

Nordic Ecolabelling for
Paper Products – Basic Module



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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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What is a Nordic Swan Ecolabel Modular System for Paper Products?

Nordic Swan Ecolabelled paper products may be made of cellulosic fibres from wood, plants and/or recycled fibre. The criteria for Nordic Ecolabelling of paper products encompass a wide range of requirements, most of which relate to pulp and paper production. Since the raw materials, chemicals and manufacturing processes in pulp and paper production are similar, Nordic Ecolabelling has introduced a so-called modular system for paper products.

The Basic Module contains general requirements concerning forestry management, emissions, energy use and waste disposal regarding pulp and paper production.

The Chemical Module contains general requirements regarding the use of chemicals in the manufacture of pulp and paper.

Supplementary Modules contain those requirements, regarding specific paper products, which must be fulfilled in order to grant a licence for the products to carry the Nordic Swan Ecolabel. The requirements' levels in a Supplementary Module may be more stringent or more lenient than those of the Basic or Chemical Module. If the requirements in the modules differ, the requirement levels specified in the applicable Supplementary Module are to be applied. For a product to be granted a licence to carry the Nordic Swan Ecolabel, the relevant requirements in the Basic Module and Chemical Module, in addition to the requirements in the applicable Supplementary Module, must be fulfilled.

Version 3 of the modular system includes the following documents:

- Paper Products – Basic Module
- Paper Products – Chemical Module

And the following Supplementary Modules:

- Copy and Printing Paper
- Grease-Proof Paper
- Tissue Paper

Other Nordic Swan Ecolabel criteria may refer to the modular system, such as the criteria for Disposables for Food and the criteria for Sanitary Products.

What is Nordic Swan Ecolabelled paper/inspected paper?

The Nordic Swan Ecolabel on a paper product signifies that the product meets strict environmental requirements. This means that the paper has minimal environmental impact throughout its lifecycle.

Paper assessed by Nordic Ecolabelling:

- Is either made of virgin fibres or and/or recycled fibres. At least 70% of fibres used in paper must come from sustainably managed forests or be recycled.
- Meets strict requirements concerning chemicals that are hazardous to health and harmful to the environment.
- Is manufactured in an energy efficient way.
- Generates less emissions to air and water during production.

The Basic Module contains energy and emission reference values for pulps used in paper manufacturing but also some specific reference values for certain paper/board grades such as liner and fluting used in paper products. No definitions of product groups are, however, made in the Basic Module since the requirements stipulated in this document apply generally to pulp and paper production. Specific product groups are given in the aforementioned Supplementary Modules.

A registered item for a specific use, inspected paper is paper without a Nordic Swan Ecolabel that has been assessed for use in Nordic Swan Ecolabelled printing houses and used in printing of Nordic Swan Ecolabelled printed matter. The definition and requirements for Inspected Paper are set in Appendix 1 in the Basic Module.

More information can be found <http://www.nordic-ecolabel.org/certification/paper-pulp-printing/>

Why choose the Nordic Swan Ecolabel?

- The Nordic Swan Ecolabel is a very well-known and well-reputed trademark in the Nordic region.
- The Nordic Swan Ecolabel is a simple way of communicating environmental work and commitment to customers.
- The Nordic Swan Ecolabel clarifies the most important environmental impacts and thus shows how a company can cut emissions, resource consumption and waste management.
- Environmentally suitable operations prepare pulp and paper manufacturers for future environmental legislation.
- Nordic Ecolabelling can be seen as providing a business with guidance on the work of environmental improvements.
- The Nordic Swan Ecolabel not only covers environmental issues but also quality requirements, since the environment and quality often go hand in hand. This means that a Nordic Swan Ecolabel licence can also be seen as a mark of quality.

How to apply

Application and costs

For information about the application process and fees for this product group, please refer to the respective national web site or <http://www.nordic-ecolabel.org/certification/paper-pulp-printing/>. For addresses see page 2.




What is required?

The application must consist of an application form/web form and documentation showing that the requirements are fulfilled. Applications are to be submitted with the aid of the web-based application tool My Swan Account. My Swan Account can be accessed via the internet addresses shown on page 3 of this document or via <http://www.nordic-ecolabel.org/portals/paper/my-swan-account1/>

Pulps used in the paper must be inspected and listed at the Nordic Ecolabelling's website or in My Swan Account. The pulp producer is responsible for the application fee and annual listing fee for the pulp.

Each requirement is marked with the letter O (obligatory requirement) and a number. All requirements must be fulfilled to be awarded a licence.

The text describes how the applicant shall demonstrate fulfilment of each requirement. There are also icons in the text to make this clearer. These icons are:

-  Upload
-  State data in web-based application tool
-  Requirement checked on site

All information submitted to Nordic Ecolabelling is treated confidentially. Suppliers can send documentation directly to Nordic Ecolabelling, and this will also be treated confidentially.

On-site inspection

In connection with handling of the application, Nordic Ecolabelling normally performs an on-site inspection to ensure adherence to the requirements. For such an inspection, data used for calculations, original copies of submitted certificates, test records, purchase statistics, and similar documents that support the application must be available for examination.

Queries

Please contact Nordic Ecolabelling if you have any queries or require further information. See page 3 for addresses. Further information and assistance (such as spreadsheets) may be available. Visit the relevant national website or <http://www.nordic-ecolabel.org/certification/paper-pulp-printing/> for further information.

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 cutting the rolls 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, based on (EC) No 1221/2009.
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 waste water treatment	External waste water treatment plant is the plant on site where waste water is treated before discharge to recipient. This is not to be mixed with waste water treatment done by an external part such as municipal waste water 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 but fulfills certain criteria set by Nordic Ecolabelling. Paper is a registered item for a specific use that is 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 treated between different processes and thereafter water is recycled within the production plant. See also external waste 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 of pulp and paper. 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. Even waste water treatment chemicals are included, see closely the Chemical Module.
Purchased electricity	Electrical energy bought from outside the mill to be used on site.
Recycled material	Recycled material is defined in accordance with ISO 14021 in the following two categories. 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.

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.

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.

1 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.

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 pulp – producer, name, production site, type of pulp (such as ECF, TCF, CTMP etc., market pulp or not). 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 waste water 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.

2 Quality and regulatory requirements

04 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.

05 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. Refer also to the Annual Follow-up (O16).
- 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 (trials are excluded).



