



JRC TECHNICAL REPORTS

Revision of EU Ecolabel Criteria for *Converted and Printed Paper Products*

*(printed paper, stationary paper, and paper carrier
bag products)*

Technical Report v.2.0:

Draft criteria proposal for revision of
EU Ecolabel criteria

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DRAFT

ABBREVIATIONS

AHWG	Ad-hoc Working Group Meeting
AOX	Adsorbable Organic Halogen
BAT	Best Available Technology
BAT-AELs	BAT-associated emission levels
BPA	Bisphenol-A
BREF	Best Available Techniques Reference Document
CLP	Classification, Labelling and Packaging
CO ₂	Carbon dioxide
CP	Converted paper products
CTP	Computer to Plate
DIBP	Diisobutyl phthalate.
DIPN	Diisopropylnaphthalene.
EDTA	Ethylenediaminetetraacetic acid
EMAS	Eco Management and Audit Scheme
EN	European Norm
EU	The European Union
EUEB	The European Union Eco-labelling board
EuPIA	The European Ink Industry's Association
FSC	Forest Stewardship Council
GMO	Genetically modified organism
INGEDE	Internationale Forschungsgemeinschaft Deinking-Technik (International Association of the De-inking Industry)
ISCC	(International Sustainability and Carbon Certification),
IPA	Isopropyl alcohol: propan-2-ol (also called isopropanol).
ITX	Isopropylthioxanthone
IPPC	Integrated Pollution Prevention and Control
ISO	International Standardisation Organisation
LCA	Life Cycle Assessment
NGO	Non-governmental organizations
NO _x	Nitrogen Oxides
PEFC	Programme for the Endorsement of Forest Certification
PAH	Polycyclic aromatic hydrocarbons.
PBT	Persistent Bioaccumulative Toxic
PP	Printed paper products
PVC	Polyvinyl chloride
PUR	Polyurethane
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RSB	Roundtable on Sustainable Biomaterials
RSPO	Round Table on Sustainable Palm Oil
RTTS	Round Table on Responsible Soy
SETAC	Society of Environmental Toxicology and Chemistry
SO ₂	Sulphur Dioxide
TOC	Total organic carbon, expressed as C (in water or in gases)
TVOC	Total volatile organic carbon, expressed as C (in air).
VOCs	Volatile Organic Compounds
vPvB	Very persistent, very bioaccumulative

ABSTRACT

The Ecolabel criteria for printed and converted paper products are under revision, therefore, the updated product scope and criteria are defined in line with the rationales based on the preliminary reports.

A draft preliminary reports (PR) have been published for both product groups in parallel with the technical report (November 2018) ahead of the first AHWG meeting held in December 2018. The PRs examine the product groups in the current legal, political and market context. The technical aspects of each product group are also considered from an LCA perspective in order to identify the main environmental hotspots.

The technical report (TR 2.0) provides an update on the criteria revision, based on desk research, information provided by the involved parties and collected within the course of the project (i.e. stakeholders' discussion and further inputs, co-operation with recyclability sub-group).

The purpose of the update of Technical Report (TR 2.0) is to help frame the discussion for the 2nd AHWG meeting.

Each criterion is analysed within a separated chapter that includes the main discussion points, as well as proposed changes and rationales for the revised proposal. **Further findings are inserted in BLUE. The key modifications of the revised criterion are marked in yellow.**

The most significant changes are:

- Merging of the product groups converted (CP) and printed paper (PP) under one common Commission Decision (one Annex);
- Change of the name of the merged product group to: "*printed paper, stationary paper, and paper carrier bags products*", in order to better reflect the scope of the product group;
- Harmonising the substrate requirements (Criterion 1) with the EU Ecolabel for copying and graphic paper (Annex I of Commission Decision (EU) 2019/70¹);
- Harmonising the recyclability criterion (Criterion 3) with technical information collected from the recyclability sub-group discussions;
- Revision of the emission criterion (Criterion 4). Alternative proposals are included in the revised TR 2.0;
- Assessment and verification of the system for handling waste by means of EMAS and ISO 14001 EMAS; Revision of the thresholds for the paper for recycling (Criterion 5).
- Assessment and verification of the energy management system by means of ISO 50001, EN 16247:2012 or EMAS.
- Verification of fitness for use based on the clients' feedback;

Comments on the proposed changes can be sent prior to the 2nd AHWG Meeting in the hope to outline different perspectives ahead of the meeting.

¹ OJ L 15, 17.1.2019, p. 27–57

1 INTRODUCTION

The EU Ecolabel promotes the production and consumption of products with a reduced environmental impact along the life cycle and is awarded only to the best (environmental) performing products in the market.

The entire life cycle of the product, from the extraction of raw materials through production, packaging, distribution, use and disposal is considered. The EU Ecolabel may define criteria that address environmental impacts from any of these lifecycle phases, with the aim to target those areas of most significant impact preferentially. The criteria development process involves scientists, non-governmental organisations (NGOs), member state representatives, and industry stakeholders. The overall ambition level for criteria should aim to target 10% to 20% of the most environmentally friendly products currently on the market.

Since the life cycle of each product and service is different, the criteria are tailored to address the unique characteristics of each product type. They are revised to reflect upon technical innovation such as alternative materials or production processes, reductions in emissions and market advances. The development and revision processes are carried out in accordance with the EU Ecolabel Regulation (EC) No 66/2010. An important part of the process for developing or revising EU Ecolabel criteria is the involvement of stakeholders through publication of and consultation on draft technical reports and criteria proposals. This is achieved by working group meetings and written consultation processes managed via an online platform.

The overall aim of this project is to update existing criteria for the printed paper product group (Commission Decision 2012/481/EU²) and converted paper product group (Commission Decision 2014/256/EU³). The project performs an evaluation of the existing criteria by identifying their relevance and need for the revision. It also examines whether any new criteria need to be introduced for the identified areas of concern. The key factors considered are:

- New technological development: where progress in existing processes or where new processes become available and economically viable and could mitigate environmental impacts;
- Stricter legal requirements: which may render existing criteria obsolete or of low ambition or which may introduce new restrictions that need to be reflected (e.g. the use of hazardous substances in paper manufacturing or in waste disposal);
- Developments in other ISO 14024 Type I ecolabels: to align where possible and where a clear rationale can be established;
- Published LCA evidence: to help ensure that proposed criteria focus mainly on the environmental hotspots of the paper production.

This technical report aims to provide the background information and rationale for the revision of the criteria, and to suggest changes concerning to the EU Ecolabel criteria for printed and converted paper product groups. The study has been carried by the Joint Research Centre (JRC Seville). The technical support for printed paper products was provided by LEITAT whereas for converted paper products by the Institute of Sustainability in Civil Engineering (Institut für Nachhaltigkeit im Bauwesen - INaB) RWTH

² Commission Decision No 2012/481/EU of the European Parliament and of the Council of 16 August 2012 establishing the ecological criteria for the award of the EU Ecolabel for printed paper, available online at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012D0481>

³ Commission Decision of 2 May 2014 establishing the ecological criteria for the award of the EU Ecolabel for converted paper products (notified under document C(2014) 2774) Text with EEA relevance. <https://publications.europa.eu/en/publication-detail/-/publication/ae7cce99-ea68-11e3-8cd4-01aa75ed71a1>

Aachen. The work is being developed for the European Commission's Directorate General for the Environment.

2 THE CRITERIA REVISION PROCESS

The typical standard approach that is taken for the revision of EU Ecolabel criteria is illustrated in Figure 1.

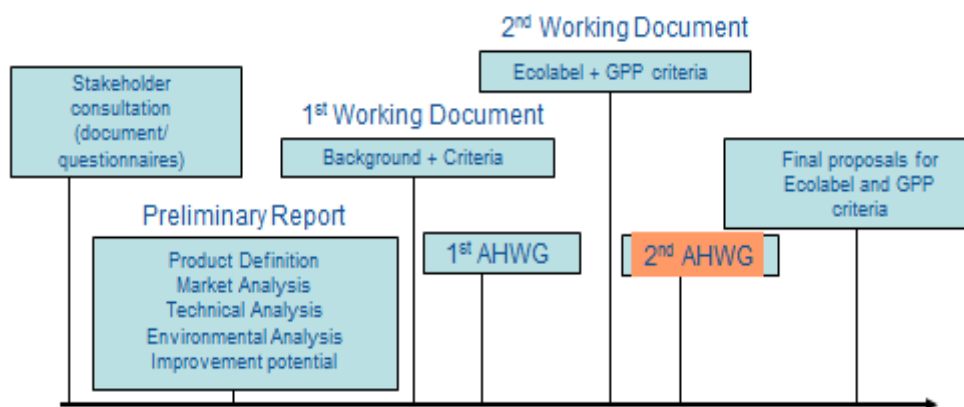


Figure 1. Overview of the typical EU Ecolabel revision process

The current stage in the process is highlighted in the red box in Figure 1.

This report (TR2.0) should be comprehended together with the information contained in the Preliminary Report and Technical Report v.1.0 The TR (2.0).provides an update on the criteria revision, based on new information collected during the revision and provided by the involved parties (i.e. through stakeholders' discussion at the 1st AHWG meeting, further stakeholder inputs following the meetings and additional desk research).

Several iterations of the criteria are anticipated before they will be finally voted and these will be reflected in subsequent version of this Technical Report

The criteria should attempt to target the top 10% to 20% of the most environmentally friendly products currently on the market otherwise the criteria run the risk of becoming meaningless as a basis for highlighting good performance. However, it is appreciated that this is not often possible to judge accurately where multiple criteria are set on a pass-fail basis as is the case with the EU Ecolabel approach.

3 SUMMARY OF THE PRELIMINARY REPORTS

This section summarises the main conclusions of the PRs. The full text documents can be found on the BATIS platform and also at the project website:

Printed paper products: http://susproc.jrc.ec.europa.eu/Printed_paper_products/

Converted paper products: http://susproc.jrc.ec.europa.eu/Converted_paper_products/

The outcome of the analysis provides the rationales for the proposed scope and definitions. It also clarifies the reasoning behind the proposal of merging converted paper and printed paper products under one common **Commission Decision**.

3.1 Legal and policy context

Relevant European environmental policy and legislation has been identified through the environmental regulations database. Specific EU legislation for products under revision as

well as several legislation and standards related to the environment, chemicals, health and safety that directly affect these products are analysed. The following legislation has been considered of major relevance for the revision process:

- The EU Ecolabel Regulation that establishes the legal base for the criteria revision.
1. Directive 2010/75/EU of the European Parliament and the Council of November 2010 on industrial emissions (integrated pollution prevention and control):
- The IPPC directive aims at reducing, preventing and controlling pollution in an integrated way using “best available technique” requirement (BAT). Printing installations are included in the BREF (Best Available Techniques Reference Document) on surface treatment using solvents.
 - IPPC directive applies only for big plants. Installations for the surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, with a consumption capacity of more than 150 kg per hour or more than 200 tonnes per year.
 - Council Directive 1999/13/EC of 11 March 1999 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installation.
- Chemical-related Regulations: i.e. REACH, CLP and the Biocidal Products Regulation. All EU Ecolabel product groups must have restrictions on the use of hazardous chemicals and the approach taken must be in line with these Regulations. It will be important when dealing with chemical suppliers and especially with hazardous substances that can remain in the final product.
 - *Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (Text with EEA relevance).*
 - *Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).*
 - *Regulation (EU) No 528/2012 concerning the making available on the market and use of biocidal products.*
 - *Directive 2002/61/EC of the European Parliament and of the Council of 19 July 2002 amending for the nineteenth time Council Directive 76/769/EEC relating to restrictions on the marketing and use of certain dangerous substances and preparations (azo colourants) amending Directive 76/769/EEC relating to restrictions on the marketing and use of certain dangerous substances and preparations.*
 -
 - *Directive 2000/60/EC of the European Parliament and the Council of 23 October 2000 establishing a framework for Community action in the field of water policy) for emissions to water.*
 - Council Directive 75/442/EEC of 15 July 1975 on waste and its amendments.
 - The Renewable Energy Directive: This will have an important indirect influence on the paper industry as the demand for renewable energy from biomass increases.
 - The Timber Regulation: places responsibilities on suppliers and importers of wood or wood-based materials in the EU market.

Regarding voluntary approaches, a growing number of manufacturers are implementing environmental management schemes (e.g. EMAS) in order to improve their environmental performance. Standards, which also have a voluntary nature, are also an important aspect to take into account such as BS EN 643:2014 on standard grades of paper and board for recycling which prohibits any material that represents a hazard for health, safety and environment. Moreover, there are two Technical Committees, the ISO/TC 6 on Paper, board and pulps that develops standards on terminology issues, sampling procedures, test methods, product and quality specifications, and the establishment and maintenance of appropriate calibration systems and the ISO/TC 130 that addresses standardization in the field of printing and graphic technologies.

In addition, the main ecological labels in paper products such as Nordic Swan, Blue Angel, NF Environment, Paper by Nature, labels on forest management (FSC and PEFC), etc., have been identified in order to establish a comparison with criteria set in EU Ecolabel and introduce measures to encourage harmonisation with other ecolabel schemes.

3.2 Printed paper products

3.2.1 Market analysis

The global printing industry is dimensioned to be \$980 bn by 2018. The sector is driven by growth in packaging and labels, whereas graphic applications are suffering a decrease in production during the last years. Regarding printing technologies, digital is gaining importance over analogue printing.

The US is the world's biggest print market (32%) (Figure 2). It is followed by China (17%) while the emerging markets are displacing US and EU in terms of production. European countries represent the third biggest region in terms of printed paper manufacturing, after Asia (37%) and North America (26%).

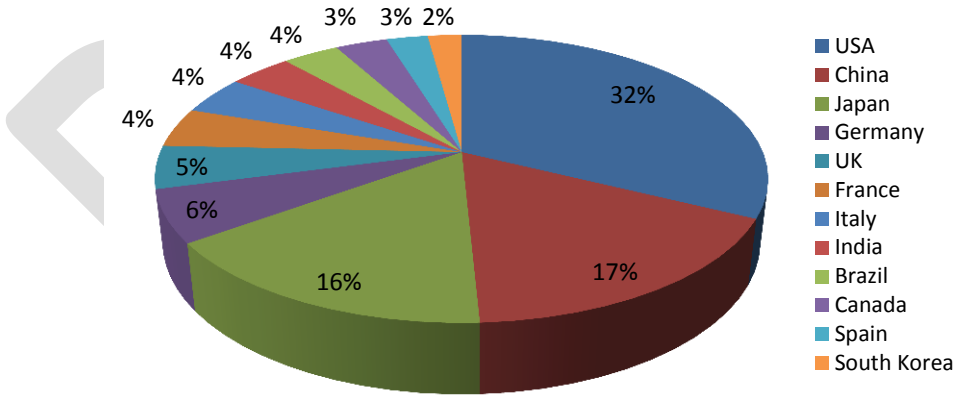


Figure 2. Market share of top 12 countries in printing (2014)
 Source: PRIMIR World Wide market for print 2014.

The EU paper printing industry generates an annual turnover of around € 52 bn, where printing activities account for €44 bn (Figure 3). During the last years, the EU printing market has experienced a continuous decrease in terms of production. Germany is leading with production value over € 10,000 m, followed by United Kingdom, Italy and France, which have also important production values exceeding € 4,000 m each.

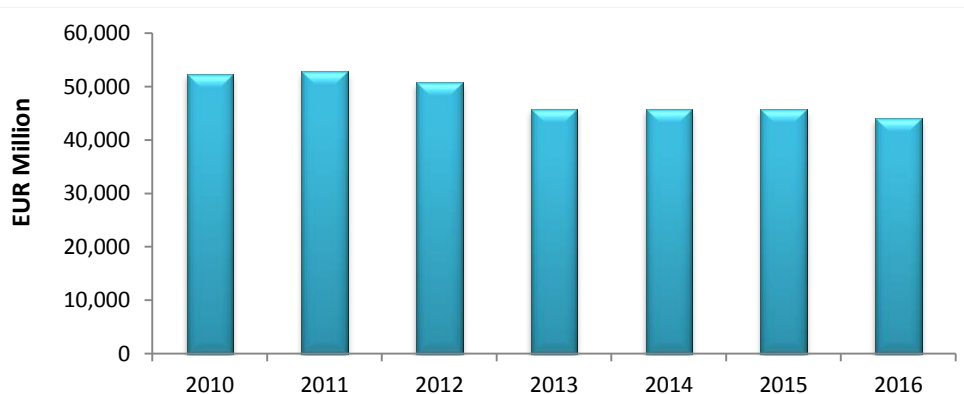


Figure 3. Evolution of the EU printed paper products production value (2010-2016)
 Source: Eurostat - PRODCOM

The EU printing industry produces different types of products; those with high market share are printed advertising material (26%), commercial catalogues (8%), books, brochures and leaflets (16%), and newspapers and journals (16%). The 27% are "other printed matter" which includes packaging products (Figure 4).

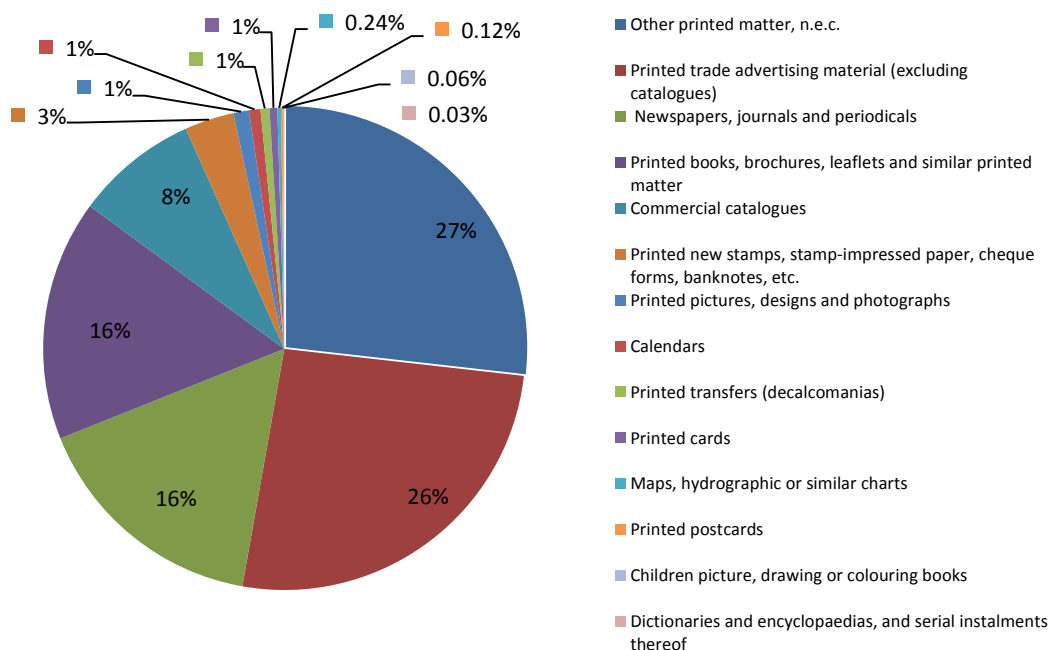


Figure 4. EU market value of printed paper by type of product (2016)
 Source: Eurostat - PRODCOM

Main suppliers for the printing industry, besides paper manufacturers, are the chemical industry (€713 bn) as well as inks (€3.1 bn) and printing equipment (€4.42 bn) manufacturers.

Printed paper products are demanded all over the world, and therefore export represents a key activity for European companies. The total printed paper products EU exports, including intra-EU28 and extra-EU28, was €17,984 m (40% of the European production value). The total import transactions in 2017, in the EU member states, were worth €13,430 m (30% of the European production value). These data include intra and extra EU transactions. The aggregated balance of trade for the European Union (EU28) was

positive, meaning that exports are higher than imports by € 4,554 m. Most of the imports (77%) and exports (69%) are carried out between EU Member states.

. At European level, a decrease of all paper products except packaging and labels is expected. New technologies and electronic media are gaining position in publications and commercial products. As a consequence, printed material as a communication medium is diminishing. Regarding consumers, although they express concerns about the environmental impacts of the printing industry and printing paper products, many of them still prefer paper-based to digitally printed products due to reading habits and lack of internet access. Nevertheless, the vast majority recognises that paper-based communication needs to be sustainable.

3.2.2 Technical analysis – Description of printing technologies

The main aspects regarding printed paper materials and technologies used in the EU are as follows:

- Flexography is a well-established printing technology. It is a high resolution and high productivity process. The use of UV curable inks is increasing.
- Offset is also a crucial technology, but its importance is decreasing. It is a high resolution and very high productivity process. The use of bio-based components in offset ink formulations is increasing. Pre-press is required.
- Publication rotogravure is also an important technique. It is a very high resolution and productivity process. The use of more environmentally friendly retention inks is established in the EU. Pre-press is also necessary.
- Inkjet is also a well presented printing technique. It has a very high resolution and pre-press is not required. The main environmental advantages are low cost per copy for small editions, use of water-based or solid inks (100%) and low waste and emissions.
- The importance of electrography is increasing for office printers and digital print presses at industrial scale. It is associated with low cost per copy for small editions. Pre-press is not required. It is a high resolution printing technology that operates environmentally friendly solid inks (100%) while generating low waste and emissions. On the contrary, relatively small/medium editions are required due to low/medium productivity. Analogous to ink-jet printing technology, a lower print quality and higher production costs are related to high print runs. Moreover, relatively high maintenance costs are associated to electrography.

3.2.3 Life Cycle Assessment

To identify the most important aspects of the examined system, a screening LCA was performed. A critical review of published LCA studies is carried out to draw the main conclusions. This analysis aims at identifying the main environmental areas of concern and lifecycle hotspots and estimating environmental improvements.

Besides the LCA screening, a simplified LCA of two case studies is performed, analysing two standard products a magazine and a book, both produced using offset printing. These LCA have been performed by LEITAT, with primary data from the European LIFE+ project 'Greening Books'. The data are revised and updated for this project.

Most of the papers refer to printed paper products: books, magazines or newspaper while others encompass a comparison between printed and digital products. In those cases, the information about the printed product is analysed.

Most of the journal papers conclude that the main impact of a printed product is sourced to the paper production. On the other hand, printing has also an important environmental

contribution due to the electricity consumption and the chemicals used during the process.

Different points were identified as relevant for the improvement of the environmental profile of printed papers:

- Paper production is the main contributor to the environmental impact; the selection and manufacturing of this paper have to be considered. The introduction of recycled fibre in paper production could lead to an environmental impact reduction.
- Next to fibres, water is the most relevant raw material.
- A clear environmental advantage for vegetable inks in comparison with mineral-based inks cannot be stated.
- Energy consumption is always relevant to the overall impact of a process. For this reason, electricity consumption during printing could be a significant impact contributor. Hence, introducing energy efficiency measures in the printing facilities could reduce the environmental impact.
- The manufacturing process (including printing), is also related to VOCs generation.
- Decisions that are taken in the design stage can determine the amount of paper and ink used, as well as the use of other materials, and therefore should not be ignored.
- End-of-life of printed product has significant life-cycle impacts. For instance, the carbon footprint of newspapers could double if newspapers are disposed of to landfills instead recycled or incinerated.
- The Book system is very sensitive to the number of users per book.

A summary of the hotspots identified during the LCA screening are presented in the following Table 1.

Table 1. LCA for printed paper products - Key impact parameters identified

RAW MATERIALS	
Substrate	Origin: recycled fibres Certification: type I ecolabels
Inks	Origin: vegetable inks or water-based inks
Adhesives	Recyclability: adhesives accepted in the recycling process Best environmental techniques
Other chemicals	Toxicity Best environmental performance
PRODUCTION	
Emissions	Emissions to air: VOC Emissions to water
Energy and water consumption	Energy sources: renewable sources Energy consumption Best environmental practices: annual energy reduction goal Water consumption
Waste	Inks and toners Washing agents, etc. Unsorted waste control
Design	Eco design strategies
PACKAGING	

Quantity	Eliminate or reduce the packaging of the product Avoid unnecessary packaging
Materials	Use of more sustainable options
USE	
Lifespan	Reuse
END-OF-LIFE	
Consumer	Information regarding recyclability
Waste treatment	Recyclability of the product

The conclusion of the LCA screening is that the analysed literature is sufficient to identify environmental hotspots of printed paper products. This information supports adequately the criteria revision process. Nevertheless, additional scientific literature has been consulted, beyond LCA studies, for examining specific parameters, such as chemicals which are not covered by the LCA studies. Furthermore, although LCA papers analyse the whole life cycle stages, specific data on printing technologies and finishing processes are not assessed in detail. Additional technical studies have been analysed to address these limitations.

3.3 Converted paper products

3.3.1 Product group name, scope and definition

Research was carried out in order to review the scope of the product group. Various definitions of converted paper products and related terms are provided as well for the product group in the related industry and in other ecolabel schemes. The outcome of the analysis is further explored under Chapter 4 that provides the rationale for the proposed scope and definition. It also clarifies the reasoning behind the proposal of merging converted paper and printed paper products under one common **Commission Decision**.

3.3.2 Market analysis

The market analysis is based on information gathered from industry, scientific publications and market research reports. In particular, specific data referring to the European market for converted paper products are sourced from official EU production statistics in PRODCOM for distinct categories covered by the Commission Decision 2014/256/EU. The majority of converted products fall under two main NACE codes 17.12 (manufacture of paper and paperboard) and 17.23 (Manufacture of paper stationery). In order to provide an indication of the market structure of converted paper products as defined in the Commission Decision 2014/256/EU, equivalence of these products with those in the identified NACE codes is assumed.

European converted paper products industry is strongly affected by the emergence and expansion of digital media and paperless communication as in most developed countries with consequent impact on the apparent consumption (Figure 5).

According to EUROSTAT, production volumes of converted paper products were at 3,507 tonnes in 2016. This represents a slight increase on 2015 figures (+1.5%), mainly from the increase of paper carrier bags.

For EU28, import trade values of the considered converted paper products amounted to EUR 1,125 billion while exports were at EUR 625 bn. Imports registered slight changes,

in particular imports on carrier bags and on writing material products were increasing by 8% and 2% respectively, in 2017. Similar trends are registered for export trade values with even lesser variations.

Production volumes in future years are estimated for the converted paper products analysed, on the base of historical trends. Paper carrier bags are expected to increase in sold production volumes by about 50% in 2021. For envelopes and other paper stationery products, a 20% to 26% decrease to the sold production in 2016, is expected in 2021.

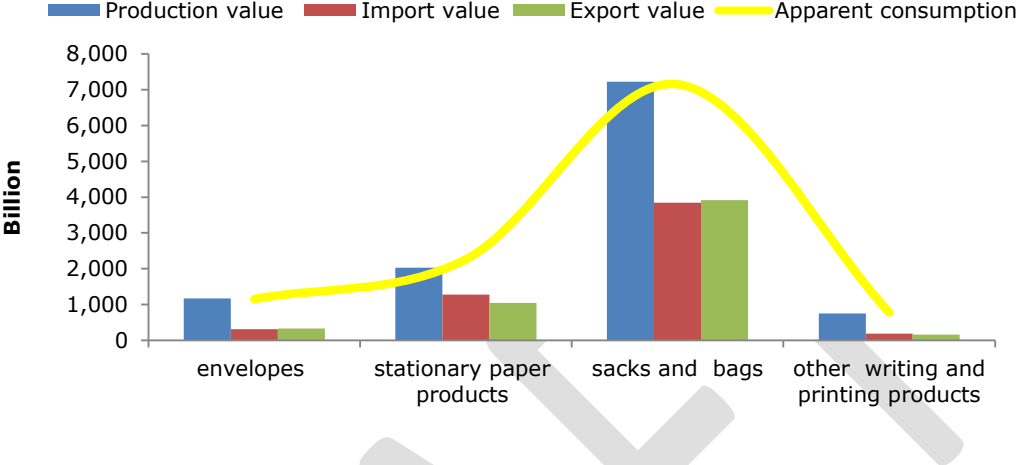


Figure 5. The EU market production, import, export and apparent consumption value for converted paper products in 2016.

The slow market uptake raises concern over difficulties that manufacturers and related stakeholders might be faced in obtaining the EU Ecolabel and whether the scope definition and criteria are representative enough for the common market practices. Hence, a revision of the EU Ecolabel is an excellent opportunity to identify suitable deployment measures to improve the widespread market uptake of the criteria.

3.3.3 Life cycle assessment

To identify relevant environmental impacts of those products along their life cycle a state of the art of the current published studies on the life cycle assessment of the converted paper products covered by the EU Ecolabel has been carried out. Hence, documents and LCA studies whose scope and definition includes, as a minimum, the supply of raw materials and manufacturing of converted paper products were collected and reviewed. When it was possible, LCA studies and LCA related analysis were also carried out based on primary data provided by actors in the related industry. This was the case for those products whose LCA studies were not publicly available or did not contain sufficient information needed to inform the revision process for example envelopes.

According to the LCA studies analysed, it was possible to identify the environmental hotspot across product life cycle. The figure below illustrates the various life cycle stages of a converted paper product such as paper carrier bags, envelopes, notebooks, folders etc.

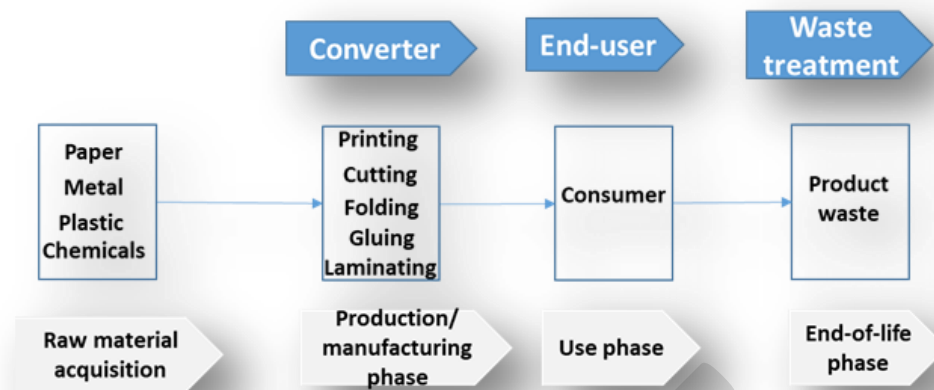


Figure 6. Various life cycle stages of a converted paper product

The LCA studies reviewed and considered for the different converted paper products indicate that:

- The use of recycled paper in paper carrier bags has a positive effect on both energy and materials related impacts
- Envelopes with windows made up of reduced/recycled plastic have reduced environmental impacts
- Notebooks with spiral binding (plastic or fibre cover) generally have higher impacts
- Among filing stationery products, impacts of lever arch files are the highest followed by those of archive boxes.

In these products, the bulk of impacts (more than 70%) will occur at the upstream raw materials acquisition/production phase. For GWP, the contribution from raw materials acquisition/production, though lesser in the case of other impacts, is still predominant followed by contributions from the manufacturing or converting phase. In the case of paper carrier bags, 33% of GWP comes from the raw material production phase while 21% from the carrier bags manufacturing phase. Further analysis on impacts occurring at the raw materials acquisition phase has shown significant contributions related to the production of pulp and paper used in these products. For all impact categories considered, pulp and paper's production contributes to about 90% of total impacts.

Considering the contribution from non-paper contents of converted paper products, metal components have a higher share of impacts compared to plastics. When comparing two notebooks with the same writing area (one with metal coil binding, and the other without), the former can be attributed 29% to 43 % more impacts than the latter for marine, freshwater and terrestrial eco-toxicity, and 17% for particulate matter formation. Chemicals including ink appear to contribute very little to impacts of the raw material acquisition of converted paper products. In the case of envelopes, inks contribute barely 3% to all impacts except Terrestrial eco-toxicity where the contribution is 19%.

Table 2. Link between the impact hotspots and the revised EU Ecolabel criteria for converted paper products

Environmental aspects related to converted and printed paper	EU Ecolabel criteria	Comments in the related criteria
Abiotic depletion fossil	Criterion 1 – Paper and board substrate	It ensures a reduction in energy use, which is the main source of impacts in the pulping, papermaking and board making processes in particular the use of recycled paper. It limits the emissions to air of CO ₂ e emissions arising mainly from the energy consumption in the pulping, papermaking and board making process
	Criterion 6 – Energy use	It promotes energy efficiency practices in the converting and printing processes ensuring that production sites reduce their energy consumption following a continuous improvement approach. It limits energy use in printing processes through maximum energy consumption thresholds for various printing technologies.
Global warming potential	Criterion 1 – Paper and board substrate	It limits the emissions to air of CO ₂ e emissions arising from the pulping, papermaking and board making process.
		It ensures a reduction in energy use, which is the main source of CO ₂ e emissions in the pulping, papermaking and board making processes.
Photochemical oxidation	Criterion 2 – Excluded or limited substances and mixtures	It limits the use of washing agents, varnishes, inks dyes and solvents containing VOC mainly responsible for tropospheric ozone depletion.
	Criterion 5 - Emissions	It limits the emissions of VOC in the converting and printing processes responsible for ozone depletion which increases risks of mortality from respiratory diseases.
Human toxicity	Criterion 1 - Substrate	It limits the hazardous substances and mixtures that can be included in paper, board and pulp, limiting environmental and health risks for employees and consumers.
	Criterion 2 – Excluded or limited substances	It limits the hazardous substances and mixtures that can be included in the converting and printing processes to avoid environmental and health risks for employees and consumers.
Abiotic depletion elements	Criterion 1 – Paper and board Substrate	It ensures that pulp, paper and board production sites have appropriate waste management systems in place, maximizing the recovery of materials and ensuring safe disposal of hazardous waste
	Criterion 1 – Paper and board substrate	It promotes sustainable sourcing of paper fibres through the use of sustainable forest management and chain of custody certificates. Resource conservation is also encouraged

Environmental aspects related to converted and printed paper	EU Ecolabel criteria	Comments in the related criteria
		through the use of recycled paper in the manufacture of pulp, paper and board.
	Criterion 6 - Waste	It ensures that converted and printed paper production sites have appropriate waste management systems in place, minimising waste generation, maximizing the recovery of materials and ensuring safe disposal of hazardous waste
	Criterion 4 - Recyclability	It ensures that converted and printed paper products are recyclable at end of life by limiting the use of substances and components that can hinder the recycling process, for example wet strength agents, adhesives, varnishes, lamination and components, especially inks, that are not easily removable.
Eutrophication	Criterion 1 – Paper and board Substrate	It limits, during pulp, paper and board production, emissions of substances to water that have nutrient-enriching effects and lead to high oxygen demand
Acidification	Criterion 1 – Paper and board Substrate	It limits emissions of SO ₂ from pulp, paper and board production responsible for health hazards due to acid rain
Water pollution	Criterion 5 - Emissions	It limits the direct discharge of silver, chromium and copper to the municipal sewage system by applying hazardous waste treatment on wastewater releases.
Exposure to Substances of Very High Concern	Criterion 2 – Excluded or limited substances and mixtures	It restricts the use in printing and converted paper processes of substances that have been identified as hazardous or toxic to humans and other organisms
Exposure to substances that are carcinogenic, mutagenic and/or toxic for reproduction		
Exposure to substances that contribute to aquatic toxicity, acute toxicity and specific target organ toxicity		

shows the relation between the impact hotspots and revised EU Ecolabel criteria.

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Table 2. Link between the impact hotspots and the revised EU Ecolabel criteria for converted paper products

Environmental aspects related to converted and printed paper	EU Ecolabel criteria	Comments in the related criteria
Abiotic depletion fossil	Criterion 1 – Paper and board substrate	It ensures a reduction in energy use, which is the main source of impacts in the pulping, papermaking and board making processes in particular the use of recycled paper. It limits the emissions to air of CO ₂ e emissions arising mainly from the energy consumption in the pulping, papermaking and board making process
	Criterion 6 – Energy use	It promotes energy efficiency practices in the converting and printing processes ensuring that production sites reduce their energy consumption following a continuous improvement approach. It limits energy use in printing processes through maximum energy consumption thresholds for various printing technologies.
Global warming potential	Criterion 1 – Paper and board substrate	It limits the emissions to air of CO ₂ e emissions arising from the pulping, papermaking and board making process.
		It ensures a reduction in energy use, which is the main source of CO ₂ e emissions in the pulping, papermaking and board making processes.
Photochemical oxidation	Criterion 2 – Excluded or limited substances and mixtures	It limits the use of washing agents, varnishes, inks dyes and solvents containing VOC mainly responsible for tropospheric ozone depletion.
	Criterion 5 - Emissions	It limits the emissions of VOC in the converting and printing processes responsible for ozone depletion which increases risks of mortality from respiratory diseases.
Human toxicity	Criterion 1 - Substrate	It limits the hazardous substances and mixtures that can be included in paper, board and pulp, limiting environmental and health risks for employees and consumers.
	Criterion 2 – Excluded or limited substances	It limits the hazardous substances and mixtures that can be included in the converting and printing processes to avoid environmental and health risks for employees and consumers.
Abiotic depletion elements	Criterion 1 – Paper and board Substrate	It ensures that pulp, paper and board production sites have appropriate waste management systems in place, maximizing the recovery of materials and ensuring safe disposal of hazardous waste
	Criterion 1 – Paper and board substrate	It promotes sustainable sourcing of paper fibres through the use of sustainable forest management and chain of custody certificates. Resource conservation is also encouraged

Environmental aspects related to converted and printed paper	EU Ecolabel criteria	Comments in the related criteria
		through the use of recycled paper in the manufacture of pulp, paper and board.
	Criterion 6 - Waste	It ensures that converted and printed paper production sites have appropriate waste management systems in place, minimising waste generation, maximizing the recovery of materials and ensuring safe disposal of hazardous waste
	Criterion 4 - Recyclability	It ensures that converted and printed paper products are recyclable at end of life by limiting the use of substances and components that can hinder the recycling process, for example wet strength agents, adhesives, varnishes, lamination and components, especially inks, that are not easily removable.
Eutrophication	Criterion 1 – Paper and board Substrate	It limits, during pulp, paper and board production, emissions of substances to water that have nutrient-enriching effects and lead to high oxygen demand
Acidification	Criterion 1 – Paper and board Substrate	It limits emissions of SO ₂ from pulp, paper and board production responsible for health hazards due to acid rain
Water pollution	Criterion 5 - Emissions	It limits the direct discharge of silver, chromium and copper to the municipal sewage system by applying hazardous waste treatment on wastewater releases.
Exposure to Substances of Very High Concern	Criterion 2 – Excluded or limited substances and mixtures	It restricts the use in printing and converted paper processes of substances that have been identified as hazardous or toxic to humans and other organisms
Exposure to substances that are carcinogenic, mutagenic and/or toxic for reproduction		
Exposure to substances that contribute to aquatic toxicity, acute toxicity and specific target organ toxicity		

In the case of Criterion 1, potential savings in energy can be achieved by using recycled paper. LCA study showed that paper carrier bags with 85% recycled content leads to 38.6% less primary energy use compared to 100% virgin paper bags. Also in the case of acidification and Eutrophication potential only 15% virgin fibre contributes to 24% and 48% of impacts respectively.

As regards consumption of raw materials or natural resources, reducing the window plastic content by 2% leads to savings of 9% Abiotic depletion fossil and reduces impacts by 5% for Global warming potential and 3.7 % for Acidification.

