

About Nordic Swan Ecolabelled

Disposable bags, tubes and accessories for health care



Version 2.6

Background to ecolabelling - 16 April 2024

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Contact info

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

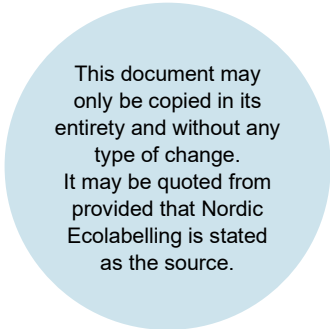
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1 Summary

The main objective of these criteria is to label products that are an alternative to products of softened PVC. PVC is still widely used in the medical industry for disposable products. There are alternatives to the use of PVC in many types of disposable products in the health care sector, so there is potential and possibility to make a difference.

PVC has several environmental aspects related to production, use and disposal of PVC. The material PVC needs plasticisers to make it flexible and soft, and many of these additives have problematic properties related to the environment and health. As the plasticisers are not bound to the polymer, they can leak out and is a source to harmful chemicals for humans and in nature. The criteria set general requirements to additives to all plastic and will therefore also handle possible harmful additives in other types of plastic than PVC.

The main changes in the revision from generation 1 to generation 2 are changes in the product group definition, new requirements to the materials latex and silicone and a general ban on phthalates. In the product group definition, it is now emphasized that the products that can be labelled must be alternatives to products made of softened PVC and it is extended with blood bags. Latex is not allowed to use in the products, as latex itself can cause allergic reactions. There is also a new requirement to the content of the cyclic siloxanes D4, D5 and D6 in silicone material. These substances are now on the EU's Candidate List.

2 Basic facts about the criteria

Products that can be labelled

The product group definition has been slightly changed from the previous generation. The product group now also comprises blood bags, as there has been a project for many years aiming to develop PVC-free blood bags¹. It is also pointed out that the products must be an alternative to products made of softened PVC on the market.

The materials that can replace softened PVC are mainly soft plastic, but also silicone or rubber is possible replacements. Products in hard plastic will not be a natural replacement for softened PVC, but some products need to contain products/parts in hard plastic to make the product work properly, for instance connections between the different parts of the products (tube and bag). All the products/parts necessary for the function of the ecolabelled product, can be included in the licence.

Products that cannot be labelled

These criteria are developed for products that are an alternative to products made of softened PVC. The environmental aspects related to disposable products made of other materials as the main material, like hard plastic or metals are not evaluated and hence cannot be ecolabelled within the scope of these criteria.

¹ <http://www.pvcfreebloodbag.eu/> (available 2019-01-08)

Basically, only product types mentioned specifically in the product group definition can be labelled. Other relevant disposable health care products that are not mentioned above may be included in the product group if they are alternative products to products made of PVC softened with plasticisers and if they are governed by the aforementioned regulation and directive. This means that a major proportion of the products on the market must be based on PVC as a material for Nordic Ecolabelling to consider including these in the product group. This is because the environmental impact for these products is closely related to the material PVC and the different plasticisers used in PVC, see also chapter 5.2.1. Nordic Ecolabelling will decide which new products may be included in the product group based on information about the product and market situation.

Medical gloves can be made of PVC, but a large proportion is also made of other materials like latex and nitrile. Nordic Ecolabelling has evaluated to set requirements for gloves specifically but have concluded to not include gloves in the product group definition. Both latex (natural) and nitrile have issues with allergy, and Nordic Ecolabelling see it as problematic to label gloves that could give an allergic reaction, either in form of the material itself (natural latex) or chemicals used in the production process, like accelerators. There is possible to make so-called accelerator-free gloves of nitrile, but now these gloves make up a very little proportion of the market, around 1%. The total evaluation is therefore that Nordic Ecolabelling does not use resources to develop criteria for such a small proportion of the market.

The exact product group definition in the criteria is:

Disposable products that can be labelled must be single-use products included under the Regulation (EU) 2017/745 on medical devices with subsequent amendments and adaptations and/or EU Medicinal Products Directive (2001/83/EC) as applicable. It is emphasized that Nordic Ecolabelling do not put any requirements to the medicinal product, but it is important that the medicinal product is according to the regulations and relevant directives.

The disposable product must be an alternative to products of softened PVC on the market. Products that can be labelled are:

- intravenous (IV) infusion treatment
- blood bags
- peritoneal dialysis (PD) treatment
- treatment of urinary retention and incontinence
- ostomy pouches and accessories for treatment following ileostomy, colostomy, or ureterostomy surgery

Other relevant disposable health care products, that are not mentioned above, may be included in the product group if they are an alternative to products made of softened PVC and if they are governed by the aforementioned regulation and directive. Nordic Ecolabelling will decide which new products may be included in the product group.

