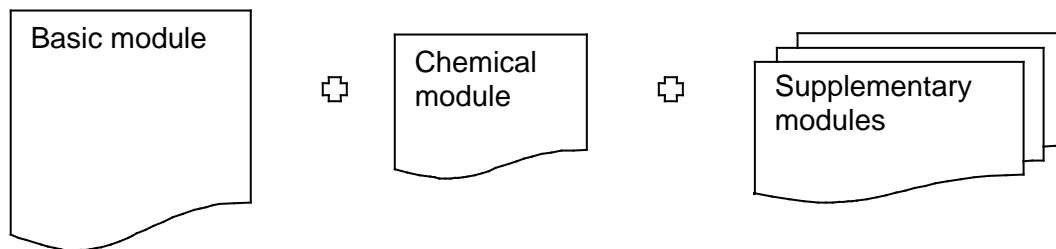


Background memo. Modules for Swan-labelled paper products

Module system

Background to the Basic Module and Chemical Module



This draft of Background document has been in public hearing. Comments from the hearing has not been inserted in this English document. Comments are only inserted in the corresponding Background document written in Swedish language. If information about hearing comments is needed please contact Nordic Ecolabelling.

Draft 21 February 2003. Draft Translation 14 April 2003.

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1. Summary

This background document outlines the requirements provided in "Basic Module. Criteria for Swan-labelled paper products. Draft proposal" and "Chemical Module. Criteria for Chemicals used in Swan-labelled Paper Products".

The Swan label encompasses a range of different paper products, each of which has, to date, had its own set of criteria. Nordic Ecolabelling's intention is now to harmonize some of these requirements while at the same time keeping other requirements separate. For this reason the structure of the criteria for coffee filters, envelopes and for greaseproof paper and greaseproof paper for baking purposes has been adjusted. The intention is that the criteria for the remaining paper products, i.e. "soft paper" (tissue paper, kitchen rolls etc.), printing paper, packaging paper and sanitary products will over time be given the same structure.

The characteristic feature of the new structure is that those requirements that are harmonized are described in a basic module. The chemical requirements that are harmonized are described in a chemical module. The reason that the chemical requirements are not included in the basic module is that these requirements are documented by subcontractors and suppliers, and accordingly it is more practical for the description of chemical requirements to be sent directly to these subcontractors.

Requirements applicable only to individual paper groups are described in supplementary modules for the product group in question. An example of a requirement that is described in a supplementary module is the requirement that Swan-labelled coffee filters must for health reasons not be made from recycled fibre. This requirement is contained in the Supplementary Module for coffee filters.

The requirements in the Basic Module and the Chemical Module apply *unless the Supplementary Module specifies otherwise*. This means that the requirements in the Supplementary Modules may be stricter, less strict or merely different from the requirements in the Basic Module. This also means that the requirements described in the Basic Module will provide the point of departure when the criteria for printing paper, soft paper, packaging paper and sanitary products are amended, but that they will not necessarily be the same. If convincing arguments can be presented that a paper group should have different criteria to those found in the Basic Module, then these arguments will be followed.

It should be noted that a licence will not be awarded solely on the basis of the requirements in the Basic Module and the Chemical Module. The requirements in the Supplementary Module must also be fulfilled. Paper that is not encompassed by any of the Supplementary Modules (or by the existing criteria) will not qualify for a licence.

Some paper groups have been subject to requirements relating to particular environmental effects that have not applied to other groups. The introduction of modules will entail that the applicable requirements will become more uniform. This means, for example, that energy requirements will be introduced for coffee filters and greaseproof paper, which were not previously subject to such requirements.

In addition to the changes to the structure of the criteria document, the level of the requirements has been made more stringent. The main changes to the technical requirements are described below:

Forestry: In the existing criteria for soft paper and printing paper there are minor differences between the structures of the forestry requirements. The point of departure in the Basic Module is the way in which the requirement is worded in the criteria for tissue paper. In addition, the requirement as to the proportion of wood taken from certified forestry operations has been increased to 20%, whereas the requirement as to the proportion of recycled fibre lies midway between the requirements in the printing paper document and those contained in the soft paper document.

The chemical requirement has the same structure as in the criteria for printing paper and soft paper. Previously, the colour requirement was confined to the criteria for soft paper. This has now been included in the Basic Module. The requirement relating to the disclosure of information on the full composition of all organic chemicals present in quantities in excess of 1kg/tonne 90% pulp or paper has been removed. In addition, certain minor changes have been made to the requirements.

Energy: This requirement has the same structure as in the criteria for printing and tissue paper but the level of the requirement has been made stricter. Previously, the score requirement for fuel was max 1.5 points. This requirement has now been tightened up to 1.25%. The requirement as to electricity remains unchanged. In the past some of the paper groups were not subject to energy requirements. This has now been changed.

Emissions: The requirement has the same structure as in the criteria for printing and tissue paper and has been made more stringent in two respects: the reference values have been adjusted, primarily in relation to what are termed BAT-values¹. This means that several of the emission requirements have been made stricter. Moreover, the score requirement has been made stricter. The formula for calculating emissions has been changed to make it more accessible for applicants and to allow emissions from paper machines to be assessed separately. However, the end result is not altered by this change to the wording, the change has come about as a result of the new reference values and score requirements.

2. Introduction and background

The purpose of this document is to outline the background to the requirements contained in "The Basic Module. Criteria for Swan-labelled paper products. Consultative proposal". At the same time it provides applicants, consumers and other interested parties with the arguments underlying the requirements.

The document was compiled in connection with the revision of the Swan criteria for coffee filters, greaseproof paper and envelopes. During the revision process, work commenced on adjusting the general structure of the criteria for paper products for which Swan licences are granted. A secretariat group has been responsible for the work on changing the structure and compiled this document. The group contacted experts to clarify specific questions, but no dedicated technical group was established.

Nordic Ecolabelling has criteria for the paper products listed below. Until now, the criteria for the individual paper group have been described separately and have also been revised separately. The periods of validity of these criteria documents are specified in the following table:

¹ Best Available Technique. IPPC-rapporter xx

Table 1. Overview of the periods of validity of paper products covered by the Nordic Ecolabelling scheme. "No." refers to the product group number. "Vers." is the version number of the criteria document. "Amended on" is the date on which minor changes were introduced between revisions. Printed matter is an end product of printing paper and is shown for reference purposes.

No.	Name	Vers.	Valid from	Valid until	Amended on	No. licences
34	Wall coverings *)	2.1	20-04-1998	14-03-2003	15-06-1999	0
47	Coffee filters	1.6	03-05-1996	14-06-2004	15-03-2002	5
49	Greaseproof paper	2.2	15-06-1998	14-06-2004	15-03-2002	2
5	Tissue paper	3.3	16-06-2000	29-10-2004	12-12-2001	30
50	Packaging paper	1.5	10-12-1998	14-03-2005	12-12-2001	0
14	Paper envelopes	3.3	15-06-1998	14-06-2005	11-06-2002	10
44	Printing paper	2.5	03-12-1999	31-01-2006	15-03-2002	25
41	Printed matter	3.1	21-03-2001	14-03-2005	17-12-2002	343
23	Sanitary products	4.1	27-09-2001	27-09-2004	03-10-2002	5

*) Ceases to apply in March 2003 and will not be renewed

When Nordic Ecolabelling criteria are adopted, the environmental impact of the product throughout its life cycle is assessed when the requirements are fixed attention is also focussed on market conditions and on the RPC of the individual requirement (relevance, potential and controllability).

Measured in terms of number of licences, printing paper and tissue paper are the two product groups in the paper category in which the Swan has achieved the highest penetration.

The main requirements relate to the production of the paper, the aim being to reduce environmental impact by imposing requirements that promote

- the use of wood raw materials from sustainable forestry
- the use of environmentally-adjusted chemicals
- low emissions to water and air
- low energy consumption
- sorting at source and recycling of waste
- eco and quality assurance
- satisfactory product quality

As noted, the criteria document for the individual product groups have been revised separately and with the assistance of different technical groups. The result has been that although the overall goal has been to achieve a certain degree of harmonization between the various criteria, there have been differences on certain points.

The overview in Appendix 1 shows the criteria imposed in the various criteria documents. Sanitary products are not included. These products have cellulose pulp requirements in common with tissue paper as well as their own requirements as to plastics and other constituent materials.

As will be seen in the overview in the table in Appendix 2.1, there are a variety of differences between the criteria for the various products. Some of these differences should continue to apply, whereas others have come about because there has been no deliberate process of harmonization of criteria. In order to harmonize those criteria that should be alike, but still retain separate requirements where this is justified on grounds of utility, technological scope or otherwise the structure of the criteria documents will be altered.

Joint modules will be introduced for those of the criteria that need to be harmonized:

- A basic module for environmental effects that are documented by employees on the factory site. In other words, energy consumption, emissions to water and air and the processing of waste from the production of cellulose pulp and paper. This module is structured in such a way that it makes clear which criteria apply to cellulose pulp and which apply to paper production.
- A module for chemicals used in the production of cellulose pulp and paper. These chemicals are specified in a separate module because they are documented by subcontractors.

"Supplementary documents" will also be introduced containing criteria that are specific to the individual product group.

- Criteria documents for coffee filters, greaseproof paper and greaseproof paper for baking purposes, packaging paper, envelopes, soft paper and printing paper.

The Basic Module and the Chemical Module contain calculation methods and requirements. The requirements apply to all paper products unless the individual Supplementary Module specifies otherwise. Thus the requirements in the Basic Module and the Chemical Module are what might be termed default requirements. One example of this is the requirement as to fibre raw material: the common requirement is that a certain portion of the fibre raw material must derive from sustainable forestry operations or must be recycled fibre. An exception applies in the case of coffee filters and greaseproof paper: for reasons of hygiene these must not be made of recycled paper. This exception will be specified in the supplementary modules. The supplementary modules also describe factors that are relevant only for end manufacturers, such as rules governing marketing and the use of the Swan logo.

As a result, the supplementary modules for the individual paper products will be considerably shorter than the criteria documents that formerly applied to the same products. This because most of the requirements will take the form of references to the Basic Module and the Chemical Module. In terms of length, the Basic Module and the Chemical Module will be more or less of the same size as the former criteria documents for printing paper or tissue paper.

Nordic Ecolabelling hopes that the overall effect of the module format will be that pulp and paper used in paper products intended for different purposes will be subject to environmental requirements that are as uniform as possible. The goal is also to make it easier for manufacturers supplying several types of pulp or paper to document compliance with the requirements. The modules take account of the environmental differences between various processes used in the production of pulp and paper. Total emissions and total energy consumption in the process as a whole are compared with reference values for the various processes.

As noted earlier, most chemical requirements are described in a separate module entitled "Chemical Module. Criteria for chemicals in Swan-labelled paper products. Draft Proposal". Those requirements that have been made stricter in relation to the individual paper group can be seen from the background document for the individual paper group. Details can also be found of the supplementary requirements applicable to chemicals, for example for coffee filters in connection with their use in contact with foodstuffs. It is Nordic Ecolabelling's hope that providing a description of the chemical requirements in a separate module will be useful, in view of the fact that most of the documentation is provided by chemical suppliers. It is useful to be able to send a total description of the requirements to the individual supplier together with forms for the suppliers to complete.

The requirements as to waste processing and eco and quality assurance have been adapted to equivalent requirements in other Nordic Ecolabelling criteria and are described in the Basic Module.

An overview of the new modules is provided below. Criteria are in force for all the product groups. Some of these have been adjusted to the module system and circulated for review.

As noted earlier, this background document discusses the requirements and changes in the Basic Module and the Chemical Module. The wordings of the requirements are shown in the background document's chapters on requirements as to forestry, energy consumption, emissions, chemicals, waste and performance properties. The wording is shown in order to make the document less cumbersome to read and to provide a document that is divided up in accordance with environmental themes. It is true that the Basic Module and Supplementary Modules too are divided up on the basis of environmental themes, but they are also divided up in accordance with stages in the manufacturing process, i.e. in a way that shows who is responsible for documenting the individual requirement. This makes it more difficult to read the requirement for the entire production chain unless the requirement is also examined here in the background document.

Table 2. Overview of the titles in status of the module criteria

Title of module	Status	Contents
Basic Module. Criteria for Swan-labelled paper products	Consultation ongoing 12 Feb. - 11. April 2003	Criteria applicable to all Swan-labelled paper products unless otherwise specified in the Supplementary Module. Basic criteria for chemicals found in separate module.
Chemical Module. Criteria for chemicals for Swan-labelled paper products	Consultation ongoing 12 Feb. - 11. April 2003	Basic criteria for chemicals. Apply to all Swan-labelled paper products unless otherwise specified in Supplementary Module.
Supplementary Module. Criteria for Swan-labelled coffee filters.	Consultation ongoing 12 Feb. - 11. April 2003	Criteria for coffee filters. Contain both references to Basic Module and Chemical Module and specific criteria for coffee filters. The specific requirements may be additional requirements or exemptions from requirements.
Supplementary Module. Criteria for Swan-labelled envelopes	Consultation ongoing 12 Feb. - 11. April 2003	Criteria for envelopes. Structured in the same way as the coffee filter document.
Supplement Module. Criteria for Swan-labelled greaseproof paper	Consultation ongoing 12 Feb. - 11. April 2003	Criteria for greaseproof paper and greaseproof paper for baking purposes. Structured in the same way as the coffee filter document.
Supplementary Module. Criteria for Swan-labelled tissue paper	Not compiled	Criteria for tissue paper. Structured in the same way as the coffee filter document.
Supplementary Module. Criteria for Swan-labelled printing paper	Not compiled	Criteria for printing paper. Structured in the same way as the coffee filter document.
Supplementary Module. Criteria for Swan-labelled packaging paper	Not compiled	Criteria for packaging paper. Structure in the same way as the coffee filter document.
Supplementary Module. Criteria for Swan-labelled sanitary products	Not compiled	Criteria for sanitary products. Structured in the same way as the coffee filter document.

Criteria and check list in one document

In addition to the restructuring of the documents, the layout of the criteria has also been adjusted. In the past these documents were intended only to describe the applicable criteria. Now, however, it is the intention that the document should also function as a check list for applicants. There are spaces in the right margin of the Basic Module, Chemical Module and the Supplementary Modules to allow applicants, paper manufactures and pulp manufacturers to enter references to appendix numbers and the like.

The products encompassed by the Swan label

The following paper types are encompassed by the Swan label:

- Printing paper
- Tissue paper
- Envelopes
- Coffee filters
- Greaseproof papers
- Packaging papers

Other paper products may be added later if supplementary modules with criteria are developed for the products in question. The fibre raw material used in Swan labelled paper products may be either collected paper (recycled paper) or fibres from trees or other plants.

The period of validity of the document

It is proposed that the Basic Module should remain in force for three years after the date on which it is adopted, i.e. until 2006. The period of validity of a licence is related to the Supplementary Module. A different period of validity applies to the Supplementary Module. The Supplementary Module defines the version of the Basic Module to which it refers. The Supplementary Module specifies when licences are to be renewed.

Historical background (renewals and extensions)

Please refer to the last section on the period of validity of the individual paper criteria documents.

Historical overview of major changes

This historical overview covers only printing paper and tissue paper, which were used as the points of departure for the structure of the Basic Module. The precursor to the criteria for printing paper was the criteria for fine paper (photocopying paper). This document was valid between 1993 and 1996, and there were two versions: 1 and 2. When criteria for printing paper were established in 1996, graphic paper was also included. The criteria for printing paper remained in force until 2000. They were revised with the assistance of a technical group and requirements as to forestry, energy and extended chemical requirements were introduced. Adjustments have been made to the forestry and chemical requirements during the current period of validity which remains in force until 2006.

Graphic paper is used for printed matter that is encompassed by the Swan label. The criteria for Swan-labelled printed matter provide that the paper must be Swan-labelled or fulfil the requirements as to the Swan labelling of printing paper. This entails that Nordic Ecolabelling must not only consider applications for licences for the Swan labelling of printing paper, but must also review the documentation on the paper used in Swan-labelled printed matter. Information on these paper qualities is not made public. Printers with licences to produce Swan-labelled printed matter are supplied with information on those qualities of the paper they use that fulfil the requirements. Paper with an ecolabel under the European Flower Scheme, criteria for copying paper and graphic paper (approved in September 2002 or later) is also accepted. The level of the requirements in the Flower criteria is very similar to the level in the Basic Module. It is therefore suggested that the use of Flower-labelled paper in Swan-labelled envelopes should be accepted.

The criteria for tissue paper were first adopted in 1992. At that time the criteria applied only to toilet paper and "household paper". New criteria were adopted in 1996. The product group was extended to all forms of "soft paper", i.e. paper that has not been laminated with other types of materials. These criteria remained in force until 2001. The criteria were revised with the assistance of a technical group and requirements as to forestry, energy and extended chemical requirements were introduced. The changes were based on the changes that had already been made to the criteria for printing paper. Moreover, adjustments to the forestry and chemical requirements have been reflecting those introduced in the criteria for printing paper have also been added during this present period of validity, between 2000 and 2004.

3. Other legislation etc. in this area

This section discusses other labelling schemes, regulation by the authorities as well as other mechanisms, industry agreements etc. The section demonstrates that ecolabelling is justified even though these other measures are in force.

Other labelling schemes

Industry uses a number of means of showing its commitment to the environment. Generally, these means can be classified as eco management, environmental product declarations and ecolabelling.

Eco management

Eco management systems allow companies to put their own houses in order and to define their own objectives for environmental improvements. Eco management systems do not contain specific requirements (threshold values) for products or production. For a company to be certified, it must be checked by an impartial third party, e.g. Det Norske Veritas. The main schemes are EMAS, which was developed within the EU, and ISO 14001 which is an international standard. These schemes are not visible externally. The system does not provide for the exclusion of undesirable products or activities.

Environmental product declarations

Environmental product declarations provide detailed environmental information but impose no requirements on the products themselves. Facts are presented neutrally since there is no predetermined level of requirements. The utility of product declarations will depend on the purchaser's knowledge of the environmental issues pertaining to the product in question. Production declarations are therefore of most use to very professional purchasers who also have time to make comparisons.

