About Nordic Swan Ecolabelled

Remanufactured OEM (Original Equipment Manufacturer) Toner Cartridges

Version 5.9

Background to ecolabelling

Date: 26 November 2024

Nordic Ecolabelling

Nordic Swan Ecolabelled Remanufactured OEM Toner Cartridges – Background to Ecolabelling

008/5.9, 26 November 2024

1 Summary

The criteria document for the Nordic Ecolabelling of recycled toner cartridges was first adopted on 13 May 1992.

The document was revised in 2011 and following the consultation during 2012. Version 5 will be presented to the Nordic Ecolabelling Board (NMN) in June 2012.

This document describes the background to the requirements regarding quality, health and the environment that are stipulated in the criteria document.

During the validity of version 4 of the criteria for toner cartridges, a number of issues have been raised within the industry and by users, new standards have been developed, product development has continued, complaints have been submitted to Nordic Ecolabelling, chemicals legislation in Europe has evolved and globalisation has led to more global players in the Nordic and European markets. Accordingly, Nordic Ecolabelling needs to adjust the requirements and requirement levels in this criteria document.

Nordic Ecolabelling has in this revision focused on improving the requirements in the areas of emissions, new high capacity (HC) toner cartridges, take-back systems for private consumers and the misuse of the Swan logo in internet sales, plus a revision of which testing standards and testing laboratories are to be used. This will mean that private consumers and professional buyers/users can now choose with confidence, when they use and buy Nordic Swan Ecolabelled remanufactured OEM (Original Equipment Manufacturer) toner cartridges (hereafter referred to as Nordic Swan Ecolabelled toner cartridges).

A first step in tackling mislabelling is to clarify that only toner cartridges originally manufactured by the OEM can be given the Nordic Swan Ecolabel. This minimises the risk that newly manufactured copies/clones will be Nordic Swan Ecolabelled. The next step is for resellers and importers to sign a declaration that they have familiarised themselves with the rules on how the Nordic Swan Ecolabel may be used in marketing. This will entail a new way of working for licensees, who in some cases do not have written agreements with their customers and resellers. In future licensing, there must also be a focus on preventing misuse.

The requirements regarding the toner powder used have been tightened and harmonised with the new criteria for printing companies. In addition, a test for undesirable pollutants in toner powder has also been introduced. This test replaces the requirement regarding emissions from toner cartridges as a whole. Testing emissions from toner cartridges would make the licensing cost considerably more expensive for applicants, and this would exclude the majority of current licensees.

A strong focus has been placed on ensuring the high quality of Nordic Swan Ecolabelled toner cartridges. The requirements refer to new current standards that may be applied by both large and small players in the industry. However, it is required either that an independent auditor certifies that the testing meets the standard, or that the applicant is certified under the industry’s own global quality system, known as

STMC[1] certification. This, coupled with the fact that the laboratories used for these tests must be approved under a separate requirement, considerably raises the requirement level compared with previous criteria.

The requirement for a take-back system has been made clearer and has been made stricter, in that consumers must now be able to return used toner cartridges free of charge. Several different solutions may be used by the licensee for this.

A trend in the industry is to expand toner cartridges so that they hold more toner powder and so deliver more printouts than the original toner cartridge. The main environmental gain from this is that the user does not need to buy more toner cartridges, which need to be transported to the user, for instance. In the requirement regarding recycled material, we have opened the way for additional expanded products to be ecolabelled, by exempting the new toner container from the calculation of 75% original material.

Consumers must be able to receive clear information on their purchase, which is why the requirement for labelling on the packaging has been improved.

The requirements have been developed in close consultation with manufacturers, raw material suppliers, representatives from public authorities and NGOs. Other international ecolabelling schemes have also participated in criteria development to ensure harmonisation between the different systems.

The review of the criteria for toner cartridges, version 5, was sent out for consultation for 60 days from July to September 2011. Responses from stakeholders have resulted in changes to the proposed criteria. All the changes made are described in this document.

The responses have also been compiled and commented on by Nordic Ecolabelling. This summary, which includes comments from the various stakeholders, will be available after the criteria are adopted, and can be obtained on request from one of the secretariats.

[1] http://www.i-itc.org/standards.htm

2 Basic facts about the criteria

Products eligible for labelling

Toner cartridges that may carry the Nordic Swan Ecolabel are remanufactured and refilled cartridges comprising toner powder, drum and the necessary drive mechanism. The cartridges are used for monochrome and colour electrophotographic printing and similar reproduction processes.

The majority of laser printers, copying machines and MFP (Multi-Function Printers) use toner cartridges. Cartridges contain toner powder and a drum. When a cartridge is empty, it is either disposed of or collected as part of various take-back systems. Nordic Swan Ecolabelled toner cartridges are remanufactured, refilled cartridges, drum units or powder containers. They are used for monochrome and colour printing in printers and copiers.

Nordic Swan Ecolabelled toner cartridges mean:

- Less waste and a lower consumption of energy and raw materials. Using toner cartridges several times reduces the total consumption of toner cartridges and accordingly the environmental impact of the product throughout its service life.
- The criteria aim to reduce waste and the product is also required to meet high standards of quality and capacity. The quality and capacity of the product must be on a par with that of newly manufactured original toner cartridges.
- There are also requirements on quality assurance of the recycling process, content of environmentally hazardous and harmful substances, and on labelling and information to the end-customer.

Only toner cartridges originally manufactured by the OEM may be given the Nordic Swan Ecolabel. In the case of remanufactured toner cartridges, the production of the original OEM toner cartridge lies outside the control of the licensee. Accordingly we do not impose any requirements on the manufacture of the original OEM toner cartridge.

Remanufacturing and refilling toner cartridges, OPC (Optical Photosensitive Conductor) units and toner powder containers reduces levels of waste, while also lowering energy use and the consumption of raw materials.

Recycling means that used, original toner cartridges, or previously remanufactured and refilled cartridges are collected, dismantled, cleaned, checked/repaired and then reassembled and refilled with toner powder. The drum is changed frequently to ensure the quality of printouts and, in some cases, to extend the service life of the toner cartridge.