3.3.4 Technical analysis

A technical analysis was focused on the converting processes applied on paper and board, from the paper making process to produce converted paper articles. The aim of this analysis was to shed light on environmental issues that result from design and production techniques adopted for converted paper products. It enabled to identify improvement potential and best practices related to the LCA results. The outcome of the study will be incorporated into Rationales for the revision proposal for each corresponding criterion.

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4 PRODUCT GROUP SCOPE AND DEFINITION

Current scope (printed paper products)

- 1). The product group 'printed paper' shall comprise any printed paper product that consist of at least 90 % by weight of paper, paperboard or paper-based substrates, except for books, catalogues, booklets or forms that shall consist of at least 80% by weight of paper or paperboard or paper-based substrates. Inserts, covers and any printed paper part of the final printed paper shall be considered to form part of the printed paper product.
- 2). Fixed inserts to the printed paper product (not intended to be removed) shall fulfil the requirements of the Annex to this Decision. Inserts that are not fixed to the printed paper (such as flyers, removable stickers) but sold or provided with it, shall fulfil the requirements of the Annex to this Decision only if the EU Ecolabel is intended to be placed on them.
- 3). The product group 'printed paper' shall not include the following:
 - 3a). Printed tissue papers;
 - 3b). Printed paper products used for packaging and wrapping;
 - 3c). Folders, envelopes, ring binders and stationary paper products.

Current scope (converted paper products)

- 1). The product group 'converted paper products' shall comprise the following products:
 - 1a). envelopes and paper carrier bags that consist of at least 90 % by weight of paper, paperboard or paper-based substrates
 - 1b). stationery paper products that consist of at least 70 % by weight of paper, paperboard or paper based substrates, except for suspension files and folders with metal fastener subcategories

In the case referred to in point (1b), the plastic component cannot exceed 10% except for ring binders, exercise books, notebooks, diaries, and lever arch files where the plastic weight cannot exceed 13%. Furthermore, the metal weight cannot exceed 30 g per product except for suspension files, folders with metal fasteners and ring binders where it can be up to 50 g and except for lever arch files, where it can up to 120 g.

- 2). The product group 'converted paper product' shall not include the following products
 - 2a). printed paper products included in the EU Ecolabel as established in Commission Decision 2012/481/EU
 - 2b). Packaging products (with the exception of paper carrier bags)

Proposed revised scope for the product group: printed paper, stationary paper, and paper carrier bags products.

The product group 'printed paper, stationary paper, and paper carrier bag products' shall comprise the following products:

2. printed paper products that consist of at least 90 % by weight of paper, paperboard or paper-based substrates, except for books, catalogues, booklets or forms that shall consist of at least 80 % by weight of paper or paperboard or paper-based

- substrates. Inserts, covers and any printed paper parts of the final product shall be considered to form part of the product
3. envelopes that consist of at least 90% by weight of paper, paperboard or paper-based substrates;
 4. paper carrier bags including paper wrappings and gift paper that consist of 100 % by weight of paper, paperboard or paper-based substrates;
 5. stationery paper products including filing products that consist of at least 70 % by weight of paper, paperboard or paper based substrates, except for suspension files and folders with metal fastener for stationery paper products;

For the products referred to in points (a) fixed inserts to the printed paper product (not intended to be removed) shall fulfil the requirements of the Annex to this Decision. Inserts that are not fixed to the printed paper (such as flyers, removable stickers) but sold or provided with it, shall fulfil the requirements of the Annex to this Decision only if the EU Ecolabel is intended to be placed on them.

For products referred to in point (d) the plastic component cannot exceed 10 % except for ring binders, exercise books, notebooks, diaries, and lever arch files where the plastic weight cannot exceed 13 %. The metal weight cannot exceed 30 g per product except for suspension files, folders with metal fasteners, ring binders and lever arch files having a filing capacity of up to 225 sheets where it can be up to 50 g and except for lever arch files having a filing capacity of more than 225 sheets, where it can be up to 170 g.

The product group 'printed paper, stationary paper, and paper carrier bag products' shall not include the following products:

- (a) packaging (with the exception of paper carrier bags and gift wrappings);
- (b) corrugated board;
- (c) products falling within the product group 'tissue paper and tissue products' as defined by Article 2 in Commission Decision (EU) 2019/70;
- (d) fragranced printed paper products, fragranced stationary paper products, and fragrance carrier bags;
- (e) PVC shall not be used

4.1 Scope merging

The ISO 4046-1 2016 defines "converting" as the set of processes or operations applied after the basic paper or board manufacturing. Therefore, the term "conversion" usually refers to series of operations that aim at transforming raw paper into new finished products, such as books, envelopes, paper tubes, paper towels, paper bags, boxes, containers, and a full range of other paper-based articles of different function and destination. Printing might therefore form an integral part of the conversion process.

The compatibility of the two product groups is also reflected by the overlap between the currently valid criteria. Hence, some ecolabel schemes, such as Nordic Swan, accommodate converted and printed paper products under one scope.

The EU Ecolabel is a part of the wider portfolio of product policy instruments that contribute to the circular economy targets. The Fitness Check study (evaluation study and stakeholder consultation) shows that the uptake of the schemes could be better and more efficient if applying a more focused approach to maximize impacts on the ground (EC, 2017)⁴. In order to improve the performance of the EU Ecolabel regulation scheme,

⁴ REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL on the review of implementation of Regulation (EC)No 122/2009 of the European Parliament and of the Council on 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme

making it more focused to ensure bigger cumulative impact, a more targeted approach should be developed. It should include bundling of closely related product groups where appropriate. The above mentioned Fitness check conclusions support the idea to merge both Decisions into one (i.e. as currently being done for graphic and tissue paper).

With the objective to ensure coherence between different product groups, and avoid redundancy, this revision tends towards aggregating category similar articles, for which analogous criteria could apply, within the same product group. The scope and definitions of merged product groups should be further explored and discussed with stakeholders.

Furthermore, the magnitude of correlation between the product groups justifies the preparation of one technical report for the two product groups. The latter addresses common areas while distinguish between the product specific issues.

Outcomes from and after the 1st AHWG meeting

Some stakeholders expressed an opinion that having one Commission Decision with one Annex that accommodates differences between the product groups is an appropriate proposal, and thus merging both product groups seems a right direction. On the other side, it was noted that merging the two product groups under one Annex might be confusing given that conversion and printing activities represent different industries.

4.2 PROPOSED FRAMEWORK FOR THE REVISION OF THE EU ECOLABEL CRITERIA AND KEY MODIFICATIONS

4.2.1 Revised product group name and definition

The division of converted and printed paper products might have been misleading for a consumer, especially considering that the same article might be both printed and converted i.e. envelopes.

Converted paper products accommodate a broad number of paper based-products of different functions. From the market perspective, converted paper product is mainly represented by the packaging material (in volume and value), followed by food contact material, and tissue product⁵. The products proposed to be included in the scope of the EU Ecolabel criteria are: office stationery paper products (including envelopes), paper carrier bags, and wrapping paper. Therefore, the currently used name might indeed be misleading for a potential applicant and a consumer.

In order to well reflect the intention of the revised product group it is proposed to change the name of the product group to: printed paper, stationery paper, and paper carrier bags products. Wrapping paper is proposed to be allocated under the definition of carrier bags, based on the wraparound function.

4.2.2 Proposed criteria structure

A scheme representing the current criteria and the ones after merging is depicted in **Error! Reference source not found.**

(EMAS) and the Regulation (EC) No 66/2010 of the parliament and of the Council of 25 November 2009 on the EU Ecolabel. COM(2017) 355 final

⁵ http://susproc.jrc.ec.europa.eu/Converted_paper_products/

Table 3. Structure of the revised criteria

Criterion	Printed Paper (PP) Decision 2012/481/EU	Converted Paper Products (CPP) Decision 2014/256/EU	Proposed structure of the revised EU Ecolabel criteria
Substrate requirements	Criterion 1	Criterion 1	Criterion 1
	1 (a) Referred to EU Ecolabel for graphic paper (2011/333/EU)	1 (a) Referred to EU Ecolabel for graphic paper (2011/333/EU), for newsprint paper (2012/448/EU)	
	1 (b) Referred to EU Ecolabel for newsprint paper (2012/448/EU)	1 (b) Board Substrate requirements	
Fibres: sustainable forest management	(requirement covered by EU Ecolabel for graphic paper, and newsprint paper)	Criterion 2	
Excluded or limited substances and mixtures	Criterion 2	Criterion 3	Criterion 2
Hazardous substances and mixtures	2 (a)	3 (a)	2 (a)
Substances listed in accordance with Article 59(1) of Regulation (EC) No 1907/2006	2 (b)	3 (b)	2 (b)
Biocides	2 (c)	3 (c)	2 (c)
Washing agents	2 (d)	3 (d)	2 (d)
Alkylphenolethoxylates – Halogenated solvents – Phthalates	2 (e)	3 (e)	2 (e)
Printing inks, toners, inks, varnishes, foils and laminates	2 (f)	3 (f)	2 (f)
Metal components	-	3 (g)	2 (g)
Recyclability	Criterion 3	Criterion 4	Criterion 3
Emissions (from printing/convert ing process)	Criterion 4	Criterion 5	Criterion 4
Emissions to water	4 (a)	5 (a)	4 (a)
Emissions to air	4 (b)	5 (b)	4 (b)
Emissions from publication rotogravure printing	4 (c)	-	4 (c)
Printing processes to which no legislative measures apply	4 (d)	-	4 (d)
Waste	Criterion 5	Criterion 6	Criterion 5
Waste management	5 (a)	6 (a)	5(a)
Waste paper	5 (b)	6 (b)	5 (b) Paper for recycling from printing facilities 5 (c) Paper for recycling from stationary paper product and carrier bags production sites
Energy use	Criterion 6	Criterion 7	Criterion 6
Training	Criterion 7	Criterion 8	Criterion 7
Fitness for use	Criterion 8	Criterion 9	Criterion 8
Information on the product	Criterion 9	Criterion 10	Criterion 9
Information appearing on the EU Ecolabel	Criterion 10	Criterion 11	Criterion 10

4.2.3 Printed paper products –

Specific scope modification proposals were presented during the 1st AHWG Meeting

Analysis of extension to printed products to printing services

If the scope is extended so that printing companies could be certified. In the questionnaire, stakeholders were asked about the possibility to change the product group of printed paper products from product to service. As result, 17% of the stakeholders agree to change to service, 26% are against this modification while 40% of the stakeholders are not sure about the change. Considering the replies, a clear conclusion on the stakeholders' interest cannot be extracted.

Ahead of the scope merging, an expansion to services would impose modifications or development of additional criteria. To certify a company which produces ecolabelled and non-ecolabelled products simultaneously might increase the complexity of verification. An additional constraint will rise due to the scope merging thus addressing the scope of the printed and converted paper on the equal bases.

All in all, from the perspective of the criteria revision process, **it is not recommended to accommodate printing service under the criteria set.**

Outcomes from and after the 1st AHWG meeting

The importance to keep the licence on the product was stressed. In this sense, service oriented criteria might cause an increase in the number of certified companies but it will not necessarily stimulate the product certification.

The proposal was also perceived as confining for the print houses with different printing lines (certified and not certified). A focus on printing service would lead to disadvantages as the end-product could not be certified. Additionally, substrate that cannot be certified might be requested by a client.

Other stakeholders supported service approach clarifying that service oriented criteria could improve the certification and reduce overall environmental impact of print houses. Service oriented criteria were perceived as straightforward to be verified. The site could produce ecolabelled and non-ecolabelled products, but at least criteria for emissions, waste, etc would apply to the entire company. Product ecolabelling would depend on paper substrate and also specific criteria for a product.

The product line certification, as adopted by Blue Angel was discussed. It was assumed as possible compromise between service and product approach. Blue Angel addresses the printing house when evaluating energy, waste management, and emissions. Criteria apply to product or product group and address main environmental aspects. If a product is accepted, it does not need to be re-checked for each product line.

Further research and main changes

The feasibility to convert product oriented criteria into service oriented ones was analysed (The feasibility to certify a product line, based on Blue Angel criteria (RAL-UZ 195) for printed matter, is proposed to be included in the Preamble to the Annex (for the further details, see: page 37).

Table 4).

Product oriented approach addresses the specific product that a company wishes to certify. This influences the environmental performance of the whole company, directly through thresholds for a product manufacturing, and indirectly through increase of the environmental awareness of the whole company. From the LCA perspective, it is not recommendable to mix a functional unit for service and another for product. In this sense, the LCA of companies is regulated by the Organisational LCA or OLCA and similar

methodologies in PEF with OEF (Organizational Environmental Footprint). Certification of a service that ends with a product will not be visible to a consumer.

The feasibility to certify a product line, based on Blue Angel criteria (RAL-UZ 195) for printed matter, is proposed to be included in the Preamble to the Annex (for the further details, see: page 37).

Table 4 Comparison between product and service oriented criteria for the product group under revision

Service oriented	Product oriented
Scope	
Service oriented – defines a type of service (printing, conversion)	Product oriented – defines a product – i.e. envelope, magazine
Well defined service (activity)	Well defined product that is covered by a scope (production)
Business model oriented in providing a service	Business model oriented in product manufacturing
LCA	
Functional unit for service	Functional unit for product
Organisational LCA (OLCA)and similar methodologies PEF with OEF (Organizational Environmental Footprint).	Product - oriented LCA
Certification - criteria	
1. Criteria need to address the operation of the printing or conversion house 2. If a company or service is ecolabelled, this will require an additional certification for the specific products (similar to Nordic approach).	Product base approach addresses the specific products that a company wishes to certify. Product certification affects the company operation: 1. directly through thresholds related to the product and 2. indirectly increasing the company’s awareness of less impacting practices that can be adopted in the whole company.
Consumer perception	
Manufacturers sells the service, if the product is not separately certified consumer does not recognise the certification.	1. Conversion and printing process aim at production of the final product that is provided to a consumer 2. Manufacturer sells the product that is certified

Extension to other printed paper products, inclusion/exclusion of specific products

The extension of the scope regarding products is suggested by some stakeholders (31% of the questionnaire respondents). However, 34% of them do not see a scope amendment as necessary.

An extension of the scope by merging the printed and converted paper products was suggested.

Exclusion or inclusion of specific printing technologies

The current EU Ecolabel scope does not exclude any specific printing technologies, so in practice all printing techniques can be used for printing eco-labelled products. The exclusion of some of them will be discussed in the first AHWG meeting. The reasons for exclusions could be related to different aspects, such as:

- The market uptake of specific printing technologies.
- Uncertainties of the sustainability behaviour of some emerging technologies and innovations.

As example, the Nordic Swan excludes screen and letterpress printing in the fifth generation of its criteria. Letterpress is an old method which, in practice, has been replaced by flexography. Screen printing is used extensively in connection with materials other than paper. In a similar way, the Blue Angel scope specifies that the product must be produced using one or more of the following printing processes sheet-fed offset, cold-set web offset, heat-set web offset, rotogravure, flexographic or digital printing.

Outcomes from and after the 1st AHWG meeting

Existing or future technologies should be eligible for meeting the criteria, which include process-specific requirements. The EU Ecolabel should not close the door to technologies that in the future may achieve the same environmental performances as current technologies.

Accordingly, no specific exclusion or inclusion of printing technique is proposed to be introduced.

4.2.4 Converted paper products – Technical specifications of the scope revision proposal

According to ISO 4046-: 2016, conversion process is defined as the manufacturing and finishing processes or operations applied to paper or board. This general understanding is also reflected in the NACE code 17 which splits the manufacture of pulp, paper and paper products into the manufacture of pulp, paper and the manufacture of converted paper products, the latter referring to further-processing of paper.

There is a broad range of products that are classified as converted paper products. The current scope focuses on selected stationary paper products (including envelopes), and paper bags.

In order to aid understanding and reduce confusion among manufacturers of converted paper products, it is proposed to further discuss if the product group name and definition should specify product types that are included (based on functionality and end use that shall be considered), namely: *paper stationery and paper wrapping*.

As a matter of fact, envelopes are classified as stationeries under the NACE classification and understood as such by the related industry. Gift wraps have a similar production process (and hence environmental impacts) as paper carrier bags which are included in the existing scope. The use of the name 'wrappings' stems from the CEPI classification of paper which includes sack kraft, machine glazed paper (MG), other wrapping kraft, sulphite and grease-proof papers. The packaging material is excluded from the scope, therefore a specific provision is needed for paper carrier bags and gift wraps that are proposed to be included in the scope.

The proposed scope does not address labels mainly because there was not sufficient information to assess their environmental impacts. However, it is worth mentioning that labels used in converted paper products are limited to those on the back of lever arch files and ring binders, where they constitute less than 0.2% of weight. Following information received from stakeholders, labels are externally supplied articles and their

verification increases administrative burdens of the scheme. It should therefore be further discussed if labels should not be exempted from the fulfilling of criteria requirements.

As regards non-paper content, Blue Angel allows a maximum of 5% non-paper content in printing and writing paper products, mainly stationeries except those for filing purpose. Feedback from industry also identified plastic content in envelopes at barely 4% (Table 5).

Table 5. Material input for envelope manufacturing

Material	Weight (kg)	Content (%)	Comments
Paper	0.0052987	93.9%	Actual paper content of envelope
Plastic	0.0001990	3.53%	
Chemicals	0.0001447	2.56%	
Waste paper	0.000912879	14.70%	Percentage of waste paper on total envelope paper input

Source: FEPE (2018)

For writing stationeries i.e. notebooks, the most of the weight is attributed to paper content. It implies that plastic and metal components might be kept as low as possible. In fact, the recently published equivalent Blue Angel criteria document limits these components to 5%. It is therefore subjected to the further discussion if it is possible to lower the threshold for non-paper content from 10 to 5%. This would represent a more stringent requirement and will result in lower environmental impacts of the product group.

A different threshold for non-paper content, mainly metals, is proposed for filing products like suspension files, ring binders and lever arch files because these components are closely related to the functional properties and durability of the products. Ring binder mechanisms are made up of steel and their weight contributes to the resistance of the folder as well as multi-opening process.

Ring binder mechanisms are usually built up of 3 components, the housing, the carrier rails inside the mechanism and the rings, riveted on the carrier rails. Tests have shown that a reduction of material thickness, thus the weight, causes a significant reduction of a mechanisms lifetime. Reducing the metal weight resulted in a reduction of the opening and closing cycles from an average 50,000 to 3,000-5,000 cycles. Furthermore, a 0.05mm reduction in thickness of the housing material causes a drop of the opening and closing force in some cases of almost 50%. This is also valid for the carrier rails inside the mechanisms.

Tension forces are required to guarantee a proper snap up while opening and an accurate closing force is necessary to hold the paper inserts securely. Due to no additional blocking or spring elements inside the mechanism needed for these tension purposes, the natural resilience of steel is used.

Feedback from industry identified different types of ring binders and lever arch files with differing metal content (see table below).

A closer look at the products reveal that the metal content varies according to type of filing product, size and especially the back size and number of rings. Highest metal content is registered for lever arch files with 80 mm back size and 2 rings. In general, the metal content in levered arch file is of range 99-107 grams, whereas for ring binders from around 20 to 155 grams (Figure 7).

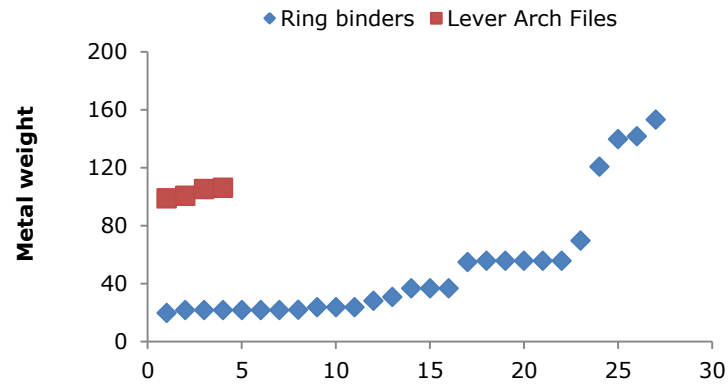


Figure 7 Weight of metal content in ring binders and lever arch file
Source: Hamelin Brands

Table 6. Variability of metal content in different filling products

Description	Sizes (paper format)	Nr. of rings	Back size (mm)	Metal content (gr)
Ring binders				
	A6	2	35	31
	A4	2	35	18
	A4	2	40	31
	A4	2	50	13
Static use	A4	4	20	60
	A4	4	25	61
	A4	4	40	66
	A4	4	40	66
	A4+	4	45	61
	24x32	4	40	61
Nomad use	24x32	4	40	71
	24x32	4	40	61
	24x32	2	30	31
	A4	2	50	31
	A4	4	40	61
Lever arch files				
Static use	A4	2	50	94
	A4	2	50	94
	A4	2	80	112
	A4	2	80	138
	A4	2	80	138
	A4	2	50	94
	A4	2	50	94
	A4	2	80	112
	A4	2	80	112
	A4	2	80	138

Source: Converted paper products EU Ecolabel Criteria. Draft Background report V3 (2013)

There is also a relation between back size and storage capacity of filing products as reported in Table 7.

Table 7. Typical characteristic of filing products

Back size (mm)	Ring diameter or height (mm)	Storage (Nr. A4 sheets)
25	15	100
35	25	165
40	30	225
55	30	400
75	55	500
80	65	750

Source: Hamelin Brands

The figures show that storage capacity increases with increase in back size and ring diameter/height requires higher metal content.

Hence, considering the above mentioned aspects, **it is proposed to adopt a functionality based threshold** for these product types. Proposed threshold for metal content is based on the storage capacity, and be summarised as follows:

- Up to 225 sheets: 50 g
- From 225 to 750 sheets: 170 g.

Therefore, the proposed scope could maintain the 50g threshold of the existing EU Ecolabel associating this, however, with the storage capacity, 225 A4 sheets. This is applied also to lever arch files, which was not the case in the existing EU Ecolabel. Furthermore, the 120g metal content threshold for lever arch files in the exiting EU Ecolabel is proposed to be increased to 170g, being applicable only for products with storage capacity higher than 225 sheets.

Outcomes from and after the 1st AHWG meeting

Stakeholder proposed to revise the threshold for non-paper content on the base of the product functionality. In general it was accepted to exclude labels from the scope.

The split view was observed as to the requirement on leaflets. It was proposed to 1) maintain the current requirement for leaflets or 2) to establish weight threshold at a level similar to the threshold proposed for the non-paper components.

The value of min. 80 % of paper content was perceived as too low; The increase for all products except for folders with metal fasteners up to 95 % (at least up to 90 %) was proposed.

The proposal to lower non-paper content threshold to 5% was perceived as not feasible in case of envelopes considering that it would exclude all envelopes. Furthermore the use of glassine paper for envelopes' windows was proposed to be further analysed.

The specific exclusion of corrugated board was proposed to be introduced in the product group scope and definition. Corrugated board is manufactured in different processes than graphic paper and thus requires additional operations that are not addressed by the EU Ecolabel criteria for copying and graphic paper. It was also requested to delete pads from the scope.

Further research and main changes

Labels

Following the feedback collected labels should be recognised based on their functionality, as follows:

1. Labels related to the usage of an article;
2. Identification labels (i.e. "back labels");
3. Labels used on the packaging of the article (i.e. printed descriptive insert, label with code-bar, etc.).

The 0.2 % w/w cut-off rule for labels, as proposed during the 1st AHWG Meeting, was perceived as too low. The use of synthetic labels that could serve as a substitute would require technical changes in the majority of labelling machines. It was therefore proposed to increase the threshold to 0,5% w/w separately for functional and identification labelling, and for the scope clarity it was proposed to specifically exclude packaging together with the respective labelling placed on it.

Identification labels in the form of loose paper i.e. identifiers in arch leveller file, are easy to be separated (not adhered to the product). Stickers that adhere to the product most probably will remain as rejects during re-pulping.

Identification labels used on the external packaging of the final product are proposed to be specifically excluded from the scope being allocated to the product packaging.

Labels and stickers are purchased by a potential applicant from the external suppliers. No ecolabel scheme has been identified for this type of product. Considering the limited % weight content of stickers in a final product, in order to reduce the administrative burdens it is proposed to exempt labels and stickers from fulfilling the requirements.

Alternatively, it is to be further discussed if the use of labels that adhere to the final product should be limited. In this case it could be proposed to establish the following rule: stickers or labels fixed to the product (not intended to be removed) that consist of less than 0,5% w/w of the final product are exempted from the verification;

Inserts

Insert are often provided to the printer in the ready-to-use form. The capacity of the applicant (print house) to verify if they meet the criteria is considered as highly limited. Not fixed inserts as being easily separable from the final product can be considered as an individual item, thus not forming part of a certified end-product. It is therefore proposed to maintain the currently valid specification: (...) *fixed inserts to the printed paper product (not intended to be removed) shall fulfil the requirements of the Annex to this Decision. Inserts that are not fixed to the printed paper (such as flyers, removable stickers) but sold or provided with it, shall fulfil the requirements of the Annex to this Decision only if the EU Ecolabel is intended to be placed on them.*

Use of glassine paper in envelopes

Paper envelopes can be produced with or without a window. Window used in envelopes in most cases consist of polystyrene film. In some cases glassine paper is used. Glassine paper is a greaseproof paper obtained through the process of pulp beating (pulp refining) that consists on the mechanical (energy consumption) action applied to wet pulp. The resulting glassine paper product is semi-transparent, has a densely packed fibre structure, increased rigidity, and smooth and glossy surface.

Following the feedback collected, due to the limited transparency, glassine windows might disturb machine readability i.e. for automatic mails insertion; and they may be more prone to tearing than plastic film. The pure glassine paper (not siliconized) can be reprocessed but if it is treated (i.e. siliconised), it is undesirable in a paper mill. From the

recyclability standpoint, glassine papers, whilst not being damaging to the process, cannot readily be re-pulped and therefore often pass into the mill waste stream⁶. Accordingly, no specific recommendation for the use of envelope's window made of glassine paper is proposed to be introduced.

% content w/w of non-paper components

Following the feedback collected, the value of 80 % w/w of paper content in "Books, catalogues, pads, booklets or forms that shall consist of at least 80 % by weight of paper or paperboard or paper-based substrates" was perceived as too low. It was recommended to increase the paper substrate content for all products addressed by the scope, except from folders with metal fasteners, up to 95 % (at least up to 90 %). The revised proposal of the scope indicates the following paper of paper-based substrate content.

- Printed paper that comprises any printed paper products that consist of at least 90 % by weight of paper, paperboard or paper-based substrates, except for books, catalogues, pads, booklets or forms that shall consist of at least 80 % by weight of paper or paperboard or paper-based substrates. Inserts, covers and any printed paper parts of the final product shall be considered to form part of the product;
- Envelopes that consist of at least 90% by weight of paper, paperboard or paper-based substrates;
- Paper carrier bags including paper wrappings and gift gift paper that consist of 100 % by weight of paper, paperboard or paper-based substrates;
- Stationery paper products including filing products that consist of at least 70 % by weight of paper, paperboard or paper based substrates, except for suspension files and folders with metal fastener for stationery paper products;

Polyvinyl chloride

In line with the feedback collected it is proposed to specifically exclude the use of PVC from the scope of the products group. The exclusion of PVC aligns the revised criteria with EU Ecolabel criteria for other product groups, such as Footwear, or Furniture.

Points for discussion:

1. Is the revised name and definition of the product group appropriate?
2. Is the scope and definition clearly defined?
3. Does the proposed cut-off % w/w of non-paper components address the product design and functionality? Or the threshold for non-paper components should be further revised
4. Considering the low % weight content of labels and stickers in a final product, in order to reduce administrative burdens, it is proposed to exempt labels and stickers from meeting the criteria. Or should stickers or labels fixed to the product (not intended to be removed) meet the criteria if they consist of more than 0,5% w/w of the final product
5. Inserts are proposed to be addressed analogically to the currently valid scope and definition with the distinction between elements that are fixed and non-fixed to the final product.
6. PVC is proposed to be excluded from the scope. This harmonises the revised criteria with EU Ecolabel criteria for other product groups.

⁶Confederation of paper Industries (CPI). Paper and Board. Packaging. Recyclability Guidelines. Available at: <https://paper.org.uk/PDF/Public/Publications/Guidance%20Documents/CPI%20Recyclability%20Guidelines%20Final.pdf>

5 ASSESSMENT AND VERIFICATION

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Aims of the criteria

The EU Ecolabel criteria target the best environmental performing printed paper, stationary paper, and paper carrier bag products on the market. Whilst the use of chemical products and the release of pollutants is an inevitable part of the production process, a product that bears the EU Ecolabel guarantees to the consumer that the use of such chemicals and associated emissions of pollutants have been restricted to the extent technically possible without prejudice to the fitness for use of the final product.

As part of the promotion of circular economy aspects, the criteria particularly aim to promote printed paper, paper stationary and paper carrier bag products that comply with minimum recyclability requirements in order to improve yields from paper mills that accept these products in recycled paper deliveries at their end of life.

The criteria also focus on the reduction of VOC emissions and help guarantee associated benefits for worker health and for reductions in local and regional atmospheric pollution.

The criteria for awarding the EU Ecolabel to 'printed paper, stationary paper, and paper carrier bag products' are as follows:

1. Substrate;
2. Hazardous substance restrictions;
3. Recyclability;
4. Emissions;
5. Waste;
6. Energy;
7. Training;
8. Fitness for use;
9. Information on the product
10. Information appearing on the EU Ecolabel.

The ecological criteria cover the manufacturing of printed paper, stationary paper products, and carrier bags products, including all constituent sub-processes from the paper production to the site(s) and dedicated production lines where the printed paper, stationary paper and paper carrier bag products are printed and/or converted.

The ecological criteria do not cover the transport and packaging. **Labels and stickers are exempted from fulfilling the criteria.**

~~If there are converting, printing, coatings and finishing processes exclusively used for ecolabelled products, criteria 2, 4, 5, 6 and 7 shall apply to those processes only.~~

All printing or converting on the printed paper, stationary paper and paper carrier bag products shall fulfil the respective requirements. Parts of the final product that are printed or converted by a sub-contractor shall therefore also fulfil the related requirements. The application shall include a list of all the printing houses and subcontractors involved in the production of the product, and their geographic locations.

~~Criterion 1 applies only to paper substrates used in the final product.~~

~~Criterion 2 applies both to the non-paper components of the final product and to the~~

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~~converting, printing, coating and finishing processes of the paper components.~~

~~Criteria 3, 8, 9 and 10 apply to the final product.~~

~~Unless separately specified, criteria 4, 5 and 6 apply to the converting, printing, laminating and finishing processes.~~

~~Criterion 7 applies to the production site where the final product is manufactured.~~

~~The ecological criteria do not cover the transport of raw materials, consumables and final products.~~

An application can be submitted for a specified product type group such as e.g. glued brochure of 2-30 pages. In the application, all chemicals, types of paper and other components that may be used in the printed or converted matter, the maximum number of pages, the maximum format, all possible types of binding must be specified. The EU Ecolabel can be used for all subsequent products that comply with the defined criteria for the sample product. Any change in the production process that is addressed by the criteria should be notified to the competent body being a subject of the further evaluation.

For a product type printed on a recurring basis or a product type that will only be manufactured once, the application should address a specific product.

~~The applicant shall provide a list of chemical products used in the printing house for the production of the products. This requirement applies to all consumables used during the converting, printing, coating and finishing processes. The list provided by the applicant shall include the amount, function and supplier of any chemical product used, together with the Safety Data Sheet, designed in accordance with the guidance in sections 10, 11 and 12 of Annex II to Regulation (EC) No 1907/2006 of the European Parliament and of the Council (1).~~

Assessment and verification: *The specific assessment and verification requirements are indicated within each criterion.*

Where the applicant is required to provide declarations, documentation, analyses, test reports or other evidence to show compliance with the criteria, these may originate from the applicant and/or his supplier(s) and/or their supplier(s), etc. as appropriate.

Competent bodies shall preferentially recognise attestations and verification that are issued by bodies accredited according to the relevant harmonised standard for testing and calibration laboratories, and verifications issued by bodies that are accredited according to the relevant harmonised standard for bodies certifying products, processes and services.

Where appropriate, test methods other than those indicated for each criterion may be used if the competent body assessing the application accepts their equivalence.

Where appropriate, competent bodies may require supporting documentation and may carry out independent verifications or on-site inspections to check compliance with these criteria.

The following definitions shall apply:

- (1) 'Adhesive application' refers to processed adhesives used in finished paper products (typically applied as films). The physicochemical properties responsible for the behaviour of the "adhesive applications" during the paper recycling process depend on the composition of the adhesive, the setting mechanism and the geometry (mainly thickness) of the application;
- (2) 'Cleaning agents' (also sometimes known as washing agents or cleaners) means the following: (a) liquid chemicals used to wash printing forms, both separate (off-press) and integrated (in-press), and printing presses to remove printing inks, paper dust and similar products; (b) cleaners for finishing machines and printing machines, such as cleaners to

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- remove adhesive and varnish residues; (c) printing inks removers used in washing off dried printing inks. Washing agents do not include cleaning agents for cleaning other parts of the printing machine or for cleaning other machines than printing machines and finishing machines
- (3) 'Converting process' means a process whereby a material is processed into a converted paper product. This process can include a printing process (pre-press, press, and post-press operations);
- (4) 'Converted paper product' is a paper, board or paper based substrates, either printed or unprinted, generally used to protect, handle or store items and/or notes, for which the converting process is an essential part of the production process, comprising three main categories of products: envelopes, paper carrier bags and stationery paper products;
- (5) 'Flexography' means a printing activity using an image carrier of rubber or elastic photopolymers on which the printing areas are above the non-printing areas, using liquid inks which dry through evaporation;
- (6) 'Fugitive emissions' means any emissions not in waste gases of volatile organic compounds into air, soil and water as well as solvents contained in any products, unless otherwise stated in Part 2 of Annex VII of 2010/75/EU⁷;
- (7) 'Halogenated organic solvent' means an organic solvent which contains at least one atom of bromine, chlorine, fluorine or iodine per molecule;
- (8) 'Heatset web offset' means a web-fed printing activity using an image carrier in which the printing and non-printing area are in the same plane, where web-fed means that the material to be printed is fed to the machine from a reel as distinct from separate sheets. The non-printing area is treated to attract water and thus reject ink. The printing area is treated to receive and transmit ink to the surface to be printed. Evaporation takes place in an oven where hot air is used to heat the printed material;
- (9) 'Laminating' means adhering together of two or more flexible materials to produce laminates;
- (10) 'Pressure-sensitive adhesive coatings' (PSA): means adhesives with still mobile molecules on their surfaces, even after setting, can produce sufficient adhesion by pressing their cohesive films (coating) against the surface to be bonded. Since they can be "activated" by pressure, they are also called "pressure-sensitive adhesives / PSA"(i.e. labels or tapes). PSAs can be formulated to feature a wide variety of physicochemical properties. Since, in paper recycling, the separation of non-paper components is mainly achieved by mechanical sorting, it is desirable for the PSA coatings to have a "minimum size", a sufficient thickness;
- (11) 'Publication rotogravure' means a rotogravure printing activity used for printing paper for magazines, brochures, catalogues or similar products, using toluene-based inks;
- (12) 'Rotary screen printing' means a web-fed printing activity in which the ink is passed onto the surface to be printed by forcing it through a porous image carrier, in which the printing area is open and the non-printing area is sealed off, using liquid inks which dry only through evaporation. Web-fed means that the material to be printed is fed into the machine from a reel as distinct from separate sheets;
- (13) 'Rotogravure' means a printing activity using a cylindrical image carrier in which the printing area is below the non-printing area, using liquid inks which dry through evaporation. The recesses are filled with ink and the surplus is cleaned off the non-printing area before the surface to be printed contacts the cylinder and lifts the ink from the recesses;

⁷ OJ L 334, 17.12.2010, p. 17-119

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- (14) 'Varnishing' means an activity by which a varnish or an adhesive coating for the purpose of later sealing the packaging material is applied to a flexible material.
- (15) 'Volatile Organic Compounds' (VOC) means any organic compounds having an initial boiling point less than or equal to 250 °C measured at a standard pressure of 101,3 kPa as defined in Directive 2004/42/EC⁸ and which, in a capillary column, are eluting up to and including n-Tetradecane (C₁₄H₃₀);
- (16) 'Waste paper' means paper generated during the production of finished product and which does not form part thereof;
- ~~(17) 'Consumables' means chemical products used during the printing, coating and finishing processes and capable of being consumed, destroyed, dissipated, wasted, or spent. Consumables include products such as printing inks and dyes, toners, overprinting varnishes, varnishes, adhesives, washing agents and damping solutions;~~

Rationale for the proposed Assessment and Verification

The assessment and verification text refers to the different type of evidence that is considered relevant as a proof of compliance for each criterion. It is therefore proposed to introduce A&V as a tool that establishes the general rules for the verification methodology.

For the clarity reasons some definitions from the Act are proposed to be moved to the Preamble of the Annex.

Printed product vs. product type (product line)

During the 1st AHWG Meeting a compromise between service and product certification was proposed as a possible solution to potentially increase the scheme uptake and accommodate a quick change in a production (printing line). Blue Angel criteria (RAL-UZ 195) for printed matter address the printing house when evaluating energy, waste management, and emissions. Criteria apply to specific product or defined product group and look at paper, chemicals, printing machines, etc. for each product. These are combined in different product lines. If a product is accepted, it does not need to be re-checked in each product line.

Alignment with Blue Angel (RAL-UZ 195) would require the distinction between two product types:

- I. Product type (or products line) is characterised by the constant production, and is defined as a theoretical product on the base of format, materials, inks, and bindings used. For this product the license would be given to the product group of certain type that fulfils the general description. If there is any change it should be notified to CB.
- II. The second one is a pre-ordered and pre-defined concrete product type manufactured on the individual bases. For this product the license would also have to be awarded on the individual bases.

The following information is therefore proposed to be included in the preamble to the Annex:

⁸ OJ L 143, 30.4.2004, p. 87–96

An application can be submitted for a specified product type group such as e.g. glued brochure of 2-30 pages. In the application, all chemicals, types of paper and other components that may be used in the printed or converted product, the maximum number of pages, the maximum format, all possible types of binding must be specified. The EU Ecolabel can be used for all subsequent products that comply with the defined criteria for the sample product. Any change in the product description that is addressed by the criteria should be notified to the competent body being a subject of the further evaluation.

For a product type manufactured on the recurring bases or a product type that will only be manufactured once the application should address a specific product.

Definitions have been revised based on stakeholders feedback. Definitions that refer to printing processes are based on Annex VII, Part 1(9) of IED Directive⁹. Definition for volatile organic compounds (VOCs) is proposed to be harmonised with Commission Decision (EU) 2015/886, Article 1(1)¹⁰

Points for discussion

1. Is the distinction between product and product line an adequate proposal to accommodate the dynamic nature of printing industry?
2. If YES, should further specification be introduced in the Annex (legal text), or in the User Manual,
3. If NO, which is the most appropriate solution to accommodate dynamic character of printing industry.

⁹OJ L 334, 17.12.2010, p. 17–119

¹⁰ OJ L 144, 10.6.2015, p. 12–16

5.1 Criterion 1 - Substrate

Current criterion (Printed paper product)

1a).The printed paper product shall be printed only on paper bearing the EU Ecolabel as established in Commission Decision 2011/333/EU (2).