At present there is no international system for environmental product declarations, although work is underway on such a system within the ISO. In addition, systems are being developed by various industries, e.g. the paper industry. One self declaration system of this type is Paper Profil² which is operated by the paper industry and covers a number of environmental parameters, e.g. the certification of wood, emissions, purchased electricity and quantity of waste land filled. As with eco management, this system does not provide for the exclusion of environmentally undesirable products or activities.

Ecolabelling

Of all the systems discussed, ecolabelling is the system that makes it easiest for consumers to choose the products with the lowest environmental impact. Products are approved on the basis of specific environmental requirements and all the difficult assessments with regard to the environmental effects of the products are performed by the organizations that operate the systems. Ecolabelling schemes exclude products that do not satisfy their requirements and an independent third party verifies that the products fulfil the requirements.

In addition to the Nordic Ecolabel, the Swan label, there are other ecolabels operating within the area of paper. In Sweden, the Swedish Society for Nature Conservation operates a label known as Bra Miljöval (Good Environmental Choice). The Blaue Engel scheme operates in Germany. Within the EU the Flower label applies to photocopying paper, graphic paper and soft paper. To date the Swan label has proved to be very successful, presumably because so much of the cellulose pulp and paper used in Europe is produced in the Nordic countries.

² Paper Profile, <http://www.paperprofile.com/>, 20. januar 2002

The Swan label is also widely known within the paper industry outside the Nordic countries, accordingly there are a number of foreign licence holders. The Flower label drew on the experience of Nordic Ecolabelling when revising its criteria. By the same token, Nordic Ecolabelling seeks to harmonize its requirements with those of the Flower scheme, where appropriate. Other national ecolabelling schemes have preferred to simply incorporate the criteria of the Swan label in their own national schemes, as is the case in the Netherlands and New Zealand.

We have experienced that certain paper corporations have turned away from Nordic Ecolabelling as a result of mergers and the formation of large multi-national companies. However, several of these have opted for Nordic Ecolabelling to assess their printing paper so that they can continue to supply Swan-labelled printed matter. Thus, the work that Nordic Ecolabelling has laid down in maintaining the criteria has had an environmental effect, even though the corporations themselves have preferred not to hold licences on their paper. Instead their contact with Nordic Ecolabelling has been via printers.

Conversely there has recently been an increase in interest in Swan labels for other products than printing paper. Accordingly, the conclusions must be that the Swan label will continue to play an important role in the work on reducing the environmental impact of paper use. In performing this role, Nordic Ecolabelling will not only interact directly with licence holders, but will also operate indirectly in relation to other ecolabels and in relation to paper manufacturers supplying paper for Swan labelled printed matter.

Legislation

There are legal regulations governing the production of cellulose pulp and paper in force in all the Nordic countries and, presumably, in most other countries outside the Nordic countries. Typically these regulations apply to working conditions and to the external environment. Regulations relating to the external environment generally encompass emissions to water, emissions to air and the disposal of chemical waste and other hazardous waste. Furthermore, the use of certain chemicals may be subject to regulations governing both the working environment and the external environment.

The Swan requirements relate primarily to the external environment and are generally stricter than the requirements laid down by the authorities. However, there may be production facilities located in particularly sensitive natural surroundings that may be subject to particularly strict requirements with regard to certain environmental effects. The Swan label criteria also encompass other environmental effects than those that are usually encompassed by the regulations laid down by the authorities. One example of this is energy consumption. Moreover, certain Swan label requirements that are aimed primarily at the external environment, will also impact upon the working environment. By and large these are chemical requirements and requirements as to sorting production waste and hazardous waste on site.

The objective of the regulations laid down by the authorities is to exclude facilities that the authorities would rather did not operate. The objective of the Swan label is to encourage/promote products that have been produced under conditions that take account of the environment. Accordingly, there is a role for Swan label even where the requirements of the authorities function smoothly.

4. Survey of the market

In order for the environmental improvements sought by an ecolabel like the Swan label to have an effect, it is important that the label should encompass products that are used in large numbers.

The following market overview is based on figures from the mid and late 1990s. The market overview was not updated during this revision. Nevertheless, Nordic Ecolabelling has no information to suggest that consumption has changed significantly. Even so, the relative quantities of imports and exports may have changed in line with the establishment of new production facilities in the Far East. Based on the information in the overview, consumption in the Nordic countries totals approximately 7 million tonnes. This is equivalent to 280 kg per head of the population per year, assuming a population in the Nordic countries of approximately 25 million people. The Danish EPA has calculated consumption in 1999 to be 250 kg per head of the population, i.e. slightly lower than the figure calculated by Nordic Ecolabelling.

Paper products are used in such large quantities that the operation of a Swan labelling scheme for these products is justified.

Table 3 The penetration of the Swan label on the Nordic market

	Coffee filters	Grease-proof paper	Envelopes	Packaging paper	Tissue paper	Printing paper
Production		90,000 t	52,000 t	7.7 million tonnes	0.5 million tonnes	14.2 million tonnes
Imports				0.6 million tonnes	0.12 million tonnes	1 million tonnes
Exports				6.5 million tonnes	0.15 million tonnes	10.5 million tonnes
Consumption	3000 million 35 mill EUR	10,000 t	5.5 billion 1.1 mill. FIM	1.8 million tonnes	0.48 million tonnes	4.8 million tonnes
Information from (year)	mid-1990s	1997	1996	1996	1997	1998

5. Overall environmental impact of the product (Relevance and Potential)

In the following a brief outline is provided of the main environmental problems caused by paper products. The discussion is based on information from past criteria documents as well as from the literature. The following chapters 6 to 11 discuss environmental effects in more detail as well as explaining the background to the requirements.

Raw materials

Fibre is the dominant raw material in the production of paper. Fibre raw materials are based on wood or other plants or on used paper. Forestry operations can reduce biodiversity and threaten the rights of indigenous populations. As certified sustainable forestry operations become more widespread, the potential for achieving environmental improvements grows. Sometimes, a particular production method might appear to be better than others, but when looked at more generally, the situation can prove to be more complicated. For example, the method used for bleaching will have an effect on strength, since under otherwise identical conditions ECF bleaching will result in a stronger fibre than is the case for TCF with the same degree of brightness. TCF is therefore used where strength is not of decisive importance but where entirely chlorine-free bleaching is of paramount importance. The consequence of this can be that the quantity of wood

used in the production of one tonne of paper can be up to 50% higher than if ECF bleaching is used.

Extracting energy raw materials also affects the environment. Energy is used in the extraction of coal, oil, gas, wood etc. Generally, however, the quantity of energy consumed will be low in comparison with the quantity of energy acquired. A variety of different chemicals is used in the extraction of energy. Since manufacturers of pulp and paper have no influence over what chemicals are chosen, these chemicals are not encompassed by the criteria.

A number of chemicals are also used in the production of pulp and paper. In terms of the quantities used, fillers are the most prevalent. Investigations have been conducted into the environmental impact of filler production. This is discussed in the section on environmental factors in respect of which requirements are not imposed.

Production

The production of cellulose pulp and paper affects the environment in a number of ways. Overall, the environmental impact of cellulose pulp production is greater than the environmental impact of paper machines.

Energy

A great deal of energy is expended in the production of cellulose pulp and paper. Although some of this energy derives from renewable sources, a significant part comes from non-renewable resources. Electricity is often purchased from the public electricity grid. The generation of electricity affects the environment. Depending on the energy form used to generate electricity, there will be air pollution and residual products that require disposal and the habitats of animals will be disturbed. Various energy experts and scientists have pointed out possibilities for energy saving in the production of pulp and paper. Saving energy reduces environmental impact. In integrated production, no drying is required between the pulp plant and the paper plant. Plants in which sulphate pulp is produced are often self-sufficient in heat and are sometimes able to sell off surplus heat. This is because a smaller proportion of the wood is used in the pulp. Other types of pulp plant also generate residual products, albeit in smaller quantities, since a greater portion of the wood is used in the pulp itself. The remaining part of the wood can accordingly be used as energy. In addition to heat, the residual products of the wood can also be used in the generation of electricity. If energy saving is applied in the pulp plant, residual energy can be sold off as bio fuel to other businesses or private individuals.

Emissions

Emissions are released during the production of cellulose pulp and paper. Emissions to water include substances that result in over-fertilization (N and P) or distort the balance between N and P. This results in an increase in algae and oxygen deficit. Accordingly, the effect is the same as when COD is released by factories. This too consumes oxygen and causes sea-bed die back. The emissions also include residual chemicals from the bleaching process and auxiliary substances from the production process. Air pollution originates in part in the production process itself and in part in energy consumption. Air pollution encompasses acidifying substances, substances that result in over-fertilization and carbon-dioxide and substances that contribute to the greenhouse effect. The variations between the emissions from various production processes suggest that it is possible to achieve improvements in many plants.

Chemicals

Chemicals with a variety of negative effects are used. Some do not break down readily in the environment and may accumulate in plants and animals. Others are carcinogenic or cause hormonal disturbances. The work on the last version of the printing paper and tissue paper criteria revealed that it is in fact possible to replace or restrict chemicals that produce undesired effects.

Waste

Waste products are formed during the production process. The production of paper from virgin fibre results in residual products such as bark and fibre remains. Recycled paper results in large quantities of sludge consisting of fillers and printing ink from the paper that was recycled.

After the consumer has used the paper, it ends up as waste. Toilet paper is removed in the sewage system. Household paper, for example, kitchen rolls and paper serviettes, are removed as domestic rubbish, after which it is burned, composted or dumped in landfill sites. Office paper and paper for printed matter is either burnt, composted, dumped in landfill sites or collected for recycling. In Sweden, just over 60% is collected for recycling, in Norway and Denmark the figure is about 50% and in Finland about 70%.

Burning paper can serve as a replacement for non-renewable energy sources such as coal, oil and natural gas thereby providing an environmental benefit. Reusing paper also saves resources since the production of paper from virgin fibre requires more resources than if recycled fibres are used. It is not the case, however, that all environmental effects are reduced if recycled paper is used - for example carbon dioxide emissions will often be higher if the recycling plant is located in an area in which wood is not available as a source of energy at competitive prices. If paper is dumped in a landfill site, it loses its thermal value and its value as a raw material in other paper or board products. Reuse of paper fibre is restricted to between 5 and 8 times. After this, the fibre becomes worn.

The potential for improvements in the production process starts with good sorting at source. Here, an overview of quantities and types is helpful.

The following sections provide more details of environmental effects and on the background to the criteria applicable to Swan-labelled paper products.

6. Forestry

The environmental impact of the product relating to forestry

Generally, paper products consist of at least 50% wood from forestry operations. Certain types of paper may be made of other plant fibres and some types of paper may contain up to 50% filler. The type of wood used in the paper and the way in which the forests are managed are key parameters in the assessment of the environmental impact of paper.

The forests of the world cover a greater proportion of the planet than any other eco system on land and key ecological, economic and social interests are associated with forestry operations. Well over half of the life forms on earth live in the forest³. According to WWF Norway the figure for Norway is even higher: of the approximately 24,000 known species, about two-thirds rely on forest habitats. Half of the original first growth forests of the earth have already disappeared, most during the last three decades. Of the remaining forests three-quarters are threatened with extinction. Between 1980 and 1995 we lost 180 million hectares of forest. This is equivalent to an area the size of Indonesia or Mexico⁴.

³ Data from WWF Norge's forestry programme, <http://www.wwf.no/core/skog/index.asp>

⁴ Protection and certification of forests - easier abroad than at home? Jon fosse, WWF Norge, http://www.wwf.no/core/miljo_og_utvikling/200106_tema_skog_sertifisering.asp

Background to the requirement that wood must derive from certified forestry operations

Sustainable forestry is essential in order to allow the resources of forests to continue to be exploited in the long term and in order for the rights of indigenous peoples to be protected. Sustainable forestry is also important in order to avoid disturbing the natural eco-system to an excessive degree, to retain biodiversity and to enable forests to be used for recreational purposes. At the same time we are only too aware that the availability of wood from certified forestry operations is limited. Availability is expected to increase in the not too distant future.

Work on developing criteria/standards and certification schemes for sustainable forestry has been going on for many years in the Nordic countries and elsewhere. In Sweden and Denmark this work is inter alia conducted under the auspices of the Forest Stewardship Council (FSC), in Norway through the Living Forests project and in Finland through the Finnish Forest Certification Systems. A common feature of all these programmes is that social, economic and environmental interests have been represented during their development. Other countries too, in for example Asia and America and elsewhere in Europe, work is under way on producing standards for sustainable forestry, under the auspices of for example FSC, PEFC (Pan European Forest Certification) and other organizations.

In view of the fact that various criteria/standards and certification schemes for sustainable forestry already exist, Nordic Ecolabelling decided against establishing its own standards and certification schemes. Any system that fulfil the requirements defined in our criteria will be approved. Lists of the standards approved at any time are available from the Nordic ecolabelling secretariats. Forestry standards are reviewed and approved in connection with licence applications to Nordic Ecolabelling. Forestry certification must be conducted via what is known as third party certification on the basis of an applicable forestry standard.

The forestry requirement in the Basic Module

In the Basic Module the requirements as to forestry are provided in section 1.6 (paper manufacturers) and 2.6 (pulp manufacturers).

The requirements imposed on paper manufacturers as regards fibre raw materials

Preconditions:

The forestry requirement applies only to fibre from wood raw materials. In the case of other plant fibres, e.g. cotton fibres, there are at present no requirements as to cultivation methods.

The requirements in the Supplementary Module may be more or less strict than the requirement in the Basic Module if special circumstances relating to the type of paper in question so require, for example pulp for coffee filters may consist only of virgin fibre.

Requirements:

The paper manufacturer must work to ensure that fibre raw materials (wood) do not come from forestry environments with a great need for protection for biological and/or social reasons. The licence may be revoked if it is found that fibre raw materials from such environments have been used. This requirement is documented by the pulp manufacturer.

Annually at least

- 1) 20% of the fibre raw material in the paper must come from certified forestry operations

or

- 2) at least 75% of the fibre raw material in the paper must be recycled fibre

or

- 3) a combination of 1) and 2). If the fibre raw material in the paper consists of less than 75% recycled fibre, the proportion of fibre raw material based on certified forestry operations from sustainable forestry must be calculated using the following formula:

Requirement as to the proportion of certified fibre raw material in the paper (%) = $20 - 0.26x$

where x = the proportion of recycled fibre.

The proportion of fibre raw material in the paper taken from certified forestry operations is calculated as a weighted total of the proportion in each ingoing pulp.

Exception to the requirement concerning fibre raw material from certified forestry operations. Nordic Ecolabelling may in certain cases consent to the granting of a licence even if the wood used in production has not been certified in accordance with an approved forestry standard. This will apply if documentation of some other credible type can be provided that the fibre raw material in the paper (in the same proportion as the requirement as to the fibre raw material from certified forestry) is based on wood from a sustainable forestry operation and fulfils the same level of requirements. If applicable this must be documented by the pulp manufacturer.

Definitions:

A certified forestry operation is a forestry operation that is managed in accordance with standards that fulfil Nordic Ecolabelling's requirements as to sustainable forestry, see Appendix 1 to the criteria in the Basic Module.

Fibre raw materials may consist of virgin fibre from timber and sawmill chippings. Sawmill chippings can be subdivided into cuttings and by-products. By-products are woodshavings and sawdust. Recycled fibres come from paper that has been used by consumers, i.e. post consumer paper fibre.

The forestry requirement may be formulated in a different way in the supplementary modules, for example by-products (chippings or sawdust) may be exempted from the requirement that there be 20% fibre raw material from certified forestry (envelopes) or that recycled fibre may not be used in certain products (coffee filters and grease-proof paper).

Documentation:

- Information on the proportion of fibre raw material from certified forestry operations and the proportion of recycled fibre in the paper and in each ingoing pulp. Calculations showing that the forestry requirement has been fulfilled must be attached.
- Documentation of the proportion of fibre raw material from certified forestry operations and the proportion of recycled fibre used during the preceding year must be submitted to Nordic Ecolabelling by 1 April of each year during the period of validity of the licence.

The requirements imposed on pulp producers as regards fibre raw materials

Main principles

The forestry requirement applies only to fibre from wood raw materials. In the case of other plant fibres, e.g. cotton fibres, there are at present no requirements as to methods of cultivation.

Requirements:

- The pulp manufacturer must ensure that fibre raw materials (wood) do not come from forestry environments with a great need for protection for biological and/or social reasons. The licence may be revoked if it is found that fibre raw materials from such environments have been used. This requirement does not apply to recycled fibre.
- The pulp manufacturer must document the proportion of fibre raw material from certified forestry operations and the proportion of recycled fibre in the pulp as specified below.

- In the case of fibre raw material from certified forestry operations the pulp manufacturer must submit documentation on the forestry standard, certification system and certification body as described in Appendix 1. The system for tracing the same fibre raw material from the timber stage and until the gate of the pulp factory must also be described. A certificate signed and approved by the certification body must be submitted to Nordic Ecolabelling. Nordic Ecolabelling may require the submission of further documentation in order to assess whether the requirements relating to standards and certification systems have been fulfilled.

The proportion of fibre raw materials in the pulp deriving from certified forestry operations is calculated either by:

1. using the total proportion of fibre raw material from certified forestry operations purchased annually by the factory, assuming that fibre raw material from certified forestry operations is present in all pulp types. In this approach the proportion will be the same for all pulps produced by the mill;
or
2. by calculating the input in each individual pulp type for the year as a whole. Here documentation must be submitted on the system used for tracing fibre raw materials from certified forestry operations within the factory. In the case of pulps containing several wood types the proportion of fibre raw material from certified forestry operations is calculated as the total of the weighted proportion of each wood type based on an annual average. (The proportion of fibre raw material from certified forestry operations is multiplied by the proportion of the wood type in question in the pulp. The figures for all wood types are then added up.)

Exception to the requirement concerning fibre raw material from certified forestry operations. Nordic Ecolabelling may in certain cases consent to the granting of a licence even if the wood used in production has not been certified in accordance with an approved forestry standard. This will apply if documentation of some other credible type can be provided that the fibre raw material in the paper (in the same proportion as the requirement as to the fibre raw material from certified forestry) is based on wood from a sustainable forestry operation and fulfils the same level of requirements. If applicable this must be documented by the pulp manufacturer.