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

06 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.

3 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 all must be fulfilled, either by the pulp manufacturer or the paper manufacturer, or both:

- a) Virgin tree species listed on Nordic Ecolabelling's list of restricted tree species* must not be used in pulp/paper.

The list consists of tree species listed on:

- i. CITES (Appendices I, II and III)
- ii. IUCN red list, categorized as CR, EN and VU
- iii. Rainforest Foundation Norway's tree list
- iv. Siberian larch (originated in forests outside the EU)

Exemptions

Eucalyptus and Acacia used for pulp and paper production are exempted from the list (note **).

Tree species listed on either ii, iii or iv may be used if it meets all of the following requirements:

- the tree species does not originate from an area/region where it is IUCN red listed, categorized as CR, EN or VU.
 - the tree species does not originate from Intact Forest Landscape (IFL), defined in 2002 <http://www.intactforests.org/world.map.html>.
 - the tree species shall originate from FSC or PEFC certified forest/plantation and shall be covered by a valid FSC/PEFC chain of custody certificates documented/controlled as FSC or PEFC 100% through the FSC transfer method or PEFC physical separation method. Tree species grown in plantation shall in addition originate from FSC or PEFC certified forest/plantation, established before 1994.
- b) **The pulp manufacturer** must 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. All fibres shall be covered by valid chain of custody certificates issued by FSC or PEFC or be classified as recycled material***.
- d) Certification of fibre raw materials in paper:
1. On an annual basis/the latest 12 months, a minimum of 70% (note **) 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 consist of a minimum of 70% of recycled fibres or be labelled as FSC or PEFC recycled,
or
 3. A combination of certified and recycled fibres. If the paper contains both recycled and certified fibres, the sum of these fibres shall in total be a minimum of 70%.
- 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. For paper labelled with FSC / PEFC or EU

Ecolabel, no documentation is required, the requirement is considered to be met.

* *The list of restricted tree species is located on the website: <http://www.nordic-ecolabel.org/certification/paper-pulp-printing/pulp--paper-producers/forestry-requirements-2020/>*

** *Regarding pulp, fibre raw material from eucalyptus/acacia must be a minimum of 70% 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 tree species listed on i-iv) are not used. Regarding acacia/eucalyptus, documentation showing that the quantity of certified fibre in pulp is met. Appendix 2 shall be used.

If species from the lists ii), iii) or iv) is used:

☞ The applicant/manufacturer/supplier are required to present a valid FSC/PEFC Chain of Custody certificate that covers the specific tree species and demonstrate that the tree is controlled as FSC or PEFC 100% through the FSC transfer method or PEFC physical separation method.

☞ The applicant/manufacturer/supplier are required to document full traceability back to the forest/certified forest unit thereby demonstrating that;

- the tree does not originate from an area/region where it is IUCN red listed, categorized as CR, EN or VU;
- the tree species does not originate from Intact Forest Landscape (IFL), defined in 2002 <http://www.intactforests.org/world.webmap.html>;
- For plantations the applicant/manufacturer/supplier are required to document that the tree species does not originate from FSC or PEFC certified plantations established after 1994.

☞ **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 used in the pulp/paper (e.g. via link to website).

☞ Recycled fibres shall be covered by EN 643 delivery notes if FSC or PEFC recycled claims are not used.

☞ **Paper manufacturer** shall enclose documentation that paper is labelled with FSC / PEFC or EU Ecolabel or 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 in

paper is met. Nordic Ecolabelling may request further documents to examine whether the requirements are fulfilled.

4 Chemicals

08 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. This is to be documented mainly by the manufacturer or supplier of the chemical product.

Please note that requirements O1, O4, O6 and O8 in the Chemical Module include sub requirements that pulp/paper manufacturer shall declare in the web-based application tool.

To reduce the release of not readily biodegradable organic chelating agents such as EDTA or DTPA, techniques in line with Best Available Techniques (BAT) Reference Document for the production of Pulp, Paper and Board is to be used.

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 shall be included upon request. Safety data sheet/product specification must be in line with prevailing European legislation (Annex II to REACH Regulation, 1907/2006/EC). Regarding EDTA and DTPA, declaration of techniques in line with BAT ref. document.

5 Energy and greenhouse gases

Energy consumption is regulated through requirements on fuel and electricity while fuel type used for production of heat is regulated by the greenhouse gas 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 requirement. Pulp manufacturers shall, however, provide details of energy use and greenhouse gas emissions to paper producer. See also Appendix 4 where instructions for calculations are given.

09 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 TMP/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 gases

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

- 575 kg CO₂ /tonne paper for paper made from 100% deinked/recycled pulp
- 500 kg CO₂ /tonne paper for paper made from 100% chemical pulp
- 550 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.

6 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. 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, $P_{\text{emissions_total}}$:

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

☞ **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.

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 waste water from chlorine dioxide production is dealt with anaerobic treatment (chlorate reduced).

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

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.

7 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.

8 Annual reporting

O16 Annual follow-up

The pulp manufacturer shall on an annual basis report the specific emissions to water and air and energy consumption in the production of pulp.

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.

Follow-up inspections

Nordic Ecolabelling may decide to check whether paper fulfils Nordic Ecolabelling requirements during the licence period or as long as the pulp constitutes a part of the ecolabelled product. This may involve a site visit, random sampling or similar test.

The licence may be revoked if it is evident that paper does not meet the requirements.

Criteria version history

Nordic Ecolabelling adopted version 3.0 of the criteria for paper products – basic module on the 5 October 2020. The criteria are valid until 31 December 2025.

Appendix 1 Inspected paper

Appendix 1 shall be used by paper manufacturers who are applying for assessment of their paper as printing material in Nordic Swan Ecolabelled printing companies.

Only paper which 1) has been awarded a Nordic Swan Ecolabel licence or 2) is registered item for a specific use, that is meets the requirements for inspected paper may be used in Nordic Swan Ecolabelled printed matter.

