About Nordic Swan Ecolabelled

Grease-proof paper

Version 4.6

Background to ecolabelling
28 November 2023

Nordic Ecolabel

Content

049 Grease-proof paper, version 4.6, 28 November 2023

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Addresses

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

Denmark
Ecolabelling Denmark
Danish Standards Foundation
Göteborg Plads 1, DK-2150 Nordhavn
Fischersgade 56, DK-9670 Løgstør
Tel: +45 72 300 450
info@ecolabel.dk
www.svanemaerket.dk

Finland
Ecolabelling Finland
Box 489
FI-00101 Helsinki
Tel +358 9 61 22 50 00
joutsen@ecolabel.fi
www.ecolabel.fi

Iceland
Ecolabelling Iceland
Umhverfisstofnun
Suðurlandsbraut 24
IS-108 Reykjavik
Tel: +354 591 20 00
svanurinn@ust.is
www.svanurinn.is

Norway
Ecolabelling Norge
Henrik Ibsens gate 20
NO-0255 OSLO
Tel: +47 24 14 46 00
info@svanemerket.no
www.svanemerket.no

Sweden
Ecolabelling Sweden
Box 38114
SE-100 64 Stockholm
Tel: +46 8 55 55 24 00
svanen@ecolabel.se
www.ecolabel.se

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1 Summary

The requirements in the supplementary module of grease proof paper have been tightened significantly. The revision work focused on energy consumption and emissions from paper manufacturing as well as the use of chemicals specific to grease proof paper. The Nordic Ecolabelling criteria for grease-proof paper are included in a module system, meaning that many of the requirements for grease-proof paper can be found in the Basic and Chemical Modules, version 2. These documents were revised in 2011. The revision of the requirements in the Basic and Chemical Modules entails a significant tightening of the requirements for grease-proof paper.

Nordic Swan Ecolabelled grease-proof paper has less impact on the environment than most other papers in its product group. Characteristics for grease-proof paper are:

- They contain fibre raw materials from sustainable forestry operations
- They are produced with low energy consumption and with a limited use of chemicals. Chrome- and fluorine compounds are absolutely forbidden.
- Manufacturing has low emissions to air and to water.

With these revised requirements for grease-proof paper, Nordic Ecolabelling aims to reduce the environmental impact, especially through requirements for energy efficient productions and bans on chemicals harmful to human health and the environment. The requirements apply to both paper manufacturers and converters.

Grease-proof papers are in this criterion defined as cellulose-based papers coated with various substances. The paper mills normally use finely milled cellulose which is coated with various waxes and silicones. Nordic Swan Ecolabelled grease-proof paper is comprised of baking paper and food paper, sandwich wrapper and sandwich interlay paper, roasting bags, and converted products from the aforementioned paper types. Examples of converted products include baking cases (e.g. cupcake and muffins cups).

The most important changes to the requirements in the **Supplementary Module for grease-proof paper, version 4** are:

- The requirements have been adapted to the revised requirements in the Basic and Chemical Modules, version 2.
- Reference values for the paper machine's energy consumption (fuel and electricity) have been introduced.
- New limit values for energy (fuel and electricity) have been introduced.
- New limit values for CO_2 have been introduced.
- The reference values for paper machine emissions (COD, S and NO_X) have been revised.
- Tightened requirements for coating chemicals cover also the use of fluoride impregnation chemicals and cyclic siloxanes octamethylcyclotetrasiloxane (D4) and decamethylcyklopentasiloxane (D5).

Adoption of the new limit values and reference values for energy and CO_2 entails a significant tightening of the requirements compared with the previous version 3 of the Criteria.

This document outlines the background to the requirements in the Supplementary Module for grease-proof paper. The background to the Basic and Chemical Modules can be found in the background document for the Basic and Chemical Module.

2 Basic facts about the criteria

2.1 Products that can be labelled

Grease-proof papers are cellulose based papers coated with various substances. The paper mills normally use finely milled cellulose pulp which is coated with various waxes and silicones. Grease-proof paper that comes into contact with foodstuffs must be made from virgin fibre.

The product group includes:

- grease-proof paper (parchment paper) such as baking paper and food paper, interlay paper, baking tray liner, sandwich paper and other grease-proof paper used for food wrapping, various types of 'high density paper' (e.g. for tracing).
- converted products from the aforementioned paper types. Examples of converted products include baking cups (e.g. cupcake and muffins cups).
- various types of release paper and grease-release paper. (Release paper is used, for example, as a base for adhesive labels).

Grease-proof paper products have a close association with products included in the criterion for 'Disposables for food' as this product group also includes paper used for food packaging. The definition is as follows: when grease-proof paper is used to wrap food, e.g. sandwich paper, etc., the paper can be Nordic Swan Ecolabelled under the Supplementary Module for grease-proof paper. The same applies to grease-proof paper that is converted into various types of baking cups. However, if the grease-proof paper has been converted into/is used in various types of disposable items, these cannot be Nordic Swan Ecolabelled through the criteria for grease-proof paper. They can, however, be labelled based on the criteria for Nordic Ecolabelling of Disposables for food. These in turn require the grease-proof paper used in the disposable items to meet the requirements presented in the Supplementary Module for grease-proof paper.

If you are not sure which products are covered by these requirements, contact Nordic Ecolabelling.

In order to be awarded a Nordic Swan Ecolabel licence, the relevant requirements in the Basic and Chemical Modules must be met, in addition to those of the Supplementary Module for the paper product concerned. If the requirements for a given area differ between the Basic and Chemical Modules and the Supplementary Module, the levels stated in the Supplementary Module shall apply.

2.2 Justification for Nordic Ecolabelling

This chapter outlines the RPS (Relevance, Potential and Steerability) of the environmental impacts resulting from the production and use of grease-proof paper. The relevant environmental impacts are described and the potential for improvement within the industry assessed. The steerability with regard to ensuring development in the right direction is also examined. Please see also the Background document to the Basic Module and the Chemical Module, version 2[1], which contains a general description of RPS for the paper industry.

Relevance (environmental impact)

The environmental impact of grease-proof paper production is somewhat different from the environmental impact associated with other paper production. In order to achieve a surface that repels water and grease, the fibre pulp used to manufacture grease-proof paper undergoes far more extensive milling that that used to produce other types of paper. This results in far greater energy consumption at the point of milling, dewatering and drying. One other specific impact relating to grease-proof paper is the use of special coating and impregnation chemicals.

The environmental impact of paper production derives from the extraction of raw materials, production of pulp and paper and conversion. The raw materials used in paper production are mainly cellulose based. Forestry operations can have a marked impact on forest life through changed and fragmented habitats, changes to landscapes and disruption to the lives of wild animals and birds, particularly during the latter's nesting period. In some areas, forestry operations may also impact on the living conditions of aboriginal peoples. These are relevant environmental impacts both in tropical areas and in the Nordic ecosystems. It is therefore important to ensure that the extraction of wood and fibre raw material is sustainable and considerate in order to protect the forest as a habitat and preserve biodiversity.

The production of chemical pulp and paper impact on the environment in several ways. Overall, the environmental impact of cellulose pulp production is greater than that of paper production. Different production processes result in different environmental effects. However, all production of cellulose pulp and paper is energy intensive. The production of grease-proof paper consumes more energy than other paper products as the pulp needs to be more finely milled in order to achieve the desired properties. The generation and use of energy results in various environmental impact. In addition to the climate effect and air pollution resulting from combustion, the environment is affected through the production of energy raw material and the landfill disposal of waste products. It is thus important to focus on energy consumption when trying to reduce the environmental impact of the paper industry.

Emissions to the air and water are also relevant environmental aspects of the paper industry. Emissions to the air are primarily dependent on the intensive energy production deriving from emissions of substances with an acid effect such as sulphur, substances resulting in eutrophication, e.g. nitrogen oxides (NO_X) and substances that contribute to the greenhouse gas effect.

Emissions to water include substances that lead to over-fertilisation such as nitrogen (N) and phosphorus (P) or substances that upset the balance between N and P. These can

[1] Background to Nordic Ecolabelling of Paper Products - basic module and chemical module, version 2, 22 June 2011.

cause algal bloom and result in a scarcity of oxygen in the aquatic environment. Emissions of COD, i.e. organic compounds that consume oxygen as they degrade, have the same effect.

Emissions of absorbable organically bound halogens, AOX, are also relevant even if problems relating to these have been decreased significantly in the past 10 years thanks to better bleaching chemicals, more efficient wastewater treatment methods and improved production processes.

The pulp and paper industry uses various types of chemicals. These include coating agents, wet strength agents, biocides, dispersants, retention agents and dyes.

Some chemicals are not readily biodegradable and can bioaccumulate in organisms. Other chemicals may be carcinogenic and disruptive to endocrine functioning. From an environmental point is biodegradability of an organic substance one of the most important properties. The readily a substance degrades, the smaller is the ecological risk in general.