Definitions:

A certified forestry operation is a forestry operation that is managed in accordance with standards that fulfil Nordic Ecolabelling's requirements as to sustainable forestry, see Appendix 1.

Fibre raw materials may consist of virgin fibre from timber and sawmill chippings. Sawmill chippings can be subdivided into cuttings and by-products. By-products are woodshavings and sawdust. Recycled fibres come from paper that has been used by consumers, i.e. post consumer paper fibre.

Documentation:

- Name (in Latin and a Nordic language) and geographical origin (country/state and region/province/municipality) of the species of wood used. In the event of uncertainty about fibre raw materials deriving from forestry environments with a high need for protection for biological and/or social reasons, the Nordic Ecolabelling may require further documentation.
- Information on the proportion of recycled fibre in the pulp.
- Information on the proportion of fibre raw material from certified forestry operations in the pulp. Calculations and information on the traceability of the pulp mill must be attached.
- Description of the system used to secure the traceability of wood up to the gate to the pulp mill.

- A copy of a certificate duly signed and approved by the certification body. The name of the certification system must be stated.
- Copy of the forestry standard and the name, address and telephone number of the organization by which the standard was formulated, as well as the final report of the certification body.
- References must be provided to persons representing parties and stakeholders invited to participate in the development of the forestry standard.
- Nordic Ecolabelling may require the submission of further documentation in order to determine whether the requirements relating to standard and certification system have been met.
- Documentation of the proportion of fibre raw material from certified forestry operations and the proportion of recycled fibre used during the preceding year must be submitted to Nordic Ecolabelling by 1 April of each year during the period of validity of the licence.

The background to the level of the requirements as to forestry

Forestry requirements for paper products were first introduced in the criteria for printing paper in 1999. The requirement at that time was set at 15% fibre raw material from certified forestry operations or that at least 50% of the fibre raw material was to be recycled fibre or fibre raw material from sawdust/cuttings and waste wood from sawmill operations. The criteria for tissue paper, which were revised in 2000, specify that at least 15% of the fibre raw material must be from certified forestry operations or that the paper must contain 100% recycled fibre.

On the basis of experience from processing applications for licences for printing paper, tissue paper and printed matter (where the paper must fulfil the requirements in the criteria for printing paper) it has been concluded that the requirements as to the proportion of fibre raw material from certified forestry operations can be increased to 20%. The availability of wood from certified forestry operations is increasing steadily, although the availability is very low in some regions. Paper manufacturers can to a certain extent compensate for this by purchasing market pulp.

If it is not possible to fulfil the requirement as to the proportion of wood from certified forestry operations, at least 75% of the fibre raw material must consist of recycled paper. This proportion must not include sawdust and chippings as provided for in the criteria for printing paper. On the other hand, the supplementary modules may contain exemptions from the requirements provided for in the Basic Module, as in the case of the "Supplementary Module. Criteria for Swan-labelled Envelopes", which has also been circulated for comment. The supplementary requirements for coffee filter and grease-proof paper contain exceptions from the requirement in the basic modules in that the use of recycled fibre is not permitted.

There is scope in the forestry requirement for an exemption to be granted from the requirement as to 20% wood from certified forestry operation. This applies only if credible documentation can be submitted that the fibre raw material derives from a sustainable forestry operation that fulfils the same level of requirements as in the approved standards. This exemption has been granted because in many areas forestry standards have not yet been developed.

Nordic Ecolabelling will follow developments in the use of wood from certified forestry operations and recycled fibres in order to have a sound basis for subsequent revisions. This is the reason for the requirement that pulp and paper manufacturers must provide us with an annual update.

Future criteria and the need for background information on forestry operations

Nordic Ecolabelling will follow developments in forestry certification and may tighten up the requirements when the Basic Module is next revised and when the criteria for the various paper products are next revised.

7. Chemicals

The criteria for chemicals are in a separate Chemical Module.

What are production chemicals?

A large number of chemicals are used in the production of pulp and paper products. These chemicals can be divided into process chemicals for pulp production and additives and auxiliary chemicals for use in paper production. Additives are used to provide the paper with various required properties and auxiliary chemicals are used to increase efficiency and to simplify the production processes. Additives display a high degree of adhesion to fibres, whereas auxiliary chemicals have a low degree of adhesion and therefore frequently end up in effluent water.

The inherent properties of chemicals may change when they react with other chemicals. Since it is difficult to predict how a particular chemical will react in a production process, the chemical requirements are imposed with respect to the inherent properties of the individual chemicals at the point at which they are added to the process.

The term "production chemicals" used in this document and in the revision proposal (Chemical Module. Criteria for Chemicals in Swan-labelled Paper Products) is a collective term for additives and auxiliary and process chemicals.

Environmental effects

Although the chemical requirements are imposed primarily on the basis of the environmental harmfulness of the individual chemical, the potential hazard to the health of users has also been taken into account.

In order to assess the environmental harmfulness of a substance, information must be available on its degradability, toxicity and whether it is assumed to be bioaccumulative.

From an environmental perspective the degradability of an organic substance is one of its most important properties. Generally, the more readily a substance breaks down, the less its ecological risk. Substances that break down very slowly accumulate in the environment and may represent a risk in the future, even if they do not display any acute toxicity. The substances remain in the environment over an extended period of time and may be spread far afield.

Toxic substances that are not readily degradable represent a major risk to the environment. There is not sufficient time for them to break down in the sewage system, as a result of which they end up either in the recipient environment where degradation is far slower and the substance remains toxic for an extended period of time or in the sludge and, ultimately, on fields if the sludge is used as a soil improvement agent.

The tendency of a substance to accumulate in a waterborne organism, e.g. fish, is indicated by means of the substance's bioconcentration factor (BCF) which is the ratio between the weight concentration of the substance in the organism and the weight concentration of the substance in the surrounding water, at equilibrium. Substances with high bioaccumulability, particularly those

that are not readily degradable, have a tendency to build up to levels that are harmful to the organism.

RPC for chemical requirements

Relevance

The quantities of production chemicals used in terms of kilos per tonne of pulp or paper produced often appear to be small. Nevertheless, millions of tonnes of pulp and paper are produced annually throughout the world, as a result of which the total quantity of chemicals consumed is considerable. As the pulp/paper mills replace their production chemicals with chemicals that are less harmful to health and the environment in response to ecolabelling requirements, the demand for chemicals that are better in environmental terms has increased. This encourages chemical manufacturers to change their production to chemicals that are better in environmental terms.

The proposal imposes requirements on chemical groups with known effects on health and/or the environment and that are used in large quantities.

Potential

Throughout the European Union a process of phasing out harmful chemicals is underway. Ecolabelling has proved to be a quicker means to this end and therefore represents a sensible supplement to legislation. It can sometimes be difficult for personnel at factories to determine the relative degree of harmfulness of various chemicals. In such cases the ecolabelling requirements offer those responsible for environmental matters assistance in finding production chemicals that are less environmentally harmful.

Moreover, EU Directives apply only within the EU, and Nordic Ecolabelling is open to licence applications from anywhere in the world, and accordingly also imposes requirements on pulp/paper production outside the EU.

Controllability

Chemical suppliers to pulp/paper mills are often able to offer or produce alternative products if a demand exists for such products.

Experience of the criteria for tissue and printing paper has shown that it is relatively easy to replace chemicals that are harmful to health and the environment with less harmful chemicals. It could be argued that ecolabelling steers demand in the direction of chemical products that are less harmful to health and the environment.

General comments on the chemical requirements

Which chemicals are encompassed by the requirements?

The chemical requirements apply to production chemicals used in the production of pulp and paper and in certain cases to chemicals used in the conversion of the paper. Accordingly the requirements do not include chemicals used in the processing of raw water, in energy production or in maintenance work that is not defined as maintenance of pulp and paper production equipment.

(Wire cleaning or the cleaning of cooking and bleaching equipment is regarded as maintenance of pulp and paper production equipment, whereas felt washing agents used continuously in production are viewed as production chemicals.)

Chemicals used in the external treatment of water may be exempted from the requirements below at the discretion of Nordic Ecolabelling if the chemicals used in the treatment plants lie outside the control of the pulp and paper manufacturer (e.g. municipal treatment plants).

The requirements in the Chemical Module are basic requirements, which means that the supplementary modules for the various product groups may contain requirements that are specific to the product group in question. These may be stricter or less strict than the basic requirements in the Chemical Module. Where this is the case, the whole requirement will be stated in the Supplementary Module.

How are the requirements to be documented?

Fulfilment of the requirements is documented primarily with the aid of certification from chemical manufacturers/suppliers. Nevertheless, Nordic Ecolabelling will be entitled to request chemical manufacturers/suppliers for information on the complete chemical composition of a product in order to check the contents of the product when necessary.

Requirements applicable to all chemicals

This chapter outlines the requirements, how the requirements are to be documented and their background. It also specifies whether the requirement is new or has been amended in relation to the chemical requirements in the criteria document for printing paper (version 2.5) or for tissue paper (version 3.3).

Requirements:

The pulp/paper manufacturer must report all production chemicals/products, stating their complete name, product safety data sheets in accordance with Directive 2001/58/EC, area of application, supplier and quantities used in kg/tonnes pulp/paper. The report must include all chemical products used both in internal and external water treatment and in production.

Documentation requirements

- Report on the chemical products used in accordance with the requirement, see formula 1 in the Chemical Module
- Full product safety data sheets in accordance with Directive 2001/58/EC for all chemical products.

Background:

The requirement provides an overview of the chemicals and quantities used in pulp and/or paper production, thereby allowing Nordic Ecolabelling to check that sufficient and correct information has been submitted on the chemicals in respect of which requirements are imposed.

The requirement is stricter in the criteria for tissue paper (version 3.3) and printing paper (version 2.5) in that the disclosure is required of all components in organic production chemicals used in quantities in excess of 1 kilo/tonne pulp or paper, with details of the unambiguous chemical name and CAS number and the content. The reason for the reduction in the level of the requirements is that the previous requirement specifying the documentation both of the complete content and certification did not result in any significant environmental gain and in many cases simply increased the level of bureaucracy. It is now considered sufficient for certification to be submitted by the manufacturer of the chemical product and for Nordic Ecolabelling to have the right

to require complete information on the content of chemical products if the available information is unclear.

Requirements as to specific chemicals

Alkylphenol ethoxilates

Requirement:

Alkylphenol ethoxilates or other alkylphenol derivatives must not be deliberately added to production chemicals/products.

Documentation requirements

Chemical manufacturers/suppliers must demonstrate that alkylphenol ethoxilates and other alkylphenol derivatives have not been actively added to system cleaning agents or felt washing agents, dispersants, de-inking chemicals, coatings, foam inhibitors or glue in accordance with certificate 1 (felt washing agents and dispersants), 2 (de-inking chemicals), 4 (coatings), 6 (foam inhibitors) or 9 (glue) in the Chemical Module.

Coatings encompass products applied to the base paper after the press section on a paper machine.

Background:

This requirement has been made stricter compared with the equivalent requirement in the criteria documents for tissue paper (version 3.3) and printing paper (version 2.5). Alkylphenol ethoxilates are now prohibited in all production chemicals and not solely in specific chemicals.

Alkylphenol ethoxilates are prohibited because they break down into alkylphenols. Nonylphenols do not break down readily and are suspected of causing hormonal disturbance. As a precautionary measure no alkylphenol ethoxilates that might break down into alkylphenols must be present in chemicals used in pulp and paper production.

Alkylphenols are a group of substances that are generally used as raw materials in the production of alkylphenol ethoxilates. The latter are surfactants that are used as detergents, dispersants and emulsifiers. Nonylphenol ethoxilates are used as auxiliary agents in the plastic, paper and pulp industries, in textiles, in dyes, in detergents, in glues and in lubricants.

Since alkylphenol ethoxilates can be found in other types of chemicals than system cleaning products, felt washing products, de-inking chemicals, foam inhibitors, dispersants and coatings, the requirement has been restated to encompass all production and auxiliary chemicals. Since the aforementioned product types are the preparations to which alkylphenol ethoxilates are most commonly added, the documentation requirements apply to these products. Nevertheless, the chemical manufacturer/supplier must ensure that chemical products used in the production of ecolabelled pulp/paper do not contain alkylphenol ethoxilates even if the type of product in question is not encompassed by the documentation requirement.

De-inking surfactants

Requirements:

If more than 100 g of surfactant per tonne of fibre is used in de-inking (the total of all surfactants used in the various de-inking products in use), each surfactant must be readily degradable (OECD test method No. 301 A-F). If the total of all surfactants used is less than 100 g surfactant/tonne of

fibre, each surfactant must be either readily (OECD test method No. 301 A-F) or potentially (OECD test method No. 302 A-F) degradable.

Documentation requirements

The chemical manufacturer/supplier must report the composition of the product in accordance with certificate 2 in the Chemical Module, and the result of testing for degradation properties must be reported in the form of e.g. a product safety data sheet in accordance with Directive 2001/58/EC.

Background:

Surfactants are used in large quantities in the production of pulp and paper. One of the environmental problems that this gives rise to is toxicity combined with poor degradability and potential bioaccumulability. However, because of the chemical structure and function of surfactants, it is difficult to perform tests on their bioaccumulability or toxicity since the standard tests are not applicable. Accordingly requirements are imposed only with regard to degradability.

There is a development in the direction of more efficient substances requiring fewer additives than traditional de-inking chemicals. The disadvantages of these new substances, however, is that they are not readily degradable (non-ionic surfactants). Since these substances do not require the same quantities of additives as older substances, they will be accepted in limited quantities (100 g surfactant/tonne of fibre) if the surfactants are wholly degradable.

The wording of the requirement has been made clearer.

Biocides

Requirement:

Active substances in biocides used for countering slime formation organisms in pulp and paper production must not be potentially bioaccumulable.

Documentation requirements

Chemical manufacturers/suppliers must report on the composition of the product in accordance with certificate 3 in the Chemical Module. Test results on the bioaccumulation potential of the active substances must be reported in the form of e.g. material safety datasheets as provided for in Directive 2001/58/EC.

Background:

The increased use, for environmental reasons, of closed circulation water systems in the production of pulp and paper increases the risk of the growth of micro-organisms. Uncontrolled growth of such micro-organisms can result in slime formation, non-organic and organic deposits, the formation of gases and corrosion. This in turn may impact upon the capacity of the paper machines and compromise the quality of the paper. This means that in some circumstances the use of biocides is necessary in pulp/paper production. The micro-organisms consist of various species of bacteria or fungae.

Various types of biocides are available on the market. Some preparations kill the micro-organisms and then break down, whereas others work over an extended period. Thus the function of the biocides is to be toxic. Furthermore, rapid degradability will not always be sought in this type of preparation if a preventive effect is required. It is considered justified, however, to impose requirements as to the bioaccumulability of the biocides. During the next revision process attention should be focused on whether requirements might also be imposed as to the degradability of these preparations.

Inorganic biocides do not bioaccumulate in inorganic form and are accordingly not encompassed by the requirement.

The requirement is stricter than the equivalent requirement in the criteria document for tissue paper (version 3.3) and printing paper (version 2.5), which impose requirements only on biocides that are added to circulation water systems containing fibres.

All biocides used in pulp and paper production are now encompassed by the requirements as to non-bioaccumulability. For example, biocides that are added in the preparation of coating slurry are encompassed by the requirement. (Biocides used in the treatment of raw water, in energy production and in maintenance work that is not defined as the maintenance of pulp and paper production equipment are excluded.)

Residual monomers

Requirements:

Polymer products used in the process and in water treatment - including wet strength agents - may contain a maximum of 100 ppm residual monomers - calculated on the basis of the dry matter content of the product - classified as environmentally hazardous in accordance with EU Directive 67/548/EEC, most recent adaptation, with classified with risk phrases R50+R53, R51+R53 or R52+R53, or classified as harmful to health in accordance with EU Directive 67/548/EEC, most recent adaptation, with risk phrases R45, R46, R49, R60 or R61.

An exception to the above is acrylamide where the threshold for permitted residual monomer content is 750 ppm calculated on the basis of the dry matter content.

In wet strength agents epichlorohydrin (ECH) is regarded as a residual monomer, whereas DPC (dichloroisopropanol) and CPD (chloropropanediol) are not.

Documentation requirements

The manufacturer of the polymer product must certify in accordance with Appendix 7 to the Chemical Module that content of monomers classified in accordance with the requirement and calculated on the basis of the dry matter content of the product does not exceed 100 ppm, with the exception of acrylamide where the content must not exceed 750 ppm.

Background:

Many of the chemicals used in the production of pulp and paper contain polymers. Often polymer products that are of themselves harmless contain residual monomers that are classified as harmful to health and the environment. In order to limit the quantities in use a threshold has been set on the content of classified residual monomers of 100 ppm based on the dry matter content of the commodity.

Polyacrylamide is a common chemical and is classified as R45 and R46. For production-technical reasons a threshold of 100 ppm acrylamide as residual monomer would be excessively strict. Within the EU the permitted quantity of residual acrylamide in products is 1,000 ppm, whereas the classification limit in Norway is 100 ppm. Nordic Ecolabelling's goal is to influence the development of production technology that results in fewer harmful residual monomers. At the same time the ecolabelling requirements must not be impossible to fulfil. The permitted amounts of acrylamide in dry matter in polyacrylamide has therefore been set at 750 ppm.

This requirement has not been changed in relation to the criteria documents for printing paper, version 2.5, and tissue paper, version 3.3.

Foam inhibitors

Requirements:

None of the ingoing active substances in foam inhibitors that are made up of several substances must be subject to classification as environmentally harmful in accordance with applicable regulations in Denmark, Finland, Iceland, Norway, Sweden or EU Directive 67/548/EEC most recent adaptation and subject to the risk phrases R50+R53, R51+R53 or R52+R53.

As an alternative, foam inhibitors where 95% by weight of the ingoing active substances are either readily degradable (OECD 301 A-F) or potentially degradable (OECD 302 A-C) may be used.

Active substances means substances in the product that have a foam inhibiting or foam retarding effect.

The exception to the above is foam inhibitors that are added to the flow that is directed for incineration as part of the chemical recycling process.