A list of inspected paper grades is published on Nordic Ecolabelling's publicly available web portal <http://www.nordic-ecolabel.org/certification/paper-pulp-printing/>

A fee is charged for assessment and publication of paper grades, see closely <http://www.nordic-ecolabel.org/certification/paper-pulp-printing/apply--fees/>

Definition of inspected paper

Paper grades eligible for inspection are the following:

- Wood-containing and wood-free unconverted printing paper produced from chemical and/or mechanical pulp and/or recycled fibre, for, printing.
- The following boards produced from chemical and/or mechanical pulp and/or recycled fibre:
 - Homogeneous board SBB (Solid Bleached Board), SBS (Solid Bleached sulphate) and SUB (Solid Unbleached Board)
 - FBB (Folding Boxboard)
 - Board based on recycled fibre WLC (White Lined Chipboard)
 - Kraftliner, testliner, wellenstoff, semichemical fluting made from NSSC (neutral sulphite semi-chemical pulp)

Requirements for inspected paper

Inspected paper must meet the requirements of A or B below.

A. Inspected paper must meet all requirements in the Basic Module for paper products, version 3, and the Chemical Module, version 3, with the following exceptions:

- The definition of special paper and niche products in O4 in the Supplementary module for Copying and Printing Paper version 4 also applies to inspected paper.

☞ The paper producer shall provide confirmation of the above by completing the web-based application tool.

☞ Chemical suppliers shall use web-based application tool for assessment of chemicals.

B. Paper already labelled with the EU Ecolabel must fulfil the following requirements of the Basic Module for Paper Products, version 3

- O7 Fibre raw material
- O8 Chemicals
- O9 Total energy score
- O10 Emissions of greenhouse gases
- O14 Emissions of AOX

☞ The paper producer shall provide confirmation of the above by completing the web-based application tool.

☞ Chemical suppliers shall use web-based application tool for assessment of chemicals.

Inspected pulps

A registered item for a specific use, that is pulps used in the paper must be inspected and listed at the Nordic Ecolabelling's website or in My Swan Account. The pulp producer is responsible for the application fee and annual listing fee for the pulp.

My Swan Account can be accessed via the internet addresses shown on page 3 of this document or via <http://www.nordic-ecolabel.org/portals/paper/my-swan-account1/>

Appendix 2 Wood material in pulp

Declaration for requirement O7 is completed by the pulp producer.

Pulp producer	Pulp name
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Restricted wood varieties

Are tree species listed in the list of restricted tree species (Nordic Ecolabelling-Prohibited Wood*) used in pulp? Yes No

Eucalyptus and Acacia used for pulp and paper production is exempted from the list. Regarding pulp, fibre raw material from eucalyptus/acacia must be a minimum of 70% certified.

* The list of restricted tree species is located on the website: <http://www.nordic-ecolabel.org/certification/paper-pulp-printing/pulp--paper-producers/forestry-requirements-2020/>

Nordic Ecolabelling may request further information if there is any doubt concerning specific wood varieties.

If tree species on the list of restricted tree species are used:

Scientific name of the tree species: _____

Is the tree species listed on CITES list I,II and III: Yes No

Tree species listed in CITES is not permitted in Nordic Swan Ecolabelled products.

Please send in the following documentation for the tree species used:

- 🏠 A valid FSC/PEFC Chain of Custody certificate from the supplier or manufacturer of the Nordic Swan Ecolabelled product of the wood that covers the specific tree species and demonstrate that the tree is controlled as FSC or PEFC 100% through the FSC transfer method or PEFC physical separation method.
- 🏠 The applicant/manufacturer/supplier are required to document full traceability back to the forest/certified forest unit thereby demonstrating that;
 - the tree does not originate from an area/region where it is IUCN red listed, categorized as CR, EN or VU;
 - the tree species does not originate from Intact Forest Landscape (IFL), defined in 2002 <http://www.intactforests.org/world.webmap.html>;
 - For plantations the applicant/manufacturer/supplier are required to document that the tree species does not originate from FSC or PEFC certified plantations established after 1994.

Wood species used

State the name (species name/scientific name) of the wood raw materials used in pulp:

Eucalyptus/acacia pulps

Regarding eucalyptus/acacia pulps, state the share of certified fibre raw material in the pulp:

Pulp producer's signature

Place and date	Company name/stamp
Person responsible	Signature of person responsible
Telephone	E-mail

Appendix 3 Information on production chemicals

Pulp/paper manufacturer:

Table 3.1. List of production chemicals

Name of chemical	Function	Manufacturer/supplier	Amount used (kg/tonne)	Site/place of use in mill

Signature of the pulp/paper manufacturer

Place and date	Company name/stamp
Person responsible	Signature of person responsible
Telephone	E-mail

Appendix 4 Energy and greenhouse gases

4.1 Requirement for energy consumption

The energy requirement for paper manufacturing is 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 represents the energy score. The requirement for energy is divided into fuel and electricity. The energy calculation encompasses the entire production process – both paper manufacturing and the constituent pulps. Energy consumption in converting and packaging or transport of the raw material or transport within the mill area is not included in calculations. The calculation for paper does not include filler.

There are no absolute limit values for the energy consumption in pulp production, but the pulp producer reports energy consumption of the pulp, specified as fuel and electricity, to the paper manufacturer. The paper manufacturer then uses it in the calculation of the paper's energy score. In the calculation, the paper manufacturer shall use the reference values stated in tables 4.1 and 4.2 for different pulp and paper types.

4.1.1 *Non-integrated pulp mill*

Electricity

Both purchased and on-site generated electricity must be included in the calculations.

Electricity pulp = internally generated electricity + purchased electricity - sold electricity

The consumption of electricity shall be based on bills and electricity meter readings. On-site produced electricity is documented by reading meters on the electricity production.

The requirement covers all processes of pulp production from debarking of wood to drying of pulp including also waste water treatment. Electricity for offices or lighting in the factory area is thus not covered. If the pulp mill produces only pulps of equivalent quality with the same type of process, the average value of the electricity consumption can be used for all pulps.

Fuel

Both purchased fuel and fuel produced within the plant must be included in the calculations, divided into fossil and renewable fuels. The pulp producer shall also report the fuel used for on-site generated electricity. The pulp producer shall deduct the amount of fuel used for on-site generation of electricity before reporting the values to the paper producer.

Fuel pulp = fuel produced within the plant + purchased fuel - sold fuel (sold fuel /or heat/0.8)

For purchased fuel, the quantity purchased must be reconciled with the quantities at the beginning and end of the current year. Consumption of

internally produced fuel from residuals such as liquor, bark and woodchips, etc. is calculated based on calculated thermal values for the fuels used or measured. In section 4.5 and 4.6 heat values and some calculation examples are given.