Some disposable products for medical use that are not included in these criteria can be labelled under the criteria for sanitary products, for example plasters, compresses, mattress covers/protectors, draw sheets, surgical gowns, patient gowns/patient covers, surgical masks and caps.

Disposable medical gloves cannot be labelled.

Justification for Nordic Ecolabelling

The motive for starting ecolabelling of disposable products for the medical industry in 2007 was a potential for improvements in the waste cycle and for health by excluding PVC and harmful phthalates which are common to use as plasticisers. Production of PVC also have negative impacts on the environment. These aspects are still relevant today. Plastic materials other than PVC can also contain additives with a possible negative impact on the environment and health. As of today, Nordic Ecolabelling considers that purchasers of hospital products have a desire and need for a simple guide to a good environmental choice.

Version and validity of the criteria

The generation 1 of the criteria were published the first time on December 13, 2007. Generation 1 have been changed three times where a minor limit has been introduced for environmentally hazardous substances, a change regarding mandatory text together with the Nordic Swan Ecolabel and updating of the chemical requirements according to REACH and CLP. The criteria have also been extended with catheters and ostomy bags. Generation 1 of the criteria has been prolonged 6 times. Generation 2 of the criteria was decided September 09, 2019, and are valid until December 31, 2023.

Nordic Swan Ecolabel licences in the Nordic Market

There is today 1 licence that is valid in all the Nordic countries. The licence is for equipment for the treatment of peritoneal dialysis and comprises bags, tubing and different accessories in different sizes.

3 The Market

The medical device industry is extensive and global, with a large number of international manufacturers often represented at the national level either through subsidiaries or trading companies. In the Nordic market there is a consolidation with fewer operators on the market in the last years. In Sweden there are for example only two suppliers for equipment for peritoneal dialysis, Fresenius Medical Care and Baxter.

Of the total use of PVC in the world, it is estimated that a little less than 1% is used in medical devices. The consumption of PVC for medical devices in Europe is approximately 85.000 tons every year and almost one third of plastic based medical devices are made from PVC². In Denmark the import of PVC for medical devices was estimated to 850 tons in 2017.³ The two main application areas for medically approved PVC compounds are flexible containers and tubing to be used in for instance containers for blood or urine or for ostomy products, tubing used for blood taking and blood giving sets, haemodialysis set and catheters.

There are PVC-free alternatives available today on the market in nearly all areas of use except for blood bags. However, the project "PVC-free blood bags" is aiming to develop a blood bag of alternative materials. The project has not yet resulted in launching of products to the market, but Karolinska University Hospital are

² <http://www.pvc.org/en/p/health> (available 2019-01-08)

³ Kortlægning af PVC i Danmark 2018, Miljøstyrelsen november 2018, Miljøprojekt nr. 2049

working together with two European companies to establish contact with a partner who can launch PVC-free blood bags on the market⁴. Hopefully, these blood bags will soon be on the market.

A driving force in Europe for increased environmental focus in the health care sector is the organization Healthcare Without Harm. Among other things, they have focused on the use of PVC products that contain harmful phthalates and have prepared the report Non-toxic Healthcare: Alternatives to Phthalates and Bisphenol A in Medical Devices⁵ in 2014. When it comes to PVC and phthalate DEHP, they write that there are alternatives in many product areas such as gloves and IV solution bags. For gloves, latex and nitrile are mentioned and HDPE is mentioned for bags. Alternatives to other soft PVC products such as tubes are silicone, ethylene vinyl acetate (EVA), polyester, elastomers and various polyolefins.

In general, the purchase of disposable products for health care is mainly done through public procurement. There has traditionally been a focus on quality and safety as well as price in the health care sector. However, there is more and more interest in the environment and health aspect in the public health sector, although this varies between the Nordic countries and within each country. Several actors in the public health care sector in Sweden have long focused on phasing out the use of products containing PVC. The Region of Västra Götaland decided in 2014 that no gloves purchased for the health care sector should be PVC⁶. Stockholms Läns Landsting (SLL) also has a strong focus on phasing out PVC and products containing harmful chemicals. In their action plan for 2012-2016, it was stated that products containing different phthalates such as DBP, DEHP, DINP and DNOP or products, like catheters and urine bags made of PVC should either be phased out or reduced⁷.

4 Environmental impact of the product group

The main objective of these criteria is to label products that are an alternative to PVC. The material PVC needs plasticisers to make it flexible and soft, and many of these additives have problematic properties related to the environment and health. The main plasticisers used in PVC are phthalates. Many of these phthalates, particularly DEHP, BBP, DBP and DIBP, has been a focus point the last decades due to their reproductive and endocrine disrupting effects. As the plasticisers are not bound to the polymer, they can leak out and is a source to harmful chemicals for humans and the environment. As the products that can be ecolabelled are in close contact with the body, it is important that they do not contain substances with a possible harmful effect.