1b).Where newsprint paper is used, the printed paper product shall be printed only on paper bearing the EU Ecolabel as established in Commission Decision 2012/448/EU (3).

Assessment and verification: the applicant shall provide the specifications of the printed paper products concerned, including the trade names, amounts and weight/m² of the paper used. The list shall also include the names of the suppliers of the papers used. The applicant shall provide a copy of a valid EU Ecolabel certificate for the paper used.

Current criterion (Converted paper products)

Criterion 1 – Substrate

Part A – Paper Substrate

The substrate used shall be in conformity with the criteria 1, 2, 4 and 5 of the EU Ecolabel as established in Commission Decision 2011/333/EU (2) for Copying and graphic paper or in Commission Decision 2012/448/EU (3) for Newsprint paper and shall demonstrate the conformity to the criterion 2 – Fibres: sustainable forest management of the EU Ecolabel as established in this Commission Decision for converted paper products.

Assessment and verification: the applicant shall provide the specifications of the converted paper products concerned, including the trade names, amounts and weight/m² of the paper used. The list shall also include the names of the suppliers of the papers used. Conformity with the criteria 1, 2, 4 and 5 of the EU Ecolabel as established in Decision 2011/333/EU or Decision 2012/448/EU shall be proven for each substrate by providing a copy of a valid EU Ecolabel certificate for the paper used. Conformity with criterion 2 on fibres sustainable forest management shall be proven for each substrate by providing a PEFC, FSC or equivalent certificate valid for the substrate used, or through a self-declaration in case the applicant already has a valid EU Ecolabel certificate for the substrate used.

Part B – Board Substrate (detailed criterion text can be found in APPENDIX I)

Criterion B1 – Emissions to water and to air

Criterion B2 – Energy use

Criterion B3 – Excluded or limited substances and mixtures

Criterion B4 – Waste management

Criterion 2 – Fibres: sustainable forest management

The fibre raw material may be recycled or virgin fibre. Virgin fibres shall be covered by valid sustainable forest management and chain of custody certificates issued by an independent third party certification scheme such as FSC, PEFC or equivalent.

However, where certification schemes allow mixing of certified material, recycled materials and uncertified material in a product or product line, the proportion of uncertified virgin material shall not exceed 30 % of the total fibre raw material. Such uncertified material shall be covered by a verification system which ensures that it is legally sourced and meets any other requirement of the certification scheme with respect

to uncertified material.

The certification bodies issuing forest and/or chain of custody certificates shall be accredited/ recognised by that certification scheme.

Assessment and verification: the applicant shall provide appropriate documentation indicating the types, quantities and origins of fibres used in the pulp and the board production.

Where virgin fibres are used, the product shall be covered by valid forest management and chain of custody certificates issued by an independent third party certification scheme, such as PEFC, FSC or equivalent. If the product or product line includes uncertified material, proof should be provided that the uncertified material is less than 30 % and is covered by a verification system which ensures that it is legally sourced and meets any other requirement of the certification scheme with respect to uncertified material.

Where recycled fibres are used, the applicant shall provide a declaration stating the average amount of grades of recovered paper used for the product in accordance with the standard EN 643 or an equivalent standard. The applicant shall provide a declaration that no mill broke (own or purchased) was used for the percentage calculation.

Main proposal for the revised criterion 1: Substrate

The paper substrate, including board and cardboard, used in a final product shall bear the EU Ecolabel for "Graphic paper, tissue paper and tissue products" in accordance with Commission Decision (EU) 2019/70¹¹

Assessment and verification: the applicant shall provide the specifications of the products concerned, including the trade names and amounts of paper used. The list shall also include the names of the suppliers of the papers used.

The applicant shall provide a copy of a valid EU Ecolabel certificate for each paper substrate used in a final product, according to Annex I to Commission Decision (EU) 2019/70

Rationale

Paper and board substrate are the most important resources used for producing printed matter and converted paper products. Paper manufacturing represents the main environmental and resource-related burden in the life cycle of printed and converted paper products, as found in most LCA studies analysed.

The EU Ecolabel for graphic paper has been recently revised including updated thresholds and definitions related to the paper substrate. Thus, the harmonisation with graphic paper requirements benefits from the consensus built and knowledge gained during the revision of EU Ecolabel criteria for graphic paper and leads to the compatibility across the scheme. Consequently, in line with this approach, it is proposed to align requirements for substrate with criterion 1, 2, 3, 4 and 5 as laid down in Annex I of Commission Decision (EU) 2019/70:

For printed matter, currently EU Eco-labelled paper is requested as a paper substrate. Most of the stakeholders agreed on maintaining this requirement. However, 29% of the questionnaire participants proposed to open the criteria to other Type I Ecolabels. Finally, one stakeholder pointed that in some cases is not possible to obtain EU Ecolabel. Since

¹¹ Decision of 11 January 2019 on establishing the EU Ecolabel criteria for graphic paper (OJ L15, 17.1.2019, p.27)

there is not the adequate certified substrate, it is proposed to address different scenarios:

- Scenario 1: The paper substrate used is awarded EU Ecolabel for graphic paper. In this case, the applicant (or substrate manufacturer) should demonstrate the compliance with the criterion providing a valid copy of EU Ecolabel certificate for graphic paper.
- Scenario 2: Paper substrate that is not awarded EU Ecolabel for graphic paper. In this case, the applicant should demonstrate equivalency of compliance with the Criterion 1, 2, 3, 4 and 5 as established by Commission Decision (EU) 2019/70. "**Equivalency**" that is **proposed to be accepted** is a documentation provided by paper manufacturer that **proves the compliance with the criteria**, or certificate granted by other type I Ecolabels, as long as the specific requirements are at equal or higher level of stringency.

An important argument for not recognising other Type I ecolabel papers is that its equivalency in ambition level for fibre sourcing, energy consumption and emissions. With regards to fibres, there are important differences between the main European Type I ecolabels (Nordic, Blue Swan and EU Ecolabel) in terms of ambition level. The Commission has recently published a study about how to set sustainability criteria for timber and timber-related products and suggests that the conclusions therein can be considered as counting towards evidence of sustainable virgin materials (EFECA, 2018¹²). However, in the absence of a EU Ecolabel for the product, the paper supplier would also need to provide supporting evidence of compliance with the other requirements for specific energy consumption, emissions to water and emissions to air.

The proposed criterion aims at minimizing the main environmental impacts of paper production during its life cycle (*for more details please see the paper project website: http://susproc.jrc.ec.europa.eu/Paper_products/*):

Board manufacturing

During the EU Ecolabel revision for graphic paper the grammage upper limit of 400 g/m² was assumed as being misleading and not related to industrial practices.

Information from board producers indicates that **there is no specific manufacturing process of pulp destined for board production**, and the key difference lies in the papermaking phase when board can undergo lamination, if requested by client.

Board lamination is usually done inline on the board production machine. Laminating provides a thicker board, a coloured board or a barrier by applying PE or PET, aluminium foil etc. depending on customer needs and production location. This can be on one or both sides/surfaces according to client specifications. In the case of a liner with plastic film, the laminating process basically consists of applying the liner with glue, such as Polyvinyl acetate (PVA), to the surface of the board and then heating to vaporize the added water from the glue till the moisture specification of the board are met. The glue usually has about 10%-15% moisture which has to be dried up using heat energy from steam in drying cylinders. The thickness of the board can be set at the board machine itself as well as adding lamination paper. **The lamination of multiple layers of board together is not done for the type of board used for producing folders or binders.**

As to the criterion on emission to water and air, a more detailed examination reveals that values for paper lamination are derived from adding the value for pulp making to the value for board making. Similar approach is observed for energy consumption criterion (i.e. energy consumption for laminated RCF pulp is expressed by summing up the energy

¹² EFECA, 2018. Draft proposal: GPP/Ecolabel criteria for timber and timber products.

consumption for RCF pulp and for board making). e(Table 8 As the reference values refers to board manufacturing, **the practicality of adding the term "lamination" is not clear and requires further consultation with stakeholders.** The reference values for calculating emissions to air and water, and also electricity and fuel consumption for the paper lamination and board production processes are reported in Table 8, and Table 9. The values are built on Commission Decision 2011/332/EU) on establishing the ecological criteria for the award of the EU Ecolabel for copying and graphic paper. This Decision is shortly going to be amended by the revised criteria for graphic paper.

EU ecolabel for graphic paper does not make a grammage distinction; therefore, adopting requirements for graphic paper will not lead to inconsistencies related to paper and board machine reference values.

On the contrary, referring to paper and board making as a common process is in line with the feedback collected from pulp and paper industry (for further information please see: http://susproc.jrc.ec.europa.eu/Paper_products/documents.html).

Furthermore, the revised EU Ecolabel criteria for graphic paper are built on the Commission Implementing Decision 2014/687/EU of 26 September 2014 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council. Thus, the corresponding reference document (BREF) encompasses both pulp and board making process.

Table 8. Currently Valid EU ecolabel reference values for lamination and board manufacturing

	kg/adt				kWh/adt	
	COD	S	NOx	P	Fuel	EE
Laminating bleached kraft paper	19	0.9	2.4	0.055	6100	1600
Laminating unbleached kraft paper	11	0.9	2.4	0.055	6100	1600
Laminating recycled paper	3	0.5	1.1	0.02	3100	1600
Board production (non-integrated mill)	1	0.3	0.8	0.01		
Board production (integrated mill)	1	0.3	0.7	0.01		
Board machine					2100	800

Source: Commissions Decision (2014/256/EU).

In the case of fuel and electricity, conducted literature review did not confirm nor provide specific reference values for laminating kraft and recycled paper as required in the existing EU Ecolabel. For board machine, the provided electricity reference value is 800kWh/ADdt¹³. However, the same source reports a fuel reference value of 1860 kWh/ADt as opposed to 2100kWh/ADt required in the existing EU Ecolabel. Following Blum et al (2007)¹⁴ when applying best practice, manufacturing of RCF-based board (with deinking) requires 1000 kWh/t of heat, and 450/t of electricity consumption. The values refer to energy consumption at paper mill¹⁵.

¹³Worrell et al. (2008). World Best Practice Energy Intensity Values for Selected Industrial Sectors

¹⁴Blum, O., Maur, B., Oller, H-J. 2007. Revision of Best Available Technique Reference Document for the Pulp & Paper Industry. Use of energy saving techniques. Umwelt Bundessamt

¹⁵For additional information on EU Ecolabel for graphic paper, please refer to the project website: http://susproc.jrc.ec.europa.eu/Paper_products/

In line with the revised EU Ecolabel criteria for graphic paper, the threshold for energy consumption at paper mill is as follows:

- Uncoated fine paper, magazine paper (SC), newsprint paper: fuel – 1700 kWh/tonne and electricity 750 kWh/tonne.
- Coated fine paper, coated magazine paper (LWC, MWC): fuel – 1700 kWh/tonne, electricity 800 kWh/tonne

Table 9. Currently valid reference values for electricity and fuel – converted paper products.

Pulp grade	Fuel kWh/ADT Reference	Electricity kWh/ADT E reference
Chemical pulp	4000 ^a	800
Mechanical pulp	900 ^b	1900
CTMP	1000	2000
Recycled fibre pulp	1800 ^c	800
Laminating kraft pulp (Bleached or unbleached)	6100	1600
Laminating recycled pulp	3900	1600
Board production	2100	800

^afor air dry market pulp containing at least 90% dry matter (admp), this value may be upgraded by 25% for the drying energy.

^b this value is only applicable for admp

^c for admp, this value may be upgraded by 25 % for the drying energy

*value for lamination process is equal to sum of energy for pulp manufacturing and board production.

Source: Commission Decision (2014/256/EU)

Further research and consensus is needed in order to:

1. Harmonise reference value for board manufacturing with the revised EU Ecolabel for graphic paper; or
2. Establish a specific value for board manufacturing, (including lamination). The preliminary proposal should be further discussed with industry stakeholders: 1700 kWh/tonne for fuel, and 750 kWh/tonne for electricity., or/and
3. Withdraw the term lamination that generally refers to board manufacturing.

Outcomes from 1st AHWG meeting

Some stakeholders expressed the opinion that only EU Ecolabel certified paper should be accepted, alternatively other Ecolabel ISO type I certified substrate should be eligible.

Other stakeholders were in favour to allow the compliance check with EU Ecolabel criteria for graphic paper. It was stated that cardboard suppliers are not necessarily interested in the certification as they generally represent packaging industry. Packaging is specifically excluded from the scope of the product group. At this moment, there is no EU Eco-labelled board on the market.

Further research and main changes

During the revision process 3 options of addressing substrate requirement were discussed:

- 1 The paper substrate used in converted and printed paper products shall have been awarded the EU Ecolabel for "Graphic paper, tissue paper and tissue products" in accordance with Commission Decision (EU) 2019/70.
- 2 The paper substrate used in converted and printed paper products shall have been awarded the EU Ecolabel in accordance with Commission Decision (EU) 2019/70 or shall have been awarded another EN ISO 14024 type I ecolabel that is nationally or regionally officially recognised in the Member States and that fulfils criterion 3 on Fibres and criterion 4 on Restricted hazardous substances and mixtures of Commission Decision (EU) 2019/70 and the related verification and assessment requirements.
- 3 The paper substrate used in converted and printed paper products shall have been awarded the EU Ecolabel for "Graphic paper, tissue paper and tissue products" in accordance with Commission Decision (EU) 2019/70 or shall be in conformity with the criteria 1 ("Emission to air"), 2 ("Energy use"), 3 ("Fibres"), 4 ("Restricted hazardous substances and mixtures") and 5 ("Waste management"), of the EU Ecolabel as established in Commission Decision (EU) 2019/70 for "Graphic paper, tissue paper and tissue products" and related verification and assessment requirements.

The key advantages and disadvantages of each option are summarised in Table 10

Table 10. The key advantages and drawbacks of the proposals to address requirement for paper substrate.

	PROS	CONS
Option 1	<ul style="list-style-type: none"> • Simpler criteria, easy to verify; • Consistent with current criterion for printed paper; • Potential boost of the market share for EU Ecolabel for C&G Paper used as substrate; 	<ul style="list-style-type: none"> • Potential scarce availability of substrate on the market; • Potential loss of EU Ecolabel licenses for Converted Products due to the lack of availability of EU Ecolabel substrate for cardboard;
Option 2	<ul style="list-style-type: none"> • Higher availability of eligible substrate in respect to option 1; • More flexibility of criteria; • Potential boost of the market share for EU Ecolabel for Printed paper products due to the higher availability of ecolabel substrate; 	<ul style="list-style-type: none"> • Potential loss of EU Ecolabel licenses for C&G paper (current licence holders may decide to apply for other ISO type I schemes); • Potential loss of EU Ecolabel licenses for Converted Products due to the lack of availability of ecolabel substrate for cardboard; • Requirements for substrate are not fully equivalent across the schemes;
Option 3	<ul style="list-style-type: none"> • More flexibility for converters and for applicants in general; • Higher availability of eligible substrate; • Potential boost of the market share for EU Ecolabel for converted paper products due to the higher availability of substrate; 	<ul style="list-style-type: none"> • More complex set of criteria, more difficult to verify (unpaid extra work for CBs); • Substrate not linked to an ecolabel license: more difficult to check its compliance over time; • Potential loss of EU Ecolabel licenses for C&G Paper (why to go for the EU Ecolabel if I can do without?)

Following the EU Ecolabelling Board feedback collected after the EUEB Meeting in June 2019, the paper substrate should meet the specification of Option 1, as follows:

The paper substrate used in converted and printed paper products shall have been awarded the EU Ecolabel for "Graphic paper, tissue paper and tissue products" in accordance with Commission Decision (EU) 2019/70.

DRAFT

5.2 Criterion 2 – Hazardous substance restrictions

5.2.1 Horizontal restrictions: a) SVHCs and b) CLP

Current criteria on horizontal CLP restrictions for printed paper established by Commission Decision 2012/481/EU

2a) Hazardous substances and mixtures

Consumables that could end up in the final printed paper product, and that contain substances and/or mixtures meeting the criteria for classification with the hazard statements or risk phrases specified below in accordance with Regulation (EC) No 1272/2008 of the European Parliament and of the Council¹⁶ or Council Directive 67/548/EEC¹⁷ or substances referred to in Article 57 of Regulation (EC) No 1907/2006 of the European Parliament and of the Council¹⁸ shall not be used for printing, coating, and finishing operations of the final printed paper product.

This requirement shall not apply to toluene for use in rotogravure printing processes where a closed or encapsulated installation or recovery system, or any equivalent system, is in place to control and monitor fugitive emissions and where the recovery efficiency is at least 92 %. UV varnishes and UV inks classified H412/R52-53 are also exempted from this requirement.

The non-paper components (up to 20 % in weight, as specified in Article 1) that are part of the final paper product shall not contain the substances referred to above.

List of hazard statements and risk phrases:

Hazard Statement ¹⁹	Risk Phrase ²⁰
H300 Fatal if swallowed	R28
H301 Toxic if swallowed	R25
H304 May be fatal if swallowed and enters airways	R65
H310 Fatal in contact with skin	R27
H311 Toxic in contact with skin	R24
H330 Fatal if inhaled	R26
H331 Toxic if inhaled	R23
H340 May cause genetic defects	R46
H341 Suspected of causing genetic defects	R68
H350 May cause cancer	R45
H350i May cause cancer by inhalation	R49
H351 Suspected of causing cancer	R40
H360F May damage fertility	R60
H360D May damage the unborn child	R61
H360FD May damage fertility. May damage the unborn child	R60; R61; R60-61
H360Fd May damage fertility. Suspected of damaging the unborn child	R60-R63
H360Df May damage the unborn child. Suspected of damaging fertility	R61-R62
H361f Suspected of damaging fertility	R62
H361d Suspected of damaging the unborn child	R63
H361fd Suspected of damaging fertility. Suspected of damaging the unborn child	R62-63
H362 May cause harm to breast fed children	R64
H370 Causes damage to organs	R39/23; R39/24; R39/25;

¹⁶ OJ L 353, 31.12.2008, p. 1.

¹⁷ OJ 196, 16.8.1967, p. 1.

¹⁸ OJ L 396, 30.12.2006, p. 1.

¹⁹ Decision of 7 June 2011 on establishing the ecological criteria for the award of the EU Ecolabel for copying and graphic paper (OJ L 149, 8.6.2011, p. 12).

²⁰ Decision of 12 July 2012 establishing the ecological criteria for the award of the EU Ecolabel for newsprint paper (OJ L 202, 28.7.2012, p. 26).

	R39/26; R39/27; R39/28
H371 May cause damage to organs	R68/20; R68/21; R68/22
H372 Causes damage to organs through prolonged or repeated exposure	R48/25; R48/24; R48/23
H373 May cause damage to organs through prolonged or repeated exposure	R48/20; R48/21; R48/22
H400 Very toxic to aquatic life	R50
H410 Very toxic to aquatic life with long-lasting effects	R50-53
H411 Toxic to aquatic life with long-lasting effects	R51-53
H412 Harmful to aquatic life with long-lasting effects	R52-53
H413 May cause long-lasting harmful effects to aquatic life	R53
EUH059 Hazardous to the ozone layer	R59
EUH029 Contact with water liberates toxic gas	R29
EUH031 Contact with acids liberates toxic gas	R31
EUH032 Contact with acids liberates very toxic gas	R32
EUH070 Toxic by eye contact	R39-41

Substances or mixtures which change their properties upon processing (e.g. become no longer bioavailable, undergo chemical modification) so that the identified hazard no longer applies are exempted from the above requirement.

Concentration limits for substances and mixtures which may be, or have been, assigned the hazard statements or risk phrase listed above or which meet the criteria for classification in the hazard classes or categories, and concentration limits for substances meeting the criteria of Article 57(a), (b) or (c) of Regulation (EC) No 1907/2006, shall not exceed the generic or specific concentration limits determined in accordance with Article 10 of Regulation (EC) No 1272/2008. Where specific concentration limits are determined they shall prevail over the generic ones.

Concentration limits for substances meeting criteria set out in Article 57(d), (e) or (f) of Regulation (EC) No 1907/2006 shall not exceed 0.1 % weight by weight.

Assessment and verification: For substances not already classified in accordance with Regulation (EC) No 1272/2008, the applicant shall prove compliance with these criteria by providing: (i) a declaration that the non-paper components that are part of the final product do not contain the substances referred to in these criteria in concentration above the authorised limits; (ii) a declaration that consumables that could end up in the final printed paper product and used for printing, coating, and finishing operations do not contain the substances referred to in these criteria in concentration above the authorised limits; (iii) a list of all consumables used for the printing, finishing and coating of the printed paper products. This list shall include the quantity, function and suppliers of all the consumables used in the production process.

The applicant shall demonstrate compliance with this criterion by providing a declaration on the non-classification of each substance into any of the hazard classes associated to the hazard statements referred to in the above list in accordance with Regulation (EC) No 1272/2008, as far as this can be determined, as a minimum, from the information meeting the requirements listed in Annex VII to Regulation (EC) No 1907/2006. This declaration shall be supported by summarised information on the relevant characteristics associated to the hazard statements referred to in the above list, to the level of detail specified in Sections 10, 11 and 12 of Annex II to Regulation (EC) No 1907/2006 (Requirements for the Compilation of Safety Data Sheets).

Information on intrinsic properties of substances may be generated by means other than tests, for instance through the use of alternative methods such as in vitro methods, by quantitative structure activity models or by the use of grouping or read-across in accordance with Annex XI to Regulation (EC) No 1907/2006. The sharing of relevant data is strongly encouraged.

The information provided shall relate to the forms or physical states of the substance or mixtures as used in the final product.

For substances listed in Annexes IV and V to REACH, exempted from registration obligations under Article 2(7)(a) and (b) of Regulation (EC) No 1907/2006 REACH, a

declaration to this effect will suffice to comply with the requirements set out above.

The applicant shall provide appropriate documentation on the recovery efficiency of the closed/encapsulated installation/recovery system, or any equivalent system, that has been put in place to deal with the use of toluene in rotogravure printing processes.

2b) Substances listed in accordance with Article 59(1) of Regulation (EC) No 1907/2006

No derogation from the prohibition set out in Article 6(6)(a) of Regulation (EC) No 66/2010 shall be granted concerning substances identified as substances of very high concern and included in the list provided for in Article 59 of Regulation (EC) No 1907/2006, present in mixtures in concentrations higher than 0,1 %. Specific concentration limits determined in accordance with Article 10 of Regulation (EC) No 1272/2008 shall apply where the concentration is lower than 0,1 %.

Assessment and verification: the list of substances identified as substances of very high concern and included in the candidate list in accordance with Article 59 of Regulation (EC) No 1907/2006 can be found here:

http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp

Reference to the list shall be made on the date of application.

The applicant shall prove compliance with the criterion providing data on the amount of substances used for the printing of the printed paper products and a declaration stating that the substances referred to in this criterion are not retained in the final product above the concentration limits specified. The concentration shall be specified in the safety data sheets in accordance with Article 31 of Regulation (EC) No 1907/2006.

Current criterion on horizontal CLP restrictions for converted paper products established by Commission Decision 2014/256/EU

Criterion B3 – Excluded or limited substances and mixtures

Assessment and verification: the applicant shall supply a list of the chemical products used in the pulp and board production, together with appropriate documentation (such as SDSs). This list shall include the quantity, function and suppliers of all the substances used in the production process.

(a) Hazardous substances and mixtures

In accordance with Article 6(6) of Regulation (EC) No 66/2010 of the European Parliament and of the Council the board shall not contain substances referred to in Article 57 of Regulation (EC) No 1907/2006 nor substances or mixtures meeting the criteria for classification with the hazard classes or categories specified below.

List of hazard statements and risk phrases:

Hazard Statement	Risk Phrase
H300 Fatal if swallowed	R28
H301 Toxic if swallowed	R25
H304 May be fatal if swallowed and enters airways	R65
H310 Fatal in contact with skin	R27
H311 Toxic in contact with skin	R24
H330 Fatal if inhaled	R26
H331 Toxic if inhaled	R23
H340 May cause genetic defects	R46
H341 Suspected of causing genetic defects	R68
H350 May cause cancer	R45
H350i May cause cancer by inhalation	R49
H351 Suspected of causing cancer	R40
H360F May damage fertility	R60
H360D May damage the unborn child	R61

H360FD May damage fertility. May damage the unborn child	R60; R61; R60-61
H360Fd May damage fertility. Suspected of damaging the unborn child	R60-R63
H360Df May damage the unborn child. Suspected of damaging fertility	R61-R62
H361f Suspected of damaging fertility	R62
H361d Suspected of damaging the unborn child	R63
H361fd Suspected of damaging fertility. Suspected of damaging the unborn child	R62-63
H362 May cause harm to breast fed children	R64
H370 Causes damage to organs	R39/23; R39/24; R39/25; R39/26; R39/27; R39/28
H371 May cause damage to organs	R68/20; R68/21; R68/22
H372 Causes damage to organs through prolonged or repeated exposure	R48/25; R48/24; R48/23
H373 May cause damage to organs through prolonged or repeated exposure	R48/20; R48/21; R48/22
H400 Very toxic to aquatic life	R50
H410 Very toxic to aquatic life with long-lasting effects	R50-53
H411 Toxic to aquatic life with long-lasting effects	R51-53
H412 Harmful to aquatic life with long-lasting effects	R52-53
H413 May cause long-lasting harmful effects to aquatic life	R53
EUH059 Hazardous to the ozone layer	R59
EUH029 Contact with water liberates toxic gas	R29
EUH031 Contact with acids liberates toxic gas	R31
EUH032 Contact with acids liberates very toxic gas	R32
EUH070 Toxic by eye contact	R39-41
No commercial dye formulation, colorants, surface-finishing agents, auxiliaries and coating materials shall be used on either pulp or board that has been assigned or may be assigned at the time of application the hazard statement H317: May cause allergic skin reaction.	R43

The use of substances or mixtures which change their properties upon processing (e.g. become no longer bioavailable, undergo chemical modification) so that the identified hazard no longer applies are exempted from the above requirement.

Concentration limits for substances or mixtures which may be or have been assigned the hazard statements or risk phrase listed above, meeting the criteria for classification in the hazard classes or categories, and for substances meeting the criteria of Article 57(a), (b) or (c) of Regulation (EC) No 1907/2006, shall not exceed the generic or specific concentration limits determined in accordance with the Article 10 of Regulation (EC) No 1272/2008 of the European Parliament and of the Council. Where specific concentration limits are determined they shall prevail over the generic ones.

Concentration limits for substances meeting criteria of Article 57(d), (e) or (f) of Regulation (EC) No 1907/2006 shall not exceed 0,10 % weight by weight.

Assessment and verification: the applicant shall prove compliance with the criterion providing data on the amount (kg/ADT board produced) of substances used in the process and that the substances referred to in this criterion are not retained in the final product above concentration limits specified. The concentration for substances and mixtures shall be specified in the Safety Data Sheets in accordance with Article 31 of Regulation (EC) No 1907/2006.

(b) Substances listed in accordance with Article 59(1) of Regulation (EC) No 1907/2006

No derogation from the prohibition set out in Article 6(6) of Regulation (EC) No 66/2010 shall be granted concerning substances identified as substances of very high concern and included in the list provided for Article 59 of Regulation (EC) No 1907/2006, present in mixtures, in an article or in any homogenous part of a complex article in concentrations higher than 0.10 %.

Specific concentration limits determined in accordance with Article 10 of Regulation (EC) No 1272/2008 shall apply in case it is lower than 0,10 %.

Assessment and verification: the list of substances identified as substances of very high concern and included in the candidate list in accordance with Article 59 of Regulation (EC) No 1907/2006 can be found here:

http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp

Reference to the list shall be made on the date of application.

The applicant shall prove compliance with the criterion providing data on the amount (kg/ADT board produced) of substances used in the process and that the substances referred to in this criterion are not retained in the final product above concentration limits specified. The concentration shall be specified in the safety data sheets in accordance with Article 31 of Regulation (EC) No 1907/2006.

Proposed criterion on horizontal CLP restrictions for printed paper, stationary paper and paper carrier bag products

The basis for demonstrating compliance with each of the sub-criteria under criterion 2 shall be the applicant providing a list of all the relevant chemicals used together with appropriate documentation (safety data sheet and/or a declaration from the chemical supplier). All process chemicals used in the relevant printing or converting processes must be screened. This criterion does not apply to chemicals used for wastewater treatment unless the treated wastewater is recirculated back into the printing or conversion process.

2(a) Restrictions on Substances of Very High Concern (SVHCs)

The product, and any component article therein, shall not contain substances that have been identified according to the procedure described in Article 59(1) of Regulation (EC) No 1907/2006 and included in the Candidate List for Substances of Very High Concern in concentrations greater than 0.10 % (weight by weight). No derogation from this requirement shall be granted.

Assessment and verification: *The applicant shall provide a declaration that the product does not contain any SVHC in concentrations greater than 0.10 % (weight by weight). The declaration shall be supported by declarations from suppliers of any component articles and by appropriate declarations or safety data sheets from chemical suppliers regarding process chemicals used by the applicant.*

The list of substances identified as SVHCs and included in the candidate list in accordance with Article 59(1) of Regulation (EC) No 1907/2006 can be found here:

http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp.

Reference to the list shall be made on the date of application.

2(b) Classification, Labelling and Packaging (CLP) restrictions

Unless derogated in Table X, the product, and any component articles therein, shall not contain substances or mixtures in concentrations greater than 0.1 % (weight by weight) that are classified with any of the following hazard statements in accordance with Regulation (EC) No 1272/2008:

- Group 1 hazards: Category 1A or 1B carcinogenic, mutagenic and/or toxic for reproduction (CMR): H340, H350, H350i, H360, H360F, H360D, H360FD, H360Fd, H360Df.
- Group 2 hazards: Category 2 CMR: H341, H351, H361, H361f, H361d, H361fd, H362; Category 1 aquatic toxicity: H400, H410; Category 1 and 2 acute toxicity: H300, H310, H330; Category 1 aspiration toxicity: H304; Category 1 specific target organ toxicity (STOT): H370, H372; Category 1 skin sensitizer: H317*.

*only applies to dye formulations, colourants, surface finishing agents and coating materials used.

- Group 3 hazards: Category 2, 3 and 4 aquatic toxicity: H411, H412, H413; Category 3 acute toxicity: H301, H311, H331; Category 2 STOT: H371, H373.

The use of substances or mixtures that are chemically modified during the production process so that any relevant restricted CLP hazard no longer applies shall be exempted from the above requirement.

Table X. Derogations to the CLP hazard restrictions and applicable conditions.

Substance / mixture type	Applicability	Derogated classification(s)	Derogation conditions
Mineral oils and distillates	Heatset, coldset or digitally printed paper products	H304	The applicant shall demonstrate to the Competent Body that all relevant instructions included in the safety data sheet regarding safe handling and storage and suitable exposure controls and personal protection are in place and declare that these are being complied with.
Nickel	Metal components	H317, H351, H372	The applicant must provide information to the consumer regarding the use of nickel for metal electroplating, coating or alloying.

Assessment and verification: The applicant shall provide a list of all relevant chemicals used in their production process together with the relevant safety data sheet or chemical supplier declaration and any relevant declarations from component article suppliers.

Any chemicals containing substances or mixtures with restricted CLP classifications shall be highlighted. The approximate dosing rate of the chemical, together with the concentration of the restricted substance or mixture in that chemical (as provided in the safety data sheet or supplier declaration) and an assumed retention factor of 100 %, shall be used to estimate the quantity of the restricted substance or mixture remaining in the final product.

Justifications for any deviation from retention factor of 100% (e.g. solvent evaporation) or for chemical modification of a restricted hazardous substance or mixture must be provided in writing to the competent body.

For any restricted substances or mixtures that exceed 0.10% (weight by weight) of the final printed paper, stationary paper or paper bag product, or of relevant component articles therein, a relevant derogation must be in place and proof of compliance with any relevant derogation conditions must be provided.

Rationale

The structure of the horizontal hazardous substance criteria (a) SVHC restriction and b) CLP restrictions) follows the general recommendations of the EU Ecolabel Chemicals Task Force. The wording of the current proposal is based predominantly on the most recently voted product group which is an article (Graphic paper, Tissue paper and Tissue paper products, voted in June 2018) and a very similar wording has been proposed for the EU Ecolabel Hard Coverings criteria revision, which is being carried out in parallel.

a) SVHC restrictions

The 0.1% limit is particularly useful for SVHC declarations since it aligns perfectly with communication requirements that are stipulated in the REACH Regulation (specifically in Articles 7(2) and 33 of REACH).

Article 7(2) requires importers or producers to notify ECHA if an SVHC is present in articles they import or produce in concentrations exceeding 0.1% (w/w) and add up in total to more than 1 tonne of a particular SVHC per actor per year.

Article 33 is even more relevant, since any recipient (i.e. a business to business transaction) or consumer (business to consumer transaction) must, upon request, be informed within 45 days of the presence of any SVHC present in the article(s) they have purchased if the concentration of the SVHC exceeds 0.1% (w/w). The weak point of Article 33 is that this communication requirement is only triggered by a specific request and only if the answer is positive (i.e. that there is an SVHC present >0.1%). There is no obligation to respond if no SVHC is present >0.1% w/w, even if it is simply to confirm that there is no issue.

Since printed or converted paper products may include separable components, it is worth mentioning here that the 0.1% threshold for SVHC and CLP restrictions should apply to the individual component level, not simply the weight of the entire complex article. This is in line with the European Court of Justice ruling on case 106/14 in September 2015 regarding communication requirements on SVHCs. The 0.1% limits should apply to any component that can be considered as an individual article in itself.

b) CLP restrictions

There is no longer any reference to risk phrases (e.g. R45, R50 etc.) when mentioning the classification of substances and mixtures because these were linked to the Dangerous Substances Directive (67/548/EEC) which was repealed by the CLP Regulation as of June 2015. Instead, reference is exclusively made to hazard statements and classes (e.g. H350, H400 etc.).

The term "*toxic, hazardous to the environment, carcinogenic, mutagenic or toxic for reproduction (CMR)*" from Article 6(6) was translated into specific CLP hazard categories by the EU Ecolabel Chemicals Task Force and resulted in the Group 1, Group 2 and Group 3 hazards as listed in the criterion proposal.

Depending on the nature of the product group and its normal use, the potential to also restrict category 1 skin sensitizers (H317) or category 1, respiratory sensitizers (H334) may be considered. These are far more relevant in products such as textiles and rinse-off cosmetics, due to the higher degree of skin contact. Nonetheless, the skin sensitization hazard could perhaps be relevant to some printed paper, stationary paper and paper carrier bag products (due to potential for prolonged skin contact when holding or carrying books, folders, envelopes or bags) and so the H317 restriction for skin sensitisers is listed in the proposed CLP criterion with a limited scope to certain process chemicals that, once cured and dried, are most likely to end up in skin contact with users.

The existing criteria for both Printed Paper and Converted Paper make reference to a series of EUH hazards in the horizontal CLP restrictions (specifically: EUH059; EUH029; EUH031; EUH032 and EUH070). These hazards are not specifically addressed by the work of the EU Ecolabel Chemicals Task Force and seem to be related purely to labelling for the assurance of safe onsite handling of the chemicals. Consequently, it is proposed to no longer include these hazards in the horizontal CLP restrictions for final products.

Unfortunately REACH does not make any provision for communication requirements about non-SVHC substances in articles like converted or printed paper and the CLP Regulation is focussed on labelling of substances and mixtures, not articles. Consequently, in order to demonstrate compliance with the CLP restriction criteria, the EU Ecolabel applicant has to be aware of all of the chemical substances or mixtures that have been used during the processing of the product. The following pieces of information are needed:

- List of chemical substances or mixtures used.
- Safety data sheets or relevant supplier declarations.
- Information about dosing rates and chemistry of any reactions that take place.

Armed with the above information, each chemical product can then be cross-checked against the following flow chart (Figure 8):

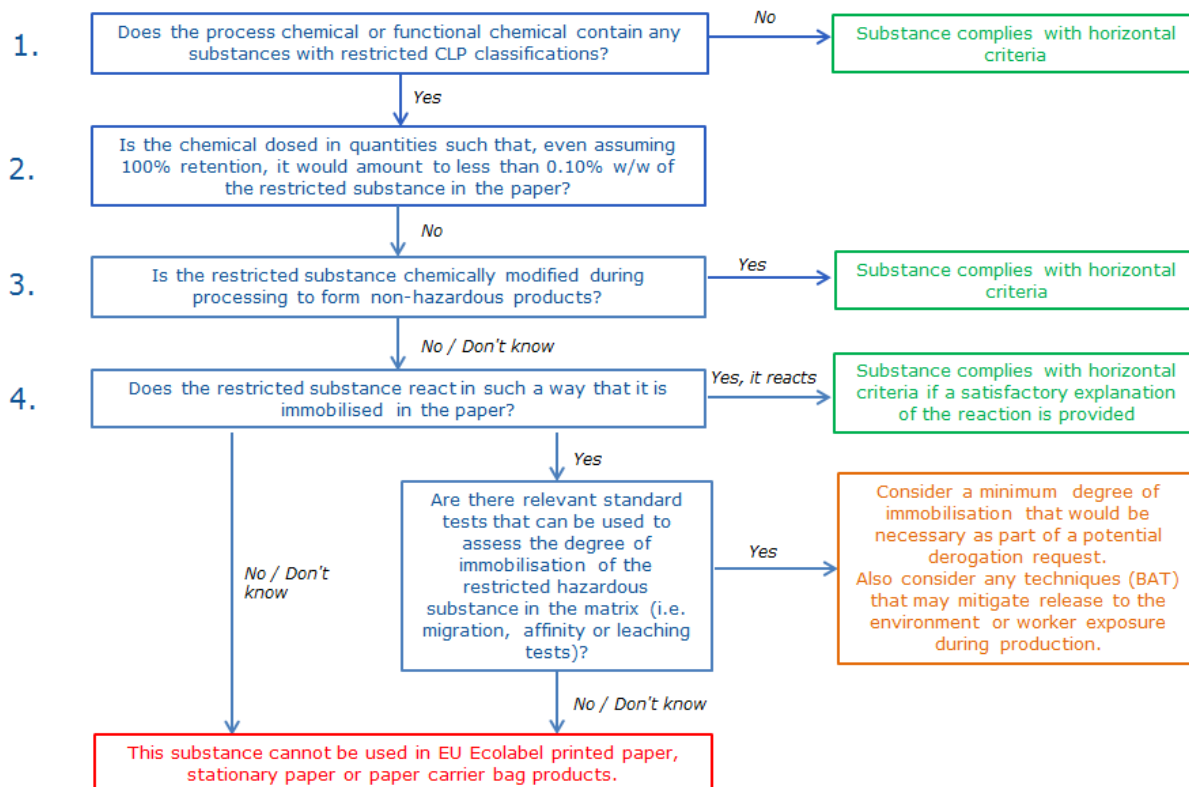


Figure 8. Flow chart for checking compliance with CLP restrictions

According to the flow chart above, the easiest means to demonstrate compliance is simply not to use chemicals containing hazardous substances in the first place.

When considering whether or not it is technically feasible to substitute the chemical or not, consideration has to be given to the functionality that the chemical imparts (e.g. brightness, gloss, scratch resistance etc.). If less hazardous alternatives do exist, then a case has to be made for why the more hazardous chemical is used. Maybe it is more efficient, maybe its performance is better proven etc.