Justification for Nordic Ecolabelling

Toner cartridges in laser printers are replaced when the toner powder in the cartridge is used up or when the print quality is poor. The volume of used toner cartridges produced in the Nordic region is considerable and produces correspondingly significant quantities of waste if the cartridges are not recycled. There are many companies, in Europe and worldwide, that recycle toner cartridges.

The aim of the criteria is to reduce quantities of waste and ensure that the recycled toner cartridges maintain the quality demanded by the user. Product quality must also be sufficiently high that the cartridges do not risk damaging the machines in which they are installed.

Besides waste reduction and resource savings, the criteria stipulate that the toner powder and materials shall not be harmful to human health or the environment.

Several studies show that recycled toner cartridges are better for the environment than buying new cartridges. For example:
- LCA performed at the University of Kalmar[2].
- LCA "Carbon Footprint and Ecodesign of Toner printer cartridges" by Xanfeon, December 2008[3].

Over 1.1 billion toner cartridges and ink jet cartridges are sold annually. More than 500 million of these end up in landfill around the world. However, a toner cartridge can be remanufactured 2-3 times without difficulty, and doing so would reduce the number going to landfill by 66-75%. It would also conserve natural resources.

The reuse of the plastics and metals in a toner cartridge is the most environmentally sound way to handle what is in principle a waste product – the empty toner cartridge. For example, aluminium that is reused in a remanufactured product requires 95% less energy than virgin aluminium. Recycling is a viable way to tackle the growing waste problem and provides both job opportunities and substantial environmental benefits.

The European Commission, in its EMAS environmental statement, voices a preference for reused toner cartridges[4]. The European Union has also recently established new guidelines for its general waste management policy. The prevention of waste is now the highest priority, followed by recycling and reuse. The recycling of toner cartridges thus follows the EU's priorities.

RPS

Within Nordic Ecolabelling, an RPS is a fundamental tool for selecting which product groups we should work with and a tool for setting the right criteria. In RPS, the R stands for Relevance – are there relevant environmental aspects to the product group that are reflected in the environmental philosophy of Nordic Ecolabelling? The P stands for Potential – is there potential to find better products/services that improve the prioritised environmental considerations based on a life cycle analysis within the product group. And then is it possible to carry out checks that products/services meet the requirements set out in the criteria in order to achieve the goal of being the best eco-choice in the product group? This is where the S for steerability comes in.

We have compiled the following RPS for toner cartridges.

[2] Jonas Berglind & Henric Eriksson, Life Cycle Assessment of Toner Cartridge HP C4127X
[3] Xanfeon, Carbon Footprint and Ecodesign of Toner printer cartridges
[4] European Commission,
http://ec.europa.eu/environment/emas/pdf/es_library/99en_eu05_en.pdf Page: 31

Relevance

A newly manufactured toner cartridge comprises 4-6 litres of virgin crude oil according to information from licensees. The majority of these toner cartridges would previously have been sent to landfill once used. Such consumption of resources is not sustainable in today's society. Legislation, primarily in the EU, has led to less waste going to landfill and more materials being recycled.

The remanufacturing of toner cartridges has established itself as an industry in itself and has developed over the past 30 years. This industry shows how products can be recycled and thus save resources. Increasing the proportion of toner cartridges that are recycled generates considerable environmental gains. Today, around 30% of toner cartridges are recycled by companies, and there is a certain amount of take-back on the part of the OEMs. However, recycling by OEMs does not lead to the toner cartridges being remanufactured and refilled. Instead the material is sent for plastics recycling or for incineration and energy recovery.

If remanufacturing is to lead to resource savings, the quality of the products must be extremely good. Life cycle analyses show that remanufactured products of poor quality lead to an increased environmental impact, chiefly through an increase in paper consumption to achieve decent printouts.

The toner powder used in toner cartridges comprises chemical substances that are combined to create as good quality printouts as possible. Heat adheres the toner to the paper to create these printouts. This can lead to problems recycling the paper and to emissions of chemical substances from the heating process – emissions that may spread in the office environment. Within Nordic Ecolabelling, we work to chemical guidelines in a move to phase out the most dangerous chemicals from products. The relevant requirements in all product groups are based on these guidelines.

Potential

With less than a third of toner cartridges recycled today[5], there is major potential to increase this figure. It is therefore important to secure systems for recycling that lead to toner cartridges being returned efficiently to remanufacturing companies.

International standards have been developed for testing the quality and capacity of toner cartridges. These standards are important if the remanufacturer is to be able to offer products of good quality, and ensuring their use will lead to this quality. Licensees having systems to follow up user complaints about products also leads to higher quality. Overall, the result is high quality products that do not have a greater environmental impact than the OEM product, when comparing parameters such as the number of printouts by the user.

Research and development by toner manufacturers is leading to products that are better in terms of quality and the environment. We are seeing, for example, the development of biobased toner powder. A development in chemical legislation is also leading to products that are better from an environmental perspective. However, it is important to check compliance with the legislation and to enable implementation of

[5] www.etira.org

the legislation before it actually comes into force, for example via a voluntary ecolabelling system.

Steerability

The proposed requirements can be checked effectively. There are established standards that can be used. The criteria allow the possibility of using different types of standards in order to make the system cost-effective. Practically all the players work to some kind of certified quality assurance system, and this means that checks can be carried out by independent auditors and through Nordic Ecolabelling inspections.

Chemicals manufacturers are accustomed to reporting data for their chemicals. New legislation arising from the CLP regulation and REACH is leading to further, much clearer reporting and simpler checks.

Transport and distribution

The transport and distribution of toner cartridges has an impact on the environment – both when collecting used toner cartridges and delivering the remanufactured cartridges. The industry is becoming more global and we have seen more international players showing an interest in Nordic Ecolabelling. We are unable to introduce requirements regarding transport and distribution in this version of the criteria. No effect, such as reduced environmental impact, can be guaranteed, since we are unable to exert any influence over transport and distribution. Keeping distances short does not, on its own, guarantee more environmentally friendly transport. Moving products by road through Europe can have a greater environmental impact, for example, than longer shipping by sea from Asia. The environmental effects are therefore uncertain. Contributors to the consultation also pointed out that there are not yet any internationally accepted standards for measuring issues such as emissions of greenhouse gases from transport. It is important, during the next revision of the criteria, to revisit the question of setting transport requirements.

