Swan-labelled

sanitary products

Background memo on the
Swan labelling of sanitary products, Version 5.2

Contents

Nordic Ecolabelling has updated the background memo March 2010 in accordance with the changes introduced with version 5.2 of the criteria for sanitary products.

1 The main changes made in this revision of the criteria

The main changes made to the revised criteria for sanitary products, Version 5, are as follows:

- The product group has been extended. In addition to products such as disposable breast pads, diapers, sanitary towels, incontinence care products and tampons, a Swan Label is now available for cotton buds, cotton wool, toothpicks, underlays, draw sheets, bed linen, wash cloths and surgical gowns.

- The environmental impacts associated with the production of sanitary products will be reduced as a result of stricter requirements applicable to the production of the materials contained in the product. This applies to reductions in emissions, energy consumption and the use of chemicals in the production of raw materials such as fluff pulp (cellulose pulp), super-absorbents, cotton, viscose and various polymers.

- The climate effect of the product has been reduced in that the product must document low CO_2 emissions per product, or an increased proportion of renewable materials.

- The effects on health have been reduced in that the requirements applicable to additives and chemical content have been made considerably stricter.

2 Summary

Proposals for new revised environmental requirements for Swan-labelled sanitary products have now been compiled by the Nordic Ecolabelling secretariats.

Sales of sanitary products to consumers in the Nordic countries are dominated by the major food retail chains, but the products are also sold through pharmacies, retail clothing chains and health-food shops. Price is an important factor in the case of diapers and, in general, in the case of sanitary products health arguments receive greater attention than environmental arguments. In the case of the professional market, environmental awareness amongst buyers is increasing.

There has long been discussion about what is considered best from an environmental perspective: disposable products or reusable products. Numerous studies have been conducted with the aim of determining which approach is best from an environmental perspective. The conclusion reached by the latest life cycle analysis of diapers, conducted in 2005, is that there are no significant differences in terms of environmental impact between the three diaper systems that were studied: disposable diapers, textile diapers washed at home and textile diapers with a collection system for laundering. The report offers recommendations for reducing the environmental impact of all three systems. The reason that Nordic Ecolabelling has not imposed requirements designed to promote a particular type of waste processing can be ascribed to the large proportion of diapers that is incinerated on the Nordic market. The consumer has no control over how waste is processed.

Several of the LCA studies referred to support Nordic Ecolabelling's view that the production of materials used in sanitary products result in the greatest environmental impact. The studies also show that polymers from fossil raw materials make the greatest contribution in terms of climate emissions, which, in turn, provides grounds for promoting the use of renewable raw materials.

Nordic Ecolabelling is of the view that the new requirements will in particular contribute to a reduction in the negative effects of the products on health and the environment. One of the main changes proposed is that a number of new products may now be ecolabelled. In addition to products such as disposable breast pads, diapers, sanitary towels, incontinence care products and tampons, a Swan Label may now be applied for for cotton buds, cotton wool, toothpicks, underlays, draw sheets, bed linen, wash cloths and surgical gowns.

The stringency of the requirements governing the production of constituent materials, which generally consist of fluff pulp (cellulose pulp), super-absorbents, cotton, viscose and various polymers has been increased considerably. The requirements applicable to polymers have been formulated from a resource perspective with a view to stimulating the use of renewable resources and of materials involving low emissions of climate gases. Material composition requirements for the products have therefore been drafted that can be fulfilled in one of three ways: that 7 per cent of the polymers are produced using renewable raw materials, that emissions of climate gases from the products of the materials in the product are less than 2.10 kilo CO_2 equivalents per kilo of sanitary products, or that at least 50% by weight of the materials consists of renewable raw materials.

Health has been a particular focus of attention during the revision process, and the requirements applicable to substances that may be added to sanitary products during production in the form of inter alia chemicals, adhesives, fragrance, lotion, dyestuffs and ink have been tightened up considerably.

3 Introduction

This background memo has been drafted for the criteria for the Swan-labelling of sanitary products, version 5. The document provides background information on the product group and the requirements imposed by Nordic Ecolabelling. The requirements were revised in 2006/2007, and supersede those contained in criteria version 4, which was an amalgamation of the criteria for "Ecolabelling of disposable diapers, version 3.2" and "Ecolabelling of female sanitary products, version 1.4".

The Swan-labelling of sanitary products, version 4, was evaluated in 2005/2006. The evaluation report recommended that the criteria document be given a new layout and that two of the requirements in particular be clarified. These recommendations were followed and on 23 March 2006 the layout of the criteria document was adjusted and the document was translated into Norwegian. Moreover the polyester requirement was removed and greater detail was added to the requirements applicable to PE/PP, SAP, non-woven and cellulose pulp. Breast pads were included in the product group. The original validity date of the criteria was until 27 March 2008 and the document was allocated version No. 4.5. Since then the validity data has been extended and the criteria will now remain in force until 30 June 2009.

The evaluation also recommended a revision whereby the product group would be extended to include other products made of the same types of materials (paper pulp, super-absorbents, viscose, cotton and various types of polymers). A review of the individual requirements was also recommended. The retention of the general disposition of the document with a division into material requirements, product requirements and function requirements was recommended. The polymer requirement in particular should be assessed, and the extension of the product group necessitates the introduction of requirements applicable to new polymer materials.

The revision work was conducted in 2006 and 2007. During the revision process contact with the industry generally took the form of contact with manufacturers of diapers and incontinence care products as well as with suppliers and trade associations for polymer manufacturers. The fluff pulp requirements are based on the work conducted by the paper group during the development of module criteria for the Swan-labelling of paper products.

4 The markets in the Nordic countries

4.1 Sales figures

Table 1 shows sales figures for various sanitary products. The figures are taken from the background memo drafted in 2001, except the figures for Sweden and Finland, which are from 2005 and 2006. In the case of Sweden and Finland the oldest figures are shown in brackets. The table shows that there has been relatively little change in sales figures, and accordingly resources have not been expended on securing updated figures from the other countries.

Table 1. Sale figures for sanitary products in the Nordic countries expressed as millions of items. The figures are primarily pre 2001, but in the case of Sweden and Finland more recent data have been included. The oldest figures are provided in brackets.

Country/Product	**Diapers**	**Sanitary towels**	**Incontinence care products**	**Tampons**
Sweden[a]	410 (428)	240 (237)	220 (225)	120 (149)
Denmark[b]	- [c)]	570	- [c)]	9
Finland [d]	225 (250)	261 (215)	- [c)]-	41 (40)
Iceland	- [c)]	- [c)]	- [c)]-	- [c)]
Norway[e]	240	260	- [c)]-	50

a) SIS Miljömärkning, February 2005.
b) Statbank Denmark, 1997 figures taken from the Background Memo for Sanitary Products, Version 4. .0
c) Figures not available
d) AC, Nielsen, Finland Oy 2006
e) Ecolabelling Norway 2000, data taken from the Background Memo for Sanitary Products, Version 4.

Clearly, the use of sanitary products will vary depending on the age of the population. Diapers and incontinence care products have become more efficient because of the use of super-absorbents as a partial replacement for paper pulp in the products. Although this has not been documented in detail, it would appear that there are more products available on the market and that the products are designed to be used more frequently. In relative terms, sales of tampons are highest in Sweden.

4.2 The manufacturers

Swedish-owned SCA[i] is one of the largest multinational manufacturers of tissue and sanitary products. The firm is the third largest in Europe in the area of female sanitary products (including the brands Libresse and Saba) and is a major manufacturer of incontinence care products and hospital/care home articles such as undersheets (Tena). SCA is the leading manufacturer of tissue in Europe. According to a survey from "Råd & Røn" and "Svenska Naturskyddsföreningen" from 2004 the firm's Libero diaper brand[ii] has a 55% share of the Swedish market. SCA also manufacturers ob tampons for Johnson & Johnson. The firm has a 9% share of the European market for female sanitary products and a 15% share of the diaper market.

Procter & Gamble (P & G)[iii] is one of the world's largest consumer products manufacturing groups and also has a large share of the Nordic market. Their brands include Always and Alldays sanitary towels and Tampax tampons. The firm's diaper brand Pampers has a 35% of the share of the market in Sweden according to the survey from 2004.

Delipap is the largest manufacturers of sanitary products in Finland. The firm's product range includes diapers, incontinence care products, sanitary towels and breast pads. Delipap has a large share of the market for sanitary towels in Finland with the brands Vuokkoset, Helmi, Harmony and Luxus Muumi. The bulk of production is of own brands, but the firm also has extensive private label production.

Rostam[iv], an Israeli producer, produces tampons for the large chains, including for pharmacies in Sweden.

The Ellen tampon brand is sold through RFSU AB. This is a patented Swedish-developed tampon to which lactic acid bacteria have been added. Ellen holds a European patent on a production process in which freeze-dried lactic acid bacteria are protected by means of a water-repellent film. When the tampons are used, the bacteria are brought to life by the body's moisture[v]. The tampons are manufacturer in Slovenia and are sold through national distributors, Norwegian and Swedish Apotek and ICA and ETOS[vi].

Kimberly-Clark[vii] is one of the world's largest sanitary product manufacturing groups. The group produces female sanitary products and incontinence care products as well as Huggies diapers, which have recently been launched on the Norwegian market. Kimperly-Clark also produces disposable potty training pants (Pull-ups) as well as Little Swimmers, which are disposable swimming pants. The diapers are available on both the Norwegian and the Danish markets.

Abena[viii] of Denmark has production facilities in Denmark, Sweden, France and Germany and amongst other products produces diapers, incontinence care products, sanitary towels, underlays and draw sheets. Abena's output is produced for hospitals and institutions, and the company also produces products for the consumer market (primarily private label products).

Novacare is a French manufacturer of sanitary products and produces some 800 million diapers per year among others also to the Nordic marked.

In addition to the above there are also a number of other manufacturers of sanitary products, many of which produce for the private brands of chains or wholesalers. Kronosept is a Swedish manufacturer of sanitary towels and also sells machines for the production of sanitary products[ix]. Swedish manufacturer Dambi produces sanitary products such as sanitary towels and breast pads, 95% of which are for private labels[x].

Other manufacturers emphasise the use of natural materials, for example Natracare[xi] in the UK. Their products are sold through health food shops in Norway and include tampons, sanitary towels and panty liners. Moltex Øko[xii] of Germany produces diapers and insert pads for children. The firm stresses that its products do not contain additives such as lotion, fragrance etc. The cores of the diapers contain tea leaves, which the manufacturer claims reduce smell and protect the skin as the leaves contain cell regenerating agents, including vitamins A, C and E. In Norway the diapers are sold through health food shops.

Naty AB is a Swedish manufacturer of natural diapers and sanitary products[xiii] (Nature boy & girl diapers). The products are made of 70% renewable materials. They are based on a patented Swedish invention and instead of plastic based on fossile fuels contain a compostable biological maize film that breathes. According to the company's website the products are on sale in the UK, the Netherlands, Australia and Belgium.

According to the Cellcomb[xiv] website, the company is one of Europe's leading manufacturers of disposable products for the health service, care for the elderly and the sanitary products market. The company's products include 2 and 3-layer laminates of fluffpulp, non-woven, PE and a biopolymer based on starch. Some of the products are described as wholly compostable. The company produces surgical textiles, undersheets, bed linen, protective sheets and sanitary products. Cellcomb is based in Karlstad in Sweden.

Mölnlycke Health Care[xv]is another major manufacturer of disposable surgical gowns and surgical drapes for use in operations. The company is headquartered in Gothenburg.

Espe produkter[xvi] sell laminated and non-laminated products such as disposal sheets, quilt covers, draw sheets, towels and wash cloths.

Manufacturers and suppliers of toothpicks on the Nordic market include Jordan (Norwegian manufacturer), Dentaco As and Zendium.

4.3 Market conditions

Figure 1 shows the relationship between the various elements in the supply chain. The markets of the Nordic countries are generally organised in this way.

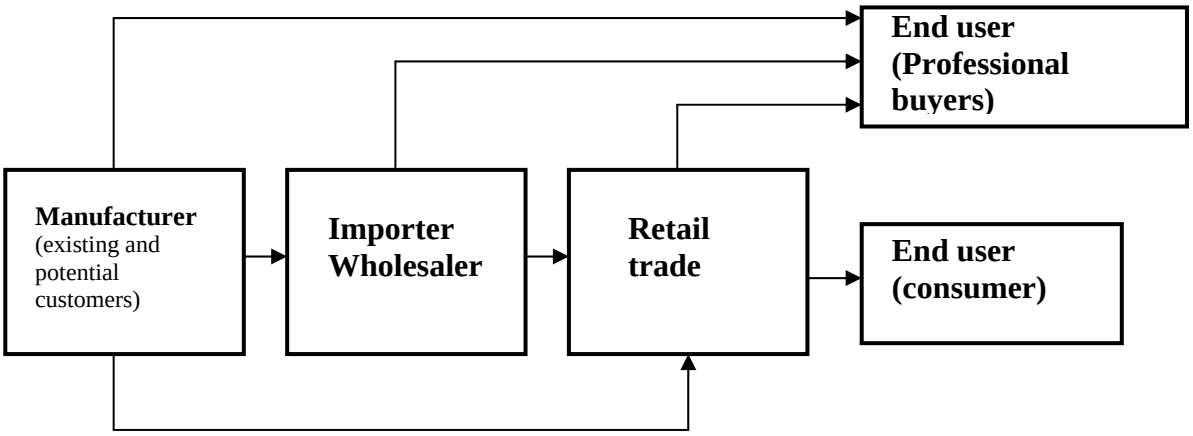

Figure 1: *Typical supply chain and alternative relationships between the individual elements*

To date, the major manufacturers such as SCA and Procter & Gamble have not wished to Swan-label their own brand goods, e.g. diapers. The manufacturers are of the view that there is not sufficient demand amongst consumers for Swan-labelled products, and retail outlets are increasingly focusing on two categories of products: well-known quality products and low cost products. In retail outlets Swan-labelled diapers are often sold under separate brands and the retail trade determines whether a product should be Swan-labelled. In Denmark ecolabelled diapers are cheaper than the major brands Pampers and Libero (2005). The standard price for ecolabelled diapers is approximately DKK 80-90, whereas Libero and Pampers diapers are normally priced in the region of DKK 160-170 for the same package size. Diapers are often sold on special offer, and many chains use diaper prices to attract customers. For example Kiwi, a supermarket chain in Norway, has a diaper contract where every fourth packet of Libero diapers is free. The view of one of the supermarket chains is that in terms of importance for consumers' tissue ranks highest, followed by diapers and then female sanitary products.

With some exceptions, environmental factors do not appear to be of major importance to buyers of sanitary products in retail outlets in the Nordic countries (2005). Consumers appear to regard price as the most important factor and health arguments are often ascribed greater weight than environmental issues. One survey of "light green" consumers in Denmark found that these consumers are interested in products that are beneficial environmental terms, and in Sweden the environmental director of Apoteket says that the chain is not unfavourably disposed towards ecolabelling, but that more emphasis is placed on quality and health aspects.

Sales to consumers via retail outlets are dominated by the major supermarket chains, which also form part of international groups. In Sweden pharmacies have a relatively high share of the market, including Apoteket's own brand and their tampons are Swan-labelled. Other retail outlets include clothes chains such as H&M and health food stores.

The potential for increasing the number of ecolabelled products on the professional market is considered to be great since only a small proportion of products on this market are ecolabelled at present and environmental awareness amongst buyers is increasing. In this segment, too, the market for sanitary products is growing.