Toxic substances that do not degrade are extremely hazardous for the environment. They pass undisturbed through sewage treatment and end up in the recipient, where decomposition occurs slowly and the toxic effects are long-term. Substances that bioaccumulate and are not easily biodegradable can easily accumulate to levels which are harmful to organisms. It is therefore important to reduce the use of harmful chemicals and to ensure that production facilities have treatment plants capable of limiting emissions.

Various chemicals can be used for the manufacture of grease-proof paper, for example to coat and impregnate the paper. Several of the substances used as coating agents can be harmful to human health and the environment. One example is N-ethyl perfluorooctane sulfonamidoethanol (N-EtFOSE)[2], which is suspected of breaking down to form volatile perfluorooctane sulphonate (PFOS)[3]. PFOS is a type of perfluorinated organic compounds (PFAS), the shared name for a large group of chemicals that are persistent and easily absorbed by the body. These substances affect the biological processes in the body and are suspected to have both endocrine disrupting properties and carcinogenic properties[4]. These compounds are found all over the world, including in the Arctic; proof that they can be spread over large distances. Several of the compounds, including PFOA (perfluorinated octane acid) and PFOS, are not readily biodegradable and have serious implications for human health and the environment[5]. N-EtFOSE was found in slurry samples from 8 Norwegian water treatment plants in 2010, as well as in wastewater leaving these plants. N-EtFOSE is found in commercial products and can also result from the formation of MeFOSE in the water treatment plant. The compound binds to the slurry and is thus removed from the wastewater. An analysis of the different

[2] Government programme for pollution monitoring, The Climate and Pollution Agency (2011), Occurrence of selected organic micro pollutants and silver at wastewater treatment plants in Norway. Report no. 1090/2011
TA 2784 Performed by The Norwegian Institute for Water Research in collaboration with The Norwegian Institute for Air Research
[3] Shoeib M, Harner T, Ikonomou M, Kannan K. (2004) Indoor and outdoor air concentrations and phase partitioning of perfluoroalkyl sulfonamides and polybrominated diphenyl ethers. Environ Sci Technol. 38 (5):1313-20.
[4] OSPAR 2005: Hazardous Substances Series,Perfluorooctane Sulphonate (PFOS), OSPAR Commission, 2005(update 2006.
[5] State Of the Environment (SOE) Norway, PFOS-PFOA-og-andre-PFCs (19 March 2013):
http://www.miljostatus.no/Tema/Kjemikalier/Noen-farlige-kjemikalier/PFOS-PFOA-og-andre-PFCs/

perfluorinated compounds found in cardboard and paper food packaging was performed in Denmark in 2012. The study showed that these compounds can migrate to food[6].

Fluoride chemicals are not only used as coating agents. Since the price of the chemicals has fallen, they are now also added to the pulp. The result is that the paper can contain up to 10 times more fluoride compounds than if it was just coated[7]. A test of muffin cups in Tænk in December 2012 found that two of the ten cups tested contained fluoride substances[8].

Other substances used to coat grease-proof paper are silicones which may contain small amounts of cyclic siloxanes (ring structured), e.g. octamethylcyclotetrasiloxane, D4, and dekametylcyklopentasiloxan D5. These siloxanes are also found in the environment and have even been found in the Arctic[9]. A study by the Norwegian Institute for Water Research in 2012 showed high concentrations of D5 in fish from Mjøsa[10]. D4 and D5 are not readily degradable in the environment and accumulate in the food chain. D4 is also classified as reproduction toxic and toxic to aquatic organisms[11]. Another environmental and health problem is the use of organotin compounds as catalysts in the silicone coating of grease-proof paper, since the tin compounds have been shown to migrate into the food that is in contact with the paper. At a European Silicones Centre meeting in 2003, the EU's Scientific Committee on food was informed that no European manufacturers use butyltin as a catalyst[12]. The manufacture of grease-proof paper has slowed down in Europe, meaning that there is a risk of increased imports of paper containing organotin compounds.

Chromium can also be used as a coating/impregnation chemical. Chromium compounds are not readily degradable and can accumulate in organisms to varying degrees[13]. Hexa-valent chromium compounds are classified as very toxic aquatic organisms. Trivalent chromium compounds are generally somewhat less toxic, however, individual species may be particularly sensitive to these. Trivalent chromium can also oxidise to form hexa-valent chromium under certain conditions. The emission of chromium to the waste system from consumers or mill wastewater should thus be avoided. Coating agents containing chromium are used for e.g. baking paper. However, such paper cannot be reused.

Several studies and research institutes report that nanocellulose, also known as micro fibrillated cellulose, can be used to provide barrier properties or increase the paper's

[6] The Danish Veterinary and Food Administration 2012, Migration af fluorerede stoffer fra fødevarekontaktmaterialer af pap og papir, J. nr.: 2010-20-793-00107
[7] Personal communication with Xenia Trier, the National Food Institute of the Technical University of Denmark, department for Food Chemistry (30 August 2012).
[8] Tænk (2012) Muffins cases, Denmark. *Tænk* Dec/2013: 8 – 11.
[9] State Of the Environment Norway, Siloxanes (19 March 2013): http://www.miljostatus.no/Tema/Kjemikalier/Noen-farlige-kjemikalier/Siloksaner/
[10] Borgå et al., Food Web Accumulation of Cyclic Siloxanes in Lake Mjøsa, Norway, Environ. Sci.Technol., 2012, 46 (11), pp 6347-6354
[11] State Of the Environment Norway, Siloxanes (19 March 2013): http://www.miljostatus.no/Tema/Kjemikalier/Noen-farlige-kjemikalier/Siloksaner/
[12] Opinion of the Scientific Committee on Food on Potential risks from organotin compounds used as catalysts in silicone-coated baking papers (expressed on 5 March 2003).
[13] State Of the Environment Norway (19 March 2013): http://www.miljostatus.no/Tema/Kjemikalier/Noen-farlige-kjemikalier/Krom/

strength[14, 15, 16, 17, 18, 19]. Nanocellulose is nano size cellulose fibre with a diameter of 10-50 nm and a length of ~ 1000 nm. They are produced by delamination of cellulose fibres in high pressure homogenizers. However, the need to achieve fibre delamination has resulted in an energy intensive process. In 2012, Swedish research institute Inventia demonstrated that it is possible to reduce energy consumption by 98%, down to about 0.5 MWh per tonne[20]. As cellulose is biodegradable and there are no concerns over the use of nanocellulose and its impact on human health or the environment, Nordic Ecolabelling has not set any requirements to nanocellulose in this revision.

The use of optical whiteners and printing inks also involves chemicals that contribute to the overall environmental impact resulting from the manufacture of grease-proof paper.

Potential and steerability

Traditionally, the paper industry has had a considerable impact on the environment with major emissions to water and air and a heavy use of chemicals. Concern of the environment has increasingly become a focus and environmental load has been reduced. However, there is still potential for further improvement. The fibre raw material used by the paper industry are not always derived from sustainable forestry operations. Emissions to the air and water could be reduced by optimising the production processes and adapting the use of chemicals for improved health and environmental effects. Energy optimisation is also important when it comes to reducing environmental load.

Studies show that food packaging can contain substances that can be of concern when it comes to human health and the environment, for example chromium and PFOS. Nordic Ecolabelling has set out requirements for various types of paper for many years and has seen how the paper industry improve continuously their production processes. By imposing absolute requirement for, among other things, sustainable forestry operations, energy consumption and chemicals, Nordic Ecolabelling is able to steer the industry in a more environmentally friendly direction. There are ecolabelled alternatives on the market today and public authorities and other organisations in the Nordic countries have identified the Nordic Swan Ecolabel as a good choice for the environment and for human health. The Norwegian website erdetfarlig.no[21] and Grønn Hverdag i Norge[22] recommend e.g. Nordic Swan Ecolabelled food and baking paper. A report from the Swedish Chemicals Agency[23] on the use of perfluorinated substances in Sweden mentions that these are banned in Nordic Swan Ecolabelled baking and food paper.