Documentation requirements

The manufacturer of the foam inhibitor must certify that the product does not contain components that are subject to classification as environmentally harmful in accordance with the requirements and certificate 6 in the Chemical Module.

Or

where foam inhibitors consists of a mixture of various substances the degradability of the individual substances must be reported in the form of for example product safety data sheets as provided for in Directive 2001/58/EC.

Background:

The increased use, for environmental reasons, of recycled fibres of closed plants has led to a higher demand for foam inhibitors in for example paper production. A number of different types of foam inhibitors are in use in pulp production, the majority of which are oil or silicon based.

Silicon based foam inhibitors provide efficient foam inhibition and are therefore used in smaller quantities than is the case for mineral oil based inhibitors. They are not toxic and it is difficult to test them for degradability since silicons are insoluble in water and chemically inert.

Mineral oil based foam inhibitors are not readily degradable but it is assumed that they may be potentially degradable and possibly bioaccumulable. They may also contain small quantities of aromatic compounds and dioxins. Even so, their toxicity towards waterborne organisms is low.

Foam inhibitors are often preparations and there was some discussion during the revision process about the possibility of wording the requirement in such a way that the classification requirement would relate to the preparation and not to the ingoing substances. This with a view to new classification rules for preparations. It was concluded, however, that a change of this type would involve a reduction in the stringency of the requirements since this would permit levels of up to 25% of substances classified as R52-53 in the preparation.

Wet strength agents

Requirements:

Wet strength agents may contain a maximum total of 0.01% by weight of chloro-organic compounds - calculated on the basis of the dry matter content of the commodity - classified as environmentally harmful or harmful to health in accordance with EU Directive 67/548/EEC, most

recent adaptation. Examples of chloro-organic compounds include epichlorohydrin (ECH), dichloroisopropanol (DCP) and chloropropanediol (CPD).

Documentation requirements

The manufacturer of a wet strength agent must certify in accordance with Appendix 7 of the Chemical Module that the content of chloro-organic compounds classified in accordance with the requirements and calculated on the basis of the dry matter content in the commodity does not exceed a total of 0.01% in weight.

Background:

This requirements is stricter than the corresponding requirement in the criteria document for tissue paper, Version 3.3 since the permitted content of chloro-organic compounds has been reduced from 1.0% in weight to 0.01% in weight of dry matter in the commodity.

The active components in wet strength agents are based on polyamid-epichlorohydrin resin. The finished products contain the residual monomer epichlorohydrin and its reaction products dichloroisopropanol (DCP) and chloropropanediol (CPD).

Epichlorohydrin and dichloroisopropanol are carcinogenics. Furthermore, DCP is a volatile substance that is released into the air when the paper dries.

In 2001 BgVV of Germany introduced new requirements as to the residual content of DCP and CPD in paper and board intended to come into contact with foodstuffs. This has speeded up the development of wet strength agents with a very low content of residual products. Most suppliers are now able to offer these products or are willing to increase their production of these, more environmentally-friendly, products if there is sufficient demand.

Dyestuffs

Requirements:

Dyes (trade products) classified as environmentally harmful in accordance with EU Directive 99/45/EC or applicable regulations in any Nordic country must not be used for the colouring of pulp or in the printing of paper products. Moreover, dyes for printing and colouring may contain a maximum of 2% by weight of substances classified as environmentally hazardous in accordance with EU Directive 67/548/EC, most recent adaptation, and allotted risk phrases R50+R53, R51+R53 or R52+R53 or in accordance with regulations applicable in any Nordic country.

The above requirement does not include dyestuffs that are fixed to fibres > 98% where the ingoing substances are not found in Begränsningsdatabasen (Sweden) (Products Register), "Listen over uønskede stoffer", (List of undesired substances), Orientering fra Miljøstyrelsen. No. 1 1998. (Information from the EPA No. 1 1998 (Denmark) and Miljøvernmyndighetenes Obs-liste (the Environmental Authorities' Warning List) in Norway). The degree of fixation is calculated as the total retention of dye stuffs on the fibres during the process.

Dye stuffs or pigments in dyes (applies both to the dyeing of pulp and printing inks) must not be based on heavy metals, aluminium or copper (e.g. aluminium in silver colours, copper in gold colours) with the exception of copper in phthalocyanine pigment.

Compounds of Pb, Hg, Cr and Cd in dyes (applies to the dyeing of pulp and printing inks) must not exceed a total content of 100 ppm.

The following threshold values apply in the case of individual substances in direct dyes: Pb 100 ppm, Hg 4 ppm, Cd 20 ppm, As 50 ppm and Cr 100 ppm.

The following threshold values apply in the case of individual substances in pigment dyes: Pb 100 ppm, Hg 25 ppm, Cd 50 ppm, As 50 ppm and Cr 100 ppm.

Phthalates must not be present in the dyes used.

Requirement: Commercial dye must not contain pigments that may shed the amine specified in Table 7.1.

Table 7.1. Dyestuffs must not shed the following amines

Amine	CAS-number
4-amino-biphenyl	92-67-1
Benzidine	92-87-5
4-chloro-toluidine	95-69-2
2-naphtylamine	91-59-8
o-aminoazo-toluene	97-56-3
2-amino-4-nitro-toluene	99-55-8
p-chloroaniline	106-47-8
2,4-diamino-anisol	615-05-4
2,4'-diamino-diphenylmethane	101-77-9
3,3'-dichlorobenzidine	91-94-1
3,3'-dimethoxybenzidine	119-90-4
3,3'-dimethylbenzidine	119-93-7
3,3'-dimethyl-4,4'-diamino-diphenylmethane	838-88-0
p-cresidine	120-71-8
4,4'-methylenebis(2-chloroaniline)	101-14-4
4,4'-oxydianiline	101-80-4
4,4'-thiodianiline	139-65-1
o-toluidine	95-53-4
2,4-toluidenediamine	95-80-7
2,4,5-trimethylaniline	137-17-7
0-anisidinedimethoxyaniline	90-04-0
2,4-xylydine	95-68-1
4,6-xylydine	87-62-7
4-aminoazobenzene	60-09-3

Documentation requirements

The chemical manufacturer/supplier must report on the composition of the products and, if applicable, the classification of the production and the ingoing substances in accordance with Certificate 8 of the Chemical Module and in the form of e.g. a product safety data sheet as provided for in Directive 2001/58/EC.

The dye manufacturer must also submit certification in accordance with Certificate 8.

- that no phthalates are present in the dye.
- that the total content of compounds of lead, cadmium, mercury and chromium does not exceed 100 ppm
- that direct dyes contain no more than 4 ppm of mercury, 20 ppm of cadmium, 100 ppm of lead, 50 ppm of As and 100 ppm of Cr.

- that pigment dyes contain no more than 4 ppm mercury, 20 ppm of cadmium, 100 ppm of lead, 50 ppm of As and 100 ppm of Cr.

Background:

The requirements as to dyes used in the colouring of pulp and printing on paper are based on the information obtained in a report into the environmental impact of printers conducted during the revision of the Criteria Document for Printed Matter, (the environmental impact of the graphic industry in Sweden conducted on 15 April 1995 and 18 June 1997 by Milgraf AB and PALAB AB).

This requirement differs from the equivalent requirements in the criteria document for tissue paper, version 3, as regards restrictions on classified substances in dyestuffs. This is in order to focus on and specifically restrict the content of substances in dyestuffs with long-term effects on the aquatic environment (R50+R53, R51+R53 and R52+R53). Substances classified with the risk phrase R50 (highly toxic to waterborne organisms) have already been restricted with the requirement that dyestuffs classified as environmentally harmful in accordance with EU Directive 99/45/EC must not be used for in dyeing pulp or printing in paper production.

The exception granted in the case of dyes fixed to fibres to 98% concerns cationic dyes, the only environmentally harmful property of which is the cationic charge. The background to this exemption is that colours of this type are fixed almost completely to the fibres and to other organic materials found in the system. This means that the cationic charge is rendered harmless before emission (where applicable) to the recipient environment.

The exemption for copper in phthalocyanine pigments has been included because it is difficult to produce blue and green colours without this pigment.

The requirements applicable to pollutants in dyestuffs is intended to limit the aforementioned heavy metals to contents that can be considered to be so low that they cannot be removed from the dyestuffs. The limits have been set in such a way that it will not be possible to actively add these metals.

ETAD (Ecological and Toxicological Association of Dyes and Organic Pigments Manufacturers) has imposed the same threshold values for the aforementioned metals. However, ETAD's list contains additional metals. The reason that requirements have not been imposed as to all metals on ETAD's list is that the intention has been to phase out those metals that are most harmful to health and the environment. Dye manufacturers that are members of ETAD should follow ETAD's recommendations as regards these pollutants. It should also be noted that the threshold values are identical to the equivalent values in the EU Flower criteria for textile products and the EU Flower criteria for copying and graphic paper. The requirements in both of these documents are based on ETAD's threshold values. However, both documents impose requirements on all metals in ETAD's lists. Accordingly documentation of fulfilment of the requirements may take the form of, for example, a product safety data sheet as provided for in Directive 2001/58/EC for guaranteeing that dyestuffs do not contain more than the threshold values specified by ETAD. In such cases the applicable analyses must be performed in accordance with ETAD's directive. Documentation may also be provided in the form of own measurements for the products in question.

Direct dyes are dyes containing water soluble dye stuffs that may be for example anionic or cationic. Pigments are not water soluble.

Phthalates are prohibited since they are thought to have hormone-disrupting effects.

Azodyes that shed the carcinogenic substances specified in Table 7.1 are no longer produced by serious dye manufacturers in Western Europe, although they are still produced in Eastern Europe.

PCB and formaldehyde are also used outside Western Europe. Although most Swan-labelled dyed paper is produced in Western Europe, there is a risk that these azodyes could be used in ecolabelled paper if they were not prohibited given that Nordic Ecolabelling licences are available to applicants from all over the world.

Glues

Requirements:

Glues used in the production, conversion and packaging of the products must not contain phthalates, halogenated solvents or ethylene glycol ethers classified as harmful to health in accordance with EU Directive 67/548/EEC, most recent adaptation, with the risk phrases R60 or R61.

Documentation requirements

The chemical manufacturer/supplier must disclose the composition of the product and its classification in terms of harmfulness to health and the environment in accordance with the requirements and certificate 9 in the Chemical Module.

Swan-labelled glue will be approved provided that the trade name and licence number are specified.

Background:

Phthalates in glue are suspected of having a disturbing effect on hormones and are accordingly prohibited in glues used in ecolabelled paper. Halogenated solvents represent a major problem as regards the environment and the working environment. Many chlorinated solvents are ozone-depleting and some have been classified as carcinogenic. Halogenated solvents may also be toxic to waterborne organisms and are not readily degradable.

Changes in relation to the Criteria Document for Tissue Paper, version 3.3, and Printing Paper, version 2.5.

The main changes as regards chemical requirements:

- ✓ The requirement as to the reporting of the complete content of all chemical preparations used in quantities in excess of 1 kg/tonne pulp/paper has been removed. This information must now be reported when requested by Nordic Ecolabelling.
- ✓ Alkylphenol ethoxilates must not be present in any production chemical. Previously this requirement applied only to specified production chemicals.
- ✓ The biocides requirement now encompasses all biocides added at the factory, except biocides in raw water and energy production which are exempted from the requirement. Previously the requirement applied only to biocides used in circulation water systems with a fibre content.
- ✓ The requirement as to wet strength agents has been made stricter and accordingly the permitted content of chloro-organic compounds has been reduced from 1% by weight to 0.01% by weight.

Chemicals for which no requirements are imposed

In the course of the revision process the substance bisphenol A was discussed since it is suspected of having a disturbing effect on hormones and is used in the production of heat sensitive paper.

However, a risk evaluation prepared for the EU's Scientific Committee on Toxicity, Eco-Toxicity and the Environment (SCTEE) which acts as an advisory body to the EU Commission, concluded that bisphenol A occurs in such low concentrations that the control measures already performed by the authorities is regarded as sufficient.

A variety of studies have been performed on bisphenol A's toxicity, many of which have focused on hormonal effects and harmful effects on reproduction. The major studies conducted by industry and the authorities reveal a fairly low hormone-disturbing effect in mammals. However, a number of smaller scientific studies, mainly conducted in the United States, point out that even negligible quantities of bisphenol A may have hormone-disturbing effects on experimental animals.

The EU has come down on the side of the major studies, although it has at the same time said that the data produced by scientists cannot be ignored. For this reason one of the EU's chemical programmes has commenced upon a large-scale test program in which the low dosage effect of bisphenol A will be studied in detail. The results of these studies are not expected for some years.

It was concluded during the revision that bisphenol A should not be prohibited in ecolabelled paper this time around, but that Nordic Ecolabelling should monitor the results of the EU test programme which might provide a more extensive basis for a possible ban on this chemical.

Fillers

Fillers can make up a fairly extensive percentage portion of paper. The controllability of a criteria relating to the environmental impact of fillers would be high, given that pulp and paper manufacturers are in a position to choose their suppliers of fillers. Investigations were also conducted into whether the imposition of such criteria for fillers would have relevance and potential. It was concluded, however, that compared to the other environmental impacts of paper a criteria would not offer sufficient relevance and potential. Appendix 7.1 provides further details. A summary of the investigations is provided below.

The environmental impact of paper and pulp fillers can be categorized as follows:

- Production of filler
- Transport of filler to the user
- The use of fillers entails a need for additives, cleaning chemicals, emissions and the effects of emissions
- Recycling of fillers, directly and via recycled paper

The production of fillers involves considerably less energy than pulp and paper production. Production generally involves mechanical processes, there is little use of chemicals. Fillers produced from residual products offer definite environmental advantages compared with primary fillers.

The environmental impact of fillers is dominated by transport. A good filler will be transported over a short distance to the user and should preferably be pre-dispersed. If transport requirements are introduced, there would be grounds for including criteria for filler transport for certain paper product groups.

Mechanical processes are used for fillers, mostly mixing and pumping. Chemicals play a minor role in filler production. Requirements are already imposed as to chemicals in the printing paper criteria. Where older technology is used, emission of fillers may be high, in the worst cases no recycling is used.

Fillers can already be reused in the same function, although reuse is not widespread. Fillers can also be recycled and reused as building materials or composts.

Swan-labelling should encourage greater recycling and reuse of fillers. It would not be relevant to impose separate criteria requirements for fillers.

GMO starch

Nordic Ecolabelling has debated whether requirements should be imposed to exclude the use of starch from genetically modified organisms (GMO). The decision not to impose such requirements was based on discussions with a supplier. At present, suppliers do not purchase GMO. Where possible they avoid this because public opinion is against GMO. Suppliers do not expect this situation to change over the coming two to three years. Predicting developments after this time is difficult. Suppliers supply starch to both the food industry and the paper industry. If GMO is accepted for foodstuffs, it is doubtful whether separate GMO-free products for the paper industry will continue to be supplied. This could cause problems, because once GMO has been permitted, it will be spread to other plants. Italy has a complete ban on the cultivation of GMO. However, in France it is not banned.

Given the current situation, it has been concluded that there are no grounds for imposing requirements. It might be relevant, however, to consider this point during the next revision.

Analyses

All testing must be conducted in accordance with OECD Guidelines.

Biodegradability is determined with the aid of the OECD Guidelines for the testing of chemicals (ISBN 92-64-1222144) No 301 (A -F) and 302 (A-C) or equivalent test specified in EU Directive 84/499 EEC and 88/302 EEC.

Bioaccumulation potential is determined with the aid of OECD Guidelines for the testing of chemicals (ISBN 92-64-1222144) Nos 107, 117, 305 A-E or equivalent tests as provided for in EU Directive 84/499 EEC and 88/302 EEC.

References

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Risk Assessment of Slimicides, U. Ericksson, A. Johnson och M. Törnlund, KEMI Report No 9/95, 1995

Bra Kemval för tvätt och rengöring, Version 2, 1998, B. Svärd, Miljöförvaltningen Göteborg och C. Wahlberg, Stockholm vatten AB

8. Energy

Energy-related environmental impact of the product (relevance)

Pulp and paper production are energy-intensive industries. Energy requirements were first introduced in the Criteria for Printing Paper, version 2.0, because it was concluded that energy use causes relevant environmental problems, there is potential for improvement and the possible improvements are controllable.

The environmental problems considered relevant for ecolabelling are caused by a number of factors. Energy could become so scarce that future generations will have to pay a significantly higher price to meet their energy needs. Energy use causes a wide range of environmental problems: emissions of pollutant gases and particles to the atmosphere, disposal of residual products containing substances that cause problems for the environment, changes in biotopes which disturb animal and plant life. All the most common forms of energy used in modern society give rise to one or more of these problems.

The background to the imposition of requirements as to energy (potential and controllability)

The potential exists for bringing about environmental improvements by introducing an energy requirement. In round figures the energy consumed in the production of 1 kg of paper is equivalent to the energy content of 1 kg oil. Since on average each person uses 280 kg of paper per year, the energy consumption involved in the production of paper cannot be ignored. The energy required to produce the paper used by a family of four persons is equivalent to the energy content of just over 1,000 kg of oil. Normally, heating is regarded as the most energy-intensive activity of a family and the activity that has the greatest impact on the environment. Typically it takes 2,000 to 2,500 kg of oil to meet the heating requirements of a four-person dwelling. Thus the energy consumed in meeting the paper needs of a family is equivalent to approximately half of the energy required for heating purposes. Fortunately, a great deal of the energy used in paper production is met by burning wood and residual products from wood, as a result of which the greenhouse effect of paper production is not correspondingly high. Nevertheless this does not alter the fact that a great deal of energy is consumed in paper production and that savings should be sought.

Although the pulp and paper industry is already aware of the need to save energy, the experience of energy experts has been that there are wide differences between the energy consumption of various producers and, moreover, that generally speaking there is still considerable scope for improvement in terms of savings.^{5 6}

Manufacturers are able to control the quantities of fuel and electricity consumed. The manufacturers determine whether or not to invest in energy-saving equipment. The type of fuel used can also be fairly well controlled, and some degree of control over the type of electricity used is also possible.

