

About Nordic Swan Ecolabelled

Paper Products – Basic and Chemical Modules



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Appendix 1	Q & A: Nordic Ecolabelling requirement for greenhouse gas emissions for paper
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Addresses

In 1989, the Nordic Council of Ministers decided to introduce a voluntary official ecolabel, the Nordic Swan Ecolabel. These organisations/companies operate the Nordic Ecolabelling system on behalf of their own country's government. For more information, see the websites:

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1 Environmental impact of paper products

Nordic Ecolabelling assesses a product's environmental impact throughout its life cycle. In order to achieve environmental benefits, Nordic Ecolabelling must be able to set requirements that are relevant for the environment. For paper- / board-based products, primarily four areas are of greatest significance when assessing the product's environmental impact. The first is forestry, and the others are related to chemicals use, emissions to air and water, and energy consumption in production of pulp and paper. By setting requirements on the aforementioned areas, Nordic Ecolabelling is able to set requirements that are relevant for the environment.

Paper products cover a large variety of different kinds of products. Characteristics and qualities of a paper are determined by the use of various pulp and chemicals. The characteristics and qualities of pulp are in turn determined by the various types of fibre and production processes used. There are three main types of pulp manufacturing processes: chemical, mechanical and production of pulp from recycled paper. These three methods have a different impact on the environment

- Mechanical pulp production may consume large amounts of electricity, but emissions to water and air are low and small amounts of chemicals is used. Yield is high, 85-95% of wood fibres are extracted and used.
- Chemical pulping processes give rise to large emissions, but chemical pulp mills are almost self-sufficient in energy, using biofuels for heat and electricity generation. The use of chemicals is high. For bleached chemical pulp, the process extracts only 45–50% of wood fibres from the raw material.
- The use of recycled paper has a limiting effect on the exploitation of forestry resources. Lower water and energy consumption are also attributed to paper made from recycled fibre. However, the deinking of recycled paper creates large amounts of sludge, for which an acceptable method of disposal must be found. The collection of used paper results in turn in an increase in the number of transports undertaken.

In this section, the environmental impact of the manufacturing of paper products is presented shortly. The following sections are divided into sustainably managed forestry, energy consumption, emissions to air and water and waste and recycling. Nordic Ecolabelling also sets requirements for chemicals used in production. The primary objective of chemical requirements is to limit and reduce potential impact to the environment, but health aspects are also considered. Requirements for chemicals are presented closely in Appendix 2.

Energy consumption and effects on climate change

All production of cellulosic pulp and paper is energy intensive, Overall, the environmental impact of the production of cellulosic pulp is greater than that of paper manufacture but chemical pulp mills can achieve energy self-sufficiency due to using biofuels for production of process heat and electricity generation (on-site). Besides climatic impact and air emissions generated by the combustion of

fuel, the production of primary energy sources and disposal of waste have an impact on the environment¹.

Energy savings have an important role to play in reducing the environmental impact². With regard to global warming and climate change, the pulp and paper industry is in the unique position since its main raw material (wood) is renewable. As a result, waste and surplus energy may be utilized with a low climate impact. The main area of improvement lies in the systematic efforts to make production processes more energy efficient³.

Nordic Ecolabelling has previously introduced requirements limiting quantities of fuel consumed in heat generation, as well as levels of electricity consumption, during the manufacturing of pulp and paper. Furthermore, Nordic Ecolabelling sets requirements on carbon dioxide emissions from the production phase of paper and pulp manufacture.

Emissions to water and air

Life cycle assessments have shown that environmental impact on air is primarily caused by the energy production required by the energy-intensive pulp and paper industry⁴. The industry is responsible for polluting the air with acidifying substances, such as sulphur, substances that lead to eutrophication, such as NO_x, and substances that contribute to the greenhouse effect.

Emissions to water consists in, among others, substances that lead to eutrophication, such as nitrogen (N) and phosphorous (P), or that upset the balance between N and P. In sensitive environments, incidences of algal bloom and oxygen depletion may occur. The same effect occurs when organic compounds degrade and consume oxygen in water (measured as emissions of COD – Chemical Oxygen Demand).

Better bleaching chemicals, more effective methods of wastewater treatment and the optimisation of the manufacturing process have led to major reductions in absorbable organic halogen (AOX) emissions to water over the last few decades. AOX categorised compounds of chlorine have been replaced by less toxic compounds, as chlorine gas is no longer used in bleaching.

Emissions to air and water are taken into consideration by Nordic Ecolabelling in the setting of requirements to emissions from pulp and paper production.

Waste, residual products and recycling

Waste generated during production include bark, fibre residues and sludge arising from wastewater treatment or deinking of recycled paper. These residue products are currently mainly utilized as energy in the production process.

¹ EC, 2015. PEF screening study for intermediate paper products. Available the registered stakeholders at: <https://webgate.ec.europa.eu/fpfis/wikis/display/EUENVFP/PEFCR+Pilot%3A+Intermediate+paper+product>

² http://publications.jrc.ec.europa.eu/repository/bitstream/JRC111652/kjna29280enn_jrc111652_online_revised_by_ipo.pdf

³ https://ec.europa.eu/energy/sites/ener/files/documents/151201%20DG%20ENER%20Industrial%20EE%20study%20-%20final%20report_clean_stc.pdf

⁴ EC, 2015. PEF screening study for intermediate paper products. Available the registered stakeholders at: <https://webgate.ec.europa.eu/fpfis/wikis/display/EUENVFP/PEFCR+Pilot%3A+Intermediate+paper+product>

Regarding by-products of kraft pulping, industry has ongoing projects to develop new renewable raw material for chemicals, fuels and materials to replace the present oil-based products^{5, 6}. Pulp and paper mills, called biorefineries today, would for example, generate energy from sources with a low climate impact and side-streams that can be processed to new products. Examples of these are fibrous soil amendments⁷ or chemicals extracted from lignin that may have numerous application possibilities. The BAT reference document (BREF) for the production of pulp, paper and board⁸ also makes reference to the development of the biorefinery as one of the emerging techniques that will bring significant technological, economic and social advantages for this industry.

Paper becomes waste after use by the consumer. Paper can be recycled five to seven times, thus, contributing to circular economy⁹. Recycling is energy and resource efficient since the production of paper from virgin fibre requires greater resources than production from recycled fibre. The majority of used office paper, newspapers and other printed matter are collected as recycled paper. Several of the Nordic countries are approaching the theoretical limit for the possible collection of paper for recycling, which is set at 90%. Not all types of used paper are, however, suitable for recycling, e.g. paper for hygiene articles or wallpaper.

Nordic Ecolabelling sets requirements on waste treatment and disposal associated with production. The Nordic Swan Ecolabel also promotes the use of paper for recycling by setting requirement for a high proportion of recycled fibre in Nordic Swan Ecolabelled paper as an alternative to the use of certified virgin fibre.

Sustainably managed forests

Environmental benefits of the criteria are also related to the opportunities to promote sustainably sourced renewable raw materials. Sustainable raw materials production entails using e.g. various certification schemes to ensure the traceability of the raw material and its origins. Certification systems protect e.g. forests from illegal felling and fulfil several different environmental requirements and social aspects. By setting a requirement that wood must come from FSC or PEFC certified forestry, Nordic Ecolabelling supports the transition towards more sustainable forestry.

By setting requirements for the above mentioned certified raw materials, production chemicals, energy consumption, emissions to air and water and waste Nordic Ecolabelling is able to set requirements that are relevant for the environment. Nordic Ecolabelling also contributes to the UN Sustainable Development Goals¹⁰, especially to goal 12 Responsible Consumption and Production. Goals 6 and 7 regarding clean water and clean energy, goal 13 Climate Action and 15 Life on Land are also related to the Nordic Ecolabelling's criteria for paper products.

⁵ <https://www.uusipuu.fi/en/>

⁶ <https://cris.vtt.fi/en/publications/from-biomass-to-value-added-furan-based-platform-chemicals-furche>

⁷ https://www.uusipuu.fi/en/ratkaisut/soil_amendments/ (2019-04-10)

⁸ https://eippcb.jrc.ec.europa.eu/reference/BREF/PP_revised_BREF_2015.pdf

⁹ http://ec.europa.eu/environment/circular-economy/index_en.htm

¹⁰ <https://sustainabledevelopment.un.org/sdgs>

2 Justification of the requirements

This chapter presents proposals for new and revised requirements, and explains the background to the requirements, the chosen requirement levels and any changes compared with previous generation 2 of the Basic Module and Chemical Module. Many of the arguments for the proposed changes are also pertinent to issues arising from the revision of the Supplementary Module for Copy and Printing Paper, which is under revision at the same time. This background description may also be useful for future revisions of Nordic Ecolabelling's Criteria for Tissue Paper and other paper-related products.

2.1 Definition of the product group

No definitions of product groups are made in the Basic Module since the requirements stipulated in this document are only those basic requirements that apply generally to pulp and paper production. Differences in production methods that derive from the differing qualities of various paper products are dealt with in the supplementary modules for each product type.

Requirements for Inspected Paper, including definition of paper grades eligible for use by Nordic Swan Ecolabelled printing companies, are set in Appendix 1 in the Basic Module.

2.2 Definitions for the Basic Module

Term	Explanation or definition
ADt	Air dry tonne (ADt) is dry solid content of pulp and paper where specific chemical and energy consumption, and emissions are expressed. ADt for pulp is 90%, while ADt for paper means a solid content of 94%.
AOX	Absorbable organic halogens. A measurement of the quantity of chlorine (and other halogens) associated with organic compounds.
BAT-AELs	The range of emission levels obtained under normal operating conditions using a best available technique or a combination of best available techniques, as described in BAT conclusions, expressed as an average over a given period of time, under specified reference conditions (Art 3.12. of Directive 2010/75/EU).
Broke	Broke is waste from production (scrap, strips from converting at the paper mill etc.) and is not classified as recycled fibre.
Chemical	Please see "Production chemical".
Chemical product	Please see "Production chemical".
COD	Chemical oxygen demand. A measurement of the quantity of oxygen that is consumed during the chemical breakdown of organic material.
CTMP	Chemi-Thermomechanical Pulp
Deinking	Removal of inks/toners from a printed product by means of a deinking process.

DIP	Deinked Pulp – pulp made from paper for recycling from which inks and other contaminants have been removed.
DTPA	Diethlyene triamine pentaacetic acid (complexing/chelating agent used in peroxide bleaching).
ECF	Elemental Chlorine Free. Bleach sequence containing chlorine dioxide but not elemental chlorine gas.
EDTA	Ethylene diamine tetraacetic acid (complexing/chelating agent).
Electricity produced on site	Electrical energy produced on the mill site from different primary sources such as steam boilers, recovery boilers etc.
EMAS	Eco-Management and Audit Scheme
Energy from renewable sources	Energy from renewable sources or ‘renewable energy’ means energy from renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas, and biogas (Directive 2009/28/EC).
External water treatment	An external water treatment plant is the plant on site where waste water is treated before discharge to recipient. Not to be mixed with wastewater treatment done by an external part such as municipal wastewater treatment plant. See also internal water treatment.
Fossil fuels	Coal, natural gas, peat and petroleum products (such as oil) from the decayed bodies of animals and plants that died millions of years ago.
Inspected paper	Inspected printing paper is paper without a Nordic Swan Ecolabelled licence that has been approved for use in Nordic Swan Ecolabelled printing houses and used in printing of Nordic Swan Ecolabelled printed matter. Requirements for inspected printing paper are set in the Appendix 1 in the Basic Module.
Integrated production	Integrated production means that pulp and paper are produced in the same plant. See also non-integrated pulp and paper mills.
Internal water treatment	Internal water treatment means processes on site where process water is sometimes treated between different processes and thereafter water is recycled within the production plant. See also external water treatment.
My Swan Account	Nordic Ecolabelling's web-based application tool for paper and paperboard manufacturers. The tool also applies to pulp and chemicals producers wishing to have their products assessed by Nordic Ecolabelling.
Non-integrated pulp and paper mills	Non-integrated pulp mills (market pulp) produce pulp that is sold on the open market. Non-integrated paper mills are using purchased pulp for their paper production.
NO_x	Collective chemical symbol for nitrogen oxides (NO, N ₂ O and NO ₂). In this document, NO _x refers to the total of NO and NO ₂ , expressed as NO _x .
NSSC	Neutral Sulphite Semi-Chemical pulp