If the quantities of the restricted hazardous substance(s) involved are small then applicants should check their dosing rates and calculate if its use can be justified based on the fact that it would account for less than 0.10% of the final product weight.

The last chance for justifying the use of a chemical containing restricted hazardous substances without any specific derogation is to assess whether or not the substance reacts in such a way as to no longer be hazardous. Reactivity should be considered in terms of chemical reaction instead of physical immobilisation. For example, a monomer reacting to form a polymer is a clear example of a relevant chemical reaction but the depositing of a pigment in a coloured matrix is simply immobilisation, and thus not a relevant reaction.

Finally, if a restricted hazardous substance cannot comply with the previous four steps but its use is considered fundamentally important to specific products or desirable product functionalities, then a derogation request should be made by the industry to the JRC.

Any derogation request should explain clearly what substance(s) are involved, their CLP classification(s), why they should be derogated and suggested conditions that could be attached to any such derogation (e.g. worker exposure control, maximum dosing rate, minimum functionality imparted or minimum degree of immobilisation achieved etc.).

Outcomes from 1st AHWG meeting

JRC presented the proposed changes in the criteria structure to incorporate the horizontal approach to CLP restrictions for hazardous substances in line with the recent work of the 2nd Chemicals Task Force (final recommendations unpublished at that point). JRC commented that the current restrictions appear to focus on consumables more than on the final product. In order to correctly match the intention of Article 6(6), this criterion should focus on the final product. JRC presented the hierarchical approach that should be taken to screening for CLP restrictions (see **Error! Reference source not found.**).

The JRC stated that the specific requirement for toluene in the printed paper criterion from 2012 should be moved to a standalone criterion about toluene recovery in rotogravure printing processes. The main reason for this is because residual toluene remaining in printed paper does not exceed 0.1% w/w but is more likely to remain at levels around 0.04% w/w immediately after printing and decreasing rapidly with time after printing due to evaporation of toluene traces. So instead of a derogation for the use of toluene in the horizontal criteria (simply not applicable due to the 0.1% rule) it is later proposed to have a specific criterion required relating to toluene recovery and fugitive emissions from the rotogravure process.

Input about the use of hazardous substances in the production process and their chemistries in general was requested by the JRC. Industry were also informed that any derogation request should explain clearly what hazardous substance(s) are involved, their CLP classification(s), why they should be derogated and suggested conditions that could be attached to any such derogation (e.g. worker exposure control, maximum dosing rate, minimum functionality imparted or minimum degree of immobilisation achieved etc.). A representative of EuPIA, the European Printing Inks Association offered to collaborate with both the gathering of hazard information about inks and the potential consideration of necessary derogation requests.

Concern was expressed by one stakeholder that moving the focus of the horizontal CLP restrictions away from consumables and towards the final product would weaken the criteria significantly. The JRC agreed in principle with this comment although at the same time queried whether Competent Bodies were fully applying this horizontal CLP restrictions to all consumables or not. In order to not create a gap for hazardous substance screening of inks, it was proposed to create a new standalone hazardous substance criterion specifically for inks used in printed paper products.

Further research and main changes

With the collaboration of industry representatives, SDSs for a total of 33 relevant ink formulations were gathered and screened for restricted hazard classifications. Of these 33 ink and varnish formulations:

- 22 of the formulations had no CLP classification as a mixture.
- The other 11 formulations had a total of 51 CLP hazard classifications between them defined in part 2 of their SDSs.
- Overall there were 100 ingredients with a total of 289 CLP classifications between them declared in part 3 of SDSs.

Some ingredients and some mixtures had multiple CLP classifications. The distribution of classified ingredients and mixtures is illustrated below.

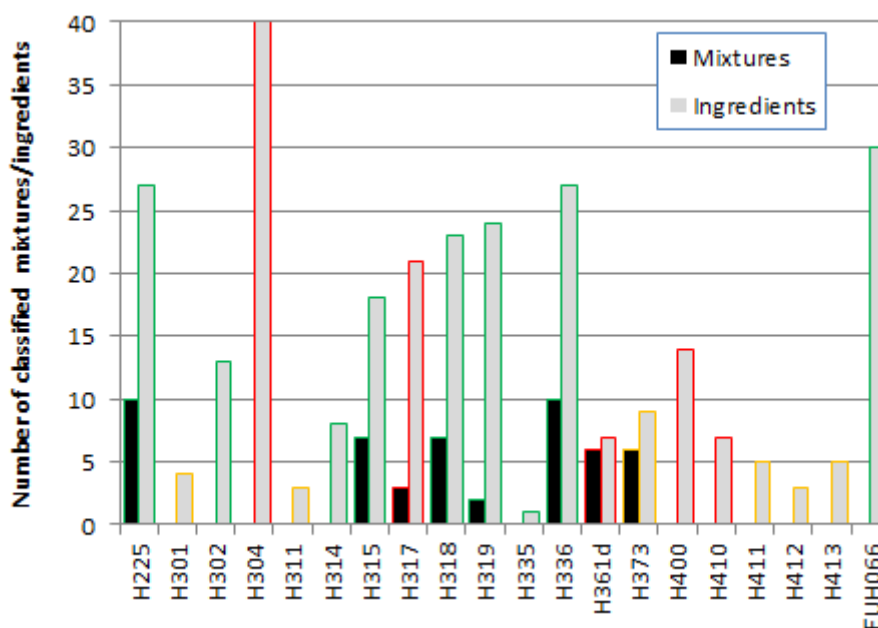


Figure 9. Distribution of CLP classifications mixtures and ingredients from a review of 33 relevant SDSs.

When considering the horizontal restrictions for CLP classified substances, the EU Ecolabel focuses only on certain CLP hazards, as per the recommendations of the EU Ecolabel Chemicals Task Force. The columns highlighted with a green border represent those CLP classifications that are less severe and that are not restricted by the EU Ecolabel Regulation *per se* (i.e. H225, H302, H314, H315, H318, H319, H335, H336 and EUH066). The columns highlighted with an orange border represent those CLP classifications of "Group 3 hazards" that are restricted by the EU Ecolabel Regulation if they remain in the final product (i.e. H301, H311, H373, H411, H412 and H413). The columns highlighted with a red border represent those CLP classifications of "Group 2 hazards", which are more severe than Group 3 hazards and are also therefore restricted by the EU Ecolabel Regulation if they remain in the final product (i.e. H304, H317, H361d, H400 and H410).

A closer look at the group 2 hazards identified

All the mixtures that were classified as H361d (suspected of damaging the unborn child), arguably the most serious of all the restricted CLP hazards that were identified, were due to the presence of large quantities (>50% by wt.) of toluene as a solvent. The only other appearance of H361 classified ingredients were minor amounts (<2.5% by wt.) of two substances found in one yellow ink. Since toluene is a solvent, it is not intended to remain in the final product and so would pass the horizontal screening for the EU Ecolabel CLP restrictions that are placed on the final product. However, due to the seriousness of the hazard involved, the quantities of toluene involved and its indispensable use in the rotogravure process, it is considered relevant to set a separate criterion on the recovery of toluene from the process.

The H304 hazard (may be fatal if swallowed and enters airways) was the most commonly reported Group 2 hazard for ingredients and was associated with both toluene and with hydrocarbons used in ink formulations (petroleum distillates, white mineral oil, C14-C18 n-alkanes, isoalkanes, cyclics or varying aromatic contents). These substances could be present in quantities exceeding 20% of the ink formulation. However, due to the volatile nature of these substances and the final product, this hazard cannot be considered as relevant to the safety of consumers, but instead to workers in the supply and production chain.

The H317 hazard the next most commonly reported Group 2 hazard but was associated with lots of different substances used for different purposes. For example, with 1,2-Benzisothiazol-3(2H)-one as an in-can preservative for water-based ink formulations or varnishes at very low concentrations (<0.025% by wt.) or with 2,4,7,9-Tetramethyl-5-decyne-4,7-diol as a colourant (<1.0% by wt.) or 2-tert-butylhydroquinone as a stabiliser to control evaporation rates (<1.0% by wt.). Due to the merging with the criteria for converted paper set out in Decision 2014/256/EU, there is now a horizontal restriction posed for H317 when used in certain types of chemical (dye formulations, colourants, surface finishing agents and coating materials used in paper stationary or paper carrier bag products). The current proposal now extends the H317 to printed paper products. Although the quantities involved imply that these substances would only potentially remain at levels <0.1% wt. of the final printed paper product, the potential need for a derogation for certain ink formulations or varnishes may be necessary.

The H400 and H410 hazards (very toxic to aquatic life) often appeared together for the same substance. These hazards were associated with the same in-can preservatives that also carried the H317 hazard as well as some alkylamines used in yellow ink (<5% by wt.), oleic acid copper salt (<0.25% by wt.) used in black ink and 2-tert-butylhydroquinone (<1.0% by wt.) used in black ink.

Is a derogation needed for UV inks and varnishes?

The derogation for UV-curing inks and varnishes has provisionally been removed since it is understood that the UV curing process results in the "*radical polymerisation*" of the formulation applied to the substrate that is 95% completed with a fraction of a second and 100% completed within one day (**Huber Group, 2017**).

A UV-curing ink formulation would typically consist of:

- 60-70% "vehicle" (a mix of "oligomer" and "monomer" compounds rich in terminal acrylate groups based on acrylated epoxy resins, polyesters, polyethers and polyurethanes).
- 15-20% "pigment" (the absorption/reflection spectra of pigments needs to be also considered in the UV range and not just the visible range of electromagnetic radiation).
- 8-12% photoinitiator (depending on the maxima for UV absorption, any particular photoinitiator will be more or less suitable for surface curing or sub-surface curing).
- 5-8% "additives" (mainly stabilisers to extend the ink shelf-life, extenders to improve the flow characteristics of the ink formulation and lubricants).

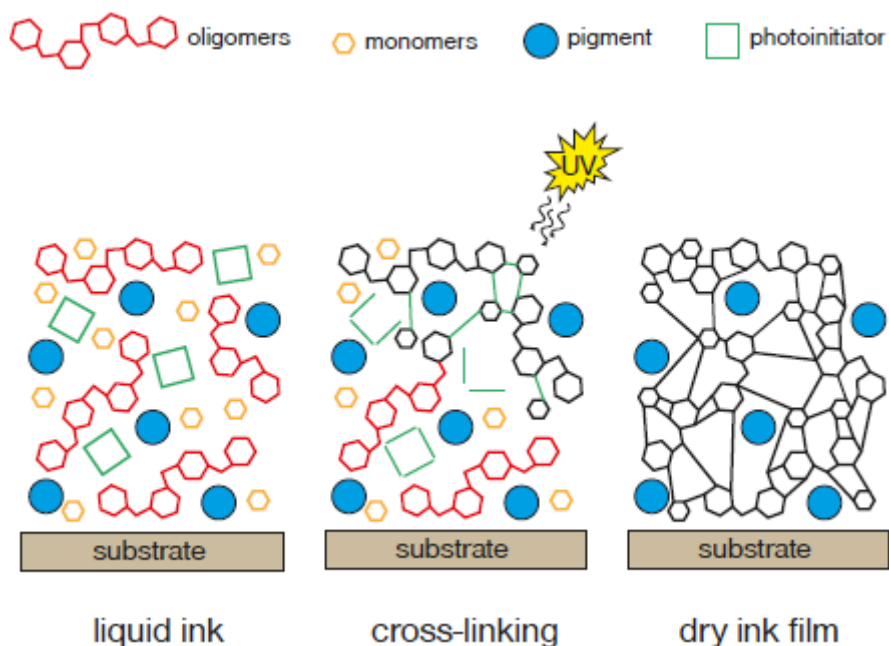


Figure 10. Illustration of UV-curing ink reaction (Source: Huber Group, 2017)

A derogation was introduced in TR v1.0 to simply reflect the exemption to criterion 2a) that was already stated in Decision 2012/481/EU.

However, looking at the reaction mechanism in Figure 10, it is clear that UV inks are examples of hazardous substances that undergo chemical reactions (i.e. radical polymerisation into 3-D cross-linked polymers) such that the original restricted hazardous substance(s) no longer apply to the final product in quantities exceeding 0.1% by weight. The only ingredient that could be argued to not be chemically modified is the pigment. Consequently, whether or not the H412 derogation needs to be maintained in the new proposal ultimately depends on whether or not the classification was associated with the pigment. By derogating the H412 hazard, it would also make sense to derogate the similar, but less severe but equally restricted H413 hazard, to avoid the need for any amendments should a less hazardous variation of UV inks, varnishes or lacquers become available on the market.

Derogation request from industry: Mineral oils

A derogation request for mineral oils and distillates with the H304 classification was submitted. It was explained that mineral oils are used as solvents and help to optimise the behaviour of the ink for different printing techniques. In heatset processes the mineral oils are mostly evaporated in the drying process but in coldset processes, a larger fraction of the mineral oils will remain absorbed to the paper substrate.

It was also stated that there are no known substitutes for mineral oils and that in most cases they will end up accounting for less than 0.10% wt. of the final printed paper product. The risk of the H304 hazard (may be fatal if swallowed and enters airways) means it generally presents no risk unless it is actively inhaled or ingested by workers handling the inks. However, due to the need for a consistent application of the criterion, in principle, derogation for the potential presence of residual mineral oils in printed paper products was considered relevant by the JRC.

Derogation proposal for nickel

Nickel is used in metal components either as an alloy in stainless steels, where it is melted together with iron, and perhaps chromium metal, or is applied as a fine surface layer of nickel on carbon steels. In both cases, nickel improves the technical properties of the steel. The total quantity of nickel in stainless steel can be 10% by weight, while the

nickel content in electroplated steel is around 1% by weight. Even though the content of nickel is much higher in stainless steels, the nickel is much less bioavailable.

A survey carried out by a converted paper manufacturer has shown that all metal mechanisms in suspension files, folders with metal fastener, ring binders and lever arch files present on the marketplace are treated with nickel. However, the survey also confirmed that there is low probability of having prolonged exposure or skin contact with these metal mechanisms. The surface coating with nickel has a minor effect on the overall weight of a metal mechanism (ca. 0.3%).

Nickel (CAS No 7440-02-0) has a harmonised classification in the *ECHA C&L inventory* of H317, H351 and H372. In particular, according to note 7 of the C&L entry, the H317 classification is linked to alloyed articles when the Nickel release rate exceeds 0,5 µg Ni/cm²/week according to EN 1811.

The JRC considered that the potential for metal components of printed paper (e.g. staples) and paper stationary products (e.g. mechanisms in ring binders and arch-lever files) coming into direct skin contact for long enough to provoke skin sensitisation is negligible (unlike the case for jewellery, zips and certain furniture products. For this reason, the derogation requirement for paper stationary products is not the same as those presented for EU Ecolabel textiles and EU Ecolabel furniture, which set requirements on nickel release rates to minimise the risks of skin sensitisation.

Points for discussion

1. Opinions on the nickel derogation?
2. Clarifications about the existing UV inks and UV varnishes derogation? (The fact that it also applied to varnishes suggests that it had nothing to do with pigments...and if it is not a pigment, surely it will be chemically modified and thus not need derogation...).
3. If the derogation for UV inks needs to be maintained, should it be nuanced for certain product life times (e.g. only intended for use for >1 year) or product parts (e.g. book covers, magazine inserts etc.)?
4. Any other derogation requests foreseen? Especially considering the H317 hazard and any pigments?
5. Regarding the mineral oil derogation, is there an important difference between coldest and heatset products in terms of the % remaining in the product? In the worst case, could it exceed 0.10% w/w of the printed product? (if not, then no derogation is necessary)...
6. With criterion 2a), how often should the Candidate List be checked? Right now the criterion implies that it only needs to be checked at the date of application, but what about periodic updates and when licenses are renewed? How often does renewal happen in general?

5.2.2 Specific restrictions – c) biocidal products

Current criteria on biocides for printed paper established by Commission Decision 2012/481/EU

Biocides, either as part of the formulation or as part of any mixture included in the formulation, that are used to preserve the product and that are classified H410/R50-53 or H411/R51-53 in accordance with Directive 67/548/EEC, Council Directive 1999/45/EC or Regulation (EC) No 1272/2008, are permitted only if their bioaccumulation potentials are characterised by log Pow (log octanol/water partition coefficient) < 3,0 or an experimentally determined bioconcentration factor (BCF) ≤ 100.

Assessment and verification: the applicant shall provide copies of the material safety data sheets for all biocides used during the different production stages, together with a documentation of the concentrations of the biocides in the final product.

Current criterion on biocides for converted paper products established by Commission Decision 2014/256/EU

Biocides, either as part of the formulation or as part of any mixture included in the formulation, that are used to preserve the product and that are classified H410/R50-53 or H411/R51-53 in accordance with Directive 67/548/EEC, Directive 1999/45/EC of the European Parliament and of the Council (1) or Regulation (EC) No 1272/2008, are permitted only if their bioaccumulation potentials are characterised by log Pow (log octanol/ water partition coefficient) < 3,0 or an experimentally determined bioconcentration factor (BCF) ≤ 100.

Assessment and verification: the applicant shall provide copies of the material safety data sheets for all biocides used during the different production stages, together with a documentation of the concentrations of the biocides in the final product.

Proposed (merged) criterion on biocidal products for printed paper, stationary paper and paper carrier bag products

2(c) Biocidal products

Printed paper, paper stationary and paper carrier bag products shall not be treated with any biocidal products, including those of type 7 (film preservatives) and of type 9 (fibre, leather, rubber and polymerised materials preservatives).

Only in-can preservatives (biocidal product type 6: preservatives for products during storage) present in printing inks, varnishes, lacquers and any other formulations used during the production processes may be permitted, subject to:

- their having been approved, or being under examination pending a decision on approval, by Regulation (EC) No 528/2012 for product type 6 uses;
- their inclusion in Annex I of Regulation (EC) No 528/2012;
- their inclusion in Annex XXXVI to the BfR recommendations for preservatives in paper and board for food contact.

If any biocidal active substance meeting the above condition(s) is classified as H410 or H411, its use shall only be permitted if the bioaccumulation potential (log Pow octanol/water partition coefficient) is < 3.0 or if the bioconcentration factor (BCF) is ≤ 100.

Assessment and verification: the applicant shall provide a declaration of compliance, supported by copies of safety data sheets for all biocidal products used during the production process, together with any relevant declarations and test reports from the manufacturer of the biocidal products.

Rationale

The existing criterion in Decisions 2012/481/EU and 2014/256/EU for printed paper and converted paper product respectively are very similar, only minor updates to some terms were made for the TR v.1.0 proposal, in line with feedback received from experts in biocidal products for other projects since 2014. However, stakeholder feedback to TR v.1.0 has led to the more significant changes proposed in TR v.2.0.

Outcomes from 1st AHWG meeting

As seen from the table above, both the printed paper and converted paper product groups had identical criteria for "*biocides*". JRC presented the minor changes to the wording that had been included, explaining in particular that the term "*biocides*" should be replaced by "*biocidal products*" when relating to mixtures and formulations or "*biocidal active substances*" when referring to individual substances with a biocidal effect.

In Technical Report v1.0, JRC asked the open question of what is meant by the term "*preserve the product*" that appears in the criterion text. No responses were received during the meeting but written comments were received later.

The written feedback confirmed that no biocidal active substances should be used on these products for the purpose of preserving the final printed paper, paper stationary or paper carrier bag product. It was also requested that the criterion be aligned better with the approach in the Blue Angel. One stakeholder requested that the biocidal products consider the food-contact requirements as a basis for approving biocidal products/active substances while the transitional measures of the Biocidal Products Regulation are in place.

Further research and main changes

Alignment with Blue Angel

The comment on the alignment with the Blue Angel approach provided a quotation of the specific text that should be aligned with, which was as follows:

"3.11 Biocides: In the production of the recycled paper, only those substances that have been approved in accordance with the Biocidal Products Regulation (EU) 528/2012 (EU list of approved substances; formerly included in Annex I of the Biocidal Products Directive 98/09 EC) or that have been notified for the relevant biocidal product type and are still being tested as part of the EU review programme for existing active substances may be used as biocides.

It is only permitted to use those biocidal products that have been approved for their respective type of use. Products containing existing active substances that are still part of the EU review programme may be used without approval until a decision has been reached.

In addition, it is not permitted for the products to contain any substances that have been considered as candidates for substitution according to Article 10 of the EU Biocidal Products Regulation 528/2012.

Until the approval requirements for the respective biocidal products come into force, only those substances that are also listed in the XXXVI recommendation from the BfR are permitted.

The following may not be used:

- Tetramethylthiuram disulfide (CAS no. 137-26-8) and
- Nano silver (CAS no. 7440-22-4).

Compliance verification

The applicant shall declare compliance with the requirement in Annex 1 to the contract and state which biocidal substances have been used with their IUPAC names and CAS numbers, as well as the quantities used per kilogram of dry pulp."

The Blue Angel follows a significantly different product group structure than the EU Ecolabel. Consequently, it was considered necessary to ensure that these requirements are intended to apply to in-can preservatives in the formulations used in print houses, or just in the production of paper.

A check of the Blue Angel criteria for different product groups revealed the following:

- DE UZ 14a for recycled paper (2018 version) had the word for word requirement on biocidal products that was quoted by the stakeholder. However, the scope of these criteria only extends to the graphic paper substrate and masking paper (i.e. not to printing processes).
- DE UZ 72 for printing and publication paper made primarily from waste paper (2014 version) also had the word for word requirement on biocidal products that was quoted by the stakeholder. However, again the scope of these criteria only extends to a long list of paper substrates listed in Appendix A and not to the actual printing process.
- DE UZ 195 for printed matter (2015 version) does not contain a single mention of the terms biocide, biocidal product or preservative even though the scope of this product group is highly relevant (e.g. books, magazines, brochures, catalogues etc.).

Due to these inconsistencies in the applicable scopes associated with the stakeholder comment, it was not deemed appropriate to align the Blue Angel requirements for biocidal products on paper substrates (i.e. applicable at paper mill) with the EU Ecolabel requirements for biocidal products in printed paper products (i.e. applicable at the print house).

Specific exclusions and alignment with BPR terminology

Other stakeholder comments confirmed that no preservatives were used at the level of the final product (only in-can preservatives are used in water-based formulations). In order to put this into the correct terminology, the Biocidal Products Regulation was consulted. In Annex V to the Regulation, the following biocidal product types are defined:

- **Product-type 1: Human hygiene.** Products in this group are biocidal products used for human hygiene purposes, applied on or in contact with human skin or scalps for the primary purpose of disinfecting the skin or scalp.
- **Product-type 2: Disinfectants and algacides not intended for direct application to humans or animals.** Products used for the disinfection of surfaces, materials, equipment and furniture which are not used for direct contact with food or feeding stuffs. Usage areas include, inter alia, swimming pools, aquariums, bathing and other waters; air conditioning systems; and walls and floors in private, public, and industrial areas and in other areas for professional activities. Products used for disinfection of air, water not used for human or animal consumption, chemical toilets, waste water, hospital waste and soil. Products used as algacides for treatment of swimming pools, aquariums and other waters and for remedial treatment of construction materials. Products used to be incorporated in textiles, tissues, masks, paints and other articles or materials with the purpose of producing treated articles with disinfecting properties.
- **Product-type 3: Veterinary hygiene.** Products used for veterinary hygiene purposes such as disinfectants, disinfecting soaps, oral or corporal hygiene products or with anti-microbial function. Products used to disinfect the materials and surfaces associated with the housing or transportation of animals.
- **Product-type 4: Food and feed area.** Products used for the disinfection of equipment, containers, consumption utensils, surfaces or pipework associated with the production, transport, storage or consumption of food or feed (including drinking water) for humans and animals. Products used to be incorporated into materials which may enter into contact with food.
- **Product-type 5: Drinking water.** Products used for the disinfection of drinking water for both humans and animals.
- **Product-type 6: Preservatives for products during storage.** Products used for the preservation of manufactured products, other than foodstuffs, feedingstuffs, cosmetics or medicinal products or medical devices by the control of microbial deterioration to ensure their shelf life. Products used as preservatives for the storage or use of rodenticide, insecticide or other baits.

- **Product-type 7: Film preservatives.** Products used for the preservation of films or coatings by the control of microbial deterioration or algal growth in order to protect the initial properties of the surface of materials or objects such as paints, plastics, sealants, wall adhesives, binders, papers, art works.
- **Product-type 8: Wood preservatives.** Products used for the preservation of wood, from and including the saw-mill stage, or wood products by the control of wood-destroying or wood-disfiguring organisms, including insects. This product-type includes both preventive and curative products.
- **Product-type 9: Fibre, leather, rubber and polymerised materials preservatives.** Products used for the preservation of fibrous or polymerised materials, such as leather, rubber or paper or textile products by the control of microbiological deterioration. This product-type includes biocidal products which antagonise the settlement of micro-organisms on the surface of materials and therefore hamper or prevent the development of odour and/or offer other kinds of benefits.
- **Product-type 10: Construction material preservatives.** Products used for the preservation of masonry, composite materials, or other construction materials other than wood by the control of microbiological, and algal attack.
- **Product-type 11: Preservatives for liquid-cooling and processing systems.** Products used for the preservation of water or other liquids used in cooling and processing systems by the control of harmful organisms such as microbes, algae and mussels. Products used for the disinfection of drinking water or of water for swimming pools are not included in this product-type.
- **Product-type 12: Slimicides.** Products used for the prevention or control of slime growth on materials, equipment and structures, used in industrial processes, e.g. on wood and paper pulp, porous sand strata in oil extraction.
- **Product-type 13: Working or cutting fluid preservatives.** Products to control microbial deterioration in fluids used for working or cutting metal, glass or other materials.
- **Product-type 14: Rodenticides.** Products used for the control of mice, rats or other rodents, by means other than repulsion or attraction.
- **Product-type 15: Avicides.** Products used for the control of birds, by means other than repulsion or attraction.
- **Product-type 16: Molluscicides, vermicides and products to control other invertebrates.** Products used for the control of molluscs, worms and invertebrates not covered by other product-types, by means other than repulsion or attraction.
- **Product-type 17: Piscicides.** Products used for the control of fish, by means other than repulsion or attraction.
- **Product-type 18: Insecticides, acaricides and products to control other arthropods.** Products used for the control of arthropods (e.g. insects, arachnids and crustaceans), by means other than repulsion or attraction.
- **Product-type 19: Repellents and attractants.** Products used to control harmful organisms (invertebrates such as fleas, vertebrates such as birds, fish, rodents), by repelling or attracting, including those that are used for human or veterinary hygiene either directly on the skin or indirectly in the environment of humans or animals.
- **Product-type 20: Control of other vertebrates.** Products used for the control of vertebrates other than those already covered by the other product-types of this main group, by means other than repulsion or attraction.
- **Product-type 21: Antifouling products.** Products used to control the growth and settlement of fouling organisms (microbes and higher forms of plant or animal species) on vessels, aquaculture equipment or other structures used in water.
- **Product-type 22: Embalming and taxidermist fluids.** Products used for the disinfection and preservation of human or animal corpses, or parts thereof.

The only two potentially relevant biocidal product groups for printed paper, stationary paper or paper carrier bag products, at the level of preserving the final product, are

product types 7 and 9. Since the stakeholder comments confirmed that these are not necessary, these product groups could be explicitly excluded by the new proposal.

The only relevant biocidal product group relating to in-can preservatives, which would be necessary in some formulations that may be used in the printing process, is product type 6. Consequently, the conditional requirements on any biocidal products or active substances should relate to this product type.

A consideration of alignment with food contact requirements in Germany

In Annex XXXVI to the database of BfR recommendations on food contact materials, the following text is mentioned about preservatives:

B. Production aids

The following production aids may be used:

I.

II.

III.

...

VIII. Preservatives:

1. Sorbic acid
2. Formic acid
3. Adduct of 70 % benzyl alcohol and 30 % formaldehyde Extract of the finished products must contain no more than 1.0 mg formaldehyde/dm².
4. *o*-Phenyl phenol and its sodium and potassium salts, max. 0.01 %
5. Mixture of 5-chloro-2-methyl-4-isothiazolin-3-one (approx. 3 parts) and 2-methyl-4-isothiazolin-3-one (approx. 1 part)²⁵. No more than 0.5 µg/dm² of the mentioned isothiazolones in total must be detectable in the extract of the finished product.
6. 1,2-Benzisothiazolin-3-one²⁵. No more than 10 µg/dm² of this substance must be detectable in the extract of the finished product.
7. 2-methyl-4-isothiazolin-3-one²⁵. No more than 1 µg/dm² of this substance must be detectable in the extract of the finished product.
8. Zinc pyrithione, max. 17 µg/dm²
9. *N*-(3-Aminopropyl)-*N*-dodecylpropane-1,3-diamine. No more than 10 µg/dm² of this substance must be detectable in the extract of the finished product.
10. 2-Octyl-2H-isothiazol-3-one. No more than 5 µg/dm² of this substance must be detectable in the extract of the finished product.
11. 2,2'-dithiobis[*N*-methylbenzamide]²⁵, max. 22 µg/dm²
12. Dodecylguanidine hydrochloride, max. 0.02 % based on the dry fibres weight

The preservatives listed above must only be used in the amounts necessary to protect the raw materials (Section A), processing aids (Section B), and paper refining agents (Section C) from deterioration and decay.

The recommendations seem to present a green list of preservatives but it is not clear if any other preservatives would be allowable under these recommendations, even if they were approved under the Biocidal Products Regulation (EC) No 528/2012. In any case, simply offering the means of a preservative being on this recommended list as an alternative means of verification should not create any obvious problem.

Points for discussion

Is it appropriate to refer to the BfR recommendations in this criterion? Any potential conflict with the application of the Biocidal Products Regulation?

5.2.3 Specific restrictions – d) cleaning agents

Current criteria on washing agents for printed paper established by Commission Decision 2012/481/EU

2(d). Washing agents

Washing agents used for cleaning in printing processes and/or sub-processes that contain aromatic hydrocarbon shall only be allowed if they are in compliance with point 2(b) and if one of the following conditions is fulfilled:

- (i) The amount of aromatic hydrocarbons in the washing agent products used does not exceed 0,1 % (w/w);
- (ii) The amount of aromatic hydrocarbon-based washing agent used annually does not exceed 5 % of the total amount of washing agent used in one calendar year.

This criterion shall not apply to toluene used as washing agent in rotogravure printing.

Assessment and verification: the applicant shall provide the Safety Data Sheet for each washing agent used in a printing house during the year to which the annual consumption refers. The washing agent suppliers shall provide declarations of the aromatic hydrocarbon contents in the washing agents.

Current criterion on washing agents for converted paper products established by Commission Decision 2014/256/EU

3(d) Washing agents

Washing agents used for cleaning in printing processes and/or sub-processes that contain aromatic hydrocarbon shall only be allowed if they are in compliance with point 3(b) and if one of the following conditions is fulfilled:

- (i) the amount of aromatic hydrocarbons in the washing agent products used does not exceed 0,10 % (w/w);
- (ii) the amount of aromatic hydrocarbon-based washing agent used annually does not exceed 5 % of the total amount of washing agent used in one calendar year.

This criterion shall not apply to toluene used as washing agent in rotogravure printing.

Assessment and verification: the applicant shall provide the Safety Data Sheet for each washing agent used in a printing house during the year to which the annual consumption refers. The washing agent suppliers shall provide declarations of the aromatic hydrocarbon contents in the washing agents.

Proposed (merged) criterion on cleaning agents for printed paper, stationary paper and paper carrier bag products

2(d) Cleaning agents

Cleaning agents used for routine cleaning operations in printing processes and/or sub-processes shall:

- Not contain solvents with a flashpoint < 60°C.
- Not contain benzene in concentrations > 0.10% (by weight).
- Not contain toluene or xylene in concentrations > 1.0% (by weight).
- Not contain aromatic hydrocarbons (≥C9) in concentrations > 0.1% (by weight)
- Not contain any ingredients based on halogenated hydrocarbons, terpenes, n-hexane, nonylphenols, N-methyl-2-pyrrolidone or 2-butoxyethanol.

These restrictions do not apply to cleaning agents used in special formulations that are only occasionally used such as dried ink removers and blanket revivers.

The restriction on toluene does not apply to cleaning agents used in rotogravure processes.

Assessment and verification: the applicant shall declare the different cleaning agents that are used and whether they are used for routine cleaning procedures or for special procedures such as dried ink removal or blanket revival. A Safety Data Sheet shall be provided for each cleaning agent used. For the routinely used cleaning agents, the Safety Data Sheets shall be supported by a declaration of compliance with the relevant restrictions listed above from the supplier of the cleaning agent.

Rationale

Although not prompted by stakeholder debate, further research on washing and cleaning agents was conducted by the JRC because:

- they involve volatile solvents and other hazardous chemicals,
- they are often manual operations with significant risks of worker exposure
- they are frequently carried out (e.g. whenever there is a change of colour, a change of ink formulation, that a certain running time has been reached or that the daily shift is ending)
- The research focussed on identifying good industry practice and how this compares with the current EU Ecolabel criteria. There were also some interpretation issues that needed to be cleared up, for example, a definition of the term "*aromatic hydrocarbon*" would be needed for the assessment and verification text (or at least the User Manual) if the current criteria are to be maintained. It would also be useful to consider what different types of cleaning operation there are in printing processes and sub-processes in order to know better which ones this criterion should be applied to.

Outcomes from 1st AHWG meeting

As seen from the table above, both the printed paper and converted paper product groups had identical criteria for "*washing agents*". No changes to the criterion were proposed by the JRC at the 1st AHWG meeting and no comments were received on the matter.

Further research and main changes

German offset printing industry standard

A wide range of washing and cleaning solutions might be used in a single print-house where each solution is optimised for:

- The ink used (e.g. conventional inks, UV-cured inks, hybrid inks or dispersion varnishes).
- The type of printing technology (e.g. sheet-fed or web-fed, coldest or heatset printing).
- Cleaning of very particular or niche parts (e.g. rubber materials, damping rollers, brush rollers or impression cylinders).

It is important to know that the cleaning solution will not damage any of the materials that it will potentially come into direct contact with. Particular care also has to be taken with safety concerns for possible explosion risks when solvent vapours can come into contact with air.

Washing and cleaning solutions may be diluted with water when water soluble particulates and paper fibres need to be removed or be used undiluted when ink fountains or inking rollers are used. Specifically formulated washing and cleaning solutions must also be used for rollers and cylinders (e.g. cylinder cleaning pastes). Washing solutions are examples of combustible liquids and can be classified as follows:

Table 11. Classification of combustible liquids (Source: Bernd Schwegmann)

Flash point	Hazardous characteristics	Washing solution type
< 0°C	Highly inflammable	Special grades of petroleum spirit
< 21°C	Easily inflammable	Special grades of petroleum spirit
< 21-55°C	Inflammable	White spirit
< 55-100°C	None	White spirit
> 100°C	None	High-boiling
> 150°C	None	Cleaning solution on vegetable oil basis

In 1995, the German offset printing industry made a commitment to only use cleaning agents that fulfil a number of criteria based on health and/or technical grounds.

Table 12. Offset printing industry criteria on cleaning agents (Source: BG ETEM)

Criterion	Health grounds	Technical grounds
Flash point: >55°C	Means a lower evaporation rate and therefore lower contamination of the air.	No particular explosion protection measures necessary; lower consumption of cleaning agent;
Benzene content: <0.1%	Can cause cancer.	Aromatic compounds can cause damage to seals and roller or blanket materials.
Toluene and Xylene content: <1%	Workplace limit concentration: 50 and 100 ppm	
Aromatic compounds (≥C9): <1%	hazardous substances: (only low workplace limit concentrations permitted)	
Absence of halogenated hydrocarbons	Neurotoxic; ozone-depleting substances	Can cause shrinkage or swelling of blankets
Absence of terpenes	Sensitizing; can cause skin irritation	Can damage various materials in the printing machine
Absence of n-hexane	Neurotoxic; workplace limit concentration 50 ppm	Very low flash point (-22°C); other hydrocarbon-based washing agents can be used
Absence of secondary amines and amides	Possible formation of carcinogenic nitrosamines under certain conditions	Corrosion of brass. Other anticorrosive agents are available
Absence of nonylphenols	Reprotoxic	Substitutes available: e.g. Sorbitan laurate as an emulsifier
Absence of N-methyl-2-pyrrolidone (NMP)	Reprotoxic, easily absorbed through the skin, corrosive/irritant to skin; workplace limit concentration (steam) 20 ppm	
Absence of 2-butoxyethanol	workplace limit concentration 10 ppm (since Jan. 2012); on the basis of toxicological data and GHS classification criteria: "Toxic in contact with skin or if inhaled"; high vapour pressure	

Most of the criteria listed above are justified by both health and technical reasons. The criteria also allow for the potential to add other substances to the restriction list if unacceptable health risks are identified.

The current EU Ecolabel criteria only focus on one criteria (aromatic hydrocarbons <0.1% or limited used of hydrocarbon-based washing agents). Comparing the EU Ecolabel criteria with the German offset printing industry criteria above, it seems like there is a disparity in the language used. For example, the EU Ecolabel talks about hydrocarbons in general without any clear definition of what is meant by this term whereas the German industry criteria talk about benzene, toluene, xylene and aromatic compounds ≥C9 (all of which are potentially hydrocarbons).

Safe cleaning guidelines in the UK

Very similar criteria to the ones presented above have been proposed in the UK via the UK Printing Solvent Substitution Scheme (**HSE, 2002**) although the aromatic content (C9) was set at 10% and additional requirements for fountain solutions (not cleaning agents) are mentioned and the infrequent use of low boiling point cleaning agents is

specifically permitted in certain circumstances (e.g. in blanket revivers and dried ink removers).

The UK guidance looks at chemical hazards and safety hazards from different printing processes in general. Specifically focussing on chemical hazards from cleaning operations, the following points were raised:

- Risk of burns from strong alkalis (NaOH or KOH) when cleaning screens from a screen printing process.
- Risk of dermatitis from isopropylalcohol (IPA), methylethylketone (MEK) or white spirit used as solvents in cleaning agents for lithographic printing.
- Risk of dizziness, cardiac arrhythmia or long term adverse effects on the liver/kidneys from chlorinated hydrocarbons like dichloromethane and ketones like MEK when cleaning rollers, cleaning cylinders or restoring blankets.

Based on the criteria that have been promoted in the UK and in DE for a number of years already, it was considered appropriate to adjust the EU Ecolabel criterion for washing agents in TR v2.0 to better align with these industry standards. However, the stricter limit of 0.1% (instead of 1% in DE standard) for aromatic hydrocarbons ($\geq C9$) from TR v1.0 was maintained in the TR v2.0 proposal.

Points for discussion
<p>This is a big change from TR v1.0, any opinions?</p> <p>Is there any redundancy in the requirements?</p> <p>What is the most appropriate term: cleaning agents or washing agents (or something else)?</p>

5.2.4 Specific restrictions – e) Alkyl phenol ethoxylates – Halogenated solvents – Phthalates

Current criteria on Alkyl phenol ethoxylates – Halogenated solvents – Phthalates for printed paper established by Commission Decision 2012/481/EU

2(e). Alkyl phenol ethoxylates – Halogenated solvents – Phthalates

The following substances or preparations shall not be added to inks, dyes, toners, adhesives, or washing agents or other cleaning chemicals used for the printing of the printed paper product:

- Alkyl phenol ethoxylates and their derivatives that may produce alkyl phenols by degradation.
- Halogenated solvents that at the time of application are classified in the hazard or risk categories listed in point 2(a).
- Phthalates that at the time of application are classified with risk phrases H360F, H360D, H361f in accordance with Regulation (EC) No 1272/2008.

