 60 N – 3 mm opening	At 60 N – 2 mm opening
Swimwear	At 60 N – 3 mm opening	At 60 N – 2 mm opening
Lining	At 60 N – 3 mm opening	At 60 N – 3 mm opening

* The use of normal and slim fit is explained in 4.1.1.1 where the ECLA document is described.

Bursting strength

All pull tests mentioned previously cannot be performed on knitted fabrics. When a pull force is applied to a knitted fabric, the result is untrustworthy. Therefore, a bursting strength test is performed on knitted fabrics. The fabric is blown up until it bursts open. This is done by pushing a membrane via hydraulic or pneumatic pressure through the fabric. The membrane and fabric are pushed through a hole in a metal plate with a precise predetermined dimension, stretching a precise surface of fabric until it finally bursts and the membrane breaks through. The result is the maximum force needed to burst open the knitted fabric and is expressed in kPa. It is important to notice that this result is related to the surface of the knitted fabric pressed through the hole in the metal plate and thus the dimension of the hole in the metal plate. It is therefore important to compare results from tests that are performed with the same hole dimension. The possibilities are 7.3 - 10 - 50 or 100 cm².

The bursting strength is directly related to the strength of the knitted fabric and thus to its lifetime. The stronger the knitted fabric, the longer it will probably be in use.

The main standards used in the EU are:



- EN ISO 13938-1 (2019) - Textiles - Bursting properties of fabrics - Part 1: Hydraulic method for determination of bursting strength and bursting distension (ISO 13938-1:2019)
- EN ISO 13938-2 (2019) - Textiles - Bursting properties of fabrics — Part 2: Pneumatic method for determination of bursting strength and bursting distension

It is rare that both test methods give the same result. The main difference between the 2 methods is the medium that applies the force onto the membrane: hydraulic or pneumatic. A failure is when the result is below the minimum requirement.

The minimum requirements could be:

In the ECLA document and PPE standards, the plate with a 7.3 cm² hole is used and the minimum requirement is 200 kPa. For PPE, the plate with a 50 cm² hole can also be used with 100 kPa as requirement.



Abrasion

Abrasion is the resistance to rubbing a fabric against surfaces. This criterion can influence the end-of-life in different ways:

- Yarns break and form a hole
- Fibre loss is important to the aspect (look), comfort and use of the product (e.g. piles on a corduroy fabric that are rubbed off) and might make the consumer decide that the garment is end-of-life.
- Due to abrasion, fibres disappear, and the fabric weakens so that it becomes more likely that the fabric will tear apart when a force is applied. For some products (e.g. a baby carrier cloth) this could, in addition to the end-of-life of the product, result in safety issues.

The main standard used in the EU is:



ISO 12947-2 (2016) – “Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 2: Determination of specimen breakdown”

A test specimen is rubbed against a standardised woollen fabric in an oval movement (lissajous movement) in a constantly changing direction. One oval movement is called a cycle or rub, and the result is expressed in the number of cycles or rubs that a fabric resists before breaking down. The resistance to abrasion is checked after submitting the fabric to a predetermined number of cycles.

The result is the number of cycles or the check when the fabric was not broken down. What is meant with broken down can differ depending on the tested sample or the requirements set. The following endpoints are possible:

- A. 2 broken yarns in a woven fabric
- B. 1 broken yarn forming a hole in a knitted fabric
- C. For pile fabrics, piles are fully worn or option A or B
- D. A hole in a nonwoven
- E. Alternative endpoints like colour change assessed by ISO 105 A2 or in the case of a filament yarn combined with a staple fibre yarn when all staple fibres are worn off.

2 different forces can be applied on the sample during rubbing. A weight that applies 9kPa or a weight that applies 12 kPa:

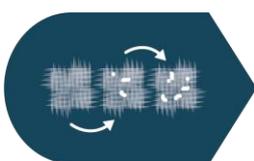
- 9 kPa is used for fabrics intended for apparel and household textiles, excluding upholstery and bedlinen.
- 12kPa for fabrics intended for workwear, upholstery, bed linen and fabrics for technical use.

Depending on the endpoint the requirement might differ. All product categories below could be tested at 9kPa except for the workwear that is tested at 12 kPa. A failure is when the result is below the minimum requirement.

The minimum requirements could be the values shown in Table 8.

Table 8. Minimum requirements for abrasion for clothing, number of cycles

Article	Minimum	Premium
Trousers and shorts	20,000	40,000
Skirts	20,000	40,000
Jackets	16,000	36,000
Coats	16,000	36,000
Knitwear	8,000 (is extremely low, depending on the article this must be higher)	26,000
Anoraks, skiwear and sportswear	16,000	26,000
Pyjamas and nightwear	10,000	20,000
Shirts, dresses and blouses	12,000	22,000
Lingerie	10,000	20,000
Swimwear	20,000	30,000
Lining	10,000	20,000
Workwear and PPE workwear	30,000 (more than 50,000 when tested with 9kPa)	50,000



Pilling, fuzzing or matting

Pilling is the formation of little fibrous balls on a fabric formed by fibre-ends sticking out of the fabric that mingle with each other or fibre contaminations on the fabric. These little balls give a sloppy or dishevelled appearance, and some consumers will consider the textile product as end-of-life because of this appearance. Because it is a visual aspect, there is a big difference in consumer behaviour regarding this aspect. Therefore, there is the possibility that via the second-hand market the garment will be reused. Also for work garments where the employee has no representative function it might be less important, while for employees who face clients this might be an important aspect.

Fuzzing and matting are also assessed, but here it is not known what the influence is on the end-of-life moment of the textile product. Probably there are consumers who will discard the garment if some areas have fuzzing and/or matting whereas others will not.

The main standards used in the EU are:



- EN ISO 12945-1 (2021) - Textiles - Determination of the propensity of textile fabrics to pill, fluff or felt on the surface - Part 1: Method using the pilling test kit
- EN ISO 12945-2 (2021) - Textiles - Determination of fabric propensity to surface pilling, fuzzing or matting - Part 2: Modified Martindale method
- EN ISO 12945-3 (2021) - Textiles - Determination of the propensity of fabrics to pill, lint or felt on the surface - Part 3: Random tumble pilling method

For all methods the samples are rubbed against each other, sometimes also against other surfaces, and then visually assessed after a number of cycles (also called rubs) on the appearance of pilling, fuzzing and/or matting. A quotation is given on a scale from 1 to 5. The results of the 3 standards cannot be compared because the surfaces against which the samples are rubbed are not comparable nor is the number of rubbing cycles.

Part 1 of the ICI pilling box standards is well-known by producers of knitwear. 4 tubular samples, 2 in each production direction of the fabric, rub against each other and against the cork surface of a rotating square box.

The most used and widely spread standard is part 2 – “Martindale method” because it is performed on the same device as the Martindale abrasion test ISO 12947-2:2016 – “Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 2: Determination of specimen breakdown”. Therefore, this is the preferred standard in the industry. During this test, 2 flat circular samples rub against each other. There is also the possibility to rub the sample against a standardised woollen fabric.

Part 3 takes the contamination of foreign fibres into account. This is not done by the other 2 standards. In a cylinder the samples turn around against each other and the cork surface of the cylinder. The influence of the contamination by foreign fibres is checked by adding grey fibres. The issue with this standard is that there are doubts about the consistency of the results. Samples might stick behind the turning pines of the rotator and cause inconsistent results due to an inconsistent friction between the samples.

The test method described in EN ISO 12945-2 (2021) – “Textiles - Determination of fabric propensity to surface pilling, fuzzing or matting - Part 2: Modified Martindale” results in a quotation of the tested sample after different cycles. After every assessment, the sample is remounted on the device and tested further. The assessment is done after 125, 500, 1000, 2000, 5000 and 7000 cycles. Some stakeholders only test up to 2000 cycles and assess the sample only once. The problem is that after a low number of cycles more pilling is visible than after a higher number of cycles because the fibres break, making the pilling disappear. Wool is a weak fibre that breaks off more easily than e.g. polyester, so it is possible that a lot of pilling on a woollen woven fabric appears after 125 or 500 cycles and that when the fibre breaks during further testing the result at 2000 cycles is acceptable because some of the pilling has disappeared.

When the consumer notices pilling after a short time of use comparable to the result after 125 or 500 cycles, he might stop using the garment so that the pilling is never rubbed off like it was after 2000 cycles. It is therefore advisable to test according to the standard and take all cycles into account. A degradation of the result with an increase in the number of cycles is acceptable. A failure is when the result is below the minimum requirement.

The minimum requirements could be the values in Table 9.

Table 9. Minimum requirements for pilling for clothing

Article	Minimum visual assessment	Premium visual assessment
Woven fabrics	4 for every number of cycles that is checked	4-5 for every number of cycles that is checked
Fabrics with raised surfaces	125 – 4-5, 500 – 4, 1000 – 3-4, 2000 – 3-4, 5000 - 3, 7000 2-3	125 – 4-5, 500 – 4-5, 1000 – 4, 2000 – 4, 5000 – 3-4, 7000 - 3-4
Knitted fabrics	125 – 4, 500 – 3-4, 1000 – 3, 2000 – 3, 5000 - 2-3, 7000 2-3	125 – 4-5, 500 – 4, 1000 – 3-4, 2000 – 3-4, 5000 - 3, 7000 2-3

Dimensional stability

Dimensional stability is the change in dimensions of a garment after washing. In most cases this is shrinkage, but with knitted fabrics it is possible that an enlargement appears. If a garment shrinks, it might not fit any more and the user will consider it as end-of-life and this possibly after 1 usage. Therefore, it is an important parameter. For some garments it is acceptable to have more shrinkage than for others. It is important that the size of a garment has not altered after washing. Therefore, there is a direct link with the measuring tables used. The shrinkage is assessed according to standard EN ISO 5077 (2008) - Textiles - Determination of dimensional change in washing and drying. The assessment can be done both on a finished garment (3 garments are assessed) and on a fabric. This assessment can be done after washing according to the standards on care instructions:

- EN ISO 6330 (2012) - Textiles — Domestic washing and drying procedures for textile testing
- EN ISO 15797 (2018) - Textiles - Industrial washing and finishing procedures for testing of workwear
- EN ISO 3175-2 (2017) - Textiles — Professional care, dry-cleaning and wet cleaning of fabrics and garments — Part 2: Procedure for testing performance when cleaning and finishing using tetrachloroethene
- EN ISO 3175-3 (2017) - Textiles — Professional care, dry-cleaning and wet cleaning of fabrics and garments — Part 3: Procedure for testing performance when cleaning and finishing using hydrocarbon solvents
- EN ISO 3175-4 (2018) - Textiles — Professional care, dry-cleaning and wet cleaning of fabrics and garments — Part 4: Procedure for testing performance when cleaning and finishing using simulated wet cleaning



Regarding the dry-cleaning procedures, there are new solvents on the market that claim to be more environmentally friendly. It is not known yet how these solvents influence the textile. It is possible that the present standards do not simulate the influence of these solvents.

The minimum requirements for dimensional stability could be:

A maximum shrinkage of 3%. So the limits would be +0% to -3% when assessed according to EN ISO 5077. For knitted garments, it could additionally be an enlargement of 5%. So the limits would be -3% to +5% when assessed according to EN ISO 5077. A failure is a result outside the proposed limits.

Visible change after washing

It is possible to assess the visual change after washing. If the item changes to a great extent, it is possible that the garment is considered end-of-life by the user. Just as in the case of pilling, not every consumer reacts in the same manner to visual changes. There is still the possibility that the garment is reused via the second-hand market. Also trends, like vintage, make it more likely that other consumers will use the garments with a degraded aspect.

For domestic washing, the following standard can be used: ISO 15487 (2018) - Textiles — Method for assessing appearance of apparel and other textile end products after domestic washing and drying.

In this standard several aspects are assessed, including smoothness, pilling, fuzzing, matting of the fabric, colour change, staining, change of the print and seam slippage. Also accessories of a garment can be assessed such as buttons, press fasteners, touch and close fasteners, labels, embroidery, and the spirality of a garment.

It is important to know that many assessments are voluntary within standard ISO 15487 (2015) and that not every aspect needs to be assessed. In addition, also a grading system is optional. It could therefore be wise to indicate what aspect shall be assessed according to this standard and if the grading system shall be used.