P	The chemical symbol for phosphorus. In this document, P refers to total emissions of phosphorous compounds to water.
PEF	Product Environmental Footprint, a project initiated by the EU Commission with the aim of developing a harmonized environmental footprinting methodology to measure environmental performance throughout the lifecycle.
Plant	Cellulosic fibres such as those from wood and bamboo can be used in production of Nordic Swan Ecolabelled paper products. If fibres from other plants are included in the product group, contact Nordic Ecolabelling. Nordic Ecolabelling will determine which new fibres may be included in the product group.
Production chemical	Collective term for chemical products used during production. It can refer to chemical additives, auxiliary chemicals and process chemicals. The term is further used to refer to starch, filler material and so on.
Purchased electricity	Electrical energy bought from outside the mill to be used on site.
Recycled material	<p>Recycled material is defined in accordance with ISO 14021 in the following two categories.</p> <p>Material in the pre-consumer phase. Material that has been taken from the waste flow during the manufacturing process. The exception is the re-use of material that is generated in a process, e.g. waste that can be recycled within the same process that generated it.</p> <p>Material in the post-consumer phase. Material generated by households or by trade, industry or institutional facilities in their role as end-users of a product that can no longer be used for its intended purpose. This includes the return of materials from the distribution chain.</p>
Recycled pulp	Pulp manufactured from paper for recycling and used for the manufacture of paper.
Residue	Residue means a substance that is not the end product(s) that a production process directly seeks to produce; it is not a primary aim of the production process and the process has not been deliberately modified to produce it.
S	The chemical symbol for the element sulphur. In this document, all forms of sulphur compounds emitted in gaseous form to air are recalculated to the total S before used in calculations.
Sold electricity	Electrical energy produced on site and sold to the public grid network or other electricity consumers.
TCF	Totally Chlorine Free. Bleaching of pulp without using chlorine compound chemicals
TMP	Thermomechanical pulp
TOC	Total organic carbon. TOC may be used in place of COD if the applicant demonstrates how these two methods of analysis correlate with each other. See also COD.
Wood fibre	Wood fibre may consist of virgin fibre from timber or sawmill chippings. Wood shavings and sawdust are residuals and not regarded as virgin fibres.

2.3 Information about production

This Basic Module imposes requirements on pulp and paper production.

The following requirements must be fulfilled by **paper manufacturers**: O1–O6, O7 (certain sections), O8–O11 and O14–O16.

The following requirements must be fulfilled by **pulp manufacturers**: O1–O6, O7 (certain sections), O8–O11, O12–O13 and O14–O16.

Note that some requirements, such as those on energy and emission to water and air require the paper manufacturer to collect information from the pulp manufacturer.

Note also that in addition to fulfilling these requirements, a Nordic Swan Ecolabelled paper product must fulfil the requirements in the Chemical Module and the applicable Supplementary Module.

O1 General comments on documentation

The pulp/paper manufacturer must submit documentation that demonstrates fulfilment of all the pertinent requirements of this Basic Module. The documentation required is to be submitted with the aid of the web-based application tool.

A spreadsheet for energy and emissions has been developed by Nordic Ecolabelling and is to be used for these calculations.

The pulp manufacturer is not required to submit new documentation for market pulp that has already been assessed by Nordic Ecolabelling.

If the paper manufacturer operates other reporting systems, such as EMAS, ISO 14 000 or reports to the authorities, this information may be approved if it is sufficiently specific to the product and if the basis for calculation is the same as that used by Nordic Ecolabelling. Documentation from other audit systems must provide clear reference to the applicable requirements.

 Overview of the above points can be found in the web-based application tool.

Background to requirement

This requirement is unchanged. However, it is now made clear that the documentation required are to be submitted with the aid of the web-based application tool.

This requirement describes the procedure for application. The requirement is relevant to both pulp and paper manufacturers. Pulps used in the paper must be assessed and listed at the Nordic Ecolabelling's website or in the application tool¹¹. The pulp producer is responsible for the application of pulp. Pulp manufacturer shall, however, send pertinent information of the pulp to the paper manufacturer, upon request. Paper manufacturer needs information on pulps to verify that the paper complies with the requirements of Nordic Ecolabelling.

Among other things, the requirement presents a description of the documentation acceptable as part of an application. For example, if market pulp

¹¹ <http://www.nordic-ecolabel.org/certification/paper-pulp-printing/>

has already been assessed according to the currently valid generation of the Basic Module, there is no need to submit documentation again. This measure simplifies the application process, and the documentation needed, for all parties involved. It has also been clarified that paper applicant must use Nordic Ecolabelling's spreadsheet for calculations.

O2 Type of pulp and paper

The pulp/paper manufacturer shall provide information regarding the type of pulp and paper.

Paper manufacturer. A technical description of the paper, its intended use and its composition shall be submitted. The description must include the name and production site of ingoing pulp, the proportion of the ingoing pulps (ADt/tonne paper) and the grades in which the paper is available. The documentation must specify whether the paper is coated or uncoated and the grammage in which the paper is available.

Pulp manufacturer. Information on the type of pulp. Specific requirements may apply to individual pulp types.

 Description of the above points in the web-based application tool.

O3 Production technology

The pulp/paper manufacturer shall submit information on the production method and technology used for the pulp/paper. Specify whether the pulp comes from integrated production.

Paper manufacturer. A description of the manufacturing process used in the papermaking shall include

- all stages of the process, from the purchasing of the pulp raw material/paper for recycling to winding the paper onto rolls, for example slushing, grinding, the addition of chemicals, drying, coating,
- a description of the water circulation system, method of internal and external wastewater treatment, including sampling points for emissions to water,
- a description of energy system, type of fuels used in each production phase, including the air emission measurements methods and air emission sampling points.

Pulp manufacturer. A description of the manufacturing process used in production of pulp shall include

- all ingoing sub-processes, from the point at which the fibre raw material/paper for recycling passes the plant gates to the point at which the pulp leaves the pulp mill,
- a description of the water circulation system, method of internal and external water treatment, including sampling points for emissions to water,
- a description of energy sources such as boilers and driers, type of fuels used in boilers/driers, including the air emission measurements methods and air emission sampling points.

The deinking of recycled fibre is also considered a pulp process.

 Description of the above points in the web-based application tool.

Background to requirements

The requirements are unchanged. The requirements set out how the producer should provide information on the pulp and paper types that are used in the

production of Nordic Swan Ecolabelled/inspected paper products. These are significant requirements, in that it is important to be informed of the methods of production employed in the manufacture of the product, since the environmental impact and energy consumption of different production techniques may differ considerably.

2.4 Quality and regulatory requirements

O4 Regulatory requirements

The pulp/paper manufacturer shall ensure compliance with all applicable local laws and provisions at all production sites in production of pulp/paper for Nordic Swan Ecolabelled product, e.g. with regard to safety, working environment, environmental legislation and site-specific terms/permits.

- ☒ Duly signed application form.

O5 Quality assurance

The pulp/paper manufacturer respectively are responsible for ensuring that the quality of the pulp or paper in the Nordic Swan Ecolabelled product is maintained throughout the period of validity of the licence or as long as the pulp/paper constitutes a part of the ecolabelled product.

The pulp/paper manufacturer shall ensure that:

- All requirements in the ecolabelling criteria that are relevant to the pulp/paper manufacturer are fulfilled and that they are verifiable during the validity period of the licence or as long as the pulp/paper constitutes a part of the Nordic Swan Ecolabelled product.
- The Nordic Swan Ecolabelled paper can be traced throughout the entire production process from raw material to finished product.
- Unforeseen non-conformities or planned changes in production, which may affect the product's ability to fulfil the ecolabelling requirements, are reported to Nordic Ecolabelling without delay.
- A person within the organization is assigned the responsibility and authority to guarantee that the requirements of the ecolabelling criteria are fulfilled.
- A contact person, responsible for reporting to Nordic Ecolabelling, is appointed.

The paper manufacturer shall have written permission from Nordic Ecolabelling before carrying out any changes that may be of relevance for the fulfilment of the ecolabelling requirements. Examples of such changes are a change of recipe (pulp mixture), exchanging raw materials such as pulps and chemicals, and new production methods.

- ☞ **The pulp/paper manufacturer** shall provide confirmation of the above by completing the web-based application tool.

O6 Quality manual

The pulp/paper manufacturer must follow written procedures from the company's quality manual for the production of pulp/paper for ecolabelled products. These are:

1. Procedures for securing the traceability of Nordic Swan Ecolabelled product through the entire production process.

2. Procedures for handling non-conformities and changes in the production of the Nordic Swan Ecolabelled product and reporting these to the contact person and Nordic Ecolabelling.
3. Procedure for logs and annual reports.

☞ **The pulp/paper manufacturer** shall provide confirmation of the above by completing the web-based application tool. On initial application, the applicant shall also submit a copy of procedures to Nordic Ecolabelling.

🔍 The following documents must be kept available in the event of an inspection visit:

- Background data to the documentation that is submitted along with the application.
- Journals of unforeseen deviations and planned production changes in the production of the ecolabelled product.
- Quality manual with procedures for the production of the pulp/paper in ecolabelled products.
- Complaints and claims relating to the paper in ecolabelled products.

Background to requirements

The requirements are unchanged apart from slight amendments of texts. Equivalent quality and regulatory requirements are always included in Nordic Ecolabelling's product criteria. The purpose of these is to ensure that fundamental quality assurance and applicable environmental requirements from the authorities are dealt with appropriately. They also ensure compliance with Nordic Ecolabelling's requirements for the product throughout the period of validity of the licence or as long as the pulp/paper constitutes a part of the Nordic Swan Ecolabelled product.

2.5 Fibre raw material

This requirement applies to cellulosic fibres such as those from wood and bamboo. Other relevant cellulosic fibres may be included in the product group upon request. Nordic Ecolabelling will determine which new fibres may be included in the product group.

07 Fibre raw material

The requirement consists of four parts that must all be fulfilled, either by the pulp manufacturer, the paper manufacturer or both:

- a) Tree species listed on Nordic Ecolabelling's list of prohibited tree species* must not be used in pulp/paper.
- b) **The pulp manufacturer** shall state the name (species name/scientific name) of the fibre raw material used in the production of pulp.
- c) **The pulp and paper manufacturer** must be Chain of Custody certified in accordance to FSC or PEFC.
- d) Certification of fibre raw materials:
 1. On an annual basis/the latest 12 months, a minimum of 70%** of the fibre raw material that is used in the paper shall originate from forestry certified under the FSC or PEFC schemes,

or

2. The paper must be labelled as “FSC or PEFC recycled” or consist of 70% of recycled fibres***,

or

3. A combination of certified and recycled fibres. If the paper contains less than 70% recycled fibres, the content of certified fibre shall be calculated using the following formula.

Requirement as to the proportion of certified fibre raw material in the paper (Y)

$$Y (\%) \geq 70 - x$$

where x = the proportion of recycled fibres.

The proportion of fibre raw material in the paper taken from certified sources and the proportion of recycled fibres, is calculated as a weighted total of the proportion in each constituent pulp.

The remaining proportion of fibre raw material must be covered by the FSC/PEFC control schemes (FSC controlled wood/PEFC controlled sources).

Certified wood raw material must be accounted/recorded to the paper/production line.

* *The list of prohibited tree species is located on the website: www.nordic-ecolabel.org/wood/*

** *Fibre raw material from plantations such as acacia/eucalyptus must be 100% certified.*

*** *Recycled material defined according to ISO 14021 in the following two categories:*

Pre-consumer material: Material diverted from the waste stream during a manufacturing process. Excluded is reuse of materials such as broke generated in a process and capable of being reused 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, which can no longer be used for its intended purpose. This includes returns of material from the distribution chain.

🏠 Declaration from the **pulp manufacturer** that the requirement regarding tree species not permitted to be used are met. Appendix 2 shall be used.

🏠 **Pulp manufacturer** shall describe name (species name) on the fibre raw material used in the pulp.

🏠 **Pulp/paper manufacturer** must present a valid FSC/PEFC Chain of Custody certificate covering all fibre raw material and recycled fibres used in the pulp/paper (e.g. via link to website). Non FSC/PEFC certified recycled fibres shall be covered by EN 643 delivery notes.

🏠 **Paper manufacturer** shall enclose documentation e.g. a third party-controlled balance sheet from CoC credit account system or a rolling average of the certification percentage on a production line showing that the quantity of certified fibre raw material and recycled fibres in paper is met. Non FSC/PEFC certified recycled fibres shall be covered by EN 643 delivery notes. Nordic Ecolabelling may request further documents to examine whether the requirements are fulfilled.