5 The impact of sanitary products on the environment

5.1 Disposable products

The discussion about which is better for the environment, reusable products or disposable products, has been ongoing for many years. Nevertheless, it is a fact that in the case of diapers and sanitary products for consumers and for use in the health service the use of disposable products is widespread. One of the earliest stages in the development of modern disposable diapers probably took place in Sweden at the Paulistrom factory, which between 1936 and 1942 developed several types of diapers made of layered and bleached creped tissue inside rubber pants. The motivation for this may have been that cotton was a strategic material during the war. During the ensuing years there has been a gradual development in diaper design from rectangular inserts for mesh pants or triangular plastic sections that were tied round the child to hold the diaper in place to today's tailored "up-and-go" diapers. Super-absorbents (SAP) were introduced in the 1980s.

Numerous studies and life cycle analyses have been conducted with a view to determining whether textile diapers are better than disposable diapers or vice versa. The most recent, the UK Environmental Agency's "Life Cycle Assessment of Disposable and Reusable Nappies in the UK[xvii] "from 2005, concludes that there is no significant difference between the environmental impact of the three diaper systems that were studied: disposable diapers, textile diapers washed at home and textile diapers with a laundry collection system. The report contains recommendations aimed at reducing the environmental impact of all three systems.

In the case of tampons, products with and without applicators are available and sales of tampons with applicators appear to vary from country to country. Tampax produces products with applicators made of cardboard or plastic[xviii].

One of the greatest problems associated with disposable products is the large quantity of waste that they generate. More information on this is provided in Chapter 5.5 Waste. Several types of compostable diapers have been launched, but do not appear to have been available in the Nordic countries. A firm known as Knowaste[xix] has launched a technology designed to separate incontinence care products and diapers and recycles both paper and plastic materials. The firm's European facility in The Netherlands has been operating since 1999, receiving hygiene products from health institutions. Some local authorities collect used diapers together with wet organic waste for composting[xx].

5.2 The composition of the products

According to the background memo developed for the last version of the criteria, the main environmental impact from the use of disposable sanitary products derives from the production of the raw materials used in the products. In the case of disposable diapers some 80% of the energy consumed derives from the production of raw materials. Moreover approximately 60% of water consumption and 80% of water pollution in diaper production relates to the production of raw materials[xxi]. The UK LCA study on diapers shows that the production of raw materials remains the primary cause of the environmental problems together with the production of electricity for manufacturing the diapers. The waste processing of disposable diapers after use is a

major source of methane emissions and is the dominant waste processing stage in the life cycle of a diaper.

The combination of raw materials used will depend on the type of sanitary product in question, and many of the products contain the same raw materials but in different proportions. One exception is tampons, where the main product is cotton. Table 2 describes the normal composition of diapers.

Table 2. Combination of raw materials used in diapers and incontinence care products expressed as a percentage of the total weight of the product (average figures). The figures are taken from a UK LCA study, from the European Disposables and Nonwovens Association and the Finnish VTT Research Institute. The year refers to the year in which the figures were produced, not the year of publication of the reports.

Raw material	**EDANA diapers 1996**	**VTT[xxii] 1993**	**EDANA[xxiii] diapers 2001**	**UK diapers[xvii] 2001/2002**	**EDANA[xxiv] diapers 2004**	**EDANA[Fejl! Bogmærke er ikke defineret.] incontinence diapers 2004**
Fluff pulp	60	69	60	43	43	59
SAP	15	9	27	28	27	14
PP	11	15	10	15	15	9
PE	7	7	13	8	7	10
Adhesive				3	3	4
Elastic				0,5	1	1
Other	7		7	3,1	4	3

Table 2 shows that the trend over the last ten years has been in the direction of a lower fluff pulp content in diapers. However, fluff pulp cannot be excluded entirely, because this material plays an important role in transporting the fluid away from the surface and distributing it throughout the product. Sanitary products have also become thinner, lighter and more efficient[xxiv]. The EDANA figures from 2004 show that incontinence care products contain more fluff pulp than SAP, see Table 2. Diapers and sanitary towels also fit the shape of the body more closely than in the past and follow trends in fashion (e.g. for G-string undergarments). The ratio of SAP to fluff pulp is different in the case of sanitary towels since they are designed primarily to absorb blood, not urine. We have not succeeded in ascertaining the percentage composition of these products, although here too there has been a major shift in the direction of thinner products. Tissue paper is also used in sanitary products such as diapers, but is not included in the table above.

A comparative LCA assessment of sanitary pads and tampons[xxv] found that the pads contain 60 % fluff pulp with super-absorbents, although the quantity of the individual components is not specified. The report was a group study conducted by a course on life cycle analyses at the Royal Institute of Technology in Stockholm and concluded that tampons represent a more environmentally friendly alternative, mainly because of the negative contribution from PE in the sanitary pads. The report contains clear flow charts over the production of the products.

The British LCA study of diapers assessed the environmental factors: resource depletion, climate effect, degradation of stratospheric ozone, human toxicity, acidification, fresh water toxicity, terrestrial toxicity, photochemical ozone formation (smog) and eutrophication, whereas noise, biodiversity, and the tying up of land were excluded. The study revealed that the contribution made by the production of SAP

represents the greatest source of environmental impact in the production of disposable diapers. The contribution made by fluff pulp was not regarded as significant as had been expected, given the quantity contained in the products.

This document does not describe the environmental impact deriving from the production of fluff pulp or other pulps since this is described in detail in the background memo to the Swan-labelling criteria for paper products[xxvi]. The criteria documents for "The Swan-labelling of Paper Products — Version 1" and "The Swan-labelling of Paper Products — Chemical module, Version 1" include requirements relating to the production of fluff pulp and impose requirements as to wood fibre, chemical use, emissions to water and air and energy consumption. These documents emphasise requirements designed to result in reduced environmental impact from forestry operations and in the production of the fluff pulp. The requirements entail that special account must be taken of biodiversity in forestry operations, reduced spread of environmental toxins, reduced impact of emissions resulting in acidification, nutrient transfers to water and reduced emissions of climate gases.

Sanitary products contain one or more layers of non-woven. This may consist of viscose, polyester (PET), polypropylen (PP) or fluff pulp/cellolose pulp. Non-woven also forms part of compound materials such as tape and elastic side panels which are e.g. used in diapers. Neither the British LCA study nor the most recent EDANA report mentions viscose. One reason for this may be that newer production methods for non-woven made of PP and PET create the same cotton-like feeling that viscose products have traditionally been known for. In the production of non-woven, short fibres form a "sheet" which is then bound together by mechanical means (e.g. needle or water jets), with the aid of adhesives or thermally after the addition of a binding agent that melts at high temperatures. An additive known as "spin-finish" is used in the production of non-woven. This is an organic chemical that serves, inter alia, to prevent static electricity. Air-laid is a type of non-woven based on cellulose pulp. Air-laid is used in different types of sanitary products such as feminine hygiene products, sitting pads, bibs etc. Air-laid is a technique for production of paper with air instead of water. Air-laid typically consists of fluff pulp and possibly a binder. Differentiation is made between different types of bonding such as: latex bonding, thermo-bonding and hydrogen-bonding. Binders such as EVA (ethylene vinyl acetate) is used in latex bonding, whereas synthetic fibers (bi-component fibers) are used in thermo-bonding. Bi-component fibers typically contain polyethylene and polypropylene. Hydrogen-bonding us conducted under high temperature and pressure and does not require synthetic binders [xxvii]. In addition to fluff pulp and binders air-laid may also contain other materials such as superabsorbants.

Compound materials such as tape and elastic materials are also used in diapers in order to keep the diaper in place. Besides non-woven and adhesives, other types of polymers than those mentioned above may be used in these compound materials. This can be e.g. elastane, polystyrene and styrene ethylene butadiene styrene (SEBS). All together, these polymers will make up a minor part of the diaper.

Other disposable products such as disposable bed linen, bed underlays and draw sheets, surgical gowns and diaper inserts contain one or more of the same materials as diapers, incontinence care products and sanitary pads. Bed underlays may for example consist of several layers of cellulose, non-woven and a plastic coating. In addition

they may contain fluff pulp that increases absorption. The product information on some products states that they feature seams that are sufficiently strong for patients to be lifted and that their edges are sealed with paraffin and thus secured against leakages[xxviii]. The plastic film may for example be of polyethylene (PE) or be a biobased plastic film and prevents moisture from penetrating through the products. Espe Products sells laminated and unlaminated made either of non-woven viscose, which is compostable, or polypropylene (PP), which it is claimed is recyclable even with a biofilm lamination. Plastic laminate film is applied to non-woven either with the aid of adhesive (water-based dispersion adhesive or hot-smelt glue or by extruding the plastic film directly. Use of non-woven products has increased in recent years – particularly in the health sector – at the expense of cotton/polyester products. A number of different types of disposable bedclothes are available on the marked made of e.g. non-woven PP-fibre.

One of the best-known biobased plastic films is MATER – BI produced by Novamont of Italy. This is a biodegradable thermoplastic made from natural components (such as maize starch and vegetable oil derivatives) and biodegradable synthetic polyester[xxix]. The material is certified as biodegradable and compostable, but is not, as we have seen, produced using 100% renewable sources.

The European organisation for bioplastics (European Bioplastics) defines bioplastics in the following way[xxx]:

- Plastics based on renewable resources
- Biodegradable polymers which meet all criteria of scientifically recognised norms for biodegradability and compostability of plastics and plastic products. In Europe this is the EN 13432.

In their consultative reply, PlasticsEurope point out that EN 13432 is a standard applicable to packaging for all materials. EN 14995 applies to plastics and plastic products and shares a similar approach to EN 13432. (EN 14995 – Plastics – Evaluation of Compostability – Test Scheme and Specifications.)

A life cycle analysis of surgical gowns for wet operations (specialist gowns)[xxxi] concludes that the environmental impact of multiple use gowns is less than that of the equivalent disposable products. The materials used in the gowns are shown in Table 3. Both products contain the same quantities of polyester, but here the similarities end. Neither of the gowns contains biopolymers.

Table 3. Composition of materials in surgical gowns[xxxi] expressed as percentages.

Raw material	**Disposable**	**Multiple use**
Polyester	40	42
Viscose	2	0
Celluloce	45	0
PE	12	0
Other plastic materials (PP and PA)	1	0
Stainless steel (press studs)	0	1
Gore Surgical Barrier	0	57
Total grams	**220g**	**344g**

The disposable gown also consists of viscose, cellulose, PE and 1 % other plastic materials. The primary material in the reusuable gown is “Gore Surgical Barrier”,

which is a membrane based on polytetrafluoroethylene (PTFE) produced by DuPont (Teflon). This is also the material that contributes to the ozone degradation effect of the reusable gown. This is the only environmental parameter in the study where the disposable gown has less of an environmental impact than the reusuable gown.

The LCA study of surgical gowns considered fewer environmental factors than the British LCA study of diapers and looked at: climate effect, degradation of stratospheric ozone, acidification, eutrophication and photochemical ozone formation. The study does not appear to have included the effects of e.g. chemicals and biodiversity.

A similar disposable product is disposable liners for washable diapers. These liners may be made of paper or non-woven. Naturebotts, which sells these products on the Internet, claims that the products are both compostable and can be disposed of in the toilet[xxxii]. They are made of 98% paper and 2% viscose. Diaper liners allow any faeces to be removed without difficulty so that the textile diaper that is to be washed will not need separate cleaning even if they are left for a time before being laundered. Many people also find it more hygienic to use nappy liners. However, water and sewage organisations in the Nordic countries (such as NORVAR in Norway and Svenskt Vatten in Sweden) remain sceptical about the idea of flushing a product like a diaper liner down the toilet[xxxiii]. Development work is ongoing on a test method to determine whether products can be dissolve in the sewage system. However, before this test has been developed, it will be difficult to have quality requirements showing that it is acceptable to flush diaper liners down the toilet.

Disposable breast pads may consist of pure cotton, or an equivalent combination of materials to that contained in diapers and sanitary pads, i.e. fluff pulp, non-woven and with or without SAP.

As has already been noted, the main material used in tampons is cotton, and there may also be a type of non-woven around the tampon. The string in the product may be made of cotton, PET or viscose. Some tampons also have an applicator, which in the case of Tampax used to be made of cardboard, but is now made of plastic. A simple survey with weighing products bougth in Oslo have shown that an applicator of this type weighs just as much as the tampon itself[xxxiv]. SAP does not appear to be used in tampons any longer. This can be attributed primarily to toxic shock syndrome (TSS), which is a serious bacterial illness. Several websites state that using less absorbent tampons can reduce the risk of TSS[xxxv]. Most tampons are individually packaged inside a thin plastic film or cellophane.

Cotton buds and cotton wool are made of the same materials as tampons. The sticks in cotton buds may be made of wood, plastic or board. The weight of the stick can be up to 2 – 3 times the weight of the cotton, shown by weighing bought products. Toothpicks are generally made of wood materials and the product was included because it is a disposable sanitary product and the criteria include requirements as to wooden materials. The revision process did not include any specific investigations into toothpicks and no comments were received from the consultative bodies.

Other constituent substances mentioned in the British diaper study apart from the primary materials noted above are adhesive, calcium carbonate, tape, elastic and lotion. Some tampons have lactic acid bacteria additives and some diapers feature tealeaves to counteract rashes. Incontinence care products in particular may contain odour retardants, such as active charcoal, zeolites, cyclodextrin etc. According to a patent on Procter & Gamble's website[xxxvi] cyclodextrin can function as a suitable matrix for fragrance and the fragrance will only become active when the cyclodextrin is wetted. Cyclodextrin is a cyclical oligosacharide that can be produced from food starch.

Toothpicks are primarily made of wood, although plastic toothpicks are also available. Flavours are incorporated in many types of toothpick, e.g. peppermint.

Disposable washcloths made of pure plastic products, for example polyurethane, were considered during the revision process, but have not been included in the product group in this revision because no requirements are imposed on polyurethane. Gloves made solely of plastics such as polyethylene, PVC, latex, nitrile or the like have not been assessed and are therefore not included in the product group.

Suggested expansion of the productgroup in the context of criteria version 5.2:

Bibs and sitting pads for saunas are typically composed of air-laid. Such products were suggested included with version 5.2 of the criteria based on inquiries/interest from manufacturers. Data showing the turn-over for these types of products have not been found but on a volume basis, bibs and sitting pads are expected to be niche-products compared to e.g. diapers, feminine hygiene products, incontinence products etc. Disposable bibs and sitting pads (for sauna) are typically not products that are sold directly to the consumers. The products have their primary use in the healthcare sector and in sports/swimming centres.

Disposable wiping paper, which can not be ecolabelled according the criteria for tissue paper due to the material composition, and which consist of a combination of the material types included in the criteria for sanitary products, were also suggested included in version 5.2 of the criteria for sanitary products. In such wiping paper the share of tissue papir may be > 80% whereas the remaing part is made up by plastic reinforcement and binder.

Nordic Ecolabelling has decided not to expand the product group at this stage (February 2010). Disposable wiping paper made of a combination of tissue paper and plastic/other materials have the same functionality as "regular" tissue products which can be ecolabelled according to the criteria for tissue paper. However, it is comcluded that adequate information regarding possible differences in the environmental impact of the products in a life-cycle perspective is not available for these different types of wiping paper. With regard to bibs and sitting pads, information regarding turn-over and relevance is at present insufficient.