It is not advisable to assess staining according to this standard since staining might appear on a ballast sample and not on the witness sample. A second reason is that in the case of a multi-colour garment it might be unclear which colour is the issue. ISO 105 C06 is more advisable in this case.

If an assessment according to industrial washing is needed this must be expressed and will be a deviation of the standard, with a washing and drying procedure according to ISO 15797 instead of ISO 6330.

There is not enough information about the correlation between the visual change of a garment and the end-of-life consideration by the consumer to propose a minimum level. That items should still be functional after 5 washing cycles could be a minimum requirement. This shall then be taken up in the requirements.

4.1.1.1.2 Colour fastness

Just as with visual changes after washing, some users may discard a garment after the colour of the garment, fabric or a component changes under a certain influence. If discolouration occurs uniformly all over the item, it will be less of an issue than if the colour change occurs locally. Local colour changes are much more visible, e.g. colour change of a t-shirt due to perspiration under the arms. In addition to colour changes, the colour can bleed out causing damage to other products. For example, a garment can stain its colorant on a white sofa leading to the end-of-life of the sofa.

For some of the colour fastness tests, witness samples are used to check staining. Depending on the use of the garment, a monofibre or multifibre is chosen. Monofibre means that 2 witness samples of 1 fibre type are added to the test. For example, working garments that are mostly made from a polyester-cotton blend that are washed with only other polyester-cotton working garment, will be checked with a polyester and a cotton witness sample. Multifibre witness samples will be checked with more fibre types. There are 2 possibilities described in ISO 105 F10 (1989) – “Textiles — Tests for colour fastness — Part F10: Specification for adjacent fabric: Multifibre”

- Multifibre DW composed of Secondary acetate, Bleached cotton, Polyamide, Polyester, Acrylic, Wool
- Multifibre TV composed of Triacetate, Bleached cotton, Polyamide, Polyester, Acrylic and Viscose

It is advisable to use multifibre witness samples where it is unknown what materials come into contact with the tested samples, e.g. fashion.

Both colour change and staining (if assessed within the specific part of ISO 105) are assessed by giving a quotation from 5 to 1. Only colour fastness to light has an assessment from 8 to 1, where 8 is the best quotation and 1 the worst.

Colour fastness tests are performed according to the EN ISO 105 series. The most important colour fastness tests are: washing, rubbing, perspiration, water and light.



Colour fastness washing

The method that is most used is ISO 105-C06 (2010) – “Textiles - Tests for colour fastness - Part C06: Colour fastness to domestic and commercial laundering”. This method is a simulated wash (drying is excluded) of a small sample in a small container containing water, detergents and sometimes ballast. The container is heated in a water bath. There are several options within this test method. There is the possibility to use a program designed to simulate 1 laundry cycle or multiple laundry cycles. Other programs use perborate to simulate the use of detergents for white laundry. It is important to state the program to be used when it comes to formulating a criterion.

The proposed limit can be set on 4 for both staining and colour change. In the case of a garment with several colours where the colours have a high contrast (e.g. black/white combination) the staining could be 5 to avoid problems. Any lower figure would be a failure. This is the case for all colour fastness tests where staining is involved.

Regarding this criterion, the EU Ecolabel requirements are very unclear when it comes to industrial laundry. The requirement for industrial laundry mentions ISO 15797 in combination with ISO 105 C06. A choice must be made in order to be correct:



- A washing method within EN ISO 105 C06 and then assessed according to EN ISO 105 C06 which refers to EN ISO 105 A02 colour change and EN ISO 105 A03 staining.
- A maintenance according to EN ISO 15797 industrial maintenance and an assessment according to EN ISO 105 A02 colour change. Also in this case, it is not advisable to assess staining due to the high volumes of ballast and unquantified amount of test samples in the standard. Therefore it is recommended to use EN ISO 105 C06 instead.

Colour fastness rubbing

The influence of rubbing a fabric against another fabric is assessed by ISO 105-X12 (2016) – “Textiles — Tests for colour fastness — Part X12: Colour fastness to rubbing”. The sample is tested by rubbing a cotton fabric in dry and wet state against the textile that is tested. By doing so, only the staining is assessed.

The limit could be a minimum of 4 for dry rubbing colour fastness and 3-4 for wet rubbing colour fastness. If this minimum requirement is generally applied, it is possible that many denim products are non-compliant since it is typical of this product to release its colorants easily.

It is also important to state that some textile materials that are known for linting, i.e. shedding fibre particles, which might result in a failure since the fibres will cause staining of the cotton witness sample. It is for example possible that linen fabrics will fail not because the colour is transferred to the witness sample but due to a contamination of the witness sample by small, coloured linen fibre particles. These particles can be removed by rubbing or washing, and do not cause the products to be damaged permanently. The testing method needs to be adapted to assess linen.

Colour fastness perspiration (sweat)

ISO 105-E04 (2013) – “Textiles — Tests for colour fastness — Part E04: Colour fastness to perspiration” is used to assess colour changes in a textile under the influence of human perspiration.

The textile is assessed after contact with an artificial alkaline and acid perspiration solution. It is possible that a colour change or staining occurs due to only one of the solutions. Therefore, it is important always to test both solutions. The limit could be minimum 4 for both change and staining. For lining fabrics, a change of 3-4 could be acceptable since it is less visible. When the limit for staining is too low for a lining fabric, it might stain on the outer fabric causing visible stains and the end-of-life of the garment.

Colour fastness water

When textile is wet and comes into contact with another piece of textile the colour might stain. This can happen after washing when the textile is not immediately removed from the machine. The test standard used is EN ISO 105 E07 (2010) – “Textiles — Tests for colour fastness — Part E07: Colour fastness to spotting: Water”

The minimum requirement could be 4.

Colour fastness to light

Colour can be broken down under the influence of light. Especially for outdoor and bathing garments this is of importance. The colour change is assessed by EN ISO 105 B02 (2013) – “Textiles — Tests for colour fastness — Part B02: Colour fastness to artificial light: Xenon arc fading lamp test”. Since it is not only sunlight that might destroy the colourant but also artificial light, this is an important requirement, and the minimum limit can be 5. A lower result is acceptable for linings, pyjamas and lingerie because they come less into contact with light and a minimum of 4 would be acceptable.

4.1.1.1.3 Product specific criteria

Product specific colour fastness requirements

Depending on the use case some additional colour fastness requirements could be required. The following standards can be used:

When dry-cleaning is possible:

- EN ISO 105-D01 (2010) - Textiles — Tests for colour fastness — Part D01: Colour fastness to dry-cleaning using perchloroethylene solvent

Contrasting colours - any garment:

In case the coloured textiles are combined with white textile and there is a chance it might be bleached.



- EN ISO 105-N01 (1993) - Textiles — Tests for colour fastness — Part N01: Colour fastness to bleaching: Hypochlorite
- EN ISO 105-N02 (1995) - Textiles - Tests for colour fastness - Part N02: Colour fastness to bleaching - Peroxide
- EN ISO 105-N03 (1995) - Textiles - Tests for colour fastness - Part N03: Colour fastness to bleaching - Sodium chlorite (mild)
- EN ISO 105-N04 (1995) - Textiles - Tests for colour fastness - Part N04: Colour fastness to bleaching - Sodium chlorite (severe)

In the case of swimwear:

- EN ISO 105-E02 (2013) - Textiles — Tests for colour fastness — Part E02: Colour fastness to sea water

- EN ISO 105-E03 (2010) - Textiles — Tests for colour fastness — Part E03: Colour fastness to chlorinated water (swimming-pool water)

For textiles that can be ironed:

- ISO 105-X11 (1994) - Textiles — Tests for colour fastness — Part X11: Colour fastness to hot pressing

A failure is when the result is below the minimum requirement.

The minimum requirements could be:

For these colour fastnesses the minimum requirement for both the change and if applicable the staining could be 4.

Accessories

Accessories are not limited to clothing and can be found on several textile products. Therefore, the standards below could also be used for other textile products.



Zippers

EN 16732 (2015) - Slide fasteners (zips) – Specification is a test standard for zippers that also has minimum requirements depending on the size of the zipper. Some experts are of the opinion that for some zipper classes stated in the standard, the minimum requirements set for certain parameters are too low. For this reason, some product standards related to safety demand a

higher minimum limit. Nevertheless, this standard can be used as a starting point. The standard takes both physical properties and colour fastness properties into account. It is important to mention the standard will be reviewed in the coming years (2022 – 2025).



Buttons and press fasteners

There are 2 standards to check if buttons and press fasteners are correctly applied and will not break down prematurely:

- EN 17394-2 (2021) - Textiles and textile products - Part 2: Safety of Children's Clothing - Security of Attachment of Buttons - Test method
- CEN/TS 17394-3 (2021) - Textiles and textile products - Part 3: Safety of children's clothing - Security of attachment of metal mechanically applied press fasteners - Test method

These test methods are relatively new and used to assess the safety of e.g. children's clothing and toys. The safety limit of 70 N or 50 N linked to the product safety standards is too low to be considered good quality. What the limit could be needs to be discussed amongst experts.



Baby articles

For baby articles it might be important to have no staining when the colourant comes into contact with saliva. A textile product might not be used anymore when the colourant stains, due of health issues when a baby puts the textile into its mouth. This can be verified with one of the national standards, since there is no EN or ISO standard for this: DIN 53160-1 (2010) - Determination of the colour fastness of articles for common use - Part 1: Test with artificial saliva.

When no staining is the requirement the minimum limit shall be 5.



Rainwear

Regarding coated or uncoated fabrics, there is no reason to accept lower minimum requirements for coated fabrics when it comes to physical defects. There might be different test standards applicable or differences in performing a test that might lead to a different minimum value. Within this study this was not further investigated. The following standards could be applied:



- EN ISO 1421 (2016) Rubber- or plastics-coated fabrics — Determination of tensile strength and elongation at break
- EN ISO 4674-1 - Rubber- or plastics-coated fabrics - Determination of tear resistance - Part 1: Constant rate of tear methods

Next to this requirement on use, the following requirements could be implemented to cover waterproofness, tightness of the seam tapes and membrane or coating, breathability. EN 343 (2019) - Protective clothing - Protection against rain could be used where the lowest class is set as a minimum for normal non-protective rainwear.



Socks

For socks there is a special abrasion test for the sole and heel of a sock using special holders on a Martindale testing device. Since the weight applied is 12 kPa, the number of cycles for a requirement cannot be the same as for other garments tested with 9 kPa. The used standard is CEN EN 13770 (2002) - Textiles - Determination of the abrasion resistance of knitted footwear garments

The minimum requirement could be 12000 cycles because next to shrinkage and colour fastness this is the most important aspect of a sock.

Other claims made by suppliers

Suppliers make claims, but in many cases the durability of the claimed property, for example, crease recovery or easy ironing, is not tested. A requirement could be based on the assessment according to ISO 9867 (2009) – “Textiles — Evaluation of the wrinkle recovery of fabrics — Appearance method”. This assessment could be done after a certain number of washing cycles to verify if the claimed property is still functional.

“ISO 2313:1972 - Textiles — Determination of the recovery from creasing of a horizontally folded specimen of fabric by measuring the angle of recovery” is also used but due to the curling of some samples, the assessment might be less accurate. Therefore, ISO 9867 is the preferred standard.

4.1.1.2 Product group 2 - Bath, bed and kitchen textile



The European standard EN 14697 (2005) - Textiles. Terry towels and terry towel fabrics. Specifications and methods of test sets out requirements based on general applicated test methods.

This standard sets requirements for:

- Dimensional stability
- Colour fastness to light, rubbing, water, washing, oxidative bleach, chlorinated water, chlorine bleach,
- Physical properties: tensile strength, bursting strength, absorption time, DP-number (polymerisation grade of the cellulose, only applicable on cellulose fibres), pile loop extraction, seam slippage (optional)
- Mass per unit area and terry ratio. This parameter only defines the sample but does not relate to the quality level. It is only useful between trade partners when there is a discussion on whether the product as agreed has been delivered.

The testing standard is also well-known and used in the garment industry, except for pile loop extraction, absorption time and terry ratio. There are 2 levels identified, one for the contract market where the towels are used often and one for the domestic market. The requirements for the domestic market are less severe and these requirements could be used to set the minimum quality level.