The material PVC is also linked to other environmental problems related to the production process and waste handling. The main problem in the production process of PVC is related to chlorine. PVC is manufactured in three separate

⁴ <https://www.karolinska.se/en/karolinska-university-hospital/about-karolinska/environment-and-sustainability/pvc-free-blood-bag/> (available 2019-01-08)

⁵ Non-toxic Healthcare: Alternatives to Phthalates and Bisphenol A in Medical Devices, 31. Desember 2014, Health Care Without Harm

⁶ http://www.upphandlingsmyndigheten.se/hallbarhet/varfor_upphandling/goda-exempel/kemikalier/pvc-fria-handskar-i-vastra-gotalandsregionen/ (tilgjängelig 10.01.2017)

⁷ <https://www.sll.se/globalassets/6.-om-landstinget/hallbarhet/miljo/stockholms-lans-landstings-utfasningslista-2012-2016.pdf> (available 2019-01-15)

stages: chlorine production, the production of the monomer VCM and finally polymerisation into PVC. All these processes can lead to chlorine pollution. Also, the production of the chlorine can lead to emissions of mercury and asbestos, as well as PFAS.⁸

Medical disposable products are mainly sent for incineration as recycling is difficult as such products very often have been in contact with medicinal products or body fluids. Chlorinated plastics such as PVC produce hydrochloric acid when they are incinerated and needs expensive equipment to neutralise the acid. The neutralising process generates a large amount of problematic residue in the incineration plant, and this residue must be deposited under special conditions. Incineration of halogenated plastic like PVC can cause release of harmful substances like dioxins. However, it is difficult to relate this to halogenated plastic alone, as there is chlorine from many other sources in municipal waste. Also, due to strict EU regulations and national legislation the problems related to this are reduced in Europe.

There are alternatives to the use of PVC in many types of disposable products in the health care sector, so there is potential and possibility to make changes. Several reports focus on the replacement of PVC and harmful plasticisers in the health care sector^{9, 10, 11}. More detailed information is given in chapter 5 under the different requirements.

5 Justification of the requirements

This chapter presents proposals for new and revised requirements, and explains the background to the requirements, the chosen requirement levels and any changes compared with generation 1. The appendices referred to are those that appear in the criteria document "Nordic Ecolabelling for disposable bags, tubes and accessories for health care".

5.1 General requirements

Background to requirement O1 Description of the product and production process

The requirement is basically not changed, but it is stated more clearly what information that must be given and that a flowchart showing the production process, including information on what kind of components that are bought from external manufacturers, and what processes that are done externally and internally, must be given. It is important to have general information about the product to make sure that the product is covered by the product group definition, that it follows the relevant regulations and directives and to get a better understanding of the production of the product.

⁸ Chlorine and Building Materials: A Global Inventory of Production Technologies, Markets, and Pollution, Phase 1: Africa, The Americas, and Europe

⁹ Non-toxic Healthcare: Alternatives to Phthalates and Bisphenol A in Medical Devices, 31. Desember 2014, Health Care Without Harm

¹⁰ Alternatives to classified phthalates in medical devices, Danish Ministry of the Environment Environmental Project No. 1557, 2014

¹¹ Alternativa mjukgörare i sjukvården, Swetox, mars 2016

5.2 Environmental and health requirements

This chapter covers both requirements to the materials in the product, and to chemicals added to the plastic material or used in or on the different components and product, like adhesives.

5.2.1 Materials

Background to requirement O2 Halogenated plastics

The requirement is not changed and forbid the use of halogenated plastics such as PVC in the product and the packaging. In this case packaging refers to any inner packaging around the products that are ecolabelled, and any outer packaging, like transport packaging. The decision to exclude halogenated plastics such as PVC was made in the light of Nordic Ecolabelling's objective to reduce problems in waste handling and to reduce the risk of health-related problems. PVC has long been in focus in the environmental debate. Some of the environmental problems of PVC are due to the molecule itself – or more precisely the organic bound chlorine in the PVC molecule both in the production and waste handling. In other cases, the problems concern additives in the PVC which are harmful to the environment and to health.

Production

PVC is manufactured in three separate stages: chlorine production, the production of the monomer VCM and finally polymerisation into PVC. The raw materials for PVC are 57% salt (NaCl) and 43% ethylene (oil or natural gas). There are three electrolysis processes used to derive chlorine from salt: the mercury method, the diaphragm method and the membrane process. The mercury method and the diaphragm method using asbestos are the oldest technologies. The two newer technologies use diaphragms or membranes coated with per- and polyfluoroalkyl substances (PFAS).

According to the BAT-report¹² on the chlor-alkali industry there are several environmental aspects related to the industry. It is energy-intensive and consumes large amounts of electricity during the electrolysis process. All three cell techniques (mercury, diaphragm and membrane) may give rise to emissions of chlorine to air and substances emitted to waste water include free chlorine, chlorate, bromate, chloride, sulphate, heavy metals, sulphite, organic compounds and halogenated organic compounds. The mercury cell technique has been a significant source of environmental pollution for many years, and mercury can be released to air, water, products and wastes. For plants using asbestos, there can be emissions of asbestos to the surroundings, but also a potential workspace problem.