Surplus energy

Surplus energy sold off in the form of electricity, steam or heat, is subtracted from the total consumption. The quantity of fuel used to generate heat that is sold off is calculated by dividing the sold heat by 0.8. The coefficient of 0.8 is equivalent to the average energy efficiency for total production of heat. Alternatively, the plant's actual energy efficiency in converting fuel to heat energy may be used, if it is documented to Nordic Ecolabelling.



Pulp manufacturer shall submit the following:

- An overview of the mill's energy supply system where the number of boilers, with information about the boiler effect and which fuel is used, is shown.
- Accounting for the amount of purchased, own produced and sold electricity.
- Accounting for the quantity of purchased, own produced and sold fuel / heat
- If thermal energy has been recalculated into fuel, conversion factors and efficiency must be stated.

For the report, the spreadsheet provided by Nordic Ecolabelling shall be used.

4.1.2 Non-integrated paper mill

Electricity

Both purchased electricity and on-site generated electricity must be included in the calculations.

Electricity paper = internally generated electricity + purchased electricity - sold electricity

The consumption of electricity shall be based on invoices and electricity meter readings. On-site produced electricity is documented by reading meters on the electricity production.

The requirement covers all processes of paper production from pulping to drying of the base paper including also waste water treatment. Electricity for offices or lighting in the factory area is thus not covered.

If the paper mill only produces paper of equivalent quality with the same type of process, the average value of the electricity consumption can be used for all paper.

Fuel

All purchased fuel must be included in the calculations, divided into fossil and renewable fuels.

Fuel paper = purchased fuel - sold heat converted to fuel energy

For purchased fuel, the quantity purchased must be reconciled with the quantities at the beginning and end of the current year.

Surplus Energy

Surplus energy sold off in the form of electricity, steam or heat, is subtracted from the total consumption. The quantity of fuel used to generate heat that is sold off is calculated by dividing the sold heat by 0.8. The coefficient of 0.8 is equivalent to the average energy efficiency for total production of heat. Alternatively, the plant's actual energy efficiency in converting fuel to heat energy may be used, if it is documented to Nordic Ecolabelling.

🏠 **Paper manufacturer** shall submit the following:

- An overview of the paper machine's energy supply system where the number of boilers with information about the boiler effect and which fuel is used is shown.
- Accounting for the amount of purchased, own produced and sold electricity.
- Accounting for the quantity of purchased, own produced and sold fuel / heat
- If thermal energy has been recalculated into fuel, conversion factors and efficiency must be stated.

The spreadsheet provided by Nordic Ecolabelling shall be used.

Steam

If excess energy from other production (for example from other industry) is used, the energy content of the steam must be included in the calculation. In that case, the steam table in Appendix 4.5 shall be used. The energy of the steam is converted into fuel with the efficiency of the boiler. If steam from electric boilers is used, the energy content must be converted to fuel in the same way, but the energy content of electricity must be multiplied by 1.25.

Both Nordic Swan Ecolabelled and non-Nordic Swan Ecolabelled production

If the paper manufacturer produces both products that are to be Nordic Swan Ecolabelled and those that are not to be Nordic Swan Ecolabelled, the specific energy consumption for the Nordic Swan Ecolabelled product shall be reported. In exceptional cases, the average value for ecolabelled and non-ecolabelled products may be applied. However, the products must be of equivalent quality and be produced with equivalent processes within the same production unit.

4.1.3. Integrated pulp and paper mill

The reporting of electricity and fuel consumption in the integrated pulp and paper mill is done as for the unintegrated mill. The allocation of the electricity consumption between pulp and paper production shall be based on meter readings on respective production. The consumption of fuel of pulp respective paper production shall be calculated from the steam consumption of respective production.

4.2. Energy calculation, paper manufacturer

4.2.1 Energy scores for paper production

Energy scores $P_{\text{paper_electricity}}$ and $P_{\text{paper_fuel}}$ for paper production in paper machines are calculated using the following formulas:

$$P_{\text{paper_electricity}} = \frac{\text{Electricity}_{\text{consumed}}}{\text{Electricity}_{\text{reference}}}$$

and

$$P_{\text{paper_fuel}} = \frac{\text{Fuel}_{\text{consumed}} - 1.25 \cdot \text{in-house generated electricity}}{\text{Fuel}_{\text{reference}}}$$

Reference values for electricity and fuel regarding paper manufacturing can be found in Table 4.1.

Table 4.1. Energy for paper manufacturing

Process	Fuel kWh/ADT Ref. value	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)	1600	650
News	1500	600
LWC	1600	650
SC	1500	600
Kraftliner	1600	650
Semichemical fluting	1600	650
Testliner/wellenstoff	1700	500
Uncoated fine paper	1600	600
Coated fine paper	1600	650

🏠 Calculation of point score using the spreadsheet provided by Nordic Ecolabelling.

4.2.2 Energy scores for a mixture of different pulp types

In the case of mixtures of different pulp types, the following formulas are used to calculate the energy scores $P_{\text{pulp_electricity}}$ and $P_{\text{pulp_fuel}}$:

$$P_{\text{pulp_electricity}} = \sum_{i=1}^n P_{\text{pulp_electricity}_i} \cdot \text{pulp}_i$$

and

$$P_{pulp_fuel} = \sum_{i=1}^n P_{pulp_fuel_i} \cdot pulp_i$$

where $pulp_i$ is the proportion by mass of the individual pulp relative to the total pulp mix. Due to spillage and differences in water content, the sum of $pulp_i$ may be greater than 1. $P_{pulp_electricity_i}$ is the energy score for electricity for pulp i . $P_{pulp_fuel_i}$ is the energy score for fuel for pulp i .

A more detailed description of the energy scores (e.g. regarding integrated production) is provided in Section 4.1 of the guidelines to the energy calculations.

☞ Calculation of point score using the spreadsheet provided by Nordic Ecolabelling.

4.2.3 Total energy score for paper and pulp production

The total score for both electricity and fuel consumption for the paper production, including pulp production, is calculated according to the formulas below:

$$P_{electricity} = P_{electricity_pulp} + P_{electricity_paper}$$

and

$$P_{fuel} = P_{fuel_pulp} + P_{fuel_paper}$$

Worst case calculations shall be included to show that each pulp recipe meets the requirements if no mass mix-specific calculations are reported for each pulp mix present. The calculation shall be specific for each pulp mix used in the papers in the application. However, so called "worst case" calculations may also be done after consultation with Nordic Ecolabelling.