The EU Ecolabel sets additional minimum requirement for colour fastness to perspiration (acid, alkaline). The minimum requirement when tested according to EN ISO 105 E04 (2013) - “Textiles - Tests for colour fastness - Colour fastness to perspiration” is 3-4 for both the colour change and staining. 3 is accepted in some cases but it is not advisable for this to be maintained.

For other products like kitchen towels, napkins, bedsheets, and pillow covers, the same sets of requirements, perhaps with different requirement levels and some changes in criteria, could be used. This needs to be investigated to set appropriate minimum requirements to guarantee a certain lifetime. So also here an investigation on the expected lifetime and end-of-life reason in terms of parameters needs to be done.

There is an additional standard that could inspire, more in particular EN 13569:2001 - Cabinet roller towels - Performance requirements and processing, as well as several ASTM standards:



- ASTM D5433 – 12 (2019) - Standard Performance Specification for Towel Products for Institutional and Household Use.
- ASTM D5432 - 12(2019) - Standard Performance Specification for Blanket Products for Institutional and Household Use
- ASTM D4111 - 12(2019) - Standard Performance Specification for Woven Napery and Tablecloth Fabrics: Household and Institutional

These standards could help in defining the parameters for the additional EN product standards.

4.1.1.3 Product group 3 – Curtains



No European standard was found that defines the quality level of curtains. There is a BS (British standard) that is implemented by several European companies due to the importance of the British market and some ASTM standards. Based on these standards, an EN standard can be developed to define a quality level. The following standards were found:



- BS 5867-1 (2004) - Textiles and textile products. Curtains and drapes - General requirements
- ASTM D3691 / D3691M - 19 - Standard Performance Specification for Woven, Lace, and Knit Household Curtain and Drapery Fabrics
- ASTM D4720 – 08 (2019) - Standard Performance Specification for Soft Window Covering Fabrics for Household Use

The above-mentioned standards take the following criteria into consideration:

- Physical properties: Tensile strength, tear strength, bursting strength
- Maintenance - dimensional stability: domestic maintenance and dry-cleaning
- Colour fastness: washing, rubbing, light, dry-cleaning

Regarding tensile strength, a difference is made between conventionally woven fabrics and stitch-bonded fabrics containing foam and backing.

The EU Ecolabel has the following requirements:

- Dimensional stability: EN ISO 6330 - domestic maintenance or ISO 15797 - industrial maintenance in combination with EN ISO 5077. Curtains must have a dimensional stability within $\pm 2,0$ %.
- Colour fastness to washing: When tested according to ISO 105 C06 or ISO 15797 the minimum colour change should be 3-4. The same comment as for clothing, that it is inadvisable to use ISO 15797 for staining, remains valid.
- Colour fastness to light: ISO 105 B02 with a requirement of 5, except for some qualities (e.g. more than 20% wool, other keratin fibres, silk, or flax and other bast fibres) and exceptionally light-coloured fabrics where the requirement is at least 4. As colour fastness to light often is the most important criteria for curtains, a level 4 could be too low.

In the EU Ecolabel, the requirements for pilling and abrasion are not clear. Pilling and abrasion are indeed 2 different aspects requiring 2 separate test methods. Only the test methods for pilling are mentioned. But even here, the number of cycles and other parameters for performing the pilling test are not mentioned. Therefore, the requirements set out in the EU Ecolabel for pilling and abrasion cannot be used as an example.

4.1.1.4 **Product group 4 - Upholstery fabrics**



4.1.1.4.1 General criteria

EN 14465 (2003) - "Textiles - Upholstery fabrics - Specification and methods of test" sets out the requirements for upholstery fabrics for indoor use. It excludes outdoor furniture as well as their use in means of public transport like boats, railway vehicles and aeroplanes because these applications fall within the scope of specific standards and legislations.

The standard is a tool of communication between supplier and customer and sets out several classes for every requirement. Some requirements have 5 performance levels while others have only 2. This diversity makes it complex to combine different assessments and classes into a single product quality ranking with several levels. Which minimum requirements for colour fastness and abrasion would one combine to obtain a same quality level? This needs further research and discussion for all product groups, see part 4.4.5. eodesign regulation.

The standard sets out the minimum levels for:

- Physical properties: Tensile strength (woven fabrics), tear strength (woven fabrics), abrasion, pilling, burst strength (knitted fabrics) and seam slippage.
- Colour fastness to light, rubbing dry and wet and water. Colour fastness to water is an optional requirement.

Several ASTM standards set out minimum requirements that can be a source of further inspiration:



- ASTM - D3597 - 02(2018) - Standard Performance Specification for Woven Upholstery Fabrics—Plain, Tufted, or Flocked.
- ASTM - D4852 – 18 - Standard Practice for Evaluation of Attached Upholstery Fabrics
- ASTM - D4771 – 19 - Standard Performance Specification for Knitted Upholstery Fabrics for Indoor Furniture

4.1.1.4.2 Product specific criteria

Some interior fabrics can be maintained because they are easily removable, such as seat and pillow covers, for which maintenance needs to be considered. In this case, EN 14465 (2003) has additional requirements for dimensional stability, colour fastness to washing and colour fastness to dry cleaning set out in 2 levels.

4.1.1.5 Product group 5 – Mattress ticking



4.1.1.5.1 General criteria

EN 14976 (2005) - “Textiles - Mattress ticking - Specifications and test methods” only has minimum requirements for several parameters but does not include a classification like the standard for upholstery fabrics. The standard specifies minimum requirements for the following quality parameters:

- Physical properties: Tensile strength (woven fabric), tear strength (woven fabric), seam slippage and bursting strength (knitted fabric). The requirements can differ for woven fabrics, knitted fabrics, and non-wovens.
- Additional requirements for flexing and bias. They are therefore voluntary and could be used as guidance. They are not mandatory because, at this moment, there is no EN standard to measure them according to EN 14976, only a BS (British standard) and NF (Norme Française) standard. However, EN ISO 13015:2013 “Woven fabrics — Distortion — Determination of skew and bow” is available. It could be wise to adapt standard EN 14976 to be used as a requirement in future ecodesign regulation for textile products.
- Colour fastness to rubbing and perspiration. Colour fastness to light might be an additional requirement and thus not mandatory.

In addition to the quality parameters it considers the identification parameters of the fabric. The following requirements are set:

- Width of the fabric -0% on the stated width
- Length of the roll with a +/- % depending on the kind of fabric (knitted or woven and mass)
- Mass per unit area +/- 5% on the stated mass

This is mainly to avoid discussion between supplier and customer and will assure that the fabric agreed upon will be delivered. It adds little to the quality level of the fabric.

4.1.1.5.2 Product specific criteria

Just as in the case of upholstery fabrics, minimum requirements are set for maintenance when the ticking is washable, e.g. removable mattress cover.

4.1.1.6 Product group 6 – Floor covering



4.1.1.6.1 Legal criteria

The harmonised EN 14041 (2004) + AC2006 - “Resilient, textile, laminate and modular multilayer floor coverings - Essential characteristics” is used to prove compliancy to regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products.

The EN 14041 has the following scope:

This European Standard specifies the essential characteristics for the following types of floor coverings:

- *resilient floor coverings, excluding loose-laid mat*
- *textile floor coverings, excluding loose-laid (barrier) mats, runners and rugs*
- *laminate floor coverings*
- *modular multilayer floor coverings.*

These types of floor coverings may or may not be formulated to enhance the performance of one or more essential characteristics.

These types of floor coverings are intended for internal use as floor coverings within a building according to the manufacturer's specifications.

For these types of floor coverings this European standard specifies the assessment methods for determination of performances of the essential characteristics, the ways of expressing their performance, the systems for assessment and verification of constancy of performance (AVCP) and their marking.

This standard does not specify requirements of floor coverings, which are not related to the essential characteristics as defined in Regulation (EU) No 305/2011.

This standard does not cover installation or maintenance of the floor coverings.

The standard includes requirements related to:

- The thickness of the product depending on the type of floor covering
- Content of dangerous substances in the product and emissions of dangerous substances
- Physical properties water tightness, slip resistance, electrical behaviour and thermal resistance
- Reaction to fire

As this standard and its requirements are compulsory, these requirements are a must for the products within the scope. They can be complemented with additional standards used by the industry.

4.1.1.6.2 General criteria

There are several standards used to classify floor covering:

- EN 1307 (2014) + A3 - Textile floor coverings – Classification
- EN 14215 (2018) - Textile floor coverings - Classification of machine-made rugs and runners

EN 1307 has the following scope:

This European Standard specifies the requirements for classification of all textile floor coverings and carpet tiles, excluding rugs and runners (see ISO 2424) into use classes with regard to one or more of the following properties: wear, appearance retention, additional performance properties and classes for luxury rating.

This European Standard refers to the classification as defined in EN ISO 10874.

EN 1307 splits up the classification into 2 main categories, i.e. domestic use and commercial use. For each of these categories there is a further classification into moderate use, general use and heavy use. This leads to 6 classes: namely 21 domestic use moderate, 22 domestic use general, 23 domestic use heavy, 31 commercial use moderate, 32 commercial use general and 33 commercial use heavy.

In common with the standard for mattress ticking, EN 1307 sets out parameters and requirements to define the carpet. Also in this case they do not contribute to the quality level and are only there to avoid misleading customers.

The quality parameters are split up into basic requirements and requirements linked to the classification. The basic requirements include:

- Colour fastness to light, to dry and wet rubbing, to water

- Dimensional stability is assessed according to ISO 2551:2020 Textile floor coverings and textile floor coverings in tile form — Determination of dimensional changes due to the effects of varied water and heat conditions and distortion out of plane.
- Physical properties: hairiness/pilling EN 1963 (2007) – “Textile floor coverings - Tests using the Lisson Tretrad Machine”, peel resistance EN ISO 11857 (1999) – “Textile floor coverings — Determination of resistance to delamination” and water permeability (annex G of the standard). Easy maintenance finishing by testing according to EN 1269 - Textile floor coverings - Assessment of impregnations in needed floor coverings by means of a soiling test

The requirements to determine the level of use classification are abrasion resistance, hairiness (pilling), general structural integrity, colour change and additional mandatory requirements e.g. dimensional stability.

EN 1307 (2014) + A3 is linked, as mentioned in the scope, to EN ISO 10874:2009 - “Resilient, textile and laminate floor coverings — Classification”. This is a labelling that, according to the scope, serves to provide guidance to manufacturers, specifiers and consumers, to enable them to choose the appropriate class of floor covering for any given area of use or specific room. This is an example of labelling the quality level within the textile industry.

For machine made rugs and runners there is the separate standard EN 14215 (2018) with the following scope:

This European Standard specifies requirements for machine made (woven, tufted, knitted, needled, flocked, bonded, hand-tufted) rugs and runners, including a classification according to use intensity and luxury. This European Standard is not applicable to hand-knotted rugs, to barrier mats or to bathroom rugs.

This standard has basic requirements for the products within the scope and some requirements related to a classification. The parameters that are taken into account are:

- Characteristics to define the product including fibre composition, dimensions, total thickness mm, total mass per unit area, and if applicable, mass of pile per unit area above the substrate, number of tufts/loops per unit area and surface pile density (SPD).
- Quality requirements including colour fastness to light, rubbing and water, tuft or loop drawn force and fibre bind.

The classification has 3 levels based on the intended intensity of use and includes requirements on change of appearance after mechanical influence, surface pile, tuft or loop density and withdrawal force. In addition, there is a luxury classification depending on the mass of pile per unit area above the substrate.

The carpet industry uses standard EN 16810 (2017) – “Resilient, textile and laminate floor coverings - Environmental product declarations - Product category rules” to make environmental claims. This standard is linked to ISO 14025:2006 – “Environmental labels and declarations — Type III environmental declarations — Principles and procedures” and EN 15804+A2 “Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products”.

4.1.1.6.3 Product specific criteria

Not every criterion of EN 1307 (2014) + A3 is used for every type of carpet. Table 4 in the standard shows what criteria are taken into account. For each criterion, 6 categories can be found, sometimes further split up according to the material present (e.g. more than 80 % wool) or foreseen use (short and long-term use). This all leads to a complex system to classify a product, because the construction (woven, tufted, type of surface [flat, piled], type of primary and additional backing) and colour structure can lead to different requirements.