Background to requirement

The requirement for fibre raw material is updated to meet the Nordic Ecolabelling's general forestry requirement¹².

Nordic Ecolabelling's general forestry requirements were introduced in 2015 with the following

- 70 percent of all wood must be certified. The percentage can, however, differ in different product groups.
- Remaining wood raw material must be either controlled wood (FSC) or come from controlled sources (PEFC).
- Certain wood species shall not be used in Nordic Swan Ecolabelled products.

The general requirement was implemented in the valid Basic Module, version 2 in 2016 as an alternative method with the following amendments

- the level of certification was adjusted from 70% to 50%.
- Documentation of the degree of certification per product / production line was allowed. This was done to avoid complex accounting per paper. In practice, it means that the manufacturer can, if necessary, document that the Nordic Swan Ecolabel paper can be manufactured on production line where the degree of certification is continuous over at least 50%.
- The current requirement for recycled material (75%) in the Basic Module was also introduced in the requirement with certain clarifications of recycled material.

In this ongoing revision, the requirement shall be re-checked and thereafter apply in the next generation. The ambition level has been raised from 50% to 70% in Nordic Swan Ecolabelled paper. This also applies to inspected paper that is used in Nordic Swan Ecolabelled printing companies, see Appendix 1. The ambition level is, however, 100% for fibre raw material originating from plantations such as acacia and eucalyptus. The degree of certification is also set to 70% for graphic paper in EU Ecolabel's recently published criteria for paper products. The level is justified by statistics of Eurostat and FSC/PEFC¹³.

Regarding recycled fibres, the Nordic Ecolabelling's current structure of the requirement is maintained. Ambition level is set to 70% (from previous 75%) with the addition that paper labelled as PEFC / FSC recycled (> 70%) is also accepted. If PEFC/FSC recycled claims are not used, then a requirement of 70% or combination of recycled / certified material in the paper must be fulfilled. In that case, verification shall be covered by EN 643 delivery notes. The adjustment from 75% to 70% is justified by a simplified documentation burden.

Nordic Ecolabelling's updated list of prohibited tree species was on open consultation in spring 2019 and is currently in the review process. Therefore, no consultation is asked for the tree list in this open consultation of the Basic Module of paper products.

¹² <http://www.nordic-ecolabel.org/certification/paper-pulp-printing/pulp--paper-producers/forestry-requirements/>

¹³ http://ec.europa.eu/environment/ecolabel/documents/tissue_paper_tr_2019.pdf

O8 Chemicals

The pulp/paper manufacturer must report all production chemicals used in the production of pulp and paper and in conversion, providing documentation regarding the product's complete name, function, area of use in the mill, supplier and quantities used in kg/tonnes pulp/paper. The requirement further applies to internal and external water treatment, see terms and definitions.

The chemicals used in the production of the pulp and paper must fulfil the requirements in the Chemical Module, version 3.

Requirements O1, O3 and O6 in the Chemical Module include sub requirements that pulp/paper manufacturer shall declare in the web-based application tool.

The documentation required is to be submitted with the aid of the web-based application tool.



The pulp/paper manufacturer shall submit a list of the chemical products used in the production of pulp/paper, see also Appendix 3 in this document. Product safety data sheets for chemical products can be included upon request. Safety data sheet/product specification must comply with the standards set out in Annex II of REACH (Regulation 1907/2006/EC).

Background to requirement

Requirement regarding chemicals is amended by merging it with the requirement concerning pulp/paper manufacturer in the current Chemical Module, version 2. This is done to clarify which requirement is applied to pulp/paper manufacturer and which concerns chemical supplier. From now on, generation 3 of the Chemical Module shall mainly be used by chemical suppliers/manufacturers. However, requirements O1, O3 and O6 in the Chemical Module contain sub requirements that shall be declared by the pulp/paper manufacturer in the web-based application tool.

Requirement O8 stipulates that chemicals used in pulp and paper production must comply with the requirements outlined in the Chemical Module version 3, which is under revision at the same time as the Basic Module.

Following revision, a number of requirements in the Chemical Module have been adjusted. A more detailed Background to requirements for chemicals is provided in Appendix 2.

2.6 Energy and greenhouse gasses

Energy consumption is regulated through requirements on fuel and electricity while fuel type used for production of heat is regulated by CO₂ emission requirement. The requirements are based on information of actual energy use in production in relation to a specified reference value. The ratio between actual energy consumption and the reference value translates to an energy score.

The energy calculation encompasses the entire production process – both paper manufacturing and the constituent pulp. The calculation for paper does not include filler. Energy calculations do not include energy consumed during transport of raw materials or in converting and packaging. The paper manufacturer shall verify the fulfilment of the the requirement. Pulp manufacturers shall, however, provide details of energy use and CO₂ emissions to paper producer. See also Appendix 4 in the Basic Module where instructions for calculations are given.

O9 Total energy score

The following requirement must be fulfilled for paper unless specified otherwise in the supplementary module for the specific paper product.

$$P_{\text{electricity_total}} < 2.5$$

$$P_{\text{fuel_total}} < 2.5$$

For paper comprising solely of TPM/GW produced on-site, the limit value for $P_{\text{fuel_total}}$ is 1.25.

$P_{\text{electricity_total}}$ and $P_{\text{fuel_total}}$ include the energy scores from paper production and the pulps that are used.

 **The pulp/paper manufacturer** shall submit calculations in accordance with Appendix 4 to demonstrate fulfilment of the requirement. Worst case calculations shall be enclosed to demonstrate that each pulp recipe meets the requirements in case pulp mixture specific calculations are not documented for each pulp mix. Nordic Ecolabelling also provides a spreadsheet that is to be used for these calculations.

O10 Emissions of greenhouse gasses

The emission of greenhouse gasses from fuels used for production of process heat must not exceed the following limit values:

- 200 kg CO₂ /tonne paper for paper made from 100 % deinked/recycled pulp
- 225 kg CO₂ /tonne paper for paper made from 100 % chemical pulp
- 150 kg CO₂ /tonne paper for paper made from 100 % mechanical pulp

For paper comprising a mixture of chemical pulp, recycled pulp and mechanical pulp, a weighted limit value is calculated based on the proportion of each pulp type.

 **The pulp/paper manufacturer** shall submit calculations in accordance with Appendix 4 to demonstrate fulfilment of the requirement. Nordic Ecolabelling also provides a spreadsheet that is to be used for these calculations.

Background to requirements

As all energy production have environmental impact, Nordic Ecolabelling focuses on limiting energy consumption and contributing to energy efficiency in production of pulp and paper. According to Nordic Ecolabelling's general principles the focus in requirements is mainly to limit energy consumption and promote energy sources with low environmental and climate impact. Regarding requirements set for energy, Nordic Ecolabelling aims to identify pulp and paper products that are manufactured using energy efficient production methods and that emit low levels of greenhouse gasses. Requirements are set with regard to electricity and fuel consumption. Carbon dioxide emissions are regulated in a separate requirement with respect to fuels used in producing process heat. Regarding requirement for CO₂ emissions originating from transport in version 2 of the Basic Module, the requirement has been removed, see closely chapter 4 Changes compared to previous version.

Energy

In this generation 3 of the Basic Module

- Reference values for fuel and electricity have been tightened.
- Total energy score calculation has been adjusted in order to balance the calculation between pulp mill and paper mill. Point scores of pulp mill

dominated the calculation of the final energy scores and in order to make the comparison equal, the equation has been changed, see also closely 4.3.4. in Appendix 4 in the Basic Module. Consequently, the P_{total} score limit values have been adjusted from 1.25 to 2.5. For paper comprising solely of TPM/GW produced on-site, the limit value for P_{fuel_total} 1.25 remains.

- New reference values have been introduced, namely for kraftliner, testliner, wellenstoff, semichemical fluting and correspondingly, for NSSC (neutral sulphite semi chemical) pulp used in fluting.

Reference values for energy

The requirement for energy is based on information on actual energy use in production in relation to a specified reference value. Each pulp and paper manufacturing process has been assigned a particular reference value. In this way the best pulps produced from each method of manufacturing may be included in the category of Nordic Swan Ecolabelled products.

The currently applicable reference values given in the Basic Module version 2 were based on licencing data of Nordic Ecolabelling and BAT values laid out in a draft version of the BREF in April 2010¹⁴. The BREF document was itself issued later in 2015¹⁵. The proposed reference values in version 3 of the Basic Module are mainly based on licencing data of Nordic Ecolabelling and data gathered from paper used in Nordic Swan Ecolabelled printing companies. Published data available is also used¹⁶. The analysis of the recent annual updates indicated that pulp and paper mills have implemented energy efficiency measures during the recent years and therefore, the proposed reference values have been tightened between 0% and 25% compared to previous version 2 of the Basic Module. In general, the pulp and paper industry have a large potential for energy optimisation^{17,18} e.g. through new investments but also through generally applicable heat recovery and optimisation of the processes such as dewatering and pumping during production. Future trends for specific energy consumption in the pulp and paper industry are expected to show a continued decrease. It has been estimated that even with increased production, by 2050 the European pulp and paper industry can reduce its energy consumption by 14% and greenhouse gas (GHG) emissions by 62% compared to 2015 levels¹⁹.

Some new reference values have been introduced in the Basic Module, namely for kraftliner, testliner, wellenstoff, semichemical fluting and regarding pulps, for NSSC (neutral sulphite semi chemical) used in fluting. New reference values are mainly based on the European Federation of Corrugated Board Manufacturers' (FEFCO) LCA database²⁰. Aforementioned types of pulp and board are used in

¹⁴ Draft 1 BREF-document for Pulp and Paper Industry, 2010. Reference documents from the European IPPC Bureau. <http://eippcb.jrc.ec.europa.eu/reference/>

¹⁵ http://eippcb.jrc.ec.europa.eu/reference/BREF/PP_revised_BREF_2015.pdf

¹⁶ <https://www.skogsindustrierna.se/skogsindustrin/branschstatistik/miljodatabas/>

¹⁷ https://ec.europa.eu/energy/sites/ener/files/documents/151201%20DG%20ENER%20Industrial%20EE%20study%20-%20final%20report_clean_stc.pdf

¹⁸ http://publications.jrc.ec.europa.eu/repository/bitstream/JRC111652/kjna29280enn_jrc111652_online_revised_by_ipo.pdf

¹⁹ <https://ec.europa.eu/jrc/en/news/how-eu-pulp-and-paper-industry-can-reduce-greenhouse-gas-emissions>

²⁰ <http://www.fefco.org/lca>

production of corrugated board that is in turn used as a raw material by Nordic Swan Ecolabelled printing companies.

Table 1 shows a comparison of the old and new Nordic Ecolabelling reference values for paper. Reference values for pulps are presented in Table 2, respectively. The tables also include data gathered from the recently adopted EU Ecolabel Criteria for Graphic Paper²¹. Nordic Ecolabelling's new reference values for paper manufacturing are lower than the values given for EU Ecolabel. Reference values for pulp manufacturing are lower or equal to the equivalent EU Ecolabel values, depending on the pulp type.

Table 1 Reference values for paper manufacturing. For comparison, reference values in the current Nordic Ecolabelling (NE) of Basic Module, version 2 and in the EU Ecolabel criteria published in January 2019 are shown.

Process	NE Basic Module 2		NE Basic Module 3		EU Ecolabel 2019	
	Fuel	Electricity	Fuel	Electricity	Fuel	Electricity
kWh/ADt Ref. value						
Folding box board (FBB) Solid bleached sulphate (SBS)/ Solid bleached board (SBB) Solid Unbleached Board (SUB) White lined chipboard (WLC)	1700	800	1600	650		
Kraft liner			1600	650		
Fluting			1600	650		
Testliner/wellenstoff			1700	500		
News	1700	750	1400	600		
LWC	1700	800	1500	650		
SC	1700	750	1500	600		
Uncoated fine paper	1700	750	1400	600	1700*	750
Coated fine paper	1700	800	1500	650	1700**	800

* magazine paper (SC) newsprint also included

** coated magazine paper (LWC, MWC) included

Table 2 Reference values for pulp manufacturing. For comparison, reference values in the current Nordic Ecolabelling (NE) of Basic Module, version 2 and in the EU Ecolabel criteria published in January 2019 are shown.