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[14] Inventia (2013), Nanocellulose. Stockholm, Sweden. Available at: http://www.innventia.com/sv/Det-har-kan-vi/Nya-material/Nanocellulosa/ (accessed 20 May 2013)
[15] Paper and Fiber Institute (2013) Nanocellulose research and applications, Trondheim, Norway. Available at: http://www.pfi.no/Info-Center/Focus-on/Topics/Nanocellulose-research-and-applications/ (accessed 20 May 2013)
[16] Christian Aulin, Mikael Gallstedt, Tom Lindstrom, Cellulose (2010) 17:559–574
[17] Mindaugas Bulota (2013), Breakthroughs in nanocellulose, Bumaga BV – Kennis in Productie, Nederland. Available at: http://www.kcpk.nl/algemeen/bijeenkomsten/presentaties/20130130-nanocellulose (accessed 20 May 2013)
[18] Yulin Deng and Art Ragauskas (2012), Green nanocellulose barriers, Georgia Institute of Technology, USA. Available at: http://www.ipst.gatech.edu/meeting/2012/2012_presentations/17-Deng,%20Yulin%20--%20Nano%20Coating-2.pdf (accessed 20 May 2013)
[19] Wikipedia (2013) Nanocellulose. Available at: http://en.wikipedia.org/wiki/Nanocellulose(accessed 20 May 2013)
[20] Thomas Boel (2012)Supermaterialet nanocellulose er nu billigt nok til masseproduktion. On-line article in Danish publication *Ingeniøren* 23 September 2012. Available at: http://ing.dk/artikel/supermaterialet-nanocellulose-er-nu-billigt-nok-til-masseproduktion-132549 (accessed 21 may 2013)
[21] The consumer website of the Norwegian Climate and Pollution Agency (22 March 2013): http://www.erdetfarlig.no/produkter/Husholdning/Husholdningspapir/
[22] Grønn Hverdag (22 March 2103):http://gronnhverdag.no/nor/Aktuelt/Mat-pakkes-inn-i-fluor/(language)/nor-NO
[23]The Chemicals Agency, 2006: Perfluorerade ämnen - användningen i Sverige, Report nr. 06/06

Today there is more interest and focus on the environmental impact throughout the entire lifecycle of the product, from raw material to use and waste. Nordic Ecolabelling sees its label as a good tool for the industry to use when it wishes to take full responsibility for the environmental impact of a product across its entire lifecycle.

2.3 Version and validity of criteria

The criteria (the Supplementary Module) for grease-proof paper (food and baking paper) version 3 were approved by NMN in October 2003 and evaluated in 2007. There have been no major changes to version 3. The criteria have been extended a number of times. The version 3.6 of the criteria for grease-proof paper was valid until 31 December 2015.

Nordic Ecolabelling of criteria for grease-proof paper are included in a module system, meaning that many of the requirements set for grease-proof paper can be found in the Basic and the Chemical Module of paper products. These documents were revised in 2011. It was the version 1 of the Basic Module and the Chemical Module that was applied to version 3.5 of the Supplementary Module. For version 4 of the Supplementary Module it is version 2, or more recent, of the Basic Module and the Chemical Module that shall be applied. Version 4 of the Supplementary Module applies from 18 November 2014 to 31 December 2018.

2.4 The Nordic market

There are a few main producers of grease-proof paper in the Nordic region. The lion's share of their production is exported to Europe, the US and Asia. According to Dow Corning Europe, which produces e.g. coating chemicals for grease-proof paper, the use of baking paper has doubled in the past 5 years and with approx. 178,000 tonnes used each year, the use of silicon treated baking paper in the food industry now accounts for 81% of all baking paper used[24].

Grease-proof paper is converted into various types of baking and cooking paper (e.g. cups for muffins, cupcakes and buns), interlay paper and other special papers (often called catering paper, cooking paper, etc.). The industrial market is far larger than the consumer market. Licensees feel that the Nordic Swan Ecolabel carries more weight in the consumer market.

The market has long been stable and has recently seen an upturn due to the increased consumption of various types of cupcakes and muffins.

The increased fast-food sales have not increased demand for what we would traditionally call grease-proof paper. Although paper is often used to wrap sandwiches, hamburgers, etc. these types of paper are not grease-proof based on the traditional production method. Their grease proof properties have been achieved through various types of chemicals coatings, e.g. using fluoride and fluoride-like chemicals. These are harmful to both human health and the environment and the increased levels of these compounds in the environment represent a significant problem. For further information, please see chapter 2.2. Traditional manufacturing of grease-proof paper uses finely milled cellulose

[24] Kris Verschueren and Christian Parein (2012), Silicone Coatings Offer New Opportunities for Food Contact Paper Performance, Dow Corning Europe S. A. Available at http://www.dowcorning.com/content/publishedlit/30-1247-01.pdf (accessed 20 may 2013)

pulp which in itself is fluid and grease-repelling, thus requiring a lesser degree of coating (using waxes and/or silicones).

Nordic Swan Ecolabel licences

There are currently 9 Nordic Swan Ecolabel licences and 13 registrations for grease-proof paper. Registration in one country means that the licence is approved via the labelling body in another Nordic country, but that the products are registered as Nordic Swan Ecolabelled also in the country where it is registered.

The licences relate to a number of different products, above all baking and food papers (baking tray and sandwich paper) and muffins cups.

Table 1. Overview of Nordic Swan Ecolabel licences for grease-proof papers in the Nordic region, 26 September 2014.

Country	Licence	Registrations
Denmark	2	5
Finland	5	2
Norway	1	3
Sweden	1	3

2.5 Different labelling and management systems

The industry incorporates environmental work on various levels, e.g. through legislative requirements and voluntary measures. The most common voluntary tools are environmental management, environmental declarations and ecolabelling. Society is increasingly starting to take environmental aspects into account in connection with public procurement. There are a number of ecolabelling systems in addition to Nordic Ecolabelling.

Ecolabelling

Ecolabelling makes it easy for consumers to choose the products that represent the best options for the environment. The products are approved based on established environmental requirements and the organisations administering the system make all the complex assessments relating to the products' environmental impact. The system excludes products that fail to meet the requirements and compliance is monitored by an independent third party. The Nordic Swan Ecolabel follows ISO 14 025, type 1 standard for a lifecycle-based and voluntary ecolabelling.

In addition to the Nordic Swan Ecolabel, there are also other ecolabelling systems assessing paper products. There has been a review of ecolabels that are members of GEN, Global Ecolabelling Network. The majority of these ecolabels set criteria for various paper products of 'food packaging' but it is not specified whether these include the same type of paper as the Nordic Ecolabelling criteria for grease-proof paper. The US ecolabel Green Seal does have requirements regarding paper products used for cooking. According to label's website, the criteria were introduced in 1997 and there are consequently no new, updated requirements. The EU Ecolabel does not set criteria for grease-proof paper.

Environmental management

Environmental management systems bring order to a company's own environmental operations and produce improvements based on the company's own targets in the environmental field. However, an environmental management system does not contain any specific requirement levels (threshold values) for the products or their production. The most important systems are EMAS, which was developed by the EU, and ISO 14001, which is an international standard.

Environmental product declarations

Environmental product declarations give detailed environmental information without any particular requirements being placed on the products. There are thus no predetermined requirement levels. The usefulness of the declarations depends on the purchaser's knowledge of the environmental conditions surrounding the product to be bought. There is no international system for environmental product declarations, but work is underway in this area within ISO. In order to make an environmental product declaration, product category rules (PCRs) must be in place or created.

It is difficult to compare various environmental declarations as these are often based on different system limits. This produces different results and the declaration cannot be used to say which the best product is in an environmental point of view.

Raw material labelling; FSC and PEFC

A paper product can be labelled with the FSC/PEFC label which ensures that the fibre raw material comes from sustainably forestry operations and the product contains a certain volume of FSC/PEFC- certified fibres. This raw materials labelling scheme only shows that a certain volume of certified wood raw material is used in the product; it does not say anything about environmental impact later during the product's lifecycle. FSC/PEFC does not set requirements concerning energy consumption, emissions, waste or the use of chemicals; neither in pulp or paper production or later in connection with printing and conversion

3 About the criteria revision

3.1 Purpose of the revision

The assessment of the Supplementary Module for grease-proof paper conducted in 2007 concluded that the product group's major environmental gains are derived from the requirements contained within the Basic and Chemical Modules. The Basic Module contains general requirements relating to forestry, emissions, energy and waste from pulp and paper production. The Chemical Module relates to general requirements for chemicals used to manufacture pulp and paper. These documents were revised in 2011 together with the criteria for copy and printing paper.

The revision of the requirements in the Basic and Chemical Modules entails a significant tightening of the requirements for grease-proof paper. The most important changes in version 2 of the Basic Module are:

- Requirements relating to energy and CO_2 emissions have been tightened.
- CO_2 requirement for transport have been introduced.
- Requirement for certified, sustainable raw material have been tightened.

The most important changes in version 2 of the Chemical Module are:

- A general ban on classified chemicals has been introduced with a trivial limit.
- The requirement relating to classified residual monomers has been expanded.
- A ban on GMO in starch has been introduced.

The revision work on the Supplementary Module for grease-proof paper focused on the following areas: adaptation to the new requirements of the Basic and Chemical Modules version 2, energy consumption and emissions in connection with paper manufacture and the use of chemicals in coatings/surface treatments (especially fluoride compounds and siloxanes), which are specific in manufacturing of grease-proof paper.