The criteria for fuel use also encompass residual products from wood, such as bark, wood chippings and lye. The reason for this is that all energy should be used as efficiently as possible. Account has been taken of this in the reference values for fuel consumption with which the quantity of fuel used is compared. These reference values also include by-products of wood.

⁵ Eri, L. S.: "Prosessindustrien har betydelig potensial for energieffektivisering", Norsk Energi 4/2002. Træforædlingsindustrien i Norge vurderes her at have teknisk potentiale for besparelser på ca. 30%.

⁶ "Kretsloppsanpassad massafabrik. Slutrapport – KAM 1. 1996 – 1999. KAM-rapport nr A31. Et MISTRA-finansieret forskningsprogram.

The requirements are based on the criteria for printing paper and tissue paper. Briefly stated, these requirements are based in part on values found in the literature and in part on an assessment of the nominal heat requirement. Nominal heat requirement is the theoretical heat value needed to for example evaporate a specified quantity of water from a specified quantity of pulp. The nominal heat values have been calculated by energy experts. For further information on these requirements, please refer to the background document for printing paper and tissue paper.

Later sections of this background document contain a discussion of the changes introduced in relation to the requirements imposed in the current criteria for printing paper and tissue paper.

Formulation of the energy requirement

The energy requirements in the Basic Module are numbered 1.8 for paper manufacturers and 2.8 for pulp manufacturers.

Principle:

The requirements encompass restrictions on the use of energy in the form of fuel and electricity. These restrictions vary depending on the sub-processes that make up the overall production process.

The basis used is information on actual energy consumption in production, in relation to specific reference values stipulated in this document. The ratio between the two represents the energy points. In this model papers and pulp with different properties are permitted to have different energy consumptions depending on the process steps involved in the production of process.

Energy used in the transport of raw materials, as well as conversion and packaging, is not included in the energy consumption calculations.

The principle is that an energy point for the product is calculated with the reference value found with aid of a technical description of the production of the pulp types and paper product, along with the manufacturer's details regarding the total energy used to produce a tonne of pulp or product.

The pulp manufacturer's calculations are then passed on the paper manufacturer who in turn must perform a calculation for the paper product as a whole and assess whether the requirements can be fulfilled. Under this model papers and pulp with different properties are permitted to have different energy consumptions depending on the process steps involved in the production of process. Pulp types have been divided into three groups, as shown in Table 1.8.1 below.

Tabell 1.8.1 Various types of pulps, in groups

Pulps	Energy criteria
Chemical pulp, (sulphate/sulphite)	Chemical pulp
CTMP, TMP, Groundwood	Mechanical pulp
Recycled fibre pulp	Recycled fibre pulp

Calculation of the reference value for energy expended during paper production

Requirements:

Describe the production processes applied in pulp and paper production. The description should cover all stages of all processes used, from the pulp entering the works zone to the finished paper on reels. Treatment of different pulps immediately before paper making shall be included (including e.g. beating)

Tick off the processes included in production in the tables in Appendix 2 in Basic module - Criteria, in which reference values for different processes are specified. Add together the reference values for the sub-processes involved to produce one total reference value for electricity and one total reference value for fuel.

A sub-process is considered to be part of production if it is used for at least three months in the year or for at least 25% of output. See also Section 1.8.3 in Basic module - Criteria, on the subject of other processes.

Bleaching will be considered to be part of production if the ISO brightness of the pulp increases by at least 5% as a consequence of bleaching and if at least half of the pulp output is bleached in this way.

Fuel for heat production:

The reference value for fuel encompasses the fuel used for heat production for the production processes.

Reporting the amount of energy used:

Requirements:

State the total energy consumption in processes used in paper production per tonne of product, specified as fuel and electricity.

The consumption of fuel and electricity may be reported for the individual subprocess and then added up or as total energy consumption. Write in the applicable information in the shaded section in the table for the production process in question in Appendix 2.1.

If fuel is used for internal electricity generation, the equivalent quantity of fuel must be subtracted from the actual fuel consumption ($= 1.25 \times$ internally generated electricity). This will ensure that energy information relating to fuel used in internal electricity generation is not counted twice.

Individual subprocesses or the entire process: If the manufacturer wishes to report energy used in the individual subprocesses instead of the total quantity of energy expended in the production of paper, the applicable energy values for each individual subprocess must be stated and then added up to provide a total value for electricity and fuel.

Electricity: The purchased electricity and internally generated electricity must both be reported.

Steam: If excess energy from other production (for example from other industrial sources) is used, the energy content of the steam must be used in the calculation. The steam table in Appendix 2 should be used for this purpose. The energy content of steam is converted to fuel in the same way as for other heat consumption. If steam from electric boilers is used, the energy content must be converted to fuel in the same way but the energy content must be multiplied by 1.25.

Other processes: If the production process includes subprocesses for which no reference values are provided in the tables in Appendix 2.1, energy consumption must be recorded both as reference values and as energy consumption under points 1-4 (alt. processes) in Appendix 2.1. Thus any new subprocesses will be included in the calculation as neutral factors that do not influence the energy score. If the energy consumption of the subprocesses in question is not known, it may be estimated as installed capacity multiplied by 0.75.

Energy consumption that cannot be traced to a specific subprocess and that is not included in the tables in Appendix 2.1 must be recorded as energy consumption without associated reference values.

Allocation: Energy consumption must be allocated to the Swan-labelled products. In exceptional cases the average value for ecolabelled products 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.

Surplus energy: Surplus energy sold off in the form of electricity, steam or heat, must be subtracted from total consumption. The quantity of fuel used to generate electricity that is sold off is calculated by dividing the sold electricity by 0.8. This is equivalent to the average degree of efficiency for total production of electricity and heat. For the calculation to be advantageous to pulp and paper manufacturers, the use of a degree of efficiency of 0.8 means that heat that is produced at the same time as the electricity must be utilized.

The fuel used in sold energy is calculated by dividing the thermal energy that is sold by 0.8, which represents the average degree of efficiency for heat production. As an alternative the actual degree of efficiency of the plant in converting fuel to thermal energy may be used, provided that this is documented to Nordic Ecolabelling.

The paper manufacturer's calculation of energy points for paper production

Requirements:

Energy points $P_{paper(el)}$ and $P_{paper(fuel)}$ for paper production in *paper machines* are calculated in according with the following formula:

$$P_{paper(el)} = \frac{Electricity, actual}{Electricity, reference}$$

and

$$P_{paper(fuel)} = \frac{(Fuel, actual - 1.25 * Internally _ produced _ electricity)}{Fuel, reference}$$

Calculation of the reference value for energy consumption in pulp production

Requirements:

Describe the production processes applied in pulp and paper production. The description should cover all stages of all processes used, from the wood raw material /recycled paper entering the works zone to the finished pulp leaving the pulp mill.

Tick off the processes included in production in the tables in Appendix 2 in Basic module - Criteria, in which reference values for different processes are specified. Add together the reference values for the sub-processes involved to produce one total reference value for electricity and one total reference value for fuel.

A sub-process is considered to form part of production if it is used for at least three months of the year or in at least 25% of output.

Bleaching is considered to form part of production if the ISO brightness of the pulp increases by at least 5% as a consequence of the bleaching and if at least half of the pulp output is bleached.

The reference value for fuel includes fuel used in heat production.

Reporting energy consumption

Requirements:

State the total consumption of energy in processes involved in pulp production per tonne of 90% pulp, specified as fuel and electricity. Energy consumed in each individual subprocess may be reported and then added up or alternatively total energy consumption may be stated. Enter the information in the shaded sections in the table for the applicable processes in Appendix 2.1.

If the manufacturer wishes to report energy consumed in individual subprocesses instead of overall energy consumption for the production process as a whole, the applicable energy values for each individual subprocess must be stated and then added up to provide a total value for consumption of electricity and fuel.

Fuel: In the case of fuel, both purchased fuel and by-products such as lye, bark and chippings must be stated. Fuel used for both heat production and internal electricity generation must be included. Fuel consumption is calculated on the basis of the effective thermal value of the dry substance. Calculations may be based either on measured thermal values or on the values specified in Appendix 2.2.

If fuel is used for internal electricity generation, the equivalent quantity of fuel must be subtracted from the actual fuel consumption ($= 1.25 \times$ internally generated electricity). This will ensure that energy information relating to fuel used in internal electricity generation is not counted twice.

Electricity: Purchased and electricity produced inhouse must be both be reported.

Steam: If excess energy from other production (for example from other industrial sources) is used, the energy content of the steam must be used in the calculation. The steam table in Appendix 2 should be used for this purpose. The energy content of steam is converted to fuel in the same way as for other heat consumption. If steam from electric boilers is used, the energy content must be converted to fuel in the same way, but the energy content must be multiplied by 1.25.

Other processes: If the production process include subprocesses for which no reference values are provided in the tables in Appendix 2.1, energy consumption must be recorded both as reference values and as energy consumption under points 1-4 (alt. processes) in Appendix 2.1. Thus any new subprocesses will be included in the calculation as neutral factors that do not influence the energy score. If the energy consumption of the subprocesses in question is not known, it may be estimated as installed capacity multiplied by 0.75.

Energy consumption that cannot be traced to a specific subprocess and that is not included in the tables in Appendix 2.1 must be recorded as energy consumption without associated reference values.

Allocation: Energy consumption must be allocated to the Swan-labelled products. In exceptional cases the average value for ecolabelled products 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.

In the case of integrated production where the pulp is used directly in paper production the drying process must not be included in the reference value if this process does not form part of the production process. In the case of integrated mills that function both as suppliers of market pulp and pump pulp for Swan-labelled products, the reference value for drying market pulp must be

specified. This means that if 1/3 of the pulp is sold on, 1/3 of the drying process must be included in the reference value used in the calculation of the score.

Surplus energy: Surplus energy sold off in the form of electricity, steam or heat must be subtracted from the total consumption. The fuel quantity used to generate electricity that is sold off is calculated by dividing the electrical energy by 0.8. This is equivalent to the average degree of efficiency for the total output of electricity and heat. For the calculation to be advantageous to pulp and paper mills the use of a degree of efficiency of 0.8 will mean that the heat produced at the same time as electricity must be utilized.

The fuel used in producing sold heat is calculated by dividing the thermal energy that is sold off by 0.8 which represents an average degree of efficiency for heat production. As an alternative the actual degree of efficiency of the plant in converting fuel to thermal energy may be used provided that this is documented to Nordic Ecolabelling.

The pulp manufacturer's calculation of energy points for pulp production

Requirements:

Energy points $P_{pulp(electricity)}$ and $P_{pulp(fuel)}$ for producing a pulp is calculated with the aid of the formula shown below:

Points for electricity consumed in pulp production:

$$P_{pulp(electricity)} = \frac{Electricity, actual}{Electricity, reference}$$

Points for fuel consumed in pulp production:

$$P_{pulp(fuel)} = \frac{(Fuel, actual - 1,25 * Internally _ produced _ electricity)}{Fuel, reference}$$

The quantity of fuel used is calculated in the following way:

$$Fuel_{used} = Fuel_{consumed} - fuel_{sold} - fuel_{for\ heat\ sold\ off}$$

Documentation:

The calculated points must be passed on to the paper mill and Nordic Ecolabelling. The paper mill can then perform a calculation of the total energy score for the finished paper. The calculation includes energy points for all pulps used and energy points for paper production.

In the case of purchased fuel and electricity, annual consumption is calculated with the aid of invoice copies for the quantity purchased. These calculations should be passed on to Nordic Ecolabelling. Invoice copies must be stored in such a way that they can be presented to Nordic Ecolabelling upon request. Internally produced electricity is documented on the basis of readings of the mill's own electricity meters. In the case of purchased fuel the purchased quantity must be reconciled in relation to the quantity at the start and end of the year in question. Internal consumption of residual products such as lye, bark, chippings etc. is calculated on the basis of the estimated thermal value of the fuel used (see table 1 in Appendix 2.2). Accordingly reporting encompasses the total (purchased) electricity consumption and consumption of fuel.

Calculation by paper manufacturer of total energy score for a mixture of different pulp types
Requirements:

Where a *mixture of different pulp types* is used, the following formulae are used in calculating energy points

$P_{pulp(electricity)}$ and $P_{pulp(fuel)}$:

$$P_{pulp(electricity)} = \sum_{i=1}^n P_{pulp(electricity),i} \cdot pulp_i$$

and

$$P_{pulp(fuel)} = \sum_{i=1}^n P_{pulp(fuel),i} \cdot pulp_i$$

where $pulp_i$ is the individual pulp's share of the total pulp mixture, i.e. tonne of 90% pulp per tonne of paper. Because of waste and differences in water content the total sum of $pulp_i$ will often be greater than 1. If so, fillers and coatings that may form part of the weight of the finished paper may entail that the total weight proportion of the pulps is less.

n is the number of how many pulps are used in the paper

i is the number of each individual pulp and runs from 1 to n (number one, number two etc.)

In the case of integrated mills where the pulp is sent directly on to paper production, the drying process must not be included in the reference value unless it forms part of the production process. In the case of integrated mills that function both as suppliers of market pulp and pump pulp for Swan-labelled products, the reference value for drying market pulp must be included. This means that if 1/3 of the pulp is sold on, then 1/3 of the drying process must be included in the reference value used in calculating the score.

Calculation by the paper mill of the total energy score for both electricity and fuel on the basis of the energy score for paper and pulp production.

Requirements:

The total score for both electricity and fuel consumption is calculated on the basis of the points of the pulp and paper mills with the aid of weighting (X = weight):

$$P_{el} = X_{pulp(electricity)} * P_{pulp(electricity)} + X_{paper(electricity)} * P_{paper(electricity)}$$

where

$$X_{pulp(electricity)} = \frac{Electricity, reference, pulp}{(Electricity, reference, pulp + Electricity, reference, paper)}$$

$$X_{paper(electricity)} = \frac{Electricity, reference, paper}{(Electricity, reference, pulp + Electricity, reference, paper)}$$

$$P_{Fuel} = X_{pulp(fuel)} * P_{pulp(fuel)} + X_{paper(fuel)} * P_{paper(fuel)}$$

$$X_{pulp(fuel)} = \frac{Fuel, reference, pulp}{(Fuel, reference, pulp + Fuel reference, paper)}$$

$$X_{paper(fuel)} = \frac{Fuel, reference, paper}{(Fuel, reference, pulp + Fuel, reference, paper)}$$

In the case of mixtures of pulps the reference value for electricity and fuel must be weighted using the proportion of pulp, pulp_i, in the formula for X.

Requirements as to total energy points for both electricity and fuel calculated using energy points for pulp and paper production

Requirement:

Unless the criteria document for the specific paper product group states otherwise, the following requirement must be fulfilled by the paper:

$$P_{energytotal} = \frac{(P_{el} + P_{fuel})}{2} < 1,25$$

and

$$P_{el} < 1,75$$

Documentation:

The paper manufacturer must report the energy points calculated for fuel and electricity consumption.

In the case of purchased fuel and electricity, annual consumption is calculated with the aid of invoice copies for the quantity purchased. These calculations should be passed on to Nordic Ecolabelling. Invoice copies must be stored in such a way that they can be presented to Nordic Ecolabelling upon request. Internally produced electricity is documented on the basis of readings of the mill's own electricity meters. In the case of purchased fuel the purchased quantity must be reconciled in relation to the quantity at the start and end of the year in question. Internal consumption of residual products such as lye, bark, chippings etc. is calculated on the basis of the estimated thermal value of the fuel used (see table 1 in Appendix 2.2). Accordingly reporting encompasses the total (purchased) electricity consumption and consumption of fuel.

Generation of electricity based on fossil fuel and nuclear power

Requirements:

Pulp and paper mills must report the proportion of electricity used in the production of paper that derives from renewable energy sources (not fossil fuels or nuclear power). Manufacturers must report any plans for increasing the proportion of electricity from renewable sources.

Documentation

Manufacturers must report annually on renewable energy sources and quantities on which the consumed electricity is based (for example fuel used for own electricity production, electricity suppliers' annual average, certificate or specified invoices). Where applicable, the documentation will already be available from the information provided in section 1.8.3. If so, reference may be made to this section.

Manufacturers must report plans for increasing the proportion of electricity deriving from renewable sources.

The changes made to the energy requirements in the criteria document

Principles governing the method of calculation

The mathematical expressions used are now common to all types of paper

The mathematical formula for calculating points for fuel where corrections are made for fuel for internal electricity generation was included in the ordinary criteria for paper, and in those criteria in which it was found (tissue paper and printed paper) the formulation was not uniform.

The calculation was introduced for the first time in Version 2 of the criteria for printing paper. The formula was as follows:

$$P(\text{fuel}) = \frac{\text{Fuel, actual}}{\text{Fuel, reference} + (1,25 \times \text{Internally _ produced _ electricity})}$$

When the criteria for tissue paper was subsequently revised, the formula was restated as follows:

$$P(\text{fuel}) = \frac{\text{Fuel, actual} - 1,25 * \text{Internally _ produced _ electricity}}{\text{Fuel, reference}}$$

The change was introduced in the criteria for tissue paper and has also been included in the Basic Module because it seemed more sensible in pedagogic terms, and easier to explain, for fuel consumption used in generating electricity internally to be subtracted from the quantity of fuel used instead of adding it to the reference value. The result is the same, but as noted, the formula seems easier to explain. The only problem is that if the reference value of the fuel is equal to zero, as is in the case of mechanical pulp, it will be necessary to divide by zero. This problem is resolved by setting the whole expression as 1.

Moreover, when the tissue paper criteria were revised, the weighting of points for pulp and paper was introduced. The weighting is achieved with the aid of the reference values for pulp and paper machines. Weighting has been introduced so that higher absolute consumption will count more than lower consumption in the total score. Weighting has also been introduced in the Basic Module.

Furthermore, during the work on the mathematical expressions there was some debate about whether to introduce a calculation method that is more like the method used for emissions. This involves first adding up all consumption and then dividing by all reference values. However, this method of calculation was not suggested until after the assessment of the effects of tightening up

the requirements in the other method. Since there will be little difference in the outcome, the method of calculation has not been changed in this revision. Advantages and disadvantages will be considered in the next revision.