There are specific requirements for certain uses or product categories, such as carpet tiles and carpets used on stairs. There are also specific tests for specific products like flocked floor coverings where the water permeability can be tested.

The standard is a complex system that leads to a classification. Furthermore, the standard refers to a mandatory standard where symbols are used to indicate the classes, luxury rating classes and additional characteristics. This is standard CEN/TS 15398 - Resilient, textile and laminate floor coverings - Floor covering standard symbols. If you also add ISO 16810 (2017) on environmental declarations, the system increases in complexity.

This set of standards is a good example for the rest of the industry, but one needs to remember that for these products, the supply chains are less complex than for textile products such as fashion. This is further elaborated in sections 4.3.1.1 of General product claims and 4.4.5 ecodesign regulation.

4.1.2 Repairability

Next to quality criteria, the repairability of textiles has a significant impact on the use time of textiles. However, to this date there is no standard to assess or define the repairability of textiles.

Fasteners (i.e. buttons, zippers, lacing, ribbons, etc.) are often one of the first things to fail on garments such as jackets, trousers, or shirts (Bauer et al., 2018). Difficulties in repairing a failed zipper or missing a garment-specific button could result in discarding the garment before the rest of the garment shows any signs of wear. Providing **access to spare parts and accessories**, including instructions, to enable easy repairs can encourage consumers to repair rather than discard. This access could be supplied together with the product at the moment of purchase through the provision of relevant spare parts including (sewing) threads or yarn. The instructions on how repairs can be easily done could be offered in-store, in packaging or accessible online. Where self-repair or alteration may not be appropriate, retailers could **provide repair services** in-store and form partnerships with repair and restyle providers based in local communities. Several brands already offer in-store repair and incentivise users to keep their garments well maintained.

In their 2018 report '*Potential Ecodesign Requirements for Textiles and Furniture*', Bauer et al. suggest that "the producer must make spare parts available for x years after product has been on sale, or alternatively must provide spare parts with the product (i.e. extra buttons, thread of correct colour, replacement zips etc.)". This ecodesign requirement would be relevant for the product groups of clothing and home textiles with fasteners/accessories and could be assessed on a proof of availability of spare parts from the producer. Many producers already supply spare parts together with the product (e.g. a spare button on the label). Not using the

spare parts may result in disposing them, although the impact of this is smaller than the impact linked to the garment being disposed (Bauer et al., 2018).

It should be noted that the access to or provision of spare parts is not the sole criteria that impacts the repairability. This also heavily depends on the user or consumer and his skills and willingness to repair. Although most people are able to sew on a button, research suggests that fewer people now have the skills to make more complicated repairs such as altering a hem or darning holes (WRAP, 2017). According to a 2020 ING report, about 50 % of consumers do not repair clothes as they lack the skills or prefer buying new (cheap) ones (ING, 2020). It could be assumed that **high physical and emotional durability** which is linked to the aesthetics and fashion aspect of textiles would in turn increase demand for repair. To make favourite clothes last longer is also the biggest motivating factor for consumers to repair their garment according to this ING study (ING, 2020)

4.1.3 Maintenance

According to the Environmental Improvement Potential of textiles study (Adrien Beton, 2014), normal clothing items are washed between 25 to 50 times and underwear 104 times. Curtains are washed about 20 times, bed linen 80 times and kitchen towels 100 times. This indicates the importance of maintenance in the life prolongations of many textile products. According to the same study, maintenance counts for an important part on the environmental impact of the use phase. Therefore, a good understanding of the maintenance instructions is important next to the life prolongation aspect of maintenance.

Contrary to the USA (CLOTHES CAPTIONING: COMPLYING WITH THE CARE LABELING RULE, 2014) where a written instruction or the use of symbols according to ASTM D 5489 is mandatory, no European legislation makes it obligatory to mention care instructions on a textile product that can be maintained. However, the consumer assumes that clothing can be maintained via a certain washing and drying procedure. Therefore, to avoid customer complaints, care instructions are mentioned and the clothing industry is thus self-regulating. For some articles like Personal Protection Equipment (PPE), it is mandatory to mention the care instructions in the entire EU market because maltreatment could damage the PPE item e.g. in the case of CE marked high-visibility garments.

A study on apparel care labels performed in Manitoba (Canada) by the Faculty of Human Ecology of the University of Manitoba (Feltham, 2006) indicated that 67% of respondents take care instruction into account when they purchase a garment and 82% are using the instruction to maintain the garment. It also shows that the % is higher with female respondents and that the % of awareness increased with the age. Next to this study a newsletter of Ginetex, the international association for textile care labelling, announced the findings of a study performed by IPSOS (Ginetex, retrieved 2021) that questioned 6000 respondents in Germany, Great Britain, France, Italy, the Czech Republic and Sweden. The study mentions the following:

70% of Europeans follow the textile care instructions featured on the labels and 80% admit that they would not (or would rarely) buy clothes without any labels, while another 84% feel concerned by water and energy savings.

So it appears that consumers take the care instructions into account when purchasing a garment and are concerned about the ecological impact of the maintenance of their textile. The same study revealed that more than 90% of the Europeans know the washing and ironing symbols, while this was only 33% for the bleaching symbol and 32% for the drying symbol. With 21%, the professional cleaning symbol is the least known symbol. Despite the low percentage, this symbol has a major importance to the professional maintenance industry that relies on this symbol to choose the correct maintenance program. The IPSOS study also revealed that 62 % of the consumers admitted cutting out the label with the care instructions before use. The main reasons according to those that remove the label is that the label itches (74%) and causes skin irritation (55%). So also, regarding the care instructions, an alternative way of informing the stakeholders could be investigated. The care instructions should therefore be taken into account when discussing a product passport because this label also mentions the composition, that could be a part of a future product passport, as an unknown composition causes an issue in the recycling process.

For other consumer articles it is sometimes unclear if one can maintain the textile due to the absence of the label. Next to garments and bed, bath and kitchen textiles product, textiles are incorporated in shoes, covers of interior products, bags and other consumer products. These textiles get soiled as well and a consumer might therefore stop using the product. If the product is ecodesigned well, the textile can be maintained but for most products this is not the case yet. On most products there are even no care instructions at all. For example, some washing machines have programs for sport shoes but, in general, no care instructions are mentioned on a sport shoe. Experience has shown that some sport shoes are washable when using the correct program even if they carry no mention of care instructions. By washing them they stay in a better condition and the use time will be prolonged in some cases. The recent corona crisis raised the question if disposable medical mouth masks could be maintained to solve the medical mask shortage. The absence of a care instruction stating that the textile product is not maintainable can even cause a potential danger. By not indicating that the mouth mask is not maintainable one might use a mouth mask that is not compliant anymore without realising it.

Stating care instructions on all textile articles, even if they are not machine maintainable, could help consumers to treat the textile properly so that it stays in a good condition for a longer period. A positive side effect might be that more ecodesign will be implemented in making consumer products maintainable as a consumer might prefer this over a non-maintainable product. This could push the market toward maintainable products and avoid the use of one-time usable products. One step further in prolonging a product's life would be to assure that all textiles incorporated in a product are maintainable by making the textile easily removable or by any other means. This could also create a new or 'reborn' service maintenance industry.

For clothing and for bed, bath and kitchen textile products, the industry mostly indicates care instructions via the care symbols of EN ISO 3758 (2012) – "Textiles — Care labelling code using symbols." In some European countries the 5 best-known EN ISO 3758 symbols are mandatory, or one can choose between the symbols and a written instruction. The 5 best-known symbols used in the EU, i.e. washing, drying, bleaching, ironing, and profession care, are under copyright. These symbols are international trademarks registered at WIPO (World Intellectual Property Organization) in Geneva by Ginetex. When used, a fee must be paid to Ginetex or a national member of Ginetex. This is one of the reasons why most European countries do not make the use of care symbols

according to EN ISO 3758 mandatory. This trademark should be considered in making care instructions mandatory for all textile products.

There is a difference between the European care instructions and the American care instructions. The European instructions are the maximum treatment that does not irreversibly damage the textile and components on the textile product. The American system indicates the optimal care instructions for the textile product and does not prevent a more severe maintenance level as the care instruction is advisory. One might therefore maintain the product with a more severe maintenance program because no limit is indicated for damaging the textile product. It is mentioned as follows in the legislation:

Provide complete instructions about regular care for the garment, or provide warnings if the garment cannot be cleaned without harm

In the USA, the care instructions must be supported by reliable evidence. So the indication that a product cannot be maintained by machine washing means that one needs to have proven that this damages the textile irreversibly and is not purely to cover claims. The exact text can be found below:

Reasonable Basis

You must have a reasonable basis for all care instructions and warnings — that is, reliable evidence to support the care instructions. For example, you can't say "Dry-clean Only" unless you have proof that washing will harm the garment.

Reliable evidence depends on several factors:

- *In some cases, experience and industry expertise serve as a reasonable basis.*
- *In other cases — for example, if you use a dye that is known to bleed, or beads that are known to be damaged in dry-cleaning — you may need test results that show the garment can be cleaned as recommended without being damaged.*
- *When a garment contains several components, you must have reliable evidence showing that the entire garment will not be damaged when cleaned as directed. Results of tests on garment components can serve as a reasonable basis as long as you have reliable evidence supporting the care instructions for the garment as a whole. For example, testing the components of a garment is not an adequate basis for a "wash" instruction if the colour of one part bleeds onto another when a consumer washes the finished garment.*

This is not the case in the EU due to the absence of a regulation. It prevents 'under-labelling' (indicating care instruction with a lower impact) as some companies build in margins to avoid complaints. It is possible that some soiling cannot be removed because consumers do not dare to maintain the textile in a more severe way. As mentioned before, the IPSOS study revealed that 84% of Europeans feel concerned about water and energy savings. Of this 84%, 90% take specific eco-actions when caring for their textile products. This supports the maximum care instruction rather than the advisable care instruction because the consumer will maintain their

garments in a less damaging way than indicated. It also indicates that the under-labelling will probably not lead to more polluting maintenance cycles and could therefore be imbedded in a regulation.

To determine what care instruction should be mentioned, EN ISO 3758 provides test methods to determine the care symbols that should be used. However, there is no limit or requirement linked to the use of the symbols. It is allowed to indicate 40° normal wash even if the colour change is quoted as 3 when tested according to ISO 105 C06. There is no legal basis saying that 3 means that it has caused irreversible damage to the garment. This counts for all parameters. Therefore, it is advisable to set at least minimum quality levels for those parameters listed in ISO 105 C06. Additionally, EN ISO 3758, currently under revision and at CD stage should clearly link a symbol to a specific parameter within a method. At this moment, this is not the case for every method, e.g. when using the 40° normal wash symbol, ISO 3758 mentions ISO 105-C06 and/or ISO 105-C08 for the colour fastness laboratory method. Within EN ISO 105 C06, there are several options for 40°C. You can choose a method that simulates a single washing cycle, another one that simulates a multiple washing cycle, and a method that simulates a single washing cycle with the addition of sodium perborate. This may result in different outcomes. Nor has it been stated whether mono or multifibre witness samples should be used to assess staining. This means that in some cases only 2 fibre types are considered for staining while the problem might occur with a third fibre type. The previous version of the standard EN ISO 3758 (2005) better defined what particular test parameters to use.

For industrial maintenance, there is a different standard that can be used. EN ISO 30023 (2010), “Textiles — Qualification symbols for labelling workwear to be industrially laundered” uses a different symbol to indicate the maintenance instruction of a garment for tunnel or tumble drying. The temperature of tunnel drying (+/- 130°C) is much higher than for tumble drying (+/- 80°C). Although these washing symbols exist, many producers use EN ISO 3758 symbols to indicate the washing instructions. The issue is that, in this case, the textile care industry does not know if it can use tunnel drying or must use tumble drying. Moreover, the instructions often indicate less severe maintenance levels than commonly used in the textile care industry. Therefore, some garments with a care instruction of 40°C normal wash are maintained at 55 – 65 °C, a common temperature in the textile care industry. These practices should be avoided because it leads to discussions between stakeholders and moreover to an early end-of-life of the textile.



4.2 CLOSING THE LOOP

Next to increasing the actual use time of textiles through ecodesign measures and/or requirements impacting the quality, reparability and maintenance, there are other ecodesign parameters that have an influence on the circularity of textile products. Recycled content, dismantlability, traceability and recyclability were defined as additional parameters that are linked to closing the loop of the textile value chain.