3.2 About this revision

The revision has been performed based on the conclusions from the evaluation. Contact has been established with paper manufacturers and converters and the consultation document has been sent to all licensees and other stakeholders for consultation. Information could also be found on Nordic Ecolabelling's websites.

The revision project group has consisted of Maria Göransson from Sweden (project manager), Eline Olsborg Hansen and Elisabeth Magnus from Norway and Jaakko Suursalmi from Finland. After the consultation period, has Niina Tanskanen completed the criteria.

4 Justification of the requirements

The Supplementary Module for grease-proof paper contains requirements that are product-specific for the manufacture of grease-proof paper. This background report only describes the background to the requirements set out in the Supplementary Module for grease-proof paper. The background to the requirements set in the Basic and Chemical Module are available in the document Background to Nordic Ecolabelling of Paper Products – Basic Module and Chemical Module[25].

4.1 Description of the grease-proof paper

Description of the product, raw materials and manufacturing process

An ecolabelling licence is awarded to a paper product, which is why it is important that the applicant gives as detailed a description of the product as possible. In order to be able to determine whether or not the product meets the ecolabelling criteria, detailed information is required about the manufacturing processes and the raw materials used.

O1 Description of the product and the manufacturing process

Describe the product and how it meets the definition of a product that can be given the Nordic Swan Ecolabel (see above under the heading 'What can carry the Nordic Swan Ecolabel?').

Describe the manufacturing process, including conversion. State the trade name of the finished product, the type designation, grammage (g/m^2), weight by volume (kg/m^3) and moisture content.

[25] Background to Nordic Ecolabelling of Paper Products - basic module and chemical module, version 2, 22 June 2011.

✉ Description and documentation pursuant to the above. Product samples must be submitted on Nordic Ecolabelling's request.

4.2 Requirements for pulp and paper manufacturing

Basic criteria for pulp and paper manufacturing

The Nordic Ecolabelling criteria for grease-proof paper are included in a module system, meaning that many of the requirements set for grease-proof paper can be found in the Basic and Chemical Modules. The Basic Module contains general requirements relating to forestry, emissions, energy and waste from pulp and paper production. The Chemical Module relates to general requirements for chemicals used to manufacture pulp and paper. Production of the grease-proof paper and pulp must meet the requirements specified in the Basic Module and the Chemical Module, version 2 or more recent, where relevant and unless otherwise stated in the requirements below.

The Basic Module and the Chemical Module were revised in 2011. The revision of these requirements in the Basic and Chemical Modules entails a significant tightening of the requirements for grease-proof paper.

The most important changes in version 2 of the Basic Module are:

- Requirements relating to energy and CO_2 emissions have been tightened.
- Requirements for certified, sustainable raw material have been tightened.
- CO_2 requirement for transport have been introduced.

The calculations for paper products are to be performed in line with the calculation structure set out in the Basic Module. The calculations encompass both paper production and constituent pulps used. The reference values for energy (O4) and emissions (O6) that should be used for paper machines manufacturing grease-proof papers are found in this Supplementary Module, similarly, the limit values to be used for CO_2 emissions requirement (O5). The Basic Module does, however, include a new requirement for reporting CO_2 emissions from transport to the paper mill which paper manufacturer shall report. The requirement also applies for grease-proof paper manufacturer (see detailed requirements K11 in the Basic Module).

The most important changes to version 2 of the Chemical Module are:

- A general ban on classified chemicals has been introduced, with a trivial limit.
- The requirement relating to classified residual monomers has been expanded.
- A ban on GMO in starch has been introduced.

The background to these requirements will not be stated here but is available in the document: Background to Nordic Ecolabelling of Paper Products – Basic Module and Chemical Module, version 2, 22 June 2011. The chemical requirements for grease-proof paper can be found under chapter 4.3 of the Supplementary Module.

If Nordic Ecolabelling has previously approved the pulp(s) in question for use in grease-proof paper pursuant to the Basic Module, version 2 or more recent, this should be

informed in requirement O2. Note that the supplementary requirement for grease-proof paper pulp, O3, must also be met if the paper comes into contact with foodstuffs.

The following applies to converters: if Nordic Ecolabelling has previously approved the paper grade in question for use as grease-proof paper in line with the criteria for such, version 4 or more recent, this should be informed in requirement O2. This removes the need for requirements O3-O6 to be documented separately.

O2 Basic requirements for pulp and paper manufacturing

Production of the grease-proof paper must meet the requirements specified in the Basic Module and the Chemical Module, version 2 or more recent, where relevant and unless otherwise stated in the Supplementary Module requirements. The reference and limit values below should be used when calculating energy (requirement O4), CO2 (requirement O5) and emissions (requirement O6).

For documentation of the requirements in the Chemical Module, see requirement O7.

Has the pulp or paper been assessed by Nordic Ecolabelling before?

✉ Documentation showing the pulps/paper types used. Trade name of the pulp/paper, name of supplier and manufacturing mill.

✉ Documentation showing how the requirements of the Basic Module, version 2 or more recent, are met. Documentation of the Chemical Module requirements should be documented in O7. To document the requirements concerning pulp, the pulp producer shall use Nordic Ecolabelling's electronic application aid My Swan Account.

✉ If pulps used to manufacture the Nordic Swan Ecolabelled grease-proof paper have already been approved by Nordic Ecolabelling pursuant to the Basic Module, version 2, or more recent versions; information stating the name of the pulps and the time of approval shall be attached.

✉ If the paper used to manufacture the Nordic Swan Ecolabelled grease-proof paper has already been approved by Nordic Ecolabelling pursuant to the criteria for grease-proof paper, version 4 or more recent versions; documentation stating the name of the paper and the time of approval shall be attached.

Requirements for pulp used to manufacture paper for use in contact with foodstuffs

If the paper is intended for use in contact with foodstuffs, the pulp must be made up of virgin fibre only. No recycled fibre may be used. This requirement is derived from version 3 of the Criteria and has not been changed in this revision. Recycled paper may contain unknown substances and be polluted with substances that should not be present in products used in contact with food. This may for example include substances that are harmful to health such as heavy metals and traces of printing inks. Therefore, Nordic Ecolabelling wishes that only virgin fibre will be used in papers in contact with foodstuffs.

O3 Requirement for pulp used to manufacture paper for contact with food

Only virgin fibre may be used in the pulp used to manufacture the paper.

✉ Declaration from the pulp supplier/suppliers that the requirement is met.

Energy, CO_2 and emission requirements applicable to production

The evaluation of the Nordic Ecolabelling Basic and Chemical Modules resulted in a consensus that the energy and CO_2 requirements represent one of the most important points of the revision. New limit values for energy (requirement O4) and CO_2 (requirement O5) have therefore been added to this Supplementary Module. New reference values have also been introduced for the paper machine's COD, S and NOx emissions (requirement O6) to adapt them to the constituent requirements in the Basic Module.

Energy

As described in chapter 2 below the Justification for Nordic Ecolabelling production of pulp and paper is energy intensive. The production of grease-proof paper consumes more energy than other paper products as the pulp needs to be more finely milled in order to achieve the desired properties. The production and consumption of energy place a number of burdens on the environment. Besides climatic impact and air pollution produced by the combustion of fuel, the production of primary energy sources and disposal of waste products impact on the environment. It is thus important to focus on energy consumption when trying to reduce the environmental impact of the paper industry. A detailed description to energy requirement's background is in the background document of Basic and Chemical Modules[26].

In the previous version of grease-proof paper, there was no separate requirement for energy. Requirements were stipulated in regard to energy consumption in the forms of fuel or electricity according to the Basic Module, version 1. The starting point was information on the actual energy consumption in the production processes that was compared to a corresponding specified reference value. Energy score is comprised of the ratio between actual energy consumption and the reference value. The total energy score (electricity + fuel) was to be less than 1.25, and score for electricity alone was to be less than 1.75.

In the Basic Module, version 2.0 the total energy score has been divided into a score for electricity points and one for fuel points. The following requirement must be fulfilled for paper unless specified otherwise in the Supplementary Module for the specific paper product.

$P_{\text{electricity (total)}} < 1.25$

$P_{\text{fuels (total)}} < 1.25$

Energy points for grease proof paper are based on the Basic Module's, version 2 way to calculate energy, i.e. separate point system to both electricity and fuel. This limit defines how much of the paper product's total energy consumption may exceed the level of consumption recorded under optimal conditions. A point limit of 1.25 indicates that the average value of the paper product's total energy consumption may not rise above a level that is 25 % higher than the energy use set by the reference value.

In the Supplementary Module for grease-proof paper, the point limits for both electricity and fuel are set at < 1.15. This tighter limit value in relation to the limit value 1.25 of

[26] Background to Nordic Ecolabelling of Paper Products - basic module and chemical module, version 2, 22 June 2011.