Process	NE Basic Module 2		NE Basic Module 3		EU Ecolabel 2019	
	Fuel	Electricity	Fuel	Electricity	Fuel	Electricity
kWh/ADt Ref. value						
Bleached chemical pulp	3750	750	3600	600	3650	750
Dried bleached chemical pulp	4750	750	4600	600	4650	750
Unbleached chemical pulp	3200	550	3200	550		
Dried unbleached chemical pulp	4500	550	4200	550		
NSSC			3200	700		
Dried NSSC			4100	700		
CTMP	N/A	2000		1500	0	1800

²¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019D0070&from=EN>

Dried CTMP	1000	2000	900	1500	800	1800
DIP	350	500	300	450	350	600
Dried DIP	1350	600	1200	450	1350	600
TMP	N/A	2200		2200	0	2200
Dried TMP	1000	2200	900	2200	900	2200
Groundwood pulp	N/A	2000		2000	0	2000
Dried groundwood pulp	1000	2000	900	2000	900	2000

Total energy score

In addition to comparison with reference values, energy consumption is regulated by a total energy score. In order to calculate total energy scores separate for fuel and electricity, the actual, specific values for electricity and fuel consumption are first divided by the reference values for both pulp and paper and finally, summed up for total energy scores.

This limit defines how much of the paper product's total energy consumption may be permitted to exceed the level of consumption recorded under optimal conditions. A point limit of 1.25 in the current version 2 of the Basic Module indicates that the average value of the paper product's total energy consumption may not rise above a level that is 25 % higher than the rate of energy use set by the relevant reference value. The points model permits a higher level of energy consumption in order to allow the paper manufacturer an increased degree of flexibility.

This flexibility is necessary since the criteria stipulate many requirements; and each must be met. The various environmental parameters, such as energy consumption and treatment of emissions, are, to a certain degree, jointly connected. Investment in treatment of water and air emissions can result in a higher rate of energy consumption than set by the reference value. The low emissions compensate for the somewhat higher energy consumption.

The point limit, in the cases of both electricity and fuel, is set more stringent for Nordic Swan Ecolabelled paper products (2.3) than the limit set out in the Basic Module (2.5), see also Supplementary Module of Copy and Printing Paper that is also under revision. A somewhat larger number of paper products meet the requirements of the lower points score level for energy as set out in the Basic Module. Justification here lies in the fact that such paper is approved as raw material for other product groups. For these product groups greater weight, from a life cycle assessment point of view, is placed on other aspects of their environmental impact than the energy consumed in the manufacture of their pulp or paper-based raw materials.

The total energy score calculation has been adjusted. Weighted scores for pulp and paper mills in the total point score calculation have been removed in order to balance the calculations between pulp and paper mills. Pulps dominate the calculations – naturally due to their greater energy use – but also due to weighting in total point score calculations. In order to have focus also on the paper mill, the paper and pulp are no longer weighted in the final calculation. This simplifies the equation presented in chapter 4.2.3 in Appendix 4 in the Basic Module, leading to a subsequent adjustment of the final P_{total} limit values. The

same level of flexibility – 25% in the Basic Module – is maintained in version 3. As the calculation has been changed, the numeric values are adjusted, respectively. Since the total energy score requirement is adjusted to have more focus on energy use in paper mill, Nordic Swan Ecolabel requirements on energy are more stringent than EU Ecolabel requirements for printing paper.

Emissions of greenhouse gasses

Requirement for emissions of greenhouse gasses from paper production has been adjusted. The requirement limits the greenhouse gas emissions of fuels used for production of process heat. Fuel emission factors shall be used in accordance with Annex VI of Commission Regulation (EU) No 601/2012²², or factors accepted by the authorities in European Union Emissions Trading System (EU ETS) shall be used.

In order to keep global warming below 1.5°C²³, requirements designed to ensure reductions in CO₂ emissions have become increasingly important. Therefore, Nordic Ecolabelling sets a requirement for CO₂ emissions as in previous generations of the criteria. According to Nordic Ecolabelling's general principles the focus in requirements is mainly to limit energy consumption (see previous requirement for energy O9) and promote energy sources with low environmental and climate impact.

In production of pulp and paper, greenhouse gas emission are mainly generated by the combustion of fuels. The previous requirement for carbon dioxide emissions included emissions from both fossil fuels and electricity. Emissions from electricity were calculated with an emission factor of 385 g CO₂ / kWh, i.e. European electric mix. In this review, the Swan has chosen to include the carbon dioxide requirement only for fuels used for production of process heat. See also Appendix 1 where Q&As regarding Nordic Ecolabelling requirement for greenhouse gas emissions for paper are presented more closely.

The limits set by the requirement are formulated in terms of CO₂ kg/ADt paper. No specific limits are set as regards types of pulp since the CO₂ impact of pulp is included in calculations by adding the weighted average value for constituent pulps to the total value of CO₂ emissions for the paper product. A weighted threshold value for blends of different types of pulp is calculated upon the basis of the threshold values for chemical pulp, recycled fibre and mechanical pulp. The threshold value of paper made from 50% chemical pulp and 50% mechanical pulp is, for instance, calculated according to the formula $0.5 \cdot 225 + 0.5 \cdot 150$ and summed up with paper production.

The pulp/paper manufacturer shall submit calculations in accordance with Appendix 4 to demonstrate fulfilment of the requirement. Nordic Ecolabelling also provides a spreadsheet that is to be used for these calculations.

²² Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council (OJ L 181, 12.7.2012, p. 30).

²³ <https://www.ipcc.ch/>

2.7 Emissions to water and air

The requirements on emissions to water and air are structured in such a way that the paper manufacturer calculates total emissions from pulp and paper production. To do this, the paper manufacturer will need information on the specific emissions from pulp production.

Measured emissions are compared with the reference values for emissions. The reference values can be found in Appendix 5, Table 5.1 in the Basic Module. Reference is made to these in the calculation of emission scores for individual emission parameters. The emission scores for chemical oxygen demand (COD), phosphorus (P), sulphur (S) and nitrogen oxides (NO_x) are summed to a total score. The calculation for paper does not include filler. The emission value that is reported is primarily based on measured emissions. Instructions for measuring emissions are found in Appendix 5. Requirements are also imposed on the laboratory, the method of measurement and frequency of measurement.

O11 Emissions of COD, P, S and NO_x to water/air

Emissions to air and/or water from the production of pulp and finished paper must be specified in terms of emissions points scores for each of the four parameters (P_{COD}, P_P, P_S, P_{NO_x}) according to the following. The measured emissions shall be compared to reference values relating to specific production methods (Appendix 5, Table 5.1).

The individual point score for P_{COD}, P_P, P_S, and P_{NO_x} must not exceed 1.3.

The total emissions score, P_{emissions_total}:

$P_{\text{emissions_total}} = P_{\text{COD}} + P_{\text{P}} + P_{\text{S}} + P_{\text{NO}_x}$ may not exceed 4.0.

 **The paper manufacturer** shall submit calculations in accordance with Appendix 5 to demonstrate fulfilment of the requirement. Nordic Ecolabelling also provides a spreadsheet that is to be used for these calculations.

Background to requirement

The requirement regarding emissions to water and air has been made more stringent. Limit value for individual point score has been changed from 1.5 to 1.3. Some reference values have been tightened, see closely Table 3.

The most important emissions from pulp and paper mills have been collected in the environmental matrix. As previously, these parameters are chemical oxygen demand (COD) and phosphorus (P) to water, and sulphur (S) and nitrogen oxides (NO_x) to air. Actual measurements are compared to reference values in the matrix. One point is awarded in the matrix if emissions are measured at the same level as that given in the reference value. If the emissions are recorded at a lower level than the reference value, the points score is < 1. If emissions are higher than allowed by the reference value the points awarded will be >1. No product receiving a point score above 1.3 will be permitted to carry the Nordic Swan Ecolabel. This point score corresponds to the same level as introduced in the EU Ecolabel's recently published Criteria for Graphic Paper²⁴. The grand total score corresponds to all emission points when added together and shall not exceed 4.

²⁴ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019D0070&from=EN>

Table 3 Reference emission values (kg/ADt) for pulp types and paper manufacture. For comparison, reference values in the current Basic Module (BM), version 2 and in the EU Ecolabel criteria (EU) for graphic paper published in January 2019 are shown.

Pulp type (pulp) or paper	CODref BM3/BM2/EU	Pref BM3/BM2/EU	Sref BM3/BM2/EU	NOXref BM3/BM2/EU
Bleached chemical pulp (sulphate and other pulps except sulphite pulp)	13 ^I /18/16 ^{II}	0.02/0.03/0.025 (0.09) ^V	0.3/0.6/0.35	1.5/1.5/1.6
Bleached chemical pulp (sulphite pulp)	23/25/24	0.03/0.03/0.04	0.3/0.6/0.75	1.5/1.5/1.6
Unbleached chemical pulp	6/10/6.5	0.02/0.016/0.016	0.35/0.6/0.35	1.5/1.5/1.6
CTMP pulp	15/15/16	0.008/0.01/0.008	0.15/0.2/0.20	0.25/0.25/0.025 (0.7) ^{VI}
TMP/Groundwood	3/3/3 (5.4) ^{III}	0.008/0.01/0.008	0.15/0.2/0.20	0.25/0.25/0.25
Recycled fibre pulp	2/3/2.4 ^{IV}	0.007/0.01/0.008	0.2/0.2/0.20	0.25/0.25/0.25
NSSC	8/-/-	0.02/-/-	0.4/-/-	1.5/-/-
Paper/board machine, uncoated	1/2/1	0.006/0.01/0.008	0.2/0.3/0.3	0.6/0.7/0.7
Paper/board machine, coated	1/2.5/1	0.006/0.01/0.008	0.2/0.3/0.3	0.6/0.7/0.7
Paper machine, special paper	3/3.8/-	0.02/0.02/-	0.5/0.5/-	0.7/0.7/-

^I To one decimal places in the Basic Module

^{II} To two decimal places in the EU Ecolabel Criteria

^{III} COD value for highly bleached mechanical pulp (70-100% of fibre in final paper) in the EU Ecolabel Criteria.

^{IV} Recycled fibre pulp with deinking in the EU Ecolabel Criteria

^V Mills using eucalyptus from regions with higher levels of P (e.g. Iberia) in the EU Ecolabel Criteria

^{VI} From non-integrated CTMP mills using flash-drying of pulp with biomass-based steam in the EU Ecolabel Criteria

The reference values for COD, P, and S have been made more stringent in this revision. The reference values are based upon BAT report²⁵, published data available²⁶ and supplemented by a review of currently held Nordic Ecolabelling's licences and data gathered from paper used in Nordic Swan Ecolabelled printing matter. Depending on the pulp, reference values set by Nordic Ecolabelling are more stringent or on the same level as those set by the EU Ecolabel. Regarding e.g. the chemical pulp widely used in paper products, new reference values set by Nordic Ecolabelling are 13 kg/tonne for COD, 0.02 for P, 0.3 for S and 1.5 for NOx whereas corresponding values set by EU Ecolabel are 16, 0.025/0.09, 0.35 and 1.6 kg/tonne, respectively.

O12 Chlorine gas bleaching

Pulps used in Nordic Swan Ecolabelled paper must not be bleached using chlorine gas. The residual quantities created during the production of chlorine dioxide from chlorate are not defined as a component of chlorine gas bleaching.



The pulp manufacturer shall certify that chlorine gas is not used for bleaching the pulp.

O13 Emissions of chlorate

Chlorate emissions from chemical pulp production must be measured and reported to Nordic Ecolabelling annually.

Measurements are not required if chlorine dioxide is not produced at the pulp mill or if the wastewater from chlorine dioxide production is dealt with anaerobic treatment (chlorate reduced).

²⁵ https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:JOL_2014_284_R_0017

²⁶ <https://www.skogsindustrierna.se/skogsindustrin/branschstatistik/miljodatabas/>

- ☞ **The pulp manufacturer** shall display results of measurements or declarations/certificates supporting the two latter points.

Background to requirements

The requirements for chlorine gas bleaching (O12) and emissions of chlorate (O13) are unchanged. Requirement for emissions of chelating agents EDTA/DTPA in version 2 of the Basic Module has been removed, see closely chapter 4 Changes compared to previous version.

O14 AOX

The weighted average value of AOX released from the pulps used in the Nordic Swan Ecolabelled paper product must not exceed 0.14 kg/tonne paper. AOX emissions from each individual pulp used in the paper must not exceed 0.16 kg/ADt.

- ☞ AOX emissions from each pulp documented by **the pulp manufacturer**. The pulp mill shall send information on emissions measured as kg/ADt to the paper manufacturer and directly to Nordic Ecolabelling.