Criteria version and validity

The first version of the criteria document for toner cartridges was adopted on 13 May 1992. The document has since been revised three times. The current version, version 4, was adopted on 23 June 2006. Following several extensions to its validity (currently version 4.3) the criteria are valid until 30 June 2013. It is proposed that version 5 of the criteria will be valid for four years until 15 December 2016.

A survey was conducted in 2010. A short questionnaire was sent to licensees, resellers, trade organisations and original equipment manufacturers (OEM) of imaging equipment. The survey regarded the possibility of also ecolabelling OEM toner cartridges. It was, however, concluded that this should not be done within this product group but under the product group of imaging equipment instead. The possibility of ecolabelling inkjet cartridges was also investigated but was not considered appropriate for this revision.

The survey showed unfortunately that the product group has suffered from the misuse of the Nordic Swan Ecolabel logo in the marketing of recycled toner cartridges. The reason behind this misuse has often been poor information between the licensee and resellers regarding the use of the Nordic Swan Ecolabel logo.

Based on the survey, it was concluded that the criteria should be revised and adapted to current demands in the industry.

Market for remanufactured toner cartridges

ETIRA[6], the European Toner & Inkjet Remanufacturers Association, provides a picture of the market for remanufactured toner cartridges. There are more than 10,000 remanufacturers of toner cartridges worldwide employing more than 65,000 people. 20-30% of all toner cartridges sold globally are recycled to some degree.

Manufacturers outside of Europe have shown increased interest in the Nordic Swan Ecolabel in the past year. This is one indication that the industry has become more global.

European market

There are over 1,400 remanufacturers in Europe. 60% of remanufacturers process both inkjet and laser cartridges; the remainder specialise in either one or the other. The remanufacturing market is worth approximately 1.2 billion euro to Europe's economy. Across Europe, there are an increasing number of broking companies which provide the third party supply link between the OEMs, cartridge users and the remanufacturers.

Of the 44 million toner cartridges sold in Europe each year, almost 12 million are remanufactured. This represents a market share of approximately 27%.

ETIRA describes the following in its annual report 2010[7]:

> *The credit crunch proved to be a blessing in disguise: many ETIRA members experienced growth since mid-2008. Faced with the need to reduce their fixed costs (such as printing), businesses all over Europe expressed a growing interest in remanufactured. As a result, unit sales were up, and margins initially improved. Market intelligence firm Lyra calculated that worldwide, in 2008, 23% of all toner cartridges and containers, and 29% of all inkjets shipped were aftermarket cartridges (i.e. remanufactured and compatibles).*
>
> *But in 2010 our major competition were not the OEM cartridges, but rather the low-priced "newbuilts" imported from SE Asia, which often infringe OEM patents and are sold at unbeatable prices. Some of these newbuilts were even labelled as "remanufactured", thus benefiting from our industry reputation but without providing the reduction in greenhouse gas emissions. In 2010, ETIRA has taken strong action against these practices.*
>
> *The "race to the bottom" pricing makes remanufacturing unsustainable. It is hard to compete if you must offer your remanufactured toner cartridge at cost-price level of i.e. 22 euro, while the empty costs 15 euro, but a newbuilt from SE Asia can be purchased on the web below 10 euro!*
>
> *Traditionally, our industry has 2 major sales arguments: our products are less expensive, and better for the environment. The "green" argument is becoming increasingly important: end-users want to combine less cost with a reduced CO_2 footprint.*

[6] www.etira.org
[7] http://www.etira.org/?website_id=77

Nordic Swan Ecolabel licences

Table 1 provides a summary of Nordic Swan Ecolabel Licences. Three licensees have remanufacturing based in the Nordic region. The remainder are based in Europe, US and North Africa.

Several licensees are resellers of toner cartridges manufactured by other European actors. There are also licensees that do not sell on the Nordic market but only to the rest of Europe

Table 1. Licence distribution in the Nordic region

Producer	Licence no./ Quantity	Registered in				
		Sweden	Norway	Denmark	Finland	Iceland
Tepro Print Products AB	308007	X		X		
Scandi-Toner AB	308010	X				
Turbon International GmbH	308015	X	X	X	X	
Turbon International GmbH	308016	X	X	X	X	
CLOVER LDA	508022	X		X	X	
K&U Printware GmbH	308028	X			X	
Supplies Team Sverige AB	308033	X				
Pelikan Nordic AB	308034	X	X	X	X	
Greenprint Aps	508035			X		
XPS b.v.	408037	X			X	
Greenman AB	308038	X				
Farbax Kft	508039			X		
Sapi s.r.l.	308040	X				
Officeday Finland Oy	308041				X	
Armor SA	308041		X	X	X	
Vidamic Prinova AB	308042	X	X		X	
Polypore	408043				X	
MM Distribution ApS	508044			X		
Micro Solutions Enterprises (MSE)	308045	X		X	X	
Total no. of licences (registrations)	19*	11 (2)	0 (5)	4 (6)	2 (9)	0 (0)

**Total no. of active licences as at 28 March 2012.*

Other labels

Other independent ecolabels for toner cartridges exist in for example Germany[8], Austria[9] and France[10]. UNEP[11], the United Nations Environmental Programme, has also produced its own criteria for toner cartridges.

[8] http://www.blauer-engel.de/en/index.php
[9] http://www.umweltzeichen.at/cms/home233/content.html
[10] http://www.marque-nf.com/?lang=English
[11] http://ebookbrowse.com/unep-toner-cartridges-basic-criteria-revised-apr-2010-pdf-d37869988

3 About the revision

Goals of the revision
Based on the survey performed in 2010, several goals were established for this revision. The two main areas of focus were the major problem of misuse of the Nordic Swan Ecolabel logo in marketing remanufactured toner cartridges and a review of transport – how this influences the overall environmental impact of the product and whether requirements could be set.