☞ Documentation shall include calculations with sub-totals. It shall be clear which base values are used for consumed fuel and electricity. Calculations shall be included to demonstrate that each pulp recipe meets the requirements. Nordic Ecolabelling also provides a spreadsheet that is to be used for these calculations.

4.3 Energy calculation, pulp manufacturer

Energy scores $P_{pulp_electricity_i}$ and $P_{pulp_fuel_i}$ for producing pulp i is calculated in accordance with the following formulas:

$$P_{pulp_electricity_i} = \frac{Electricity_{consumed}}{Electricity_{reference}}$$

and

$$P_{pulp_fuel_i} = \frac{Fuel_{consumed} - 1.25 \cdot in-house\ generated\ electricity}{Fuel_{reference}}$$

Reference values for electricity and fuel with regard to pulp manufacturing can be found in Table 4.2.

Table 4.2 Energy for pulp manufacturing

Process	Fuel kWh/ADt Ref. value	Electricity kWh/ADt Ref. value
Bleached chemical pulp	3600	650
Dried bleached chemical pulp	4600	700
Unbleached chemical pulp	3200	550
Dried unbleached chemical pulp	4200	600
NSSC	3200	700
Dried NSSC	4100	750
CTMP	N/A	1500
Dried CTMP	900	1550
DIP	300	450
Dried DIP	1200	500
TMP	N/A	2200
Dried TMP	900	2250
Groundwood pulp	N/A	2000
Dried groundwood pulp	900	2050

🏠 Calculation of point score using the spreadsheet provided by Nordic Ecolabelling.

4.4 Emissions of greenhouse gases

The requirement for greenhouse gas emissions from paper production is based on fuels used for production of process heat. Greenhouse gas emission data shall include all sources of fuels used during the production of pulp and paper. Fuel emission factors shall be used in accordance with Annex VI of Commission Regulation (EU) No 601/2012¹, alternatively factors accepted by the authorities in European Union Emissions Trading System (EU ETS) shall be used.

Paper manufacturer. The actual emission value shall be calculated as the sum of the emissions from pulp and paper production, taking into account the mixture of pulps used. The calculations shall include the weighted average of the CO₂ emissions of all pulps in the pulp mix. This average shall be summed up with the CO₂ emissions from paper production. Emissions of CO₂ from surplus energy that is sold off in the form of electricity, steam or heat, is subtracted from the total emissions. See also allocation for the co-generation of heat and electricity in section 5.2 in Appendix 5.

¹ 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).

Information on the CO₂ emissions of individual pulps shall be obtained from the pulp manufacturers. Regarding CO₂ emissions from purchased heat energy, information shall be obtained from the heat supplier.

☞ **The paper manufacturer shall:**

- specify the quantities of fuels used for production of heat.
- calculate CO₂ emissions for paper using the Emission factors for fuels in accordance with Annex VI of Commission Regulation (EU) No 601/2012² or factors accepted by the authorities in European Union Emissions Trading System (EU ETS).

The spreadsheet provided by Nordic Ecolabelling shall be used.

Pulp manufacturer. CO₂ emissions for pulp shall be calculated by using the Emission factors for fuels in accordance with Annex VI of Commission Regulation (EU) No 601/2012 or factors accepted by the authorities in European Union Emissions Trading System (EU ETS).

CO₂ emissions from surplus energy that is sold off in the form of electricity, steam or heat, is subtracted from the total emissions. See also allocation for the co-generation of heat and electricity in section 5.2 in Appendix 5. Regarding CO₂ emissions from purchased heat energy, information shall be obtained from the heat supplier.

☞ **The pulp manufacturer shall:**

- specify the quantities of fuels used for production of heat.
- calculate and send information on total CO₂ emissions specified as kg per ADt to the paper manufacturer and directly to Nordic Ecolabelling.

For the report, the spreadsheet provided by Nordic Ecolabelling shall be used.

4.5 Heat values, steam table

Table 4.3. Effective (lower) heat values for fuel dry substance

Fuel	Heat value (Lower)	Unit
Wood briquettes	10.0	GJ/m ³ loose
Wood pellets	10.0	GJ/m ³ loose
Wood powder	3.80	GJ/m ³ loose
Wood chips	3.55	GJ/m ³ loose
Sawdust	2.90	GJ/m ³ loose
Bark	2.22	GJ/m ³ loose
Piece peat	4.50	GJ/m ³ loose
Milled peat	3.75	GJ/m ³ loose
Sulphate black liquor	12.7	GJ/kg dry matter

² 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).

Sulphite liquor	14.7	GJ/kg dry matter
Tall oil pitch	36.8	GJ/m ³
Natural gas	38.9	MJ/m ³
Light fuel oil	36.0	GJ/m ³
Heavy fuel oil	38.7	GJ/m ³
LPG	46.1	MJ/kg
Coal	26.5	MJ/kg

The heat values in Table are guidelines. Manufacturers may use their own measured values if so desired.

Table 4.4 Steam table

Enthalpy in gauged steam, \hat{h} , as a function of absolute pressure, p or temperature, t. Enthalpy is divided by an efficiency of 0.9 and added to the heat consumption.

p (bar)	t (°C)	\hat{h} (kJ/kg)	p (bar)	t (°C)	\hat{h} (kJ/kg)
0.50	81.3	2646.0	16.0	201.4	2791.7
0.60	86.0	2653.6	17.0	204.3	2793.4
0.80	93.5	2665.8	18.0	207.1	2794.8
1.00	99.6	2675.4	19.0	209.8	2796.1
1.20	104.8	2683.4	20.0	212.4	2797.2
1.40	109.3	2690.3	22.0	217.2	2799.1
1.60	113.3	2696.2	24.0	221.8	2800.4
1.80	116.9	2701.5	26.0	226.0	2801.4
2.00	120.2	2706.3	28.0	230.1	2802.0
2.50	127.4	2716.4	30.0	233.0	2802.3
3.00	133.5	2724.7	32.0	237.5	2802.3
3.50	138.9	2731.6	34.0	240.9	2802.1
4.00	143.6	2737.6	36.0	244.1	2801.7
4.50	147.9	2742.9	38.0	247.3	2801.1
5.00	151.8	2747.5	40.0	250.3	2800.3
6.00	158.8	2755.5	45.0	257.4	2797.7
7.00	165.0	2762.0	50.0	263.9	2794.2
8.00	170.4	2767.5	55.0	269.9	2789.9
9.00	175.4	2772.1	60.0	275.6	2785.0
10.00	179.9	2776.2	65.0	280.8	2779.5
11.00	184.0	2779.7	70.0	285.8	2773.5
12.00	188.0	2782.7	80.0	295.0	2759.9
13.00	191.6	2785.4	90.0	303.3	2744.6
14.00	195.0	2787.8	100.0	311.0	2727.7
15.00	198.3	2789.9	110.0	318.1	2709.3

Source: Thermal Engineering Data, which refers to Schmidt, E.: Properties of water and Steam in SI Units, 1969. Springer-Verlag and R. Oldenbourg 1969.