The scores for electricity and fuel are still added up

The point scorers for electricity and fuel Pel and Pbr, have been combined, allowing manufacturers to decide whether to distinguish between electricity and fuel. This was particularly important for manufacturers who during certain periods have access to electricity from hydro power at low prices. The cost of electricity from other energy sources fluctuates less than the price of electricity generated with the aid of hydro power.

It is wrong in principle to add up electricity consumption and fuel consumption. However, there is nothing wrong in adding up points for electricity and fuel. Points for electricity and fuel express how close the mill is to the reference value. A score of 1.0 is equal to the reference value.

As the power market is deregulated, more and more manufacturers may, during certain periods, have access to hydro power-generated electricity at low prices. The cost of electricity generated with the aid of hydro power may also rise. Regardless of what transpires, it is not possible at the time of writing to predict whether the need to be able to switch between electricity and fuel will increase or decrease.

Another aspect of this matter is the question of whether the Swan label should attempt to stimulate or retard in-house production of electricity at pulp and paper mills. The Swan label endeavours to maintain a neutral position on the question of whether paper manufacturers produce electricity themselves or not. The Swan label is not thought to influence the behaviour of paper manufacturers in this area. Whether a paper manufacturer opts to produce electricity or not will be determined by factors such as the cost of electricity, the cost of fuel, the cost of personnel to operate the electricity production process, the cost of production equipment and security of supply. These factors may vary during the course of the year and moreover they may be difficult to predict. Since the Swan label does not determine whether or not a paper manufacturer decides to purchase electricity or produce it internally, it is best not to either punish or reward the manufacturer for such decisions.

Although it can be argued that electricity should not be used for heating purposes because of its high entropy rate, it is difficult to present environmental arguments against the use of electricity from hydro power rather than oil, coal or natural gas for heating purposes. The only argument in favour of this is that electricity from hydro power might displace fossil fuel as a source of electrical power. A situation could occur in which the use of hydro power electricity for heating purposes increases the demand for electricity from renewable energy sources. This will depend on the way in which the market processes electricity from renewable energy sources. This market is undergoing far-reaching changes both in the Nordic countries and in the rest of Europe. Whether or not the individual mill chooses one solution or the other will depend on factors that lie outside the Swan label's area of influence. These issues should therefore be neutral from the perspective of calculating the scores in the criteria. Accordingly, there is still a need to be able to add up points for electricity and fuel.

Harmonizing reference values

The reference values for drying mechanical pulp in the criteria for printing paper differed from those found in the criteria for tissue paper. The Basic Module proposes the use of the criteria for printing paper. In these criteria, the IPPC's value for heat requirements for TMP provides the basis for the reference value and it is now proposed that this should be applied to all mechanical pulps. This value is 1550 kWh/h. This value is close to the nominal value for drying from 38% ts to 90% ts. In the case of drying of mechanical pulp where process steam is available, the application must specify whether the energy content of the steam has been calculated and included in the form for

fuel used for heating or not. If it has been included, the reference value for drying may be counted. If it has not been included, the reference value must not be counted.

Stricter requirements

The requirement in the criteria for printing paper and tissue paper was that P_{total} should not exceed 1.5 and that P_{el} should not exceed 1.75. Investigations have been conducted into whether increasing the stringency of the requirements would have any effect on the scope for producing Swan-labelled paper. These score values are based on the relationship between actual consumption and reference values for consumption. By and large, the reference values are based on BAT values (Best Available Technology). The background document for criteria for printing paper, Version 2.5, contains a discussion of these reference values. This background document is available on request from the Nordic Ecolabelling secretariats.

Energy consumption in the production of approximately 85 pulps and approximately 50 paper qualities has been assessed.

The pulps encompass various production methods such as sulphite, sulphate, DIP, CTMP, groundwood; various types of fibre such as softwood and deciduous wood, including eucalyptus, as well as recycled fibre; various methods of bleaching, including ECF and TCF. The paper types included printing paper for use in graphics applications, printing paper for office use as well as tissue paper for toilet paper, kitchen towels, paper serviettes. The process revealed that typically scores were higher in the case of the energy consumption of pulp mills than was the case for paper machines. This suggests that the technologies designated best available (BAT) are more widespread in the case of paper machines than pulp mills. One reason for this might be that more investment is required to reduce energy consumption to BAT level in the case of pulp mills than in the case of paper machines. Alternatively, it may be difficult to change the processes involved.

The assessment revealed that the requirement as to the total point score for fuel and electricity for pulp and paper can be reduced to 1.25 in order to separate out the best products with the most resource-friendly consumption.

Electricity generation based on fossil fuels and nuclear power

The requirement that pulp and paper mills must provide a description of the steps they are taking to ensure that a greater proportion of the electricity used in their processes derives from renewable energy sources and not from fossil fuels and nuclear power was originally contained in the criteria for tissue paper. Since the electricity consumption involved in the production of other types of paper are of the same order as for tissue paper, this requirement is also considered to be relevant in the case of other pulp and paper types. Accordingly, it has been included.

Future criteria and the need for background information on energy

Developments on the electricity market should be monitored and assessed with a view to imposing criteria as to the origin and method of generation of electricity. If, for example, the use of "green certificates" for electricity produced from renewable energy sources becomes widespread, it may be possible to require manufacturers to purchase a certain quantity of green certificates, the number depending on the amount of pulp and paper produced.

Appendices with information on energy

Appendices 2.1 and 2.2 to the criteria in the Basic Module contain tables with reference values for fuel consumption and electricity consumption. The tables also contain sections for recording the quantities of fuel and electricity used. The tables are divided up on the basis of pulp types. There is also a table for paper machines.

Appendix 2.2 contains an overview of the energy content of various fuels and methods of calculating corrections for moisture content. Appendix 2.2 also contains a table on the energy content of steam and a table on CO₂ emissions from the various fuels.

Energy references

An investigation into the energy consumption of pulp and paper mills.

Eri, L. S.: "Processindustrien har betydelig potensial for energieffektivisering", Norsk Energi 4/2002. "Kretsløpsanpassad massafabrik. Slutrapport – KAM 1. 1996 – 1999. KAM-rapport nr A31. A MISTRA-funded research programme.

The background documents for criteria for printing paper version 2.5 and the criteria for tissue paper version 3.3 also contain references. These are available upon application to the Nordic Ecolabelling secretariats.

9. Emissions

The environmental impact of the product relating to emissions

Environmental effects

Atmospheric emissions

The main pollutants in flue gases are sulphur (S) and nitrogen oxides (NO_x). Both sulphur and nitrogen oxides cause acidification of soil and water. Furthermore, NO_x contributes to over-fertilization of soil and water. The atmospheric emissions come from energy use (and chemical recovery). In addition, carbon dioxide, CO₂, is released together with flue gases. Carbon dioxide is a naturally occurring gas. The combustion of fossil fuels (coal, oils and natural gas) increases the CO₂ content of the atmosphere and it is feared that this will give rise to climate changes (the greenhouse effect). This, combined with the knowledge that easily accessible deposits of oil and gas will come to an end, making extraction more costly, and the political goal of reducing dependency on the oil-producing nations, provides the background to the objective of restricting the use of fossil fuels.

Emissions to water

All pulp processes and paper production generate emissions of COD, P and N. The pollutants in the emissions to water consist of dissolved organic materials from wood and bark, fibre and remains of cooking, bleaching and paper chemicals, specified as the content of oxygen-depleting substances, COD, and the fertilizing components phosphorous, P, and nitrogen, N.

AOX, Absorbable Organic Halogens, include chlorinous organic compounds. Absorbable organic halogens include substances with a variety of properties. They may affect reproduction, the hormone system, the metabolism and the immune defence system. The precise effects on the environment of AOX from chloride bleaching are not known. One report⁷ concluded that no differences could be found between the environmental effects of bleaching with chlorine dioxide and bleaching without any use of chlorine compounds. It is suspected, however, that at the very least, some of the chlorine compounds formed from chlorine dioxide may have the effects stated above. The objective is therefore to reduce AOX emissions, even though these emissions are considerably lower now than when chlorine gas was used in bleaching.

Chlorine occurs naturally in the wood in trees and is also found in certain production chemicals. There is always a risk of AOX formation when chlorine and organic materials are present. In this

⁷ Finsk Miljösentral: J. Tana, S. Ruonala and M. Ruoppa: Environmental effects of effluents from ECF- and TCF-bleaching, Report 350 Finnish Environmental Institutet, 1999.

context the amount of AOX formed is considered to be relevant only where bleaching with chlorine dioxide is used (ecolabelled paper must not contain pulp bleached with the aid of chlorine gas).

Chlorate is harmful to bacteria and plankton. A reduction in the growth of seaweed has been observed in the Baltic. If effluent water is treated properly, there should be no emissions of chlorate.

Not enough is known about the harmful effects of chelating agents such as DTPA and EDTA on the environment beyond the fact that they are not readily degradable and contribute to an increase in fertilization as a result of increased nitrogen emissions.

Background to the emission requirements (Potential and Controllability)

Pulp and paper production cause emissions of large quantities of flue gases and water. It has, for example, been estimated that emissions of phosphorus by the pulp and paper industry to Swedish coastal waters account for approximately 40% of total (treatment plants + industry) direct emissions of phosphorus to the sea.

However, over the last 10 to 20 years there have been major changes in the emissions of pulp mills: emission levels have dropped and the types of emissions have changed. Nevertheless, the quantities of water and flue gases released from pulp and paper mills are still so great that even very low contents of a harmful substance released into rivers can have a major effect on the environment.

Sulphur emissions derive partly from the combustion of oil or coal, partly from the combustion of black lye. The differences between emissions will depend on what type of fuel the factory uses (biofuel, natural gas, light or heavy fuel oil, coal or peat) and the type of treatment equipment in which the plant has invested. Sulphur emissions can be reduced by switching to low sulphur oil or natural gas, assuming that biofuel is not a viable option. Energy savings will also serve to reduce sulphur emissions.

Only a small part of NO_x emissions derive from the nitrogen content of the wood: most of these emissions are formed when the nitrogen in air is combusted at high temperatures. Nitrogen formation may accordingly be affected by the operation and design of the boiler, for example by the use of distribution of combustion air to various positions, the installation of low NO_x burners, SNCR-systems or the equivalent or a water screen.

There is potential for reducing emissions of CO₂ by switching to a fossil fuel with a lower CO₂ value per energy unit. One example of this would be switching from oil to natural gas. A second and more effective approach is to switch to a non-fossil fuel, for example wood, or by-products of wood, such as lye or bark.

The criteria are controllable since the choice of fuel is up to the pulp manufacturer and the paper manufacturer. In practice, however, the manufacturer may, to a certain extent, at least be economically bound to a particular form of fuel since the depreciation time on energy equipment is generally in the region of 20 years or more. Some manufacturers already have access to several types of fuel. These manufacturers will have less difficulty in switching to fuel types that emit less CO₂.

The pollutants in the emission to water consist of organic substances released from wood and bark, fibres and remains of cooking, bleaching and paper chemicals specified as the content of COD and the fertilizing components phosphorus and nitrogen.

When bleached chemical pulp is produced, most of the emissions to water are from the bleachery. In the production of ecolabelled paper based on chemical pulp, pulps may be bleached with the aid of the ECF method (Elementary Chlorine Free) in which chlorine dioxide is the active chemical, or with the aid of the TCF method (Total Chlorine Free) where the active chemical is usually hydrogen peroxide or peracetic acid. ECF-bleaching results in the formation of AOX and chlorate while TCF-bleached pulps often generate emissions of chelating agents such as DTPA and EDTA, which are used to bind the metals in the pulp before bleaching.

Table 9.2.1 shows the average values of emissions by a number of pulp and paper mills. However, there is wide variation between the emissions of the various mills. For example, emissions from different chemical pulp mills may range from between 0.07 – 0.15 kg S/tonne of pulp, 0.07-2.3 kg NO_x/per tonne of pulp, 4.6-50 kg of COD per tonne of pulp, 0.05-0.3 kg AOX per tonne of pulp and 0.003-0.2 kg of P per tonne of pulp.

The experience derived from the current criteria documents for printing paper and tissue paper has been that paper mills are not always able or willing to invest in process equipment that will allow them to meet the ecolabelling requirements. On the other hand, it seems to be relatively simple to replace the pulps used in paper production with pulps that involve lower emissions. In this way, ecolabelling encourages the use of pulps that are produced with the aid of the best available technology. An overview of the production and use of various paper pulps is provided in Appendix 9.2.

The amount of pollutants released in emissions of water from pulp production will largely depend on the design and operation of the emission-creating processes and the degree to which the mill is a sealed process. From an environmental perspective it is important that as little fresh water as possible is used in production. One way of reducing water consumption is to re-use water. The re-use of emission water – above all from the bleachery – is associated with a number of problems (solutions, albeit at the research stage, are in the pipeline). One of these problems is that bleachery emissions contain a number of elements such as chlorides and calcium that give rise to corrosion and rusting in process equipment. The use of closed water systems also entails that a build-up of various substances in the system. This in turn necessitates increased use of chemicals to counter bacteria and the formation of film.

Accordingly, it is not at present possible to impose a requirement that pulp and paper mills be completely closed. On the other hand, ecolabelling can serve to encourage those manufacturers that have invested in the best available technology in order to reduce emissions of both water and pollutants.

There is considerable difference between chemical pulp mills in terms of their emissions of COD and AOX to water. The main source of these emissions is pulp bleaching. TCF bleaching can give rise to larger quantities of COD because of a less selective bleaching reaction, which in turn gives rise to a higher content of emissions of organic substances, whereas ECF bleaching accounts for AOX emissions. A further disadvantage of TCF bleaching relates to emissions of chelating agents. There is no unambiguous information available on the fate of chelating agents and their effects on the recipient environment. As regards AOX emissions, considerable progress was made when chlorine gas bleaching was replaced by chlorine dioxide bleaching in Europe at the start of the 1990s. The effects on the environment of chlorine dioxide are less harsh than those of chlorine gas, although it is still not known precisely what effects ECF bleaching has on the environment.

In imposing requirements as to COD, Nordic Ecolabelling is requiring the use of processes that are more efficient. This applies to both ECF and TCF methods. Moreover, in imposing requirements as to AOX, Nordic Ecolabelling is steering developments towards a more efficient use of carbon dioxide and supporting plants that invest in new environmentally-friendly closed technology.

Limiting the emissions of water in the production of ecolabelled products, is highly relevant. For example, the Baltic has major environmental problems as the recipient of water emissions from over 50% of the chemical pulps produced in Europe.

The content of nitrogen and phosphorus in effluent water depends on the composition of the raw material and there may be wide variations between various deliveries of wood. Biological treatments may increase or decrease the content of nitrogen and phosphorus in emission water. Over-fertilization of water-ways remains a major environmental problem, for which reason it is necessary to limit emissions of phosphorus and nitrogen.

Requirements for paper manufacturers as to emissions to water and air

1.9.1 Principles:

As a general rule, the information on emissions is based on measured emissions. Instructions for measuring emissions are found in chapter 3 on the subject of analyses. Requirements are imposed as to the laboratory, method of measurement and frequency of measurement. The criteria as to emissions of water and air are structured in three different ways.

- A. Measured emissions are compared with the reference values for emissions. Reference values express emissions from "good technology" and generally derive from BAT reports (Best Available Technology). Reference values can be found in Table 1.9.1, to which reference is made in the wording of the individual requirement values. Furthermore, some parameters are found in the total point calculation. This applies primarily to emissions of COD, P, S and NO_x.
- B. Measured emissions must be stated and must fulfil the requirement value. This principle applies to the requirements as to AOX and CO₂.
- C. Measurement emissions must be stated, but not fulfil the requirement value. This principle applies to chelating agents and chlorate.

(COD), phosphorus (P), sulphur (S) and nitrogen oxides (NO_x)

Requirements:

Emissions to air and/or water from the production of pulp and finished paper must be expressed in terms of emissions points (P_{COD}, P_P, P_S, P_{NO_x}) according to the following and for each of these parameters.

The requirement is structured in such a way that emissions are seen in relation to reference values for the production methods in question.

None of the individual emission scores for P_{COD}, P_P, P_S or P_{NO_x} must exceed 1.5.

The total emission score, P_{emission total} must not exceed 4.0.

$$P_{\text{emission total}} = P_{\text{COD}} + P_{\text{P}} + P_{\text{S}} + P_{\text{NO}_x}$$

P_{COD} must be calculated in the following way (P_P, P_S og P_{NO_x} are calculated in the same way):

$$P_{\text{COD}} = \frac{COD_{\text{total}}}{COD_{\text{ref total}}} = \frac{\sum_{i=1}^n [p_{\text{pulp},i} * (COD_{\text{pulp},i})] + COD_{\text{paper machine}}}{\sum_{i=1}^n [p_{\text{pulp},i} * (COD_{\text{ref pulp},i})] + COD_{\text{ref paper machine}}}$$

where

- COD_{total} is total emissions from the production of Swan-labelled paper
- $COD_{reftotal}$ is the emission as it would have been had the size of the individual emissions been as in the reference values below
- $COD_{pulp,i}$ is COD emissions from pulp i
- $COD_{papermachine}$ is COD emissions from the paper machine
- $COD_{refpulp,i}$ is the reference value for the pulp type provided in the table below
- $COD_{refpapermachine}$ is the reference value for the paper machine for the type of paper found in the table below. Select coated or non-coated
- $pulp,i$ is the proportion of the individual pulp type, expressed as "tonne 90% pulp/ton paper"
- n is the number of ingoing pulps

i is the number of each individual pulp and runs from 1 to n

Reference values

Table 1.9.1 Reference values for emissions from various pulp types and from paper production

Pulp type ($pulp, i$) or paper	Reference values for emissions (kg/tonne 90% pulp)			
	COD_{ref}	P_{ref}	S_{ref}	$NO_{x,ref}$ ⁸
Bleached chemical pulp (sulphate and other pulps except sulphite pulp)	18.0	0.03	0,15g/kWh *	0,29g/kWh
Bleached chemical pulp (sulphite pulp)	25.0	0.03	(Total of reference values for fuel consumption)	* (Total of reference values for fuel consumption)
Unbleached chemical pulp	10.0	0.02		
CTMP pulp	15.0	0.01		
TMP/Groundwood	3.0	0.01		
Recycled fibre pulp	2.0	0.01		
Paper machine, uncoated	2.0	0.01		
Paper machine, coated	2.5	0.01		

S and NO_x in particular

It should be noted that the reference values for S and NO_x are linked to the total of the reference values for fuel consumption, discussed in the preceding section on energy.