5.3 End production of sanitary products

As has already been noted, the British LCA study found that one of the primary causes of environmental impact is the generation of electricity for use in the production of the diapers. Production itself involves putting together the materials to create a diaper and is a fully automated process where the diaper is packed at the end of the production line. The fluff pulp that is used is often mechanically fluffed up at the factory. Presumably the production process for other sanitary products is similar.

5.4 Packaging

The primary packaging around diapers commonly contains several products, e.g. PE and board. In the case of other sanitary products, such as tampons and sanitary pads, the individual product items may also be wrapped before they are packed in their outer packaging. Stretch plastic, wooden boxes and metal wire are frequently used in transport packaging.

According to the British LCA study a child of diaper age will use diapers weighing 170 kg over a space of two and a half years. A total of 230 kg of materials will be used in producing the diapers, and 7.43 kg of PE and 5.8 kg of board will be used in the primary packaging.

5.5 Waste

Table 4 contains an overview of the proportion of household waste that is removed for incineration and landfill disposal. The information is taken from Eionet (European Topic Centre on Resource and Waste Management)[xxxvii] and provides an overview for each individual country. Figures for material recycling and composting are not included since it is assumed that sanitary products will not make up part of these fractions. The table reveals considerable differences between the Nordic countries. The figures from 2003 reveal that little household waste is incinerated in Finland, whereas virtually all household waste is incinerated in Denmark. The EU Landfill Directive[xxxviii] from 1999 prohibits the landfilling of combustible waste and regulates and reduces the disposal of biodegradable (compostable) waste. The Directive has been implemented in all the Nordic countries, but at different times, and the impact of the Directive is accordingly not necessarily reflected in the 2003 figures. The expectation is therefore that higher proportions of sanitary products will be incinerated in the future.

Table 4. Overview of proportion of household waste in the Nordic countries that goes to incineration or landfill[xxxvii.]

Disposal	**Iceland 1997**	**Norway 2005**	**Sweden 1999**	**Finland 1996**	**Denmark 1999**	**Total for Nordic countries**
Landfill	96	46	23	87	8	39
Incineration with energy recovery	4	54	77	13	92	61

Only a handful of local authorities in Norway collect diapers together with wet organic waste for composting. According to the British LCA study, 2-3% of

household waste consists of diapers. SCA's Norwegian website states that approximately 5% of household waste consists of diapers.

5.6 Environmental gains

The preceding chapters describe the raw materials that may be contained in sanitary products and note the environmental problems associated with both the production of the products and the large quantities of waste generated. Although ecolabelling can have no influence of whether consumers and buyers choose disposable products or the ways in which the products are processed as waste, there is nevertheless major potential for improving the products by imposing requirements as to raw materials and production conditions. Although the Swan-labelling requirements could have been formulated in such a way that they facilitate a particular type of waste processing, this version of the document does not promote for example compostable diapers. The reason that the document does not impose requirements promoting a particular type of waste processing is the large proportion of diapers on the Nordic market that are incinerated and because consumers do not control the way in which waste is processed. However, it would be a beneficial additional quality if the composting of sanitary products were facilitated.

The British LCA study concludes that in order to achieve improvements in disposable diapers the manufacturers of the diapers should focus on weight reductions and improvements in the production of materials. This coincides well with the requirements imposed hitherto by Nordic Ecolabelling as regards the Swan-labelling of sanitary products and also with the proposals contained in this consultative document. The requirements applicable to the Swan-labelling of hygiene products are described in further detail in Chapter 7.

6 Definition of the product group

6.1 Sanitary products eligible for Swan-labelling

The product group "Sanitary products" encompasses disposable products such as breast pads, children's diapers, incontinence care products (panty liners, shaped diapers and diapers with tape strips), sanitary towels (towels and panty liners), tampons, cotton buds, cotton wool, toothpicks, underlays, draw sheets, wash cloths and surgical gowns.

Relevant disposable products in addition to those specified above may be included in the product group upon request if they are viewed as sanitary products. Assistance in this is available from the Nordic Ecolabelling secretariats.

It should be noted that the product group includes only disposable products and that the only products included in the group are those composed of materials with respect to which requirements are imposed in this document. Requirement R2, percentage composition, specifies that at least 95% of the materials used in the product must be materials on which requirements are imposed. This means that other materials may be present in small quantities without fulfilling specific requirements. Other materials

might for example include rubber (elastic), $CaCO_3$, wax for preventing leakages in seams etc.

Since the last criteria version, comprising only nursing pads, baby diapers, incontinence products and feminine hygiene products, the product group has thus been extended. However, some relevant products may have been overlooked and accordingly the definition also opens the way for the inclusion of other disposable sanitary products subject to application to Nordic Ecolabelling. This means that Nordic Ecolabelling decides which products may be included. One reason for this is that it is important for an assessment to be conducted of whether the new products should for example satisfy other performance or quality requirements. It is important that the new products should consist of the materials on which requirements are imposed in the criteria, thus preventing excessive growth in the criteria set.

This extension of the product group reflects the recommendations made in the evaluation of the Swan-labelling of sanitary products conducted in 2005, which sought a broad definition to allow the criteria to encompass disposable products for personal hygiene where the primary materials in the product include paper pulp, cotton, viscose or polymers, i.e. materials on which requirements are imposed in the criteria document.

6.2 Sanitary products not eligible for a Swan Label

Wet wipes, paper handkerchiefs, wash cloths made of paper or textile materials, and mesh pants for use together with certain sanitary products are not eligible for Swan-labelling under the criteria for the Swan-labelling of sanitary products.Disposable wiping paper made by cellulose fibers in combination with other materials(plastic, air-laid, other), and which can not be ecolabelled according to the criteria for tissue paper, cannot be ecolabelled according to the criteria for sanitary products either. This e.g. applies to napkins, tablecloths etc made by combined materials.

Products containing medications/medicine, disinfectant substances and the like are not eligible for ecolabelling.Packaging can not be ecolabelled as an independent product either.

Nordic Ecolabelling has developed ecolabelling criteria for over 60 different products and services, and even if a product appears to be eligible for ecolabelling under several criteria, Nordic Ecolabelling determines which criteria document the product will be encompassed by. Wet wipes (may be Swan-labelled under the cosmetics criteria), paper handkerchiefs or wash cloths made of paper (may be Swan-labelled under the soft tissue criteria), or reusable wash cloths and mesh pants (may be ecolabelled under the Swan or Flower textile criteria) are not eligible for Swan-labelling under these criteria for sanitary products. Disposable wash cloths made of materials encompassed by the criteria for sanitary products and that are excluded from the criteria for textiles or tissue paper (e.g. laminated products or products made of non-woven) may be eligible for a Swan Label. Disposable wash cloths made of polyurethane are not eligible for a Swan Label because no requirements have been imposed as to this material. Products to which medicaments/medicines, disinfectant substances or the like have been added cannot be ecolabelled. Disposal gloves cannot

be ecolabelled under the criteria for sanitary products as contained in the consultative proposal.

6.3 The version number and period of validity of the criteria document

This background memo provides the background to and the stringency of the requirements imposed in the consultative document for "The Swan-labelling of Sanitary Products, Version 5, Consultative Draft". The background memo remains valid for the same period of time as the criteria document. Swan-labelling criteria are normally valid for 3 – 5 years before the requirements are revised. During the revision process the requirements will be evaluated and the stringency of the requirements increased, if applicable. A new version of the criteria will be in force for at least one year before the existing criteria cease to apply. The Board of Nordic Ecolabelling is Nordic Ecolabelling's highest decision-making body and has the final word on all criteria documents. The Board comprises the heads of the national boards/committees and the managers of the national secretariats in Denmark, Finland, Iceland, Norway and Sweden.

7 Application for a Swan Label for sanitary products

The applicant must submit documentation as specified below for each individual requirement in the criteria document. The application must be accompanied by an outline specifying the documentation attached for each individual requirement. All information submitted to Nordic Ecolabelling will be treated confidentially. This will also apply to the applicant's name and product names until such time as a licence is granted.

Documentation must be submitted only for the sanitary products encompassed by the application. Subcontractors may submit confidential documentation directly to the ecolabelling organisation, and all such information will be treated confidentially.

In order for a manufacturer or agent to be granted a Swan Label for a product, all requirements in the criteria document must be met.

8 The background to the stringency of the criteria

This chapter provides detailed descriptions of the individual requirements and the background to the requirements. The chapter is divided into the same subsections and requirements as version 5 of the criteria for the Swan-labelling of sanitary products.

A large part of the environmental impact associated with disposable sanitary products derives from the production of the raw materials used in the products. Accordingly, detailed requirements are imposed on the production of the ingoing raw materials. Some environmental impact is also associated with the processing of the products in waste form. In this revision, however, Nordic Ecolabelling has opted not to impose requirements on how consumers should process the products after use, amongst other reasons because numerous ways exist for processing sanitary products as waste and

Nordic Ecolabelling cannot impose requirements in which the products are processed as waste. Both health and environmental requirements apply to the constituent substances contained in sanitary products.

8.1 Product description

Requirements R1 and R2 - Description of the product and packaging with details of percentage composition
These requirements are imposed in order to ensure that an overview is provided of the product and the packaging for which the licence is sought. It will make it simpler to determine which requirements the raw materials must fulfil. The requirement also makes it clear that requirements are imposed with respect to the primary packaging on the product and that this includes both the packaging around the individual product in a pack and the packaging on the pack as it is sold in the shop or directly to the customer.

In the case of a Swan-labelled sanitary product 100% of the constituent components must be disclosed, and 95% of the materials, components and constituent substances must fulfil requirements imposed in the criteria document. Thread present in quantities of less than 1% is exempted from the requirements because the quantities involved are so small and may be left out of the calculation of the composition of the product in which 100% is to be disclosed. Thread may be made of cotton or polyester which are materials for which requirements are also imposed in the document, but which may lie so many stages further back in the production process that it could be difficult to obtain sufficient documentation for such a small component.

8.2 Materials in the product and packaging

8.2.1 Chemical products

Requirement R3 - Chemical products, classification
No chemical products used in the production of sanitary products must be classified as harmful to health or the environment. This is a general requirement and applies to all chemical additives present in sanitary products, even where these products are subject to additional requirements in later chapters, for example adhesives, silicon and ink/dyestuffs. For example, odour control substances permitted in incontinence care products must fulfil the requirement. The stringency of the requirement has been increased since the last version of the criteria for environmental and health reasons.

The production of sanitary products means the production process in which the sanitary product is assembled using the ingoing raw materials. Accordingly, this requirement does not apply to additives in raw materials, unless the intention is to incorporate a property that is prohibited under the criteria.

8.2.2 Fluff-/Cellulose pulp

Fluff pulp production
Fluff pulp for sanitary products is specially produced for this purpose and is manufactured from wood fibre. To be used in sanitary products the fluff pulp must possess particular properties: both processing properties and absorption must be of a satisfactory quality. Fluff pulp must:

- be readily dispersible when dry
- not create dust in the threading machinery
- not require the use of excessive energy during defibring
- provide the end product with satisfactory absorption
- have a regulated and predictable tendency to create fibre bonds, everything from the affinity of dry paper to unretarded affinity
- arrive in the appropriate form for sanitary product production. Often this means that the pulp is in roll form rather than in ball form, which is customary in paper production.

As in the case of tissue paper, a low content of fine fractions, chippings and resin in the pulp is preferable. Pulp for fluff pulp is produced in such a way that each process stage is optimalised in order to produce the required product properties. This means that the drying of the pulp and the addition of chemicals is controlled very precisely. The pulp may be produced in a variety of different ways: using the CTMP (chemi-thermomechanical pulping) method, or boiled using the sulphite or sulphate method. The fibre raw material is also selected carefully, long fibres offering a number of advantages. In Europe a handful of pulp mills specialise in the production of fluff pulp, and these include sulphate mills. In Europe CTMP fluff pulp has declined over the last ten years. However, pulp is imported to Europe from other parts of the world, as are sanitary products containing for example CTMP pulp.

A fluff pulp can be finished completely on the drying machine, including any applicable chemical additives, or may be produced using a native pre-fluff pulp where chemicals are added at a later stage. In the former case fluff pulp production will occupy a whole pulp drying line at the mill. In the latter case there is scope for variation, but the disadvantage is that the addition of chemicals must take place while the pulp is wet, in other words the pulp will need to be dried once more before it is finished. The advantage is faster quality switching and the scope for re-centrifuging the pulp, allowing “dirty” pulp to be used. Some pulps that are insufficiently bleached thus contain bark traces and fibres containing dark particles.

One of the most important factors in fluff pulp production is the degree of debonding. In some fluff pulps no extra chemicals are added; in others debonding agents or softeners are added to reduce fibre-to-fibre bonding. Two types of agents for debonding are in use: aliphatic acid mixtures and agents containing strong cationic quaternary ammonium compounds as the active ingredient. The latter substances are classified as environmentally harmful, risk phrase R50 (Very toxic to aquatic organisms). However, in contact with anionic fibres this effect is negated. In other words, they can be interpreted as not being environmentally harmful when in contact with pulp.

<u>Requirements R4 – R8 Fluff -/cellulose pulp</u>
Fluff-/cellulose pulp includes relevant types of masses such as fluff pulp and paper pulp, which are used in sanitary productsThe fluff pulp requirements in the last version of the criteria for the Swan-labelling of sanitary products referred to the requirements contained in the criteria for tissue paper. The tissue paper criteria have since been revised, and the requirements applicable to pulp production are now covered under the Basic Module and the Chemical Module[xxxix]. These criteria are

common to a number of different types of paper and encompass the requirements applicable to fibre raw materials, emissions, energy consumption and chemical consumption. Accordingly the requirements are somewhat stricter than those contained in version 4 of the criteria for sanitary products. For further information on the background to the requirements applicable to fluff pulp reference is made to the background memo to the requirements in the Basic Module and the Chemical Module[xl].

As regards the requirements applicable to fluff-/cellulose pulp reference is made to Chapter 2 of the Basic Module and to the chemical requirements in the Chemical Module. In addition the level of requirements that must be fulfilled is specified, since no specific level is provided for in Chapter 2 of the Basic Module. (Chapter 1 of the Basic Module is for paper that is to be Swan-labelled as an individual product and the requirement level is stated as a value where e.g. emissions from paper and pulp production are added together.) In addition to the general requirements applicable to pulp there is a requirement that the pulp must not be produced using return fibre. Broke is not classified as return fibre and may be used. The use of optical brightness in fluff-/cellulose pulp for sanitary products is not permitted. It is assumed that other chemicals used for fluff-/cellulose pulp will be covered by the chemical module. Accordingly no specific requirements are imposed as to debonding chemicals, over and above the requirements contained in the chemical module. As is also noted in Chapter 5.2, the basic and chemical modules emphasise requirements intended to result in a reduction of environmental impact, particularly in forestry operations and in the production of fluff-/cellulose pulp. In other words, that the requirements result in special account being taken of biodiversity in forestry operations, reduced spread of environmental toxins, reduced impact of emissions resulting in acidification, added nutrients to water and reduced emissions of climate gases.

The use of return fibre in sanitary products is not permitted because these products come into close contact with the human body over periods of several hours. The use of return fibre could result in the body coming into contact with harmful substances in the fibre that are not removed at the pulp mill.