4.2.1 Recycled content

The environmental impact of textiles is largely determined by fibre choice. By using recycled fibres, the energy and resource use can be significantly lowered, providing both environmental and economic benefits, as recycling processes generally use less energy than the production process for new fibres (ETC/WMGE, 2019). Requiring a minimum content of recycled material could further stimulate the collection of used textiles, the development of (new) sorting and recycling technologies and could also stimulate design for recycling. Furthermore, the requirement to state the recycled content in textile products could also make it easier for customers to recognise and purchase these products (Bauer et al., 2018).

The principle or requirement to procure fibres or yarn that incorporate recycled and/or reclaimed content is used in various guidelines:

Declaration of, and/or minimum threshold for, recycled content, as part of the potential ecodesign requirements for textiles (and furniture) proposed by Bauer et al. (2018): “Textile products must carry a visible label with a declaration of the percentage by weight content of recycled materials AND/OR Products within (stated fibre group) must contain a minimum of X % recycled material by weight”. This requirement would be relevant for the textile product groups clothing and home textiles.

Recycled and/or reclaimed fibre content, as a requirement in the Circular Materials Guidelines V1.0 and developed by FashionPositive; “Requirement 1A: recycled and/or reclaimed content. This requirement is centred around incorporating recycled content in fibres

- Better: 5-74% of recycled material is incorporated into fibre/yarn contents and/or reclaimed material
- Best: minimum of 75% of recycled material incorporated into fibre/yarn contents and incorporates post-consumer waste and/or reclaimed material” (FashionPositive, 2020).

The scope of this requirement is “fibre and fibrous materials production facilities”, which makes this requirement applicable to all the defined product groups in this report.

To verify the requirement to incorporate recycled and/or reclaimed content, the following (third-party) **programs or standards** are or could be used (Bauer et al., 2018); (FashionPositive, 2020):

- Recycled Claim Standard (RCS)



A chain of custody standard to verify and track recycled raw materials through the supply chain. It does not address the use of chemicals or any social or environmental aspects of production beyond the integrity of the recycled material. The RCS uses the chain of custody requirements of the Content Claim Standard (CCS).

- Global Recycle Standard (GRS)



A full product standard to verify and track recycled raw materials through the supply chain. It also includes processing criteria to prevent the use of potentially hazardous chemicals, and verifies positive social or environmental production at the facilities. The GRS uses the chain of custody requirements of the Content Claim Standard (CCS).

- QA-CER



Assures both the use of recycled materials and quality system related to the recycling process. Both the recycled content and the quality of the end product are addressed in order to support the principle of sustainability.

- SCS Recycled Content Certification



The SCS Recycled Content Certification evaluates products made from pre-consumer or post-consumer material diverted from the waste stream. Certification measures the percentage of recycled content for the purpose of making an accurate claim in the marketplace.

- UL Recycled Content Verification



Authenticates the post-consumer, pre-consumer (post-industrial), closed loop or total recycled content of products.

- Intertek’s Green Leaf Mark



Recycled Content Verification.

- C2C Certified™ (draft v4)



The Cradle-to-Cradle Certified Product Standard is the primary governing document of the Cradle-to-Cradle Certified™ Products Program.

- GreenCircle Certified – Recycled content



Certifies recycled content that comprises pre-consumer and/or post-consumer material that is used as a raw material in the manufacturing of products.

Claiming fibre content may sometimes lead to greenwashing. Some mass balance claims used by labels can create an unfair playing field. For example, if mechanically recycled fibres are used, there is a risk of quality degradation of the textile product. This means that a textile product with a 20% recycled cotton fibre content gained by a mechanical recycling process might be sooner at its end-of-life than a textile product made from 100% virgin cotton.

Due to mass balance, it is possible that a recycled content is claimed even though no single recycled fibre is present. Producer 2 in the following example needs 1000 kg of cotton to produce 10 batches. If he buys 100 kg of recycled fibres and 900 kg of virgin fibres, he could claim, via mass balance, that every batch contains 10 % recycled fibres. However, he could distribute the recycled fibres as shown in Table 10.

Table 10. Possible distribution of recycled fibres using mass balance approach

Claim on recycled content	Producer 1 - only T-shirts	Producer 2 - towels and t-shirts
Batch 1 – 10%	90 kg virgin and 10 kg recycled fibres	Towel 50 kg virgin fibres / 50 kg recycled fibres
Batch 2 – 10%	90 kg virgin and 10 kg recycled fibres	Towel 50 kg virgin fibres / 50 kg recycled fibres
Batch 3 – 10%	90 kg virgin and 10 kg recycled fibres	T-shirt 100 kg virgin fibres
Batch 4 – 10%	90 kg virgin and 10 kg recycled fibres	T-shirt 100 kg virgin fibres
Batch 5 – 10%	90 kg virgin and 10 kg recycled fibres	T-shirt 100 kg virgin fibres
Batch 6 – 10%	90 kg virgin and 10 kg recycled fibres	T-shirt 100 kg virgin fibres
Batch 7 – 10%	90 kg virgin and 10 kg recycled fibres	T-shirt 100 kg virgin fibres
Batch 8 – 10%	90 kg virgin and 10 kg recycled fibres	T-shirt 100 kg virgin fibres
Batch 9 – 10%	90 kg virgin and 10 kg recycled fibres	T-shirt 100 kg virgin fibres
Batch 10 – 10%	90 kg virgin and 10 kg recycled fibres	T-shirt 100 kg virgin fibres

If producer 2 produces articles in which damaged fibres are implemented in parts where a lower quality is of lesser importance, e.g. the loops of a towel, he might get an advantage for batches 3 to 10. When just like producer 1, he produces t-shirts where the damaged recycled fibres would have a bigger influence on the t-shirts, he could claim 10 % recycled content although there is not a single recycled fibre in the product, because he also claims 10 % for the towel. It leads to the discussion whether mass balance is to be accepted as a chain of custody principle as is done by some labels. For some recycling technologies this is not an issue because the outcome is very close or similar to the virgin product but due to price differences this can lead to unfair practices.

No real distinction is made between the **origins of the recycled fibres**. In general, recycled content could be of pre- or post-consumer origin. Although both are appreciated by the (proposed) guidelines of Bauer et al. (2018) and FashionPositive, there is a big difference in quality and availability between both (waste) material types. In addition to pre- and post-consumer material, FashionPositive also accepts ‘reclaimed’ content. The three different waste content types are defined by ISO 14021:

- Pre-consumer material (sometimes also referred to as post-industrial): material diverted from the waste stream during the manufacturing process. Excluded is the reutilisation of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.
- Post-consumer material: material generated by households or by commercial, industrial, and institutional facilities in their role as end-users of the product that can no longer be used for its intended purpose. This includes returns of materials from the distribution chain.
- Reclaimed material: material that would have otherwise been disposed of as waste or used for energy recovery but has instead been collected and reclaimed as a material input, in lieu of new primary material, for a recycling process.

Although labels exist to claim the recycled content, NEN, together with the industry and governmental organisations felt the need to set out rules to define circular textiles and especially the recycled content and its

origins. This led to NTA 8195 – “Circular textile - Requirements and categories” that sets out rules for the declaration of recycled content without limiting the amount of recycled content. This standard forms the basis of a new working item of CEN TC 248 WG 39 "Circular Economy for textile products and the textile chain".

Because of its often unknown origin and depending on treatments such as dyes that were applied during production, post-consumer recycled content can **potentially contain hazardous substances**. Since this can only be identified by rigorous chemical testing, some certification schemes that specify strict material health guidelines, such as C2C Certified™, do not allow for such recycled content to be included. However, some recycling technologies claim to purify the materials of functional chemicals so that no harmful chemicals remain. For example, the company Aquafil chemically recycles polyamide and claims it is free from harmful substances. To substantiate the claim, their recycled polyamide is certified according to Standard 100 by OEKO-TEX®.

There is also the risk that companies might produce pre-consumer waste on purpose just to be able to declare the use of this flow in recycled content. In their 2018 report *'Potential Ecodesign Requirements for Textiles and Furniture'* (Bjørn Bauer, 2018), the Nordic Council of Ministers suggested the inclusion of a separate ecodesign criterion for a maximum waste level in the production processes of textile products. This greenwashing practice is one of the reasons for the development of NTA 8195 “Circular textile - Requirements and categories”. It defines that industrial waste needs to be unavoidable and that for (finished) textile products it needs to be proven that they are without economical value.

There can also be a difference between various material types with regard to quality. Post-consumer material in particular can be of inferior quality compared to pre-consumer material. This depends upon the intensity of use and maintenance of the recycled product and on the recycling process (mechanical versus chemical recycling). This **difference in quality** could conflict with durability and might thus undermine the environmental gains. The environmental gain of life prolongation is greater than the use of recycled content (ECOS, 2021). Therefore, the use of recycled fibres is perhaps less relevant for textiles which active lifetime is determined by technical durability. The amount of recycled content that can be used without having negative effects on the use time will depend on the product. This could advocate the need to differentiate between pre- and post-consumer textile recycling in ecodesign criteria. This difference will also be important to prevent perverse effects where companies having significant production waste volumes, can claim the use of recycled content by recycling its post-consumer waste.

Limited market availability and premium prices to source and certify post-consumer material are still considered barriers to a wider adoption. This was also one of the conclusions from the participating brands after two years of the Jeans Redesign Guidelines (Ellen MacArthur Foundation, The Jeans Redesign: insights from the first two years, 2021)



4.2.2 Dismantlability

The way a product is designed and assembled determines whether and how easily it can be taken apart to facilitate maintenance, repair, (component) reuse and or recycling (total disassembly). In order to prepare garments (and especially uniforms) for resale and reuse, logos need to be removable as these could be an obstacle (Bauer et al., 2018).

Design for disassembly, as part of the potential ecodesign requirements for textiles (and furniture) proposed by Bauer et al. (2018): “The product logo, buttons and zips should be removable within X seconds. Seams should be disassembled within X seconds but without reducing durability under normal use and care. Instructions should be provided on how to do this”. This requirement would be relevant for the product groups clothing and home textiles made from a range of materials.

Enable easy disassembly of any additional material that is added to the fabric (accessories, metals, Radio-Frequency Identification, etc.), as part of the Jeans Redesign Guidelines developed by the Ellen MacArthur Foundation: “Trims that cannot be easily disassembled for removal can cause additional waste fabric at the recycling stage as they are often removed by cutting. Any additional materials, including accessories, or digital technologies should be designed to be easily removed allowing for reuse and recycling at the end of use” (Ellen MacArthur Foundation, The Jeans Redesign: insights from the first two years, 2021).

The two requirements (suggested) above are difficult to assess. ECOS recommends to “define product-specific metrics to effectively assess and compare the ease of non-destructive disassembly of products” (ECOS, 2021).

It should be noted that e.g. the use of low density stitching for easy disassembly of particular parts, should not **compromise the product strength or safety** (e.g. creating choking hazards for children).

In the past few years, there have been a number of **innovations to accommodate easy disassembly**, such as:

- disintegrating stitching/sewing yarn that melts in specialized ovens (e.g. Resortecs) or disintegrates via microwave technology (e.g. Wear2Go),
- reversible crosslinking-decrosslinking systems that can bond-debond reversibly after applying a triggering mechanism (e.g. acid, heat, UV light),
- supramolecular polymer adhesives for (reversible) bond-debond.



4.2.3 Traceability

Textile traceability is an important precondition to enable high-quality recyclability as it could provide information to the recycler about material composition, used additives and (hazardous) chemicals in the product. Next to this, it could enable customers to make conscious decisions when they have easy access to simple and standardised information on social and environmental performance. Traceability assures quality and compliance and mitigates fraud, engaging each actor in the value chain to bear the direct consequences of their

processes and activities. Collaboration throughout the value chain and supporting technology are needed to enable traceability (ETC/WMGE, 2019).

One of these supporting technologies (or carriers) could be a **product passport**. According to ECOS, this passport should “include a bill of materials and a bill of chemicals, environmental information, as well as information on reparability, durability, and due diligence (social and environmental), essential information regarding product circularity and links to external valuable data sources (LCAs, certifications, etc.)” (ECOS, 2021). This product passport could also help to identify end-of-life textiles that contain chemicals or substances of concern that are no longer accepted in new products as a result of new insights, and to prevent them from entering recycling.