Most chlorine produced in Europe and Africa comes from PFAS-coated membrane technology. However, in Europe, exemptions to regulations that otherwise prohibit asbestos and mercury-based technologies allow the largest chlor-alkali plant to continue to use asbestos, and at least five other locations will continue using mercury into the foreseeable future¹³. The main chlor-alkali producers in Africa do not use mercury cells or asbestos diaphragms. In the Americas 8 of 12

¹² Best Available Techniques (BAT), Reference Document for the Production of Chlor-alkali, 2014

¹³ Chlorine and Building Materials: A Global Inventory of Production Technologies, Markets, and Pollution, Phase 1: Africa, The Americas, and Europe

largest plants use asbestos, which constitute approximately 45% of chlorine production capacity. Asbestos diaphragm technology plants supply 7 of 16 US PVC resin plants, including 3 of the 5 largest plants in US. In China, that have 41% of the chlor-alkali industry¹⁴ many plants still use mercury.

The membrane technology is considered the most environmentally aware method. However, the use of PFAS-coated membrane is a possible source of these substances into the environment. Emissions to air or water of the PFAS chemicals are not regulated at the chlorine manufacturing plant. PFAS are highly toxic and long-lived chemicals and have been detected in the effluent from the main US manufacturer of membranes used in chlorine plants¹³. Therefore, this technology also has possible negative impacts on the environment and health.

The production of VCM and PVC can also release hazardous substances to the environment. According to the report from Healthy Building Network, most chlorinated pollution is associated with the production of EDC, VCM, and PVC resins either from the chlor-alkali process or the further production of VCM and PVC. This includes emissions of chlorine gas, carbon tetrachloride, dioxins, PCBs and VCM (vinyl chloride monomer). Carbon tetrachloride is a greenhouse gas and affects the ozone layer. Vinyl chloride monomer is released primarily during the production of PVC resins. The Australian and European PVC industries have established voluntary standards for residual VCM in PVC resins and VCM release rates from production, but this has not been done in the US¹³.

Waste handling

Medical disposable products are mainly sent for incineration. Recycling is difficult as such products very often have been in contact with medicinal products or body fluids and are therefore regarded as contaminated waste. Some of the products that can be ecolabelled will be waste from the hospitals, but some of the products are used at home, like equipment for peritoneal dialysis. These products will not be sorted but end up in the residual waste that in general is sent for incineration.

Denmark has specific national legislation (Affaldsbekendtgørelsens § 33)¹⁵ for PVC waste that sets out the rules concerning the handling of end-of-life PVC:

- The local municipality must establish a collection system for PVC waste. The system must be designed such that a substantial proportion of both recyclable and non-recyclable PVC waste is collected.
- The municipality must ensure that a substantial proportion of the collected recyclable PVC waste is recycled, and that a substantial proportion of the non-recyclable PVC waste is sent to landfill.

An important reason for introducing a regulatory framework that requires the sorting of PVC waste was that it was not suitable for incineration in the available waste incineration plants. The PVC waste accounted for a dominant share of the chlorine load in the plants, which resulted in undesirable formation of hydrochloric acid with e.g. resulting in corrosion. PVC combustion with dry flue

¹⁴ Best Available Techniques (BAT), Reference Document for the Production of Chlor-alkali, 2014

¹⁵ <https://www.retsinformation.dk/pdfPrint.aspx?id=144826> (available 2019-01-09)

gas cleaning gives rise to very large volumes of flue gas cleaning residues, whereby waste disposal costs become high. In Sweden, which mainly has waste incineration plants equipped with wet flue gas cleaning, these problems are not so severe¹⁶.

Historically, incineration of PVC has been a source to hazardous substances in the environment. Incineration of PVC leads to the risk of accidental release of hazardous substances such as polyaromatic hydrocarbons (PAH), benzo-a-pyrene, dioxins and furans.¹³ These substances can be formed by incomplete combustion of organic matter and in the presence of chlorine. According to WHO (World Health Organization), uncontrolled waste incinerators for solid waste and hospital waste is the main source of dioxins to the environment globally, due to incomplete burning¹⁷. However, it is important to point out that it is difficult to relate the release of dioxins specifically to incineration of halogenated plastics, because there is normally always chlorine from other sources in municipal waste. Due to the issues related to chlorine from halogenated plastics and municipal waste in general, Europe has strict regulations in both EU directives and national legislation. The problems related to incineration of PVC in Europe have therefore been severely reduced.