Requirements R9-R12 Paper

The requirements for paper refer to the criteria (supplementary modules) for the relevant paper types, e.g. tissue paper, printing and copy paper or grease-proof paper. The requirements R10-R12, which come from the tissue paper criteria, have been included in this document as the requirements also have relevance for copy and printing paper and grease-proof paper, which may also form part of (certain) sanitary products.

8.2.3 Cotton

The cotton requirements have been imposed to safeguard environmental, health and working environment considerations. Conventional cotton cultivation uses pesticides, defoliants, fertiliser and requires the use of large quantities of water, all of which contribute to major disadvantages in terms of health and the environment[xli]. In organic production the system of cultivation is designed with a view to maximising preventive measures to counter pests and weeds, and readily soluble mineral fertilisers and chemical/synthetic insecticides are not used. Moreover, organic production is

based on a holistic view encompassing the ecological, economic and social aspects of production and this approach to cultivation views nature as a whole. In 1995 organic cotton was cultivated in 18 countries, and the total harvest was estimated to be approximately 13,000 tonnes – equivalent to approximately 0.1% of worldwide cotton production. In the 2004-05 seasons organic cotton was cultivated in 22 countries, of which Turkey accounted for 40%, India 25%, USA 7.7% and China 7.3%. It is estimated that these countries cultivate 79% of all organic cotton[xlii]. It has been estimated that in 2005-06 some 31,000 tonnes of organic cotton will be cultivated worldwide. This means that the proportion of organic cotton will be 0.12%, given that the January edition of International Cotton Advisory Committee World Cotton Situation Review estimates worldwide cotton production to be 25 million tonnes in 2006. It is estimated that in reality the figure for organic cotton is higher since in many countries registering production as organic is costly[xliii].

The use of genetically modified organisms (GMO) is not permitted in organic cotton cultivation. Organisms of this type are widely used in conventional cotton cultivation. For example, Monsanto (producer of GMO) reports that 80% of the land on which cotton is cultivated in Australia now contains genetically modified cotton[xliv]. There is wide-spread discussion about whether the use of GMO in cotton production represents an improvement in environmental terms. It is argued that GMO use reduces the use of pesticides and increases harvests, although others argue that this is simply a short-term view. In recent years a reduction in the number of birds in GMO cultivating areas has been reported, amongst other reasons because of the powerful insecticides used and because genetically modified crops generate fewer surplus seeds for the birds to eat[xlv]. There have also been reports of cows in India dying after grazing on GMO cotton fields after harvesting and that the use of insecticides has not fallen[xlvi].

Requirements R13-R14 – Cotton

The requirements applicable to cotton are that the cotton must not be bleached using chlorine gas and that it must be cultivated organically or cultivated in a transitionary phase to organic production. This is the same requirement as in the previous version of the criteria document, but the option of documenting non-pesticide cultivation only has now been removed. The quantity of organically cultivated cotton has not increased significantly since the last revision. However, Nordic Ecolabelling is of the view that this requirement remains important, for amongst other reasons because cotton is used in products that come into close contact with the body, for example tampons.

The string on tampons is exempted from the requirement. The string is often made of cotton and makes up approximately 4% of the total quantity of cotton in the product. In order to prevent the string from snapping during use, strict quality requirements apply to the string. Organic cotton has shorter fibres and accordingly it is difficult to achieve satisfactory strength.

The requirement refers to two EU regulations on organic farming. The first (20092/91) was enacted in 1991 and has been amended several times, and the second (834/2007) has recently been enacted and enters into force from 1 January 2009. In order to facilitate the processing of applications in the case of cotton that has been

certified under other standards, a number of these are mentioned specifically, such as KRAV, SKAL, IFOAM, IMO, KbA, OCIA, TDA, DEMETER.

8.2.4 Viscose

Viscose fibre is produced from cellulose fibre and is classified as regenerated fibre. Paper pulp, for example, is used with alpha cellulose that is more than 89% pure being preferable. In other words, most of the lignin and hemicelluloses from the wood fibre has been removed. After treatment and bleaching using NaOH (alkalisation) the pulp undergoes swelling and is treated with CS_2 to produce cellulose xantogenate. This coagulates in an acid bath containing H_2SO_4, $NaSO_4$ and $ZnSO_4$. After further maturation, filtration and degassing the viscose is spun. Because viscose is normally produced on the basis of pulp, there may be major COD emissions during production. Further production stages result in emissions of both sulphur and zink (Zn).

Requirements R15-R18 – Viscose
The requirements provide that cellulose pulp must not be bleached using chlorine gas. Although no longer used in Europe, chlorine gas is still in use elsewhere in the world. Chlorine gas is an efficient bleaching agent, but results in heavy emissions of chloro-organic compounds. Satisfactory alternatives for bleaching cellulose pulp are available. The requirement applicable to COD emissions applies both to the production of pulp and the further processing of the viscose. TOC may be measured instead of COD if the interrelationship between the two values in the production process is stated. Routine analyses of COD using the ampule method contains environmentally harmful mercury (Hg) and a number of companies now use TOC as a parameter. The requirements applicable to emissions of S, Zn and COD have all been increased in stringency since the last version of the criteria. The COD requirement proposed in the consultative document was excessively strict, which would probably have resulted in only one supplier on the market being capable of meeting the requirement. As a result of an error, emissions from the dissolving process were not included when the threshold value for the consultative process was determined. The updated value has been determined on the basis of the EU's BAT report "Reference Document on Best Available Techniques in the Pulp and Paper Industry – July 2000" (even though this does not directly include values for dissolving pulp) in combination with values for viscose production from the corresponding report for the textile industry "Best Available Technology in the Production of Polymers – Final Draft July 2006".

A new method of analysis for zinc emissions has been added to Appendix 1 in the criteria document: ISO 17294 (2007).

8.2.5 Non-woven

Requirements R19 – R20 – Non-woven
As described in Chapter 5.2, non-woven may be produced from a variety of materials. The non-woven requirements refer to the material requirements applicable to the materials used and to the chemical requirement if chemicals are used during production of the non-woven material.

8.2.6 Wood

The requirements as to wood apply to cotton buds and toothpicks made of wood. The requirement is probably not applicable to other sanitary products.

Requirement R21 – Wood - Forestry
The requirement is formulated in the same way as the forestry requirements in the criteria for Swan-labelled products that consist primarily of wood. The requirement is made up of a general requirement according to which the wood used must be taken from sustainable forestry operations and not from areas where social and biological values worthy of protection are under threat. Moreover at least 70% of the wood must be taken from certified sustainable forestry operations. Nordic Ecolabelling has a forestry group which assesses applicable forestry standards. This is described in further detail in Appendix 1.

8.2.7 Polymers

The polymers that may be present in sanitary products are polyethylene (PE), polypropylene (PP), polyester (PET), polystyren (PS), polyacrylic acid-based super-absorbents (SAP), elastane and biopolymers (such as bio-SAP and starch-based thermo-plastics). Other polymers have also been considered, but have not as yet been included in this version of the criteria.

In earlier versions of the criteria the use of organic solvents when extruding polyester was prohibited. This requirement was removed when version 4.5 was drafted with a new layout because this method is not widely used today.

With version 5.2 of the criteria polystyrene has been included as one of the polymers which have specific requirements. Polystyrene is a thermoplast which is e.g. used for packaging for food[xlvii]. Polystyrene is manufactured by polymerisation of styrene. Styrene is classified as hazardous to human health and as an irritant (Xn; R20, Xi; R36/38) and is furthermore placed on the Factories Inspectorates' (Arbejdstilsynets) list of carcinogenic substances (in Denmark) with a limit of 25 ppm in the working environment. An EU Risk Assessment Report (EU RAR) has been made for styrene in 2008 and this report has subsequenstly been evaluated by SCHER (the Scientific Committee on Health and Environmental Risks). SCHER disagrees with the conclusion in the EU RAR which indicates that there is no need for concern in relation to human carcinogenicity, but apart from that SCHER generally agrees with the exposure- and effect assessments made. SCHER concludes that - apart from specific exposure scenarios (boat biolding, working with styrene containing liquids or styrene based pastes) - there is no need for further information or risk reduction measures beyound those already being applied for the consumers [xlviii]. In the EU directive for plastic materials and articles intended to come into contact with foodstuffs (2002/72/EF) no limitations for the content of styrene monomers apply. Based on the above it is thus not considered relevant to establish cut-off limits for the content of styrene in sanitary products when styrene is included as a plastic material in version 5.2 of the criteria for ecolabelling of sanitary products.

Requirements R22– Polymers, halogen-based

This requirement has not been changed since the last version of the criteria. This is a requirement that Nordic Ecolabelling imposes in many criteria documents for products in which plastic materials have a short useful life. The main problem areas associated with PVC are waste processing, the use of additives and dioxine emissions, inter alia in the production of PVC. Small quantities of highly toxic dioxins may be formed during PVC production.

According to the PVC Council of Denmark, provided that the technology and safety at the production site are satisfactory, most – but not all – dioxin emissions will be captured. In Sweden, the environmental authorities report that PVC raw material production accounts for approximately 1% of the total quantity of dioxin formed in the country[xlix]. In less modern facilities, dioxins may be released into humans and the environment during emissions from PVC production[l]. In order to withstand the temperature required during the production of a PVC product, the PVC must be stabilised (extrusion, injection moulding). The stabilizers may be based on lead, metal alloys (such as barium-zink and calcium-zink), tin or cadmium. 70% of all tin compounds produced are used for stabilising PVC[li]. 70% of the stabilizers used in PVC also contain lead. Cadmium and zink are also still used as stabilizers in PVC, according to the Green Paper from the European Commission 2000[lii]. The PVC industry in Northern Europe has phased out the use of lead in stabilizers and a plan has been formulated to phase out this use throughout Europe by 2015. The industry in Europe committed itself to discontinuing the production of stabilizers containing cadmium in 2001. However, PVC products imported from the rest of the world are not subject to the same European restrictions on the use of lead or cadmium. 15,000 tonnes of organic tin compounds were used in stabilizers for PVC in 1998, equivalent to 9.3% of the total consumption of stabilizers in Europe.

Approximately 50% of the chlorine ions in incineration plants in Europe derive from PVC. The main problems associated with the incineration of PVC are emissions of dioxins and the formation of waste in connection with the neutralisation of the hydrochloric acid that is formed as a result. Waste incineration accounted for approximately 40% of total dioxin emissions in the European Union between 1993 and 1995. However, the introduction of modern treatment technology has resulted in significant reductions in emissions. The EU has limits on the permitted emissions of dioxins from incineration plants, although these threshold values are not universally observed. Depending on the technology used to treat flue gases between 0.5 and 2 kg of waste is created per kilo of PVC incinerated. Moreover, this waste may contain heavy metals, making recycling difficult. On the whole it can be said that the environmental impact associated with the production, use and disposal of PVC is gradually shrinking, inter alia as a result of new knowledge and technological development. Nevertheless, all the signs are that there are still major problems associated with PVC. Nor are the control measures conducted on PVC imported to the EU and the Nordic countries from other parts of the world adequate. Accordingly, Swan-labelled sanitary products, which are disposable products, are therefore subject to a prohibition against the use of PVC in the products or their packaging.

<u>Requirement R23 – Polymers, constituent substances</u>
During the consultative process this requirement was divided into two: one requirement, which prohibited phthalates and halogenated paraffin, and one requirement relating to polymer catalysts. These requirements have now been

combined in the form of a single requirement applicable to the constituent substances in polymers.

As in earlier versions, phthalates are prohibited. In addition, the use of other plasticizers such as chlorinated paraffin is prohibited. This because these are compounds that are harmful to the environment, and because it would represent an unnecessary burden on the environment to permit sanitary products with such additives. A better solution is to use a different type of polymer where no such plasticizers are necessary.

Plasticizers are mostly used in PVC to give the polymer the required properties. Phthalates are not chemically bound to the polymer and may leak out of the products. Phthalates have long been a focus of attention because of their suspected effects on health. DEHP (Di(2-ethylhexyl)phthalate, DBP(Dibutylphthalate) and BBP (Benzylbutyphthalate) are classified as toxic for reproduction (R60, R61 and R62). DINP (diisononylphthalate), DIDP (diisodecylphthalate), DNOP (dioctylphthalate) are not classified, but the possibility that these substances represent a risk cannot be ruled out. An EU Commission working group has concluded that both DIDP and DINP cause category II endocrine disruption[liii]. The reason that these substances have not been given an official EU classification is that there is no classification for endocrine disruption (not to be confused with harm to reproduction). Animal experiments have also shown that in high concentrations (above the classification level) DINP and DIDP may cause harm to the unborn child, impair fertility and cause liver damage. The EU has adopted a directive prohibiting the use of the three most harmful phthalates (DEHP, DBP and BBP) in all toys intended for use by children aged up to 14 years. There are indications that three other phthalates (DINP, DIDP and DNOP) may be harmful for reproduction, and these are accordingly prohibited in toys designed for young children, which are likely to be chewed and bitten by children. The new regulations apply from 16 January 2007. The new ban will apply if concentrations of the phthalates in the part(s) of the product that has (have) been plasticized exceeds 0.1 percent by weight[liv].

The consultative proposal contained the suggestion that catalysts should not contain chlorinated organic compounds, organotin compounds, phthalates or antimony due to the compounds environmental and health effects. Organotin compounds are used in for example the production of some types of polyurethane. It is not known whether they are used in polymer materials for sanitary products, although their use in, for example, the production of elastane cannot be ruled out. Antimonytrioxyde is used as a catalyst in the production of thermoplastic polyester, primarily PET. Thermoplastic polyester generally contains antimony in concentrations of 150-350 ppm (mg/kg)[lv]. A Swedish study of the literature from 1999 claims that 90% of all polyester is produced using antimony-based catalysts and that Acordis (formerly Akzo Nobel) claims to have developed a new antimony-free catalyst for use in polyester production. In the Borås region of Sweden, two local authority treatment plants which receive waste from the textile industry have registered an increase in antimony in the waste sludge[lvi].

Phthalates and chloro-organic compounds are more widely used as auxiliary substances in catalysts. All these substances have harmful effects on health and the environment and their use should therefore be minimised.

Since the consultative process, an exemption has been specified for pollutants in the form of chlorinated organic compounds, phthalates and antimony. Pollutants are defined as traces from raw material production present in concentrations of less than 100 ppm (0.01 weight %, 100 mg/kg), but not substances added to the raw material or product deliberately and for a purpose, irrespective of quantity. In the case of organotin compounds, the limit is 10 ppb. A 200 ppm cut-off limit has been introduced for antimony in polyester. (This has been added in version 5.2 and replaces a general exclusion of antimony in polymers).

It has also been specified that the requirement applies to polymers in sanitary products and to packaging around individual products in a pack.

Super-absorbents (SAP)
Nowadays the term superabsorbent generally refers to sodium salts of polyakrylic acid. A number of different types are being developed, e.g. by modifying the chain or by adding different side groups to produce new properties. Bio-SAPs based on starch are also produced. In Denmark work is being done on the development of a product based on soya with an absorbent core. This will provide an alternative to the super-absorbents usually used in sanitary products. However, at present time little information is available on this.