Basic Module means that a new energy requirement (O4) has been introduced to Supplementary Module for grease-proof paper 4.0.

Tightened reference values for paper machines

The reference values for paper production in the Basic Module, version 1, were calculated as the sum of the values of different sub-processes. Instead of calculating reference values from the sum of values for sub-processes, a reference value for each pulp and paper type has been specified in the Basic Module, version 2.0. Following the same principle, new reference values regarding fuel and electricity consumed in grease-proof paper production have been included in the new O4 requirement specified in the criteria for grease-proof paper.

The reference values for paper machine and the new limit values for energy and CO_2, have been obtained by calculating the total energy consumption based on the Basic Module's new, tightened reference values for pulp and dialogue with manufacturers. Unfortunately, there are no BAT-values available for this kind of specific paper machines.

In order to achieve a liquid and grease-repellent surface, the fibre pulp used for grease-proof paper is milled much more finely than that used to manufacture other paper grades. This means that the energy consumption is far higher for milling, dewatering and drying. The reference values for the paper machine's energy consumption are therefore relatively high compared to other paper machines. Paper machines for grease-proof paper are relatively old and there tends to be a low frequency of new investment due to the relatively low sales volumes for this product. It should be noted that although milling is energy intensive, this means in the other hand, that less chemicals are used during manufacturing.

The reference value has been set at 3,500 kWh/tonne paper for fuel and 2,200 kWh/tonne paper for electricity. This has been done to cover different milling needs for various pulps (sulfate/sulfite) used in manufacturing and hereby to give little flexibility to the paper manufacturer to calculate the energy points.

A more detailed description of the documentation requirement and calculation methods used is found in the Basic Module, version 2 which also defines Pelectric and Pfuel. Energy consumption in transporting raw materials as well as converting and packaging is not included in the energy calculation. Worksheet provided by Nordic Ecolabelling shall be used for the calculations.

O4 Energy requirements

For Nordic Swan Ecolabelled grease-proof paper, the total electricity and fuel scores must each be less than 1.15.

$P_{electric\ (total)} < 1.15$

$P_{fuel\ (total)} < 1.15$

$P_{electric\ (total)}$ and $P_{fuel\ (total)}$ includes the energy scores for both paper production and pulp production.

The reference values for the paper machine's fuel are 3,500 kWh/tonne and for electricity 2,200 kWh/tonne.

✉ Calculation pursuant to Appendix 2 in the Basic Module, version 2, showing that the score requirement is fulfilled. The calculations shall be made on a calculation sheet developed by Nordic Ecolabelling.

CO_2 emissions

Within the EU, intense work is currently underway to develop legislation relating to energy optimisation and the lowering of greenhouse gas emissions from various activities. The Nordic Swan Ecolabel is a complement to legislation. With tightened CO_2 requirements for grease-proof paper, Nordic Ecolabelling wishes to highlight the pulps and papers manufactured in an energy efficient manner with low greenhouse gas emissions. A detailed description of the background to the CO_2 emission requirements can be found in the Background to the Basic Module and the Chemical Module[27].

According to version 2 of the Basic Module, CO_2 emissions from electricity purchased and the combustion of fossil fuels for heat generation and own electricity production shall be included in the calculation. The calculation includes CO_2 emissions both from paper production and from the production of the pulps used.

The Basic Module, version 2 contains a revised calculation system for CO_2 emissions. A new requirement (O5) is therefore introduced for total CO_2 emissions. The limit values for CO_2 given in the Basic Module, version 2, cannot be directly applied to grease-proof paper since this paper manufacturing process involves a different milling process and thus also a different energy consumption (see also section energy above). The limit value for grease-proof paper has therefore been set at 1,750 kg CO_2/tonne paper.

O5 CO_2 emissions

CO_2 emissions from purchased electricity* and from the combustion of fossil fuels for heat generation and for own electricity production must not exceed 1,750 CO_2/tonne paper. The calculation contains CO_2 emissions both from paper production and from the production of the pulps used.

**CO_2 emissions from purchased electricity shall be calculated by factor 385 g CO_2/kWh.*

✉ Calculation pursuant to the Basic Module, version 2, appendix 2, showing that the requirement is met. The calculations shall be made on a calculation sheet developed by Nordic Ecolabelling.

Emissions to air and water

The requirement has been changed since the last version. New reference values have been introduced for the paper machine's COD, S and NO_X emissions to adapt them to the requirements of pulp in the Basic Module. A more detailed description of this chapter's requirements can be found in the Background to the Basic Module and the Chemical Module[28].

By setting requirements concerning COD, P, S and NO_X, Nordic Ecolabelling can help limit emissions of these harmful substances to air and water. Life cycle analyses have shown that the environmental load in the air is primarily the result of the energy-intensive pulp and paper industry's energy requirement. Air pollution includes acidifying substances such as sulphur (S) and substances resulting in eutrophication, e.g. nitrogen oxides (NO_X) and substances that contribute to the greenhouse gas effect. Emissions to water from the manufacture of pulp and paper involve substances that cause eutrophication, e.g. nitrogen (N), phosphorus (P), or substances that upset the balance between N and P. This can cause algal blooms and a shortage of oxygen in cases where the recipient body of water is vulnerable. The effect is the same as for COD emissions,

[27] Background to Nordic Ecolabelling of Paper Products - basic module and chemical module, version 2, 22 June 2011.
[28] Ibid.

i.e. organic compounds that consume oxygen when they break down in aquatic environments[29].

The requirement applies to emissions to water and air and the structure remains unchanged from the previous version. The requirement has been formulated as a matrix, where the real COD, P, S and NO_X emissions are compared against reference values for each substance. The difference between the real emission and the reference value represents an emission score. In the matrix, emissions equal to the reference value = 1. If the emissions are lower, the score is < 1. If the emissions are higher than the reference value, the score is > 1. The total score for each parameter is calculated by looking at the emissions from both pulp and paper production. The maximum score allowed for Nordic Swan Ecolabelled paper products is 1.5. The total emission score corresponds to the total of all emission scores and must not exceed 4.

There are separate reference values for pulp and paper production. The reference values for emissions from pulp production are found in the Basic Module, version 2.0, while the reference values for the production of grease-proof paper are product-specific and have therefore been added to the Supplementary Module for grease-proof paper. The fact that the production of grease-proof paper calls for more intense milling and drying than other paper products is reflected in higher emission references.

The changes to the paper machine's reference values are based on analyses of available data and calculations based on the emission values shown for the Nordic licences. Unfortunately there are no BAT values[30] available for emissions from these types of paper machines (apart from reference to COD emissions 5 kg/ton in "speciality paper mill").

Compared with the previous version 3, has COD reference value been lowered from 8.0 to 4.0 kg/tonne. The reference value for grease-proof paper machines' COD is quite high comparing to the general value of paper and board given in the latest version of BAT Reference document but is little lower than 5 kg/tonne which was given in conjunction with the speciality paper mill[31]. However, the grease-proof paper is special paper and the high reference value for COD is justified by extra refining causing higher emissions under paper production. Moreover, additional exemption for COD's reference value has been introduced for sulphite pulp in the Supplementary Module of grease-proof paper. The reference value 35 kg/tonne pulp which is at the level presented in the latest version of BAT Reference document shall apply in to the Supplementary Module of grease-proof paper. In the Basic Module, the similar reference value for bleached sulphite pulp is 25 kg/tonne pulp.

The reference value for phosphorus remains unchanged. There are relatively few figures relating to emissions as some of the paper machines do not emit any phosphorus. The reference value for sulphur has been lowered slightly, from 0.6 to 0.5 kg/tonne. The NO_X value was previously linked to fuel consumption where the reference value for the paper machine's fuel consumption was multiplied by 0.29. However, there is no direct link between NO_X and how much fuel is used. NO_X is formed on combustion, mainly using the nitrogen in the air. In the new version of the Basic Module, there are reference

[29] Ibid.
[30] 2014/687/EU: Commission Implementing Decision of 26 September 2014 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for the production of pulp, paper and board (notified under document C(2014) 6750) Text with EEA relevance.
http://eippcb.jrc.ec.europa.eu/reference/
[31] Ibid

values for each process and the result is no longer calculated using the individual sub-processes. This means that the NO_X emissions for each specific process have their own reference value stated as kg/tonne paper or pulp in the same way as the other parameters. The new reference value for NO_X from the paper machine for grease-proof paper has been set at 1.2 kg/tonne paper. The value is based on a review of the levels in the licences and the consequences of the new method for calculating NO_X emissions.

O6 Total emission score, $P_{emissions\ total}$

A total emission score, $P_{emissions\ total}$, shall be calculated for grease-proof paper.

This score must not exceed 4.0.