Even though incineration of PVC is not desired in Denmark, a lot of products made of PVC will end in the waste fraction sent for incineration, also disposable products for medical health care. To increase the recycling of PVC from the medical sector in Denmark, there is dialogue with the different regions to include sorting of the soft PVC as an own fraction at the hospitals. There is, however, a problem around contamination and a potential need for disinfection. There is an ongoing project "Safe and efficient recycling of soft PVC from medical devices by environmentally friendly supercritical carbon dioxide (scCO₂)". The purpose of the project is to develop and demonstrate new possibilities for utilizing soft PVC from high quality medical equipment in recycling through safe removal of plasticisers and additives using environmentally friendly supercritical carbon dioxide (scCO₂) technologies¹⁸. Also, in other countries, there are initiatives to recycle PVC from the health care industry. In Australia the Vinyl Council of Australia has started the PVC Recycling in Hospitals program, which now encompasses over 90 hospitals in Australia and New Zealand¹⁹. Nordic Ecolabelling finds these initiatives to recycle PVC medical waste as very interesting and will follow the development in this area. However, Nordic Ecolabelling bases the requirements on the current situation for handling of PVC waste in the Nordic countries.

Halogenated plastics other than PVC are probably not used in medical devices or medicinal products packaging currently, so the requirement is intended to ensure that halogenated plastics are not used as an alternative to PVC in the future. Other plastics do not generate acid to the same extent in waste incineration plants and therefore are less problematic.

¹⁶ Avfall och särskilt farliga ämnen: Kartläggning och analys av avfallsströmmar som bör hanteras på särskilt sätt Naturvårdsverket 2016

¹⁷ <https://www.who.int/news-room/fact-sheets/detail/dioxins-and-their-effects-on-human-health> (available 2019-01-15)

¹⁸ Kortlægning af PVC i Danmark 2018, Miljøstyrelsen november 2018, Miljøprojekt nr. 2049

¹⁹ <http://recyclinginhospitals.com.au/> (available 29.05.2019)

Plasticisers

Soft PVC, in contrast to other polymers, requires a significant amount of plasticiser, which has the potential to migrate and enter a patient's body. If PVC ends up in the landfill, the leakage of plasticisers like phthalates is a source for these chemicals into the environment.

A precautionary approach is therefore to avoid such polymers. See more about plasticisers and other additives in chapter 5.2.2.

Background to requirement O3 Latex

The requirement is new. Latex is a possible alternative to PVC in medical devices²⁰. However, natural rubber latex may cause allergic reactions of Type I (e.g. anaphylaxis) and Type IV (e.g. allergic contact dermatitis) as well as non-allergic irritant contact dermatitis²¹. This issue is also mentioned in the report for Health care Without Harm. Nordic Ecolabelling does not wish to label products where the material itself can cause allergic reactions. Also, it is important for Nordic Ecolabelling to secure that renewable materials are sourced sustainably. Tapping of raw latex from the rubber tree (*Hevea brasiliensis*) occurs almost exclusively in tropical areas, where there may be a risk of deforestation in order to make plantations. Most natural rubber comes from plantations in South and Southeast Asia. About 75% of the total volume of natural rubber production comes from the five countries Thailand, Indonesia, Malaysia, India and Vietnam²². The global demand for natural rubber is growing and drives the expansion of rubber plantations across the tropics. Natural rubber was also considered by the EU Commission to be on the limit of being a critical raw material²³.

Background to requirement O4 Silicone

The requirement is new. Silicone may be an alternative material to PVC in for instance catheters and dialysis machines²⁴. Silicones can also be used in small parts, for instance as sealing. Octamethylcyclotetrasiloxane, D4, decamethylcyclopentasiloxane, D5 and dodecamethylcyclohexasiloxane, D6 can be residues from polymerisation of silicone. D4, D5 and D6 are now on the Candidate List²⁵. As these substances are not intentionally added, but impurities from the production of silicone, these substances will not be covered by the chemical requirements (O5-O7), and therefore there is a separate requirement to these substances. As the requirement is new, Nordic Ecolabelling has limited information about the level of impurities in medical silicone materials. In a report from Kemikalieinspektionen from 2018²⁶, the level of different silicone polymers was analysed in menstrual cups. The overall level of D4, D5 and D6 varied between the different products, but in general the levels were low (between 3,7-10,1 ppm in total of D4, D5 and D6). However, one product had as much as 2778 ppm of D4, D5 and D6 in total, with D6 making up the biggest part

²⁰ Maria José Amaral, Non-toxic Healthcare: Alternatives to Phthalates and Bisphenol A in Medical Devices, HealthcareWithoutHarm, 31. December 2014

²¹ <https://www.naaf.no/fokusomrader/allergi-og-overfolsomhet/lateksallergi/> (available 2019-01-09)

²² Brochure from FSC, 2017: FSC®-certified natural rubber: Deforestation free, socially responsible

²³ The European Critical Raw Materials review: http://europa.eu/rapid/press-release_MEMO-14-377_en.htm (available 2019-01-26)

²⁴ Maria José Amaral, Non-toxic Healthcare: Alternatives to Phthalates and Bisphenol A in Medical Devices, HealthcareWithoutHarm, 31. December 2014

²⁵ <https://echa.europa.eu/da/-/ten-new-substances-added-to-the-candidate-list> (available 2018-11-29)

²⁶ Kemikalieinspektionen: Kartläggning av farliga kemiska ämnen i intymhygienprodukter, rapport 3/18

(around 2000 ppm). In breast implants made of silicone, levels of D4 varied from not detected to 134 ppm, D5 from not detected to 457 ppm and D6 from not detected to 604 ppm²⁷. This shows that it is possible to make products with a low level of these substances, and that there is important to set requirements, as the levels can be high.