The total of the reference values for fuel consumption is multiplied by 0.,15 g/kWh for S and by 0.29 g/kWh for NO_x.

Documentation:

For each emission from the paper production process the applicant must state the measurement result, method of analysis, frequency of measurements and laboratory, see also Chapter 3.

The method of calculating points with sub-results is shown in the appendix. Applicants must clearly state the values used for the individual pulps contained in the paper.

AOX

The weighted average value of AOX released from the pulps used in the Swan-labelled paper product must not exceed 0.25kg/tonne paper.

AOX emissions from each individual pulp used in the paper must not exceed 0.40 kg/tonne.

⁸ Expressed asNO₂

Chelating agents

This requirement applies to pulp suppliers, see section 2.9.4.

Chlorate

This requirement applies to pulp suppliers, see section 2.9.5.

CO₂ from the combustion of fossil fuels within the plant

Requirements:

Emissions of CO₂ deriving from the combustion of fossil fuels at the factory must not exceed the values specified in Table 1.9.2 below. Either each individual pulp must fulfil the CO₂ requirements or the weighted average of all pulps within a pulp type (mechanical pulp, DIP or chemical pulp) must fulfil the CO₂ requirement.

A separate CO₂ requirement applies to paper production. The manufacturer must calculate CO₂ emissions from the same subprocesses that are encompassed by the energy requirement, see Appendix 2.1. There is no supplement to the threshold value for drying chemical pulp since CO₂ neutral energy is available for drying in the form of lye and by-products of wood. TMP and CTMP have lower supplements than groundwood and recycled pulp because here CO₂ neutral energy is available for drying from the refining process.

Table 1.9.2. Threshold values for CO₂ from fuel

	Threshold value for CO ₂ kg/tonne 90% pulp/paper	Supplement to threshold value for drying of pulp kg/tonne 90% pulp/paper
Chemical pulp mill	300	0
Mechanical pulp mill, refining (TMP and CTMP)	0	450
Mechanical pulp mill, grinding	0	800
Recycled pulp	300	800
Paper machines, tissue paper, conventional	900	-
Paper machines, other paper types than tissue paper, i.e. printing paper, packaging paper etc.	1000	

In the case of paper machines integrated with a chemical or mechanical (with refiner) pulp mill, the threshold value for the paper machine must be reduced because here a CO₂ neutral source of energy for the paper machine is available. The full deduction is 200 kg/t. If, for example, 2/3 of the pulp comes from the integrated pulp mill, the total deduction will be 33 kg/t.

Documentation requirement:

The paper manufacturer will already have accounted for the quantities of fossil fuels used in connection with the energy requirement.

On the basis of this paper manufacture must show calculations of CO₂ emissions in accordance with Table 3 in Appendix 2.2.

Allocation

Where both Swan-labelled and non-Swan-labelled paper is produced:

If production proceeds in such a way that information is available only on the total emissions from a factory at which, as well as the Swan-labelled production line, there are also pulp lines and/or paper lines on which Swan-labelled paper is not produced, the total emissions must be allocated in the following way:

In the case of process types that are not used for Swan-labelled production the relevant reference values can be found in the table on reference values for emissions. It is assumed that the contribution from these process types makes up just as great a proportion of total emissions as the reference values for process types make up of the total reference value for the emission.

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

$$COD_{swanprocess} = \frac{COD_{refswan_process,i}}{COD_{refemissiontotal}} * COD_{totalemission}$$

where $COD_{refemissiontotal}$ are emissions measured as kg COD/year that would be released by the plant if all subprocesses had emissions that equalled the reference values.

Integrated pulp and paper production:

If the only information available is total emissions from the integrated plant, this can be used as the numerator in the formula in section 1.9.2. 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 on the basis of the measurements of internal flows of COD and P in the effluent water.

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 in which this pulp is present.

Pulp mills: requirements as to emissions to water and air

Principle:

The criteria for 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 emissions from pulp production. Information on emissions will as a general rule be based on measurements. The chapter on analysis provides further instructions, including information on the requirements as to the laboratory, measurement methods and frequency of measurements.

Requirements:

Emissions of COD, P, S, NO_x during the production of pulp must be documented. The pulp mill will send information on emissions measured as kg/tonne 90% pulp to the paper manufacturer and directly to Nordic Ecolabelling. The paper manufacturer must use this information in calculating total emission points for the paper.

Documentation:

For each emission from pulp production information must be supplied on measurement result, method of analysis, frequency of measurement and laboratory, cf. the chapter on analyses.

Emissions of AOX, chelating agents and chlorate

Emissions of AOX

AOX emissions during production of pulp must not exceed 0.40 kg/tonne 90% pulp.

The pulp mill will send information on AOX emissions measures as kg/tonne 90% pulp to the paper manufacturer and directly to Nordic Ecolabelling. The paper manufacturer must use this information in calculating weighted average values of AOX for the paper.

Chelating agents

The pulp mill must specify the quantity of DTPA/EDTA used per tonne of 90% pulp and emissions of DTPA/EDTA to the recipient environment. This requirement does not apply to pulp mills that use < 1.0 kg DTPA/EDTA (active substance) per tonne of 90% pulp.

Chlorate

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

Chlorate emissions must be measured twice per year and the measurements must be separated by at least four months.

Measurement will not be necessary if:

- the pulp mill does not produce chlorine dioxide
- or
- effluent water from the production of chlorinedioxide undergoes chlorate reduction.

CO₂ from the combustion of fossil fuels within the factory

Requirements:

The pulp manufacturer must calculate emissions of CO₂ on the basis of the quantity of fossil fuel used to meet heat requirements. The quantity of fossil fuel used is calculated in connection with the energy requirement in Chapter 8. The amount of fossil fuel used is multiplied by the values for CO₂ emissions per energy unit in Appendix 2.2, Table 3.

The pulp manufacturer will send information on CO₂ emissions measured as kg per tonne of 90% pulp to the paper manufacturer and directly to Nordic Ecolabelling. The paper manufacturer must use this information to either

- a) check that individual pulps in the finished paper fulfil the requirements in Table 1.9.2 in section 1.9.6 or
- b) check that the weighted average of all pulps in a pulp type fulfils the CO₂ requirement in Table 1.9.2 in section 1.9.6.

Documentation requirement:

The pulp manufacturer must present the calculations of CO₂ emissions in accordance with Table 3 in appendix 2.2.

Allocation

See the explanation in the section which discusses requirements as to the paper manufacturer.

Background to the emission requirements

This section provides a brief discussion of the background to the emission requirements. The chlorate requirement is new. Some of the other requirements are new as regards certain paper

products. Changes in the requirements in relation to past requirements are described in subsequent sections.

COD, P, NOx, S

The requirements as to COD, P, NOx and S have been formulated in such a way that an emission score is calculated with the aid of a matrix. The matrix system has been a standard feature of criteria documents for various paper products for some time and has proved to be an efficient means of handling various emissions from the different pulp types and allows for a degree of flexibility that enables pulps with high emissions to be used even when equivalent quantities of pulp with very low emission values are used.

Paper pulps can be divided into three main types: Chemical and mechanical pulps and recycled fibre. These main types are in turn divided into subgroups on the basis of production processes:

Chemical pulps comprise sulphite or sulphate pulps bleached with the aid of ECF (Elementary chlorine free) or TCF (Total chlorine free) methods. Mechanical pulps are divided into RMP (Refiner Mechanical Pulp), TMP (Thermo Mechanical Pulp) and groundwood. Various designations are used for groundwood, depending on the temperature in the fibre release process or whether the process is pressurized or not. CTMP (Chemi Thermo Mechanical Pulp) is produced in the same way as TMP, but involves a slight chemical modification of the wood structure in advance of refining.

Emission levels from the various pulp processes and paper production vary greatly. Allocating a specific reference value for each parameter reflecting the level of emissions from each individual pulp type allows requirements to be imposed as to each pulp process. This encourages the use of the best pulps (from an environmental perspective) within each pulp process type.

Requirements as to chelating agents

In this context, chelating agents are EDTA and DTPA that are used to bind metal ions which catalyze peroxide disintegration during peroxide bleaching. The need for chelating agents is determined by the metal content of the wood raw material and the water, for which reason imposing specific levels for chelating agents is difficult.

Insufficient documentation is available on the environmental harmfulness of DTPAs and EDTAs, apart from the fact that they are not readily degradable and contribute to overfertilization through increased nitrogen emissions.

Although alternatives to chelating agents do exist, their availability on the market is as yet not sufficiently great for requirements to be imposed.

To allow requirements as to levels to be imposed in the next revision should alternative products not have not been developed, the requirement relating to the measurement of emissions of chelating agents as formulated in the criteria documents for tissue and printing paper has been retained.

Requirement as to the measurement of chlorate

The background to this requirement is that chlorate is harmful to bladder rack in the Baltic Sea. There should be no emissions of chlorate if effluent water is treated properly. The information available to Nordic Ecolabelling at present about the quantity of chlorate released during pulp production is not sufficient for specific requirements as to levels to be imposed. However, during the next revision attention should be focused on measurement results with a view to providing a basis for considering whether or not requirements as to chlorate emissions should be imposed.

CO₂

With a view to reducing the environmental impact of CO₂ emissions, a CO₂ requirement was imposed in the criteria for printing paper and tissue paper. The requirement was based on the calculation of fuel used in pulp and paper production relative to the quantity of this fuel that is fossil. The requirement in the Basic Module is based on this requirement.

Changes to emission requirements

The reference values have been made significantly stricter compared with the reference values found in version 3.3 of the criteria document for tissue paper and version 2.5 of the criteria document for printing paper. Table 9.1.1 specifies the reference values for the various pulp types and paper.

In addition, the threshold for the individual emission points has been lowered from 2 to 1.5.

The levels of the reference values have been determined on the basis of ranges comprising what are termed BAT values. The choice of the level in each individual BAT range has in turn been based on the levels of emissions from what are considered to be the best pulps in environmental terms. According to the IPPC Directive 96/61/EC (IPPC = Integrated Pollution Prevention and Control), all pulp and paper mills must be tested against BAT values specified in the BREF before the end of 2007. The average values for emissions from the pulps and papers that were investigated can be found in Table 9.1. Table 9.2 contains the corresponding BAT values.

Table 9.1 Average values for emissions from a number of European pulps (2000). The unit kg/tonnes means kilos per tonne of 90% pulp.

Pulp type	COD Kg/tonne*	P Kg/tonne*	AOX Kg/tonne*	NOx Kg/tonne*	S Kg/tonne*	Number of pulps
Sulphate	23	0.03	0.17 (ECF)	1.5	0.6	44
Sulphite	35	0.03	-	1.2	1.1	9
Unbleached sulphate	13	0.035	-	1.6	0.51	3
CTMP	20,6	0.03	-	0.3	0.1	6
TMP/Groundwood	3,4	0.0036	-			5
Recycled fibre	4,1	0.008	-	0.11	0.19	10
Paper machine	2,6	0.0065	-			

Table 9.2 BAT values for various pulp types and paper ("BREF") The unit kg/tonne means kilos per tonne of 90% pulp.

Pulp type	COD Kg/tonne	P Kg/tonne	AOX Kg/tonne	NOx Kg/tonne	S Kg/tonne
Sulphate	8-23	0.01-0.03	0-0.25 (ECF)	1.0-1.5	0.2-0.4
Sulphite	20-30	0.02-0.05	-	1-2	0.5-1
Unbleached sulphate	5-10	0.01-0.02	-		
CTMP	10-20	0.005-0.01	-	****	****

TMP/Groundwood,	2-5 *	0.004-0.01*	-	****	****
Recycled fibre	2-4*	0.005-0.01*	-	****	****
Paper machine	0.5-2** 0.5-1.5***	0.003-0.01** 0.003-0.01***	-	****	****
Paper machine Specialty paper *****	0,4-7,0	0.01-0.04	-	****	****

* Paper included

** Uncoated

*** Coated

**** BAT values are specified as kg/Mj for various fuel types

***** Specialty paper: High degree of beating or frequent changes in quality

The consultative proposal for module criteria separate chemical pulp production processes into sulphate and sulphite processes and these are each allotted their own reference values.

The background to this is that the matrix system has been used to impose requirements as to all pulp production processes, and that only those pulps in each group that are best in environmental terms may be used for ecolabelled paper. No production process is discriminated against. For technical reasons it is easier to reduce COD emissions from sulphate production than from sulphite pulp production, which accordingly results in higher COD emissions than is the case with sulphate pulps. Account has been taken of this in the BAT values, which are different and specific for the two pulp types. The reference values proposed in the module criteria are based on these BAT values. If a separate reference value were not given for sulphite pulp production and a single reference value was given for chemical pulps, the total reference value for chemical pulps would exclude sulphite pulps, whereas very low COD values would be imposed with regard to sulphate pulps. In order not to exclude sulphite pulp production, a separate reference value is given, which has been adjusted in such a way that only those pulps that are best in environmental terms will fulfil the requirement.

The reference values for S and NO_x have also been adjusted so that they are now linked to fuel consumption. This is the logical consequence of the fact that the energy requirement permits different reference values to be applied depending on the subprocess in which they are used. Since S and NO_x emissions relate to energy production, it should also be permissible for the reference values from these emissions to be varied depending on the design of the process. Previously it was the case that emissions of NO_x and S deriving from backpressure generated electricity could be subtracted. This specification is no longer necessary since it takes place automatically, given that S and NO_x are interlinked with fuel consumption.

In the criteria proposal separate reference values for COD and P also apply to paper machines.

The measurement of chlorate emissions during chloride dioxide production is new.

CO₂

The requirement as to CO₂ is based on the criteria for printing paper and tissue paper. The chemical pulp requirement has been made stricter in relation to the requirement contained in the printing paper criteria and is now on the same level as the tissue paper criteria. The stringency of the requirement is supported by the results of an investigation into emissions from a number of pulp and paper mills. Previously no CO₂ requirements applied to coffee filters and greaseproof paper. However, the production processes for these products should not result in significantly higher CO₂ emissions than the production of tissue paper and printing paper.

The requirements as to pulp and paper are not separated

During the revision of the EU Ecolabel, The Flower, the formula for calculating emissions (COD, P, S, NO_x and AOX) was amended so that separate reference values applied to pulp and paper machines. Prior to this the reference values had been combined, as they were in the Swan Label criteria. The advantage of dividing up the reference values is that this facilitates comparisons with values contained in the literature, particularly report on what is termed "Best Available Technology" (BAT).

The secretariat group discussed the idea of changing the method of calculating points so that separate requirements were imposed as to pulp and paper. Changing the method would not entail any advantages or disadvantages for the environment. However, it would result in less flexibility and would mean that fewer different types of Swan-labelled paper would be produced. This would represent a disadvantage for consumers. Accordingly the proposal is that separate requirements should not be introduced for pulp and paper. Instead, emissions from pulp production would be added to emissions from paper production, the total being divided by the sum total of the reference values for emissions from pulp and paper.

The formula for calculating emissions is written in a slightly different form to the formula for emissions contained in the Flower criteria. The reason for this is that the secretariat group received opinions from the industry on the formulation of the formula after the Flower criteria had been adopted. The secretariat group therefore opted to improve the formula. The Users Manual for applications for Flower licences for paper has since recommended that the formula in the Flower criteria should be interpreted in the same way as the formula proposed by the Swan Label secretariat group. Test calculations using these calculation methods reveal the same end result when the Flower formula is interpreted in the recommended manner.

Emissions for which no requirements are imposed

Nitrogen emissions into watercourses

This criteria proposal does not contain requirements as to emissions of nitrogen into watercourses. The reason for this is that the pulp and paper industry releases only a very small proportion of total nitrogen emissions to watercourses when compared with agriculture and other industry. Furthermore, the number of requirements has been increased in this revision with the addition of chlorate measurements, at the same time as which the reference values have been made stricter. Investigations will be conducted into whether there are grounds for imposing requirements as to nitrogen emissions in the next revision.

Future criteria

The next revision should:

- assess the results of measurements of chelating agents and chlorate and determine whether it would be relevant to impose requirements as to the content of these substances in outgoing effluent water.
- decide whether there are grounds for imposing requirements as to nitrogen emissions from production.
- assess the design and the level of the emission requirements.

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10. Waste

The environmental impact of product-related waste

A number of waste products are created during the production of paper products, for example wood waste, paper waste and chemical waste. The paper itself ends up as waste after use. In the Nordic countries the authorities regulate waste by determining how it is to be removed. In other parts of the world the authorities do not regulate waste to the same extent. Efficient sorting on site by the generator of waste will help ensure that as much waste as possible is removed in the most efficient way possible.

The background to the requirements imposed as to waste (potential and controllability)

Waste quantities are rising in the western world as a consequence of increasing consumption. Waste removal has an effect on the environment. The burning of waste allows the energy content of the waste to be exploited and to replace other fuel types; recycling or reuse allows other goods or raw materials to be replaced. This reduces environmental impact. Pulp and paper mills are able to control and manage the fate of production waste generated in their plants. Greater difficulty, however, attaches to the way in which used paper is removed. Some types of paper are never recycled, for example toilet paper, kitchen paper, coffee filters and the like. Other types of paper are collected and reused extensively, for example copying paper and paper used in printed matter. The only contribution that pulp and paper manufacturers can make here is to ensure that their paper is not unsuitable for reuse. The criteria relating to suitability for reuse/recycling are described in the sections dealing with the individual paper types. Some of the chemical criteria are aimed at reducing the environmental impact of used paper, one example being the criteria limiting the content of heavy metals in coloured paper.

The sorting of production waste on the factory site is fairly similar for all the various types of paper and is therefore described in the Basic Module. The requirement is that a report must be drafted on quantities, fractions and the final destination of the waste. This type of report can help manufacturers to determine whether the waste could in fact be removed in a more efficient way. The requirement that combustible waste containing wood with a positive thermal value must not go to landfill sites is imposed because manufacturers in some countries have access to energy that is so cheap that they are able to simply dispose of this waste instead of using it for energy or as a raw material in other products.