Assessment and verification: the applicant shall provide a declaration of compliance with this criterion.

Current criterion on Alkyl phenol ethoxylates – Halogenated solvents – Phthalates for converted paper products established by Commission Decision 2014/256/EU

3(e). Alkyl phenol ethoxylates – Halogenated solvents – Phthalates

The following substances or preparations shall not be added to inks, dyes, toners, adhesives, or washing agents or other cleaning chemicals used for the printing of the converted paper product:

- Alkyl phenol ethoxylates and their derivatives that may produce alkyl phenols by degradation.
- Halogenated solvents that at the time of application are classified in the hazard or risk categories listed in point 3(a).
- Phthalates that at the time of application are classified with risk phrases H360F, H360D, H361f in accordance with Regulation (EC) No 1272/2008.

Assessment and verification: the applicant shall provide a declaration of compliance with this criterion.

Proposed (merged) criterion on alkyl phenol ethoxylates, halogenated solvents and phthalates for printed paper, stationary paper and paper carrier bag products

2(e) Alkyl phenol ethoxylates, halogenated solvents and phthalates

The following substances or preparations shall not be added to inks, dyes, toners, adhesives, or cleaning agents used for in the printing process or sub-processes used to produce the printed paper, paper stationary or paper carrier bag product:

- Alkyl phenol ethoxylates and their derivatives that may produce alkyl phenols by degradation.
- Halogenated solvents that at the time of application are classified with any of the hazard classes listed in point 2(b).
- Phthalates that at the time of application are classified with risk phrases H360F, H360D, H360FD, H360Fd, H360Df, H361, H361f, H361d, H361fd or H362 in accordance with Regulation (EC) No 1272/2008.

Assessment and verification: the applicant shall provide a declaration of compliance with this criterion.

Rationale

Although not prompted by stakeholder debate, some minor changes were made to the criterion as follows:

- The reference for hazard classifications was changed from 2(a) to 2(b) because it needs to refer to the CLP restrictions and not the SVHC restrictions.
- The range of hazard classes for phthalates (focussing on the toxic for reproduction hazards) appeared too limited and so has been expanded to cover all the relevant H360 and H361 variations of those hazards as well as the H362 hazard (may cause harm to breast fed children).

Outcomes from 1st AHWG meeting

As seen from the table above, both the printed paper and converted paper product groups had identical criteria for "*alkyl phenol ethoxylates, halogenated solvents and phthalates*". No changes to the criterion were proposed by the JRC at the 1st AHWG meeting and no comments were received on the matter.

Further research and main changes

For the sake of continuing to justify the proposed criterion, some background research was conducted by JRC prior to the publication of TR v2.0.

Alkylphenol ethoxylates (APEOs)

These are a broad group of substances formed by the alkylation of phenol with different alkenes to produce alkylphenols with different chain lengths (controlled by the choice of alkene in the reaction). These substances have a range of properties that make them suitable for use in many different applications such as fuel additives, ingredients in lubricants, in polymers and especially as surfactants in non-ionic detergents. They may also be used in as reactants in the production of fragrances, antioxidants and flame retardants.

With regards to environmental controversy, the best known APEOs are the nonylphenol ethoxylate (NPE), 4-(1,1,3,3-tetramethylbutyl)phenol ethoxylate (more commonly referred to as octylphenol ethoxylate, or OPE).

As per Regulation (EC) No 552/2009, the use of NP (nonylphenol) and NPE in concentrations higher than 0.1% has been restricted as per entry 46 of Annex XVII to the REACH Regulation in cleaning products, the processing of textiles and leather and in a number of other specified uses.

Both of these compounds have been added to the ECHA Authorisation List (Annex XIV to REACH) as per Regulation (EU) 2017/999, which means that they cannot be used after their sunset date (4 January 2021) unless they are specifically authorised (deadline for authorisation requests just passed (4 July 2019)).

Although NPE and OPE do not possess any of the hazards that would qualify it to be listed as a Substance of Very High Concern (SVHC), which is a normal prerequisite before being placed on the Authorisation List, there are concerns that their degradation products (including NP and OP) are toxic to fish and aquatic species and can also result in degradation products with estrogenic activity being released to the aquatic environment.

A comprehensive literature review on the environmental fate of nonylphenol by Soares et al., (2008) showed that NP is an important degradation product of NPE in real life wastewater treatment plants and tends to absorb to sewage sludge solids (about 90% of all NP leaves the wastewater plant as sludge, with the remainder in final effluent). The low water solubility of NP increases its potential for bioaccumulation and decreases its availability for microbial biodegradation. Due to its vapour pressure (2.07×10^{-2} Pa) and Henry's Law constant (8.39×10^{-1} Pa m³/mol), it is possible for NP to pass from the aquatic environment to the atmosphere.

Nonylphenol has been shown to induce breast tumor cell proliferation (Soto et al., 1991), to mimic the natural hormone 17 β -oestradiol by competing for receptor sites that natural oestrogen would bind to (Lee and Lee, 1996; White et al., 1994) and to interfere with the proper functioning of androgens and subsequently, on the development of male reproductive systems (Lee et al., 2003).

The main alternatives for APEOs are alcohol ethoxylates which degrade more rapidly (Campbell, 2002) although the environmental fate of low water solubility degradation products may be a concern (Soares et al., 2005).

The approaches taken in EU Ecolabel criteria for other relevant product groups have been as follows:

- Textiles (Decision 2014/350/EU): limit presence of NP, NPE, OP and OPE to 25mg/kg in final product and ban OPE (4-(1,1,3,3-tetramethylbutyl)phenol) in any textile preparation or formulation.
- Graphic paper and tissue paper (Decision (EU) 2019/70): not to use any cleaning chemicals, de-inking chemicals, foam inhibitors, dispersants or coatings that contain APEOs or alkylphenol derivatives/degradation products.
- Paints and varnishes (Decision 2014/312/EU) Alkylphenoethoxylates (APEOs) and their derivatives shall not be used in any paint or varnish preparations or formulations.
- Laundry detergents (Decision (EU) 2017/1218) Alkyl phenol ethoxylates (APEOs) and other alkyl phenol derivatives shall not be included in the product formulation regardless of concentration. (same approach for other EU Ecolabel detergent products too).

The criteria for EU Ecolabel printed paper and converted paper products are very much in line with the general idea of moving away from the use of APEOs altogether, in line with almost all the examples above. The more specific and final product orientated approach for EU Ecolabel textiles should perhaps be considered in light of the already existing restriction as per entry 46 of Annex XVII to REACH, the global nature of the supply chain and the need for practical means to assess and verify the non-use of these substances in the supply chain for products which are articles.

Halogenated solvents

Halogenated solvents may be used in printing inks, paints, coatings, adhesives and plastics (directly relevant to printed paper, paper stationary and paper carrier bag products) and also in textile processing, urethane foam production and in cleaning operations on industrial machinery.

In general, there is a shift away from the use of halogenated solvents toward halogen-free alternatives, as exemplified by the ZDHC roadmap to zero programme promoted in the footwear and apparel sector, which places restrictions on:

- 1,2-dichloroethane (CAS No 107-06-2, harmonised classification H350),
- methylene chloride (CAS No 75-09-2, harmonised classification H351),
- trichloroethylene (CAS No 79-01-6, harmonised classification H341, H350 and H412),
- tetrachloroethylene (CAS No 127-18-4, harmonised classification H351 and H411).

These four well known examples of halogenated solvents all have harmonised classifications for CMR hazards. In general, the Industrial Emissions Directive (IED) 2010/75/EU has placed special requirements on facilities that use halogenated solvents classified as CMR (e.g. see Article 59(5), Article 82(8), Article 82(9) and part 4 of Annex VII to the IED).

According to information published in the draft BREF document for surface treatment using organic solvents (EC, 2017), the use of halogenated solvents in powerful cleaning agents used for industrial machinery can be replaced by ethanolamine. The same draft document states that the use of halogenated solvents is already considered as obsolete in Germany.

Another aspect to consider is the ozone depletion potential (ODP) of halogenated solvents. Although the compounds with the highest ODP potentials have been phased out already or are being phased out, the ozone depletion mechanism is widely understood to involve free chlorine radicals (UNEP, 2001), which are not present in non-halogenated solvents.

In the EU Ecolabel context, the criteria for paints and varnishes (Decision 2014/312/EU) prohibit the use of halogenated solvents in criterion 7d) regardless of their classification. A similar approach has been applied in Decisions 2012/481/EU and 2014/256/EU for printed paper and converted paper products and is maintained in this proposal as well.

Phthalates

Phthalates have found applications in many different manufacturing sectors and products such as children's toys, furniture, food wrap, medical devices, building materials, cables and packaging. The best known example is as a plasticiser in flexible PVC but other uses that are directly relevant to printed paper, paper stationary and paper carrier bag products also exist, for example as a solvent or additive in inks or coatings.

Phthalates tend to be categorised as "high" or "low" depending on the number of carbon atoms in the chemical "backbone". Backbones with 3-6 carbon atoms are considered as "low" phthalates and those with 7-13 carbon atoms as "high" phthalates.

A summary of the main phthalates of concern and some details of the relevant points are summarised in the table below.

Table 13. Summary of main phthalate restrictions and concerns

Acronym, full name and CAS No.	CLP classifications of concern and applications*	Restrictions in place
DEHP, Bis(2-ethylhexyl)phthalate, 117-81-7	H360FD (harmonised). Perfumes, flexible PVC products (shower curtains, garden hoses, diapers, food containers, plastic film for food packaging, bloodbags, catheters, gloves, and other medical equipments such as tubes for fluids, etc.)	Entry 51 of Annex XVII to REACH as per Regulation (EC) No 2018/2005: not to be used as substances or mixtures, individually or in any combination of the four phthalates, in a concentration equal to or greater than 0.1% by weight of the plasticised material** in toys, childcare products and other articles with some specific exemptions.
BBP, Benzyl butyl phthalate, 85-68-7	H400, H410, H360Df (harmonised). Perfumes, hair sprays, adhesives and glues, automotive products, vinyl floor coverings	
DBP, Dibutyl phthalate, 84-74-2	H400, H360Df (harmonised). Plastics such as PVC, adhesives, printing inks , sealants, grouting agents used in construction, additive to perfumes, deodorants, hair sprays, nail polish, and insecticides.	
DIBP, Diisobutyl phthalate, 84-69-5	H360Df (harmonised). Nitro cellulose plastic, nail polish, explosive material, lacquer Similar application and properties as DBP: used as a substitute, e.g. in PVC, paints, printing inks and adhesives	
DNOP, Di-n-Octyl-Phthalate, 117-84-0	H361, H317, H413 (individual entries). Medical tubing and blood storage bags, wire and cables, carpetback coating, floor tile, and adhesives , cosmetics and pesticides.	
DINP, Di-Isononyl Phthalate, 28553-12-0	H400, H361 (individual entries). Mostly in PVC as a plasticizer; Remaining in rubbers, inks, adhesives and sealants, paints and lacquers .	
DIDP, Di-Isodecyl-Phthalate, 26761-40-0	H400, H410, H411 (individual entries). Mostly in PVC as a plasticizer; Remaining in rubbers, anti-corrosion paints, anti-fouling paints, sealing compounds, and textile inks.	

**past and present applications*

***the term "plasticised material" includes the following relevant interpretations: surface coatings, finishes, printed designs, adhesives, sealants, paints and inks.*

****exemptions include articles for industrial or agricultural use, aircraft, motor vehicles, measuring devices for laboratory use, food contact materials, medical devices and electrical and electronic equipment.*

It is clear that the existing criteria set out in decisions 2012/481/EU and 2014/256/EU for EU Ecolabel printed paper and converted paper products respectively are much more restrictive than the current regulatory framework requires. Although this has been criticised by some representatives of the chemical industry in the past for other relevant EU Ecolabel product groups, it is clear that all of the phthalates listed above potentially have restricted CLP hazards, even if some of them have only been raised as individual entries (i.e. not yet harmonised) at this point in time.

Due to the considerable uptake that has been achieved with both product groups, and especially with printed paper, it is clear that the ban on all phthalates in inks, dyes, toners, adhesives and cleaning agents is not a significant concern for producers.

The concern with phthalates is centred on entry 51 to Annex XVII of REACH (see Regulation (EC) No 2018/2005), which restricted the placing of toys, childcare articles on the market that contained any combination of the following phthalates in concentrations exceeding 0.1% by weight of the plasticised material:

Points for discussion
When we are restricting phthalates by classification, to what level should confidence in the classification be established (i.e. just as some individual entries in the C&L inventory would be enough to justify excluding, a joint entry in the C&L inventory would be enough to justify excluding or a harmonised classification would be necessary to justify excluding)?

5.2.5 Specific restrictions – f) Printing inks, toners and varnishes

Current criteria on printing inks, toners, inks, varnishes, foils and laminates for printed paper established by Commission Decision 2012/481/EU

2(f). Printing inks, toners, inks, varnishes, foils and laminates

The following heavy metals or their compounds shall not be used in printing inks, toners, inks, varnishes, foils and laminates (whether as a substance or as part of any preparation used): cadmium, copper (excluding copper-phthalocyanine), lead, nickel, chromium VI, mercury, arsenic, soluble barium, selenium, antimony. Cobalt can only be used up to 0.1 % (w/w).

Ingredients may contain traces of those metals up to 0.01 % (w/w) deriving from impurities in the raw materials.

Assessment and verification: the applicant shall provide a declaration of compliance with this criterion as well as declarations from ingredient suppliers.

Current criterion printing inks, toners, inks, varnishes, foils and laminates for converted paper products established by Commission Decision 2014/256/EU

3(f). Printing inks, toners, inks, varnishes, foils and laminates

The following heavy metals or their compounds shall not be used as printing inks, toners, inks, varnishes, foils and laminates (whether as a substance or as part of any preparation used): cadmium, copper (excluding copper-phthalocyanine), lead, nickel, chromium VI, mercury, arsenic, soluble barium, selenium, antimony. Cobalt can only be used up to 0.10 % (w/w)

Ingredients may contain traces of those metals up to 0.010 % (w/w) deriving from impurities in the raw materials.

Assessment and verification: the applicant shall provide a declaration of compliance with this criterion as well as declarations from ingredient suppliers.

Proposed (merged) criterion on printing inks, toners and varnishes for printed paper, stationary paper and paper carrier bag products

2(f) Printing inks and related products

The following restrictions shall apply to all substances or mixtures used in printing inks, toners and varnishes for use in the printing process or sub-processes used to produce EU Ecolabel printed paper, paper stationary or paper carrier bag products:

No substances or mixtures with CLP classifications for category 1A or 1B carcinogenic, mutagenic and/or toxic for reproduction (CMR): H340, H350, H350i, H360, H360F, H360D, H360FD, H360Fd, H360Df shall be used.

- No substances or mixtures with CLP classifications for category 1 and 2 acute toxicity: H300, H310, H330 shall be used.
- No substances or mixtures with CLP classifications for category 3 acute toxicity (oral, dermal): H301, H311 shall be used.
- No substances or mixtures with CLP classifications for category 1 specific target organ toxicity (STOT: single exposure or repeated exposure): H370, H372 shall be used.
- No pigments or additives based on antimony, arsenic, cadmium, chromium (VI), lead, mercury or selenium or any compounds thereof shall be used. Cobalt can only be used up to 0.10% (w/w).
- No azo dyes, which by reductive cleavage of one or more azo groups may release one or more of the aromatic amines listed in Appendix 8 of entry 43 of Annex XVII to REACH, shall be used (see indicative list in Appendix I).
- The following solvents: 2-Methoxyethanol, 2-Ethoxyethanol, 2-Methoxyethyl

- acetate, 2-Ethoxyethyl acetate, 2-Nitropropane and Methanol shall not be used.
- The following plasticisers: chlorinated naphthalenes, chlorinated paraffins, monocresyl phosphate, tricresyl phosphate and monocresyl diphenyl phosphate shall not be used.
- Diaminostilbene and its derivatives, 2,4-Dimethyl-6-tertiary-butylphenol, 4,4'-Bis(dimethylamino)benzophenone (Michler's Ketone) and Hexachlorocyclohexane shall not be used.

Assessment and verification: the applicant shall provide a list of all the printing inks and related products used in the production of EU Ecolabel printer paper, paper stationary or paper carrier bag products, together with a safety data sheets and declaration of compliance with this criterion for each printing ink and related product from the supplier/producer of each product.

Rationale

Following on from the discussion at the 1st AHWG meeting, it is clear that the EuPIA exclusion policy would strongly overlap with the original criterion on "*printing inks, toners, inks, varnishes, foils and laminates*".

The JRC decided to examine the EuPIA exclusion policy and determine if it could indeed be incorporated into a standalone criterion for printing inks and related products, that would essentially replace and amplify the existing criterion (which only limits certain heavy metals).

Outcomes from 1st AHWG meeting

As seen from the table above, both the printed paper and converted paper product groups had identical criteria for "*printing inks, toners, inks, varnishes, foils and laminates*". No changes to the criterion were proposed by the JRC at the 1st AHWG meeting, even though there is a clear typo by the double mentioning of the term inks in the title of the criterion.

In response to a discussion that was related to the refocussing of the horizontal CLP restrictions, and the concern that moving away from a consumable-based approach to final product-based approach would essentially weaken the restrictions in place on printing inks, it was suggested that the EuPIA exclusion policy could be used as a source of inspiration for any new standalone criteria for printing inks.

Two comments were received about the heavy metal exclusions in printing inks, which prompted the JRC to carry out a comparison of the requirements in the existing EU Ecolabel, Nordic Ecolabel, Blue Angel and EuPIA documents.

Further research and main changes

Cross-check on heavy metal exclusions

- Existing EU Ecolabel criteria:** Cd, Cu (except Cu-phthalocyanine), Pb, Ni, Cr(VI), Hg, As, Ba (if soluble), Se and Sb. Co only allowed up to 0.1 % (w/w). All of these excluded heavy metals are allowed up to 0.01% (w/w) to account for impurities.
- Nordic Ecolabel criteria:** sum total of Pb, Cd, Hg and Cr(VI) must be < 0.01% in printing inks, toners, inks, varnishes, foils and laminates.
- Blue Angel criteria (DE-UZ 195):** Pb, Cd, Cr(VI), Co, Hg, Ni and Cu (except Cu phthalocyanine). Mn only allowed up to 0.5% by mass.
- EuPIA exclusion policy:** no pigment colorants based on Sb (some exception applies), As, Cd, Cr(VI), Pb, Hg or Se.

The common denominators are the exclusions on Cd, Pb, Cr(VI) and Hg. There is a lack of consistency for all of the other heavy metals.

The EuPIA exclusion policy for printing inks and related products is a voluntary commitment of the European printing ink industry that began in 1996 and is now in its

3rd edition (published in November 2016 and recently corrected in December 2018). During the more than 20 years of its existence, the exclusion policy has had to react and adapt to the implementation of the REACH and CLP Regulations, developments in classification rules and substance re-classifications due to new toxicological evidence.

The EuPIA exclusion is currently focussed on a hazard-based approach, which is not dissimilar to the way in which Article 6(6) of the EU Ecolabel Regulation has been applied as per the recommendations of the EU Ecolabel chemicals task force.

The exclusions are split into 7 different groups (A to G):

- A. Raw materials* used in formulations classified as acutely toxic, category 1 and 2 (i.e. H300, H310, H330); acutely toxic by inhalation category 3 (i.e. H331); CMR category 1 (i.e. H340, H350, H360); STOT single exposure category 1 (i.e. H370).
- B. Raw materials* used in formulations classified as acutely toxic category 3 (i.e. H301 and H311); toxic to reproduction (if threshold exists); STOT repeated exposure category 1 (H372).
- C. Pigments shall not be based on the following heavy metals or their compounds: antimony*, arsenic, cadmium, chromium (VI), lead, mercury or selenium. (*there is a specific exemption for antimony in certain non-bioavailable pigments).
- D. The following dye colourants (Basic Yellow 2, Basic Orange 2, Basic Violet 14, Solvent Blue 7 and Basic Brown 4) shall not be used in addition to any soluble azo dyes that can decompose to form category 1 carcinogenic aromatic amines.
- E. The following solvents shall not be used: 2-Methoxyethanol; 2-Ethoxyethanol; 2-Methoxyethyl acetate; 2-Ethoxyethyl acetate; Monochlorobenzene; Dichlorobenzene; Volatile chlorinated hydrocarbons such as trichloroethylene, perchloroethylene and methylene chloride; Volatile fluorochlorinated hydrocarbons; 2-Nitropropane; Methanol.
- F. The following plasticisers shall not be used: Chlorinated naphthalenes; Chlorinated paraffins; Monocresyl phosphate; Tricresyl phosphate and Monocresyl diphenyl phosphate.
- G. The following other compounds shall not be used for any particular purpose: Diaminostilbene and derivatives; 2,4-Dimethyl-6-tertiary-butylphenol; 4,4'-Bis(dimethylamino)benzophenone (Michler's Ketone); Hexachlorocyclohexane.

*Raw materials are understood as substances and mixtures used as ingredients in formulations.

Annex 2 to the EuPIA exclusion policy makes an exemption for the use of formaldehyde in micro-capsules used in scent varnishes. Such an exclusion would not be relevant to this EU Ecolabel product group since fragranced products are excluded from the scope.

Points for discussion

1. This is a big change from TR v1.0, any opinions?
2. Considering the significant divergence in heavy metal restrictions between the EuPIA exclusion policy, the EU Ecolabel, the Blue Angel and the Nordic ecolabel criteria, how best to align? Should all restrictions be grouped together to be as ambitious as possible or might this lead to unintended consequences? Can Cobalt be banned for inks in all the relevant printing technologies that apply?
3. Due to the fact that the indicative list of restricted azo dyes in Appendix II is much larger (aligned with previous EU Ecolabel research on this subject for textiles and furniture) than the list of five azo dyes specifically mentioned by the EuPIA exclusion list, the larger list must be cross-checked with ink suppliers to the paper and board printing industry.

5.2.6 Specific restrictions – g) Toluene recovery form rotogravure printing

Current criteria on toluene for printed paper established by Commission Decision 2012/481/EU

Criterion 2 – Excluded or limited substances and mixtures

(a) Hazardous substances and mixtures

Consumables that could end up in the final printed paper product, and that contain substances and/or mixtures meeting the criteria for classification with the hazard statements or risk phrases specified below in accordance with Regulation (EC) No 1272/2008 of the European Parliament and of the Council or Council Directive 67/548/EEC or substances referred to in Article 57 of Regulation (EC) No 1907/2006 of the European Parliament and of the Council shall not be used for printing, coating, and finishing operations of the final printed paper product.

This requirement shall not apply to toluene for use in rotogravure printing processes where a closed or encapsulated installation or recovery system, or any equivalent system, is in place to control and monitor fugitive emissions and where the recovery efficiency is at least 92 %. UV varnishes and UV inks classified H412/R52-53 are also exempted from this requirement.

The non-paper components (up to 20 % in weight, as specified in Article 1) that are part of the final paper product shall not contain the substances referred to above.

List of hazard statements and risk phrases:

Hazard Statement	Risk Phrase
H300 Fatal if swallowed	R28
H301 Toxic if swallowed	R25
Etc. etc.	Etc. etc.

Assessment and verification: For substances not already classified in accordance with Regulation (EC) No 1272/2008, the applicant shall prove compliance with these criteria by providing: (i) a declaration that the non-paper components that are part of the final product do not contain the substances referred to in these criteria in concentration above the authorised limits;.....etc.

Current criterion on toluene for converted paper products established by Commission Decision 2014/256/EU

Criterion 3 – Excluded or limited substances and mixtures

(a) Hazardous substances and mixtures

Consumables that could end up in the final converted paper product, and that contain substances and/or mixtures meeting the criteria for classification with the hazard statements or risk phrases specified below in accordance with Regulation (EC) No 1272/2008 of the European Parliament and of the Council or Council Directive 67/548/EEC or substances referred to in Article 57 of Regulation (EC) No 1907/2006 of the European Parliament and of the Council shall not be used for printing, coating, and finishing operations of the final printed paper product.

This requirement shall not apply to toluene for use in rotogravure printing processes where a closed or encapsulated installation or recovery system, or any equivalent system, is in place to control and monitor fugitive emissions and where the recovery efficiency is at least 92 %. UV varnishes and UV inks classified H412/R52-53 are also exempted from this requirement.

The non-paper components that are part of the final paper product shall not contain the

substances referred to above.

List of hazard statements and risk phrases:

Hazard Statement	Risk Phrase
H300 Fatal if swallowed	R28
H301 Toxic if swallowed	R25
Etc. etc.	Etc. etc.

Assessment and verification: For substances not already classified in accordance with Regulation (EC) No 1272/2008, the applicant shall prove compliance with these criteria by providing: (i) a declaration that the non-paper components that are part of the final product do not contain the substances referred to in these criteria in concentration above the authorised limits;.....etc.

Proposed (merged) criterion on toluene for printed paper, stationary paper and paper carrier bag products

2(g) Toluene recovery from rotogravure printing

Any rotogravure printing processes used to produce EU Ecolabel printed paper, paper stationary or paper carrier bag products must have a closed loop solvent recovery system in place and be able to demonstrate a toluene recovery efficiency of at least 97%.

Assessment and verification: The applicant shall provide a declaration of compliance with this criterion supported by a description of closed loop solvent recovery system and a mass balance of toluene that demonstrates a recovery of at least 97% during the most recent completed calendar year.

Rationale

According to the ECHA C&L inventory, toluene (CAS No. 108-88-3) has a harmonized classification of H225, H315, H304, H336, H373 and H361d. The EU Ecolabel chemicals task force consider the H304 and H361d hazards as Group 2 restricted hazards and H373 as a Group 3 restricted hazard.

The rotogravure process is best suited for the high volume printing of newspaper, magazines, catalogues and brochures, all within the scope of EU Ecolabel printed paper products. The high print speeds require fast drying inks and low viscosity, solvent-based inks are the most suitable.

Even though [toluene](#) residues do not remain in the final product in high enough quantities to be covered by the horizontal criterion 2b, due to the large quantities of this solvent used in the rotogravure process (some 100 000 t/yr in 32 printing plants and 125 presses in Europe) (EC, 2017), a specific criterion on toluene is considered relevant.

The criteria set out in both Decision 2012/481/EU and Decision 2014/256/EU considered that the horizontal hazardous substance criteria would apply to inks and even solvents in inks (i.e. consumables) and so a conditional exemption for toluene from those requirements by requesting that at least 92% of the toluene be recovered.

The Nordic Ecolabel criteria for printed matter also consider a recovery efficiency of 92% for toluene. A recovery of 97% is proposed to reflect recent modifications to ink compositions, which mean that the ink takes more time to solidify and thus more time is available for toluene to evaporate to the recovery system (EC, 2017).

Outcomes from 1st AHWG meeting

As seen from the table above, both the printed paper and converted paper product groups had identical criteria for "toluene". The JRC proposed to change the approach to toluene by removing it from the scope of the horizontal criteria (i.e. 2a and 2b) and creating a new standalone criterion specifically for toluene in rotogravure printing.

The JRC wished to make it clear that those horizontal criteria (i.e. 2a and 2b) are intended to apply to the final product and not to consumables such as ink or solvents, which may not remain in the final product or which may be chemically modified during the production process.

The standalone criterion proposed at the 1st AHWG meeting was essentially the same as the exemption clause inserted into the current horizontal restrictions, except that a 97% recovery was proposed instead of a 92% recovery.

No comments were received about this matter from stakeholders during the meeting although as a general comment, it was agreed that better guidance is needed about how exactly to interpret the horizontal hazardous substance restrictions.

Further research and main changes (mostly from STS BREF, EC 2017)

It is necessary to know better how a mass balance of toluene should be conducted. Printing inks used in rotogravure processes are generally mono-solvent systems, which allows for efficient closed loop recovery and reuse of the solvent.

It is normal for purchased inks for rotogravure to consist of 50% toluene and that this is mixed onsite with recovered toluene or separately purchased toluene to produce an ink formulation that is 70-80% toluene and that is ready for application.

The ink is transferred to the substrate in roller presses (which themselves can be encapsulated to reduce fugitive emissions of toluene) and the solvents are then evaporated to air in the drying sections. The normal configuration is to have 8 presses, 4 for each side and one for each of the four standard ink colours CMYK: Cyan, Magenta, Yellow and Key (black). A ninth or tenth press may also be available in cases where special inks are added, for example for fluorescent inks metallised inks or varnishes. Foils or laminates may also be added at dedicated laminating stations.

The ink applied in press 1 must be dried by passing through dedicated gas-fired or electric dryers before it reaches press 2 and so on in order to avoid smearing. The hot air from dryers is passed to a centralised recovery unit. A simple overview of 4 presses is illustrated below.

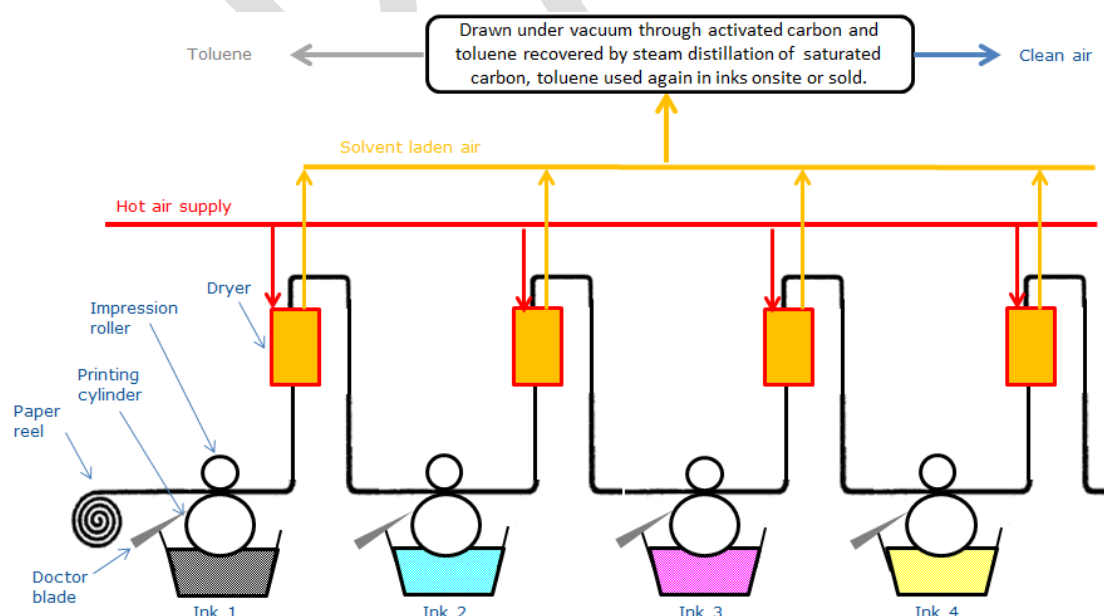


Figure 11. General illustration of process flow for rotogravure printing (one side)

The recovery unit consists of activated carbon filters connected in series. Once the activated carbon is saturated with toluene, it is regenerated with steam and the steam/toluene mixture is separated by gravity once the steam has condensed to water

after cooling. The recovered toluene is of suitable purity for reuse in the process. Recovery rates of more than 95% are possible.

After defining a minimum recovery rate, the next most important detail is to explain how to calculate the recovery rate and, more precisely, what data should the recovery rate calculation should be based on.

A narrow focus would to look simply at the toluene recovery system, with the input air volume and toluene concentration being compared to the output air volume and toluene concentration. The estimate from this data could be supported by records of the quantities of actual toluene recovered from the activated carbon regeneration and subsequent distillation.

A more holistic perspective would be to also consider fugitive emissions (both from evaporation of traces of toluene remaining in the final product and from diffuse emissions whenever ink (either from new ink being prepared or from old ink from cleaning operations or cylinders being cleaned) comes into contact with the open atmosphere. The fugitive emissions from printing and cylinder cleaning operations can be greatly reduced by the fully encapsulated processes.

An 8-hour average workplace exposure limit of $190 \mu\text{g}/\text{m}^3$ is generally applied (the WHO maximum is $260 \mu\text{g}/\text{m}^3$ in a domestic environment). Emissions from traces in remaining in the printed products have been reduced by altering ink formulations so that they take a marginally longer time to dry, providing more time in the dryer section to evaporate the solvent.

The final calculation method for determining the % toluene recovery needs to be clarified better in the EU Ecolabel criteria or at least in the User Manual. Further information will be requested from expert stakeholders and colleagues involved in the BREF process for surface treatment with organic solvents.

Regardless of how exactly the % recovery rate should be calculated, this criterion must apply to the entire rotogravure printing process and not simply to print runs for EU Ecolabel products.

Points for discussion

1. Toluene is a big issue, especially in rotogravure printing, so a standalone criterion is considered necessary. Recovery of toluene is possible in rotogravure because it is a monosolvent process, does the use of multiple solvents in other printing processes really impede their recovery?
2. Input regarding exactly how to recommend mass balances and to calculate toluene recovery rates is needed from experts.

5.2.7 Specific restrictions – h) metal components

Current criteria on metal components for printed paper established by Commission Decision 2012/481/EU

No existing criterion.

Current criterion on metal components for converted paper products established by Commission Decision 2014/256/EU

Criterion 3 – Excluded or limited substances and mixtures

(g) Metal components

Metals shall not be coated with cadmium, chromium, nickel, zinc, mercury, lead, tin and their compounds.

The surface treatment of metal surfaces with nickel or zinc can be accepted for small parts (such as rivet, eyelet, and flat bar mechanisms) where this is necessary due to heavy physical wear.

Both nickel plating and zinc galvanisation shall make use of wastewater treatment, ion exchange technology, membrane technology or equal technology in order to recycle the chemical products as much as possible.

Emissions from surface treatment shall be recycled and destroyed. The system shall be closed without drainage, with an exception for zinc where the emission can be a maximum of 0,50 mg/l.

The chemical products used in the surface treatment must be in compliance with the criteria 3 (c) Biocides and 3 (e) Alkyl phenol ethoxylates – Halogenated solvents – Phthalates.

This requirement applies to each separate metal-type component exceeding 10 % by weight of the final products in the subcategory of suspension file, folders with metal fastener, ring binder and lever arch file.

Assessment and verification: the applicant shall provide a declaration of compliance with this criterion.

Proposed (merged) criterion on metal components for printed paper, stationary paper and paper carrier bag products

Proposed to remove requirement

Rationale

Critique of the existing criterion

JRC did agree in principle that metal components could represent a significant fraction of the life cycle impact of certain paper stationary products but also explained that the existing criterion on metal components was not in any clear way reducing that impact.

The existing criterion for metal components introduces a number of additional considerations that need to be taken into account both by the applicant and upstream suppliers.

There is some confusion with nickel zinc and chromium (the main electroplating metals used) because the first sentence bans them and the second sentence allows for zinc and nickel coating/plating for "*small parts*" and only if they are subject to "*heavy physical wear*". Both of these terms would need to be explicitly defined or a comprehensive list of all relevant components for the different products in the scope that can be expected to contain metal components. The existing criteria remain quite vague and open to interpretation regarding this aspect.

By referring only to the term "chromium", it seems that Chromium III plating is banned even though the salts used in electroplating baths are much less hazardous than the equivalent Chromium VI salts.

The requirements for the destruction of Ni emissions seems unusual in the sense that Ni cannot be destroyed, but simply changed from one form to another. The exception for Zn emissions also sounds unusual because a limit is set in terms of mg/l rather than mg/m² coated. The former unit would be open to cheating by simply diluting the effluent with clean water prior to measurement of the Zn concentration.

It is unlikely that paper converters also specialise in the conversion of metal into specific components, which are now highly standardised. Consequently, all of these requirements are placed on upstream suppliers and it is uncertain how plausible it is for applicants and/or competent bodies to get this information (not forgetting the declarations on halogenated solvents, biocidal products, APEOs and phthalates).

Overall, it seems like this criterion only serves to promote the coating of metal parts by other techniques such as varnishes, paints and opaque plastic layers as opposed to pure metal coatings.

Outcomes from 1st AHWG meeting

The JRC proposed to remove this criterion by stating that the environmental benefit that could be gained seemed disproportionately small in comparison to the additional assessment and verification effort required. This was in line with both the general conclusions of the REFIT evaluation of the EU Ecolabel Regulation (COM(2017)355), which says:

"...efficiency is reduced: When compliance and verification cost for individual companies and organisations outweigh the benefits and so reduce the value for producers and organisations and discourage their participation in the schemes..."

And also with the EU Ecolabel Regulation itself, which states in recital 5:

"...Those criteria should be market oriented and limited to the most significant environmental impacts of products during their whole life cycle."

One stakeholder felt that having no criteria for metal seemed inappropriate. The JRC responded by asking if there was a general rule that all materials must have at least one EU Ecolabel criterion or if criteria just needed to focus on the main environmental impacts? It was confirmed that they only needed to focus on the main impacts.

Comments received after the meeting revealed mixed opinions, with some stakeholders supporting the removal of the criterion and others wanting the criterion to be maintained.

Further research and main changes

For reference, some of the background research carried out with regards to metal electroplating for metal components in EU Ecolabel furniture is reproduced below

"The authors are not aware of any current commercial applications for coating metal with cadmium, mercury or lead and so do not understand the added value of banning these metals.

The most relevant potential applications will be electroplating with chromium, zinc and nickel. In each case, the metal is present in the coated article, not the metal compound added to the process. This is an important point to consider since the metal will generally have a different classification to the metal compounds used at the beginning of the process. Another important consideration is the form and availability of the metal in the treated article. In terms of hazards that these coatings present in the article:

- *Chromium (CAS No. 7440-47-3) has a joint entry in the [ECHA C&L inventory](#) of not classified, which should take precedence over the many individual entries which indicate a wide range of possible hazards such as H400, H410 and H413.*
- *Zinc (CAS No. 7440-66-6) has a harmonised classification in the [ECHA C&L inventory](#) of H400 and H410 although it must be emphasised that this is related to zinc powder and not to zinc in the massive form, as it would be present in an electroplated or galvanised article.*

- Nickel (CAS No 7440-02-0) has a harmonised classification in the [ECHA C&L inventory of H317, H351 and H372](#). In particular, according to note 7 of the C&L entry, the H317 classification is linked to alloyed articles when the Nickel release rate exceeds 0,5 µg Ni/cm²/week according to EN 1811.

With regards to the last bullet point above, it is interesting to note that the H317 is covered by the horizontal CLP restrictions (2b) for paper stationary products. Consequently, a specific derogation for Nickel could be considered as relevant, since it can be tested on the supplied material if suppliers to not provide declarations. On the other hand, it could be argued that no requirement should be set at all for Nickel if the likelihood of prolonged skin contact is considered as negligible."

A survey carried out by a converted paper manufacturer has shown that all metal mechanisms in suspension files, folders with metal fastener, ring binders and lever arch files present on the marketplace are treated with nickel. However, the survey also confirmed that there is low probability of having prolonged exposure or skin contact with these metal mechanisms. The surface coating with nickel has a minor effect on the overall weight of a metal mechanism (ca. 0.3%).

A pragmatic proposal for metal plating of paper stationary product mechanisms?