5.2.2 Chemicals

Chemical products like plasticisers and other additives like colourants/pigments and antioxidants, added to the plastic, and adhesive used in or on the various parts/components of the product must fulfil requirements O5-O7.

The requirements apply to additives added to both soft and hard plastic, and any other material that might be a part of the product, like rubber and silicone.

O5 concerns the classification of the chemical product and not the classification of ingoing substances in the chemical product. The requirements O6 and O7 in the criteria document apply to all ingoing substances in the chemical product, but not impurities unless stated otherwise in the requirements. Ingoing substances and impurities are defined below:

Ingoing substances: All substances in the chemical product, including additives (e.g. preservatives and stabilisers) in the raw materials. Substances known to be released from ingoing substances (e.g. formaldehyde and acrylamine) are also regarded as ingoing substances.

Impurities: Residuals, pollutants, contaminants etc. from production, including production of raw materials that remain in the chemical product in concentrations less than 100 ppm (0,0100 w-%, 100 mg/kg).

The requirements do not apply to residual monomers in the plastic material from the production process of the plastic. However, for D4, D5 and D6 as residual products from the production of silicone there is a separate requirement, see O4.

There are no requirements for chemicals used for maintenance of machines or in the production processes (such as lubricants, cleaning chemicals etc.)

There are no requirements for chemicals used on the packaging, for instance adhesives and printing inks used on a cardboard box for packaging of the final product for transportation.

Information can be sent directly to Nordic Ecolabelling. Nordic Ecolabelling will provide confidentiality agreements if requested.

Background to requirement O5 Chemical products, classification

Background to requirement O6 CMR substances

Background to requirement O7 Other excluded chemical substances

It is important for Nordic Ecolabelling to have strict chemical requirements to the chemical products added to the plastic material or used in the production of

²⁷ Opinion on The safety of Poly Implant Prothèse (PIP) Silicone Breast Implants
Update of the Opinion of February 2012, SCENIHR, 12th of May 2014

the product like adhesive to protect both the user of the products and the environment.

By not allowing PVC, the risk of exposure to harmful phthalates is heavily reduced. However, almost all plastics contain additives to which humans, or the environment may be exposed. It is also important to ensure that replacing PVC and phthalates do not lead to the use of other harmful chemicals, but to better alternatives for the environment and health.

Adhesives can for instance be used between different layers of plastic materials in a bag. Please note that the requirements do not apply to adhesives used on the transport packaging.

Classification of chemical products, O5

The requirement is not changed, apart from an exemption for the classification H317 for 2-component adhesives and for dye products that do not come into contact with the medicinal solution or the patient during treatment. In the cured state, this classification is no longer relevant, and hence the exposure risk is reduced. The requirement concerns the classification of the chemical product added to the plastic to give it specific properties, like colourants/pigments, antioxidants, stabilisers and plasticisers or the adhesives used, and not to classification of ingoing substances in the chemical product. The requirement is set to reduce the use of chemical products that have a negative impact on the environment or to health.

UV-cured adhesives may be acrylates-based, and more and more acrylates are classified as environmentally hazardous and skin sensitizer. Under the curing process, the acrylates monomers react with each other, so they do not pose an environmental or health hazard in the finished cured adhesive nor in the final product. That is why an exemption has been made for UV-cured acrylates-based adhesives, but the exemption only applies if the classified chemical is used in a closed production system, where there is no direct contact/exposure between worker and the chemical product.

Using UV-curing have several advantages as it provides durable products and does not require solvents (low VOC-content).

CMR substances, O6

The requirement is not changed. Nordic Ecolabelling prohibits all CMR substances to increase reassurance and safety for the user. This will also exclude potentially mutagenic and/or toxic for reproduction effects in the environment. The new regulation on medical devices (2017/745) does have stricter requirements related to the use of hazardous substances than before. The use of substances that are classified as CMR of category 1A or 1B is still allowed, but the device shall only contain these substances in a concentration that is above 0,1 % weight by weight (w/w) where justified. This means that a justification for the use of the substance must be given (see 10.4 in the regulation). Where devices contain substances in a concentration above 0,1 % weight by weight (w/w), the presence of those substances shall be labelled on the device itself and/or on the packaging. This has the potential to increase the substitution of substances that are CMR category 1A or 1B. The regulation is still quite new and there is also a transition period. The result of these new requirements is therefore still

unknown. Nordic Ecolabelling also excludes substances in category 2 and does not except any substances that are CMR and that are added with purpose regardless of quantity.