Polyakrylic acid is produced by polymerising the monomer, akrylic acid - CH_2-$CH(CO_2Na)$-, into long chains which curve when dry. Sodium persulphate, $Na_2S_2O_8$, is used as a radical initiator. During polymerisation a co-polymer is also added, which has more functional units than the akrylic acid, as a result of which it is able to bond with more molecules and thereby contribute to a three-dimensional polymer. Polymerisation takes place in a sodium hydroxide solution[lvii]. The radical polymerisation is exothermic and usually takes place in suspension. The ensuing polymer is rubber-like and retains water. It is then partially neutralised and dried, and then ground up into suitable particle sizes. The polymer in the surface of the particles can also be cross-linked in separate stages to give the material specific absorption properties. According to the BASF website[lviii] greater surface cross-linking gives the gel formed as a result of absorption of fluid greater absorption against pressure.

According to the informasjon on the same website from BASF (Tetraallylethoxy) ethane and 1,1,1-Trimethylolpropanetricrylate (TMPTA) are customarily used for cross-linking. Other examples of monomers that can contribute to cross-linking are: glycerol propoxy triacrylate, triallylamine, divinyl benzene divinyltoluene, polyethylene glycol monoallyl ether, glyoxal, ethylene glycol, di- or polyglycidyl ether and ethylene diamine. Cross-linking of the surface involves the use of e.g. glycerine and this often takes place in a solution of ethylene carbonate ($C_3H_4O_3$). The manufacturers reveal very little about the cross-linkers they use and it seems that virtually anything that can react with carboxylic acid has been tried. Very small quantities are used and analysis is therefore difficult according to Fredric L. Buchholz, Research leader at Dow Chemicals, writing in an article in Chemistry in the spring of 2005[lix].

According to the same website from BASF polymer additives include surfactants which help the gel to break down into smaller units. They may also increase “wetting”

of the surface in order to improve swelling speed. Antioxidants are added to retain the whiteness of the SAP and reduce aging. Thermal or redox initiators reduce residual monomer levels, which is important in sanitary products that come into contact with skin. Flow modifiers such as fumed silica can help the polymer powder to flow more smoothly during production and improve the permeability of hydrated SAP.

Extractives from SAP are low-molecular compounds that can be extracted from the polymer in the event of a fluid surplus. Residual monomers from SAP are also measured and these might for example be cross-linkers that were not taken up in the polymer network during polymerisation. The background memo to the last version of the criteria document for sanitary products, version 4, stated that "SAP has no allergic side effects. However, residual monomers from the SAP may have an allergic effect. The applicable requirement is accordingly a maximum of 400 ppm residual monomers in the SAP in question and a maximum 5% (w/w) water-soluble extracts". A search on the Internet reveals that nowadays products can in theory be produced with less than 200 ppm residual monomers[lx]. The major manufacturers have no information on residual monomer content or extractives on their websites.

The akrylic acid monomer is produced using propene (propylene) from refineries. Degussa[lxi] uses a two-stage process with gas phase oxidation of propene via acroleine (propenal, C_3H_4O). Acroleine is toxic in concentrations of over 2 ppm. According to the European BAT Report on large volume organic chemical industry[lxii], production emissions are minimised by means of incineration of both waste water and gas emissions.

Acrylic acid (CAS No. 79-10-7) is a colourless and corrosive fluid. It is produced in nature by a number of marine algae types and in the stomach of sheep. Industrial production is used for the further production of monomers (e.g. amides, akrylonitrile, vinyl, styrene and butadiene) for polymers for use of the production of plastic materials, coatings, glue, elastomers, floor polish and paint[lxiii]. It has also been used as a pesticide[lxiv]. Akrylic acid breaks down in air and water and is not viewed as bioaccumulable, but is classified as R10, R20/21/22, R35, R50. According to a fact sheet issued by the US Environmental Protection Agency[lxv] animal studies have shown reduced birth weights where acrylic acid is present in drinking water, but no other effects on reproduction. The Health and Safety Commission in Australia applies a limit value for exposure of 2 ppm (eight hours on average). In Norway the equivalent administrative standard is 10 ppm.

Properties of SAP

According to EDANAs website the polymer is capable of absorbing 200 times its own weight of tap water and then forms a gel. Absorption is diminished if the water contains salts and minerals and the swelling capacity is 20-40 ml urine per gram of polymer[lxvi]. By comparison, fluff pulp is capable on average of absorbing approximately 12-14 g water per gram of dry fibre. According to EDANA the absorption of blood is slower, amongst other reasons because flows more slowly and contains lipids. The polymer is known as a polyelectrolyte because it includes an electrolyte group in each unit which dissociates in aqueous solutions, making the polymers charged. The swelling is based on osmotic pressure and the polymer functions as a semi-permeable membrane. According to Wikipedia[lxvii] other salts of the polymer include potassium, lithium or ammonium salts.

Absorption under pressure is important from the perspective of leakages from sanitary products and will depend on the degree of cross-linking and stiffness of the polymer. In the core of a diaper there are capillaries between the fibres in the fluff pulp and the polymer particles and these determine how the fluid is absorbed, distributed and retained in the diaper. This is affected by factors such as the temperature, distribution of materials and the degree of cross-linking of the polymer. EDANA, an international organisation for non-woven and related industry (including SAP) has developed a number of recommended tests (ERT) for polyacrylate super-absorbents such as: Residual monomers, Particle size distribution, Moisture content, Free swell capacity, Centrifuge retention capacity, Absorption under pressure, Flowrate, Density, Extractables, Respirable particles and Dust"[lxviii].

Polyacrylic acid is not readily degradable biologically.

The market
According to EDANA worldwide production capacity in 2005 for polyakrylic acid totalled 1.5 million tons and approximately 90% of this is used in sanitary products. Other uses include cables, packaging foodstuffs, as an additive in cement, sealants for buildings, gardening and agriculture (as an inert growth medium in fertilizers), as instant snow in the film industry. It can also be used for fire control purposes[lxix.] The main manufacturers are Degussa, BASF, Dow, Nippon Shokubai and San-Dia Polymers.

Other products
As was also noted in the last background memo, it appears that development work is under way on products capable of absorbing odour. According to a BASF patent, odour controlling substances may be “a cyclodextrin compound, an amphoteric surfactant, a water-insoluble phosphate, triclosan, and mixtures thereof"[lxx]. Because of reports of toxic shock syndrome resulting from the use of SAP in tampons this is not recommended by any manufacturers at present.

Biobased super-absorbents
Lysorb® is a bio-SAP produced by Lysac Technologies Inc. of Canada. It consists of renewable biological raw materials, is biodegradable and is not viewed as allergenic. According to the manufacturer the product is "hypoallergenic", which is a designation used for something that does not normally cause allergies, although this expression is not medically defined. Lysac manufactures the product using natural or modified starch from corn products such as maize and wheat as well as from guar gum. The material biodegrades by 91.8% during the course of 28 days and has no residual monomers.

Until now Bio-SAP particles have been bigger than SAP particles based on polyakrylic acid and has been mixed with polyakrylic acid SAP. In 2007 products that can be used without the need to mix in other products, stand alone products, are due to be launched.

<u>Requirements R24-25 – Super-absorbents (SAP)</u>
The maximum values in the requirements for SAP have not been changed since the last version of the criteria and are a maximum of 400 ppm residual monomers and a

maximum of 5% (w/w) water-soluble extracts in the SAP used. According to the EU's risk assessment[lxxi] of akrylic acid exposure to the monomer may occur when SAP is used in sanitary products, although this exposure is expected to be low. Nevertheless, the maximum requirement of 400 ppm remains in place, and the requirement has now been specified in that only monomers that are classified as harmful to health or the environment are restricted. This reflects the standard formulation of chemical requirements in Nordic Ecolabelling's documents.

8.3 Material composition

Requirement R26 – material composition, sanitary products
This requirement applies to the products including the materials/packaging around the individual products in a pack. For the requirement to be fulfilled, one of three conditions must be met:

Sanitary products, including the packaging/material around individual products in a pack, must fulfil either requirement A, B or C:

A. A minimum of 7.00 weight % of polymers must be based on renewable raw materials.
B. The contribution to global warming (global warming potential, GWP) of the materials contained in the sanitary product must be less than or equal to 2.10 kg CO_2 eq/kg sanitary product.
C. At least 50.00% by weight of the materials in the sanitary product must consist of renewable raw materials.

In the last version of the criteria, the requirement was as in A above, but with a limit of 5%. Moreover, an exemption applied in the case of tampons. This exemption has now been removed. In the consultative proposal for this version of the criteria, the threshold was increased to 7% and alternative B was added, but with a calculation that applied only to the polymers. In addition, the consultative proposal included an exemption for products weighing less than 5 gram. Here too, however, the exemption has been removed since several alternative means of fulfilling requirement R26 now exist.

The requirement was justified on the grounds that it is important to promote the production of polymers based on renewable raw materials (this from a resource perspective) as well as materials with a low impact on climate. The development of, for example, super-absorbents based on renewable raw materials has not proceeded as quickly as expected, and accordingly, no major increase in the stringency of Requirement A has been proposed.

The requirement relating to the use of renewable raw materials is justified on the grounds that the increasing world population will need more raw materials and services to meet its needs. This trend will affect the use of raw materials and the environmental impact on the earth on a global scale[lxxii]. The European Commission's Green Brook on Integrated Product Policy[lxxiii] describes guidelines for product design to promote the life cycle perspective to companies. The guidelines have been formulated to bring about more environmentally-friendly design for products and are aimed at integrating environmental features in product design. Several concepts are detailed, including "design that allows the use of renewable materials" as a way

towards achieving products that preserve resources and reduce waste, pollution and production risk. Against this background, Nordic Ecolabelling also wishes to promote the use of renewable raw materials. Particularly in the case of disposal products with a short life, the environmental impact associated with the production of products has a major bearing on the overall environmental impact of the product.

A polymer is viewed as a renewable resource if it consists of more than 75% by weight of renewable raw materials. Cellulose and viscose are not counted as polymers. If the polymer contains a smaller proportion of renewable raw materials than 75% by weight, the proportion must be included in the calculation of the proportion of polymers from renewable raw materials. Fillers that are not polymers cannot be deducted from the weight of the polymer, but are not counted as a renewable share. In the previous version, the proportion of polymer included in the calculations was limited to whatever proportion contained renewable materials, even if this exceeded 75%.

Many respondents commented on requirement B and several proposed that it would be better to impose a requirement that the product contain a proportion of renewable raw materials and not unilaterally focus on the polymers[lxxiv]. For this reason, an additional alternative, alternative C has been included, with a limit of 50% renewable materials in the product. The consultative bodies also submitted proposals for improved background values for calculating GWP for the individual polymers and following the consultative process, requirement B has been adjusted from applying only to polymers from fossil raw materials to applying to all primary materials in the sanitary products.

The relevance and use of the GWP parameter has increased, amongst other reasons because it specifies the contribution of production and, if applicable, the product to climate change, and is stated in terms of CO_2 equivalents. All production of materials contributes to climate change. Polymers from renewable raw materials such as polylactic acid and biopolyolefines from biopulp (e.g. wood waste via syngas) generate lower emissions of CO_2 during production than convention polyethylene[lxxv].

Although as a parameter GWP is widely used in, for example, LCA studies, few polymer manufacturers publish production specific values. LCA studies often use average values for, e.g., production in Europe. This means that different studies will reach the same outcome as regards use of the same quantity of polymer. The plastics industry is not as open about its emissions as, for example, the wood processing industry, which over the last 10-20 years has published factory-specific emission figurers.

To calculate GWP for a product, it is necessary to know the values for GWP per kg of material produced for the various materials present in the product. Nordic Ecolabelling's ambition is that manufacturers should use factory-specific values for actual production. However, where this information is not available, Table 5 provides values that can be used. Average values for production at multiple factories will not be accepted. These calculations do not include emissions from processing the materials as waste. This is a weakness since incineration, material recycling, composting and landfilling also contribute to emissions of CO_2. Table 4 shows that approximately 60% of household waste in the Nordic countries is incinerated and the

energy generated is used. Here the carbon in organic material is converted to CO_2 plus H_2O and in the LCA analyses the emission from the materials from renewables will not contribute to emissions. In landfill disposal CH_4 is created under anaerobic conditions. This results in a higher climate effect and accordingly the inclusion of contributions from materials based on renewable raw materials is relevant. The British diaper study shown in Table 7.3 (Inventory Analysis – Disposable Nappy Manufacture) reveals that the waste phase of diapers is less significant as regards emissions of CO_2 equivalents as compared with production of the materials. Accordingly the waste phase of the materials is not included in this version of the criteria. A more precise calculation in which contributions from incineration, landfill disposal and composting are included in the GWP values for the materials will be conducted in the next version of the criteria.

For the purpose of calculating factory-specific values, the quantity of electricity used per kilo of material produced must be multiplied by a factor of 2.5 to determine conversion to primary energy and then by 400 g CO_2/kWh to determine CO_2 emissions per kilo of material. 400 g CO_2/kWh is a standard value applied as the European mean figure for electricity production.

Kilo of product has been selected as the functional unit for the GWP value of the product. This allows the same method of calculation to be applied for several types of product. Litres absorbed could have been used as an alternative functional unit for diapers. However, tests of diapers have revealed that the absorptive capacity of all products on the market is good enough. A combination of properties, such as distribution of fluid and the fit of the diaper, will often determine which product is chosen. As a result, no other uniform functional unit stands out as a likely candidate.

In finding relevant GWP values for Table 5, information has wherever possible been taken from public LCA studies and other quality-assured information. However, it has been difficult to find sound sources for all parameters. For example, the values in LCA studies are often stated per product and it has therefore been necessary to backtrack in order to determine values per kilo of material. Uncertainties attach to calculations of this nature, and we therefore hoped that more accurate figures would be generated during the consultative process.

Table 5. Reference values for GWP100* for production of selected materials

Material	**GWP kg CO_2 eq/kg polymer ***
SAP	3.70
PE	2.60
PP	3.90
PS	2.80
PET	6.50
Fluff	0.90
Bio-polymer	1.20
Paper/viscose	1.20

* The contribution to global warming, GWP, is expressed in a time scale of 100 years and as kg CO_2 equivalents per kg of material from cradle to gate. The reference for the values is provided in the text below.

The GWP value for SAP is calculated on the basis of the previous mentioned “Life Cycle Assessment of Disposable and Reusable Nappies in the UK”. The values in the

studies are stated to be GWP100 for one child's diaper use over 2.5 years. To determine GWP in CO_2 eq/kg polymer, the figure is divided by the quantity of polymer used in the production of the total number of diapers for one child. The GWP value for SAP is stated as 164 kg of CO_2 eq for one child's diaper use for 2.5 years (Table 8.12 page 98). By calculating the number of kilos of SAP used in this consumption, the figure for GWP/kg of SAP is calculated. The values for SAP used in the study are original average figures for SAP production from EDANA. EDANA has not responded to our request for direct access to the same values. Because of uncertainties in the figures and because the values in the diaper study are based on average figures from EDANA, the value calculated has been increased by approximately 20%.

The GWP value for PE in the consultative proposal was 2.9 kg CO_2 eq/kg polymer. In their consultative response PlasticsEurope stated figures of 2.1 for LDPE (Low Density PE), 1.8 for LLDPE (Linear Low Density PE) and 1.90 for HDPE (High Density PE). Because these are average figures from European industry we have decided to add an uncertainty margin of 20% and to increase the value for LDPE to 2.6. LDPE is more widely used in film than HDPE. If an equivalent calculation to the SAP calculation was used based on the diaper study, the result would have been 2.6 kg CO_2 eq/kg polymer without the addition of the uncertainty factor of 20%. A study of syringes[lxxvi] by FORCE Technology reveals a value for HDPE of 2.6 kg CO_2 eq/kg polymer, which is considerably higher than the figure of 1.8 stated by PlasticsEurope in the consultative comments, even though the syringe study also claims that the figures were taken from a study of the production of bottles made of HDPE conducted by PlasticsEurope. Against the background of the above assessments, a figure of 2.6 kg CO_2 eq/kg polymers as a value for GWP is regarded as a low estimate for finished PE film.