The use of **technology** as an enabler to track and trace is still limited. According to the Ellen MacArthur Foundation that published its insights after two years of Jeans Redesign Guidelines, only 12 % of brands and garment manufacturers have opted to use technology as an enabler to track and trace materials to ensure they can be used again. The most commonly used technologies are QR codes and RFID tags (Ellen MacArthur Foundation, The Jeans Redesign: insights from the first two years, 2021). The application of markers onto fibres is another emerging technology (e.g. FibreTrace®, Tailorlux, AWARE). Upon scanning, this technology redirects the reader to a website where information about the garment’s composition, production processes, and fibre sourcing can be easily accessed. However, it is still unclear what the impact of recycling is of textiles to which these markers have been added and how this could potentially hamper recyclability or traceability of the recycled fibres from these textiles.



4.2.4 Recyclability

It is estimated that only about a quarter of non-reusable textiles are suitable for current and emerging fibre-to-fibre recycling technologies due to the need for mono-fibres or relatively simple fibre blends. Especially with mechanical recycling of textiles there are still technical challenges, such as the removal of chemicals like dye stuff. Shortening of the fibre lengths makes it more difficult to spin yarns. However, a wide range of innovative fibre-to-fibre recycling technologies are emerging at different scales. Although many are still not operating at a full industrial scale, some are expected to expand their capacity substantially over the next few years (JRC, 2021). This, however, complicates setting specific requirements for design for recyclability as products that are not (fully) recyclable today could be so tomorrow. The criteria for recyclability should be considered under readily available current technology.

Within the Jeans Redesign Guidelines, the Ellen MacArthur Foundation describes various principles that impact recyclability (more specifically for jeans within the clothing product group):

Metal rivets are removed entirely or reduced to a minimum: “Metal rivets are difficult to remove for recyclers. As a consequence, larger parts of the upper fabric of jeans are cut off and landfilled or incinerated. To maximise the amount of fabric that can be recycled, ideally metal rivets will not be used. If metal rivets are used, these must be kept to a minimum” (Ellen MacArthur Foundation, The Jeans Redesign Guidelines, 2019)

One of the insights after two years of applying the Jeans Redesign Guidelines was that the majority of participants (65 %) managed to eliminate the (metal) rivets from their products by substituting it with bar tracks, reinforced stitching or embroidery techniques (Ellen MacArthur Foundation, The Jeans Redesign: insights from the first two years, 2021).

Include a minimum of 98% cellulose-based fibres by weight in the total textile composition, as part of the Jeans Redesign Guidelines developed by the Ellen MacArthur Foundation: “To ensure materials used can be recycled at the highest quality and value, jeans produced to the Guidelines should not include more than 2% non-cellulose based fabric by weight. Further explanatory notes:

- Cellulose-based fibres include, but are not limited to cotton, hemp, lyocell, and viscose.
- Non-cellulose based materials include all plastic-based fibres, for example, elastane, nylon, and polyester.
- Any additional fibres containing tracking or tracing technology are included in the total textile composition and must not disrupt mechanical or chemical recycling processes.
- Zipper tape is included in the total textile composition.
- Thread used for seams is included in the total textile composition.
- Interlinings are included in the total textile composition.
- Labels are included in the total textile composition.
- Recycled content is included in the total textile composition”

(Ellen MacArthur Foundation, The Jeans Redesign Guidelines, 2019).

In its latest report on *‘How ecodesign can make our textile products more circular’*, ECOS recommends to “Limit the types of combination of different materials, material mix, chemicals, dyes and finishes that are not compatible with recycling. Ensure the use of safe chemicals (dyes and finishes) to avoid toxic chemicals being circulated through the recycling process. On the market, only allow products for which there is an available, mature and large-scale recycling technology” (ECOS, 2021).

Knowing the material content of a product can be a pre-requisite in enabling optimal recycling (this also links with ‘Traceability’):

Provision of detailed bill of materials, as part of the potential ecodesign requirements for textiles (and furniture) proposed by the Bauer et al. (2018): “The product must include, or link to, a list of all materials included in the product and at what level they are pure or mixed with other materials, and the share they make up by weight of the product down to a chosen threshold (e.g. 1%). Products that are made from a single material (with tolerance around 98%) must be stamped with a “100% recyclable” stamp” (Bauer et al., 2018).

The provision of a detailed **bill of chemicals** could help to prevent unwanted chemicals being circulated through the recycling process.

It should be noted that recyclability may conflict to a certain extent with technical durability. In some applications, a cotton/polyester blend can be more durable than pure cotton. In their 2018 report '*Potential Ecodesign Requirements for Textiles and Furniture*', Bauer et al. suggest that "the 100% recyclable stamp would be more applicable to fast fashion and not recommended for textiles where lifetime is generally limited by technical strength rather than change in style or change in fit, e.g. bed-linen".

4.3 RESPONSIBLE PRODUCTION



4.3.1 Environmentally friendly textiles

4.3.1.1 General product claims

Product Environmental Footprint initiative (European commission)

A company wishing to market its product as environmentally friendly, faces a range of choices and methodologies, sometimes even differentiating between markets. Getting to such results often becomes a very costly exercise for companies and creates a lot of confusion, for both companies and consumers. Therefore, under its Single Market for Green Products Initiative, the European Commission proposed the Product Environmental Footprint (PEF) and Organisation Environmental Footprint methods (OEF) as a common way of measuring environmental performance.

After a testing period of the approach between 2013 and 2018, the European Commission is now exploring how to use the PEF (Product Environmental Footprint) and OEF (Organisation Environmental Footprint) methods in policies. The series of consultations undertaken for this exploration showed that most trust and use is seen in the provision of requirements on how to communicate environmental footprint information as well as the use of PEF for new policy, including the substantiation of environmental claims where making claims is voluntary. The 2020 Circular Economy Action Plan foresees that "The Commission will propose that companies substantiate their environmental claims using PEF and OEF methods". (European Commission, The Environmental Footprint Pilots, 2016) and (European Commission, Report on 2018-2019 stakeholder consultations regarding the potential future use of the Product and Organisation Environmental Footprint methods, 2020).

In the period between the end of the EF (Environmental Footprint) pilot phase and the possible adoption of policies that implement the methods, a transition phase is established. The main aim of this phase is providing a framework for the monitoring of the implementation of existing PEF Category Rules (PEFCR), developing new PEFCRs and new methodological developments. One of the projects for PEFCR development in the transition phase is coordinated by the Sustainable Apparel Coalition (SAC) and covers apparel and footwear. Between 7 July and 24 September 2021 the PEF Representative Product study as well as the PEFCRs were under stakeholder consultation. A second period of public consultation is expected mid-2022, and completion of the work is expected in the first half of 2023 (Quantis, 2021).

The work during the pilot already indicates a number of limitations to the draft PEFCR (European Commission, The Environmental Footprint Pilots, 2016) study for apparel and footwear. In many cases, for all life cycle stages,

it relates to a lack of specific data, for example for certain raw materials or manufacturing processes. Uncertainty in modelling specific aspects of the life cycle, such as care frequency, consumer behaviour or end-of-life, is another limitation of significant importance. This could lead to wrong conclusions and a negative impact on the environment. For example, there is a lack of data concerning microplastics shed by textiles. If the impact of microplastics is excluded from the calculation and the recyclability of a fibre has a bigger weight in the calculation than the environmentally friendly production aspect, then the use of more plastic fibres over natural (e.g. hemp and flax) or regenerated cellulose fibres could be preferred. This can potentially lead to an increase of the overall microplastic shedding of textiles.

In general, the PEF/OEF initiative has received quite some criticism. It has been questioned whether the main goal of the PEF, i.e. creating more comparability between environmental footprints of competing products, has actually been achieved (Lehmann, Görmer, Finkbeiner, Bach, 2018).

Furthermore, there is the fear that it will prove unfeasible for SMEs to implement the PEF/OEF. It is mainly developed by big players from the fashion industry who have voting rights. For SMEs it is more difficult to perform profound LCA studies on their products and they have less leverage to collect data from their suppliers. A PEF/OEF system must consider this aspect.

There are certification schemes that take the sustainable production into account. For example, STEP is a certification scheme that focuses on the textile industry taking environmental performance, health & safety, social responsibility, environmental management, quality management and chemical management into account. Voluntary labels could be an alternative to a PEF/OEF system.

4.3.1.2 **Organic**

Organic fibres include cotton, wool, hemp, flax (linen), and other natural fibres grown according to national organic standards without the use of toxic and persistent pesticides, synthetic fertilisers, or genetic engineering. There are various third-party certification organisations that verify producers using only permissible methods and materials in organic production. The two main standards are described below.



The **Global Organic Textile Standard (GOTS)** is a voluntary international standard for the processing of organic fibre-containing products, addressing all the post-harvest processing stages (including spinning, knitting, weaving, dyeing and manufacturing). It includes both environmental and social provisions such as a ban on the use of child labour, genetic engineering, heavy metals, and highly hazardous chemicals such as formaldehyde, while requiring living wages and strict waste water treatment practices. GOTS permits non-organic

accessory components (fibre and non-fibre) in organic consumer products (e.g. wood or shell buttons on a shirt). However, accessory components must meet certain material requirements, and may not contain harmful or toxic characteristics prohibited in the standard. A textile product carrying the GOTS label must contain a minimum of 70% certified organic fibres, a product with the label grade 'organic' must contain a minimum of 95% certified organic fibres. GOTS labelling must be applied on the product in such a way that it is visible to the consumer at the time of purchase (e.g. on a label, packaging and/or hang tag).

The **Organic Content Standard (OCS)** is an international, voluntary standard that sets requirements for third-party certification of certified organic input and chain of custody. The goal of the OCS is to increase organic agriculture production. OCS guarantees the traceability of organically grown materials. Products that meet all requirements may be labelled with the OCS logo (Textile Exchange, 2021).



OCS 100: Certifies products made with 100% organic fibres that have been tracked through the production chain and segregated to prevent co-mingling with other fibres.



OCS Blended: Applies to all fabrics containing a minimum of 5% organic cotton and can be used for blends that contain any fibre, including conventional cotton.

4.3.1.3 From bio-source

Next to e.g. recycled content, materials from bio-source could help in making the textile industry more sustainable. Not only the fibre material can be, sometimes only partially, from bio-source, but also the chemicals applied or used to make textiles e.g. dyestuff and coating. There are developments in several TRL (EC HORIZON 2020 – WORK PROGRAMME 2014-2015, 2014) stages. For example, man-made protein fibres that are grown on biological feedstock, dyestuff from organic materials and plastics made from seaweed. Because of the sustainable aspects, the use of those materials is sometimes claimed for marketing purposes as well. There are few standards within the textile industry to define bio-based content or on how to declare it. Within the textile industry only ISO 5157, that is currently revised and at the stage of Draft DIS 5157 – “Textiles — Environmental aspects — Vocabulary”, defines bio-based, bio-based content, bio-based product, and biomass. The plastic and chemical industries have more standards to define bio-based. If needed, these standards could be implemented in the textile industry as a textile specific standard. This could enable the textile industry to communicate in a uniform manner regarding this aspect.

biobased %



There are independent labels that certify the bio-based content, e.g. Bio-based content (Biobased, 2015) which is a certification scheme controlled by NEN (the national Dutch standardisation body), adding to the trustworthiness of the claim.

Draft DIS 5157 also defines biodegradable material. There are many people who consider bio-based material automatically as biodegradable and compostable. This is however not always the case. There are biopolymers, e.g. PLA, that are not biodegradable or compostable. There is even a misunderstanding between biodegradable and compostable. A biodegradable material is not necessarily compostable and vice versa. These issues in understanding biodegradable and compostable properties are not related to natural fibres e.g. wool, cotton, flax, hemp, but mainly to man-made fibres. Therefore, ISO/TC 38/WG 30 - “Tests for Biodegradability” developed and published ISO 21701 (2019) - “Textiles — Test method for accelerated hydrolysis of textile materials and

biodegradation under controlled composting conditions of the resulting hydrolysate". A set of criteria based on standards like ISO 21701 could avoid misunderstanding and greenwashing.