- ☞ **The paper manufacturer** shall use the spreadsheet provided by Nordic Ecolabelling.

Background to requirement

The AOX requirement has been tightened. The weighted average value of AOX released from the pulps used in the Nordic Swan Ecolabelled paper product has been changed from 0.17 to 0.14 kg/ ADt. AOX emissions from each individual pulp used in the paper must not exceed 0.16 kg/ADt (previously 0.25 kg/tonne).

The production of elemental chlorine-free (ECF) bleached pulp leads to emissions of absorbable organically bound halogens (AOX). The AOX value gives an indication of, among other things, the relative effectiveness of the waste treatment and purification processes, as well as the quantities of chlorine dioxide used in the bleaching process; i.e. the lower the emissions of AOX the more efficient the waste treatment process and the lower the quantities of bleaching chemicals used in the pulp mill.

The AOX requirement has been tightened compared to version 2. The new requirements are based upon BAT reference values and supplemented by a review of currently held Nordic Ecolabelling's licences and data gathered from paper used in Nordic Swan Ecolabelled printing matter. In version 2 of the Basic Module, Nordic Ecolabelling introduced a uniform method of calculation and uniform limits for AOX emissions for all paper products. This means that these will apply to e.g. tissue paper products when those criteria are next revised.

2.8 Waste

O15 Waste

The pulp/paper manufacturer must specify that all waste types generated in the factory area are sorted at source and the various waste fractions shall be recycled or reused to as great extent as possible. The waste fractions and the way in which they are processed shall be reported.

The applicant must state if the waste is classified as environmentally hazardous in accordance with national legislation.

If the pulp/paper mill is certified according to ISO 14001 or registered with EMAS, no documentation is necessary if waste management in the production site is included within the certification/reporting system.

 **The pulp /paper manufacturer** must account for the following:

- How sorting at source is carried out.
- Sorting fractions
- How the individual fractions are handled (internal or external reuse, recycling, energy use, landfilling or other).
- Annual quantity of the different fractions. The quantities can be calculated for a shorter period and converted to annual figures.

 If pulp/paper mill is certified according to ISO 14001 or registered with EMAS, a valid certificate covering the production site shall be enclosed.

Background to requirement

The requirement has been amended, but the ambition level of the requirement remains the same as in the previous version. The requirement aims to reduce the amount of waste generated during production of pulp and paper. Pulp and paper manufacturers must have a waste management system in place including waste separation, reuse and recycling.

Analysis of Nordic Ecolabelling licences and data gathered from paper used in Nordic Swan Ecolabelled printing matter showed that all pulp and paper mills have well-functioning waste treatment and disposal systems. The majority are certified according to some sort of environmental management system that includes waste management. Therefore, no documentation is required if the production site is certified according to ISO 14001 or EMAS.

2.9 Annual reporting

O16 Annual follow-up

The pulp manufacturer shall on an annual basis report the specific emissions for production and energy consumption.

The paper manufacturer shall report pulps and chemicals used in production.

This information shall be submitted by 1 April at the latest during the licence period or so long as the pulp/paper is used in Nordic Swan Ecolabelled products.

Nordic Ecolabelling may examine a selection, or all, of the requirements. Nordic Ecolabelling maintains the right at any time to request further information, such as details of energy consumption. Changes affecting the ecolabelling requirements must be reported over and above the annual follow-up. Refer to the section on quality assurance.

Annual reporting according to above in the web-based application tool.

Background to requirement

The requirement has been changed. Regarding paper manufacturers, requirement to report annually emissions and energy has been removed. Paper producers shall only report the pulps and chemicals used. This is to ensure that changes in production, which may affect the product's ability to fulfil the ecolabelling requirements, are reported to Nordic Ecolabelling. Nordic Ecolabelling maintains the right at any time to request further information, such as details of emissions and energy consumption.

For the pulp producer, the level of reporting emissions and energy use remains the same as in the previous version. This up-to-date information is relevant for the paper producers to verify that the paper complies with the requirements set by Nordic Ecolabelling. The obligation to send in a list of used chemicals has, however, been removed in order to lessen the heavy reporting burden.

3 Areas that are not subject to requirements

This section presents requirements that are not included in the criteria, but which were discussed during the development of the criteria.

Product Environmental Footprint (PEF)

Within the EU, there has been a project to develop Final Product Environmental Footprint Category Rules (PEFCRs) and Organisation Environmental Footprint Sector Rules (OEFSRs) that can be used for calculating the Environmental Footprint profile for products and organisations in scope.²⁷ Product Environmental Footprint (PEF) Category Rules have been introduced for Intermediate paper product²⁸. Possibilities to use PEF in the Nordic Ecolabelling Criteria have been discussed during the revision work but is not subject to requirements in the generation 3 of the Basic Module. Nordic Ecolabelling will follow with interest the possibilities to use PEF in the next generation of the Basic Module.

4 Changes compared to previous generation

Overview of changes to Criteria for Copy and Printing paper, generation 5 including the Basic and Chemical Module compared with previous generations is presented more closely in Table 1 of the background document for the Criteria for Copy and Printing Paper. Comparison of Nordic Swan Ecolabel and EU Ecolabel requirement levels for graphic paper is also included in the table.

Some requirements have been removed from generation 5 of the criteria. These requirements for transport and for chelating agents are presented shortly below. Changes regarding requirements in the Chemical Module are presented more closely in Appendix 2.

²⁷ http://ec.europa.eu/environment/eussd/smgp/PEFCR_OEFSR_en.htm

²⁸ http://ec.europa.eu/environment/eussd/smgp/pdf/PEFCR_intermediate_paper_product.pdf

Transportation and distribution

A requirement for transportation (O11) was introduced in version 2 of the Basic Module. The requirement was applied only to Nordic Swan Ecolabelled paper. The paper manufacturer shall supply calculations of the total CO₂ impact of all forms of transport from the forest to the paper mill. This requirement has been removed due to low potential to gain environmental benefits. Refer to background document of the Criteria for Copy and Printing Paper which is also currently under review.

Chelating agents

In the previous versions of the Basic Module, there was requirement O15 for emissions of not readily biodegradable organic chelating agents such as EDTA or DTPA. The requirement has now been removed from generation 3 of the Basic Module. According to the recent BAT conclusions²⁹, BAT is to use a combination of the techniques to reduce the release of these organic chelating agents to the environment. As the Nordic Swan Ecolabel requirement is now covered by legally binding BAT conclusions, the requirement has been removed from the Basic Module.

²⁹ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0687&from=EN>

Appendix 1 Q & A: Nordic Ecolabelling requirements for greenhouse gas emissions for paper

The Nordic Ecolabelling, wishes a transition towards 100 % renewable energy, including electricity.

Our general principles for setting requirements for energy use and greenhouse gas emissions from energy are:

- Limiting the energy consumption
- Promoting energy sources with low environmental and climate impact.

1. What has been changed in the greenhouse gas requirement for paper, and why?

In the Nordic Ecolabelling criteria for paper, the requirement for greenhouse gas emissions has previously included emissions from both fuels and electricity. Emissions from electricity were calculated with an emission factor of 385 g CO₂/kWh, i.e. European electricity mix. In this revision, the Nordic Swan Ecolabel has chosen to let the greenhouse gas requirement only cover emissions from fuels.

A requirement that covers both fuels and electricity, has a higher uncertainty in the calculation, and it becomes more difficult to encourage the actions that lead to the greatest environmental benefit in the short term. In addition, the emission factor for electricity is debated. Different emission factors can lead to different undesired effects, for example that natural gas is favoured, instead of electricity. The Nordic Ecolabelling assesses that a requirement that only limits the emissions from fuels leads to the largest direct environmental benefits.

According to a report³⁰ from the European Commission's Joint Research Centre, the most important action to reduce greenhouse gas emissions from the paper industry is to shift from direct combustion of natural gas, oil and coal to biofuels. Conversion from fossil-based electricity is of course also important, but the Nordic Ecolabelling considers that this is currently beyond the control of the paper producer (see question 3). The most effective way of reducing the environmental impact from electricity is to keep the electricity consumption low, which is done according to requirement O9 in the Criteria.

2. How does Nordic Ecolabelling limit greenhouse gas emissions from electricity while "green electricity" is not promoted in the greenhouse gas requirement?

The Nordic Ecolabelling believes that the most effective way of limiting greenhouse gas emissions from electricity is to keep the consumption of electricity low.

³⁰ Energy Efficiency and GHG emissions: Prospective Scenarios for the Pulp and Paper Industry, http://publications.jrc.ec.europa.eu/repository/bitstream/JRC111652/kjna29280enn_jrc111652_online_revised_by_ipo.pdf

The Nordic Ecolabelling assesses that purchasing “green electricity” currently does not lead to increased production of electricity from renewable resources or a decreased production of electricity from fossil fuels (see question 3).

3. Why does the Nordic Ecolabelling not promote “green electricity” in the criteria for paper?

So-called green electricity can be booked and claimed by using guarantees of origin. Guarantees of origin are electronic documents which are traded in an open market and guarantee that the same amount of renewable electricity that is bought, has earlier been produced. The system prevents that the electricity can be sold as renewable several times. However, the electricity that you physically get is produced from a mix of renewable and fossil sources regardless of whether you purchased renewable electricity or not.

This far, the price of the guarantees of origin has been so low that the system has not functioned as a tool to increase renewable electricity production. Other factors as political measures, electricity price, etc. have had a greater importance for the increase of renewable electricity. The Nordic Ecolabelling considers that the positive effect from guarantees of origin is currently very small, and consequently, we have chosen not to promote green electricity in the greenhouse gas requirement of paper.

In addition, requirement including green electricity is complicated since the criteria must work in the whole world, regardless of where the mill is located. Guarantees of origin are currently limited to Europe.

4. Why is the requirement of the Nordic Swan Ecolabel different from the EU Ecolabel?

The greenhouse gas requirement in the EU Ecolabel Criteria for Graphic Paper covers emissions from both fuels and electricity. The emissions for grid electricity are calculated with the factor 384g CO₂/kWh in accordance with the MEErP methodology³¹. If the paper mill purchases green electricity (with guarantees of origin) it can use the specific emission factor given by the electricity supplier. The requirement will promote the purchase of green electricity.

However, The Nordic Ecolabelling assesses that purchasing of green electricity currently does not contribute to increased amount of renewable electricity in the actual electricity system (see question 3). This type of combined greenhouse gas requirement for fuels and electricity may lead to purchasing of green electricity instead of reducing combustion of fossil fuels. The Nordic Ecolabelling instead focuses on reducing the consumption of electricity, which leads to direct environmental benefits.

5. How large is the carbon footprint from the Nordic Swan Ecolabelled paper compared to other paper?

The Nordic Ecolabelling wants to ensure a significant reduction in greenhouse gas emissions from pulp and paper. Since the production of paper consumes large amounts of energy, strict requirements on energy consumption of electricity and fuels are set. The purpose of the requirement on greenhouse gas emissions is to

³¹ Methodology for the Ecodesign of Energy-related Products.

further limit the use of fossil fuels and restrict the use of fuels with the highest greenhouse gas emissions.

Greenhouse gas emissions occur during the whole life cycle of the paper – during cultivation, transportation, production, waste management etc. However, Nordic Ecolabelling does not set requirements in all phases of the life cycle (see question 6), but rather where we can achieve the largest environmental benefit.

6. Why is there no requirement for a total carbon footprint for Nordic Swan Ecolabelled paper?

The Nordic Swan Ecolabel wishes to set requirements that reduces the greenhouse gas emissions and that leads to a direct environmental benefit. Calculations of carbon footprint are a step towards acting, but do not in themselves provide any environmental benefit. Nordic Ecolabelling instead focuses on those measures that give the largest direct effect on the reduction of greenhouse gas emissions.³²

Many companies calculate the greenhouse gas emissions of their products and services but there is not yet a harmonised, mandatory calculation method. The EU Commission has initiated an extensive work to develop Product Environmental Footprint (PEF) which will hopefully result in more harmonised documentation of a product's carbon footprint.

7. Nordic Ecolabelling has a limit for the total carbon footprint for biofuels. Why not for paper?

For biofuels, the Nordic Ecolabelling uses the calculation methodology laid down in the Renewable Energy Directive (2009/28/EC), which the entire biofuel sector must follow. Such an accepted method is lacking to calculate the carbon footprint from the entire life cycle of the paper.