Other objectives for the revision from version 4 to 5 were to:

- Update Nordic Ecolabelling's RPS analysis of the product group
- Review take-back systems for toner cartridges
- Investigate high capacity toner cartridges
- Review the relevance of the health and safety requirements
- Harmonise with other ecolabelling systems
- Propose requirements regarding emissions during printing
- Investigate the difference between chemically and mechanically processed toner powder
- Update information regarding the industry
- Harmonise toner powder requirements with the Nordic Ecolabelling criteria of printing companies
- Review the current legal requirements

About this revision
This revision was initiated in January 2011 under the project leadership of Karen Dahl Jensen, Denmark. A reorganisation in Denmark in March 2011 resulted in the project management of this revision being transferred to Sweden.

Project manager:	Anders Jacobsson (Ove Jansson, Karen Dahl Jensen)
Denmark:	Lena Stenseng (Karen Dahl Jensen/Thomas Christensen)
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Norway:	Barkha Gupka (Tormod Lien)
Sweden:	Ann Strömberg (Ove Jansson)
Area coordinator:	Anders Moberg

4 Justification of the requirements

This section starts with a description of two key areas for this revision: the misuse of the Nordic Ebolabel logo and transport. The remaining text describes and justifies each individual requirement.

4.1.1 Misuse of the Nordic Swan Ecolabel

Complaints submitted to Nordic Ecolabelling indicate that the Nordic Swan Ecolabel is being misused for sales of toner cartridges on the internet in particular. The primary

problem is the lack of a valid license number to accompany the logo, and that it could be construed that all the toner cartridges offered by a site are ecolabelled.

This is such a serious issue that it forces us to revise the criteria to prevent future complaints on misuse.

Requirement R25 is now reworded to tackle this misuse. In previous criteria, the licensee was simply required to inform resellers about Nordic Ecolabelling's regulations regarding the use of the Nordic Swan Ecolabel. The draft criteria propose that the licensee confirms in writing that resellers have been informed of Nordic Ecolabelling regulations concerning use of the Nordic Swan Ecolabel. These written declarations from resellers shall be filed by the licensee and checked on site visits.

If this tightening of requirements is not effective and Nordic Ecolabelling continues to receive complaints regarding misuse, we may need to establish different types of licences for manufacturers and resellers in the future.

4.1.2 Transport and distribution

Nordic Ecolabelling has had no ambition to include requirements regarding transport of remanufactured OEM toner cartridges in this revision of the criteria. The consultation generated responses from the Swedish Energy Agency, Kyocera, the European Toner & Inkjet Remanufacturers Association (ETIRA) and MM Distribution on the transport of toner cartridges. One query that has been raised is to what extent transport and distribution influence the total environmental impact of a toner cartridge, while another is what method of calculating CO_2 emissions might be used. The increased number of international manufacturers that have obtained a Nordic Swan Ecolabel license may be one reason behind such queries. Their toner cartridges may be transported further and by different modes of transport compared to those remanufactured in the Nordic region. Since toner cartridges that carry the Nordic Swan Ecolabel must be collected and then shipped, there are double the number of journeys involved compared to other Nordic Swan Ecolabelled products. However, this has to be weighed up against the environmental impact of new manufacture and the transport involved in waste management.

It might seem obvious that the environmental impact of transporting a product produced in Asia is much higher than for a product produced in Europe, but this assumes that the mode of transport and fuel used are identical and that only the distance is different. In practice that is not always the case since, depending on the distance, different modes of transport with different carbon footprints may be used.

Nordic Ecolabelling conducted a study into the feasibility of ecolabelling freight transport in 2011. The investigation established basic facts about the environmental concerns of goods transport and highlighted the difficulties in developing criteria and specific requirements for this category. It was subsequently decided that requirements for transport should not be developed within this revision of the criteria for toner cartridges. The main reason is that, at this current time, Nordic Ecolabelling does not have a good system for checking during the licensing process exactly how the toner cartridges are transported, and associated with this is the issue of how much influence

an ecolabel is able to exert over transport. If Nordic Ecolabelling is to set requirements for transport, these will be environmental requirements that ensure a reduced environmental impact from the transport.

Nordic Ecolabelling is working on guidelines for goods transport and hopes to be able to set sound requirements for the transport of remanufactured OEM toner cartridges in a future version of the criteria.

4.2 Description of requirements

4.2.1 General description

R1 Description of the product
The purpose of this requirement is to obtain a clear description of the product as well as all trade names and trademarks. Licensing usually involves many different names and trademarks. This requirement will simplify and clarify licensing. Further it enables the licensed products to be listed more clearly on Nordic Ecolabelling's websites.

The requirement has also been developed to ensure that only toner cartridges originally manufactured by the OEM can be given the Nordic Swan Ecolabel. This requirement will help to improve the quality of Nordic Swan Ecolabelled toner cartridges and to ensure that newly manufactured copies/clones of toner cartridges which may infringe various patents are not given the Nordic Swan Ecolabel.

4.2.2 Environmental and health requirements

This section primarily stipulates requirements regarding toner powder. However, it also includes a new requirement regarding work safety and the handling of toner powder.

Requirements R2-R5 on toner powder are taken from the criteria for the Nordic Ecolabelling of printing companies[12], which were also revised in 2011. This means that the same requirements are stipulated for the same type of product, which increases Nordic Ecolabelling's credibility.

Toner powder primarily comprises binding agent (approx. 90%) that melts when heated to roughly 200°C. Common binding agents include various blends of polymers such as styrene and polypropylene. Toner powder also includes pigments. Carbon black is most often used for monochrome printing. This is a powder made from oil or iron oxide. Colour printing uses different coloured toners (yellow, cyan and magenta) commonly based on organic pigments. Silicon compounds are often added to keep the powder dry. Other additives include fillers that improve the characteristics of the toner powder.

[12] Nordic Ecolabelling, 2011

R2 Classification of toner powder

The requirements on the classification of toner powder are stricter compared with previous versions. Further, the new requirements prohibit a wide range of the most problematic substances that toner powder can include. The requirement is based on the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

The requirements for toner powder are also included in the appendices to the criteria document. This is because the manufacturer or supplier of the toner powder tends to document these requirements, rather than the manufacturer of the remanufactured cartridge.