Exemption is made for the pigment titanium dioxide which is added in powder form during raw material production. The EU Commission announced in February 2020 that titanium dioxide should be classified as suspected of causing cancer by inhalation (Category 2, H351). The classification applies only to mixtures in powder form containing at least 1% titanium dioxide particles, which are in the form of or incorporated into particles with an aerodynamic diameter of $\leq 10 \mu\text{m}$. The classification provision has been debated, as the risk that gives rise to the hazard classification applies to inhalation of powder, and not the chemical substance itself. Liquid, certain solid mixtures and the final pigmented product with titanium dioxide are not classified.

TiO₂ is a superior performing pigment to all other known alternatives because of its high brightness and high refractive index. To provide a given opacity to a coating, paints and varnishes with alternative pigments, such as zirconium oxide, zinc oxide, barium sulphate or zinc sulphate, would need to contain higher pigment contents or be applied in denser coatings, with a higher environmental impact. That is why Nordic Ecolabelling has made an exception for the use of titanium dioxide.

There is an exemption for 1,1,1-Trimethylolpropane (TMP) self-classified by several manufacturers and used in titanium dioxide mixture. About 90% of all titanium dioxide mixtures include TMP. There is no substance yet that can replace TMP.

Based on information provided by industry stakeholders, TiO₂-pigments are treated with TMP to improve their bulk flow during dosing and to improve dispersion during mixing. TMP-treated pigments facilitate superior dispersion levels and lower mixing times (estimated 30% reduction), resulting in energy savings and increased plant productivity rates. Currently there are no known alternatives that provide the bulk flow and dispersion benefits of TMP. It is estimated that research and development efforts into non-hazardous or less hazardous alternatives to TMP would take at least two years with no guarantee of success. The continued use of TMP-treated pigments in paint and varnish products has already been permitted in several other ISO 14024 Type I ecolabels in the Union.

There is an exemption in the requirement for 2-component adhesives with isocyanates classified H351. The exemption is given if the workers are not exposed during the production of the product, meaning that current legislation of working environment must be fulfilled, and the isocyanates are cured in the finished product. Emissions of isocyanate compounds or residues thereof in adhesives after curing will result in minimal exposure. However, it is important to emphasise that Nordic Swan Ecolabelled products must always meet the regulatory requirements for, among other things, the working environment which is of great importance when using isocyanate-containing products.

An exemption has been made for photoinitiators classified as Repr. 2, H361. Photoinitiators are compounds that produce radicals when exposed to UV light. Then, these react with monomers and/or oligomers to initiate polymer chain

growth. They are essential ingredients of all "modern" UV-curable adhesives, and the industry has not yet found substances that can replace them. However, the exemption only applies if the classified chemical is used in a closed production system, where there is no direct contact/exposure to the chemical product.

When required for regulatory reasons to avoid release of n-nitrosamine from polyisoprene parts, an exemption has been made for antioxidants classified as toxic to reproduction cat 2 (H361) as additive in the polyisoprene part at maximum 0.5 % and assessed as safe and not detectable in an ISO 10993 evaluation. N-nitrosamines can be classified as e.g. carcinogenic cat 2. There are international safety regulations for n-nitrosamines with safety limits for daily exposure levels from medical devices. To fulfil the regulations for n-nitrosamines, antioxidants classified as toxic to reproduction cat 2 (H361) can be needed as additive in polyisoprene parts of the product. Although it is not desirable to replace one harmful substance with another, it is unfortunately seen as necessary in this case. However, it is important to note that the product part must be assessed as safe and that the antioxidants are not released in detectable amounts in an ISO 10993 evaluation.

Other excluded chemical substances, O7

The requirement is not changed apart from a ban on all phthalates. Substances on the Candidate List covers substances that give grounds for caution due to their inherent properties. These are Substances of Very High Concern (SVHC) that meet the criteria in article 57 of the REACH Regulation, which defines SVHC as: substances that are CMR category 1A and 1B under the CLP Regulation, PBT substances, vPvB substances (see section below) and substances that have endocrine disruptive properties or are environmentally harmful without meeting the criteria for PBT or vPvB. To avoid cross-references between PBT, vPvB, CMR and endocrine disruptors, instead of excluding SVHC (which does cover some CMR, PBT, vPvB, etc.) Nordic Ecolabelling chooses to exclude from use the substances on the Candidate List and to separately exclude PBT, vPvB and endocrine disruptors.

“Persistent, bioaccumulative and toxic (PBT) organic substances” and “very persistent and very bioaccumulative (vPvB) organic substances” are substances whose inherent properties are not desirable in Nordic Swan Ecolabelled products. PBT and vPvB substances are defined in Annex XIII of REACH (Regulation (EC) No 1907/2006).