The GWP value for PP in the consultative proposal was, as in the case of the syringe study, 3.9 kg CO_2 eq/kg polymer. In their consultative comments PlasticsEurope state figures of 2.0 for PP and 3.20 for OPP film. With the addition of a 20% increase the value for OPP film is 3.85. The value from the consultative document of 3.9 kg CO_2 eq/kg polymer has been retained.

In the consultative document the GWP value for PET was calculated on the basis of the diaper study in the same way as for SAP. This provided a value of 4.8 kg CO_2 eq/kg polymer. In their consultative comments, PlasticsEurope stated the figures of 3.30 for amorphous PET and 5.40 CO_2 eq/kg polymer for PET film. Nordic Ecolabelling has opted to take the value for PET film and to add an uncertainty factor of 20%, which provides for a new value of 6.5 g CO_2 eq/kg polymer.

The GPW-value for PS has been introduced with version 5.2 of the criteria as this material is also relevant for sanitary products.The GWP-value of 2.80 kg CO_2 eq/kg originates from the previous mentioned study of syringes from FORCE Technology.

In a calculation based on the diaper study the GWP value for fluff will be 0.61 after an uncertainty factor of 20% has been added. Based on our own experience of the paper industry, Nordic Ecolabelling has reached a value of 0.90 kg CO_2 eq/kg fluff. These calculations include CO_2 from heat production from fossil fuels and from the production of electricity. In the case of electricity the quantity used has been

multiplied by a factor of 2.5 for conversion to primary energy and then by 400 g CO_2/kWh. (400 is used as the European mean value for electricity production.) The criteria for sanitary products impose requirements on the production on fluff pulp, including requirements applicable to energy consumption. This means that the pulps that are best in environmental terms will be used in the Swan-labelled sanitary products.

The GWP value for paper is somewhat higher than for fluff, because energy is also used in the production of the paper. On the other hand, the pulp will not need to be dried in integrated factories where both pulp and paper are produced. In the document entitled "Framework for the development of Carbon Footprints for paper and board products, Appendices" produced by the European paper industry organisation, CEPI[lxxvii], a GWP value of 1.0 kg CO_2 eq/kg paper is given. Here again the value has been increased by 20% in order to produce a reference value that is realistic as a worst case value for Table 5. No separate value has been provided for viscose, this is given as the same as for paper.

Since it has not proved possible to obtain a specific GWP value for bio-SAP, this value has been fixed as equal to the value for other biopolymers. In the case of other polymers too it has proved difficult to obtain figures, amongst other reasons because several commercial products, such as starch-based polymers, contain polymers based on fossil raw materials into the product. This makes it difficult to separate out the GWP values applicable to the polymer share. A number of studies with life cycle analyses also include the waste phase without separating out the CO_2 equivalents for the production and waste phase.

Based on various studies, Nordic Ecolabelling has determined a value of 1.20 kg CO_2 eq/kg biopolymer. Starch-based polymers are stated to generate between 20 and 80% lower emissions of climate gases during production[lxxviii]. MATER-BI, which is a starch-based polymer, has a GWP value of 1.54 g CO_2 eq/kg polymer, although the proportion of polymer from fossil raw materials is not stated[lxxix]. Other sources state lower GWP values for MATER-BI (such as 0.8 and 1.2 kg CO_2 eq/kg biopolymer. Various processes for BTP (biomass to polymer via synthesis gas and methanol) will produce polyolefines with GWP values of from 0.3 to 1.4 kg CO_2 eq/kg biopolymers[lxxx]. According to our information the production of polylactide (PLA) expends 25-55% less fossil energy than petroleum-based polymers. The first generation PLA has a GWP value of 1.83 g CO_2 eq/kg polymer, although it is not known which generation of the products are now on the market. Nevertheless, the description of new production processes reveals considerable scope for reducing CO_2 emissions.

Alternative C has been introduced since the consultative process. Here the requirement is that at least 50.00% by weight of the materials in the sanitary products must consist of renewable raw materials. The same requirement as in alternatives A and B applies, i.e. that a polymer is regarded as based on renewable raw materials if it consists of more than 75% renewable raw materials. The fillers in a polymer cannot be deducted from the weight of the polymer, but is counted as a non-renewable proportion. Renewable raw materials are defined as a raw material derived from biological materials that are regenerated continuously in nature. For this purpose peat and minerals such as chalk are not viewed as renewable.

Calculation example for diapers:

The appendix to the criteria document contains examples of calculations for two sanitary products. These are discussed here:

Table B2. Calculated values for GWP100* for two examples of sanitary products using the values in Table 5.

	Product 1		**Product 2**	
	Weight, g	**g * GWP**	**Weight, g**	**g * GWP**
SAP	12.00	44.40	10.00	37.00
PE	6.00	15.60	2.50	6.50
PP	8.00	31.20	9.00	35.10
PET	1.00	6.50	0.00	0.00
Fluff	12.00	10.80	22.00	19.80
Biopolymers	2.00	2.40	2.00	2.40
Paper	0.00	0.00	4.90	5.88
Other, adhesives etc.	3.00	0.00	4.00	0.00
Total	44.00	110.90	54.40	106.68
A. Proportion polymers of renewable raw materials	**-**	**6.90**	**-**	**8.51**
B. GWP kg CO_2 eq/kg product	**-**	**2.58**	**-**	**1.96**
C. Proportion renewable materials	**-**	**32.56**	**-**	**53.13**

Diaper 2 fulfils the requirements, but not diaper 1.

The advantage of including a GWP requirement is that it allows the materials used in a sanitary product to be combined to produce a product with low CO_2 impact. This is done by replacing polymers with biopolymers, by using other materials with lower CO_2 impact or by choosing a manufacturer with a lower CO_2 impact for production.

Requirement R27 Cotton buds and toothpicks, material in the stick

The requirement states that cotton buds and toothpicks must be made of renewable raw materials such as wood, board or polymer produced on the basis of renewable raw materials. If board is used, the material must not be bleached using chlorine gas. One problem associated with this type of product is that litter quantities increase if the products are not readily degradable. Moreover the sticks cause major problems in treatment plants. For the justifications for the requirement that renewable raw materials be used, see Requirement R 22 Materials in sanitary products. A detailed assessment of the materials used in sticks shows that e.g. CO_2 emissions from the production of the materials is greatest in the case of polymer materials based on fossile raw materials and lower in the case of the production of board or wooden sticks. The same definition as earlier is used here: that a polymer is renewable if it contains 75% by weight of renewable materials or more.

8.4 Other materials and additives

All materials and additives in this chapter used in the production of sanitary products are also subject to the general requirement applicable to constituent substances in sanitary products, R3, Chemical Products, classification.

Requirements R28 – R29 – Application of silicon

Requirement R28, states that if solvents are used in the application of silicon to the components of sanitary products, the manufacturer must ensure that employees are protected from the solvents. Previously the requirement was that organic solvents must not be used. There has been some criticism of this requirement because, it is argued, this is a process that is no longer in use. However, it is not entirely clear whether this applies to the world as a whole or solely to production in the Nordic countries and Europe. It has also been argued that solvent-based application generally occurs where the substrate is made of plastic. For reasons of health and safety in the working environment this requirement has been amended.

The next requirement is new and prohibits the use of octamethylcyclotetrasiloxane (D4) and (SAS 556-67-2) and decamethylcyclopentasiloxane (D5) in chemical products for silicon treatment. D4 was included in the consultative proposal, whereas the prohibition against D5 has been added since the consultative process. The manufacturer needs to declare that the requirement if fulfilled, chemical analysis is not required.

Siloxanes are used in a number of functions and may also be used in foam inhibitors, fuel additives, car polish and cleaning detergents. According to a recent Nordic study the present level of use of siloxanes does not represent an environmental hazard, although some concentration is occurring because of their low degradability. Concentrations have been discovered near areas in which siloxanes are used industrially and in population centres. Siloxanes are volatile and accumulate readily in sewage sludge.

Sanitary products often features a silicon strip, normally on paper, but not always. This serves either as protection for a strip of velcro or as protection for a self-adhesive strip of glue. In the first of these instances the silicon-treated surface (the paper) stays on the diaper. The silicon surface of the diaper does not come into direct contact with the child’s skin. A typical diaper (for a one-year old child) contains approximately 2 mg of silicon. In the second case the silicon barrier is removed (normally a strip of paper) in its entirety from the sanitary towel or pad in order to expose a self-adhesive strip. Typically the base paper will contain 1 g/m^2 of silicon.

The production of silicone-coated paper in the Nordic countries does not involve the use of solvent-based application, instead heat is used for curing. Solvent-based silicon application usually occurs where the substrate is plastic. The requirement proscribing solvent-based silicon production is justified on health and safety grounds. Solvent-free silicon application is possible either using silicon emulsion in a water solution or entirely without the aid of solvents (solventless). In both cases the silicon is hardened using heat. Some catalysts occur, usually Pt-based.

The various siloxanes used include octamethylcyclotetrasiloxane (CAS 556-67-2), also referred to as D4 and classified as “May cause long-term adverse effects in the

aquatic environment" (R53) and "Risk of impaired fertility" (R62). Even though D4 does not occur in European or Nordic sanitary products, there are grounds for prohibiting its use in ecolabelled sanitary products. Sanitary products or their siliconised components may be imported from countries in which the use of D4 is permitted. Decamethylcyclopentasiloxane (D5) was recorded on the Norwegian authorities' priority list in the autumn of 2006, with the aim of achieving a significant reduction by 2010.

A study published by the Norwegian Pollution Control Authority in the spring of 2007 revealed that D5 was also found to be present in glaucous gulls off Bear Island. The concentrations correspond to the levels registered in freshwater and saltwater fish in densely populated ares in the Nordic countries. This suggests that these substances may be spread over considerable distances, far from the sources. Octamethylcyclotetrasiloxane and decamethylcyclopentasiloxane are used by industry, added to fuels and are present in a range of consumer products such as car wax, cleaning products, cosmetics, sanitary products and foam retardants. The use of siloxanes is extensive and consumption may increase in the future[lxxxi].

A process is currently under way within the European Union and for example in Canada in which some siloxanes (D4 and D5) are being assessed for possible environmentally harmful properties. The results of the studies in Norway and the Nordic countries are being used in this work.

According to the informations from a supplier of silicone treated tape, D4 and D5 may be generated during the manufacture of silicone systems which are used e.g. for silicone treatment of paper. D4 and D5 are not actively added in this process. The trace concentrations of D4 and D5 are expected to be below the detection limit as D4 and D5 are volatile and evaporate during the production process (personal communication, Koester 2009). In version 5.2 of the criteria a triviality limit has thus been included for D4 and D5 present as pollutants, as it is considered that trace concentrations of these components can not be avoided completely.

<u>Requirement R30 – Adhesives</u>
The adhesives requirement has been extended from the proscription of phthalates to also include colophony. The background to the proscription of phthalates has already been described in R19 – Polymers, constituent substances. Colophony is prohibited because it may cause contact allergies. Colophony is drained from pine trees in the form of resin and is extracted using turpentine. The mixture contains a number of allergens.

Following the consultative process an exemption has been added for pollutants in the prohibition against colophonium and phthalates. Pollutants are defined as traces from raw material production present in concentrations of less than 100 ppm (0.01% by weight, 100 mg/kg) but not substances added to the raw material or the product deliberately and for a purpose, irrespective of quantity.

A requirement has also been included that the content of formaldehyde must not exceed 250 ppm in newly manufactured polymerdispersion and a limit of 10 ppm formaldehyde for hardened adhesive, as formaldehyde may cause allergic reactions. This requirement is identical with the formaldehyde requirement for ecolabelling of

chemical building products. Hotmelts have, however, been excepted from this requirement as formaldehyde is not relevant for hotmelt adhesives (the requirement has been changed and specified in version 5.2 compared to version 5.0/5.1, where a general limit of 10 ppm formaldehyde applied to adhesives. In practise, this excluded all adhesives but hotmelts).

Requirement R31 – Perfume, scent and flavour additives

Perfume and other fragrance substances in the form of for example essential oils, plant oils and plant extracts must not occur in sanitary products. Perfume, essential oils and plant oils and plant extracts frequently contain several allergenic or carcinogenic substances. In order to avoid unnecessary effects on health caused by substances of this type the use of perfume and fragrance substances is completely proscribed. Moreover, perfume and fragrance substances serve no function in sanitary products (except in the case of incontinence care products) and are regarded as unnecessary. Sanitary pads and panty-liners with fragrance are available on the market. The requirements applicable to perfume have been extended in version 5.

With the inclusion of toothpicks in the product group, flavour additives have been proscribed. Flavour such as peppermint may be added to toothpicks. The reason for the proscription is the same as in the case of perfume.

Requirement R32 – Lotion and skin care preparations

Sanitary products must not contain lotion or skin care and/or moisturising preparations. A small change has been made to this requirement since criteria version 4, which specified that “the product must not contain lotion/moisturiser”. To achieve a lotion effect, i.e. a moisturising effect from the surface of a sanitary product, a pre-mixed lotion is sometimes applied to the sanitary product, and in other cases ingredients with a moisturising and skin care effect may be added to the product individually. Moisturising and skin care preparations include Aloe Vera, Chamomilla Recutita, Glyceryl Stearate and Protolatum (Vaseline). Lotion preparations may contain allergenic and carcinogenic substances. Since lotion and skin care and moisturising preparations are not essential to the function of sanitary products, they are excluded for health reasons. Sanitary towels and panty-liners with a lotion effect are available on the market.

Requirement R33 – Odour control substances

As in the last version odour control substances are prohibited, except in incontinence care products. The criteria document emphasises that any odour control substances used must satisfy R3 Chemical products, classification.

Requirement R34 - Medicaments

The criteria for sanitary products have been extended to take in a number of new product types. For the avoidance of doubt about whether a product to which medicine or disinfectant substances have been added is effective and lives up to the health-related requirements applicable to the product in question, Nordic Ecolabelling has decided to proscribe medicaments in ecolabelled sanitary products. Medicaments are chemical substances designed to prevent, alleviate or cure illness, sickness symptoms and pain or to alter bodily functions (cf. the definition of Article 2 of the Cosmetics Directive). Such substances may also include chemical substances e.g. silver compounds (wound-healing) and trilosan (antibacterial and disinfectant substances).

Following the consultative process the words *bacterial growth* were added to make it entirely clear that the addition of anti-bacterial agents to the products is prohibited. Anti-bacterial agents may also reduce the process of composting (if any) the products.

An exception has been made in the case of lactic acid bacteria in tampons. These bacteria are added to a type of tampon in order to maintain the pH balance in the vagina. Lactic acid bacteria occur naturally in the body and are therefore not defined as a medicine.