Classification

This requirement has been harmonised with the similar requirement in the Nordic Ecolabelling criteria for printing companies. In harmonising these requirements, Nordic Ecolabelling has based its work on regulatory requirements regarding the classification of chemicals. They aim to eliminate the use of the most hazardous chemicals used in toner cartridge production. Classification regulates the quantity of each classified substance that is permitted in a toner powder before the actual toner powder becomes classified.

Nordic Ecolabelling is aware that small quantities of some of these substances are used without this leading to the toner powder itself being classified. In future criteria, Nordic Ecolabelling will evaluate the classification requirements, which may mean that they are changed to apply to mixtures. See also the requirement on substances of very high concern, under which several substances are prohibited and which includes changes to the 5th generation criteria for SVHC under the REACH Regulation.

The new the CLP Regulation (EC) No 1272/2008 is in force and is covered by the requirement.

Nordic Ecolabelling, backed by its environmental hazard policy for chemical substances, wishes to exclude the most hazardous classified substances based on their risk phrases[13]. This policy on chemical substances is in line with the requirements on chemicals specified by Article 6, Paragraph 6 of the regulations governing the EU Ecolabelling scheme[14]. To ensure compliance with the abovementioned regulations, the 5th generation criteria include the following additional classifications:

[13] Nordic Ecolabelling, 2007
[14] European Parliament and Council 2010

Table 2. New risk phrases and hazard statements

CLP Regulation (EC) No 1272/2008 as amended	
Hazard class and category	**Hazard phrase**
Environmental hazard	
Toxic to aquatic organisms – acute 1 Toxic to aquatic organisms – chronic 1/2/3/4 Dangerous to the ozone layer	H400 H410, H411, H412, H413 H420 (previously EU 059)
Carcinogenic/mutagenic/toxic for reproduction (CMR)	
Carcinogenicity Carc 1A/1B	H350
Carcinogenicity Carc 2	H351
May cause genetic defects Muta 1A/1B	H340
May cause genetic defects Muta 2	H341
Toxic for reproduction Repr 1A/1B	H360
Toxic for reproduction Repr 2	H361
Other toxicological properties	
Toxic for reproduction – effects on or through breastfeeding	H362
Specific target organ toxicity – repeated exposure 2	H373
Acutely lethal effects	
Acute toxicity 1/2	H330, H310, H300
Acute toxicity 2/3	H330, H331, H311, H301
Non-lethal permanent injury after a single exposure	
Specific target organ toxicity – single exposure 1	H370
Specific target organ toxicity – single exposure 2	H371
Serious harmful effects due to repeated or prolonged exposure	
Specific target organ toxicity – repeated exposure 1/2	H372, H373
Inhalation hazard 1	H304
Sensitising effects	
Sensitising – respiration 1, 1A and 1B	H334
Sensitising – skin 1, 1A and 1B	H317
Other hazards	
	EUH070
Acute toxicity 1/2/3	EUH029
Acute toxicity 3	EUH031
Acute toxicity 1/2	EUH032

H304 “May be fatal if swallowed and enters airways” was also added, as was EUH 070 “Toxic in contact with eyes” as a consequence of the environmental hazard policy for chemical substances.

In addition to the risk and hazard phrases prohibited by the environmental hazard policy for chemical substances, substances classified as allergenic (sensitising) with classification H334 or H317 are prohibited with exemptions for certain types of chemicals.

R3 Substances of very high concern

In addition to the requirement on classified toner powder, there are a number of substances that are prohibited from use. As of this version of the criteria, the requirement applies to chemicals that are actively added to the toner powder. Pollutants from the manufacture of the toner powder are exempt from the requirement.

The requirement on substances of very high concern applies for the specified substances and groups of substances. All substances and groups of substances are also listed in the appendix to the criteria.
On 18 February 2020, the European Commission decision was published that titanium dioxide (TiO_2) should be classified as a suspected carcinogen (category 2) when inhaled in accordance with the CLP Regulation. Consequences are that the use of TiO_2 goes against Nordic Ecolabelling's requirements for the presence of CMR substances. Classification as suspected carcinogen is only applicable 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 ≤ 10 μm. If titanium dioxide particles or titanium dioxide mixtures do not exist in this specific form, the classification does not apply. Requirement K7 contains work environment requirements regarding handling of powder so that this is done in a safe manner.

R4 Heavy Metals

Heavy metals, which may be present in toner powder, are most often harmful and should be avoided as far as possible. Accordingly, a limit value of max. 100 ppm is stipulated for lead, cadmium, mercury and hexavalent chromium in toner powder.

This is a tougher limit than in previous generations of the criteria. Nordic Ecolabelling believes that these heavy metals have already been phased out and that the requirement should therefore be considered as a barrier to the reintroduction of heavy metals in toner powder.

R5 Residues of aromatic amines

The requirement regarding a maximum limit value for aromatic amines in toner powder was introduced in the previous criteria version. The requirement is partly based on a Norwegian study that shows a relationship between aromatic amines in ink and an increased risk of cancer among print workers[15]. Aromatic amines can be emitted by some less stable azo compounds. Azo compounds are used in azo dyes, which include colorants and pigments. Aromatic amines can also come from the production of dyestuffs.

R6 Testing for pollutants

To ensure low levels of volatile organic compounds (VOC [1)]), heavy metals, tin-organic compounds and azo dyes, a new requirement for testing of toner powder has been introduced.[16]

A large number of responses to the consultation recommended that Nordic Ecolabelling should not set emission requirements for toner cartridges as a product. Instead, the more cost-effective solution of setting requirements for toner powder was proposed.

See the table below for the details of the new requirement following the consultation.

[15] Bye 2005
[16] © TÜV Rheinland LGA Products GmbH, which originally developed the requirement.