$P_{emission\ total} = P_{COD} + P_P + P_S + P_{NOx} \leq 4.0$

No individual emission score ($P_{COD} + P_P + P_S + P_{NOx}$) may be ≥ 1.5

In the calculation of the product's individual and total emission scores for pulp and paper manufacturing emissions, product-specific reference values for paper manufacturing (see Table 1 below) are used together with reference values for various pulp types found in the Basic Module, version 2 (Appendix 3, Table 3.1).

For sulphite pulp the COD reference value 35.0 kg/tonne pulp shall be used.

Table 1 Reference values for emissions from paper machines manufacturing grease-proof paper.

Paper type	Reference values for emissions (kg/tonne paper)			
	COD_{ref}	P_{ref}	S_{ref}	$NO_{x,ref}$
Grease-proof paper	4.0	0.01	0.5	1.2

✉ The paper manufacturer shall submit calculations and background data showing that the requirement is fulfilled. The calculations shall be made on a calculation sheet developed by Nordic Ecolabelling.

4.3 Chemical requirements

Production chemicals

All chemicals used to produce pulp or paper must meet the requirements contained in the Chemical Module, version 2 or more recent versions, where it is relevant and if there is no other requirement in the Supplementary Module. The term "production chemicals", as used in the Chemical Module, is a collective term for chemical additives, auxiliary chemicals and process chemicals. The term is further used to refer to starch, filler material are included in this term.

Under the chemical requirements, the manufacturers must submit an overview of all chemicals used. The type, trade name, supplier, field of application and volume per tonne of grease-proof paper shall be stated for each chemical. Chemicals used specifically in the production of grease-proof paper and chemicals used in conversion (e.g. adhesives or printing inks) must also meet requirements in the Chemical Module unless otherwise stated in the Supplementary Module.

The Chemical Module limits the use of chemicals classified as harmful to the environment, very toxic, carcinogenic, mutagenic or reproduction toxic. It also sets a series of requirements concerning chemicals with specific functions such as defoamers, coating agents etc. The background to the requirements in the Chemical Module is found in the background documents to the Basic Module and the Chemical Module. The classification requirement in the Chemical Module states, for example, that the use of zinc oxide (ZnO) as a chemical product is not allowed. ZnO is registered in REACH with the

classification H410 (very toxic to aquatic life with long lasting effects). The registration does not specify whether this applies to the nano or the bulk form of ZnO.

According to chemical module the term constituent substance refers to all substances in the product, including additives in the ingredients (such as preservatives and stabilisers) but does not include impurities from primary production. Impurity refers to residues from primary production which may be found in the finished product at concentrations below 0,010% (100 ppm), but not substances that have been added to a raw material or the product actively and for a particular purpose, irrespective of quantity. Residuals in the raw materials above 1.0 % are regarded as ingoing substances. Known substances realised form the raw materials are also regarded as ingoing substances.

O7 Production chemicals

The pulp/paper manufacturer must report all chemicals used in production and in converting, providing documentation in respect of the product's complete name, product safety data sheets, function, classification, area of use, supplier and quantities used in kg/tonnes pulp/paper.

All chemicals must fulfil the requirements in the chemical module, version 2 or later.

This requirement also applies to chemicals used for printing on the paper, but not for packaging printing.

The safety data sheet/product sheet must comply with Appendix II to REACH (Regulation 1907/2006/EC).

✉ Complete declaration of all production chemicals used, pursuant to Appendix 2, and complete safety data sheets for all chemical products. Documentation showing that the chemicals meet the requirements.

Optical whiteners

The optical whitener requirements remain unchanged from the previous version of the criteria. The requirement has been included to limit the use of chemicals that can have a harmful effect on human health and the environment either at the point of use or production, and these are not normally used in the production of grease-proof paper today. Optical whiteners include derivatives of 4,4-diaminostilbene-2,2-disulphonic acid. Normal use has been 5-10 kg/tonne paper. The compounds have a low retention on the paper machine, resulting that they also enter the wastewater stream. These compounds are not biodegradable. A study from 2012 showed that a significant increase in brightness was achieved using 1.5 to 2 kg/tonne on the size press[32]. Optical whiteners can contain up to 30% urea as a stabilising agent, which may result in an overdose of nitrogen in the biological treatment plant. Optical whiteners are banned under the German Blue Angel paper criteria, and in the background document to the EU's document for public procurement of paper (GGP for Copying and graphic paper)[33] a ban is based on the fact that optical whiteners can cause allergies and are toxic and not readily degradable in aquatic environments. The use of optical whiteners such as stilbene sulphonic acid derivatives is approved at concentrations up to 0.3% in paper that comes into contact with foodstuffs pursuant to the German BfR regulations. However, it must be possible to prove that these do not migrate into food[34].

[32] Liu et al. (2012), OBA use in high yiels furnish, *BioResources* 7(2), 2581-2591. Available at: http://ncsu.edu/bioresources/BioRes_07/BioRes_07_2_2582_Liu_SNYZZ_Review_of_OBA_Prodn_HYP_Paper_2618.pdf (accessed 21 may 2013)
[33]EU GPP criteria (2008) Copying and graphic paper: Technical background report. Available at: http://ec.europa.eu/environment/gpp/pdf/toolkit/paper_GPP_background_report.pdf (accessed 21 may 2013)
[34] Database BfR Recommendations on Food Contact Materials (2012) Federal Institute for Risk Assessment in Germany. Available at:

Antibacterial compounds

A substance with an antibacterial effect is defined as 'an antibacterial chemical that impedes or stops the growth of microorganisms such as bacteria, fungi or protozoa (unicellular organisms)'. Silver compounds, nanosilver and nanogold are also considered antibacterial substances in this context.

Antibacterial substances are biologically active and often harmful to the environment. There is a concern that the increased use of such substances can increase bacteria's resistance to antibiotics[35]. Both nanosilver and silver ions pose a threat to aquatic organisms. One problem is that silver particles can reduce the effectiveness of water treatment plants. Silver can also continue into the aquatic environment and cause damage there. Nordic Ecolabelling has therefore introduced a requirement stating that substances with an antibacterial effect must not be added.

There are food papers on the market that claim to impede the formation of mould, some of which claim to contain only natural extracts. Neither the efficacy nor the health and environmental effects of such papers have been studied in detail in this revision. However, if relevant these papers will be assessed in the next revision. As a precautionary measure, all such additives are banned.

O8 Optical whiteners and antibacterial substances

Optical whiteners must not be used.

Chemicals intended to provide antibacterial properties must not be added.

An antibacterial chemical is a chemical that impedes or stops the growth of microorganisms such as bacteria, fungi or protozoa (unicellular organisms). The requirement does not apply to preservatives used to preserve the chemical product, so-called in-can preservatives.

Silver compounds, nanosilver and nanogold are considered antibacterial substances.

✉ Declaration from the pulp/paper manufacturer stating that the requirement is fulfilled.

Chemicals used for impregnation and coating

As described in chapter 2, Justification for Ecolabelling, there are various methods for giving the paper the desired grease/liquid -repellent properties. Normally, the pulp undergoes extra milling to make it less porous and turn it into a 'high density' paper. Super calendaring makes the paper opaque (glassine) and afterwards it can also be surface treated in different ways. Another method used to give the paper these properties, making it suitable for grease-proof paper, is treatment with diluted sulphuric acid or zinc oxide followed by immediate washing. These methods dissolve the paper and gelify it. The paper thus created is called 'paper parchment' and has a high density, good stability, low surface tension and high resistance to heat[36].

The paper can be surface treated using starch, alginates, CMC (carboxylmethylcellulose), chromium compounds, fluoride chemicals or silicone. Dow Corning explains that the concerns relating to toxic emissions in connection with combustion are the reason why the market has moved away from chromium coating and toward voluntary initiatives for

http://www.bfr.bund.de/en/database_bfr_recommendations_on_food_contact_materials__formerly__plastics_recommendations__-1711.html (accessed 21 may 2013)

[35] Forbrugerkemi (2010) «Nanosølv bekymrer i Tyskland». Available at: http://www.forbrugerkemi.dk/nyheder/nanoteknologi/nanosolv-bekymrer-i-tyskland/?searchterm=nanosølv (accessed 21 may 2013)

[36] Wikipedia (2013) Parchment paper (baking). Available at: http://en.wikipedia.org/wiki/Parchment_paper_(baking)#cite_note-1 (accessed 20 may 2013)

reducing the use of fluoride-based chemicals. Furthermore, they state that wax paper can be an issue as the wax is not biodegradable. According to Dow Corning Europe, the use of baking paper has doubled in the past 5 years and with approx. 178,000 tonnes used each year, the use of silicone-treated baking paper in the food industry now accounts for 81% of all baking paper used[37].