8. Will Nordic Ecolabelling set requirements on the paper's total carbon footprint in the future?

Nordic Ecolabelling follows the development of the European Commission's work on PEF. To be able to set requirements on the paper's total carbon footprint, a harmonised method is required.

³² Energy Efficiency and GHG emissions: Prospective Scenarios for the Pulp and Paper Industry, http://publications.jrc.ec.europa.eu/repository/bitstream/JRC111652/kjna29280enn_jrc111652_online_revised_by_ipo.pdf

Appendix 2 Background to the chemical requirements

The chemical requirements apply to **production chemicals** used in the production of pulp and paper and to **chemicals used in the conversion of the paper**. The requirements are applied regardless of the manufacturing method.

Many production chemicals are used in the manufacture of pulp and paper products. These may be categorised into process chemicals for pulp production as well as chemical products used during production. It can refer to chemical additives and auxiliary chemicals for paper production. The term “production chemicals”, as used in this document, is a collective term for chemical additives, auxiliary chemicals and process chemicals. The term is further used to refer to starch, filler material and so on.

The requirements do not apply to chemicals that are used for:

- treatment of raw water
- energy production
- maintenance work that is defined as maintenance of pulp and paper production equipment during production. For example, the cleaning of wires, or of cooking and bleaching equipment, is regarded as maintenance of pulp and paper production equipment, whereas felt washing agents used continuously in production are regarded as production chemicals.
- wastewater treatment lying outside the control of the pulp or paper manufacturer, that is wastewater treatment done by an external part such as municipal wastewater treatment plants. Chemicals used in external water treatment plants operated by the pulp or paper manufacturer are not exempted from the requirements, see also external/internal water treatment in the list of definitions.
- trials in pulp and paper manufacturing for no longer than 10 days during a period of, at most, two months.

Ingoing substances and impurities are defined below, unless stated otherwise in the requirements:

- **Ingoing substances:** All substances in the chemical product, including additives (e.g. preservatives and stabilisers) in the raw materials. Substances known to be released from ingoing substances (e.g. formaldehyde and arylamine) are also regarded as ingoing substances.
- **Impurities:** Residuals, pollutants, contaminants etc. from production, including production of raw materials that remain in the chemical product in concentrations less than 100,0 ppm (0,01000 w-%, 100,0 mg/kg).

Examples of impurities are residues of the following: residues or reagents incl. residues of monomers, catalysts, by-products, scavengers, and detergents for production equipment and carry-over from other or previous production lines.

The chemical manufacturer or supplier shall demonstrate compliance with the requirements in the Chemical Module. Fulfilment of the requirements is documented primarily with the aid of declarations or test results from chemical manufacturers/suppliers. Declarations are to be submitted with the aid of the web-based application tool.

Nordic Ecolabelling has the right to request chemical manufacturers/suppliers for information on the complete chemical composition of a production chemical when necessary, in order to check the contents of the product.

The chemical supplier shall inform Nordic Ecolabelling regarding modifications to the composition of the production chemical or any substitutions of raw materials that might occur before the next revision of the Chemical Module.

7.1 Definitions

Term	Definition or explanation
Azo dyes	Azo dyes, which by reductive cleavage of one or more azo groups may release one or more of the aromatic amines listed in Regulation (EC) No 1907/2006 Annex XVII, Appendix 8.
Chemical	Please see "Production chemical".
Chemical product	Please see "Production chemical".
Dye	Colourant substance that is dispersed in a medium in which it is soluble. Used as colourant in dye products. This definition is based on EuPIA:s definition ³³ .
Dye product	Product sold by a manufacturer that is used for dyeing or printing.
External water treatment	External water treatment plant is the plant on site where waste water is treated before discharge to recipient. This is not to be mixed with wastewater treatment done by an external part such as municipal wastewater treatment plant. See also internal water treatment.
Impurities	Residuals, pollutants, contaminants etc. from production, including production of raw materials that remain in the chemical product in concentrations less than 100,0 ppm (0,01000 w-%, 100,0 mg/kg). Examples of impurities are residues of the following: residues or reagents incl. residues of monomers, catalysts, by-products, scavengers, and detergents for production equipment and carry-over from other or previous production lines.
Ingoing substances	All substances in the chemical product, including additives (e.g. preservatives and stabilisers) in the raw materials. Substances known to be released

³³

https://www.eupia.org/fileadmin/user_upload/181031_Standard_Glossary_of_Food_Contact_Material_Inks_and_Coatings_Terms.pdf

from ingoing substances (e.g. formaldehyde and arylamine) are also regarded as ingoing substances.

Internal water treatment	Internal water treatment means processes on site where process water is treated between different processes and thereafter water is recycled within the production plant. See also external water treatment.
Pigment	Organic or inorganic substances dispersed in a medium, in which they are insoluble. They are used as colourants in dye products. This definition is based on EuPIA:s definition. (See footnote 34.)
Production chemical	The term production chemical, as used in this document, is a collective term for chemical products used during production. It can refer to chemical additives, auxiliary chemicals and process chemicals. The term is further used to refer to starch, filler material and so on.
Raw material	In the Chemical Module, raw material refers to ingoing raw materials in production chemicals.
VOC	Volatile organic compounds are defined in accordance with the European Commission's directive 1999/13/EC on the limitation of emissions of volatile organic compounds with vapor pressure > 0.01 kPa at 20°C.

7.2 Justification of the requirements

According to Nordic Ecolabelling's overall principles, the Nordic Swan Ecolabel must be a powerful tool that works to phase out substances that are hazardous for the environment and health. The vision is for Nordic Swan Ecolabelled products not to contain prioritised substances that are hazardous for the environment and health. Prioritised substances are e.g. substances that are classified as CMR or environmentally hazardous and which are persistent, bioaccumulative and toxic (PBT substances) and/or very persistent and very bioaccumulative (vPvB substances). The precautionary principle is the starting point when substances are suspected of having serious environment and health characteristics. Official regulations (classification, labelling, official lists and regulation) are used to exclude substances and products that are hazardous for the environment and health in the criteria. As the Nordic Swan Ecolabel is an ecolabel, the requirements in the criteria are more stringent than legislation. This entails that the chemical may be prohibited from Nordic Swan Ecolabelled paper, even though it is permitted under the authorities' regulations.

The chemical requirements in the Chemical Module of paper products is formulated with the primary objective of limiting and reducing environmental impact, but consideration is also taken to the health hazards involved in handling chemicals. Quantities of production chemicals often appear to be relatively small compared to the total amount of pulp or paper produced. However, each year, millions of tonnes of pulp and paper products are manufactured, which means that a considerable quantity of chemicals is used worldwide. The properties of these chemicals, in relation to their effects on the environment, are, therefore, of major significance.

Efforts are being made across the EU to phase out the use of harmful chemicals. Pulp and paper manufacturers purchase products from a wide range of suppliers of chemicals. These suppliers are often able to offer, or develop, alternative products if there is a demand for them. Experience from the ecolabelled products such as tissue paper and printing paper has shown that it may be relatively simple to substitute chemicals that are harmful to health and the environment with less hazardous alternatives. Nordic Ecolabelling, in this way, steers production towards the use of chemical products that are less harmful to health and the environment. Chemical requirements set by Nordic Ecolabelling also contribute to the development of the chemical industry for more sustainable products and production and thus, contribute to reaching the UN Sustainable Development Goal³⁴ 3 and goal 14 Life below water.

Evaluating the environmental hazards associated with different chemicals can be a difficult task for those with responsibility for production. In such cases, Nordic Ecolabel requirements can help those charged with responsibility for environmental issues to select production chemicals with a lower negative impact on the environment. EU directives apply only to articles and goods sold or produced within the EU, but Nordic Ecolabelling accepts applications for licences to carry the Nordic Ecolabel from across the world; and, thus, the reach of Nordic Ecolabelling requirements extends to pulp and paper production beyond the boundaries of the EU.

7.3 Requirements applicable to all production chemicals

The Nordic Ecolabelling's general requirements O1 and O2 are applied to all production chemicals used in production of pulp and paper. However, they do not apply to the following bulk chemicals:

- Hydrogen peroxide
- Burnt lime
- Oxygen
- Magnesium sulphate
- Sodium hydroxide
- Sulphuric acid
- Chlorine dioxide
- Sodium chlorate
- Sodium bisulphate (sodium hydrogen sulphate)
- Phosphoric acid
- Urea
- Sodium bisulphite
- Talc
- Methanol
- Ozone or mineral chemicals such as kaoline
- Clay or calcium carbonate used as fillers or coating on paper.

The chemical manufacturer or supplier shall demonstrate compliance with the requirements by duly completing each declaration in the web-based application tool.

³⁴ <https://sustainabledevelopment.un.org/sdgs>

O1 Classification of production chemicals

Production chemicals classified according to the risk phrases indicated in the table below must not be used in pulp and paper manufacture.

Table 4 Classification of production chemicals

Classification under CLP Regulation (EC) No 1272/2008		
Classification	Hazard Class and Category Code	Hazard statement
Hazardous to the aquatic environment	Aquatic Acute 1 Aquatic Chronic 1–3	H400 H410, H411, H412
Hazardous to the ozone layer	Ozone	H420
Acute toxicity	Acute Tox. 1, 2 Acute Tox. 3	H330, H310, H300 H331, H301, H311
Specific target organ toxicity	STOT SE 1 STOT RE 1	H370 H372
Carcinogenic*	Carc. 1A/1B Carc. 2	H350 H351
Germ cell mutagenicity*	Muta. 1A/B Muta. 2	H340 H341
Reproductive toxicity*	Repr. 1A/1B Repr. 2	H360, H361 H362

* *The classifications concern all classification variants. For example, H350 also covers classification H350i.*

This requirement applies to production chemicals and not ingoing substances, see Definitions. The manufacturer of the chemical product is responsible for its' classification.

Exemptions to the requirement are the following:

- Biocidal products. Chemical products classified as Aquatic Chronic 3 H412 are also exempted if classification is due to the presence of in-can preservatives.
- Peracetic acid (bleaching agent)
- DTPA and its salts.
- Cationic polymers, if charge is the reason for classification.

Dye products classified as environmentally hazardous and/or STOT RE 1 H372 are exempted from the requirement if:

- classification of the dye product is due to the dye itself
and
- dyes are fixed to fibres > 98%. The degree of fixation is calculated as the total retention of dyes on the fibres during the process

☞ The chemical manufacturer/supplier shall demonstrate compliance with the requirement by duly completing the declaration in web-based application tool.

☞ The chemical manufacturer/supplier shall enclose safety data sheet in accordance with the current statutory requirement in the country of application, e.g. Annex II to REACH (Council Regulation (EC) no. 1907/2006) for all chemical products.

- ☞ If the exemption to dye products is applied, the chemical manufacturer/supplier and **pulp/paper producer** must verify how the requirements for the exemption are met by duly completing and signing Appendix 7 (chemical manufacturer/supplier) and Appendix 10 (pulp/paper producer) in the web-based application tool.

Background to requirement

The requirement for classification of production chemicals has been amended. New classification categories have been introduced in the requirement, namely

- Acute toxic 3: H301, H311, H331
- STOT RE 1: H372
- Aquatic chronic 3: H412

Nordic Ecolabelling aims for the health and environmental impacts of chemical products used in the manufacture of Nordic Swan Ecolabelled products to be as low as possible. Requirements are therefore set to the classification of chemical products, which is also a general chemicals requirement in several Nordic Swan Ecolabelling criteria. Chemical products classified as carcinogenic, mutagenic, reprotoxic, very toxic, toxic, or hazardous for the environment must not be used in the manufacture of the Nordic Swan Ecolabelled paper products.

The list of exemptions has been adjusted. Some exemptions have been removed such as consumption of chemicals in low quantities (0.05 kg/tonne product) that was applied to the pulp and paper producer, see closely chapter 7.5 Changes compared to previous generation. Regarding dye products, the reference to lists of restricted substances database (Sweden) or undesirable substances³⁵ or Priority list³⁶ have been removed as these substances are included in the new requirement for exclusion list (O2) below.

Some new exemptions have been added to the requirement. Dye products classified as STOT RE 1 H372 are exempted and chemical products classified as Aquatic Chronic 3 H412 are also exempted if their classification is due to the presence of in-can preservatives. This exemption is mainly due to ATP 13 of the CLP coming into force on May 2020, which implements a new factor for CMIT/MIT. Isothiazolinones are effective preservatives at low concentrations. However, they are sensitising, and there has been ongoing discussion within the EU concerning limitation of MI (methylisothiazolinone) in particular (CAS 2682-20-4).