Potential endocrine disruptors are substances that may affect the hormone balance in humans and animals. Nordic Ecolabelling bans the use of substances that are considered to be potential endocrine disruptors, category 1 (there is evidence of a change in endocrine activity in at least one animal species) or category 2 (there is evidence of biological activity related to changes in hormone balance), in line with the EU's original report on “Endocrine disruptors”²⁸ or later studies. This entails a ban on substances such as several phthalates and certain alkylphenols.

Phthalates are also included as a separate point on the exclusion list to make it clear that no phthalates are permitted. This is changed from generation 1 that had a ban on some phthalates. The ban is on esters of phthalic acid

²⁸ http://ec.europa.eu/environment/chemicals/endocrine/pdf/final_report_2007.pdf, see appendix L

(orthophthalic acid / phthalic acid /1,2-benzenedicarboxylic acid), and does not ban polyethylene terephthalate (PET). The use of phthalates is basically related to PVC, and as PVC is not allowed as a material, it is not likely that phthalates will be added to the other types of plastic used. However, Nordic Ecolabelling excludes all phthalates as a precautionary approach. Many phthalates have negative effects on health and the environment. Some phthalates are inscribed on the EU's priority list of substances that should be investigated more closely for endocrine disruption – and some have already been identified as endocrine disruptors. Some phthalates can be found on the EU's Candidate List and some on the Danish "Listen over Uønskede Stoffer" (List of undesirable substances). The use of phthalates, particularly DEHP, BBP, DBP and DIBP, in consumer products with known human exposure, has been a focus point the last decades due to their reproductive and endocrine disrupting effects. These phthalates all have a harmonised classification stating that they may damage fertility (DEHP) or are suspected of damaging fertility (BBP, DBP, DIBP). All of these phthalates are classified "May damage the unborn child". Therefore, studies have been done trying to find alternatives to these substances, especially in products used for sensitive user groups, i.e. pregnant, neonatal and small children. A project in Denmark by the Danish Ministry of the Environment identified 10 possible alternatives to these phthalates in medical devices²⁹. The conclusion in the report is that there are safer alternatives with a better toxicological profile. For some of the alternatives however, there is a lack of data. Also, other reports focus on the replacement of PVC and harmful plasticisers in the health care sector^{30, 31}.

Documentation of the requirements

The requirements shall be documented by a material safety data sheet and/or a declaration that the requirements are fulfilled.

5.3 Safety requirement

Background to requirement O8 Safety

For reasons of credibility, the applicant is required to submit documentation for compliance with the legislation regarding the safety and correct functioning of a product. In the case of a medical device, it is a copy of the approval/certificate from a notified body. For a medicinal product, it is a copy of the market authorisation from the reference member state or national authority. The legislation contains strict requirements as to the safety and function of the products.

5.4 Quality and regulatory requirements

Quality and regulatory requirements are general requirements that are always included in Nordic Ecolabelling's product criteria. The purpose of these is to ensure that fundamental quality assurance and applicable environmental requirements from the authorities are dealt with appropriately. They also ensure

²⁹ Alternatives to classified phthalates in medical devices, Danish Ministry of the Environment: Environmental Project No. 1557, 2014

³⁰ Non-toxic Healthcare: Alternatives to Phthalates and Bisphenol A in Medical Devices, 31. December 2014, Health Care Without Harm

³¹ Alternativa mjukgörare i sjukvården, Swetox, mars 2016

compliance with Nordic Ecolabelling's requirements for the product throughout the period of validity of the licence.

6 Changes compared to previous generation

An overview of changes to criteria for generation 2 compared with previous generation 1 is given below.

Requirement generation 1	Requirement generation 2	Change	New requirement	Comment
R1 Description of the product	O1 Description of the product and production process	-	-	The requirement is basically not changed, but it is stated more clearly what information that must be given, including a flowchart of the production process.
R2 Halogenated plastics in the product	O2 Halogenated plastics	-	-	The requirement is the same.
	O3 Latex		New	Latex (natural rubber) is not allowed.
	O4 Silicone		New	Restrictions of residual monomers of D4, D5 and D6 in silicone.
R3 Hazardous to health and the environment	O5 Chemical products, classification			The requirement is updated according to CLP.
R4 Particularly problematic substances	O6 CMR substances	R4 is now divided into two separate requirements, O6 and O7		The requirement is updated according to CLP.
R4	O7 Other excluded chemical substances			
R5 Phtalates	O7 Other excluded chemical substances	Ban on all phtalates instead of a list of prohibited phtalates		
R6 Recycling system				This requirement was removed during the validity of generation 1.
R7 Safety	O8 Safety			
M1-M7	O9-O15			The requirements are updated according to the newest formulations regarding Quality and regulatory requirements.