The 2006 BAT Reference Document (BREF, 2006) for the surface treatment of metals and plastics was consulted and the following relevant pieces of information were found:

- Metal coatings can often consist of more than one metal (see section 2.5.2 and section 2.5.4.3);
- Electrolytic recovery of nickel and chromium is a useful technique to maximise plating metal use efficiency and simultaneously destroy cyanide residues (see section 4.12);
- Closed loop nickel plating operations increase the use efficiency of nickel from 80-85% to 95% (see Table 5.1);
- BAT ranges for Zn emissions to wastewater varied widely (0.2 to 2.2 mg/l for small scale and large scale steel coil coating and that sometimes Zn and Ni are used together in coatings (see Table 5.2).

Based on the details in the BREF, it did not seem appropriate to set a limit of 0.5 mg/l for Zn emissions. It also appeared that the use of a closed process is only really mandatory when dealing with Chromium VI plating. A pragmatic proposal could be:

Electro-plating of metal components in paper stationary products may only be carried out using nickel, chromium III, zinc or combinations thereof. Losses of plating metals shall be minimised by the use of closed systems and/or electrolytic recovery of metals from process waste water.

In all cases, the wastewater must be treated prior to any discharge to mains sewers to:

- precipitate or crystallise heavy metals followed by separation of the sludge or crystals prior to their dewatering and subsequent reprocessing or disposal by an accredited hazardous waste operator and/or;
- concentrate dissolved heavy metals by the use of ion exchange beds and/or membrane filtration prior to evaporation of water in the concentrate and reprocessing or disposal of the dried concentrate solids by accredited hazardous waste operator and;

Assessment and verification: The applicant shall provide a declaration from their supplier(s) of compliance with the requirements, stating specifically the metal(s) used for the plating operation and any of the relevant metal recovery and wastewater management techniques used at their site(s).

Points for discussion

1. Opinions on the proposed, more pragmatic restriction on metal surface treatment?

5.3 Criterion 3 - Recyclability

Current criterion (Printed and converted products)

The printed paper product shall be recyclable. The printed paper shall be deinkable and the non-paper components of the printed paper product shall be easily removable to ensure that those components will not hinder the recycling process.

- 3a) Wet strength agents may be used only if the recyclability of the finished product can be proved.
- 3b) Adhesives may be used only if their removability can be proved.
- 3c). Coating varnishes and lamination, including polyethene and/or polyethene/polypropylene, may be used only for covers of books, pads, magazines and catalogues, exercise books.
- 3d). The de-inkability shall be proved (applicable to printed paper product group).

Assessment and verification: the applicant shall provide the test result of the recyclability for wet strength agents and removability for adhesives. The reference test methods are PTS method PTS-RH 021/97 (for wet strength agents), INGEDE Method 12 (for non-soluble adhesive removability), or equivalent test methods. The de-inkability shall be proven by using the 'Deinking Scorecard'(10) of the European Recovered Paper Council or equivalent test methods. Testing must be performed on three types of paper: uncoated, coated and surface-sized paper. If a type of printing ink is only sold for one or two specific types of paper, it is sufficient to test the paper type(s) in question. The applicant shall provide a declaration that coated and laminated printed paper products are in compliance with point 3(c). Where a part of a printed paper product is easily removable (for instance a plastic cover or a reusable exercise book cover), the recyclability test may be made without this component. The easiness of removal of the non-paper components shall be proven via a declaration of the paper collecting company, the recycling company or an equivalent organisation. Test methods shown by a competent and independent third party as giving equivalent results may also be used.

Proposed criterion on: Recyclability

3(a) The non-paper product parts of stationary paper product such as metal bars or plastic covers shall be easily removable to ensure that those components will not hinder the recycling process.

Assessment and verification: the applicant shall provide a declaration of compliance supported by a declaration of the paper collecting company, the recycling company or an equivalent organization. The declaration shall be supported by a list of non-paper materials used in a product.

3(b) Stationary paper and paper carrier bag products shall be re-pulpable.

- i) Unless otherwise specified wet strength agents shall not be used. For paper carrier bags and wrapping paper products, wet strength agents can only be used if their recyclability can be proven. Printed paper products are exempted from the requirement.
- ii) Lamination, including polyethene and/or polypropylene, shall only be used to increase the durability of products with a life span of at least 1 year, for example,

Proposed criterion on: Recyclability

books, binders, folders, exercise books, calendars, notebooks and diaries. Lamination shall not be used in newspapers, magazines, paper carrier bags, or wrapping paper. Double lamination shall not be used in any product.

Assessment and verification: the applicant shall provide a declaration of compliance supported by the following documentation.

For paper carrier bags and wrapping paper products the applicant shall provide the result of test report proving re-pulpability according to the PTS method PTS-RH 021/97, the ATICELCA 501:2019 evaluation system or equivalent standard methods that are accepted by the competent body as providing data of equivalent scientific quality.

The applicant shall provide a declaration of non-use of lamination for magazines, paper carrier bags or wrapping paper. Otherwise the applicant shall provide the result(s) of test report(s) proving re-pulpability according to the PTS method PTS-RH 021/97 or ATICELCA 501:2019 evaluation system or equivalent standard methods that are accepted by the competent body.

For laminated products, the applicant shall provide a declaration of non-use of double lamination.

Where a part of a converted paper product is easily removable (for example a metal bar in a suspension file, a magazine insert or a plastic cover or a reusable exercise book cover), the re-pulpability test may be made without this component.

3(c) Unless otherwise specified, adhesives may be used only if their removability can be proven with a score of at least 71 on the EPRC Adhesive Removal Scorecard.

Pressure sensitive adhesive coatings shall be used only if their removability can be proven with at least a positive removability score on the EPRC Adhesive Removal Scorecard.

Water based adhesives are exempted from this requirement.

Assessment and verification: the applicant shall provide a declaration of compliance with the adhesive removal scorecard according to the guidelines of the European Paper Recycling Council (EPRC). The declaration shall be supported by adhesive removability test results according to INGEDE Method 12, or equivalent standard methods that are accepted by the competent body as providing data of equivalent scientific quality.

For water based adhesives, a declaration of the water-based nature of the adhesive shall be provided by the adhesive manufacturer.

Adhesive applications listed in the Annex of the "Assessment of Printed Product Recyclability, Scorecard for Removability of Adhesive Applications", are considered compliant with the requirement.

3(d) The deinkability of printed paper products and envelopes based on white paper substrate shall be proven

The printed product is considered compliant with the requirement if it meets a minimum score of 50% of the maximum score available for each individual parameter of the EPRC deinkability score, or equivalent.

For envelopes, internal printing shall only be used for the privacy reasons in envelopes made up of paper with a grammage of less than 135 g/m² (or opacity level lower than 98%). The internal printed surface shall be less than 80% of the total interior surface minus the glued area and shall be printed with light colour shades.

Assessment and verification: the applicant shall provide a declaration of compliance

Proposed criterion on: Recyclability

with deinkability scores according to the guidelines of the European Paper Recycling Council (EPRC). The declaration shall be supported by deinking test results according to INGEDE Method 11, or equivalent standard methods that are accepted by the competent body as providing data of equivalent scientific quality.

For envelopes, the applicant shall provide a declaration of compliance with the requirement, supported by specifications of the weight/m² of the paper used according to UNE-EN ISO 536:2013 (or opacity according to ISO 2471), colour of printing ink and % coverage of any internal printing pattern.

Printing technologies and material combinations listed in the Annex of the "Assessment of Printed Product Recyclability, Deinkability Score", shall be considered compliant with the requirements.

Testing of printing technologies or inks must be performed on three types of paper: uncoated, coated and surface-sized paper. If a type of printing ink is only sold for one or two specific types of paper, it shall be sufficient to test only the paper type(s) in question.

Rationale

In line with the LCA findings, the end-of-life stage of printed matter has notable life-cycle impacts. These are increasing when the assumed waste scenario is landfill or incineration, compared to recycling. To achieve high quality recycled paper following specific issues need to be considered.

Outcomes from and after the 1st AHWG meeting

The technical sub- group was formed to support the criterion revision. The key areas addressed were:

1. To set a common and initial ambition level for converted and printed paper product, and also identify the key differences between the two product groups in term of recyclability.
2. Use of non-paper materials in the final products (lamination, varnishes, coatings, and other-non-paper components).
3. Use of adhesives and removability requirement; analysis of the applicability and ambition level of the requirement.
4. Deinkability requirement. Analysis of applicability to printed matter, and stationary paper products, with the emphasis place on envelopes. Analysis of a product (product group) specific aspects. Ambition level of deinkability score.

The components which, according to the state of the art, cannot be sorted out (coating binders, water-soluble adhesive films, etc.) shall have such properties that, if they remain in the paper recycling process, they do not disturb them.

Industry stakeholder pointed out that flexoprinting will not meet deinkability criterion. However, envelopes are usually mixed with paper waste stream and will not cause quality problems in the deinking process. Inclusion of deinkability test for envelopes in the EU Ecolabel criterion would exclude envelopes. It was also stated that deinkability is not relevant for stationeries due to low amount of ink used in these products which is not an issue for recycling (end of life), to ensure circularity or recyclability of paper should be sufficient.

For adhesives, the application was assumed as crucial for the removability aspects. The INGEDE method 12 was assumed as suitable for all adhesive films. In case of adhesive films, which disintegrate into small particles (less than 100 µm) during fragmentation,

the INGEDE method 4, which is used for the evaluation of fragmentation according to INGEDE 12, is not appropriate. There is no available method to verify microstickies or secondary stickies.

It was also proposed to increase the ambition level for lamination, and accommodate varnishes under the deinkability requirement

Additionally the verification of the presence of wet strength agents was perceived as an additional burden, considering that they are not used in the graphic paper.

The revised criterion proposal is an output of the recyclability sub-group conference calls that took place in April, and June of 2019. Rationales that support the proposal represent the summary of the meetings, being supported by additional desk research and stakeholders feedback. The minutes from the meeting that provides extensive technical information on the discussion conducted are [available on the BATIS](#) platform for registered stakeholders.

Further research and main changes

The presence of non-paper components in a paper for recovery will increase the mass of rejects per kg of material decreasing the yield of the process. In the deinking plants using mixed post-consumer material, non-paper components accounting for above 3% are taken with concern, whereas above 5%-6% are usually not tolerated except in specially equipped plants. According to Faul A.M (2010)²¹ the acceptable threshold for non-paper components established by mills range between 0,2 to 3%. The average content of non-paper components is around 0,5-0,6%. Following Villanueva and Eder (2011)²² traded waste paper has a non-paper component content between 0.25 and 2.5%, being the vast majority below 2%. Some waste paper types, such as coated and layered paper, can contain between 5 and 25% of non-paper material in the form of layers of plastic/metal. Out of 60 million tons of waste paper collected for recycling, only less than 1% is layered. The remaining 99% of waste paper types have only <0.5% of other materials than paper, e.g. spirals, staples, adhesives for binding, or windows in envelopes⁴. Most plants can e.g. easily separate tape, metals, and one-sided coatings.

In this sense, it is important to distinguish the contamination that stems from the waste paper collection from the one that refers to the product itself

The EN 643²³ on European List of Standard Grades of Paper and Board for Recycling, defines [paper and board for recycling](#) as natural fibre-based paper and board suitable for recycling, consisting of

- paper and board in any shape
- product made predominantly from *paper and board* which may include other constituents that cannot be removed by dry sorting, such as coatings, laminates, spiral bindings, etc.

The 5 standard grades of paper and board for recycling include:

Group 1: Ordinary grades;

Group 2: Medium grades;

Group 3: High grades;

Group 4: Kraft grades;

Group 5: Special grades.

²¹ Faul, A. Cellulose Chem. Technol., 44, 451 (2010).

²² Villanueva A and Eder P.2011. End-of-waste criteria for waste paper: technicalproposals. Final report. Institute for Prospective Technological Studies, European Commission, Seville

²³ EN 643. European list of standard grades of paper and board for recycling. 2013

The standard grades indicate the type of paper and board for recycling. The EN 643 Standard addresses the contamination for which the collection and handling can be made responsible. It specifies a maximum threshold for unwanted materials defined as material not suitable for the production of paper and board. Unwanted materials include metals, plastics, glass etc which do not form part of the product and can be separated by dry sorting before the recycling operations.

The recyclability of converted and printed paper products would be enhanced if they are designed to ensure the easy removal of metal or plastic elements before entering the paper for recycling stream.

During the sub-group meeting it was proposed **to address under Criterion 3(a) the key aspect of a product design such as easy separation of non-paper components from paper components.** It is therefore proposed that the EU Ecolabel provides guidance on the easy removability of non-paper parts of the products as follows:

The non-paper product parts such as metal bars or plastic covers shall be easily removable to ensure that those components will not hinder the recycling process.

For the assessment and verification of criterion 4(a) it should further be discussed during the AHWG Meeting if the declaration of compliance should be issued by "paper collecting company, the recycling company or an equivalent organization", or by a product designer/manufacturer (applicant).

Table 14. Particle size of contaminants in recovered paper processing²⁴

Type of contaminant	Specific gravity (g/cm ³)	Particle size (µm)				
		<1	<10	<100	<1000	>1000
Metal	2.7-9.0					●
Sand	1.8-2.2		●	●	●	●
Fillers and coating particles	1.8-2.6	●	●	●		
Ink particles	1.2-1.1	●	●	●	●	●
Stickies	0.9-1.1	●	●	●	●	●
Wax	0.9-1.0	●	●			
Styrofoam	0.3-0.5				●	●
Plastics	0.9-1.1			●	●	●

Coating, varnishing and lamination

Materials used for coating, varnishing and lamination of e.g. notebooks, cover books and filing products have a disturbing effect in the recycling process. They tend to fragment

²⁴ Holik, H. 2000. Unit operations and equipment in recycled fibre processing. In L.D. Gottsching & H. Pakarinen (Eds), Papermaking Science and Technology 7, pp.88. Fapet Oy, Helsinki, Finland

into particles that block the papermaking equipment, creating weak spots in the final paper product or causing that pieces of finished paper stick together. Consequently, their use is required to be as low as technically possible.

Findings from other ecolabels, in particular, NF Environment for notebooks, show that thresholds for the maximum content of laminating and varnishing plastics are required. According to NF Environment **the 4% threshold was defined by paper recycling facilities**²⁵ (AFNOR, 2011). This threshold further strengthens part (b) of the criterion, related to non-soluble adhesives. In fact, lamination involves adhesives and plastic films which hinder product recyclability.

Further research and main changes

Coatings are used during the finishing phase of printed paper to provide protection and achieve various visual effects. It is also used on magazine and report covers and on other publications subject to rough or frequent handling. Coatings can be applied in-line by the printer as part of the printing process or off-line. Coatings commonly used include varnishes, aqueous and UV coatings. Some coatings, such as varnish, can be applied to a precise point or points on the page, for example on photos while other coatings cover the entire sheet.

Lamination means adhering a layer of plastic (polyethylene, polymerized acrylics, vinyls, styrenes, among others) to a paper material mainly to increase product durability (i.e. barrier properties or mechanical resistance). Lamination is usually present in the packaging material, nevertheless functional use of lamination might occur in case of carrier bags or wrapping paper. Film laminates offer much more protection than liquid coatings. Plastic films used in lamination act as a barrier to the penetration of water in the recycling process causing low re-pulpability. This leads to loss of fibres and hence low yield of the recycling process. Double lamination, leads to even less re-pulpability.

Film laminates, for example polypropylene, polyesters, nylon, are usually applied by finishers or converters using either a wet method, which relies on solvents or water, or a thermal method, which uses heat to iron the film and paper together. The entire sheet is generally laminated as spot lamination of products is not possible.

It seems necessary to make a distinction between varnish/coating and lamination. The effect of varnish and coating on recyclability is tested in the INGEDE method 11, hence they should be addressed under the deinkability requirement.

Accordingly, during the first recyclability sub-group meeting it was proposed to separate the requirement for coating and varnishing, from the criterion on lamination. Coating and varnishing was suggested to be covered by the deinkability requirement, whereas lamination to be addressed separately by repulpability criterion. Lamination, including polyethene and/or polyethene/polypropylene, may be used only for covers of printed and converted paper products with a life-span of at least 1 year. Double lamination is proposed not to be permitted.

Books, exercise and note books, binders, folders, diaries are considered to have a life-span of at least 1 year. Magazines are considered to have a life span of less than a year.

Wet strength agents

Wet Strength agents are used to reduce the breakdown of hydrogen bonds between cellulose fibres of paper in the presence of water. Wet-strength paper therefore, contains a resin adsorbed onto paper fibers which cross-links on heating or aging, adding strength to the paper. The application of such additives to paper manufacturing might cause deleterious effects on the deinking process due forming aggregates that hinder the

²⁵ Afnor Certification. (2011). Référentiel de certification de la marque NF Environnement « PRODUITS DE NETTOYAGE », 33(0), 1-59.

deinking process by causing non-programmed stops and production delays with an increase in the cost of the paper²⁶. Re-pulpability of paper that contains wet strength agents requires specific process conditions and even then some wet strength papers do not sufficiently re-pulp²⁷.

Information exchange during EU Ecolabel criteria revision for graphic paper revealed that wet-strength agents are not normally used in a graphic grade paper, being rather designated for tissue paper production. This information has been confirmed by desk research. The use of wet strength agents is critical for tissue paper, or cellulosic filters^{28,29,30}.

Wet strength agents might however be used in carrier bags and parcelling/wrapping papers. It is therefore suggested that the restriction of wet-strength agent should be limited to these products, under condition that the recyclability of the finished product can be proven.

ATICELCA 501 evaluation system and PPS Method were indicated as the possible assessment and verification tool that could aid in verifying the re-pulping capacity of the product and inform about possible scenarios.

The PTS-Method PTS-RH 021/97 and the ATICELCA 501:2019 evaluation system were developed to assess the recyclability of paper and board packaging. They have some relevant differences, mainly in the pulping time and methodology to measure screen rejects.

ATICELCA 501; 2019 is based on the provisions of EN 13430 standard and annexes (CR 13688), it is applicable to all cellulose-based materials and products. Recyclability is intended as the efficient and effective processing of the material or product, from a technological and economic point of view, using the most currently used papermaking technologies for the processing of paper for recycling obtained from differentiated waste collection. The test assesses the following process and quality aspects of the recycling process:

- Efficiency of the recycling process as regards the loss of material and costs related to maintenance measures
- Quality of the recycled paper as regards suitability of use in paper products

The method simulates some of the main phases of industrial papermaking from paper for recycling and according to results obtained four levels of recyclability (level A+, A, B, C) and a 'non-recyclability with paper' level are defined as in the table below.

²⁶<http://www.perinijournal.it/Items/en-US/Articoli/PJL-45/how-to-prevent-the-impacts-of-wet-strength-additives-on-the-papermaking-process-clogging-felts>;

²⁷ Pratima Bajpai, Chapter 3 - Pulp and Paper Chemicals. Emerging Technologies in Sizing. PIRA Technology Report, Smithers PIRA, the worldwide authority on the Packaging, Print and Paper supply chains., Editor(s): Pratima Bajpai, Pulp and Paper Industry, Elsevier, 2015;

²⁸ Zakaria, S. 2004. Development of wet-strength paper with dianhydride and diacid. Mater. Chem. Phys., 88 (2), pp. 239-243;

²⁹ Bajpai, P. 2018. Chapter 4 - additives for papermaking P. Bajpai (Ed.), Biermann's Handbook of Pulp and Paper (3rd ed.), Elsevier, pp. 77-94;

³⁰ Onur, A., Ng, A. Garnier, G. Batchelor, W. 2019. Journal of Cleaner Production 215, pp. 226-231;

Table 15. Recyclability criteria following ATICELCA evaluation system

Evaluation criteria	Recyclable with paper				Non recyclable with paper
	Level A+	Level A	Level B	Level C	Non recyclable with paper
Coarse reject (%)	< 1.5	1.5 - 10.0	10.1 - 20.0	20.1 - 40.0	> 40.0
Macrostickies area $\phi < 2000 \mu\text{m}$. (mm²/kg)	< 2.500	2.500 - 10.000	10.001 - 20.000	20.001 - 50.000	> 50.000
Fibre flakes (%)*	< 5.0	5.0 - 15.0	15.1 - 40.0	> 40.0	-
Adhesiveness	absent	absent	absent	absent	present
Optical inhomogeneities	level 1	level 2	level 3	level 3	-

The parameter with the worst value determines the level of recyclability of the paper material or product. In case of non-recyclability, the material or product is not suitable for a separate waste collection with paper stream. It can however be used in other industrial processes or sent for energy recovery.

Two parameters reflect the potential fibre loss during the recycling process and thus are specific for evaluating of the re-pulpability of paper: percentages of Coarse reject and Fibre flakes.

The Coarse reject parameter measures the quantity of material which is rejected after pulping. It generally includes the non-paper components of a paper product such as plastic or aluminum lamination, plastic adhesive tape, envelope window, the textile hand of a shopping bag, the staple of a notebook but it also contains paper fibre which are trapped by these non-paper components or paper component with a very high wet strength resistance. Flakes measures the clusters of cellulose fibre which does not separate into single fibres. Flake are generally separated with screens which are located in a second stage, after the pulping. Those flakes are not suitable for papermaking and could also be generated due to the presence of wet-strength agents. The method, specifies the weight of flakes to be considered as coarse rejects.

PTS-Method PTS-RH 021/97³¹ was developed by the technical subcommittee "Recycling criteria for the utilisation of paper for recycling" of the ZELLCHEMING Technical Committee Utilisation of Paper for Recycling (RECO). The method investigates the recyclability of paper and board packaging as well as of graphic print products. Recyclability is determined by test results of defibration (re-pulpability) and the effect of adhesives applications or non-paper components in obtaining an undisturbed sheet formation. Category one product indicates fibre for recycling suitable for the graphic grade. The process of the PTS method for category I is illustrated in Figure 12

³¹ PTS method PTS-RH:021/97 (2012). Identification of the recyclability of paper and board packages and of graphic print products, PTS Heidenau. 2019;

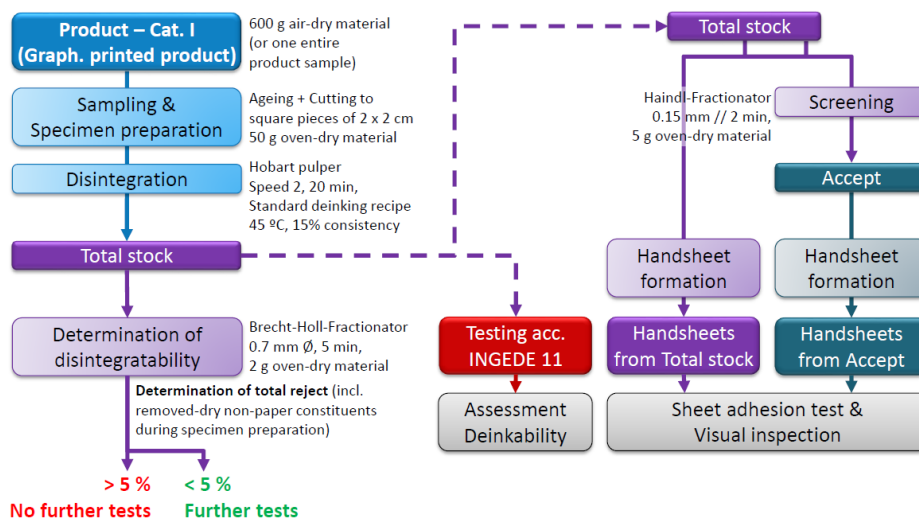


Figure 12. PTS method process scheme for Category I products (PTS, 2019)

Re-pulpability is determined by the total reject from a 0.7 mm diameter screen slot. Only products with a total reject of <5% of the total weight of the product passes the test and are further evaluated for undisturbed sheet formation (deinkability assessment and sheet adhesion and visual adhesion inspection). The expected results for recyclability are provided in Figure 13

Rating of total reject (incl. removed-dry non-paper constituents during specimen preparation)	
< 5 %	> 5 %
Recyclable	Not reasonably usable in paper recycling.

Rating of sheet adhesion test (handsheets from accept)	
No adhesion effect	Adhesion effect with damages and/or adhesions to handsheet
Recyclable	Non-recyclable due to stickies.

Rating of visual inspection to optical inhomogeneities (handsheets from accept) → from Assessment of Deinkability (according INGEDE method 11)		
No or no disturbing optical inhomogeneities	Disturbing optical inhomogeneities	Unacceptable optical inhomogeneities
Recyclable	Conditionally recyclable due to optical inhomogeneities	Not reasonably usable in paper recycling.

Figure 13. Rating of test results for Category I products (PTS, 2019)

In the case of recovered paper that is mainly used for the manufacture of packaging papers, referred to as Category II products, total reject allowed for Category II products is <50% of the product weight and deinkability test is not required. The expected results for recyclability of Category II products are provided in Figure 14.

Rating of total reject (incl. removed-dry non-paper constituents during specimen preparation)		
< 20 %	20 – 50 %	> 50 %
Recyclable	Recyclable, but worthy of product design improvement.	Not reasonably usable in paper recycling.

Rating of sheet adhesion test (handsheets from accept)	
No adhesion effect	Adhesion effect with damages and/or adhesions to handsheet
Recyclable	Non-recyclable due to stickies.

Rating of visual inspection to optical inhomogeneities (handsheets from accept)		
No or no disturbing optical inhomogeneities	Disturbing optical inhomogeneities	Unacceptable optical inhomogeneities
Recyclable	Conditionally recyclable due to optical inhomogeneities	Not reasonably usable in paper recycling.

Figure 14. Rating of test results for Category II products (PTS, 2019)

The ATICELCA method differentiates between coarse rejects (waste rejects) and fibre flakes while the PTS method measures screen rejects from 0.7mm screen slots. The PTS method has specific parameters and tests for graphic line and packaging line while the ATICELCA method does not. In particular, the PTS method includes a deinkability test according to INGEDE Method 11. The table below summarises the main differences between the two methods.

Table 16. Comparison of ATICELCA 501:2017 and PTS-RH 021/97 methods

PARAMETER	Method	
	ATICELCA 501:2017	PTS-RH 021/97
<i>Graphic and packaging</i>	Same parameters	Separate parameters
PULPING TIME	10 min	20 min
<i>COARSE REJECTS (5 mm screenslots) [required result]</i>	YES [= <40%]	NO
<i>FLAKES (0.15-0.7 mm screen slots) [required result]</i>	YES [>40%]	NO
<i>SCREEN REJECTS (0.7 mm screen slots) [required result]</i>	-	YES [<5%, <50%]
MACROSTICKIES	YES	NO
OPTICAL INHOMOGENITIES	YES	YES
ADHESION TEST	YES	YES
<i>Deinkability test</i>	NO	YES (for graphic line)

Deinkability

Methods for recycling are specified in updated publications from International Association of the Deinking Industry (INGEDE)³² and the European Paper Recycling Council (EPRC). The EN 643 specifies grades for paper and board for recycling usually intended for deinking, paper and board for recycling which is not suitable for deinking is usable in other recycling processes³³.

The aim of this section is to address the deinkability properties of paper and board for recycling intended for deinking that is fed into the graphic paper production line.

The key steps of deinking are the detachment of the ink film from the paper, the ink fragmentation into a suitable size range and removal from the pulp slurry. The flotation technique is mostly used for deinking of graphic papers³⁴. Brightening is often one of the steps in a deinking process to optimise paper optical properties.

Nordic Swan and Blue Angel address the deinkability aspect of converted and printed paper products. Differences lie on the level of deinkability required or the scope of the products (applicability). Both schemes refer to the EPRC deinkability scorecard as the assessment and verification tool.

Nordic Ecolabelling sets a deinkability score of at least 51 points (on a scale of -100 – +100) in accordance with EPRC's points system for all tested paper types. This corresponds to "Good" or "Fair" deinking.

Blue Angel recommends that finished products should be deinkable stating that "The product should comply with the recyclability requirements of the EPRC".

NF Certification does not require deinkability but recommends that a deinkability test is carried out and results submitted. However, the certification sets a threshold on ink coverage of 50% for the inside surface printing of an envelope³⁵.

The EPRC deinkability assessment is applied to printed graphic products on originally white paper and converts results from INGEDE Method 11 (test method) into the EPRC Deinkability Scorecard³⁶. This deinkability score is derived from 6 deinkability parameters:

- Y: Luminosity
- a*: Colour a* (green – red) of the CIELAB system³⁷
- A: Dirt particle area
- A50: Dirt particle area for particles larger than 50 µm (circle equivalent diameter)
- A250: Dirt particle area for particles larger than 250 µm (circle equivalent diameter)
- IE: Ink elimination
- ΔY: Filtrate darkening

Combining the individual scores of these parameters gives the deinkability score of a product, ranging from -100 to +100. The deinkability of printing inks are proven if the printed matter on which they are used have a positive score according to the EPRC Deinkability Scorecard. However, there are different levels of deinkability which reflect the whiteness of the paper substrate achieved.

- Good deinkability corresponds to 71-100 Points

³² www.ingede.org

³³ EN 643. European list of standard grades of paper and board for recycling. 2013

³⁴ <http://thedpda.org/paper-recycling-and-deinking> and correspondence with recycling industry

³⁵ Référentiel de certification de la marque NF Environnement, ENVELOPPES ET POCHETTES POSTALES. 2014

³⁶ EPRC. (2017). *Assessment of Printed Product Recyclability*

³⁷ International Commission on Illumination <http://www.cie.co.at/>

- Fair deinkability corresponds to 51-70 Points
- Tolerable deinkability corresponds to 0-50 Points

In charts, the following colours are used in order to reflect the deinkability of printed paper:

- Below 0 points: red
- 0 to 40 points: orange
- 40 to 50 points: transition orange to yellow
- 50 to 70 points: yellow
- 70 to 80 points: transition yellow to green
- 80 to 100 points: green

Based on the above colour legend, the classification of printing technologies according to their deinkability is provided in the chart below alongside visual results of deinked paper.

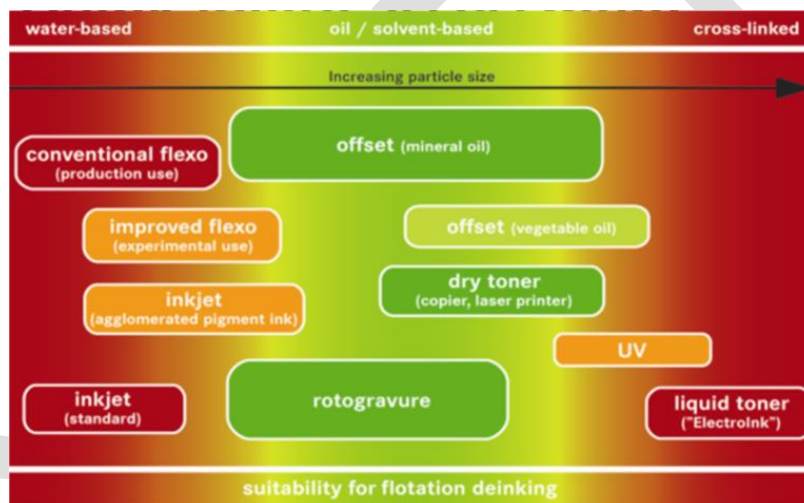


Figure 15. Deinkability of printed products-newspapers by printing technology. (INGEDE)

The number of tests carried out for each category is provided above each column alongside the percentage of positive results. Of the more than 700 tests carried out, 70% have positive deinkability scores, the average score is above 70. In addition, for the categories that passed the test (no parameter with negative score), the average score is more than 50. Experience has shown that if the most critical parameter is just slightly better than the threshold, the scores of the other parameters usually result in a sum of about 50 points³⁸. This means, requesting deinkability for printed and converted paper products implies reaching as a minimum a score of 50.

Further research and main changes

The size of ink particles to be removed is one of the important aspects as can be seen in Figure 16. Washing is most effective for removal of the small particles (<10 µm) whereas

³⁸ ERPC. (2017). *Assessment of Printed Product Recyclability*

flotation for the medium-sized particles (10–100 μm). For removal of large ink particles (>100 μm), screening and centrifugal cleaners are used³⁹.

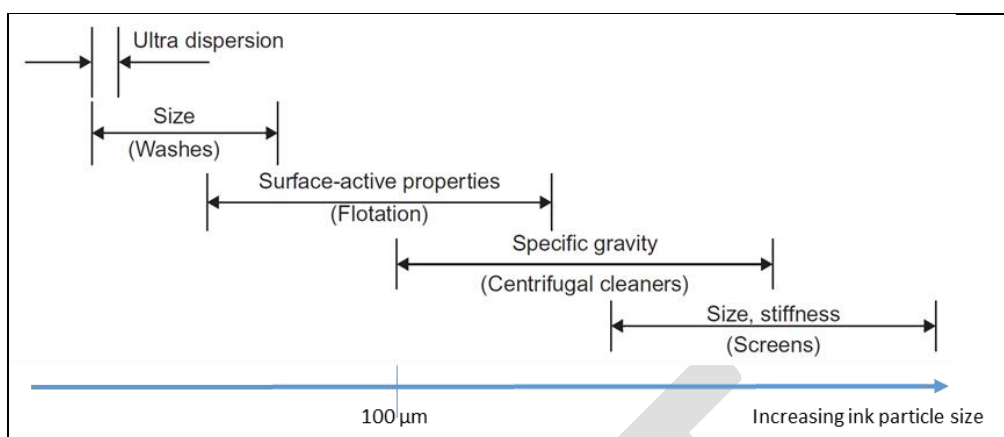


Figure 16. Ink removal efficiency of various methods and particle sizes. (adapted from Bajpai, P., 2014)

According to Bajpai (2014)⁴⁰, the optimal ink particles size for the process efficiency is 20 - 100 μm, whereas Faul. A. (2010)⁴¹ suggests the range of particles size from 4 to 180 microns. The exact limits will be influenced by the hydrophobicity and, possibly, rigidity of the ink particles.

Given that deinking by flotation is efficient in case of hydrophobic inks (i.e. conventional offset and gravure printing), 81% of the offset prints, mostly newspapers and magazines, achieved a positive assessment of their deinkability.⁴¹ In line with the recently revised EPRC, these printing technologies have been proven to have deinkability score ranging from 71 to 100, being accordingly exempted from the further deinkability testing.^{42:}

The non- conventional offset printing i.e. thermochromic^{43,44} along with toner (laser, photocopy) and flexographic prints might result difficult to be deinked by the means of flotation process. Cross-linked ink particles (i.e. UV) are too large for the flotation. Sometimes, in some cases a disperser and the second flotation loop is used, but it does increase the complexity and cost of the process. UV-curing, most current commercially used inkjet inks are not deinkable. UV printing inks are increasingly being used in flexographic printing where the curing is by UV⁴⁵, leading to cross-linking and negative consequences for deinking.

Table 17 Overview of deinking capacity for different printing techniques (Vukoje et al, 2016)

Prints	Deinkability	Nature of ink particles	Problems
Offset	Good	Hydrophobic	Bad ink detachment after aging process
Gravure	Good	Hydrophobic	-
Flexographic	Poor	Hydrophilic	Small size and hydrophilic nature of the ink

³⁹ Pratima Bajpai, 4 - Process Steps in Recycled Fibre Processing Editor(s): Pratima Bajpai, Recycling and Deinking of Recovered Paper, Elsevier. 2014.

⁴⁰Pratima Bajpai- Process Steps in Recycled Fibre Processing Editor(s): Pratima Bajpai, Recycling and Deinking of Recovered Paper, Copyright © Elsevier. 2014.

⁴¹ Faul, AM. 2010, Quality requirements in graphic paper recycling, Cellulose Chemistry and Technology 44 (10), pp.451-460

⁴² ERPC. (2017). *Assessment of Printed Product Recyclability*

⁴³ Vukoje, M.,Jamnicki, S. ,Rožić, M. 2016. Nord.Pulp Pap. Res. J., 31, 692

⁴⁴

<http://www.cepi.org/system/files/public/documents/publications/recycling/2009/GuidetoandOptimumRecyclabilityofPrintedGraphicPaper.pdf>

⁴⁵ Izdebska J and Sabu T. 2016. Printing of polymers. Fundamentals and applications. Copyright © 2016 Elsevier Inc. All

Prints	Deinkability	Nature of ink particles	Problems
			particles are suitable for flotation process
Digital	Poor	Hydrophilic	Generating numerous ink particles below 100 µm
Inkjet	Poor	Hydrophilic	Ink may stain the fiber and forms small particles
Hot melt based ink jet prints	Poor	Fused during drying - residual toner	Sticky deposits
Toner	Poor	Fused during printing	Formation of larger particles, flat and plate like particles
Liquid toner	Poor	too soft to pass the screens	Large visible ink film specks
UV curable	Poor	Formation of cross-linked films which are difficult to break down	Visible speck contaminations by large flat and plate-like particles

Recent tests carried out by Stora Enso in collaboration with the German ink producer Siegwark, on a newly developed UV/LED ink solution showed improved results related to dirt specks.



Figure 17. Dirt specks after flotation: UV/LED Ink (SIEGWARK)

The tests reported deinkability scores ranging from 93-100⁴⁶ for UV/LED offset inks mainly due to increased removal of ink particles as illustrated in Figure 17. The inks include 8 different formulations of commercial UV/LED inks printed high- and low-weight coated paper and uncoated virgin fibre-based newsprint. Experts at Stora Enso and SIEGWARK also identify the choice of paper as an important aspect affecting deinkability results and further tests will be carried out in collaboration with INGEDE, on different paper types.

Carré, B.A. et al.⁴⁷ (2005) studied deinkability of several commercial digital prints (such as: dye and pigment based inkjet, normal toners and UV curable technologies), observing following deinkability problems:

- (a) UV inks: their presence lead to unacceptable speck contamination, and their mechanical dispersion will not be sufficient to hide their presence;
- (b) Liquid toner: large visible inked film specks are observed which cannot be removed by flotation or screening; their mechanical dispersion will not be sufficient to hide their presence;
- (c) Holt melt based ink jet prints: residual toner will fuse during drying leading to sticky deposits;
- (d) Waterbased pigment based inks (home and office inkjets): due to hydrophilic nature inks cannot be floated.

⁴⁶ Stora Enso & SIEGWARK. INGEDE Symposium. 2019

⁴⁷ Carré, B., Magnin, L., and Ayala, C. 2005. "Digital prints : a survey of the various deinkability behaviors." Conference Proceeding, available at: <https://www.ingede.com/digital/digideink-publications.html>

Following feedback received ' *Method 11 it is not appropriate for all printing technologies or ink (...) modern printing techniques, such as digital inks, should be accommodated under different concept, as there is a significant body of evidence that these products can be deinkable even if they do not pass Method 11, and if Method 11 is even relevant for these technologies*⁴⁸. Indeed, Bhattacharyya et al (2012)⁴⁹ demonstrated at the laboratory – scale a good deinkability of digital prints in the near - neutral deinking process. Runte and Putz (2018)⁵⁰ and Pschigoda, L.E. (2019)⁵¹ reported good deinkability of the digital prints mixed with conventional printed matter by means of the two – loop deinking method⁵².

Considering the limited applicability of INGEDE Method 11 to the digital printing, alternative proposals to address the new printing techniques have been provided by the digital industry stakeholders, as follows:

"1. Removal of the requirement for deinking and rely upon demonstration of recyclability only (e.g. PTS method 021/97). This will ensure that the printed product can be reused for a paper-based product.