The classification requirement concerns chemical products used in the production of pulp and paper. The requirement is, however, not applied to bulk chemicals listed such as inorganic cooking chemicals (such as NaOH, Na₂S), inorganic bleaching chemicals (such as H₂SO₄, SO₂) or mineral chemicals such as kaoline, clay or calcium carbonate (CaCO₃) used as fillers or coating on paper. Bulk chemicals may be present in large quantities, and play a vital role in paper production, while not posing the most significant risks to the environment. These

³⁵

http://www.mst.dk/Virksomhed_og_myndighed/Kemikalier/Stoflister+og+databaser/listen_over_uoenske_de_stoffer/

³⁶ <http://www.miljostatus.no/Tema/Kjemikalier/Kjemikalielister/Prioritetslisten/>

chemicals may be classified as environmentally hazardous or very toxic at high concentrations, inter alia due to high alkalinity. A requirement with respect to classification (O1) of these chemicals is not deemed to be of benefit to the environment. Bulk chemicals may, of course, constitute a hazard in the workplace if handled without due care and attention, but requirements placed on workplaces by the authorities are considered by Nordic Ecolabelling to constitute sufficient regulation.

O2 Prohibited substances

The following substances must not be ingoing substances in chemical products used in the production of pulp and paper.

Concerning residual monomers, please note that their quantity shall be measured as dry substance per monomer on newly produced polymer dispersion / powder.

- APEO – alkylphenol ethoxylates and alkylphenol derivatives (substances that release alkylphenols on degradation)
- Phthalates
- Bisphenol A, F och S
- Substances on the Candidate List*

An exemption to the requirement is made for acrylamide (CAS number: 79-06-1), which must not exceed 700 ppm/dry substance, measured on newly produced polymer dispersion/powder.

- CMR substances – Carcinogenic, Germ cell mutagenicity, Reproductive toxicity category 1 A/B or category 2
- Substances that have been judged in the EU to be PBT (Persistent, Bioaccumulative and Toxic) or vPvB (very Persistent and very Bioaccumulative)**
- Substances that are considered to be potential endocrine disruptors in category 1 or 2, according to official lists within the EU***

* *The Candidate List can be found on the ECHA website:*

<http://echa.europa.eu/candidate-list-table>

** *PBT and vPvB in accordance with the criteria in Annex XIII of REACH*

*** *The EU's report on endocrine disruptors can be read in full at*

http://ec.europa.eu/environment/chemicals/endocrine/pdf/final_report_2007.pdf Appendix L, page 238 onwards)



The chemical manufacturer/supplier shall demonstrate compliance with the requirement by duly completing the declaration in Appendix 2 in the web-based application tool.

Background to requirement

The requirement is new in the Chemical Module.

Nordic Ecolabelling's vision is for Nordic Swan Ecolabelled products not to include prioritised substances that are hazardous for health and the environment. Prioritised substances are e.g. substances that are persistent, bioaccumulative and toxic (PBT substances) and/or very persistent and very bioaccumulative (vPvB substances). PBT and vPvB are defined in Annex XIII of REACH (Regulation no. 1907/2006). Nordic Ecolabelling therefore sets the requirement that chemical substances with these problematic characteristics

must not be included in chemical products used in the production of pulp and paper.

Nordic Ecolabelling also excludes substances on the Candidate List and possible endocrine disruptors. Substances on the Candidate List are inscribed on the Authorisation List, which means that they may become regulated in the future. Since these substances face being phased out, banned or subjected to other forms of restriction, it is only logical for Nordic Ecolabelling not to permit these types of substances in Ecolabelled products. CMR substances are restricted via requirement for classification of chemical products (O1), but CMR substances are nonetheless included as a separate item on the list of prohibited substances, in order to make it very clear that they are prohibited.

Requirement R6 in generation 2 of the Chemical Module set strict requirements on the content of residual monomers in specific production chemicals such as coating agents, retention agents, flocculants, foam inhibitors/ defoamers and wet strength agents. In this generation, requirement R6 has been removed and instead residual monomers on the Candidate List and those classified as CMR are covered by requirement O2. This also means that there is no longer requirement on residual monomers classified as e.g. environmentally hazardous.

In the current generation 2, the limit value for monomer acrylamide in the dry matter content of polyacrylamide is set to 700 ppm. Acrylamide is classified as a CMR substance and is also listed on the Candidate List. For practical reasons to do with production techniques, the limit of 100 ppm in the newly produced polymer is too strict a requirement with regard to acrylamide. The previous limit for the permitted amount of acrylamide is unchanged in this version of the Chemical Module.

Potential endocrine disruptors are substances which can affect the endocrine balance of people and animals. Changes in the endocrine balance can have adverse effects, and there is an extra focus on hormones that affect sexual development and reproduction. Nordic Ecolabelling prohibits the use of substances that are considered to be potential endocrine disruptors, category 1 (there is evidence of a change in endocrine activity in at least one animal species) or category 2 (there is evidence of biological activity related to changes in the endocrine balance), in line with the EU's original report on "endocrine disruptors" or later studies. This entails a ban on substances such as bisphenol A, several phthalates and certain alkylphenols. Phthalates are, nonetheless, a separate item of the prohibited list, in order to make it very clear that phthalates are prohibited. Phthalates are esters of phthalic acids (1,2-benzene dicarboxylic acid) and have been banned in dye products in the previous versions of the Chemical Module. Phthalates are a group of substances that comprise many different substances. Several phthalates are reprotoxic and environmentally hazardous.

Besides Bisphenol A, Bisphenol F and S are now included in the list of prohibited substances. These can be used as a substitute for bisphenol A. Therefore, Nordic Ecolabelling has introduced a general prohibition of bisphenol A, F and S on the

basis of the precautionary principle and the suspicion that these substances may be endocrine disruptors.³⁷

Alkylphenol ethoxylates can be broken down into alkylphenols that are not easily degradable, of which some are suspected to be endocrine disruptors. There is a strong political ambition in the Nordic countries to phase out these substances and they are e.g. included on the Danish list³⁸ of adverse substances.

In the current Chemical Module, version 2, the ban on alkylphenol ethoxylates (APEOs) or other alkylphenol derivatives is applied to several specific chemicals such as cleaning agents and dispersants, deinking chemicals, coating agents, retention agents, flocculants and foam inhibitors and defoamers. In version 3 of the Chemical Module, the ban on these APEOs have been merged in the new exclusion list requirement and consequently is applied to all production chemicals used in manufacturing of pulp and paper. Due to merging to the exclusion list requirement, some separate requirements such as the requirement for cleaning agents and dispersants and requirement for coating agents, retentions agents etc. have been removed or adjusted.

7.4 Requirements applicable to specific chemical products

Requirements applicable to specific chemicals are set with respect to the following chemical products. Forms that are equivalent to declarations in this document (in parentheses) are available in web-based application tool:

- Deinking chemicals (Appendix 3)
- Biocidal products and slimicides (Appendix 4)
- Wet strength agents (Appendix 5)
- Foam inhibitors/defoamers (Appendix 6)
- Dye products (Appendix 7)
- Adhesives (Appendix 8)
- Starch products, GMO (Appendix 9)
- Declaration from the pulp and paper manufacturer (Appendix 10)

03 Deinking chemicals

All surfactants used in deinking processes must be readily or inherently biodegradable.

Surfactants based on silicone derivatives are exempted from this requirement if sludge from the deinking process is incinerated.

 The chemical manufacturer/supplier shall report the composition of the production chemical regarding surfactants, stating complete names, CAS no. and amounts in accordance with Appendix 3 in the web-based application tool. The result of testing for biodegradation must be reported e.g. in a safety data sheet.

³⁷ Johanna R. Rochester and Ashley L. Bolden Bisphenol S and F: A Systematic Review and Comparison of the Hormonal Activity of Bisphenol A Substitutes Environ Health Perspect; DOI:10.1289/ehp.1408989 <http://ehp.niehs.nih.gov/wp-content/uploads/advpub/2015/3/ehp.1408989.acco.pdf>

³⁸ <http://www2.mst.dk/udgiv/publikationer/2010/978-87-92617-15-6/pdf/978-87-92617-16-3.pdf> (accessed 05.10.2016)

- ☞ If the exemption to silicone derivatives is applied, the **pulp/paper producer** shall certify how the requirements for the exemption are met by duly completing and signing Appendix 10 in the web-based application tool.

Background to requirement

The requirement has been adjusted. Requirement concerning the amount of surfactants used that the paper manufacturer shall report has been removed in order to clarify the requirement. This is also a harmonisation with EU Ecolabel's newly revised criteria for graphic paper and tissue paper and tissue products³⁹. See O2 for requirements regarding alkylphenol ethoxylates or other alkylphenol derivatives.

Surfactants are used in production of pulp and paper. Development of the industry has led to the use of more effective substances that can be added in much smaller quantities than is the case for traditional deinking chemicals. Environmental concerns are raised by the toxicity of these substances in combination with poor biodegradability and risk for bioaccumulation. Testing the bioaccumulation potential of surfactants is, however, difficult, as standard testing methods do not work due to the chemical structure and function of these substances. It is for these reasons that requirements continue to be set with respect to the biodegradability of surfactants.

Surfactants based on silicone derivatives are exempted from this requirement if sludge from the deinking process is incinerated. Pulp/paper producer shall document the fate of sludge to Nordic Ecolabelling.

O4 Biocidal products and slimicides

Active organic substances in biocidal products used for countering slime-forming organisms in pulp and paper production must be approved or under evaluation according to regulation (EU) No 528/2012 and they shall not be bioaccumulative or potentially bioaccumulative.

Biocides/slimicides are deemed not to be bioaccumulative if $BCF < 500$ or $\log K_{ow} < 4$. If both values are available, the value for the highest measured BCF is to be used, see Analyses and Test Methods in Appendix 1.

- ☞ The chemical manufacturer/supplier shall report the composition of the production chemical regarding biocides, stating their complete name and CAS no. in accordance with Appendix 4 in the web-based application tool.

- ☞ Test results on the bioaccumulation potential of the active substances must be reported e.g. in safety data sheets.

Background to requirement

The requirement has been adjusted by including reference to regulation (EU) No 528/2012. Active organic substances in biocides used for countering slime-forming organisms in pulp and paper production must be approved or under evaluation according to regulation (EU) No 528/2012. This is legal requirement in the EU but considered relevant to include in the requirement for biocides as Nordic Ecolabelling accepts applications for licences to carry the Nordic Swan Ecolabel from across the world; thus, the reach of Nordic Ecolabelling requirements extends to pulp and paper production beyond the boundaries of the EU.

³⁹ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019D0070&from=EN>

Closed systems for the circulation of water used in pulp and paper mills that are intended to lower environmental impact also increases the risk of growth of microorganisms, composed of different species of bacteria or fungi. Uncontrolled growth can lead to slime formation, inorganic and organic deposits, production of gas and corrosion. These may, in turn, affect the capacity of the paper machine and lead to a decline in the quality of the paper product. Consequently, biocides occasionally must be used in the production of pulp or paper.

There are several different types of biocides on the market. Certain products kill the microorganisms and biodegrade immediately, whereas others have a long-term effect. It is, consequently, in the nature of biocides to be toxic. Moreover, rapid biodegradability may not necessarily be desirable if the product is to perform a preventive function. It is, however, considered appropriate to set requirements with respect to bioaccumulation. All biocides used in pulp and paper production are required to be non-bioaccumulative. For example, biocides added to preparations of coating slurry must be non-bioaccumulative. Biocides used in the treatment of crude water, in energy generation and in maintenance work that is not defined as maintenance of pulp and paper production equipment are exempted from the requirement. Inorganic biocides do not bioaccumulate in organic form and therefore fall outside the scope of the requirement.

O5 Wet strength agents

Wet strength agents must not contain more than 100 ppm (0.01%) in total of the low molecular organochloride compounds epichlorohydrin (ECH), dichloroisopropanol (DCP) and chloropropanediol (CPD) – calculated on the basis of the dry matter content.

☞ The manufacturer/supplier of organochloride wet strength agents shall certify that the requirement is fulfilled by duly completing and signing Appendix 5 in the web-based application tool.

Background to requirement

The requirement has not been changed. The requirement is that wet strength agents must contain a total of no more than 100 ppm (0.01%) low molecular organochloride compounds epichlorohydrin (ECH), dichloroisopropanol (DCP) and chloropropanediol (CPD) – calculated on the basis of the dry matter content.