Table 3. In the LGA test, the limit values are as listed below

No.	Parameter	Unit	Limit value	
1	Volatile organic compounds (VOC[1]):			
1.1	TVOC (Total VOC)	mg/kg	< 300	
1.2	Benzene	mg/kg	< 0.35	
1.3	Styrene	mg/kg	< 40	
1.4	Volatile CMR substances	mg/kg	< 1	
2	Heavy metals:			
2.1	Cobalt	mg/kg	< 25	
2.2	Nickel	mg/kg	< 70	
3	Tin-organic compounds:		A [2]	B [2]
3.1	Total content of tin-organic compounds	mg/kg	< 5	< 0.5
3.2	Sum of dibutyl tin (DBT) and tributyl tin (TBT)	mg/kg	< 0.5	< 0.05
4	Azo dyes (only for colour toner, mixed samples)	mg/kg	< 30	

1) Definition of VOC: Volatile Organic Compound is an umbrella term for several groups of organic compounds. Specifically, VOCs are organic compounds that have a steam pressure of > 0.01 kPa (at 20°C). This is the definition described in the VOC Directive 1991/13/EC.

2) Method A is suitable if methanol is used for the extraction. If the value is exceeded, Method B is to be applied (extraction of sample with artificial sweet solution, DIN EN ISO 105 E04).

Test methods:
Volatile organic compounds:
Benzene, Styrene, TVOC and volatile CMR compounds shall be analysed by thermo-extraction and subsequent thermodesorption GC/MS.

Heavy metals:
Cobalt and Nickel shall be analysed by digestion with microwave following determination with inductively coupled plasma (ICP) spectrometry.

Tin compounds:
Extraction with methanol (method A)
Extraction of the sample with methanol, derivatisation with sodium tetraethyl borate. The quantification is based on capillary gas chromatography (GC).

Extraction with artificial sweet solution (method B)
Extraction of the sample with artificial sweet solution, derivatisation with sodium tetraethyl borate. The quantification is based on capillary gas chromatography (GC).

Examples of tin-organic compounds: n-butyl tin, di-n-butyl tin, tri-n-butyl tin, n-octyl tin, di-n-octyl tin, tri-cyclohexyl tin and tri-phenyl tin.

R7 Working environment

In developing criteria for imaging equipment, the German ecolabelling organisation Blue Angel studied the risks of inhaling toner powder particles[17]. This study showed that there were no risks associated with particles from toner powder. However, we

[17] http://www.blauer-engel.de

feel that there is a risk when handling large quantities of loose toner powder, for example when refilling toner cartridges. To minimise the risk of inhaling loose toner powder, we therefore set a requirement regarding breathing masks and extraction fans or full mechanisation in the production of Nordic Swan Ecolabelled toner cartridges. This must be documented in a description of how the requirement is fulfilled in the production process, and it is to be checked during on-site inspections.

R8 Plastics and R9 Chlorinated plastics in packaging

The biggest problem areas for chlorinated plastics such as PVC are waste management, use of additives and dioxin emissions, for example in the production of PVC. The production of chlorine (the chlor-alkali process) and the production of PVC can produce small quantities of dioxins, which are very toxic. If the production technology and safety procedures are in order, the PVC Information Council Denmark believes that the majority of the dioxin emissions will be captured, but not all[18]. At modern small-scale production plants, dioxins may be released to people and the environment by emissions from the manufacture of PVC[19].

To avoid incineration of PVC, PVC waste is to be sorted and handled separately at recycling centres in Denmark. The collected PVC material is sent for recycling or to landfill, depending on the nature of the plastic. In 2002 Denmark collected 1,100 tonnes, which equates to 3% of the total amount of waste and 16% of the waste that can potentially be recycled[20]. The other Nordic countries have no requirements regarding separate sorting.

PVC requires stabilisation to withstand the temperature needed when manufacturing PVC products (extruding, injection moulding and so on). Stabilisers may be based on lead, metal alloys (such as barium, zinc and calcium-zinc) or tin. The PVC industry in Northern Europe has phased out the use of lead stabilisers, and has drawn up a plan for recycling across Europe by 2015. Between 2000 and 2010, there was a programme to replace lead-based stabilisers, which led to a 68% reduction in their use[21]. It is now prohibited to use cadmium compounds for the stabilisation and colouring of plastic[22].

Two examples of plastics used in plastic wrap are PVC (polyvinyl chloride) and PVDC (polyvinylidene chloride), both of which are types of polyvinyl chloride. PVDC contains twice as much chlorine, but there is generally less softener in PVDC film than in PVC film[23].

Around 50% of the chlorine ions in incineration plants in Europe come from PVC. The greatest environmental problems relating to incineration of PVC are dioxin emissions and the waste that arises from neutralising the hydrochloric acid that is formed. PVC is not suitable for incineration, since the chlorine content can lead to the formation of dioxins in exhaust gases from waste incineration. Dioxins are one of the most acutely toxic substances created by mankind and are suspected of being endocrine disruptors and carcinogens[24]. In terms of total emissions of dioxins in the EU

[18] PVC Information Council Denmark
[19] Life Cycle Assessment of PVC and of principal competing materials
[20] Waste Strategy 2005-2008, Danish Government 2003
[21] Vinyl 2010, Progress Report
[22] http://www.kemi.se
[23] Migration of the plasticiser DEHA from PVC stretch film, 2000/2001
[24] Danish Environmental Protection Agency

over the period 1993-1995, levels have fallen significantly with the help of modern purification technology. In the European Union, where the Hazardous Waste Directive (91/689/EEC) applies, limits have been set for emissions of dioxins from incineration plants.

Depending on the technique used to clean exhaust gases, between 0.4 and 1.7 kg neutralised waste is produced per PVC incinerated[25]. This waste may also contain heavy metals, which makes it difficult to recycle.

In summary, the environmental impact arising from the production, use and disposal of PVC suggests that there are still major problems associated with PVC. There are also insufficient checks on the PVC that is imported into the EU and the Nordic countries from other parts of the world.

The Nordic Ecolabelling's Criteria Group decided on the 16 November 2017 to remove R8 due to low relevance according to today's technology, while requirement R9 is a tightening of the requirement that applies to all chlorinated plastics in packaging.

4.2.3 Reuse, take-back system and waste

R10 Reuse

The primary aim of the criteria is to reduce resource consumption through the reuse of materials, in particular plastics. Accordingly, Nordic Ecolabelling considers the requirement that toner cartridges comprise at least 75% reused materials to be the most important. This level has been used in previous criteria and has proven to be a suitable level.