4.6 Energy content of damp fuel

4.6.1 Formula for calculating the energy content of damp fuel

The effective thermal value of damp fuel can be calculated using the following formula:

$$Q_{iw} = Q_{ik} \cdot \frac{(100 - w)}{100} - 2.45 \cdot \frac{w}{100}$$

Where

Q_{iw} = lower calorific value of moist fuel in unit kJ/kg

Q_{ik} = lower calorific value of dry fuel in unit kJ/kg

w = water content of fuel in %

4.6.2 Calculation of the energy content of wood chippings

The energy content of wood chippings depends primarily upon their water content. The following example shows how this is calculated.

The energy content (lower calorific value) of dry wood is specified as 19 MJ/kg.

Energy is required to evaporate the water normally found in wood. This reduces the calorific value of the wood. The formula for calculating the relationship of the energy content to the water content can be arranged as follows:

$$19 \text{ MJ} \cdot \frac{(100 - \% \text{ of water})}{100} - 2.45 \cdot \frac{\% \text{ of water}}{100} = xx \text{ MJ/kg}$$

A precondition for this calculation is that the water content of the wood is known.

When a tree is felled, the water content may be as high as 55%. The water gradually evaporates from the wood, initially during transportation and subsequently when it is cut and seasoned for use in for example pulp production. At this point the water content will depend on precipitation during the period in question. Normally it will have dropped to 20–40%.

With a water content of 40%, the energy content is calculated as follows:

$$19 \text{ MJ} \cdot \frac{(100 - 40\%) }{100} - 2.45 \cdot \frac{40}{100} = 10.4 \text{ MJ/kg}$$

With a water content of 20%, the energy content is calculated as follows:

$$19 \text{ MJ} \cdot \frac{(100 - 20\%) }{100} - 2.45 \cdot \frac{20}{100} = 14.7 \text{ MJ/kg}$$

Appendix 5 Emissions to water and air

5.1 Emission requirements

Emissions to air and water from the production of pulp and finished paper must be specified in terms of emissions 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 (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, $P_{\text{emissions_total}}$:

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

P_{COD} shall be calculated in the following way (P_{P} , P_{S} and P_{NO_x} are calculated in the same way):

$$P_{\text{COD}} = \frac{\text{COD}_{\text{total}}}{\text{COD}_{\text{ref_total}}} = \frac{\sum_{i=1}^n (\text{pulp}_i \cdot \text{COD}_{\text{pulp}_i}) + \text{COD}_{\text{paper machine}}}{\sum_{i=1}^n (\text{pulp}_i \cdot \text{COD}_{\text{ref_pulp}_i}) + \text{COD}_{\text{ref_paper machine}}}$$

where:

$\text{COD}_{\text{total}}$	Total emissions from the production of Nordic Swan Ecolabelled paper
$\text{COD}_{\text{ref_total}}$	The weighted sum of reference values for pulps and reference value for the paper machine
$\text{COD}_{\text{pulp}_i}$	COD emissions from pulp i
$\text{COD}_{\text{paper machine}}$	COD emissions from paper machine
$\text{COD}_{\text{ref_pulp}_i}$	Reference value for pulp i (see table below)
$\text{COD}_{\text{ref_paper machine}}$	Reference value for the paper machine and paper type (see table below). Select coated or uncoated
Pulp_i	Proportion of the pulp type expressed as ADt following the elimination of filler
n	Number of constituent pulps
i	Index of each individual pulp and runs from 1 to n.

Table 5.1 Reference emission values (kg/ADt) for pulp types and paper manufacture.

Pulp type (pulp _i) or paper	COD_{ref}	P_{ref}	S_{ref}	$\text{NO}_{x\text{ref}}$
Bleached chemical pulp (sulphate and other pulps except sulphite pulp)	15.0	0.025/0.08**	0.35	1.5
Bleached chemical pulp (sulphite pulp)	23.0	0.03	0.5	1.5
Magnefite pulp	27	0.04	0.5	1.5
Unbleached chemical pulp	6.5	0.016	0.35	1.5
NCCS	8.0	0,02	0,4	1,5
CTMP pulp	15.0	0.008	0.15	0.25
TMP/Groundwood	3.0/5.0*	0.008	0.15	0.25
Recycled fibre pulp	2.0	0.007	0.2	0.25
Paper/board machine, uncoated	1.0	0.007	0.2	0.6
Paper/board machine, coated	1.0	0.007	0.2	0.6
Paper machine, special paper	3.0	0.02	0.5	0.7

* Reference value for highly bleached mechanical pulps

** Reference value for eucalyptus pulps

Section 5.2 describes the rules for allocation if the mill produces both Nordic Swan Ecolabelled and non-ecolabelled paper, for integrated pulp and paper production and for the co-generation of heat and electricity.

☞ **Paper manufacturer** shall supply

- The specific emissions (kg/ADt) of COD, P, S and NO_x during the production of paper.
- For each emission parameter, test results, method of analysis, test frequency, sampling points for emissions and the compliance of laboratories with laboratory requirements (see also Section 5.3, Analyses)
- Calculation of scores using the spreadsheet provided by Nordic Ecolabelling.

☞ **Pulp manufacturer** shall supply

- The specific emissions (kg/ADt) of COD, P, S and NO_x during the production of pulp.
- Information on emissions measured as kg/ADt to the paper manufacturer and directly to Nordic Ecolabelling.

For each emission from pulp production, test results, method of analysis, test frequency, sampling points for emissions and the compliance of laboratories with laboratory requirements (see Section 5.3, Analyses).