The requirement stating that coating agents must not contain chromium compounds or fluoride compounds remains unchanged from the previous version. It has, however, been expanded to include impregnation substances and chemicals that are added to the pulp. The background to the requirement is concerns for human health and the environment previously outlined in chapter 2. The fluoride compounds are not only used as coating chemicals. Because the price of the chemicals has fallen down, are these chemicals also added to pulp. As a result, the paper can include 10 times more fluoride compounds than if it only was coated[38]. A test of muffin cups in Tænk in December 2012 found that two of the ten cups tested contained fluoride substances[39].

Even though chromium coatings are no longer used in Europe, the requirement has been included to prevent their reintroduction via grease-proof paper imported from other parts of the world.

As in the previous version of the Supplementary Module, silicone coating is allowed. In the past, silicone coatings were applied using a solvent-based process. However, this method is currently being phased out due to a wish to stop the use of solvents. The European industry phased out organotin catalysts for hardening silicone coatings in 2002[40].

Silicone is the common name for polysiloxanes (polyorganosiloxanes). These have a general chemical formula (–SiR2–O–)n . Siloxane describes silicon oxygen bond that forms the backbone of the inorganic polymer chain. Silicones are produced in different chain lengths ranging from oil products (silicone oil) until macromolecular, rubber-elastic products. R can be = hydrogen or organic groups such as: methyl, ethyl or phenyl[41]. When it comes to coating, the most commonly used agent is an emulsion consisting of polydimethylsiloxane (PDMS). PDMS is formed through polycondensation of linear siloxanes or through polymerisation of cyclic siloxanes. There are small remnants of cyclic siloxanes in PDMS, such as D4 or D5 dependent on the type of reaction and process conditions in the polymerisation. [42], [43],[44],[45]. PDMS is applied in liquid form and

[37] Kris Verschueren and Christian Parein (2012), Silicone Coatings Offer New Opportunities for Food Contact Paper Performance, Dow Corning Europe S. A. Available at http://www.dowcorning.com/content/publishedlit/30-1247-01.pdf (accessed 20 may 2013)
[38] Personlig kommunikasjon med Xenia Trier, , DTU Fødevareinstituttet, Afdeling for Fødevarekemi (30.08.2012)
[39] Tænk (2012) Muffinsformer, Danmark. *Tænk* des/2013: 8 – 11.
[40] European Commission (2007), Impact Assessment of Potential Restrictions on the Marketing and Use of Certain Organotin compounds, Final Report – October 2007, Directorate-General Enterprise and Industry. Available at: http://ec.europa.eu/enterprise/sectors/chemicals/files/studies/organotins_en.pdf (accessed 20 May 2013)
[41] Wikipedia.no: http://no.wikipedia.org/wiki/Silikon (Sept 2012)
[42] Huse, A and Aas-Aune, S. (2009) Kartlegging av bruk, forekomst, og omfang av siloksaner i Norge. Report SFT TA-2557/2009
[43] Lassen et al. (2005) Siloxanes - Consumption, Toxicity and Alternatives. Rapport Miljøstyrelsen no.1031 2005
[44] Environment Canada Health Canada (2011) Screening Assessment for the Challenge Siloxanes and Silicones, di-Me, hydrogen-terminated. Available at: http://www.ec.gc.ca/ese-ees/4996570F-FFC7-4214-A693-7C55757CF6D7/Batch%2011_70900-21-9_EN.pdf(accessed 27 May 2013)
[45] Polydimethylsiloxanes (PDMS). From the European Silicones Center website. Available at: http://www.silicones-science.com/chemistry/polydimethylsiloxanes-pdms/cyclic-polymerisation (accessed 28 may 2013)

hardened as the vinyl side groups cross-link with e.g. hydrogen in the Si-O chain with the help of a catalyst such as a salt complex consisting of platinum, palladium or rhodium.

As described in chapter 2, siloxanes are a group of substances that have long been a focus area for the environmental authorities. The reason for this is that some of the substances are not readily degradable and tend to bioaccumulate in organisms. According to the Norwegian Climate and Pollution Agency (Klif) the ring-shaped siloxanes octamethylcyclotetrasiloxane (D4) and decamethylcyclopentasiloxane (D5) in particular are problematic as these are not readily degradable in water and sediment and may accumulate in organisms[46].

Siloxanes such as PDMS are not biodegradable but are easily absorbed in sludge, making treatment plant removal possible. Combustion results in the formation of amorphous silica, carbon dioxide and water. Siloxanes are not very mobile but will break down abiotically at a slow rate in soil and sediment to form dimethylsilandiol. This substance is water soluble and can break down to form carbon dioxide, water and inorganic silica (proven in laboratories)[47]. The main concern when it comes to siloxanes is thus cyclic siloxanes, e.g. D4 and D5, content.

One type of grease-proof paper was studied as part of a mapping of siloxanes in Norway. No oligomeric siloxanes were found over the detection limit[48].

Requirement O9 includes a ban on octamethylcyclotetrasiloxane (D4) and decamethyl-cyclopentasiloxane (D5) that coating products used must not contain these substances. Impurities are exempt from this requirement. Impurity refers to residues from primary production which may be found in the finished commercial product at concentrations below 800 ppm (0.08% by weight, 800 mg/kg). The limit value is applied to each substance separately. The commercial product refers to the coating bath of silicone emulsion. Limit values for impurities of siloxanes shall be reviewed in the next revision.

It has also been specified in the O9 that requirement R6 for residual monomers (excluding acrylamide) in the Chemical Module does not apply to chemical products used in silicone treatment of greaseproof paper. Reason for this is that the requirement O9 now covers also the silicone treatment of the paper. The requirement in the Chemical Module was originally directed to coating of printing paper and is not entirely relevant to specific chemicals used in the production of grease-proof paper. The exemption covers only the residual monomers in the requirement R6.

O9 Chemicals used for impregnation and coating

Chemicals added to the pulp or to impregnation/coating must not contain chromium or fluoride compounds.

The following requirements must be met in connection with silicone treatment of the paper:

- Solvent-based painting/coating agents must not be used.

[46]The website of the Norwegian Climate and Pollution Agency: http://www.klif.no/Sok/?query=siloksan (Sept 2012)
[47] Linear polydimethylsiloxanes (2011) European Center for Ecotoxitiy and Toxicology of Chemicals, Jacc report No 55. available at: http://www.ecetoc.org/index.php?mact=MCSoap,cntnt01,details,0&cntnt01by_category=3&cntnt01order_by=Reference%20Desc&cntnt01template=display_list_v2&cntnt01display_template=display_details_v2&cntnt01document_id=5338&cntnt01returnid=91(besøkt 27.05.2013)
[48] Huse, A and Aas-Aune, S. (2009) Kartlegging av bruk, forekomst, og omfang av siloksaner i Norge. Report SFT TA-2557/2009

- Octamethylcyclotetrasiloxane, D4, (CAS 556-67-2) and decamethylcyklopenta-siloxane, D5, (CAS 541-02-6) must not be used. D4 and D5 impurities are exempt from this requirement*.
- Organotin catalysts may not be used.

Requirement for residual monomers (apart from acrylamide) in R6 in the Chemical Module, version 2 or more recent does not apply for chemical products used in silicone treatment of grease proof paper.

** Impurity refers to residues from primary production which may be found in the finished silicon polymer (calculated based on dry residue in the commercial product) at concentrations below 800 ppm (0.08% by weight, 800 mg/kg), but not substances that have been added to a raw material or the product actively and for a particular purpose, irrespective of quantity. The commercial product refers to the coating bath of silicone emulsion.*

✉ Declaration from the pulp-/paper manufacturer stating that the product does not contain chromium or fluoride compounds. Declaration from the chemical supplier stating that the requirement for silicone treatment is fulfilled. Appendices 3 and 4 can be used.

4.4 Product function requirement

Nordic Ecolabelling sets also requirements for product's function. Good quality, i.e. function properties is important, good function of the grease-proof paper may save resources. The requirement remains unchanged. There are no international standards for use characteristics for grease-proof paper. Reference to own test methods are thus sufficient.

O10 Function properties

The product must meet the function requirements applicable within the industry.

It must be possible to reuse baking paper. See also O12 Labelling.

✉ Overview of tested function properties and the associated test results. Example of technical information about this.

4.5 Requirement for paper that comes into contact with foodstuffs

Nordic Ecolabelling has adjusted requirement for paper that comes into contact with foodstuffs. The requirement has been set to ensure safe use. Chemicals used to manufacture paper and cardboard may contain substances that are harmful to human health. Materials that come into contact with food must comply with general legislation for the area (regulation no. 1935/2004). However, paper and cardboard that comes into contact with foodstuffs is not regulated in detail within the EU/EEA and none of the Nordic countries set any special requirements for these materials[49]. Furthermore, the products that are ecolabelled may also be produced in countries outside of Europe. The requirement represents additional assurance that the products are safe to use, regardless of the country of manufacture.