There is no point in increasing this figure since the maximum possible proportion of reused parts in a toner cartridge depends to a large extent on the design of the OEM cartridge, something we are unable to influence through these criteria. It is in principle possible to set different levels for the different cartridge types presently on the market, but this would make the criteria unnecessarily complicated without achieving any significant environmental gains.

In addition, it is important that the licensee has a well-established system for the collection of used cartridges, so that these can be reused. Further, licensees must have a waste sorting system so that relevant fractions (e.g. plastics and metals) can be collected and recycled (not sent for energy recovery).

The licensee is sometimes able to expand toner cartridges by adding new toner containers that house more toner powder and so give a higher print capacity than the original OEM toner cartridges. OEM toner cartridges are available for the same printers but with different print capacity. The printer may be delivered with a "Starter" cartridge that is then replaced with a "Standard" toner cartridge. In some cases toner cartridges may be available with increased print capacity, and these may be referred to as "High Capacity" (HC), "More Capacity" or "X" toner cartridges.

[25] Green Paper – Environmental issues of PVC, European Commission 2000

HC cartridges are generally used to increase print capacity. In the new criteria, the Nordic Swan Ecolabelled HC cartridges with new toner containers must deliver at least 50% more printouts than the specified number from the equivalent of OEM HC toner cartridges. If an HC toner cartridge is available for the printer in question, the increased number of printouts is to be calculated from this level. Otherwise, the level is calculated from the specified number of printouts from the standard toner cartridge. For this type of HC toner cartridge, the remanufacturing company may exclude any new toner container from the 75% requirement if the toner container needs to be replaced.

This type of toner cartridge must naturally also meet the performance requirements for print quality (R15) and print capacity (R16). The test method that is to be used to measure print capacity is described in the requirement R16.

R11 Take-back system for remanufacturing

The collection of used toner cartridges is fundamental to the reuse of toner cartridges We have therefore reworded the requirement so that it is clearer.

The aim of the requirement is to make it easier for private individuals to return used toner cartridges. The pressure on pricing in recent years has meant that fewer toner cartridges come with free-post return, both among licensees and other actors. This has made it difficult for private consumers to return toner cartridges to the manufacturer at a reasonable cost and a reasonable level of effort. The requirement is now clearer in stating that private consumers must be able to return individual toner cartridges free of charge. The licensee may resolve this issue in various ways, including offering free postage or recommending that individual toner cartridges can be deposited at the nearest store or take-back point. The requirement also states that the licensee must set up agreements with resellers and distributors to ensure that they also offer take-back systems.

R12 Waste

Waste minimisation and material recycling are fundamental to these requirements. It is therefore important that licensees work actively to minimise production waste and where possible recycle as much waste as possible. A minor change has been made to the requirement in this revision. The change means that the licensee must pack toner powder waste in sealed packaging to minimise spillage of loose powder.

4.2.4 Performance

R13 Production quality

High product quality is essential. Poor quality risks eroding the credibility of Nordic Ecolabelling and the user’s faith in recycled toner cartridges. This requirement is measured by the number of complaints received for each type of toner cartridge. The limit value is set at 1%. Data from previous licensing shows that this level is reasonable. Only complaints associated with Nordic Ecolabelling requirements shall be included in the statistics, such as print quality and capacity. Complaints regarding damage during shipping, for example, are not included.

R14 Analysis laboratory

This new requirement ensures that the analysis laboratory is independent or inspected by an independent body. Previous revisions included the formulation but not as a requirement. Its inclusion as a requirement ensures that the requirement is documented and checked.

Nordic Ecolabelling refers to international standards (EN ISO 17025, the ISO 9000 series) to ensure that the analysis laboratory is of sufficient quality to perform the tests stipulated in R6, R15 and R16.

R15 Print quality

The requirement has been clarified and has been moved from its location in an appendix to become a unique requirement in the criteria document. High print quality is of central importance to the user. Nordic Ecolabelling requires that print quality shall be on a par with that of the equivalent OEM toner cartridge. If the applicant is an OEM-manufacturer it must be shown that the OEM toner cartridges have a good print quality.

All toner cartridges must be tested to and comply with DIN Technical Report No. 155[26] or ASTM F:2036[27] (applies to monochrome printouts). These are the latest recognised test methods, which can be used by players both large and small within the industry. The development of new standards continues and Nordic Ecolabelling will monitor this work for future revisions. 50% of the Nordic Swan Ecolabelled toner cartridges are to be tested annually while the licence remains valid. This is tougher than the previous criteria, which required 10% to be tested. However, if the applicant is an OEM-manufacturer they can instead declare that the same toner powder and spare parts are used in the remanufactured OEM cartridges as are used in the new manufactured OEM cartridges.

The documentary requirement has been developed in this version of the criteria, requiring an independent auditor to certify that testing complies with the standard. Alternatively, the company may be certified in line with the industry's own certification system, known as the Standardized Test Methods Committee (STMC) system[28].

The licensee must make the test results available during inspection visits, plus the documentation must also be made available to Nordic Ecolabelling on request.

R16 Print capacity

Print capacity is one of the most important requirements in the criteria. Print capacity equal to or better than the equivalent OEM toner cartridge is something all users expect. As with the requirement concerning print quality, this requirement has been updated to include new test methods. The number of printouts is to be tested in line

[26] DIN Technical Report No. 155 – Information Technology: Office and data technology – Requirements for refilled modules with toner (monochrome/colour), September 2007.
[27] ASTM F:2036 – Standard Test Method for Evaluation of Larger Area Density and Background on Electrophotographic Printers.
[28] http://www.i-itc.org/standards.htm

with one of the following testing standards: DIN Technical Report No. 155, ISO/IEC 19752:2017[29], ISO/IEC 19798:2017[30] or ASTM F:1856[31].

All types of toner cartridge shall be tested on application. 50% of the Nordic Swan Ecolabelled toner cartridges are to be tested annually while the licence remains valid. This is tougher than the previous criteria, which required 10% to be tested. The requirement has been clarified and has been moved from its location in an appendix to become a unique requirement in the criteria document.

To ensure that the remanufactured OEM toner cartridge can produce the required yield of printouts, it is to be tested and compared against the capacity of the equivalent OEM cartridge. The capacity of the remanufactured OEM cartridge must not fall below the capacity of the OEM cartridge by more than 10%.