5.2 Allocation of emissions to water and air

5.2.1 Emissions to water

Mixed production of both Nordic Swan Ecolabelled and non-ecolabelled paper

If a mill produces both Nordic Swan Ecolabelled and non-ecolabelled paper and/or pulp for both ecolabelled and non-ecolabelled paper, but only total emission data is available, the total emissions shall be allocated to the Nordic Swan Ecolabelled paper as follows (the allocation method only works if the non-ecolabelled process is covered by the Nordic Swan Ecolabel requirements and there are reference values for the process):

It is assumed that the Nordic Swan Ecolabelled process share of the total emission can be calculated from the ratio between the emission that would take place from the annual production of the ecolabelled paper and the non-ecolabelled paper if the specific emissions of both processes were equal to the reference values of the processes given in the table 5.1.

Which process lines are not used for Nordic Ecolabelled paper must be clearly stated.

If COD is used as an example, this means that:

$$COD_{swan\ process} = \frac{COD_{ref_swan\ process\ i}}{COD_{ref_emissions_total}} \cdot COD_{total_emission}$$

Where:

COD _{Swan process}	Emissions from the production of Nordic Swan Ecolabelled pulp/paper (that is process)
COD _{ref_swan process_i}	Reference value for Nordic Swan Ecolabelled pulp/paper i (see Table 5.1)
COD _{ref_emissions_total}	The sum of reference values for pulp/paper
COD _{total emission}	Total emissions of the mill

Integrated pulp and paper production

If the only information available is total water emissions from the integrated plant, this can be used as the numerator in the formula in Section 5.1. If the manufacturer of chemical pulp also sells off part of the pulp, the manufacturer must demonstrate the way in which emission values need to be reduced based on the measurement of emissions.

If purchased pulp is used as well as the pulp produced at the integrated mill, the emissions from the purchased pulp must be added to the denominator after it has been multiplied by the proportion of which this pulp is present in paper, in which the effect of filler is excluded.

5.2.2 Emissions to air

The emissions to air, at an integrated mill, shall be allocated the pulp respective paper production according to the fuels and boilers used to generate the steam. Fuels derived from the pulp production and associated CO₂ emissions are assigned to the pulp production. NO_x and S emissions from the boilers and the lime kiln that are closely associated with the pulp production are also primarily allocated to pulp mills.

The excess steam and its air emissions from the pulp production shall be allocated to the paper production. Auxiliary boilers and associated fuels and air emissions, not fired with the fuels originating from the pulp production, shall be allocated to the paper production.

Allocation for the co-generation of heat and electricity

The requirement on emissions to air (S, NO_x and CO₂) does not include emissions from electricity generation. Therefore, in case of co-generation of heat and electricity, emissions shall be allocated to the electricity and calculated according to the following equation, thereafter the share can be deducted from the total emission of S, NO_x and CO₂:

The share of emissions to air allocated to electricity generation =

$$2 * (\text{MWh}(\text{electricity})) / [2 * \text{MWh}(\text{electricity}) + \text{MWh}(\text{heat})]$$

Net energy (net production of heat and net production of electricity) is referred to in the above formula. The definition of net energy is the following:

- The electricity in this calculation is the net electricity, where the part of the working electricity that is used at the power plant to generate the

energy is excluded, i.e. the net electricity is the part that is delivered from the power plant to the pulp/paper production.

The heat in this calculation is the net heat, where the part of the working heat is that used at the power plant.

5.2.3 Emissions of surplus energy

Emissions from surplus energy that is sold off in the form of electricity, steam or heat, is subtracted from total emissions.

5.2.4 Emissions of broke

Broke is waste from production (scrap, strips from cutting the rolls at the paper mill etc.) and is not classified as recycled fibre. Broke used on the same paper machine where it was produced shall not be taken account. If broke is used on other paper machines, the emissions from broke must be calculated from the average emissions and energy consumption of the used pulps. Regarding purchased broke, emissions and energy usage shall be calculated from the average of the used pulps in the paper production/s that gave arise for the broke/s.

5.3 Analyses

5.3.1 Documentation

Documentation requirements for analyses can be found in this document and in the Chemical Module or the Supplementary Module and encompasses:

- Sampling programme for waste water and emissions to air, including sketches of emission points, emission figures for the last 12 months (monthly or annual reports), frequency of measurement and methods of analyses of AOX, COD, P, S, NO_x and chlorate. Annual reports containing emission figures must be submitted to Nordic Ecolabelling annually, see closely requirement O16.
- Documentation showing that the laboratories and test institutions used perform the analyses in an impartial and competent way. For example, a copy of the valid certificate for accreditation including the scope of the accreditation of external and internal laboratory used must be enclosed if the laboratory is accredited.

In case of production conditions that give rise to increased emissions, or if required by Nordic Ecolabelling, new test results shall be submitted.

5.3.2 Analysis laboratories

The analysis laboratory used must be impartial and competent. Raw data must be available for inspection by Nordic Ecolabelling during the period of validity of the licence or as long as the paper constitutes a part of ecolabelled products. The

licence applicant is liable for costs in connection with documentation and analyses.

The analysis laboratory must fulfil the general requirements under standard EN ISO 17025 or be an official GLP-approved analysis laboratory.

The applicant's own analysis laboratory/test procedure may be approved for analysis and testing if:

- the authorities monitor the sampling and analysis process, or if
- the manufacturer has a quality management system encompassing testing and analysis and has been certified in accordance with ISO 9001 or is EMAS registered, or if
- the manufacturer can demonstrate agreement between a first-time test conducted in parallel at an independent test institute and the manufacturer's own laboratory, and that the manufacturer takes samples according to a fixed sampling plan.

Testing and analysis of function may be performed by the producer in an uncertified laboratory, subject to assessment by Nordic Ecolabelling.

5.3.3 Methods of analysis, sampling, frequency of analysis and calculation of emissions

Sampling and analysis must be performed in a competent manner. The methods of analysis described in Table 5.2 and Table 5.3 are approved by Nordic Ecolabelling. As an alternative, methods of analysis considered to be equivalent by an independent and competent body will be accepted.

A copy of the standard and a declaration from the third part verifying that the standard/method used is equivalent to any of the standards listed in Table 5.2 and/or Table 5.3 have to be enclosed.