Formulation of the requirements

Pulp suppliers and paper manufacturers must sort various types of waste on site. They must ensure that as much waste as possible is reused or recycled. The various fractions must either be recycled or processed in some other satisfactory way.

Combustible waste with a wood content with a positive thermal value must not be discarded.

Review of the changes relating to waste made in the criteria document

The requirement is based on the criteria for tissue paper and printing paper.

The supplementary modules for finished paper products may contain further waste requirements designed to promote the reuse or efficient use of raw materials. One example of this is requirements relating to cutting waste from envelopes and coffee filter production.

Inspections

A product for which an ecolabelling licence has been granted may be checked by an impartial test institution at the request of the ecolabelling organization. An inspection of this nature may take one of many forms, for example a random test of a product purchased from a retail outlet and then tested by an impartial test institution. If the product is found not to comply with the information upon which the application was based, the licence-holder will be liable for the cost of such testing.

11. Performance properties

The environmental impact of the product relating to its performance properties

It is important that Swan-labelled products should have satisfactory performance properties. If they do not, their environmental impact may increase if, for example, it becomes necessary to use more of the product in order to achieve the same result. In addition, consumers will be disappointed and less inclined to choose Swan-labelled products on future occasions.

The specific performance properties relate to the finished products. The criteria are therefore described in the supplementary modules for the individual paper product. For example, the criteria for the filtration properties of coffee filters are described in the Supplementary Module. Criteria for Swan-labelled coffee filters.

If no specific requirements are given, the general requirement is that the product must fulfil the normal requirements relevant to the product group. Admittedly this is not a particularly precise formulation, but it does provide scope for intervention if the product proves not to have satisfactory performance properties.

Coloured paper must fulfil the requirement that bleeding must not occur. This requirement can be found together with the chemical requirements in Chapter 7.

12. Analyses

The documentation requirement

The documentation requirement can be found in the Basic Module, the Chemical Module or the Supplementary Module and encompasses:

Pulp and paper manufacturers:

- 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, chlorate and chelating agents. Annual reports containing emission figures must be submitted to the ecolabelling organization annually. See the Basic Module.
- Documentation showing that the laboratories and test institutions used perform the analyses in an impartial and competent way.
- In the event of changes in production conditions or if requested by the ecolabelling organization, the test results must be re-reported unless evidence can be provided in the individual case that the requirements continue to be fulfilled.

Analysis laboratories and test institutions

The analysis laboratory/test institution used must be impartial and competent. Raw data must be available for inspection by the ecolabelling organization during the period of validity of the licence. The cost of documentation and analyses must be borne by the applicant.

The laboratory must fulfil the general requirements contained in the standard EN 45001/DS/EN/ISO/IEC 17025 or have official GLP approval. The manufacturer's laboratory may be approved for performance of analyses and tests if the authorities monitor the sampling and analyses process or if the manufacturer has a quality system in place encompassing sampling and analyses and the laboratory is certified to SO 9001/9002/14001 or is EMAS registered. Performance testing and analyses may be conducted by the manufacturer even if the laboratory is not certified, subject to an assessment by the ecolabelling organization (e.g. measurement of seam strength of for coffee filters and bleeder test for tissue paper).

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

General comments on sampling and methods of analysis

Sampling and analysis must be performed in a competent way. The methods of analysis described in Table 1 of the criteria in the Basic Module (not shown in this background document) have been approved by Nordic Ecolabelling. As an alternative, methods of analysis considered to be equal by an independent and confident body will be accepted.

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. The results of the analysis are then reduced by the degree of 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 1.

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. In the event of the introduction of new processes or internal improvements, the level of emissions must be determined on the basis of 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 the ecolabelling organization, the minimum being 40 samples in total.

Chelating agents must be subject to at least two representative samples per year, separated by approximately six months.

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.

The results must be reported as:

COD: number of kg O₂/tonne of pulp or paper

P: number of kg P/tonne of pulp or paper

AOX: number of kg AOX/tonne of paper or pulp

Emissions to air

Emissions to air of sulphur, S, and nitrogen oxides, NO_x must be measured at all emission points and diffuse emissions of S must be reported, e.g. emissions of sulphur during the production of pulp using chemicals with a sulphur content. 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, toll oil digesters, steam boilers, other steam boilers, kilns for combusting strong-smelling gases and the production of electricity generated for internal consumption with the exception 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. In the case of oil, the sulphur content is calculated on the basis of one of the methods of analysis provided in Table 1. In the case of natural gas, sulphur emissions may be set as equal to zero. Analyses performed by the fuel supplier will be accepted.

Frequency of measurement

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.

Reduced frequency of measurement of NO_x from natural gas:

Where natural gas is used, less frequent measurements of NO_x will be accepted. One measurement every third year will be acceptable subject to the following conditions.

1. Measurement results exist from two series of measurements separated by at least half a year, showing that the relative difference is so small that the total of the highest measured result + the relative difference does not exceed the required value.
2. The boiler and burner are inspected at least once a year and found to be in order.
3. No changes are made to the boiler and burner such as the installation of a new burner, changes to the combustion air conditions or the like.

For the exception to apply, the manufacturer must provide details of the above information on NO_x together with the annual reporting.

Results must be reported as:

NO_x: number of kg NO₂/tonne pulp or paper

S: number of kg S/tonne pulp or paper

Chemicals

If the results of analysis of chemicals are not available, scientifically instigated references to the literature may be used to demonstrate that the chemicals fulfil the requirements.

Annual reporting

Some environmental effects change from year to year. For this reason, paper and pulp manufacturers are subject to the following requirements as regards annual reporting:

- The proportion of certified fibre raw material in the paper must be reported on an annual basis by 1 April in the following year for each year the licence remains in force.
- Emission figures for paper and pulp production must be reported on an annual basis by 1 April in the following year for each year the licence remains in force

Any changes that impact on the licence must be reported outside the annual reporting, see the chapters above.

Documentation that the requirement has been fulfilled must be submitted to the ecolabelling organization annual during the period of validity of the licence.

This requirement corresponds to the requirements contained in the criteria contained in printing paper and tissue paper.

Inspection

Products for which an ecolabelling licence has been granted may be checked by an impartial test institution at the request of the ecolabelling organization. An inspection of this nature may take one of many forms, for example random tests of a product purchased from a retail outlet and tested by an impartial test institution. If the product is found not to comply with the information upon which the application was based, the licence-holder will be liable for the cost of such testing.

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Other appendices relating to Chapter 7, chemicals, can be found only in the Chemical Module.

Appendix 2.1 Overview of existing criteria for paper

Table 2.1 Overview of criteria in the paper groups as at 16 January 03

Criteria	Coffee filters	Greaseproof paper	Envelopes	Packaging paper	Tissue paper	Printing paper
Wood raw material from sustainable forestry				x Criteria 5.1 20% certified or 100% return	x Criteria 5.1 15% certified or 100% return	x Criteria 5.1 15% certified or 50% return
Pulp raw material or paper raw material	x Criteria 5.1.1 Chemical pulp only	x Criteria 5.1 Virgin fibre pulp only	x Criteria 5.1.1. No wet strength paper			
Chemicals	x Criteria 5.1.3		x Criteria 5.1.3		x Criteria 5.2	x Criteria 5.2 and 5.3
Biocides	x	x	X	x	x	x
Surfactants, alkyl phenol ethoxylates				x (nonylphenol ethoxylates)	x	x
Surfactants, de-inking of recycled fibre			x	x	x	x
Chlorine gas bleaching		x	x	x	x	x
Wet strength agents		x			x	
Residual monomers					x	x
Foam retardants		x			x	x
Chelating agents					x	x
Heavy metals				x		x
Glue	x		x Criteria 5.3.1		x	
Coating chemicals		x Not chromium				
Emissions from production	x Criteria 5.1.2	x Criteria 5.3	x Criteria 5.1.2	x Criteria 5.5	x Criteria 5.3	x Criteria 5.4
AOX	x	x	x	x	x	x
COD	x	x	x	x	x	x
Phosphorus	x	x	x	x	x	x
Sulphur	x	x	x	x	x	x
NOx	x	x	x	x	x	x
Product safety	x Part of criteria 5.1.3. Concerns contact with food, colour, optical brightness	x Criteria 5.2. Concerning contact with food.			x Criteria 5.4. Concerning skin contact, bleeding of colour, optical brightness, fragrance.	
Waste from production. Plan required for sorting at source and re-use	x	x Criteria 5.4	x Criteria 5.1.4	x Criteria 5.2	x Criteria 5.5	X Criteria 5.7
Combustible wood based waste				x	x	X
Packaging materials	x Criteria 5.2.2	x Criteria 5.5	x Criteria 5.3.3		x Criteria 5.6	

Criteria	Coffee filters	Greaseproof paper	Envelopes	Packaging paper	Tissue paper	Printing paper
Packaging quantity	x					
Energy					x Criteria 5.7	X Criteria 5.5
Electricity					X	X
Fuel					x	X
CO2 from fuel				x	x	X Criteria 5.6
CO2 from electricity				x		
Other requirements	x Criteria 6	x Criteria 6	x Criteria 6	x Criteria 6	x Criteria 6	x Criteria 6
Official requirements as to safety working environments external environments	x	x	x	x	x	x
Performance	x Criteria 5.2.3 General filtration. Seam strength	x Criteria 5.6. General use	x Criteria 5.3.4 General use	x Criteria 5.4 Tearing, breakage, bending, strength		x Criteria 5.8 General use
Envelope production			x Criteria 5.2			
Printing method			x Concerning type of printing and printing			
Processing			x Criteria 5.3 Concerning glue (specified earlier) windows			

Appendix 6.1. Requirements as to forestry certification

Wood used in production must be certified by a third party in accordance with an applicable forestry standard that fulfils the requirements as to standard and certification system.

The following requirements apply to the standards and certification systems acceptable by Nordic Ecolabelling.

Standards

1. The standard must balance economic, ecological and social interests and comply with the UN's Rio Document; Agenda 21 and the Forestry Principles, and respect the relevant international conventions and agreements.
2. The standard must contain absolute requirements and promote and be aimed at sustainable forest management.
3. The standard must be generally available. The standard must be developed in an open process in which ecological, economic and social interests are invited to participate.

The certification system

The certification system must be transparent, have broad national or international credibility and allow for verification that the requirements in the Forestry Standard (see above) have been fulfilled.

The certification body

The certification body must be impartial, credible and able to verify that the standards in the requirement have been fulfilled, able to communicate the results and be able to ensure efficient implementation of the standard.

Documentation

- A copy of the forestry standard, the name, address and telephone number of the organization by which the standard was formulated, and the final report of the certification body.
- References must be provided to persons representing parties and interest groups that were invited to participate in the development of the Forestry Standard.
- A description of the system used to secure the traceability of wood.

Nordic Ecolabelling will be entitled to require the submission of further documentation in order to assess whether the requirements relating to the standard and the certification system have been fulfilled.

Bilag 7.1. Pigment (Dansk:fyldstoffer) til massa- och papperstillverkningen

This appendix telling more details on environmental impacts of fillers for pulp and paper has not been translated to English.

Appendix 9.1 The production of and market for pulps

Number of production sites

The pulps used in ecolabelled products are generally produced in Europe. However, pulps from North and South America and Asia and Canada also occur.

There are 93 chemical pulp mills in Europe, of which 19 sulphite and 74 sulphate pulp mills. 6 of the sulphite pulp mills are in Sweden and one in Norway. Sulphite pulps are not produced in Finland. There are 18 sulphate pulp mills in Finland, 22 in Sweden (of which 15 produced bleached sulphate) and two in Norway. No cellulose pulp based on virgin fibre is produced in Denmark.

There are 21 mechanical pulp mills in Finland, 9 in Sweden and 9 in Norway.

Production

Chemical pulps

22 071 ktonnes of sulphate pulp (bleached and unbleached) were produced in Europe in 2000. 15,161 ktonnes of this was produced in the Nordic countries (69%). The production of sulphite pulp totalled 2,486 ktonnes of which 979 ktonnes was produced in the Nordic countries (39%).

Mechanical pulps

A total of 14 675 ktonnes of mechanical pulp is produced in Europe in 2000. 10 481 (71%) of this was produced in the Nordic countries.

Recycled fibres

Recycled fibres used in various types of paper totalled 41 135 ktonnes in 2000 for Europe as a whole. The quantity of recycled fibres used in the Nordic countries totalled 3 246 ktonnes

Types and area of use for various types of paper pulps

The properties of the fibres in all these different types of pulps are different and this again reflects the different types of paper in which they are used. The term paper technical properties covers many different aspects and the properties will often be assessed differently depending on the paper in which the pulp is to be used and on the other components found in the paper. Moreover the manufacturers of one and the same paper product may prioritise pulps differently depending on local conditions. Even so, the main areas of use for the various types of pulp are as follows:

Printing paper

Chemical pulps where fibre separation takes place with the aid of pulping with pulping liquor is hard on the fibres than the mechanical methods of releasing fibres for which reason the fibres are both longer and stronger than mechanical pulp fibres. Furthermore, softwood with long fibres provides strong pulps suitable for reinforcement fibres and paper such as newspaper, in which the greatest proportion of the fibres consist of mechanical pulps or recycled fibres. Sulphate pulps produced from hardwood are weaker than sulphate pulp produced from softwoods. On the other hand, they provide a good formation for the paper, which means that the paper's printing properties are good. As a result, the finest printing papers may contain up to 80% hardwood fibres from chemical pulp, the rest being chemical softwood pulp.

Newsprint

Mechanical pulps like TMP and ground wood pulp are particularly well-suited for use in newsprint and other printed matter with a shorter useful life than fine paper. The mechanical process of releasing fibres breaks the fibres apart by severing the fibre walls, as a result of which the lignin remains in the pulp. Furthermore, there is considerable shortening of the fibres. For this reason the pulp contains whole fibres, fibre fractions and fine material which admittedly results in good optical scattering, but it also produces a weak point which yellows after a short period of time. For this reason, newsprint always contains a varying content of bleached sulphate produced from softwood as further common mixtures of different pulp types, see Table 9.2.1.

Table 9.2.1

	Chemical pulp Short fibres	Chemical pulp Long fibres	Mechanical pulp TMP, CTMP	Recycled Fibre
Newsprint		0-15%	90-30%	35-55%
Journal paper -uncoated paper -coated paper		30% 50%	70% 50%	
Fine paper, Copying paper -uncoated paper -coated paper -recycled paper	60-80% 50-60% 100%	20-40% 40-50%		100%
Graphic paper (220-240 g/m ²)	25-35%	0-15%	75-50%	

Soft paper

Soft paper is also produced from chemical pulp comprising mainly softwood. The usefulness of pulp for soft paper (e.g. toilet paper, kitchen paper and serviettes) or fluff (e.g. for diapers and sanitary products) is largely determined by the properties of the fibre surface and the surface energy and surface charge. The main factors are the way the fibre material interacts with the paper technical environment in the production process. Several different types of fibre are used in soft paper.

Hardwood pulps are avoided for amongst other reasons their low strength or high degree of fuzziness. But for other quality reasons (softness) or for cost reasons, a mixture of up to 40% of e.g. birch, eucalyptus or acacia may be used if the pulp is intended for toilet paper or serviettes. Up to 60% hardwood pulp may be used if the product is twin-ply.

Up to 100% mechanical pulp may be used in soft paper if the requirements made of the end products so permit. However, tissue paper with a high content of mechanical pulp often has a roughness that is not always acceptable to the customer. Low resistance to tearing and dusting are other limitations to the use of mechanical pulp. For this reason TMP and pressurized groundwood pulp are preferred to ordinary groundwood pulp. CTMP is even better. CTMP is superior to TMP because of the lower content of fines, the lower content of resin, particularly after peroxide bleaching and softer fibre walls as a result of sulphination. However, CTMP has a tendency to stick to the surface of the Yankee-cylinder, as a result of which chemical spraying is necessary. The highest permitted quantity of CTMP in the stock is 50% if an acceptable strength and optimum adhesion to the cylinder is to be secured. Table 9.2.2 shows typical proportions of the various pulp types in soft paper.

Draft proposal. Modules for Swan-labelled paper products
Background memo.

Table 9.2.2

	Hardwood sulphate	Softwood sulphate	TMP/groundwood	CTMP	DIP
Tissue paper	0-40/60%*	0-100%	0-100%	0-50%	0-100%

*)Two-ply

Coffee filters

The paper used in coffee filters is usually unbleached or wholly bleached softwood sulphate pulp. This is because the longer and rougher softwood fibres provide the optimum structure for filtration and give the paper strength. Pulp produced on the basis of bamboo is also used. Swedish producers of pulp for coffee filters state that there are no particular quality requirements as regards pulp for coffee filters compared with pulps for tissue and printing papers. The bleached qualities are exactly the same. However, the unbleached qualities undergo an extra washing process. These pulps have low conductivity and a low metal content. No special chemicals are used in the production of coffee filter pulps.

Greaseproof paper

Greaseproof paper is also produced from bleached softwood sulphate. The pulp undergoes extensive beating before paper production for which reason good beating properties in the pulp are essential. What are termed neutral sulphite semichemicals are also used in greaseproof paper. Neutral sulphite semichemical is a cross between chemical and mechanical pulp. The woodchips are first heated to a high kappa value (a measure of the amount of lignin remaining in chemical pulp) after which it is ground down to a suitable SR figure (a measure of the amount of grinding the pulp has undergone).

Packaging paper

In packaging paper strength is an important property. For this reason packaging paper is often made from unbleached softwood sulphate pulp. If a light printed surface is required, the board can be coated with a liner of bleached hardwood sulphate or recycled fibre.

Fluff

Long-fibred pulp, i.e. softwood pulp, is always used in fluff pulp since the normally unbound dry network will not have sufficient strength and bulk if the fibres are not sufficiently long. Long and fairly stiff fibres are an advantage. In the case of tissue and fluff, strength plays an entirely different role than in other types of products. By normal standards they are weak to very weak. However, thanks to a high degree of extensibility there is usually sufficient strength as a result of considerable breaking. Fibre strength is of less importance.

Recycled fibres

Recycled fibres are ideal for use in newsprint and liners for packaging paper. It is also used in tissue paper and printing paper.