Requirements R35 – R36 – Nanomaterials and flame retardants
The proscriptions of nanomaterials and flame retardants are both new requirements that have been included on the basis of the precautionary principle. Nanomaterials/nanoparticles are added to many new products in order to for example give the product an antibacterial effect or surface. These are properties that are necessary in normal sanitary products, and accordingly nanomaterials are proscribed. Little is known about the effects on health and the environment of nanomaterials/nanoparticles, amongst other reasons because no tests have yet been developed suitable for measuring the effects of these materials/particles. According to the information available nonomaterials/nanoparticles are not used in sanitary products at present.

Following the consultative process, this requirement is as follows: Nanomaterials/nanoparticles/nanofibres such as nanometals, nanominerals, pure nanocarbon compounds or nanofluorine compounds) must not be actively added to sanitary products unless adequate documentation can be furnished that they will not cause health or environmental problems and that they perform an important function in the sanitary product. Nanoparticles are classified as microscopic particles where at least one of the dimensions is less than 100 nm. Nanometals include nano silver, nano gold and nano copper.

Polydispersions for water-based film-forming polydispersions (latex) that in the original material may have a diameter of less than 100 mm are not regarded as nano materials in sanitary products.

Nor as far as Nordic Ecolabelling is aware are flame retardants used in sanitary products. However, Nordic Ecolabelling has registered that flame retardants are applied to products if they are flammable and are to be stored in a way where the consequences of a fire would be disastrous.

8.5 Colours for printing and dyeing

Requirements R37 – R38 – Colours for printing and dyeing
The proscription against dyeing sanitary products is a new requirement. The purpose is to reduce the content of substances that are hazardous to the environment and health in products which are in close contact with the skin and to prohibit unnecessary colouring of the products. Exceptions may, however, be granted from this requirement in the case of specialist products for use in hospitals and nursing homes if special reasons exist for colouring the products, for example to enable staff to distinguish between various sizes or the like.

Material components that are not in direct contact with the skin may be excempted from the requirement if the colour has a specific function. This may e.g. be colouring of the outside of nursing pads in order to avoid visibility through white/light coloured clothes. Tampon string is also excepted from the requirement as colouring of the string has an important function, namely that the string can be separated from the product without damaging the product. This exemption has been introduced with version 5.2 of the criteria.

If the products or raw materials are to be dyed, they must satisfy the requirements in R3 and in addition the requirements contained in the chemical module ("The Swan-labelling of paper products – Chemical module, version 1 or later").

Print is found on certain hygiene products, e.g. on diapers, the reverse of the release paper on the bottom of panty-liners and on incontinence care products etc. Generally, flexographic printing is used for this purpose. Other techniques such as inkjet are also used in relation to the printing of sanitary products or their packaging. Dyes used for printing are also subject to the requirements contained in the chemical module. A more in-depth description of the background to the requirement imposed in the chemical module can be found in the document "Background memo. Modules for Swan-labelled paper products – The Module system – Background for the basic module and the chemical module, February 2003".

Following the consultative process, an exemption has been introduced for dying using TiO_2 which is often used for polymers. TiO_2 used for polymers is not nano level, and has larger particles which also form agglomerates. TiO_2 is widely used because plastic might otherwise have a grey appearance which will make it less appealing when used in sanitary products. TiO_2 affords good coverage and is permitted in foodstuffs such as sweets, toothpaste, biscuits, bakery goods, ice cream, tablets, cheese etc.

Requirements R39 – R40 - Packaging

No changes have been made to this requirement since the last version of the criteria. In the case of plastic packaging, PVC or other halogen-based polymers are proscribed, and the plastic must be labelled to allow the types of plastic materials used to be identified. Sanitary products are frequently packaged in group packaging and some product types such as incontinence care products, panty-liners and tampons may be individually packaged to allow them to be carried in for example a handbag. Some sanitary towels may be packaged in plastic packaging that also functions as "release" paper. Because individual packaging may be important for reasons of hygiene, no requirements are imposed with regard to the permitted quantity of packaging on the individual product.

Requirement R41 - Waste

No changes have been made to the requirements applicable to waste generated during the production of sanitary products. Waste must be sorted at source and the maximum permitted quantity of waste is 5% (w/w) if waste products are not recovered and recycled.

In the case of waste generated in the production of tampons a maximum of 10% (w/w) is permitted. Generally more waste is generated during the production of

tampons, as a result of which the requirement is not as strict as in the case of sanitary products.

8.6 Requirements as to products

Requirement R42 - Tampons
As in the previous version, restrictions apply to the quantity of aerobic micro-organisms per gram of product. This requirement has been imposed for reasons of hygiene.

Requirement R43 – Information on the packaging
Some changes have been made to the requirements applicable to the information text since the last version of the criteria. The declaration of all materials in the product and their weight (in g) is no longer required. There was some uncertainty about how the requirement should be interpreted and about the degree of detail that the declared information should contain. Whether or not the materials contained in a product were declared varies from product type to product type and more information will generally be provided on products such as tampons than in the case of diapers or sanitary towels/panty-liners.

The requirement that the quantity of fibre released from tampons must be stated has been removed. There was doubt about the utility of this requirement.

A new requirement has been introduced according to which consumers must be urged not to discard cotton buds in the toilet. Cotton buds get caught in the mechanical filters of treatment plants creating problems. Following the consultative process, the wording was amended to read that the requirement applies to relevant products but with examples such as diapers, sanitary towels, panty-liners, tampons, cotton buds etc. being given. Disposal of sanitary articles in toilets causes blockages and build-ups in waste outlet pipes in many municipalities which, in turn, can lead to basement flooding and emissions of pollutants into nature[lxxxii].

The other requirements applicable to the information text, such as the disclosure of information on the absorption of the relevant products and the specification of the size of the product are unchanged. This is information that is of importance to consumers because they wish to use products that perform satisfactorily the first time they are used. The parameters that are of interest to the consumer are the purpose of the product, if applicable the age or size of the consumer (this applies in particular to diapers for use by children) and the time at which the product is to be used. One good example of the latter is sanitary towels for example day time or night time use.

Requirement R44 - Function
It is in the interest of both licence holders and ecolabelling that Swan-labelled sanitary products should have satisfactory performance characteristics. The function requirement states that: *"The effectiveness/quality of the product shall be satisfactory and on a par with equivalent products available on the market. In the case of products where an acknowledged test is available this test must be used. Tests might include laboratory test, the manufacturer/applicant internal quality testing, consumer testing or comparable test on an equivalent product. In the case of diapers, sanitary products*

(sanitary towels and panty-liners), incontinence care products and breast pads, the performance test must as a minimum cover absorption and dryness on the exterior side (or: "rewet under pressure" or "wetback"). In the case of tampons the performance test must as a minimum include absorption ability. If a consumer test is performed, a minimum of 80% must be satisfied with the product out of the minimum of 10 users."

Standard performance tests do not exist for most types of sanitary products. One exception is incontinence care products, where a standard does exist. Manufacturers may accordingly use their own modified tests for children's diapers, sanitary towels, breast pads and other sanitary products, in other words there is a certain degree of freedom in relation to documentation. Different tests may be used provided that the test used provides answers to relevant parameters, and comparisons must be made with equivalent products available on the market. The responsibility for finding equivalent products is left to the licence applicant and considerable variations and degrees of detail exist for sanitary products.

Many manufacturers of sanitary products and producers of the raw materials used in sanitary products have expressed the wish that Nordic Ecolabelling should impose requirements as to the performance of specific tests and the measurement of various parameters such as absorption ability under pressure, swelling capacity etc. However, variations exist in the way the products are built up and the way the products function for the individual consumer. For example some parents prefer a particular brand of diaper, whereas others are of the view that a different brand suits their child better A range of tests has been performed by various consumer organisations/consumer magazines, and as long as these tests show that the products function "well enough", Nordic Ecolabelling does not wish to impose specific requirements in relation to the tests conducted. For example some consumers may prefer the product to have a different fit, some prefer the thinnest products, others in turn may prefer a slightly thicker product that allows more air to circulate and does not feel so enclosed.

<u>The background memo to the last version of the criteria stated that:</u>
"Tests conducted by the National Consumer Agency (NCA) in Denmark have shown that there are no major differences between the technical properties of the different types of diaper that exist. They all meet the requirements applicable to absorption ability and surface dryness. In an in-depth interview the NCA stated that it is not necessary for a diaper to absorb more than the diapers that are available on the market at present. In fact some diapers have an unnecessarily high absorption capacity. What it is important to look at is whether the fit is sufficiently good. Here it is an advantage for the diaper to be thin to allow itself to mould itself more closely to the body.

Test conducted by the NCA on sanitary towels show that the absorptive capacity of most is satisfactory. Similarly most absorb sufficiently quickly for them to feel dry. However, there are differences in the amount that women bleed during a menstrual cycle (from 40 – 80 ml) and accordingly it is difficult to see a specific figure for when absorption can be considered to be sufficient.

Both tests are based on SS 87 22 02, but have been adapted by the NCA.

Furthermore, tests on female sanitary products have also been conducted in Finland and Sweden. These tests too revealed little difference between the performances of the products. In Finland tests were conducted on 11 different sanitary towels produced by three manufacturers. The absorption capacity and surface dryness of all the sanitary towels was "very good" or "good". In Sweden tests were conducted on 9 sanitary towels and 4 tampons. The test revealed that the differences in price were significantly greater than in quality.

No changes have been made to the product testing requirement. However, investigations should be conducted into whether the required tests are sufficient or whether simpler means might exist for testing performance. The performance of the products is an important parameter which cannot be ignored."

Since the background memo for the last version of the criteria was drafted, a number of tests have been performed on sanitary products. The most recent test on tampons was conducted in Økotest No. 4/2007.The report entitled "Blöjor och Miljö" published in January 2004 contains the results of a number of tests of diapers conducted between 1993 and 2003[ii.]

8.7 Quality and the requirements of the authorities

Requirements R1 – R9 are standard requirements in all criteria for Swan-labelled products.

Requirement A1 Laws and regulations

The final sentence of this requirement states that the products must also meet relevant product specific requirements imposed by the authorities. Prior to the consultative process, the document stated that this applied, for example, to products for hospital use. Following the consultative process this has been amended to read as follows: "e.g. sanitary products may be classified in accordance with EU Directive on Medical Equipment, 93/42/EU with subsequent amendments and adaptations must be safe to use and must function in accordance with the Directive". This specification corresponds to the safety requirements in the criteria for disposable medical equipment.

9 Referances

[i] SCA homepage. Avalable at: www.sca.se/, (visited 08.08.2005)
[ii] Wijkmark, J.: "Blöjor och miljö - En miljögranskning av sju olika sorters barnblöjor", VERNA Ekologi AB, januari 2004 på oppdrag for Råd & Rön och Svenska Naturskyddsföreningen.
[iii] Procter & Gamble homepage. Avalable at: www.pg.com/main.jhtml, (visited 08.08.2005)
[iv] Rostam homepage. Avalable at: www.sanpoint.se/israel.phtml, (visited 08.08.2005)
[v] Nyhet på hjemmesiden til Ny Teknik i Sverige. Avalable at: www.nyteknik.se/art/49508 (visited 15.03.2007)
[vi] Ellen tampon homepage. Avalable at: www.ellenab.com/ (visited 13.02.2007)
[vii] Kimberly-Clark homepage. Avalable at: www.kimberly-clark.com/, (visited 08.08.2005)
[viii] Abena homepage. Avalable at: www.abena.com/, (visited 08.08.2005)
[ix] Kronosept homepage. Avalable at: www.kronosept.com/, (visited 06.08.2005)
[x] Dambi homepage. Avalable at: www.dambi.se/, (visited 06.08.2005)

[xi] Natracare homepage. Avalable at: www.natracare.com/, (visited 07.08.2005)
[xii] Moltex Øko homepage. Avalable at: www.naturebotts.co.uk/moltex_oko_nappies/, (visited 07.08.2005)
[xiii] Naty homepage. Avalable at: www.naty.se/index.htm (visited 07.08.2005
[xiv] Cellcomb homepage. Avalable at: www.cellcomb.se/index_se.html (visited 28.02.2007)
[xv] Mölnlycke Health care homepage. Avalable at: www.tendra.com/item.asp?id=266&lang=2&si=6 (visited 01.03.2007)
[xvi] Espe produkter, homepage. Avalable at: http://espe-produkter.no/?page=184004 (visited 23.02.2007)
[xvii] Life Cycle Assessment of Disposable and Reusable Nappies in the UK, 2005 ISBN: 1-84-432427-3, The Environment Agency, www.environment-agency.gov.uk
[xviii] Tampax homepage. Avalable at: www.tampax.com/ (visited 04.07.2007)
[xix] Knowaste homepage. Avalable at: www.knowaste.com/index.html (visited 23.02.2007)
[xx] Informasjon fra GLØR, et interkommunalt renovasjonsselskap for Lillehammer, Gausdal kommune og Øyer kommune i Norge. Avalable at: www.glor.no/eway/default.aspx?pid=261&trg=MainPage_4926&MainPage_4926=4950:0:10,1687
[xxi] A life-cycle inventory of baby diapers subject to Canadian conditions, SETAC 1994.
[xxii] Hakala et al.: "Life-cycle assessment, comparison for biopolymer and traditional diaper systems", VTT (Technical Reasearch Center of Finland), Reaeach notes 1876, 1997.
[xxiii] EDANA: "DIAPERS Healt Benefits and Environmental Aspects", 2001, Avalable at: www.edana.org
[xxiv] EDANA: "Sustainability report: baby dapers and incontinence products", 2005. Avalable at: www.edana.org
[xxv] Mazgai et al.: "Comparative Life Cycle Assessment of Sanitary Pads and Tampons", 2006-05-22, gruppearbeid fra kurset: Life Cycle Assessment, 1N1800. Royal Institute of Technology Stockholm (KTH), Miljöstrategisk analys - fms.
[xxvi] Nordisk Miljømerking, Baggrundsnotat. Moduler for Svanemærkede papirprodukter, 2003
[xxvii] The Airlaid Manufacturing, Informasjon på hjemmesiden for NovaThin av EAM Corporation, htt://www.novathin.com/news/TheAirlaidManufacturingProcess_2_.pdf
[xxviii] Abena nettbutikk, Avalable at: https://disponering.abena.dk/Products.aspx?ProductGroupID=015001100020 (visited 23.02.2007)
[xxix] From Novamont's wbpage. Avalable at: www.novamont.com/ing/html/PDF/EPD_PE_180202.pdf (visited 4. juni 2007)
[xxx] European Bioplastics homepage. Avalable at: www.european-bioplastics.org/index.php?id=129
[xxxi] Eriksson, E og Berg, H: " Livscykelanalys av operationsrockar", CIT Ekologik Ab Chalmers Industriteknik, En rapport på uppdrag av Westma, Göteborg 2003
[xxxii] Naturebotts! in Great Britan, homepage. Avalable at: http://www.naturebotts.co.uk/shop/nappyliners/index.htm (dato 23.02.2007)
[xxxiii] Personal communication with Norvar og Svenskt Vatten (May 2007)
[xxxiv] Based on weighing of products bought in Norge, November 2006.
[xxxv] Danish webpage for Tampax, Avalable at: www.dk.tampax.com/tsstamponsafety.php (visited 24.02.2007)
[xxxvi] P&G Cyclodextrin for Odor Control, http://pg.t2h.yet2.com/t2h/page/techpak?cargs=3%25091%25090%2509%2509%2509%2509%2509240000&id=10531&sid=50&abc=0&page=tpprint (dato 23.02.2007)
[xxxvii] Eionet, European Topic Centre on Resource and Waste Management, http://waste.eionet.europa.eu/wastebase/quantities/index_html
[xxxviii] Rådets direktiv 99/31/EF af 26. april 1999 om deponering af affald
[xxxix] "Svanmärkning av Pappersprodukter — Basmodul og "Svanmärkning av Pappersprodukter — Kemikaliemodul".
[xl] Bakgrunnsdokument for Basismodulen. Svanemerking av papirprodukter, Nordisk Miljømerkning, oktober 2003.
[xli] Well dressed? The present and future sustainability of clothing and textiles in the United Kingdom.
2006, ISBN 1-902546-52-0
[xlii] ORGANIC COTTON FIBER REPORT, Spring 2006, Organic Exchange, www.organicexchange.org
[xliii] IFOAM, International Federation Of Organic Movements).