Wet strength agents are necessary in order to increase the strength of products when they come into contact with liquids. As such, they are relevant to the function of the product⁴⁰. Wet strength agents are often used in kitchen towels, napkins and wipes, but also in lesser quantities in copy and printing paper.

The wet strength agents used in paper are mainly polyamide-epichlorohydrin resins, which give the paper durable wet strength. The complete development of wet strength (polymerisation) in a paper product takes about a week. Subsequently, a small amount of residual monomers, such as ECH and its reaction products DCP and CPD, may be left in the paper product. DCP and CPD are usually formed during synthesis and storage of epichlorohydrin (Braga et al,

⁴⁰ Reference document on Best available techniques in the Pulp and Paper industry, Integrated Pollution Prevention and Control (IPPC), December 2001

2009)⁴¹. Both ECH and DCP have received a harmonised classification of Carc. 1B by ECHA, meaning that they may cause cancer^{42,43}. CPD is volatile and can be released from the paper to air during drying. Although it lacks a harmonised classification from ECHA, several companies have submitted dossiers in which they have classified it as both Repr. 1B and Carc. 2⁴⁴. Both of the reaction products are skin-penetrating. Epichlorohydrin resins are also toxic to aquatic organisms and do not readily biodegrade. 90% of all wet strength agents used remains in the paper, and less than 10% is released into the waste water system.

O6 Foam inhibitors and defoamers

None of the ingoing substances in the foam inhibitor/defoamer that have a foam inhibiting or foam retarding effect may be classified as environmentally hazardous in accordance with Table 1 in O1.

As an alternative, 95 w% of the ingoing substances in the foam inhibitor/defoamer with a foam inhibiting or foam retarding effect must be either readily or inherently biodegradable.

Foam inhibitors/defoamers that are destroyed in chemicals recycling are exempted from this requirement.

- ☞ The chemical manufacturer/supplier of a foam inhibitor/defoamer shall certify that the product does not contain components that are classified as environmentally hazardous in accordance with the requirement and complete Appendix 6 in the web-based application tool or
- ☞ If foam inhibitors/defoamers consist of a mixture of substances, each substance shall be stated with its full name, CAS no. and concentration. The result of testing for biodegradability of the individual substances shall be reported for example in safety data sheets and with a completed Appendix 6 in the web-based application tool.
- ☞ If the exemption to foam inhibitors/defoamers destroyed in chemicals recycling is applied, **pulp/paper producer** shall certify how the requirements for the exemption are met by duly completing and signing Appendix 4 in the web-based application tool.

Background to requirement

The requirement has not been changed. Several types of defoamers are in use in pulp/paper production, of which the most common are silicone-based, mineral oil-based and those based on EO/PO block copolymers, which are nonionic surfactants. Silicon-based defoamers are especially effective and are added in smaller quantities than those based on mineral oil. They are not toxic, and their biodegradability is difficult to test as silicon does not dissolve in water and is chemically inert. EO/PO block copolymers may not be readily biodegradable.

Mineral oil-based defoamers are not readily biodegradable but may be assumed to be potentially biodegradable and possibly prone to bioaccumulate. They may also contain small amounts of aromatic substances and dioxins, even if their toxicity with respect to aquatic organisms is low.

⁴¹ Braga D., Kramer G., Pelzer R., Halko M., Recent developments in wet strength chemistry targeting high performance and ambitious environmental goals, Professional Papermaking 3-4/2009

⁴² <https://echa.europa.eu/sv/substance-information/-/substanceinfo/100.003.128>

⁴³ <https://echa.europa.eu/sv/substance-information/-/substanceinfo/100.002.266>

⁴⁴ <https://echa.europa.eu/sv/brief-profile/-/briefprofile/100.002.267>

O7 Dye products, metals

Dyes or pigments in dye products that are based on aluminium, silver, arsenic, barium, cadmium, cobalt, chromium, copper, mercury, manganese, nickel, lead, selenium, antimony, tin or zinc must not be used for colouring or printing.

Copper in phthalocyanine pigment and aluminium in aluminosilicates are exempted from this requirement.

The levels of ionic impurities in the dye products used must not exceed the following limits:

- Antimony: 50 ppm
- Arsenic: 50 ppm
- Barium: 100 ppm
- Cadmium: 20 ppm
- Chromium: 100 ppm
- Cobalt: 500 ppm
- Copper: 250 ppm
- Lead: 100 ppm
- Mercury: 4 ppm
- Nickel: 200 ppm
- Selenium: 20 ppm
- Silver, 100 ppm
- Tin: 250 ppm
- Zinc: 1 500 ppm.

 The manufacturer/supplier shall demonstrate compliance with the requirement by duly completing and signing Appendix 7 in the web-based application tool.

Background to requirement

The requirement has been partly adjusted and harmonised with EU Ecolabel's requirement for metal-based pigments and dyes, including ionic impurities, in the criteria for graphic paper and tissue paper and tissue products. However, definition of metal-based pigments and dyes given in EU Ecolabel (containing more than 50% by weight of the relevant metal compound) is not applied in the Nordic Swan Ecolabel. The Nordic Ecolabelling requirement is absolute – dyes shall not be based on these metals, there is no limit value for the weight of relevant metal compound, when the requirement is applied.

This harmonisation means that the disputable term 'heavy metals' is removed from the requirement. Instead it is specified which metals the dyes cannot be based on. Furthermore, the list of ionic impurities that are restricted in the dyes has been expanded with antimony, arsenic, barium, cobalt, copper, nickel, selenium, silver, tin and zinc. The limit values for impurities previously included in the Chemical Module; lead, mercury, chromium and cadmium; remain unchanged.

The requirement with respect to ionic impurities in dye products is intended to reduce the presence of the listed metals to those levels of impurity that are considered to be the lowest attainable. The limits are set to make it impossible to add these metals actively to dye products. The threshold values are the same as

those set by the EU Ecolabel in their newly revised criteria for graphic paper and tissue paper and tissue products⁴⁵.

O8 Dye products, amines

Azo dyes, which by reductive cleavage of one or more azo groups may release one or more of the aromatic amines listed in Regulation (EC) No 1907/2006 Annex XVII, Appendix 8, must not be used.

☞ The producer/supplier shall demonstrate compliance with the requirement by duly completing and signing Appendix 7 in the web-based application tool.

Background to requirement

The requirement has been adjusted to clarify that it regards azo dyes that by reductive cleavage of one or more azo groups may release one or more of the aromatic amines listed in Regulation (EC) No 1907/2006 Annex XVII, Appendix 8.

Azo dyes that liberate the aforementioned aromatic amines are no longer offered by dye manufacturers in Europe. Although the majority of coloured paper carrying the Nordic Swan Ecolabel is manufactured in Europe, Nordic Ecolabelling accepts applications for pulp and paper worldwide. The same legal requirements regarding azo dyes do not necessarily exist outside the EU and it is therefore important for countries outside the EU to be aware of this.

O9 Adhesives

Adhesives used in the production, conversion or packaging of the product shall not contain:

- Halogenated volatile organic compounds
- Ethylene glycol ethers classified as any of the classifications listed in Table 1 in requirement O1.

☞ The chemical manufacturer/supplier shall give an account of the composition and classification of the production chemical by duly completing and signing Appendix 8 in the web-based application tool.

Background to requirement

The requirement is changed with regard to ethylene glycol ethers. Ethylene glycol ethers classified in accordance with Table 1 in requirement O1 are prohibited in adhesives, compared to version 2 of the Chemical Module where all ethylene glycol ethers were prohibited. See O2 for requirements with respect to alkylphenol ethoxylates or other alkylphenol derivatives and phthalates.

Both halogenated solvents and ethylene glycol ethers are volatile organic compounds, VOCs. Volatile organic compounds are undesirable, since they are typically harmful to health, often non-readily-degradable in an aquatic environment and can have negative effects on the earth's ozone layer. In addition to this, some halogenated solvents have been classified as carcinogenic and they may also be toxic for aquatic organisms and do not easily degrade. Therefore, the presence of halogenated solvents in adhesives used in Nordic Swan Ecolabelled paper is prohibited. Ethylene glycol ethers that are classified in accordance with Table 1 are now prohibited, which allows the use of non-hazardous alternatives.

⁴⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019D0070&from=EN>

O10 Starch products, GMO

The use in production of starch products that derive from genetically modified organisms (GMO), e.g. certain potato and maize starches, is prohibited.

- ☞ The chemical manufacturer/supplier of the starch product shall demonstrate compliance with the requirement by duly completing and signing Appendix 9 in the web-based application tool.

Background to requirement

The requirement has not been changed. GMOs (genetically modified organisms) that can be relevant in starch products used in paper are maize and potato. About 30 percent of the world's commercially available maize is GMO⁴⁶ whereas GMO starch potato is not cultivated at the moment⁴⁷.

GMOs are highly controversial and several countries have banned cultivation of GMOs. Topics that are discussed include food security, land use, lack of scientific knowledge about effects under local agricultural/forest conditions and risk of adverse effects on health and the environment.

Nordic Ecolabelling emphasises the precautionary principle and bases its position on regulations that maintain a holistic approach to GMOs, and that emphasise sustainability, ethics and benefit to society together with health and the environment. Nordic Ecolabelling is not against genetic engineering or GMOs as such but is concerned about the consequences when genetically modified plants, animals and microorganisms are propagated in nature. Nordic Ecolabelling believes that GMOs should be assessed on a case by case basis.

Research has not clearly shown that today's GMOs contribute towards sustainable agriculture with lower use of pesticides and there is a lack of research on long-term consequences of GMOs, both environmental, social and economic consequences. There are possible adverse effects of GMOs along the entire value chain from crop research and development, through cultivation, storage, use and waste management⁴⁸. In several of these stages, there is a lack of scientific studies, and there is a lack of holistic assessment^{49,50,51}. Today's GMOs are also adapted to industrial agriculture with companies that have gained a monopoly-like position, and the Nordic Ecolabelling wishes to limit the negative consequences of this.

⁴⁶ ISAAA (2019) Brief 54: Global Status of Commercialized Biotech/GM Crops: 2018.

<http://isaaa.org/resources/publications/briefs/54/default.asp> (3.10.2019)

⁴⁷ <https://www.reuters.com/article/us-eu-gmo-potato/eu-court-annuls-approval-of-basfs-amflora-gmo-potato-idUSBRE9BC0DI20131213> (3.10.2019)

⁴⁸ Catacora-Vargas G (2011): "Genetically Modified Organisms – A Summary of Potential Adverse Effects Relevant to Sustainable Development. Biosafety Report 2011/02, GenØk – Centre for Biosafety.

⁴⁹ Catacora-Vargas G (2011): "Genetically Modified Organisms – A Summary of Potential Adverse Effects Relevant to Sustainable Development. Biosafety Report 2011/02, GenØk – Centre for Biosafety.

⁵⁰ Fischer et al. (2015) Fischer et al. (2015): Social impacts of GM crops in agriculture: a systematic literature review. Sustainability 7:7.

⁵¹ Catacora-Vargas G et al. (2018): Socio-economic research on genetically modified crops: a study of the literature. Agriculture and Human Values 35:2.

7.5 Changes compared to previous generation

This section describes changes that have not been mentioned in sections above.

Chemical requirement for paper/pulp manufacturers

In the current Chemical Module, version 2, the requirement regarding production chemicals used in production of pulp/paper (O1) is amended by merging it with the requirement concerning pulp/paper manufacturer in the Basic Module (O8). Requirement O8 in the Basic Module stipulates that pulp/paper manufacturer shall report all production chemicals used. All chemicals in pulp and paper production must comply with the requirements outlined in the Chemical Module version 3.

From now on, generation 3 of the Chemical Module shall mainly be used by chemical producers whereas all requirements relevant to pulp/paper manufacturers are presented in the Basic Module. However, requirements O1, O3 and O6 in the Chemical Module contain sub requirements that shall be declared by pulp/paper manufacturer in their web-based application tool.

This is done to clarify which requirement is applied to pulp/paper manufacturer and which concerns chemical manufacturer/supplier.

Exemption to Classification of Production Chemicals (O2)

In the classification requirement O2 of the current Chemical Module, version 2 there is an exemption applied to pulp/paper producers. If the consumption of the chemical is less than 0.05 kg/tonne produced pulp or producer paper, the chemical can be exempted from the requirement for classification. The limit value was introduced during the last revision of the criteria and was mainly based on some dye products used. As the dye products are covered by other exemptions given in the requirement, this exemption related to used amounts is removed in order to clarify the structure of the Chemical Module.