5.3.4 Emissions to water

Water samples must be taken after treatment of the waste water in a treatment plant and the water flow at the time of sampling must be stated. If the waste water is treated together with other waste water, or if campaigns are run, samples must be taken before the treatment plant and before being mixed with other water. The results of the analysis are then reduced by the efficiency of the treatment plant, which must be documented. Analyses must be performed on unfiltered and unsedimented samples using the methods of analysis specified in Table 5.2.

In the case of continuous pulp and paper production, the annual average value based on at least one representative 24-hour sample per week for COD and P must be used.

In the case of pulp manufacturers using chlorine dioxide for bleaching, AOX must also be measured on the basis of at least one representative 24-hour sample per

week. Chlorates must be subject to at least two representative samples per year, separated by at least four months.

In the event of the introduction of new processes or internal improvements, the level of emissions must be determined based on at least 40 consecutive daily samples. In the case of pulp and paper types produced on a campaign basis, the numerical values must be based on 40 consecutive 24-hour samples. In the case of shorter campaigns, representative daily samples can be accepted for each campaign subject to an assessment by Nordic Ecolabelling, the minimum being 40 samples in total.

The values of the raw water can be subtracted when calculating the result. Raw water is water that is taken into the factory from the outside environment and not from some other process. Analyses must be performed on unfiltered and unsedimented samples once a year using the methods of analysis specified in Table 5.2.

The results must be reported as:

COD: kg O₂/ ADt

P: kg P/ ADt

AOX: kg AOX/ ADt

5.3.5 Emissions to air

Emissions to air of sulphur, S, and nitrogen oxides, NO_x, must be measured at all emission points. Diffuse emissions of sulphur must be reported, e.g. emissions of sulphur during the production of pulp using chemicals containing sulphur.

NO_x is primarily released during combustion processes and accordingly diffuse emissions of NO_x are not expected. The emission values for nitrogen oxides and sulphur in gas form, both in reduced and oxidized form, should encompass all emissions from the production of pulp and paper, including any steam and condensate generated outside the production site. Total emissions must encompass the result of measurements relating to process equipment, for example recycling boilers, lime kilns, tall oil digesters, steam boilers, other boilers, kilns for combusting malodorous gases and the production of electricity generated for internal consumption with the exception of back pressure generated electricity.

In the case of emissions of sulphur to air from various fuels, calculations will also be accepted. These calculations must be based on the sulphur content of the various fuels. Emissions of sulphur from black liquor shall be measured. In the case of oil, the sulphur content is calculated on the basis of one of the methods of analysis provided in Table 5.3. In the case of natural gas, sulphur emissions may be set as equal to zero. Analyses performed by the fuel supplier will be accepted.

The emission figures must be expressed as an annual average value based on the charting of emissions with the aid of representative sampling, measurements and calculations.

Emissions of S and NO_x shall be measured on a continuous basis (for emissions from boilers and reactors with a capacity exceeding 50 MW) or a periodic basis (at least twice a year for boilers and driers with a capacity less than or equal to 50 MW each). In special cases, periodic measurements for emissions from boilers and reactors with a capacity exceeding 50 MW may be accepted by Nordic Ecolabelling. In such case, the number of periodic measurements shall never be less than two per year.

5.3.6 Overview of analysis methods

Table 5.2. Methods of analysis of water samples approved by Nordic Ecolabelling.

Emission parameter	Method	Comments	
AOX	ISO 9562		
	Scan-W 9:89		
	DIN 38409 part 14		
	EN 1485		
	EPA method 1650c		
COD	ISO 6060	Alternatively, TOC can be analysed since the TOC method does not include mercury.	
	ISO 15705		
	SFS 3020	Other photometric methods using potassium dichromate as the oxidization agent and silver sulphate as the catalyst, approved by the appropriate authority, may be used, e.g. Dr. Lange, Hack, WTW or DS 217:1991	
	SFS 5504		
	SS 02 81 42		
	DIN 38409 part 41		
	NFT 90101		
	ASTM D 1252-06		
	NEN 6633		
	HACH 8000		
	5220D		
	5310A		
TOC	ISO 8245	TOC may be used in place of COD if the applicant demonstrates how these two methods of analysis correlate with each other.	
	EN 1484		
	ASTM D4839		
	DIN 38409	The correlation coefficient must be based on a statistically significant number of measurements and be assessed by an independent party.	
	SM 5310C		
	Hach Lange LCK 385		
Phosphorous	SS 02 81 02		
	SFS 3026		
	NS 4725		
	SS 02 81 27		
	SS 02 81 27-2		
	DS 292:1985		
	Hach Lange LCK 349		
	ISO 6878		
	4500-P.A., 4500-P.B. and 4500-P C, D, E, F		
	PND F 14.1:2.106-97		
	NCh2313/15-2009		
	NEN 6604 (Intertek method 1)		
	EPA Method 365.1		

Table 5.3. Methods of analysis of air samples approved by Nordic Ecolabelling.

Emission parameter	Method	Other comments
Sulphur emissions – general comments	Sulphur emissions must normally be measured at all emission points both as reduced and oxidized sulphur. Exceptions may be granted following an assessment of process conditions by an independent body. In the case of incineration plants, sulphur may be calculated on the basis of fuel.	In the case of atmospheric emissions of nitrogen oxides and sulphur, continuous measurements are also accepted if the measurements are calibrated in accordance with the methods described in this table or if approved by the authorities. In the case of measurements of emission from boilers, the boiler must be operated at full loading. Oxygen levels during measurement shall be specified. The measurement must be repeated at least three times.
Sulphur content of oil	ISO 8754:1992	
	ASTM D4294–98	
Sulphur emissions (ox)	NS 4859	
	SFS 5265	
	SS 02 84 21	
	EPA method no.6	
	EPA method no.8	
	NBN T95-201	
	NBN T95-202	
	ISO 7934:1989	
	ISO 7935:1992	
	ISO 11632:1998	
	ISO 10304-1	
	EN 14791	
Sulphur emissions (red)	SFS 5727:1992	
	IP 336	
	SFS 3865	
	EPA method no. 15A	
	EPA method no. 16A	
EPA method no. 16B		
NOx	ISO 10849:1996	An exemption is granted in the case of frequencies of measurements of NOx from natural gas firing.
	SS 02 84 25	
	EPA method no.7	
	ISO-11564:1998	
	DS/ISO 10849	
	EN 14792	
ISO 14181		