[xliv] Nettsiden til Monsanto, http://www.monsanto.com/biotech-gmo/asp/country.asp?cname=Australia (3. juni 2007).
[xlv] Reuters News Service 2007, http://www.planetark.com/avantgo/dailynewsstory.cfm?newsid=30028 (3. juni 2007).
[xlvi] Miljøjounalen nr.5/2007
[xlvii] Informasjon om polystyren på Wikipedia, et fritt leksikon på Internett, http://en.wikipedia.org/wiki/Polystyrene
[xlviii] SCHER 2008: Risk Assessment Report on Styrene Human Health Part, May 2008. http://ec.europa.eu/health/ph_risk/committees/04_scher/docs/scher_o_095.pdf
[xlix] PVC Informationsrådet i Danmark. www.pvc.dk (22/3-05).
[l] Life Cycle Assessment of PVC and of principal competing materials, EU Commission 2004.
[li] espa, European Stabiliser Producers Assosiation, http://www.stabilisers.org/breakdown.htm, (30.03.2005)
[lii] Green Paper – Environmental issues of PVC, European Commission 2000.
[liii] Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption. European Commission DG ENV 2000.
[liv] SFT, Nyhetsartikel, http://www.sft.no/artikkel____39831.aspx (21.06.2007)
[lv] Miljøstyrelsen, Miljøprojekt nr. 892, 2004, Antimon - forbrug, spredning og risiko.
[lvi] Antimon i Sverige - användning, spridning och miljöpåverkan, IVL Svenska Miljöinstitutet AB, Stockholm, Juni 2002, side 16.
[lvii] Nettsiden til EDANA, som er en internasjonal organisasjon for non-woven og relatert industri med 190 medlemmer i 26 land, http://www.edana.org 21/12.2006.
[lviii] Over head til et foredrag "Superabsorbent Polymers" av Mark Elliott, Product Development Scientist for SAP,BASF Aktiengesellschaft, http://www.functionalpolymers.basf.com:80/portal/streamer?fid=291076, 1/1-2007
[lix] artikkel i Chemistry, våren 2005, http://www.lysac.com/lysac/Chemistry_spring_2005.pdf, 1/1-2007
[lx] http://frangky69.trustpass.alibaba.com/offerdetail/13968063/Sell_Super_Absorbent_Polymers.html, http://www.freepatentsonline.com/5442014.html, http://pi.hyosung.co.kr/pi_kor/trade/chemical/fine_04.jsp,
[lxi] Degussas nettside, 1/1-2007 http://www.superabsorber.com/notesData/absorber.nsf/englisch
[lxii] EUROPEAN COMMISSION, (IPPC), Reference Document on Best Available Techniques in the Large Volume Organic Chemical Industry February 2003
[lxiii] Wikipedia, et fritt leksikon på Internett om "acrylic acid", http://en.wikipedia.org/wiki/Acrylic_acid, 4/1-2007.
[lxiv] The National Pollutant Inventory (NPI) i Australia, http://www.npi.gov.au/database/substance-info/profiles/6.html#sources, 4/1-2007
[lxv] EPA, faktaark om akrylsyre fra 1994, http://www.epa.gov/chemfact/f_acrlac.txt, 4/1-2007
[lxvi] http://www.eng.buffalo.edu/Courses/ce435/Diapers/Diapers.html 1/1-2007, En nettside med informasjon om superabsorbenter fra et kurset "CE435 - Introduction to polymers" ved Dept of Chemical and Biological Engineering, University at Buffalo, The State University of New York.
[lxvii] Wikipedia, et fritt leksikon på Internett, om super absorbenter, http://en.wikipedia.org/wiki/Superabsorbent_polymer, 21/12-06
[lxviii] EDANA recommended test methods (ERT), Available at: http://www.edana.org/Content/Default.asp?PageID=128vv
[lxix] http://www.eng.buffalo.edu/Courses/ce435/Diapers/Diapers.html 1/1-2007, En nettside med informasjon om superabsorbenter fra et kurset "CE435 - Introduction to polymers" ved Dept of Chemical and Biological Engineering, University at Buffalo, The State University of New York.
[lxx] Patenet "Superabsorbent polymer containing odor controlling compounds and methods of making the same",http://www.google.com/patents?vid=USPAT6229062&id=UlgGAAAAEBAJ&printsec=abstract&zoom=4&dq=SAP++polyacrylic+acid++degradation, 5/-2007
[lxxi] Risk Assessment of: 2-Propenoic acid (ACRYLIC ACID) - CAS N°: 79-10-7 - EINECS N°: 201-177-9 - Report version : Draft, 05.01.2001

[lxxii] Sustainable use and management of natural resources, European Environment Agency 2005, EEA Report No 9/2005)
[lxxiii] Grönbok om Integrerad produktpolicy, Europeiska Kommissionen, KOM (2001) 68
[lxxiv] Høringssammenstillingen for revisjonen av kriteriene for hygieneprodukter, versjon 5, Nordisk Miljømerking 2008
[lxxv] Selim Nouri: "Environmental Assessment of Emerging Technologies -The Case Of Biopolymers", thesis for the degree of licentiate of eng., Department of Energy and Environment, Chalmers university of technology, Göteborg, Sweden, 2006.
[lxxvi] Environemtal assessment of 0,5 ml syringes, Emunio ApS, Denmark, forfatter: Anders Smidt, Force Techology.
[lxxvii] CEPI, september 2007, http://212.3.246.141/Objects/1/Files/Carbon%20Footprint%20appendices.pdf
[lxxviii] M. Patel et al.: "Environmental assessment of bio-based polymers and natural fibres", Utrecht University, Department of Science, Technology and Society (STS), Copernicus Institute, Netherlands.
[lxxix] Miljøvaredeklarasjon for MATER-BI fra Novamont, Italia, http://www.materbi.com/ing/html/PDF/EPD_PE_180202.pdf
[lxxx] Vink et al.: "Applications of life cycle assessment to NatureWorksTM polylactide (PLA) production", Polymer Degradation and Stability, 80 (2003) p. 403–419
[lxxxi] Miljøstatus i Norge, http://www.miljostatus.no/templates/themepage____5383.aspx
[lxxxii] Høringssvar fra NORVAR BA (Norsk Vann og Avløp BA), Høringssammenstillingen for revisjonen av kriteriene for hygieneprodukter, versjon 5, Nordisk Miljømerking 2008.

Appendix 1
Swan requirements for wood raw materials

The Swan has two types of forestry requirements to ensure that raw materials come from sustainable forests. We require, depending on the available supply, that raw materials come from a certified forest. We also require that all wood found in Swan-labelled products complies with a so-called *catch requirement.* As with other requirements for Swan labelling, forestry requirements are evaluated and revised regularly.

1.1.1 About the catch requirement

The catch requirement

> The licensee must ensure that raw materials do not originate from forest environments meriting protection due to their high biological and/or social value. Nordic Ecolabelling may revoke a licence if it is found that wood raw materials are derived from forest environments of this type.

The catch requirement is included in all criteria where wood raw materials represent a significant part of the environmental impact of the Swan-labelled product. The requirement implies that the licensee must strive to ensure that raw materials do not originate from forest environments meriting protection due to their high biological and/or social value. In other words, felling of the raw material must not lay waste or destroy these biological or social values.

The catch requirement is necessary because Nordic Ecolabelling is not at present able to require that 100% of all wood raw materials in Swan-labelled products come from certified sustainable forests. The catch requirement is used when Swan labelling is applied for. But it is also retroactive insomuch as the licence may be revoked if it becomes evident that the licence holder uses timber from forests meriting protection where these values are damaged or threatened. The Swan licence applicant must specify where the wood raw material comes from. This enables Nordic Ecolabelling to request more documentation if the timber comes from a "sensitive" area where forest utilisation is controversial. The requirement can be found under different headings in different criteria. In the criteria for small houses, it can be found under "Requirements on sustainable forestry" and in our paper criteria, the requirement can be found in the Basic Module, under the heading "Origin of the fibre raw material". If the catch requirement is included, it encompasses all timber, i.e. both timber that is certified and timber that is not. If the catch requirement is not fulfilled, the licence will be revoked. It may also mean that the application will not be granted or that the licence will have a limited scope, for example that certain products will not be covered by the licence.

1.1.2 The catch requirement in practice

Nordic Ecolabelling applies the catch requirement by reacting to signals, for example, from environmental organizations that provide information that wood raw materials are suspected of coming from forestry businesses which are laying waste forests that merit protection. By keeping ourselves informed about forestry at a global level, Nordic Ecolabelling receives information as to how forestry management is conducted in various regions throughout the world. It should however be pointed out that Nordic Ecolabelling is not a global organisation and does not monitor forestry

businesses, but rather is dependent on information from independent organisations, environmental organisations and NGOs.

Here follows some examples of situations which can lead to Nordic Ecolabelling revoking a licence: the wood raw material comes from, for example, forest land where citizens' rights are violated; considerable forest conservation rights are under threat; illegal felling is carried out and it is not possible to guarantee that the timber does not come from these forests; and that natural forests are being felled and replaced by plantation forests. The requirement also applies to deliveries of wood raw materials from sustainable forests which are suspected of containing wood raw materials from protected forests. There are examples whereby certified deliveries of wood raw materials from underwater logging have been topped up by wood raw materials from protected forests. In Norway this is called "grønnvasking" (green wash).

The definition of a protected forest is complicated and varies from region to region. Nordic Ecolabelling is not able to provide a global definition of what a protected forest is but evaluates the situation from case to case when it is justified to assess whether or not the catch requirement should be applied to an ecolabelling licence.

The requirement works well in practice and The Swan has on several occasions investigated wood raw materials which were suspected of coming from forests that merited protection, both in tropical and boreal regions. Nordic Ecolabelling allocates resources to keep up-to-date on global forestry issues. But with the limited resources we have access to, it is important that environmental organisations continue to provide Nordic Ecolabelling with information on dubious practices and alarm reports on forestry issues. This has worked well up to now and is expected to continue to work well in the future. It is important that contact with environmental organisations that are concerned with forestry issues is maintained and is good.

1.1.3 Legislation and regulatory requirements must be fulfilled

Besides the requirement for forestry certification and the catch requirement, a general requirement is included in the Swan criteria to augment the forestry requirements. Nordic Ecolabelling always requires that the licensee complies with current regulations and legislation. This requirement also means that the licensee may not manufacture ecolabelled products with wood raw materials that have been felled illegally. The requirement is a standard requirement which is included in all Swan labelling criteria .

Laws and regulations

> The licensee must guarantee adherence to safety regulations, working environment legislation, environmental legislation and conditions/concessions specific to the operations at all sites where the Swan-labelled product is manufactured.

1.1.4 Requirements on certified forestry

Nordic Ecolabelling wishes to promote sustainable forestry (ecologically, economically and socially). From a life-cycle perspective, forestry represents an important part of the environmental impact that wood products have. Wood products can be found in several of the products which are ecolabelled today and it is important that the renewable raw material is cultivated and utilized in a sustainable

manner. Unfortunately, forestry is not sustainable today; the consequences are, for example, reduced biodiversity, soil erosion, and the repression of indigenous populations. These problems arise in the boreal forests in the northern hemisphere and in the rain forests of the southern hemisphere. Tropical forests are currently being felled at a high rate. There is a real danger that by the next generation, the tropical forests will have been lost for all time since these cannot be recreated through planting.

For this reason there is a requirement that wood raw materials in Swan-labelled products come from certified sustainable forests.

Certification of forests in accordance with a standard is one way to environmentalize forestry management. Nordic Ecolabelling has not developed their own requirements for forestry but has instead chosen to specify the requirement that sustainable forestry must comply with existing standards and certifications.

Nordic Ecolabelling would like to participate and support the development of standards and certification systems for forestry management by, in our criteria, specifying requirements that wood raw materials shall come from a certified forest. The certification of forestry management is an ongoing process which contributes to environmental gains in the forest, and the process means gradual improvement.

Certification is carried out today in accordance with several different forestry management standards and certification systems because generally countries throughout the world develop their own standards and certification systems. These standards maintain different requirement levels. Legal requirements and the participation of national environmental organisations in forestry management certification also vary from country to country. Today the most widespread systems for certification of forestry management are: Programme for the Endorsement of Forest Certification schemes (PEFC), Forest Stewardship Council (FSC), The Sustainable Forest Initiative (SFI) in the USA and Canadian Standard Association's Sustainable Forest Management (CSA) in Canada.

1.1.5 Forestry standard requirements

Nordic Ecolabelling specifies requirements on the standards to which forestry management is certified. The requirements are described below. Every individual national forestry management standard and certification system will be checked by Nordic Ecolabelling to ensure fulfilment of all requirements. When the forestry management standard is revised, the standard is checked again.

Requirements regarding standards

The standard must balance economic, ecological and social interests and comply with the United Nation's Rio declaration, Agenda 21 and the Statement of Forest Principles. It must also respect applicable international conventions and agreements.

The standard must contain absolute requirements. It must encourage and promote sustainable forestry.

The standard must be generally available. The standard must have been developed in an open process in which stakeholders with ecological, economic and social interests have been invited to participate.

The requirement on forestry standards is formulated as a process requirement, where the point of reference is that if economic, social and environmental interests in a process are in agreement as to a forestry standard, an acceptable level can be assured for the standard.
If a forestry standard is developed or accepted with regard to economic, ecological and social interests, it assures that the standard maintains a suitable level of requirements. That is why requirements are specified that the standard must take all three interests into consideration and that all stakeholders must have been invited to participate in the development of the forestry standard.
The standard must contain absolute requirements which must be met before the forest can be certified. This ensures that the forest complies with an acceptable level of environmental work. When Nordic Ecolabelling requires that the standard shall encourage and promote sustainable forestry management, it further requires that the standard must be evaluated and revised regularly so that the process moves forward and the environmental impact reduces successively.

1.1.6 Requirements regarding certification systems and certification bodies

Retirements regarding certification systems

The certification system must be open, have wide-spread national or international credibility and be able to verify that the requirements in the forestry standard are fulfilled.

Requirements regarding certification bodies

The certification body must be independent and recognised. It must be able to verify that the requirements in the standard are met, able to communicate the results and be suitable for the efficient application of the standard.

The purpose of certification is to quality assure that the requirements in the forest standard are met. Nordic Ecolabelling has neither the skills nor the resources to check how forests are managed themselves or verify a forest standard and has therefore chosen to specify requirements for independent third-party certification.

The certification system must be able to verify that requirements in the forestry standard are met. The method used in the certification process must be repeatable and applicable to forestry, and certification must take place in accordance with one specific forest standard. There must be a check on the standards in the forest before a certificate is issued.