An important aspect related to biodegradability and compostability is the chemical content of the textile. Even if the material is biodegradable and compostable, it might cause issues due to its chemical content. Some harmful chemicals might still be present after biodegradation or composting and pollute the environment or compost. This aspect is considered by some certification schemes. In addition, future standardisation might create some more guidance and clarity.



4.3.2 Labour conditions

In most EU countries labour conditions are strictly organised by national regulations. This is certainly not always the case outside the EU. This creates an unfair playing field. The EU cannot dictate what legislation other countries shall implement but it could set out strict rules when it comes to claims made (see unfair consumer practices).



Several labels consider the labour conditions and a lot of them are based on the standard created by the international labour organisation (ILO - International Labour Organization, retrieved 2021). Several institutes certify companies according to this standard ensuring compliancy.

Some labels, specialised in textile products and the textile industry, take the labour conditions into account, e.g. STeP, GOTS, standard 100 by OEKO-TEX®, and FairWearFoundation. The problem with FairWearFoundation is that companies producing in countries where the labour rights are strongly imbedded in the legislation, e.g. Belgium, cannot obtain the label because no audits are performed. Some purchasers and procurement officers put this label in their requirements because it is mentioned in sustainable buying guides. Consequently, European producers are excluded from tendering. This is damaging the EU economy and should be avoided. It could be a solution to implement a control organism on environmental and sustainable labels.



4.3.3 Chemical use and content

The use of chemicals within the textile industry is strongly regulated by the REACH regulation. As a result of the SVHC list and the obligation to declare the presence of chemicals on the list when they are present in textile for a concentration of more than 0.1%, the use of these chemicals is lowered. Producers want to avoid declaring these chemicals because it could damage their image. Related to the direct ban on chemicals, due to the authorisation list Annex XIV and restrictions list Annex XVII, there is a transition in the chemicals that are used in the textile industry.

It is important to differentiate between chemical content and chemical use. Some chemicals shall not be used (or in limited amounts) during textile production and can be detected on the final textile products, e.g. Azo dyes might release or mutate into the carcinogenic aromatic amines. If they are detected in a textile product, this

textile product is banned from the EU market. Other chemicals, however, that should not be used in the production process are not necessarily present in the final textile product, e.g. banned biocides on cotton (BPR regulation). They are not always detected on the final textile product as there is the possibility that they are washed out during the production process of the textile article (e.g. during dyeing and finishing). Therefore, the REACH regulation has a limited effect outside of the European market.

Voluntary labels and certification schemes commonly used within the textile supply chain, e.g. standard 100 by OEKO-TEX®, Blue sign, GOTS, Nordic Swan, and STeP by OEKO-TEX®, are also active outside the EU. These labels with a focus on textiles are used by the industry to make environmental claims on the chemical use and chemical content. In addition, they are also used to prove to stakeholders compliancy with regulations such as REACH or with claims made such as textile free of chemicals related to the Greenpeace DETOX Campaign (OEKO-TEX®, retrieved 2021). Because some major players oblige suppliers to deliver only textile products that are certified according to one of these labels, or even several labels, there is a strong limitation of the use of harmful chemicals in the textile industry outside of the EU. In this way these labels have a stronger effect on the chemical use than the REACH regulation itself. A collaboration between the EU and voluntary labels could be useful.

As mentioned in the paragraph product group 7 floor covering, the chemical content and release are taken up into EN 14041 (2018) - “Resilient, textile, laminate and modular multilayer floor coverings - Essential characteristics”. The situation of floor coverings is slightly different due to the special relationship of some construction standards with the legislation. Harmonised standards are in principle voluntary. This means that one can still make a risk assessment instead of using the harmonised standard. The standards for construction products are compulsory when harmonised with regulation (EU) No 305/2011 and therefore products need to comply with the standards. The mandate from the European commission stipulates the inclusion of the chemical requirements. The CEN TC 134 was able to include these chemical requirements in EN14041 (2018) because they have the essential involvement of the chemical experts, toxicologists, and the experts from the commission. This resulted in restrictions in the use of certain chemicals for resilient, textile, laminate and modular multilayer floor coverings.

There is a debate amongst experts regarding this implementation of requirements on the dangerous substances content and chemical emissions in standards. Most experts involved in standardisation do not want these requirements included in product standards. If every CEN TC and working group would take into account chemical requirements it could be that for the same product a different requirement is applicable based on the use. This would lead to inconsistency and make assessments more difficult. For example, a fabric used for a normal garment and PPE garment could end up with different requirements. Normal garments rely on the REACH regulation because there is no standard development for adult garments and PPE has several standards to guarantee safety. The same situation arises with, for example, a terry fabric used for a teddy bear, baby sleeping bag and jacket. Every product needs to comply with a standard developed in a different standardisation working group. Therefore, most experts prefer that the REACH regulation addresses the dangers for specific products. ECHA has more experience when it comes to chemicals and their behaviour than most experts in a standardisation working group.



4.4 LEGISLATION

The legislation in the EU is mainly there to protect the consumer. In some cases, the legislation includes environmentally friendly production. However, sustainability in a broader sense, ecodesign and circularity are often not considered. There are two well-known examples:

- Directive 2005/29/EC of the European Parliament and of the Council of 11 May 2005 concerning unfair business-to-consumer commercial practices does not mention greenwashing, sustainable nor environmental claims.
- Regulation (EU) No 1007/2011 of the European Parliament and of the Council of 27 September 2011 on textile fibre names and related labelling and marking of the fibre composition of textile products forbids the declaration of some fibres in certain products. This is counterproductive because the recycling industry needs to know the presence of this fibre content in order to process these blends with the best available technique.

Therefore, it could be a standard practice that existing and new legislation would be systematically reviewed to take sustainability aspects into account.

The legislation mentioned in this chapter includes one or several aspects relevant to the definition of design criteria of consumer textiles. Also suggestions to enlarge the scope or add additional elements to existing legislation are given, so that these legislations can help defining the design criteria, as they may provide a solid framework to work with.

4.4.1 EU-Ecolabel

The EU ecolabel, with the Ecoflower symbol, is a voluntary label that is linked to Regulation (EC) No 66/2010 of the European Parliament and of the Council of 25 November 2009 on the EU Ecolabel. This label system takes into account several environmental aspects such as chemical use, fitness for use (quality) and best production practices. It is an example of a private and governmental collaboration on the declaration of a product claim. Although it is a regulation, it is certified by independent institutes. The claim of the EU Ecolabel is that the products carrying the label excel in environmental aspects. For the textile industry, the criteria are set out in the commission decision 2014/350/EU “COMMISSION DECISION of 5 June 2014 establishing the ecological criteria for the award of the EU Ecolabel for textile products”.



When investigating if EU Ecolabel standards could be used to determine a certain quality level on textiles, it can be noted that the **included limits are often equal or even lower than the ones in the quality standards commonly used by the textile industry**, as for example the limits for colour fastness to washing according to EN ISO 105 C06. Both the ECLA document and the ETSA requirements for workwear fabrics demand a grade higher

than the grade 3-4 demanded by the EU Ecolabel. GOTS certification demands the same limit as the EU Ecolabel. The ETSA requirements even state that they expect that there are low limitations in use when this level of quality is maintained. See the Table 11 for the limits.

Table 11. Requirements of EU Ecolabel for colour fastness to washing are lower than the ECLA and ETSA requirements for workwear.

ECLA	ETSA	EU Ecolabel	GOTS
Minimum 4 (recommended even higher for staining in the case of contrast colours: 4-5)	Low limitations in use: expected 4-5 Some limitations in use: expected 4 High limitations in use: expected 3-5	3-4	3-4

This points out that the requirements set out in the EU Ecolabel regulation for textiles meet the common practices in the textile industry of the EU and are not of a superior level. It would be advisable to resolve this situation. This could be done in 2 ways:

1. Review the commission’s decision 2014/350/EU with stakeholders and experts to improve the requirements.
2. Give CEN a mandate to develop standards for specific products that are linked to the EU Ecolabel regulation. Two standards could be developed for every product type, 1 with a set of criteria to define the premium quality level to serve the EU ecolabel and 1 with a set that defines the minimum quality level that serves the Ecodesign regulation for textile products.

The advantage of the second option is that the requirements for the superior quality could be also implemented by the industry independently of the EU Ecolabel. This could further drive the quality improvements of textile products.

4.4.2 Fibre composition

The fibre composition of a textile product needs to be declared according to the Regulation (EU) No 1007/2011 of the European Parliament and of the Council of 27 September 2011, on textile fibre names and related labelling and marking of the fibre composition of textile products. The regulation’s purpose is mainly to prevent misleading the consumer. It sets out a framework on how the textile composition shall be declared to the consumer and how the composition should be determined.

The regulation allows recycled content to be declared by stating that a fibre material is a recycled material, before or after the official fibre name. Example polyester – recycled or recycled - polyester. However, this possibility does not oblige nor organise the declaration of the percentage of recycled fibres or materials as some fibres contain only a fraction of recycled materials. It also does not define how to declare the origin of the recycled content. For example, in the NEN workgroup on circular textiles the experts agree that when it comes to production waste only unavoidable production waste can lead to the status of recycled materials. When

production waste can just be added to the same process again it is not considered recycling, but optimal material use within an economic operation. This is included in standard NTA 8195:2020 as follows:

-

Production waste (C)

These are materials that come from unavoidable waste from textile production. This excludes materials that are or can be reused with minimal effort when producing textile and in the same production process from which they originate. These materials have not degraded and are not considered to be waste.

Although all material reuse or recycling should be applauded some consumers estimate the value of recycled content originating from an end-of-life product more valuable than from production waste.

In addition, environmentally friendly produced fibre content is now not subject to regulation. This leads to the misleading of consumers, i.e. greenwashing. The regulation could bring a solution if it defines how the recycled or sustainable content shall be declared and how this shall be measured or proven.

The regulation contains tests to validate the fibre composition by market authorities. Because recycled content and environmentally friendly fibres are not considered, validation of content is not considered either. There are some indicational tests to check if the fibres are, for example, recycled but these tests never give a 100% certainty that the claim is trustworthy. Neither are these test methods standardised and for many claims there are no specific test methods available. When it comes to recycled materials, some are the same as the virgin fibre. So for most of these claims, only a chain of custody, audits and certification can give a high degree of certainty on the claim made. CEN TC 248 WG 39 - Circular textiles is developing a working item that puts out requirements on the input materials of recycled, refurbished, repaired and reused textiles. Some guidance could be provided for market authorities on how to check the validity of this content.

For some textile products containing recycled fibres, it is difficult to determine the exact composition of the textile product. This is e.g. the case when cross-contamination occurs during mechanical recycling. Fibres from a previous production batch can stick in the machinery and end up in a following production batch.

The regulation allows the producer to declare unknown or various fibre content when it is not clear at the production stage or impossible to be determined due to inconsistencies during the production. The following parts of the legislation refer to this:

Article 9 - Multi-fibre textile products

2. [By way of derogation from paragraph 1, and without prejudice to Article 7(2),] a fibre which accounts for up to 5 % of the total weight of the textile product, or fibres which collectively account for up to 15 % of the total weight of the textile product, may, where they cannot easily be stated at the time of the manufacture, be designated by the term 'other fibres', immediately preceded or followed by their total percentage by weight.

and

4. [Without prejudice to Article 5(1),] for textile products the composition of which is hard to state at the time of their manufacture, the term 'mixed fibres' or the term 'unspecified textile composition' may be used on the label or marking.

However, with this possibility it remains unclear how to put this part of the legislation into practice. Also, no clear guidance is provided to market surveillance authorities and labs for determining the fibre content when these statements are done. As it is a priority to have more products with recycled content on the market, improvements to the regulation are needed and/or more guidance should be provided to create clarity on how to deal with this uncertain fibre content.

Furthermore, the regulation hinders the recyclability of a textile product. To prevent the consumer from being misled, some fibres shall not be mentioned when stating the fibre composition in a textile product. For example, for socks the additional elastic yarns used in the cuff, the stiffening and reinforcement yarns of the toe and the heel shall not be taken into account. This means that a sock declared as 100% cotton can contain elastane and polyester if the elastic yarn consists of elastane covered by polyester and the stiffening yarns are polyester. If this sock were to be pulped and used to make regenerated cellulosic fibres, it could cause problems in the production process due to the unknown presence of elastane and polyester.