In the previous version of the criteria, paper contacting foodstuff shall meet the guide-lines of the European Council resolution. In the current requirement, three different guidelines and/or recommendations are referred: the guidelines of the European Council resolution, the German risk assessment institute BfR's recommendation or the CEPI

[49] European Commission, Summary of the national legislation, Sanco E6/MS(28/09/2010):http://ec.europa.eu/food/food/chemicalsafety/foodcontact/documents_en.htm

Industry guideline. All three have been included to give applicants the opportunity to use the guidelines that they are already working with. The European Council policy statement concerning paper and board materials and articles intended to come into contact with foodstuffs, version 4, 2009[50] includes specific descriptions of what additives may be used, test methods and Good Manufacturing Practice (GMP) for the production of paper and cardboard that is to come into contact with food. CEPI has developed the guidelines: "Industry guideline for the Compliance of Paper & Board Materials and Articles for Food Contact: Issue 2"[51]. The German risk assessment institute, BfR, has issued recommendations relating to paper and cardboard that comes into contact with foodstuffs: "'XXXVI. Paper and board for food contact'[52], found in their database. The latest version of BfR's recommendation has been included in the Criteria. As an alternative, BfRs recommendation "XXXVI/2 Paper and Paperboard for Baking Purposes" can also be used. This recommendation is applied to paper that comes into contact with foodstuff during baking. The latest versions of these BfR's recommendations have been published on 1 June 2013.

Fulfilment of the requirements must be certified by an independent third party. In Sweden and Norway respectively, Normpack and Emballasjekonvensjonen help companies to ensure that their disposable items and food packaging meet the applicable laws and regulations. Denmark does not have any such regulatory framework. Nordic Ecolabelling does not restrict which organisations may perform such third party assessments, meaning that others in addition to above mentioned, may also perform these.

O11 Paper that comes into contact with foodstuffs

Paper marketed as coming into contact with foodstuffs must, besides laws and regulations comply with one of the following regulations:

- European Council 'Policy statement concerning paper and board materials and articles intended to come into contact with foodstuffs', version 4, 2009, or more recent versions.
- BfR's recommendation XXXVI. Paper and Board for Food Contact, or XXXVI/2. Paper and Paperboard for Baking Purposes, June 2013 or more recent versions.
- CEPIs Industry guideline for the Compliance of Paper & Board materials and articles for food contact, Issue 2, September 2012 or more recent versions.

Fulfilment of the requirements must be certified by an independent third party.

✉ Copy of certificate or declaration from an independent control body (third party) stating that the requirement is fulfilled.

4.6 Packaging requirements

Packaging material requirements

Grease-proof paper such as baking paper can be used several times, reducing consumption and quantities of waste. This is why there is a requirement that the product must be labelled to this effect. The requirements have not changed since the last version of the criteria.

[50] Resolution ResAP (2002): Policy statement concerning paper and board materials and articles intended to come into contact with foodstuffs, version 4 2009
[51] Industry guideline for the Compliance of Paper & Board Materials and Articles for Food Contact: Issue 2
[52] http://bfr.zadi.de/kse/faces/DBEmpfehlung_en.jsp (accessed 23 may 2013)

The packaging materials for grease-proof paper are generally made of cardboard or plastic. Compared to the previous version, the requirements concerning packaging material and design have been removed. Producers tend to take care of packaging material composition, recycling and optimisation for transport and therefore these requirements are not considered relevant any more.

O12 Labelling

The following text must be visibly printed on baking paper packaging: "The paper can be used more than once before being discarded".

For labelling with the Nordic Swan Ecolabel logo, see the section on 'Design of the Nordic Swan Ecolabel' at the end of these criteria.

✉ Examples of packaging labelling shall be submitted, showing the label and any text for baking paper.

4.7 Waste requirement

The requirement remains unchanged and is set as a means to ensure responsible waste treatment. This requirement is also found in the Basic Module for pulp and paper manufacturers and is extended to include converters here.

O13 Waste

Waste generated in the mill area shall be separated and the various fractions reused as far as this is possible. The waste fractions and the treatment of these shall be outlined.

If the waste falls into a national definition of hazardous waste, this too shall be stated.

No further documentation is required in cases where the paper manufacturer and converter are certified to ISO 14001.

✉ The paper manufacturer/converter shall account for the following:

- Waste sorting process.
- Sorting fractions.
- Treatment of the individual fractions (internal and external recycling, energy use, landfill or other).

4.8 Quality and regulatory requirements

The requirements ensure that the licensee holding the Nordic Swan Ecolabel licence is responsible for safety, working environment, environmental legislation and for ensuring that site specific conditions/conventions are met in connection with the production of ecolabelled products.

These requirements are set as a means to ensure that the ecolabelling criteria are fulfilled throughout the validity period of the licence.

O14 Legislation and regulations

The licensee must guarantee compliance with the safety, working environment, environmental legislation and/or plant-specific conditions/concessions applicable to the operations at all sites where the Nordic Swan Ecolabelled product is manufactured.

✉ Documentation is not required. However, Nordic Ecolabelling may revoke the licence if the requirement is not fulfilled.

O15 Person responsible for the Nordic Swan Ecolabel licence

The company shall appoint a person responsible for ensuring the fulfilment of Nordic Ecolabelling requirements, and a contact person for communications with Nordic Ecolabelling.

✉ Organisational chart showing who is responsible for the above.

O16 Documentation

The licensee must be able to present a copy of the application and factual and calculation data supporting the documents submitted on application (including test reports, documents from suppliers and suchlike).

🔑 Checked on site.

O17 Quality of the grease-proof paper

The licensee must guarantee that the quality of the Nordic Swan Ecolabelled product is maintained throughout the validity period of the licence.

✉ Procedures for collating and, where necessary, dealing with claims and complaints regarding the quality of the Nordic Swan Ecolabelled grease-proof paper.

O18 Planned changes

Planned changes affecting the Nordic Ecolabelling requirements must be approved by Nordic Ecolabelling in writing.

✉ Procedures detailing how planned changes are dealt with.

O19 Unforeseen non-conformities

Unforeseen non-conformities that affect Nordic Ecolabelling requirements must be reported to Nordic Ecolabelling in writing and logged.

✉ Procedures detailing how unforeseen non-conformities are handled.

O20 Traceability

The licensee must have a traceability system for the production of the Nordic Swan Ecolabelled grease-proof paper.

✉ Description of/procedures for fulfilment of the requirement.

O21 Take-back system

The Nordic Ecolabelling's Criteria Group decided on the 9 October 2017 to remove this requirement.

O22 Annual follow-up

The environmental requirements must be followed-up annually based on a checklist (Appendix 1 to this document or the Basic Module) from Nordic Ecolabelling. The checklist should be signed by the person responsible for the Nordic Swan Ecolabel licence and then sent to Nordic Ecolabelling. Note that this applies to both paper and pulp.

✉ Duly completed Appendix 1.

5 Changes compared to previous version

The most important changes in the Supplementary Module for grease-proof paper, version 4 are the following:

- The requirements have been adapted to the revised requirements in the Basic and Chemical Modules, version 2.
- Reference values for the paper machine's energy consumption (fuel and electricity) have been introduced.
- New limit values for energy (fuel and electricity) have been introduced.
- New limit values for CO_2 have been introduced.
- The reference values for paper machine emissions (COD, S and NO_X) have been changed.
- Tightened requirements for coating chemicals and a ban on the use of fluoride impregnation chemicals.

Introducing of the new limits and reference values for energy and CO_2 is a major tightening of requirements compared with the previous version of the criteria.

6 New criteria

The following points should be followed up and reviewed in the next revision:

- Levels of energy and CO_2 requirement and requirement of emissions to air and water.
- Requirement related to certified raw material.
- Requirement of impregnation and coating chemicals, limit values for siloxane impurities D4 and D5.

Terms and definitions

Term	Explanation or definition
AOX	Absorbable organically bound halogens. A measurement of the quantity of chlorine (and other halogens) associated with organic compounds.
BfR	German risk assessment institute BfR.
COD	Chemical oxygen demand. A measurement of the quantity of oxygen that is consumed during the chemical breakdown of organic material.
CEPI	Confederation of European Paper industry.
NOX	Collective chemical symbol for nitrogen oxides (NO, N_2O and NO_2). In this document, NO_X refers to the total of NO and NO_2, expressed as NO_2.
P	The chemical symbol for phosphorus. In this document, P refers to emissions of phosphorous compounds to water.
S	The chemical symbol for the element sulphur. In this document, S refers to all forms of sulphur compounds emitted in gaseous form to air.
Release paper	Paper used in different type of self-adhesive system for example, e.g. in label rolls and in diapers/pads.