The documentary requirement has been developed in this version of the criteria, requiring an independent auditor to certify that testing complies with the standard. Alternatively, the company may be certified in line with the industry's own quality system, the STMC standard.

The licensee must make the test results available during inspection visits, plus the documentation must also be made available to Nordic Ecolabelling on request.

4.2.5 Quality and regulatory requirements

The following four requirements (R17-R20) are included in all criteria for Nordic Ecolabelling. These place requirements on administration to ensure that the licensee follows Nordic Ecolabelling requirements for the entire licence period.

R17 Licence administrators
R18 Documentation
R19 Planned changes
R20 Unforeseen non-conformities
R21 Traceability

The traceability requirement has been clarified. This means that, as a minimum, it must be possible to trace the date of manufacture, the toner powder used and other constituent parts for each individual toner cartridge.

R22 Legislation

In this revision, which aims to ensure that the licensee follows the applicable legislation, we have extended the requirement so that it also includes patent law. Views have been raised within the industry as to the respect of patents. Through this requirement, we want to stress that this issue is important to Nordic Ecolabelling.

[29] ISO/IEC 19752:2017 – Method for the determination of toner cartridge yield for monochromatic Electrophotographic printers and multi-function devices that contain printer components.
[30] ISO/IEC 19798:2017 – Method for the determination of toner cartridge yield for colour printers and multi-function devices that contain printer components.
[31] ASTM F:1856 – Standard practice for Determining Toner Usage for Printer cartridges.

R23 Take-back system – nationally regulated systems

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

There has previously been a voluntary industry agreement on packaging operations in Norway, which has led Nordic Ecolabelling to have a requirement to ensure that licensees for a number of (45) product groups comply with this regulation.

Requirements for return systems have now been incorporated into the Norwegian Waste Regulations, which means that the Nordic Ecolabelling requirement for membership in a return company will be out of date and therefore no longer need to be managed by Nordic Ecolabelling in a separate requirement.

4.2.6 Information

R24 Customer information

The requirement has been reworded and made clearer in order to minimise misuse of the Nordic Swan Ecolabel and ensure that customer information accompanies the product. The change specifies, for example, which information is to be included on the packaging. Information regarding warranties, health hazards and complaints is to be given in all Nordic languages. If the products will not be sold on the Nordic market, such translation is not necessary.

4.2.7 Marketing

R25 Information to resellers and distributors

The Nordic Ecolabelling's Criteria Group decided on the 16 November 2017 to remove this requirement due to updated Guidelines for using the Nordic Swan Ecolabel.

5 Changes compared to previous versions

The following changes have been made in the new version of the criteria:

- Only toner cartridges originally manufactured by the OEM may be Nordic Swan Ecolabelled.
- New requirement for remanufactured OEM "High Capacity" (HC) toner cartridges. For these HC products, the licensee may exclude any new toner container when calculating recycled material.
- The criteria have been harmonised with the requirements for toner powder in the Nordic Ecolabelling criteria for printing companies, and updated through the introduction of a harmonised system for the classification of substances and mixtures under the CLP Regulation (EC) No 1272/2008.
- The list of undesirable substances in toner powder has been extended and tightened. Additives categorised as substances of very high concern (SVHC) have been included in the requirement, in line with REACH (Registration, Evaluation and Authorisation of Chemicals). Persistent and bioaccumulative substances (PBT, vPvB substances) are also included in line with REACH, as are substances that are considered to be endocrine disruptors or potential

endocrine disruptors according to the EU. Substances recorded on the EU's Candidate List that do not belong to any of the above-mentioned groups are also on the requirement list.

- A requirement regarding testing for pollutants of different kinds in toner powder has been introduced.
- There is a new working environment requirement regarding the handling of loose toner powder in the production process.
- The requirement for take-back systems for private consumers has been made more stringent. The take-back systems must now allow private, non-commercial individuals to send back used cartridges free of charge.
- New standards, test methods and documentary requirements have been included in the requirements concerning print quality and print capacity.
- A new requirement regarding analysis laboratories ensures that they meet the requirements under the standard ISO 17025, or that they are an official "Good Laboratory Practice" (GLP) lab.
- The requirement for the licensee to follow the applicable legislation has been extended to also include patent law.
- The requirement to sign up for national collection systems for packaging recycling has developed such that the licensee must be affiliated to the systems in all Nordic countries.
- The requirement regarding customer information has been extended. There are now clearer stipulations about which information is included on the packaging, and the requirement now also ensures that the customer is provided with information to accompany the product.
- The requirement that all the licensee's resellers and distributors must have entered into an agreement with the licensee in accordance with an appendix to the criteria. The agreements are set up to ensure that the sale and marketing of Nordic Swan Ecolabelled toner cartridges is done correctly.

The following requirements have been deleted from this version:

- The requirement for information from a chip. The requirement created confusion during licensing and was difficult for the applicant to interpret. All chips used on the market are developed to give the user clear information.
- In previous versions of the criteria, Nordic Ecolabelling had an information requirement regarding sales outside the Nordic region. Nordic Ecolabelling now has a good grip on which markets the Nordic Swan Ecolabel is being used in outside the Nordic region, and has the ability to gather this information by other means.
- The calculation of a TE value has been removed, and we now refer to the use of current standards in the requirements regarding print quality and capacity.
- Requirement R23 Take-back system – nationally regulated systems has been removed as decided on the 9 October 2017 by the Nordic Ecolabelling's Criteria Group.

6 New criteria

Many comments received during the consultation period have provided information on areas in which requirements can be stipulated in the future. We see a possible

focus on developing requirements for the transport and distribution of toner cartridges, social/ethical aspects of production and the take-back systems.

We also see a need to develop different types of licences for different actors within the industry and once more review the possibility of extending the product group to include inkjet cartridges.

7 References

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Standards/Test methods

© TÜV Rheinland LGA Products GmbH, which originally developed the test for pollutants in toner powder.

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ASTM F:2036 – *Standard Test Method for Evaluation of Larger Area Density and Background on Electrophotographic Printers.*

ASTM F:1856 – *Standard practice for Determining Toner Usage for Printer Cartridges.*

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