For some other fibres, the regulation leaves the choice of whether the fibre content is declared or not. This is the case for some decorative and antistatic fibres. Again, it is possible that the 100% cotton sock contains a small design made from e.g. coloured polyamide yarns that are considered decorative and therefore not declared in the composition.

With the product passport in mind, it would be helpful to alter the regulation so that all fibre content must be declared. Simply mentioning their presence could be sufficient to keep the overall composition calculation of a textile product simple and feasible. The limits to declare a % or not should be investigated and discussed with the textile recycling industry.

A future revised regulation could go further and also set out rules for a product passport. Then, not only the material content could be taken into account but further information that might be useful for the collection, sorting and recycling industry. An example is chemical content, disassembly instructions, repair possibilities.

To be compliant with Regulation 1007/2011, the composition is now in most cases mentioned on a firmly attached label. Even if the composition label is still readable after use, it is often cut out as stated in the section on Maintenance. A new way of communication might be added to regulation when revised in the future to avoid the information being lost during use.

4.4.3 Unfair consumer practices

Directive 2005/29/EC of the European Parliament and of the Council of 11 May 2005 concerning unfair business-to-consumer commercial practices could be used to prevent greenwashing. It states that claims shall not be misleading and that all claims which convince a consumer to choose a product over another product must be trustworthy. Annex I lists which practices are considered as unfair and misleading in all circumstances. Paragraph 2 of this annex states the following:

2. Displaying a trust mark, quality mark or equivalent without having obtained the necessary authorisation.

To prevent greenwashing, misleading sustainability claims could be added to this annex. This would be a strong signal leaving no doubt that it is misleading the consumer while creating a legal framework for market surveillance officers.

To further avoid greenwashing, the use of general terminology, e.g. green, sustainable, circular, environmentally friendly, without specifying the specific action and obtained goals could be forbidden. Only a clear communication on the precise sustainable action or sustainable property, in combination with the use of standards proving this aspect, can avoid greenwashing. A list of standards to be used to prove the commonly made claims could bring more clarity. It will also point out where these standards are missing. A mandate could be given to CEN to develop the missing standards.

In addition, standards to measure sustainable aspects that exist already could be harmonised so that it is clear to producers how they can safely make their claims. For example, ISO 14021 (2016) – “Environmental labels and declarations — Self-declared environmental claims (Type II environmental labelling)”, ISO 21701 (2019) - “Textiles — Test method for accelerated hydrolysis of textile materials and biodegradation under controlled composting conditions of the resulting hydrolysate”

4.4.4 Organic production and labelling regulation

Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on organic production and labelling of organic products mentions cotton and wool as the only fibres. However, these are not the only natural fibres used in the textile industry and thus considered to be organic. Flax, hemp, ramie, kapok, angora, cashmere, silk (although unlikely), camel hair, and others are lacking in this regulation and could be added in a future revision or amendment. In addition, it is unclear if a textile product containing cotton or wool can still be called organic after chemicals are applied to this textile and therefore if the EU organic label can be used on a textile product.

4.4.5 Ecodesign regulation

The current ecodesign regulation is focussing on electronic products. Next to a set of requirements to make these products more sustainable, there is a labelling requirement that declares energy consumption of the

electronic product via a classification. The energy consumption is an important impact when looking at the sustainability of an electronic product. Therefore the classification is mainly based upon these criteria.

For a textile product, quality could be a first step to classify the product as this can be objectively determined to a large extent. **The ecodesign regulation could set a minimum quality level to prevent textile products from going to the market if they are not fit for use over a longer period.** Perhaps an additional superior level could be determined as well. This **superior level could also serve as requirement for the EU Ecolabel label and also be used separately to push the industry to a better quality level.**

After a discussion with the stakeholders including the industry, NGOs and governmental organisations, a minimum level could be implemented for those textile products for which the stakeholders have enough data on the expected lifetime. More research is needed to find out when and why consumers dispose their textiles. This could lead to an identification of the important parameters and minimum requirements. The following steps would be needed:

1. Identifying the end-of-life reasons of a textile product category and subcategory if needed
2. Linking those reasons to a product quality parameter
3. Identifying for every parameter a test method
4. Defining minimum limits for every test method via a correlation study on the lifetime of a textile product and the result of a test method
5. Combining the test methods and minimum limits into clear requirements

These parameters could lead to a **labelling system** in the future. The existing standards that are developed based on experience of the industry and stakeholders prove that it is a complex matter. Therefore, a labelling system can probably only be implemented after extensive research and discussions. For some specific textile products standards are already available based on the expertise of the industry, e.g. for floor covering a classification and labelling standards are available. The GUT-label (GUT-Label, retrieved 2021) integrated this in a product passport and labelling system shown in Figure 1.

Figure 1. Example of GUT-PRODIS Product Pass since 2020



Because maintenance is important to the product’s lifetime prolongation, an obligation to mention care instructions could be implemented. The advantages and their importance are discussed in the section on Maintenance.

A labelling system like the one for electronic products could be based on classes taking into account the PEF (product environmental footprint). As stated in 4.3.1.1 General product claims, this is difficult due to the lack of data. A study is needed to determine for which textile products it is feasible before this is implemented.

To facilitate the recycling industry, some stakeholders want to implement a mandatory minimum percentage of recycled content for every product. The Ecodesign regulation on textile products could do this. It is probably too soon for many textile products because of the immaturity of the recycling industry. This could be implemented once the technologies have matured and more recycled materials are available on the market. Until then there is the danger of setting back sustainable fibre development e.g. hemp fibres or protein fibres grown from bio-based feedstocks. Therefore, this needs to be done with care.

It could be advisable to define a set of clear rules on how to declare the recycled content to facilitate the use of recycled fibres. The same goes for environmentally friendly produced fibres. This could be linked to the regulation on fibre composition as mentioned in 4.4.2 Fibre composition.

The obligation to make textile products fit for recycling is not feasible at the moment. It is very difficult to determine what is recyclable and what not due to the immaturity of the recycling industry. At present, it is probably only feasible to deliver some advice on the possibilities for the textile product that is end-of-life. It would make more sense to require separate collection of textile waste into different fractions to facilitate the recycling industry since they have problems to find recyclable textiles in sufficient quantities. Sorting and mechanical recycling facilities might be an important part of the circular textile chain. This could be done by adapting the waste regulation.

The future study “EcoClassMat” will look into the ecodesign and eco-classification of mattresses and could give more insight.

4.4.6 REACH

A study on the status of recycling technologies has shown that chemicals might have an important influence on the recyclability of textiles. The REACH Regulation does not impose the declaration of chemicals that might be present although this might have a clear effect on the recyclability of textiles. Much more investigation is needed to map the chemicals that might hinder recyclability.



Once this mapping of chemicals is done, the chemicals that are known to hinder a recycling technology could be mentioned in a product passport. The REACH regulation could facilitate this.

4.4.7 Compliance outside the EU

For any adaptation and new regulation, the compliance assurance of products produced outside the EU needs to be considered to assure a fair level of playing field and to maximise the impact of the measures.

5 BIBLIOGRAPHY

- Adrien Beton, D. D. (2014). *Environmental Improvement Potential of textiles (IMPRO Textiles)*. Luxembourg: European commission - JRC scientific and policy reports - Publications Office of the European Union.
- Bauer et al. (2018). *Potential Ecodesign Requirements for Textiles and Furniture*.
- Biobased. (2015). *Biobasedcontent*. Retrieved from <https://www.biobasedcontent.eu/en/certification-documents/>
- Bjørn Bauer, D. W.-K. (2018). *Nordic Co-operation - Potential Ecodesign Requirements for Textiles and Furniture*. Retrieved from [norden.diva-portal.org: http://norden.diva-portal.org/smash/record.jsf?pid=diva2%3A1221509&dswid=4280](http://norden.diva-portal.org/smash/record.jsf?pid=diva2%3A1221509&dswid=4280)
- CLOTHES CAPTIONING: COMPLYING WITH THE CARE LABELING RULE. (2014). Retrieved from Federal Trade Commission - Protecting America's consumers: <https://www.ftc.gov/tips-advice/business-center/guidance/clothes-captioning-complying-care-labeling-rule#complying>
- EC HORIZON 2020 – WORK PROGRAMME 2014-2015. (2014). *G. Technology readiness levels (TRL)*. Retrieved from https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf
- ECOS. (2021). *Durable, repairable and mainstream. How ecodesign can make our textiles circular*. Retrieved from <https://ecostandard.org/wp-content/uploads/2021/04/ECOS-REPORT-HOW-ECODESIGN-CAN-MAKE-OUR-TEXTILES-CIRCULAR.pdf>
- ECY-TWIN project. (2021). Retrieved from <http://www.ecytwin.eu/>
- Ellen MacArthur Foundation. (2019). *The Jeans Redesign Guidelines*.
- Ellen MacArthur Foundation. (2021). *The Jeans Redesign: insights from the first two years*.
- ETC/WMGE. (2019). *Textiles and the environment in a circular economy*.
- European Commission. (2016). *The Environmental Footprint Pilots*. Retrieved from EC Europa: https://ec.europa.eu/environment/eusds/smgp/ef_pilots.htm
- European Commission. (2020). *Report on 2018-2019 stakeholder consultations regarding the potential future use of the Product and Organisation Environmental Footprint methods*.
- FashionPositive. (2020). *Circular Materials Guidelines 1.0*.
- Feltham, T. S. (2006). *APPAREL CARE LABELS: UNDERSTANDING CONSUMERS' USE OF INFORMATION*. Alberta: ASAC - University of Manitoba.
- Ginetex. (retrieved 2021). *RESULTS OF THE 3RD IPSOS EUROPEAN BAROMETER 2021, "Europeans and the textile care label" conducted with IPSOS*. Retrieved from Ginetex.net: https://www.ginetex.net/userfiles/files/GINETEX_IPSOS%20Barometer_%20EUROPE_ENG_Final_Vdef.pdf
- GUT-Label. (retrieved 2021). *GUT-Label*. Retrieved from <https://gut-prodis.eu/en/info-gut/gut-label>
- ILO - International Labour Organization. (retrieved 2021). *Labour standards*. Retrieved from ILO: <https://www.ilo.org/global/standards/lang--en/index.htm>
- ING. (2020). *Learning from consumers: how shifting demands are shaping companies' circular economy transition*. Retrieved from <https://new.ingwb.com/binaries/content/assets/insights/themes/circular-economy/ing-circular-economy-survey-2020-learning-from-consumers.pdf>

- JRC. (2021). *Study on the technical, regulatory, economic and environmental effectiveness of textile fibres recycling*.
- Kirsti Cura, N. R. (2021). *Textile Recognition and Sorting for Recycling at an Automated Line Using Near Infrared Spectroscopy*. Basel: MDPI.
- Klepp, K. L. (2011). *Environmental improvement by prolonging clothing use period*. Copenhagen: National Institute for Consumer Research (SIFO).
- Laura Farrant, S. I. (2010). *Environmental benefits from reusing clothes*. Springer.
- Lehmann, Görmer, Finkbeiner, Bach. (2018). *Product Environmental Footprint (PEF) Pilot Phase—Comparability over Flexibility?* Retrieved from <https://www.mdpi.com/2071-1050/10/8/2898/htm>
- Lerelais. (2021). Retrieved from <https://www.lerelais.org/index.php>
- OEKO-TEX®. (retrieved 2021). *Detox to Zero by OEKO-TEX®*. Retrieved from [oeko-tex.com: https://www.oeko-tex.com/en/our-standards/detox-to-zero-by-oeko-tex](https://www.oeko-tex.com/en/our-standards/detox-to-zero-by-oeko-tex)
- Quantis. (2021). Retrieved from <https://quantis-intl.com/strategy/collaborative-initiatives/product-environmental-footprint-fashion/>
- Textile Exchange. (2021). *Organic Content Standard*. Retrieved from <https://textileexchange.org/standards/organic-content-standard/>
- WRAP. (2017). *Sustainable clothing – A practical guide to enhancing clothing durability and quality*. Banbury: Wrap_UK. Retrieved from <https://wrap.org.uk/sites/default/files/2020-08/WRAP-Sustainable-Clothing-Guide-2017.pdf>



This study was performed within the framework of the C-MARTLIFE project.
The C-MARTLIFE project has received funding from the LIFE Programme of the European Union.