2. Derogation of selected technologies from the deinking requirement; demonstration of recyclability will be sufficient.

3. Temporary derogation of selected technologies from the deinking requirement to allow the development of new testing methods which will better reflect actual mill practice. Examples could be the use of mixtures or two loop methods. This will also allow better differentiation between ink/paper combinations, and may spur developments in these fields, since the current method is not sensitive enough. A better test may show differences between ink/paper combinations for digital technologies, thereby resulting in selection of those superior in performance.

4. Consider moving to a point system, with the recycling criteria being an optional category.

5. Allowing the use of pilot trial data as evidence of deinkability, since this is much more realistic than any lab test. As can be seen from some of the supporting evidence, digital print companies have already invested in pilot studies to demonstrate real-world deinkability of their printed products."

No additional evidence on industrial scale deinking plant for digital printing have been found apart from research articles reporting laboratory scale deinking testing. This should be further discussed during the 2nd AHWG Meeting.

Deinkability requirement for envelopes

Poor deinkability of water-based inks is caused by the small size and hydrophilic nature of ink particles after ink detachment. Flexographic water based newspaper reduce pulp brightness by 20% compared to offset newspapers. Flexographic water based inks are used in envelope printing leading to most envelopes not being deinkable as the ink dissolves in water lowering the brightness of the recycled paper.

It is noted that inks used for printing inside envelopes are flexographic inks which are generally not de-inkable. The conclusions from the current revision recognise that the

⁴⁸ Internal communication with industry;

⁴⁹ Manoj K. BhattacharyyaN, Hou T. NgN, Laurie S. MittelstadtN, Eric G. Hanson N. (2012) Deinking of Digital Prints: Effect of Near-Neutral Deinking Chemistry on Deinkability. *Journal of Imaging Science and Technology* 56(6);

⁵⁰ Runte, S and Putz H-J. 2018. Influence of digital prints products on the deinking behaviour of paper for recycling mixture in a 2-stage deinking process INGEDE Symposium, 2018 Munich;

⁵¹ Pschigoda, L.E. (2019) Deinkability of Inkjet- Printed Commercial Papers as Determined by Benchtop and Pilot Scale Methods;

⁵² INGEDE Method 11 is based on a one stage flotation process;

development of deinkable inks is an improvement to strive for in the future⁵³. It is important to mention that the water based nature of flexo inks used in envelopes is a result of envelope manufacturers seeking to reduce/eliminate VOC emissions from previous solvent based ink formulations.

New developments in water based flexographic inks, using cationic or anionic resins could lead to deinkability of printed paper in a flotation process but very few envelope manufacturers use a special blend in which the colours are adjusted to achieve some deinkability. This is about 60% more expensive and implies more use of water in cleaning machines as they are less soluble than the conventional envelope flexo inks. Consequently, these inks have not been adopted widely in the envelope sector⁵⁴.

During the recyclability sub-group meeting it was emphasised that the inner envelopes' printing is due to the privacy reasons (product's functionality). It was therefore proposed to improve product deinkability by applying inner printing only when the transparency of paper needs to be reduced, without compromising the privacy of correspondence. The intensity of printing pattern was also proposed to be addressed.

Opacity defines the amount of light that passes through the paper. It determines the extent to which printing on a particular side of paper will be visible from the reverse side. The higher the opacity, the lower the amount of light that can pass through. Paper opacity is increased with the larger amount of fillers used in production and the larger basis weight and thickness of the finished sheet, and it also depends on the fibre type⁵⁵. The ISO 2471:2015 Standard specifies a method for the measurements of opacity (paper backing) of paper by diffuse reflectance. The luminance factor of a single sheet of the paper over a black cavity and the intrinsic luminance factor of the paper are determined. The opacity is calculated as the ratio of two luminance factor values, and express as percentage (%). The method is restricted to white and near-white papers and boards.

Most printing papers fall within the opacity range 80 to 98%⁵⁶. For instance, 94 is the usual opacity value for 80g offset. The rest varies between 92 and 98%⁵⁷.

Following information collected, grammage of paper used in envelope falls within the range of 80 to 115g/m². All paper in the grammage range of 80-135 g/m² lacks total opacity, thus there will always be a need to print an opaque pattern to ensure the privacy of the envelope's content.

Following the feedback collected, it is proposed to use the grammage of 135 g/m² as a reference threshold to justify the inner printing of envelopes. It should be nevertheless further discussed during the 2nd AHWG Meeting, if the opacity of 98% is not more adequate technical parameter to be used as a reference value.

Deinkability performance

The deinkability average test results of newspapers printed with different technologies and inks are provided in Figure 15.

A simulation was carried out based on the maximum scores for each parameter according to the EPRC assessment in order to better understand the ambition level that should be adapted for the revised criterion.

A baseline analysis considers 50% of the maximum score of each parameter which corresponds to a deinkability score of 51. Then each parameter is modified and summed up to obtain an overall deinkability score of 61 or above 70. The results are provided in the Table 18 and Table 19.

⁵³ Background Report. EU Ecolabel Criteria for converted paper products. 2013,

⁵⁴ Communication with FEPE.

⁵⁵ Jurič, I., Karlović, I. Tomić, I and Novaković, D. 2013. Optical paper properties and their influence on colour reproduction and perceived print quality. Nordic Pulp and Paper Research Journal 28(2):264-273, .

⁵⁶ <http://websupport1.citytech.cuny.edu/faculty/pherry/paperchari.html>,

⁵⁷ Communication with stakeholders,

Table 18. Baseline scenario 50% of the maximum parameter scores

Parameter	Points	Range of Parameter results
Y	18	$R_p > 53$
a*	10	R_p
A₅₀	8	$R_p \leq 1500$
A₂₅₀	5	$R_p \leq 400$
IE	5	$R_p \geq 55$
ΔY	5	$R_p \leq 12$
Total removal points	51	

Table 19. Alternative scenario, simulation of scoring for each parameter to reach deinkability scores of 60 and 70

Parameter	Addition to baseline score (% of max parameter score)	
Y	20	20
a*	0	20
A₅₀	20	20
A₂₅₀	20	20
IE	0	20
ΔY	0	20
Total points	62	70

Simulation shows that requesting a 60 deinkability score implies adding 20% of the maximum parameter score to the baseline points for luminosity and speck area only. The score of 70 can be reached adding 20% of the maximum parameter scores to the baseline points for all parameters.

It is also noted that in the baseline scenario considered the necessary range of parameter results satisfies the threshold values for low ink coverage products (brightness $\leq 75\%$).

The proposed revised criterion for deinkability aims at ensuring the good performance (51%) of each parameter addressed by INGEDE Test Method 11:

- 1. The printed product is considered compliant with the requirement if it meets a minimum score of 50% of the maximum score available for each individual parameter of the EPRC deinkability score, or equivalent.*
- 2. For envelopes, internal printing shall only be used for the privacy reasons in envelopes made up of paper with a grammage of less than 135 g/m². The internal printed surface shall be less than 80% of the total interior surface minus the glued area and shall be printed with light colour shades.*

It is also proposed to consider Printing technologies and material combinations listed in the Annex of the "Assessment of Printed Product Recyclability, "Assessment of Printed Product Recyclability, Deinkability Score", compliant with the requirement.

Alternative proposal for the further discussion were submitted by stakeholders:

- Printing technology and inks may be used on white paper grades, excluding envelopes, only if their deinkability can be proven with a minimum score of 51 (or 71) on the EPRC Deinkability Scorecard.

It should be mentioned that the proposal considerably increases the ambition level of the PASS/FAIL requirement when comparing to the currently valid one (positive score), and also other schemes of reference. Some stakeholders indicated that: *'We see no reason to deviate from the concept of the EPRC scorecard, which uses a point system based on a weighted sum of the individual parameters. Changing the system to demand 50% of score for each individual parameter is a paradigm change and questions the validity of the scorecard. Since typically the total score is used and not the percentage of the individual parameter, we have no estimation how many printed products would pass this criterion. (...) Since the EPRC scorecard was designed to define a valid and workable deinkability score this case should not occur (...) We strongly recommend keeping the scoring system, which was agreed by the whole paper value chain.'*⁵⁸

Removability of adhesives

Adhesives used by paper industry are generally polymers dissolved or dispersed in water or in adhesives where the polymers are melted for application.

Bonding is based on the two physical effects "adhesion" (interaction of the molecules of the adhesive with the molecules on the surface of the materials to be bonded) and "cohesion" (interaction of the molecules in the adhesive with one another). Both interactions are caused by electromagnetic forces whose range is in the order of atoms. For bonding, the adhesives must therefore come very close to the material surface. This is usually achieved by the application of liquid adhesives, for example by means of nozzles or rollers. By a subsequent physical and / or chemical process, the adhesive maintains its cohesion. An "adhesive application" refers to processed adhesives used in finished paper products (typically applied as films). The physicochemical properties responsible for the behaviour of the "adhesive applications" during the paper recycling process depend on the composition of the adhesive, the setting mechanism and the geometry (mainly thickness) of the application.

Removal of adhesives is crucial for paper recycling. Adhesives might create stickies that cause problems in paper processing and final paper properties. Deposits of adhesives decrease the machine speed and requires costly down-time for cleaning. Moreover, these deposits result to quality defects and can interfere with subsequent printing and converting operations⁵⁹.

Generally, stickies are classified in three groups: macro, micro and secondary stickies. Macro stickies have no upper limit starting from a size of 100 or 150 µm, including tacky particles⁶⁰. The micro stickies are particles smaller than 100 or 150 µm but bigger than 1-5 µm. The last category is the secondary or potential secondary stickies. The formation of secondary stickies is generally caused by thermoplastic materials that enter the recycling process (paper coating binders, printing inks, wax, wet strength resin, papermaking additives and adhesives). The mechanism of their formation is unknown. This group includes dissolved and colloidal or dispersed stickies which are smaller than micro stickies. This type of stickies is supposed to cause major problems after

⁵⁸ Communication with stakeholders

⁵⁹ Venditti et al., THE EFFECTS OF ADHESIVE PROPERTIES ON THE REMOVAL OF PRESSURE SENSITIVE ADHESIVE CONTAMINANTS IN PAPER RECYCLING. Progress in recycling paper. 2007.

⁶⁰ Blanco et al., Prog. Paper Recycling 11(2):26. 2002.

modifications in temperature, pH or chemical environment as they are known to agglomerate into bigger particles and deposit on the paper machine or paper⁶¹.

Further research and main changes

In paper products there are a variety of different adhesive applications that are chosen by the paper converter to guarantee the function of the final product. Most adhesive films, when applied in appropriate geometry, can be easily sorted out. Adhesive films made of water-soluble or redispersible adhesive can be destroyed in particles that are too small to be sorted out. In order to re-agglomerate, the adhesive particles must be thermoplastic, adhesive films, or thermosetting adhesive films⁶². Therefore, a typical way in which stickies form is the agglomeration of dispersed or dissolved auxiliary materials, e.g. water-soluble or redispersible adhesives, paper-coating binders, coatings, varnishes and printing ink constituents. When assessing the effects of adhesive films, it is important to investigate whether the parts of adhesive films that cannot be removed from paper mill sorting facilities can cause problems in the paper recycling process.

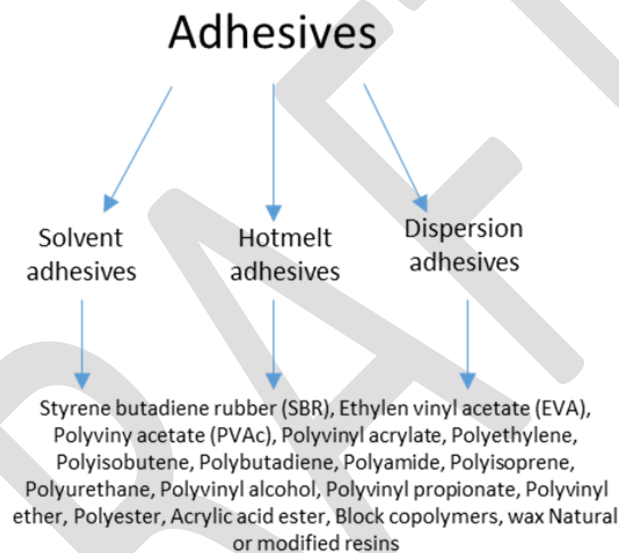


Figure 18. Adhesive contaminant deposits frequently identified in paper machine deposits (adapted from Putz, 2000)⁶³

Hot melt adhesives are used for magazine, diary, book binding and folders. They usually do not hinder the recovery process; in particular, applications of non-water-soluble or non-re-dispersible hot melt adhesives are included in the exemption list for the INGEDE adhesive removability test under the following conditions:

- Softening temperature of the adhesive (according to R&B): 68 °C minimum
- Layer thickness of the adhesive (non-reactive adhesive): 120 µm minimum
- Layer thickness of the adhesive (reactive adhesive): 60 µm minimum
- Horizontal dimension of the application (in either direction): 1,6 mm minimum.

PSA or self-adhesives coatings are used on labels (envelope flaps) and sticky notes, as well as peel-and-stick stamps. PVAc is particularly useful for gluing porous materials, such as wood, and paper (envelopes and folders/binders). PSA or self-adhesives coatings

⁶¹ Tiina Sarja. MEASUREMENT, NATURE AND REMOVAL OF STICKIES IN DEINKED PULP. 2007.

⁶² Communication with FEICA

⁶³ Putz H-J (2000) Stickies in recycled fiber pulp. In: Götsching, L & Pakarinen, H (eds.) Papermaking Science and Technology, Book 7, Recycled Fiber and Deinking. Fapet Oy, Jyväskylä, Finland, 441-498.. 2000

can consist of very different polymers, i.e. polyacrylates. The behaviour of such coatings in paper recycling has primarily nothing to do with the polymers, but mainly with the usually low PSA coatings film thicknesses of the adhesive films. PSAs traditionally do not achieve positive removability score. UPM Raflatac developed new adhesive of the PSA coating that passes the test INGEDE 12 reaching average EPRC adhesive removability scores of 38⁶⁴.

PVAc:
Very good redispersibility to small or even colloidal size

PSA:
Size distribution of macrostickies from labels in CERC lab test (4 PA and 2 SB based PSA)

EVA:
Breaks down to mostly large, good screenable stickies

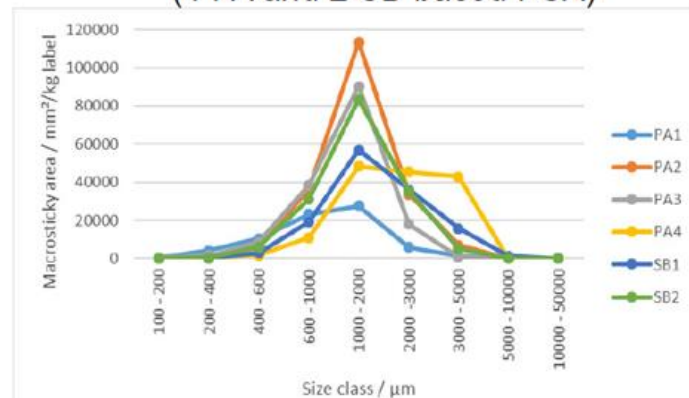


Figure 19. Typical behaviour of adhesive in the deinking process (UPM R&D)

The type of adhesive application plays an important role while speaking about recyclability, e.g. layer thickness results in the formation of large macrostickies that can be easily sorted out. The thickness is a key aspect, as the first step of repulping process is mechanical. In this sense, the tiny adhesive might break into tiny particles, whereas . thicker film is more stable towards fragmentation thus forming large macrostickies will be found. For example, in the appendix of the "EPRC Scorecard for the Removability of Adhesive Applications", the following is required in order to achieve a safe sorting out (100 score points) (specially for non-water-soluble or non-redispersible hot melt adhesives):

Layer thickness of the adhesives (non-reactive adhesives) 120 µm minimum
Layer thickness of the adhesives (reactive adhesives) 60 µm minimum
Horizontal dimension of the application (in either direction) 1.6 mm minimum

Soluble, dispersible and/or colloidal adhesives are proposed to be exempted from the above criteria due to the lack of a standardised measurement method.

To reflect the key terminology used by the adhesives industry the following definitions are proposed to be added:

- (1) 'Adhesive application' refers to processed adhesives used in finished paper products (typically applied as films). The physicochemical properties responsible for the behaviour of the "adhesive applications" during the paper recycling process depend on the composition of the adhesive, the setting mechanism and the geometry (mainly thickness) of the application;
- (2) 'Pressure-sensitive adhesive coatings' (PSA): means adhesives with still mobile molecules on their surfaces, even after setting, can produce sufficient adhesion by pressing their cohesive films (coating) against the surface to be bonded. Since they can be "activated" by pressure, they are also called "pressure-sensitive adhesives / PSA"(i.e. labels or tapes). PSAs can be formulated to feature a wide

⁶⁴ UPM Global Sustainability correspondence

variety of physicochemical properties. Since, in paper recycling, the separation of non-paper components is mainly achieved by mechanical sorting, it is desirable for the PSA coatings to have a "minimum size", a sufficient thickness

Measurement of stickies and adhesive removability assessment methods

Methods to estimate the amount of stickies include solvent extraction methods, macro stickies methods based on screening and image analysis, chemical analyses and miscellaneous other methods for micro and secondary stickies⁶⁵. The main drawback of all these methods is that their association with the performance of the paper machine has not been confirmed. Moreover, none of the methods are able to measure all of the types of stickies and none of them measures only stickies. Table 20 sums up all methods with their drawbacks and benefits.

Table 20. Summary of the most common stickies measurement method classes (Tiina Sarja, 2007)

Method class	What does it measure?	Main positive features	Main negative features
Macro methods	stickies Sticky particles retaining on a 100 or 150 µm slotted screen	Standardized methods, widely in use	Ignore micro stickies
Gravimetric extraction	solvent The amount of substances soluble in the solvent used	Stickies of all sizes included	Also non-stickies included in the analysis; solvent-dependent results
Solvent extraction + analytical quantification of sticky substances	The substances / substance class identified with the detector	Quantified substances of all sizes included, non-stickies not included in the result	Does not describe the tackiness; requires expensive instrumentation
Wet deposition testers	Amount of depositing material in wet conditions	Imitates real deposition phenomena	Deposits in the drying section more common than at the wet end; large variations in the result
Dry deposition testers	Amount of depositing material in drying section conditions	Imitates real deposition phenomena	Large variations in the results

The INGEDE method 12 is the only method currently suitable for making quantitative statements about the behavior of adhesive films in the paper recycling process

The Method is based on mechanical screening with slotted screens which is the most efficient tool for sticky removal. Efficient removal occurs if the adhesive dis-integrates into large sized particles (>2000µm), hence there is limited presence of small particles which can re-agglomerate into larger particles in the paper recycling process as secondary stickies⁶⁶.

The EPRC Assessment for the Removability of Adhesive Application⁶⁷ evaluates the results of the INGEDE Method 12 and converts them into scores on the Removal Scorecard. The EPRC removability score is therefore based on two parameters which are measured using the INGEDE Method 12:

⁶⁵ Tiina Sarja. MEASUREMENT, NATURE AND REMOVAL OF STICKIES IN DEINKED PULP. 2007.

⁶⁶ *Assessment of Printed Product Recyclability, Scorecard for the Removability of Adhesive Applications. (2017). EPRC*

⁶⁷ *Assessment of Printed Product Recyclability, Scorecard for the Removability of Adhesive Applications. (2017). EPRC*

- I. Score 71 to 100 points – *Evaluation of removability*: **Good**;
- II. Score 51-70 points - *Evaluation of removability*: **Fair**;
- III. Score 0-50 points - *Evaluation of removability*: **Tolerable**;
- IV. NEGATIVE - *Evaluation of removability*: **Insufficient**.

The removability properties of adhesives are illustrated in the EPRC assessment of adhesive removability through their scores for the share and area of macrostickies, RS_S and RS_A respectively. The examples are results from the INGEDE 12 Method.

Table 21. Adhesive removability results for various paper products (EPRC)

Parameter / Sample	Example A	Example B	Example C	Example D
Share				
Threshold for the share	50%	50%	50%	50%
Target for the share T_s	10%	10%	10%	10%
Maximum score for the share	20	20	20	20
Score for the share RS_S	3	20	2	-20
Area				
Scoring limit for the area	5000	5000	5000	5000
Target for the area T_A	500	500	500	500
Maximum score for the area	80	80	80	80
Score for the area RS_A	55	80	0	0

Where:

A is Book with protein, EVA and PVAc adhesives

B is Telephone directory with EVA hotmelt adhesives

C is PSA paper label with UV acrylic, non tackified adhesive

D is Book with PVAc dispersion adhesive

It might be assumed that the examples represent the range of scores achievable for different types of adhesives currently available on the market. The difference in non re-dispersible (soluble) and re-dispersible PVAc is illustrated in the scores of Example A (>50) and D (negative) respectively.

Adhesive removability requirements in related ecolabels

Nordic Ecolabelling requires at least 51 points for the prescribed INGEDE Method 12 which corresponds to "Good" or "Fair" removability (Nordic Ecolabel, 2011). This is a mandatory requirement for PSA excluding those used on laminates, for mounting, or on labels or stickers. In addition, adhesives, including PSA, can be awarded maximum points for recycling if they score at least 51 points on the EPRC Removal scorecard (Adhesive for laminates and adhesive for foils for foil printing is exempted). For a product to be licensed Nordic Swan a minimum number of points is required for various printing methods applied.

Blue Angel recommends that adhesives applications should be removable according to the EPRC guidelines on removability. No score is defined and there is an exemption for re-dispersible (water based) adhesives.

The Austrian Ecolabel requires the removability of hotmelt adhesives according to the EPRC Scorecard without specifying a score.

The proposed criterion is an output of the discussion conducted during the meetings of recyclability sib-group, and reflects an expertise feedback of adhesives industry.

Points for discussion

1. Criterion 3(a) – Removability of non-paper elements: Should the declaration of compliance be issued by "paper collecting company, the recycling company or an equivalent organization", or the declaration of compliance should be released by a product designer/manufacturer (applicant)?
2. Do you agree with the proposed formulation of Criterion 3 b (i) for wet strength agents, including the derogation granted for printed matter due to no use of wet strength agents in graphic

papers?

3. Criterion 3b (ii) Lamination, including polyethene and/or polyethene/polypropylene is proposed to be used only for covers of printed and converted paper products with a life-span of at least 1 year, such as: books, binders, folders, exercise books, calendars, notebooks and diaries. Double lamination is proposed not to be allowed. Is the limitation as well as a list of products for which lamination is permitted straightforward?

4. Is the proposed assessment and verification of re-pulpability (PTS-Method PTS-RH 021/97 or ATICELCA 501 evaluation system) adequate?

5. Criterion 3(c): Do you agree with the proposed criterion that addresses removability of adhesives?

6. The proposed revised criterion 3(d) for deinkability requires minimum score of 50% of the maximum score available for each individual parameter of the EPRC deinkability score.

Do you think that the formulation of the criterion should rather refer to the sum up of the individual scores: Printing technology and inks may be used on white paper grades, excluding envelopes, only if their deinkability can be proven with a minimum score on the EPRC Deinkability Scorecard of:

a) **51** in line with the Nordci Swan approach, or

b) **71** as proposed by several stakeholders.

7. Envelopes: Is the reference grammage of 135 g/m² an appropriate proposal to justify the envelopes' inner printing, or the opacity 98% is more adequate parameter?

8. According to feedback collected from industry digital prints are deinkable even if they do not pass Method 11'. Should criterion be structured differently for digital prints? Is there any experience with positive deinkability results on industrial scale? Any additional opinion about?

5.4 Criterion 4 - Emissions

Current criterion (Printed and converted products)

4a). Emissions to water

- i). Rinsing water containing silver from film processing, as well as from plate production, and photo-chemicals shall not be discharged to a sewage treatment plant.

Assessment and verification: the applicant shall provide a declaration of compliance with this criterion, together with a description of the management of photo-chemicals and silver containing rinsing water on site. Where the film processing and/or the plate production are outsourced, the sub-contractor shall provide a declaration of compliance with this criterion, together with a description of the management of photo-chemicals and silver containing rinsing water at the subcontractors.

- ii). The amount of Cr and Cu discharged into a sewage treatment plant must not exceed, respectively, 45 mg per m² and 400 mg per m² of printing cylinder surface area used in the press.

Assessment and verification: discharges of Cr and Cu into the sewage shall be checked at rotogravure printing plants after treatment and before their release. A representative sample of Cr and Cu discharges shall be collected each month. At least one annual analytical test shall be carried out by an accredited laboratory to determine the content of Cr and Cu in a representative sub-sample of these samples. Compliance with this criterion shall be assessed by dividing the content of Cr and Cu, as determined by the annual analytical test, by the cylinder surface used in the press during the printing. The cylinder surface used in the press during printing is calculated by multiplying the cylinder surface ($= 2\pi rL$, where r is the radius and L the length of the cylinder) by the number of printing productions during a year (= number of different printing jobs).

(4b) Emissions to air

Volatile Organic Compounds (VOC)

The following criterion must be met:

$$(P_{\text{VOC}} - R_{\text{VOC}})/P_{\text{paper}} < 5 \text{ [kg/tonnes]}$$

Where:

P_{VOC} =the annual total kilograms of VOC contained in the purchased chemical products used for the annual total production of printed products

R_{VOC} =the annual total kilograms of VOC destroyed by abatement, recovered from printing processes and sold, or reused

P_{paper} =the annual total tonnes of paper purchased and used for the production of printed products.

Where a printing house uses different printing technologies, this criterion shall be fulfilled for each one separately.

The P_{VOC} term shall be calculated from SDS information related to VOC content or from an equivalent declaration provided by the supplier of chemical products.

The R_{VOC} term shall be calculated from the declaration on the content of VOC contained in the chemical products sold or from the internal counting register (or any other equivalent document) reporting the annual amount of VOC recovered and reused on site.

Specific conditions for heat-set printing:

- (i) For heat-set offset printing with an integrated after-burner unit in place for the drying

unit, the following calculation method shall apply:

P_{VOC} = 90% of the annual total kilograms of VOC contained in damping solutions used for the annual production of printed products + 85% of the annual total kilograms of VOC contained in washing agents used for the annual production of printed products.

(ii) For heat-set offset printing, without an integrated after-burner unit in place for the drying unit, the following calculation method shall apply:

P_{VOC} = 90% of the annual total kilograms of VOC contained in damping solutions used for the annual production of printed products + 85% of the annual total kilograms of VOC contained in washing agents used for the annual production of printed products + 10% of annual total kilograms of VOC contained in the printing inks used for the annual production of printed products.

For (i) and (ii), proportionately lower percentages than 90% and 85% may be used in this calculation if more than 10% or 15% respectively of annual total kilograms of VOC contained in the damping solutions or washing agents used for the annual production of printed products are shown to be abated in the treatment system for combusting gases from the drying process.

Assessment and verification: a declaration of the VOC content in alcohols, washing agents, inks, damping solutions or other corresponding chemical products shall be provided by the chemical supplier. The applicant shall provide evidence of the calculation according to the criteria laid down above. The period for the calculations shall be based on the production during 12 months. In case of a new or a rebuilt production plant, the calculations shall be based on at least three months of representative running of the plant.

(4c) Emissions from publication rotogravure printing

(i) Publication rotogravure printing emissions of VOC to air shall not exceed 50 mg C/Nm³.

Assessment and verification: the applicant shall provide appropriate documentation showing compliance with this criterion.

(ii) Equipment for reduction of emission to air of Cr⁶⁺ shall be installed.

(iii) Emissions of Cr⁶⁺ to air shall not exceed 15 mg/tonne paper.

Assessment and verification: the applicant shall provide a description of the system in place, together with a documentation related to the control and the monitoring of Cr⁶⁺ emissions. The documentation shall include the test results related to the reduction of Cr⁶⁺ emissions to the air.

(4d) Printing processes to which no legislative measures apply

Volatile solvents from the drying process of heat-set offset and flexography printing shall be managed by means of recovery or combustion or any equivalent system. In all cases where no legislative measures apply, the emissions of VOC to air must not exceed 20 mg C/Nm³.

This requirement does not apply to screen printing and digital printing. Moreover it does not apply to heat-set and flexography installations with solvent consumption lower than 15 tonnes per year.

Assessment and verification: the applicant shall provide a description of the system in place together with documentation and test results related to the control and the monitoring of emissions to air.

Proposed criterion on: Emissions

Two alternative options are proposed for further discussion during the 2nd AHWG meeting

OPTION I (Revision of the reference values established in the currently valid criterion)

4a). Emissions to water from rotogravure printing

4a(i) Rinsing water containing silver from film processing, as well as from plate production, and photo chemicals shall not be discharged to a sewage treatment plant.

Proposed to be withdrawn as an obsolete technique

~~**Assessment and verification:** the applicant shall provide a declaration of compliance with this criterion, together with a description of the management of photo chemicals and silver containing rinsing water on site. Where the film processing and/or the plate production are outsourced, the sub-contractor shall provide a declaration of compliance with this criterion, together with a description of the management of photo chemicals and silver containing rinsing water at the subcontractors.~~

The amount of Cr and Cu discharged into a sewage treatment plant must not exceed, respectively, 20 mg per m² and 200 mg per m² of printing cylinder surface area used in the press.

~~**Assessment and verification:** discharges of Cr and Cu into the sewer shall be checked at rotogravure printing plants after treatment and immediately prior to discharge into the sewer. A representative composite sample of Cr and Cu discharges shall be collected each month. At least one annual analytical test shall be carried out by an accredited laboratory to determine the content of Cr and Cu from the composite sample according to EN ISO 11885 or equivalent standard methods that are accepted by the competent body as providing data of equivalent scientific quality.~~

~~Compliance with this criterion shall be assessed by dividing the content of Cr and Cu, as determined by the annual analytical test, by the cylinder surface used in the press during the printing. The cylinder surface used in the press during printing is calculated by multiplying the cylinder surface (= $2\pi rL$, where r is the radius and L the length of the cylinder) by the number of printing productions during a year (= number of different printing jobs).~~

~~The reference test methods are for Cr: EN ISO 11885 (Water quality. Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES)), and EN 1233 (Water quality. Determination of chromium. Atomic absorption spectrometric methods), and for Cu: EN ISO 11885 (Water quality. Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES)).~~

(4b) Emissions to air

The criterion shall apply to all printing and conversion processes where organic solvents are used.

Volatile Organic Compounds (VOC)

The following criterion must be met:

$$(P_{\text{VOC}} - R_{\text{VOC}})/P_{\text{paper}} < 3 \text{ [kg/tonnes]}$$

Where:

P_{VOC} =the annual total kilograms of VOC contained in the purchased chemical products used for the annual total production of printed products

R_{VOC} =the annual total kilograms of VOC destroyed by abatement or recovered from printing processes and sold or reused

P_{paper} =the annual total tonnes of paper purchased and used for the production of printed products.

Where a printing house uses different printing technologies, this criterion shall be fulfilled for each one separately.

The P_{VOC} term shall be calculated from SDS information regarding the VOC content or from an equivalent declaration provided by the supplier of chemical products.

The R_{VOC} term shall be calculated from the declaration on the content of VOC contained in the chemical products sold or from the internal counting register (or any other equivalent document) reporting the annual amount of VOC recovered and reused on site.

Specific conditions for heat-set printing:

(i) For heat-set offset printing with an integrated after-burner unit in place for the drying unit, the following calculation method shall apply:

P_{VOC} = 90% of the annual total kilograms of VOC contained in damping solutions used for the annual production of printed products + 85% of the annual total kilograms of VOC contained in washing agents used for the annual production of printed products.

(ii) For heat-set offset printing, without an integrated after-burner unit in place for the drying unit, the following calculation method shall apply:

P_{VOC} = 90% of the annual total kilograms of VOC contained in damping solutions used for the annual production of printed products + 85% of the annual total kilograms of VOC contained in washing agents used for the annual production of printed products + 10% of annual total kilograms of VOC contained in the printing inks used for the annual production of printed products.

For (i) and (ii), proportionately lower percentages than 90% and 85% may be used in this calculation if more than 10% or 15% respectively of annual total kilograms of VOC contained in the damping solutions or washing agents used for the annual production of printed products are shown to be abated in the treatment system for combusting gases from the drying process.

Assessment and verification: a declaration of the VOC content in alcohols, washing agents, inks, damping solutions or other corresponding chemical products shall be provided by the chemical supplier. The applicant shall provide evidence of the calculation according to the criteria laid down above. The period for the calculations shall be based on the production during 12 months. In case of a new or a rebuilt production plant, the calculations shall be based on at least three months of representative running of the plant.

(4c) Emissions from publication rotogravure printing

4c(i) Publication rotogravure printing emissions of VOC to air shall not exceed 16 mg C/Nm³.

4c(ii) Equipment for reduction of emission to air of Cr(VI) shall be installed

4c(iii) Emissions of Cr(VI) to air shall not exceed 15 mg/tonne paper

Assessment and verification: the applicant shall provide appropriate documentation showing compliance with this criterion.

For the monitoring of total VOC (TVOC) emissions to air in waste gases, any stack with a TVOC load less than 10 kg C/h should be performed at least once a year according to EN 12619, or equivalent. In the case of a TVOC load less than 0.1 kg C/h (as an annual average), or in the case of an unabated and stable TVOC load of less than 0.3 kg C/h, the monitoring frequency may be reduced to once every three years or the monitoring may be replaced by calculation provided that it ensures the provision of data of an equivalent scientific quality.

The applicant shall provide a description of the system in place, together with a documentation related to the control and the monitoring of Cr6 + emissions. The documentation shall include the test results related to the reduction of Cr6 + emissions to the air.

(4d) Printing processes not covered by the Industrial Emissions Directive 2010/75/EU

The following requirements shall apply to printing processes not covered by Annex VII Part 2 of Directive 2010/75/EU.

In all cases where no legislative measures apply, the emissions of VOC to air must not exceed 20 mg C/Nm³. In addition, fugitive emissions should be lower than 10%.

Volatile solvents from the drying process of heat-set offset and flexography printing shall be managed by means of recovery or combustion or any equivalent system.

This requirement does not apply to screen printing and digital printing. Moreover it does not apply to heat set and flexography installations with solvent consumption lower than 15 tonnes per year.

Assessment and verification: the applicant shall provide a description of the system in place together with documentation and test results related to the control and the monitoring of emissions to air.

For total or fugitive VOC emissions, an applicable solvent mass balance calculation based at least on the production during 12 months shall be compiled. In case of a new or a rebuilt production plant, the calculations shall be based on at least three months of representative running of the plant.

A declaration of the VOC content in alcohols, washing agents, inks, damping solutions or other relevant chemical products shall be provided by the applicant or a chemical supplier.

For the monitoring of total VOC (TVOC) emissions to air in waste gases, measurements in any stack with a TVOC load less than 10 kg C/h should be performed at least once a year according to EN 12619, or equivalent. In the case of a TVOC load less than 0.1 kg C/h (as an annual average), or in the case of an unabated and stable TVOC load of less than 0.3 kg C/h, the monitoring frequency may be reduced to once every three years or the monitoring may be replaced by calculation provided that it ensures the provision of data of an equivalent scientific quality.

OPTION II (Based on BATs requirements from STS BREF)

4(a) Emissions to water from rotogravure printing

~~4 a(i) Rinsing water containing silver from film processing, as well as from plate production, and photo-chemicals shall not be discharged to a sewage treatment plant.~~

~~**Assessment and verification:** the applicant shall provide a declaration of compliance with this criterion, together with a description of the management of photo-chemicals and silver containing rinsing water on site. Where the film processing and/or the plate production are outsourced, the sub-contractor shall provide a declaration of compliance~~

~~with this criterion, together with a description of the management of photo-chemicals and silver-containing rinsing water at the subcontractors.~~

The amount of Cr and Cu discharged into a waste water treatment plant must not exceed, respectively, **20 mg per m² and 200 mg per m²** of printing cylinder surface area used in the press.

Assessment and verification: discharges of Cr and Cu into the sewer shall be checked at rotogravure printing plants after treatment and immediately prior to discharge into the sewer. A representative composite sample of Cr and Cu discharges shall be collected each month. At least one annual analytical test shall be carried out by an accredited laboratory to determine the content of Cr and Cu from the composite sample according to EN ISO 11885 or equivalent standard methods that are accepted by the competent body as providing data of equivalent scientific quality.

Compliance with this criterion shall be assessed by dividing the content of Cr and Cu, as determined by the annual analytical test, by the cylinder surface used in the press during the printing. The cylinder surface used in the press during printing is calculated by multiplying the cylinder surface ($= 2\pi rL$, where r is the radius and L the length of the cylinder) by the number of printing productions during a year ($=$ number of different printing jobs).

~~The reference test methods are for Cr: EN ISO 11885 (Water quality. Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES)), and EN 1233 (Water quality. Determination of chromium. Atomic absorption spectrometric methods), and for Cu: EN ISO 11885 (Water quality. Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES)).~~

4(b) Volatile Organic Compounds (VOCs) emission from rotogravure publication printing

4 b (i) Fugitive VOC emissions as calculated by the solvent mass balance should be lower or equal to 2.0% as calculated by the solvent mass balance and total VOC (TVOC) emissions to air in waste gases shall be lower or equal to 16.0 mg C/Nm³.

4 b (ii) Equipment for reduction of emission to air of Cr(VI) shall be installed.

4 b (iii) Emissions of Cr(VI) to air shall not exceed 15.0 mg/tonne paper.

Assessment and verification: the applicant shall provide data and detailed calculations showing compliance with this criterion, together with related supporting documentation.

For total or fugitive VOC emissions, as applicable solvent mass balance calculation based at least on the production during 12 months shall be compiled. The solvent input output mass balance shall meet the rules defined in Part 7(2) of Annex VII to Directive 2010/75/EU as specified in Commission Implementing Decision (EC) 2020/XX/XX. In case of a new or a rebuilt production plant, the calculations shall be based on at least three months of representative running of the plant.

A declaration of the VOC content in alcohols, washing agents, inks, damping solutions or other corresponding chemical products shall be provided by the applicant or a chemical supplier.

For the monitoring of total VOC (TVOC) emissions to air in waste gases, any stack with a TVOC load less than 10 kg C/h should be performed at least once a year according to EN 12619, or equivalent. In the case of a TVOC load less than 0.1 kg C/h (as an annual average), or in the case of an unabated and stable TVOC load of less than 0.3 kg C/h, the monitoring frequency may be reduced to once every three years or the monitoring may be replaced by calculation provided that it ensures the provision of data of an equivalent scientific quality.

The applicant shall provide a description of the system in place, together with a documentation related to the control and the monitoring of Cr⁶⁺ emissions. The

documentation shall include the test results related to the reduction of Cr6 + emissions to the air.

4(c) Volatile Organic Compounds (VOCs) emission from headset web offset printing

Total VOC emissions as calculated by the solvent mass balance should be lower or equal to 0.03kg VOCs per kg of ink input; alternatively fugitive VOC emissions as calculated by the solvent mass balance should be lower or equal to 8% and total VOC (TVOC) emissions to air in waste gases should be lower or equal to 12.0 mg C/Nm³.

4(d) Volatile Organic Compounds (VOCs) emission from flexo and non – publication rotogravure printing

Total VOC emissions as calculated by the solvent mass balance should be lower or equal to 0.24kg VOCs per kg of ink input; alternatively fugitive VOC emissions as calculated by the solvent mass balance should be lower or equal to 9.6% and total VOC (TVOC) emissions to air in waste gases should be lower or equal to 16.0 mg C/Nm³.

Assessment and verification: For criterion 4 c) and 4d) the applicant shall provide detailed calculations and test data showing compliance with this criterion, together with related supporting documentation.

For total or fugitive VOC emissions, as applicable solvent mass balance calculation based at least on the production during 12 months shall be compiled. The solvent mass balance shall meet the rules defined in Part 7(2) of Annex VII to Directive 2010/75/EU as specified in Commission Implementing Decision (EC) 2020/XX/XX. In case of a new or a rebuilt production plant, the calculations shall be based on at least three months of representative running of the plant.

A declaration of the VOC content in alcohols, washing agents, inks, damping solutions or other corresponding chemical products shall be provided by the applicant or a chemical supplier.

For the monitoring of total VOC (TVOC) emissions to air in waste gases, any stack with a TVOC load less than 10 kg C/h should be performed at least once a year according to EN 12619, or equivalent. In the case of a TVOC load less than 0.1 kg C/h (as an annual average), or in the case of an unabated and stable TVOC load of less than 0.3 kg C/h, the monitoring frequency may be reduced to once every three years or the monitoring may be replaced by calculation provided that it ensures the provision of data of an equivalent scientific quality.

For any stack with a TVOC load higher or equal to 10 kg C/h the monitoring shall be continuous according to EN15267-1, EN15267-2, EN15267-3 and EN 14181.

4(e) Printing processes not covered by the Industrial Emission Directive 2010/75/EU

The following requirements shall apply to printing processes not covered by Annex VII Part 2 of Directive 2010/75/EU.

In all cases where no legislative measures apply, the emissions of VOC to air must not exceed 20 mg C/Nm³. In addition, fugitive emissions should be lower than 10%.

Volatile solvents from the drying process of heat-set offset and flexography printing shall be managed by means of recovery or combustion or any equivalent system.

This requirement does not apply to screen printing and digital printing. Moreover it does not apply to heat set and flexography installations with solvent consumption lower than 15 tonnes per year.

Assessment and verification: the applicant shall provide a description of the system in place together with documentation and test results related to the control and the monitoring of emissions to air.

For total or fugitive VOC emissions, as applicable solvent mass balance calculation based at least on the production during 12 months shall be compiled. The solvent input output mass balance shall meet the rules defined in Part 7(2) of Annex VII to Directive 2010/75/EU as specified in Commission Implementing Decision (EC) 2020/XX/XX. In case of a new or a rebuilt production plant, the calculations shall be based on at least three months of representative running of the plant.

A declaration of the VOC content in alcohols, washing agents, inks, damping solutions or other corresponding chemical products shall be provided by the applicant or a chemical supplier.

For the monitoring of total VOC (TVOC) emissions to air in waste gases, any stack with a TVOC load less than 10 kg C/h should be performed at least once a year according to EN 12619, or equivalent. In the case of a TVOC load less than 0.1 kg C/h (as an annual average), or in the case of an unabated and stable TVOC load of less than 0.3 kg C/h, the monitoring frequency may be reduced to once every three years or the monitoring may be replaced by calculation provided that it ensures the provision of data of an equivalent scientific quality.

Rationale

Emission to water

The main concern is possible emissions from rotogravure cylinder preparation, Nowadays, many flexography and non-publication rotogravure sub-contract the cylinder manufacturing and engraving, consequently the emissions to water from the electroplating of cylinders are outsourced to specialist suppliers (BREF, 2017). Usually, printing facilities are not equipped with waste water treatment plant. Waste water can be treated and disposed of to the sewerage system or disposed of as waste. Often liquid waste is removed from site by specialist waste companies through established waste handling processes, which are subject to permitting under national or local waste management regulations.

The Nordic Swan criteria for printing companies require a maximum of 25 mg chromium (Cr-tot) and of 90 mg copper (Cu) per tonne of product for rotogravure printers. The measurement is done after the treatment.

Emission to air

Volatile organic compounds (VOCs) are organic chemicals that have a low boiling point and consequently a high vapor pressure at room temperature. At that point, the main sources of VOC releases are fugitive emissions from printing machines and other equipment, VOC from ink solvents remaining on the printed products, and VOC in the waste gas (EC, 2009)⁶⁸. The total European unabated VOC emission from heat-set offset printing is estimated at 100 kTonne per year. Half of the quantity is sourced to the isopropyl alcohol (IPA) while the rest originates from the cleaning agents (EEA, 2016).

The current threshold is based on a mass balance approach where relevant sources of emission are identified and calculated. **The need and magnitude of revision of the current equation should be further discussed with stakeholders.** In line with BAT 9 (DRAFT, BREF 2017), the following techniques should be considered to perform an adequate annual solvents mass balance as defined in Part 7(2) of Annex VII to Industrial Emission Directive (2010/75/EU) - Table 22.

⁶⁸ European Commission, 2009. Guidance on VOC Substitution and Reduction for Activities Covered by the VOC Solvents Emissions Directive (Directive 1999/13/EC)

Table 22. BAT 9 - Solvent mass balance of the solvent inputs and outputs of the plant

Technique	Description
Implementation of solvent tracking system	A solvent tracking system aims to control both used and unused quantities of solvents returned to storage from the application zone.
Full characterisation and quantification of the relevant emission sources	<p>This includes:</p> <ul style="list-style-type: none"> • Identification and listing of emissions sources, i.e. WGT system, each fugitive emissions source; • Quantification of each emission source's contribution and the methodology used: measurement, calculation using emission factors, estimation based on operational parameters, etc. • Regular update of emission data
Monitoring of changes that influence normal operation	<p>Any change that could influence the accuracy of the solvent mass balance is recorded, such as:</p> <ul style="list-style-type: none"> • Malfunctions of the waste gas treatment : date and time period; • Changes that may influence air/gas flow rates, e.g. replacement of fans, drive pulleys, motors; the date and type of change are recorded, e.g. replacement to original specification, refurbished, and upgraded.

Heat-set web offset printing

The main sources of air emissions are organic solvents in inks as well as cleaning and dampening solutions (commonly isopropanol). Installations are commonly equipped with thermal waste off-gas treatment techniques. Most installations in the sector apply integrated dryer/oxidisers at each press specifically designed for the use on heatset web offset printing presses. The reported average total VOC emission (TVOC) to air in waste gases in 2015 are presented in Table 23. The reported values of fugitive emission expressed as percentage of solvent input were in 2015 between 0.8%–10.72% (BREF, 2017). The concentration of IPA varies between 8%–15%. In the last decade IPA has been widely reduced and/or substituted by IPA free dampening solutions. For example, in Germany IPA in the dampening solution has been reduced to < 8 wt-% from 2001 to 2007 and to < 5 % in 2013 (BREF, 2017).

Table 23. Statistical parameters of reported average values for TVOC emissions to air in waste gases in 2015 (STS BREF, 2017)

Applied technique	Number of values	Average	Max	Min
		mg C/Nm ³		
Thermal oxidation	14	6.4	17.0	2.1
Recuperative thermal oxidation	5	2.4	3.5	1.2

Regenerative thermal oxidation	6	8.0	15.0	2.0
TRO-3	1	1.7		

Flexography and rotogravure printing – Laminating, varnishing, and packaging printing

Reported values of total organic solvent consumption show a range from 40 up to 390 g of solvent per kg of printed surface. An average of 1.78 kg VOC per kg purchased ink input is used in the production and auxiliary processes of the plant. The relevant range of reported values for total solvent consumption expressed against the printed surface of printed surface is from 1 up to 30 kg of solvent per 1000 m² (BREF, 2017)

Publication rotogravure

The European publication rotogravure industry uses annually 30 kTonne pigments, 50 kTonne resins and 100 kt toluene and 180,000 tonnes of ink (2006). More than 95 % of the toluene is reused. This is technically feasible since gravure uses a mono-solvent system. Publication printing inks contain 50% toluene. The dilution is made in the printing plant to obtain a toluene concentration of 70%–80%. The solvents are evaporated by heat and air in the drying section. The traces of toluene which remain in the printed product at the moment of leaving the production are lower than 0.04%. The toluene mass balance of two plants is shown in Table 24⁶⁹.

Table 24. Toluene balance of two gravure printing plants

	Plant 1 (t/year)	Plant 2 (t/year)
Total toluene consumption (fresh and recovered)	2.571	2.179
Toluene in waste	11	0
Toluene in sold products	10	10
Toluene recovered and reused on site	1.694	1.428
Toluene recovered and sold	599	613
Emissions		
Toluene emissions after treatment	1.1	4
Fugitive toluene emission *	265	133
Total toluene emission	266.1 (10%)**	137 (6%)**

*Inclusive 10 tonnes of toluene in sold product;

** Consumption (%)

The BAT (Best Available Techniques) Reference Document (BREF) for Surface Treatment Using Organic Solvents⁷⁰ examines the feasibility to reduce the current 50 mg C/Nm³ threshold for VOC emissions to air in rotogravure printing to 20 mg C/Nm³. This reduction is technically feasible although associated with additional steam requirements and consequent economic and environmental costs.

⁶⁹Aminal et al. Evaluatie emissiereductiepotentieel voor VOS-emissies van de grafische sector, deel 1", Aminal. Afdeling Algemeen Milieubeleid, 00.1688., 2002.

⁷⁰ BREF for Surface Treatment Using Organic Solvents (D1)

The recently revised Nordic Swan criteria for printing companies establish scoring system according to the intensity of VOC emission. A VOC emission of 5 kg/tonne paper is granted 50% of the maximum score available indicating the average requirement.

Table 25. Nordic Swan point award system for VOC emissions

VOC (kg/tonne paper)	Points
0	20
2	16
5	10
8	4
10	0

The respective BREF document (JRC, 2017) is proposed to serve as reference for the further revision of the emission thresholds. Moreover, consultation with stakeholders is deemed to identify the reference for the updated criteria. It should also be discussed whether the equation that sets a threshold for total VOC emission should be harmonised with the BREF approach, being based on percentage of VOC input.

Monitoring of air emission

Emission levels associated with BAT-AELs refer to concentrations expressed as mass of emitted substance per volume of waste gases under the following standards conditions: Temperature 273.15 K, pressure 101.3 kPa, without correction of O₂ and expressed in the unit mg/Nm³. Both continuous and periodical monitoring is considered:

- Continues monitoring: Daily average over a period of one day based on valid hourly or half-hourly averages;
- Periodical monitoring: Average over the sampling period, average value of three consecutive measurements of at least 30 minutes each.

Outcomes from and after 1st AHWG meeting

It was proposed to maintain the criterion in its current form, while considering the issues summarized below:

- 4a). To evaluate the possibility to further restrict the current amount of Cr and Cu discharged into a sewage treatment plant.
- 4b). To evaluate the possibility to further restrict the current limits related to VOC emissions:
 - Reduce the ratio of kilograms of 'lost VOC' per tonnes of paper used in the production of printed products.
 - Reduce the current limit for the VOC emissions from publication rotogravure printing.
 - Reduce the current limit for the VOC emissions from processes where no legislative measures apply.
 - Modify thresholds or eliminate some of the derogations from the VOC emission limits in processes where no legislative measures apply.
- 4d). To evaluate the possibility to restrict the current limit of Cr6+ to air from publication rotogravure printing.
- 4e). To introduce the obligation to have local exhaust extraction for all printing units on all printing machines with more than two print/varnish units if the annual VOC consumption for the printing method concerned is more than 9 kg per tonne of product and year.

The requirement for silver was notified to be disproportionate when compared to Cr and Cu, considering that photographic process is obsolete in the printing industry so there is no use of silver any longer. The criterion was proposed to be withdrawn.

The VOC emissions of feed shed printing and heatset printing mainly depend on the use of isopropanol and cleaners of low volatility, but reduction of isopropanol to 0 – 3% in the dampening solution is possible in these techniques⁷¹. Coldset printing does not need isopropanol in the process and offset printing can use less volatile cleaning agents (flame point at least between 55-100°C). Based on these considerations and on the Blue Angel criteria the limit values for VOC emissions was proposed to be lower than 5 kg/t⁷²: sheet fed < 4 kg/t; for coldset < 2 kg/t; for heatset web offset printing <10% fugitive emissions should be allowed, in combination with a limit value of 20 mg/Nm³ in captured emissions. Monitoring should be done annually² No more than 20 mg toluene/Nm³ per day was proposed to be allowed in captured emissions with continuous monitoring.

The second questionnaire was distributed among Competent Bodies in order to collect data on current emission levels that are notified by license holders. The questionnaire served as a base for the further revision of reference values, as follows:

- The current levels of Cu and Cr discharged to a sewage treatment plant are: 1-5 mg/m² Cr and 1-188 mg/m² Cu;
- Limited data reported by EU Ecolabel license holders indicate the following ranges of emission values: for sheet offset: 1,5 to 4,5 kg/t of paper, for gravure printing 0,3 to 1,5 kg/t of paper, for offset 0.5 to 2.4 kg/t of paper³⁰, and for heat set is 0,6 to 1 kg/t of paper. Regarding the VOC emissions from rotogravure printing, the emission values reported in a total of 3 applications ranged from 8 to 22 mg/Nm³.

Nevertheless, given the limited number of the data provided, second proposal (Option II) was also developed. The alternative proposal (Option II) aims at harmonising the monitoring and notification of the VOCs emission with BATs. The information included in STS BREF are considered to be representative for the European printing industry, and could therefore be taken as the primary reference for the revision process, being contrasted with the data gathered, and further consultation process.

For emissions from printing processes to which no legislative measures apply it was proposed to introduce the reference value for fugitive emissions lower than 10%. The data collected from license holder (singular data) shows the VOC emission level of 0.15 mg C/Nm³ for heatset rotation, and 0.5 mg C/Nm³ for offset.

Further research and main changes

Emission into water

Chromium (VI) compounds hold a harmonised classification under CLP as highly toxic to the aquatic life (Aquatic Acute 1 and Aquatic Chronic 1), Carcinogenic 1B, and skin sensitizer 1⁷³. Copper compounds (e.g., copper (II) oxide, copper sulphate, or copper chloride) are also classified as highly toxic to the aquatic life (Aquatic Acute 1 and Aquatic Chronic 1)⁸.

The ambition level of the currently valid requirement cannot be directly compared with the Nordic Swan, and Blue Angel criteria. The Nordic Swan settles the emission threshold per tonne of product; and the measurement is done after treatment and not at the point of discharge, as required in the existing EU Ecolabel⁷⁴. The Blue Angel's requirement

⁷¹ JRC Science for Policy Report; Industrial Emissions Directive 2010/75/EU (integrated Pollution Prevention and Control) Draft 1 – (October 2017). Best Available Techniques (BAT) Reference Document on Surface Treatment using Organic Solvents, p. 351 and 362.

⁷² Tonnes of paper purchased and used for the production of printed products.

⁷³ European Chemicals Agency, C&L Inventory.

⁷⁴ Nordic Ecolabelling for printing companies, printed matter, envelopes and other converted paper products. Version 5.13. 15 December 2011 – 31 March 2021, p. 20.

foresees separated treatment of chromium containing wastewater⁷⁵ and establishes the threshold of 0.08 mg Cr/L before effluents mixing, independently from the production volume. The restriction is explicitly associated to rotogravure printing¹¹ due to chromium plating of rotogravure printing cylinders. Similarly, the main source of copper in waste water is associated with its use in the rotogravure technique.

STS BREF (EC, 2017)⁷⁶ reported Cu and Cr emission values from two publication gravure installations the emission data is notified as the concentration of metal in the discharged waste water. Secondary waste water treatment (by the activated sludge process) is more efficient in the Cr removal than the primary stage. Approximately 40% of the Cr in raw sewage is removed through primary waste water treatment; whereas 75 – 80 % removal is achieved by combining primary and secondary waste water treatments⁷⁷. Therefore, in terms of more homogeneous comparative burden to different industrial settings, it is preferable, to establish the thresholds at the exit of the pipe before the sewage treatment plant in line with the currently valid requirement.

Table 26. Reported values of metal concentration from two publication rotogravure printing installations for 2015 (STS BREF, EC 2017)

Pollutant	Plant 1	Plant 2
	Average concentration (mg/L)	Average concentration (mg/L)
Cu	0.39	0.144
Cr(VI)	0.01	0.278
Cr Total	0.08	0.003

The appropriate analysis of the ambition level of the current criterion is burdened by the following aspects: (1) very limited data on Cr and Cu emission levels provided by the existing license holders, (2) limited data reported in BREF (2017) is expressed as mg/L, and cannot be contrasted with the EU Ecolabel criterion (expressed as metal concentration per printing cylinder surface area); there is no BAT-AELs proposed for Cu, and Cr emission, mainly because of the common outsourcing of the treatment. (3) the criteria settled down in the Blue Angel and Nordic Swan Ecolabelling systems refer to different units, mg/L and mg/tonne, respectively, thus neither being comparable with EU Ecolabel requirement.

Data from 3 license holders indicates the range of 1 to 5 mg Cr/m² and 1 to 188 mg Cu/m² of printing cylinder surface area used in the press. **The current thresholds are proposed to be reduced to 20 from 45 mg/m² for Cr and to 200 from 400 mg/m² for Cu.** The proposed revised reference values represent 50% reduction of the current requirement for Cu and Cr. From the data collected from license holders, further reduction seems to be feasible. Nevertheless, considering limited number of input data, any additional strengthening of the ambition level needs to be further discussed during the 2 AHWG Meeting.

An alternative, would be to modify the criterion on Cr and Cu emissions harmonising with the best practice reported by BREF.

The amount of Cr and Cu discharged into a sewage treatment plant must not exceed, respectively, 0.08 mg/L and 0.39 mg/L.

⁷⁵ Der Blaue Engel, January 2015. Basic Criteria for Award of Environmental Label, Printed Matter. RAL-UZ 195 p. 23 and 21.

⁷⁶ JRC Science for Policy Report; Industrial Emissions Directive 2010/75/EU (integrated Pollution Prevention and Control) Draft 1 – (October 2017). Best Available Techniques (BAT) Reference Document on Surface Treatment using Organic Solvents, p. 464 and 428.

⁷⁷ http://ec.europa.eu/environment/archives/waste/sludge/pdf/sludge_pollutants_2.pdf

Requirement for silver emission

Uses of photographic processes are mostly obsolete. The withdrawal of the requirement is proposed to be further discussed.

Emission into air: further analysis of the VOC emissions limits

Following information summarizes relevant input from the STS BREF findings (D1) (EC, 2017), Blue Angel and Nordic Swan, being supported by data collected from the license holders:

Heat-set web offset printing

The Blue Angel sets the limit of 3% by volume of IPA or ethanol content in the dampening solution and indicates a threshold of 4 kg/t⁷⁸ limit for sheet-fed offset printing, and a 2 kg/t limit for the coldset web offset printing. One tonne of ink allows the printing of about 330 000 m² (both sides) or approximately 225 000 catalogues (48 pages DIN A4) (EC, 2017).

Publication rotogravure printing

Following the communication with the printing industry, a four press printing plant may annually use between 50 and 100 kt of paper and up to 10 kt of press ready ink and will consequently have a solvent input of some 8,000 tons of solvent. Of this amount some 7000 tons are recovered and either reused or sold back to the ink manufacturer.

Data reported by BREF (2017) for solvent consumption varies from 70 kg/t up to 92 kg/t, while the average solvent consumption per millions of m² of substrate varies from 2.1 kg up to 4.8 kg/106m². A new generation of toluene-based inks, also known as 'retention inks' evaporates more efficiently in the dryers. Although they contain about 5 % more toluene when press-ready, they can lead to less fugitive emissions.

Flexography and rotogravure printing

The Blue Angel sets a limit of 2 kg/t for flexographic printing. Some stakeholders have proposed to introduce additional criteria to restrict emissions from rotogravure printing, such as establishing a toluene minimum recovery level and/or limit the fugitive emissions. BREF (EC, 2017) reports less than 3% VOC emissions vs. total solvent input for fugitive emissions from rotogravure printing.

Monitoring

One stakeholder expressed the need to improve the current methodology to estimate VOC emissions. The current methodology implies calculating the total input (kg) of VOC contained in the purchased chemical products used for the annual production of printed products (Pvoc), as well as the annual total kilograms of VOC destroyed by abatement, recovered from printing processes and sold, or reused (Rvoc), and also the annual total tonnes of paper purchased and used for the production of printed products (Ppaper). Specific assumptions to calculate the Pvoc are included for heat-set offset printing, depending on whether an integrated after-burner unit is in place for the drying unit. Such assumptions are based on the proportion of VOC abated in the treatment system for combustion gases from the drying process. Only in the case of emissions from publication rotogravure printing, these are expressed in terms of mg C/Nm³, therefore based on emission monitoring data⁷⁹.

⁷⁸ Kilogram of solvents purchased versus tonnes of paper used in the printing processes.

⁷⁹ Commission Decision of 16 August 2012 on establishing the ecological criteria for the award of the EU Ecolabel for printed paper. (OJ L 223, 21.8.2012), p. 63.

Following indication of BAT 10: *BAT is to monitor total and fugitive VOC emissions by compiling at least on an annual basis, a solvent mass balance of the solvent inputs and outputs of the plant, as defined in Part 7(2) of Annex VII to Directive 2010/75/EU. In order to minimize the uncertainty of the solvent mass balance data, BAT is to use all of the specified techniques.*

BAT 9 specifies the rules to monitor total and fugitive VOC emissions by compiling e, at least on an annual basis, a solvent mass balance of the solvent inputs and outputs of the plant, as defined in Part 7(2) of Annex VII to Directive 2010/75/EU.

Following indication of BAT 10 the TVPC measurement should meet the following requirements:

Any stack with a TVOC load < 10 kg C/h / EN 12619 / Once every year. In the case of a TVOC load less than 0.1 kg C/h (as an annual average), or in the case of an unabated and stable TVOC load of less than 0.3 kg C/h, the monitoring frequency may be reduced to once every three years in the case of a TVOC load of less than 0.1 kg/h (as an annual average) or the monitoring may be replaced by calculation provided that it ensures the provision of data of an equivalent scientific quality.

Any stack with a TVOC load ≥ 10 kg C/h / Generic EN standards / Continuous/ EN15267-1, EN15267-2, EN15267-3 and EN 14181.

Mass Balance (BAT 9)

The solvent mass balance (SMP) is a powerful management tool that enables to control efficiently the emissions from the printing processes and to identify these areas where changes might be necessary. The solvent mass balance is required by Best Available Techniques in line with Annex VII to the Directive 2010/75/EU (IED) and environmental permits.

The SMP provides a method for the following:

- a) Calculation of the annual input (expressed in t/a)
- b) Reliable estimation of the fugitive emissions (expressed in t/a)
- c) Calculation of the fugitive emissions as percentage of input.

The method is designed to use, wherever possible, only information that is, or should be, readily available such as annual quantities used of inks, dampening additives and cleaning agents and information provided by suppliers on the VOC content of their products.

The annual input is the sum of the VOC content of the inks, dampening additives and cleaning agents used in the applicable year. It is calculated by multiplying the quantity of the product used by its VOC content percentage as provided by the supplier. For inks the VOC content at drying temperature may not be available. In that case the inks may be assumed to contain 35% VOC.

BREF provides detailed information about SMF Methodology including the rules for the calculation of fugitive emissions using the conservative parameters, such as:

- Assume VOC in waste: zero,
- Fugitive emissions from dampening solutions: Multiply the amount of VOC in dampening additives by 90%.
- Fugitive emissions from cleaning agents: Multiply the amount of VOC in cleaning agents by 85%.
- Assume no VOC in dryer inlet air.
- Oils in inks are not VOC at room temperature, there do not contribute to the fugitive emissions.

Where the usual percentage IPA is more than 4 or 5% (w/w) it is unlikely that fugitive emissions lower than the limit value can be obtained. Another possible cause is the application of cleaning agents with a high solvent content. Where this is the case, it is recommended to first reduce or substitute the amount of IPA consumed or reduce the solvent content of the cleaning agents, before dedicating any effort to an increase of the accuracy of the SMP.

One of the key aspects for the further discussion, is whether **the criterion should be based on the revised VOC emission levels or be harmonised with the BREF approach (BAT-AELs)**. Very limited feedback has been collected, therefore the potential impact of revision need to be further discussed during the 2nd AHWG Meeting.

Examining the possibility to restrict the current limit of Cr⁶⁺ to air from publication rotogravure printing.

At the moment, a threshold of 15 mg/tonne paper is considered for emissions of Cr⁶⁺ to air⁸⁰. Some stakeholders consider that these levels should be markedly reduced, as alternatives to rotogravure printing exist. Based on a limited number of ecolabel holder applications, the levels of Cr⁶⁺ emissions to air ranged from 4,5 to 13 mg/ton.

VOC emission limits from processes where no legislative measures apply.

The European Council Directive 1999/13/EC (known as SED Solvent Emissions Directive or VOC Directive), was incorporated in 2010 into Industrial Emission Directive 2010/75/EU (IED). The legislative requirement applies to large professional (industrial) printers if the annual VOC emission thresholds in is exceeded. The following solvent consumption thresholds appears:

- Heatset web offset printing (> 15 tonnes/year):
- Publication rotogravure (>25 tonnes/year)
- Other rotogravure, flexography, rotary screen printing, laminating or varnishing units (>15 tonnes/year), rotary screen printing on textile/cardboard (>30 tonnes/year).

In the Directive there are no provisions on solvent ink prohibition, nor is there Community legislation under preparation that would prohibit printers using solvent inks.

Besides the current threshold of 20 mg C/Nm³ for emissions of VOC to air²⁸, it has been proposed to introduce a limit of 10% for fugitive emissions. Concerning the impact of withdrawing the derogations regarding VOC emission limits⁸¹, no comments have been received, but it should be remarked that the Blue Angel Ecolabelling does not include such type of derogations, and VOCs in the waste gases from the dryer of heatset web offset printing are restricted irrespective of the solvent consumption. The Blue Angel also considers limits for flexographic printing, irrespective of the solvent consumption. In particular, 50 mg C/Nm³ when using a biological waste gas cleaning process and 20 mg C/Nm³ in all other cases, together with a 20% limit for diffuse emissions of VOCs⁸².

OPTIONAL PROPOSALS OF THE REVISED CRITERION

Option I: Maintaining the current structure of the criterion

According to the information summarized above the current threshold for the VOCs emission based on mass balance is proposed to be reduced from 5 to **3 kg/tonne**. The threshold for rotogravure printing is proposed to be reduced from 50 to **16 mg C/Nm³**, based on BAT-AELs. The possibility to include a specific limit for isopropanol, in terms of

⁸⁰ Commission Decision of 16 August 2012 on establishing the ecological criteria for the award of the EU Ecolabel for printed paper. (OJ L 223, 21.8.2012), p. 63.

⁸¹ I.e., Crit 4d requirement "does not apply to screen printing and digital printing. Moreover it does not apply to heat-set and flexography installations with solvent consumption lower than 15 tonnes per year".

⁸² Der Blaue Engel, January 2015. Basic Criteria for Award of Environmental Label, Printed Matter. RAL-UZ 195 p. 20 and 23.

maximum concentration in dampening solutions or in terms of emission levels is also open for discussion.

Option II: Harmonise the criterion with BAT-AELs on surface treatment using organic solvents

The applicability of the emission data contained in BREF was analysed. The DRAFT BAT-AELs levels (JRC, 2017)⁸³ are proposed to serve as the reference for the further revision. As analysed beforehand, the units indicated by BAT-AELs are not compatible with the units referred by the currently valid Criterion on emissions. Therefore, proposed emission thresholds are expressed as specific emission load per normal cubic metre (in line with IED) per type of printing technique. The thresholds proposed correspond to 80% of the upper range of BAT-AELs being a subject for the further discussed in consideration of the existing license holder data. The referenced BAT-AELs are estimated to become mandatory in approx. 2024⁸⁴.

Table 27. Proposed EU Ecolabel reference values for the VOC emission from printing processes based on BAT-AELs (BREF, 2017)

Parameter	Unit	BAT-AEL	Proposed revised EU Ecolabel threshold
Heatset web offset printing: SMB of Total VOC emissions or % of Fugitive emission			
<i>(As an alternative to the BAT-AEL as specified in point 1. the BAT-AELs as specified in point 2 can be used).</i>			
1. Total VOC emissions as calculated by the solvent mass balance	Kg VOCs per kg of ink input	<0,01 -0,04*	<0,03
2. Fugitive VOC emissions as calculated by the solvent mass balance	Percentage (%) of the solvent input	< 1-10*	<8
TVOC	mg C/Nm3	< 1-15	<12
Publication rotogravure printing			
3. Fugitive VOC emissions as calculated by the solvent mass balance	Percentage (%) of the solvent input	<2.5	<2
4. TVOC	mg C/Nm3	<10-20	<16
Flexography and non – publication rotogravure printing			
<i>(As an alternative to the BAT-AEL as specified in point 5. the BAT-AELs as specified in point 6 can be used).</i>			
5. Total VOC emissions as calculated by the solvent mass balance	kg VOCs per kg of ink input	<0,1 -0,3	<0,24
6. Fugitive VOC emissions as calculated by the solvent mass balance	Percentage (%) of the solvent input	<< 1-12	<9,6

⁸³ JRC Science for Policy Report; Industrial Emissions Directive 2010/75/EU (integrated Pollution Prevention and Control) Draft 1 – (October 2017). Best Available Techniques (BAT) Reference Document on Surface Treatment using Organic Solvents.

⁸⁴ The exact date may vary, Communication with European IPPC Bureau

Parameter	Unit	BAT-AEL	Proposed revised EU Ecolabel threshold
TVOC	mg C/Nm ³	<< 1-20	<16

Points for discussion

1. Which is the preferably Option (Option 1, or Option 2) for the structure of the revised criterion?;
2. Acceptability/feasibility of the proposed revised values;
3. Are the changes suggested for the criterion on Cr and Cu emissions to water for rotogravure printing adequate, or the threshold should be further adapted?
4. Is the suggested generic limit (Option 1) for emission for VOCs to air adequate?
5. Are the reference values based on BAT-AELs adequate (Option 2)?;
6. Is the assessment and verification adequately revised, and reflect the industry practice?
7. Is a 10% limit for fugitive VOC emissions from processes where no legislative measures apply adequate?
8. Would you agree to withdraw the exclusion from the subcriterion 4d) for screen printing and digital printing and flexographic installations with solvent consumption lower than 15 tonnes per year?
9. Do you agree to withdraw the requirement for silver?

5.5 Criterion 5 - Waste

Current criterion (Printed paper products)

5a). Waste management

The facility where the printed paper products are produced shall have in place a system for handling waste, including residual products derived from the production of the printed paper products, as defined by local and national relevant regulatory authorities.

The system shall be documented or explained and shall include information on at least the following procedures:

- (i) handling, collection, separation and use of recyclable materials from the waste stream,
- (ii) recovery of materials for other uses, such as incineration for raising process steam or heating, or agricultural use,
- (iii) handling, collection, separation and disposal of hazardous waste, as defined by the relevant local and national regulatory authorities.

Assessment and verification: the applicant shall provide a declaration of compliance with this criterion, together with a description of the procedures adopted for waste management. Where appropriate, the applicant shall provide the corresponding declaration to the local authority every year. Where the waste management is outsourced, the sub-contractor shall provide a declaration of compliance with this criterion as well.

5b). Waste paper

The amount of waste paper 'X' produced shall be:

Printing method	Maximum Waste paper (%)
Sheet offset	23
Cold-set, newspaper	10
Cold-set, form printing	18
Cold-set rotation (except newspapers and forms)	19
Heat-set rotation	21
Gravure printing	15
Flexography (except corrugated fibreboard)	11
Digital printing	10
Flexography, corrugated fibreboard	17
Screen printing	23

where:

X= Annual tonnes of waste paper produced during the printing (including finishing processes) of the eco-labelled printed paper product, divided by annual tonnes of paper purchased and used for the production of eco-labelled printed paper product.

Where the printing house carries out finishing processes on behalf of another printing house, the amount of waste paper produced in those processes shall not be included in the calculation of 'X'.

Where the finishing processes are outsourced to another company, the amount of waste paper resulting from the outsourced work shall be calculated and declared in the calculation of 'X'.

Assessment and verification: the applicant shall provide a description of the calculation of the amount of waste paper, together with a declaration from the contractor collecting the waste paper from the printing house. The outsourcing terms and calculations on the amount of paper waste involved in the finishing processes shall be provided. The period for the calculations shall be based on the production during 12 months. In case of a new or a rebuilt production plant, the calculations shall be based on at least three months of representative running of the plant.

Current criterion (converted paper products)

(a) Waste management

The facility where the converted paper products are produced shall have in place a system for handling waste, including residual products derived from the production of the converted paper products, as defined by local and national relevant regulatory authorities.

The system shall be documented or explained and shall include information on at least the following procedures:

(i) handling, collection, separation and use of recyclable materials from the waste stream;

(ii) recovery of materials for other uses, such as incineration for raising process steam or heating, or agricultural use;

(iii) handling, collection, separation and disposal of hazardous waste, as defined by the relevant local and national regulatory authorities.

Assessment and verification: the applicant shall provide a declaration of compliance with this criterion, together with a description of the procedures adopted for waste management. Where appropriate, the applicant shall provide the corresponding declaration to the local authority every year. Where the waste management is outsourced, the sub-contractor shall provide a declaration of compliance with this criterion as well.

(b) Waste paper

The amount of waste paper 'X' shall not exceed:

- 20 % for envelopes*
- 20 % for stationery products*
- 10 % for paper bags*

where, X = annual kilos of waste paper produced during the converting (including finishing processes) of the ecolabelled converted paper product, divided by annual tonnes of paper purchased and used for the production of ecolabelled converted paper product.

Where the printing house carries out finishing processes on behalf of another printing house, the amount of waste paper produced in those processes shall not be included in the calculation of 'X'.

Where the finishing processes are outsourced to another company, the amount of waste paper resulting from the outsourced work shall be calculated and declared in the calculation of 'X'.

Assessment and verification: the applicant shall provide a description of the calculation of

the amount of waste paper, together with a declaration from the contractor collecting the waste paper from the printing house. The outsourcing terms and calculations on the amount of paper waste involved in the finishing processes shall be provided. The period for the calculations shall be based on the production during 12 months. In case of a new or a rebuilt production plant, the calculations shall be based on at least 3 months of representative running of the plant.

Revised proposal for criterion on Waste management

5a). Waste management system

The facility where the product is manufactured shall have in place a system for handling waste which addresses and documents the measures taken to reduce the amount of solid and liquid waste, including waste paper, ink waste, washing agent solution and dampening solution waste as defined by local or national regulatory authorities.

The system shall be documented or explained and shall include information on at least the following procedures:

- (i) handling, collection, separation and use of recyclable materials from the waste stream;
- (ii) recovery of materials for other uses, such as incineration for raising process steam or heating, or agricultural use;
- (iii) handling, collection, separation and disposal of hazardous waste, as defined by the relevant local and national regulatory authorities.

Assessment and verification: the applicant shall provide a declaration of compliance with this criterion, together with a description of the procedures adopted for waste management. ~~Where appropriate, the applicant shall provide the corresponding declaration to the local authority every year.~~ Where the waste management is outsourced, the sub-contractor shall provide a declaration of compliance with this criterion as well.

Applicants registered with EMAS and/or certified according to ISO 14001 shall be considered as having fulfilled this criterion if:

- the inclusion of waste management in the scope of EMAS is documented in the EMAS environmental statement, or

- the inclusion of waste management is sufficiently addressed by the ISO 14001 certification

Assessment and verification: *The applicant shall provide a waste minimisation and management plan for each of the sites concerned and a declaration of compliance with the criterion. The applicant shall provide a declaration of compliance with this criterion, together with a description of the procedures adopted for waste management. Where the waste management is outsourced, the sub- contractor shall provide a declaration of compliance with this criterion as well.*

Applicants registered with EU Eco-Management and Audit Scheme (EMAS) and/or certified according to ISO 14001 shall be considered as having fulfilled this criterion if:

- 1) *the inclusion of waste management is documented in the EMAS environmental statement for the production site(s), or*
- 2) *the inclusion of waste management is sufficiently addressed by the ISO 14001 certification for the production site(s).*

Revised proposal for criterion on Waste management

5(b) – Paper for recycling from printing facilities

The amount of waste paper 'X' produced shall be:

Printing method	Maximum waste paper (%)
Sheet offset	20
Cold-set, newspaper	10
Cold-set, form printing	18
Cold-set rotation (except newspapers)	18
Heat-set rotation	18
Rotogravure printing	12
Flexography printing	11
Digital printing	10
Screen printing	23

Where:

X = annual tonnes of waste paper produced during the printing (including finishing processes) of the eco-labelled printed paper product, divided by annual tonnes of paper purchased and used for the production of eco-labelled printed paper product.

Where the printing house carries out finishing processes on behalf of another printing house, the amount of waste paper produced in those processes shall not be included in the calculation of 'X'.

Where the finishing processes are outsourced to another company, the amount of waste paper resulting from the outsourced work shall be calculated and declared in the calculation of 'X'.

Assessment and verification: the applicant shall provide a description of the calculation of the amount of waste paper, together with a declaration from the contractor collecting the waste paper from the printing house. The outsourcing terms and calculations on the amount of paper waste involved in the finishing processes shall be provided.

The period for the calculations shall be based on the production during 12 months. In case of a new or a rebuilt production plant, the calculations shall be based on at least 45 subsequent days of stable running of the plant.

5(c) – Paper for recycling from stationary paper product and carrier bags production sites

The amount of waste paper 'X' shall not exceed:

– 17 % for envelopes

Revised proposal for criterion on Waste management

- 15 % for writing stationery products, excluding diaries;
- 18 % for diaries;
- 20 % for filing stationery products printed on one side;
- 30 % for filing stationery products printed on both sides
- 10 % for paper bags and wrapping paper

where, X = annual kilos of waste paper produced during the stationery paper products and carrier bags manufacturing (including finishing processes) of the eco-labelled paper product, divided by annual tonnes of paper purchased and used for the production of eco-labelled converted paper product.

Where the printing house carries out finishing processes on behalf of another printing house, the amount of waste paper produced in those processes shall not be included in the calculation of 'X'.

Where the finishing processes are outsourced to another company, the amount of waste paper resulting from the outsourced work shall be calculated and declared in the calculation of 'X'.

Assessment and verification: the applicant shall provide a description of the calculation of the amount of waste paper, together with a declaration from the contractor collecting the waste paper from the printing house. The outsourcing terms and calculations on the amount of paper waste involved in the finishing processes shall be provided. The period for the calculations shall be based on the production during 12 months. In case of a new or a rebuilt production plant, the calculations shall be based on at least 45 subsequent days of stable running of the plant.

Rationale

Waste generated during production process can have relevant environmental impacts. According to LCA review, the major part of the impacts for printing process comes from the process residues (between 24 and 88% of contribution depending on the impact category). The waste generated in printing industry can be broadly classified as hazardous waste and non-hazardous waste (see Table 28).

Table 28. Classification of printing wastes

Hazardous waste	VOC	Pollutes wastewater	Non-hazardous waste	solid
Photographic waste including intensifiers scrap film and photo developer.	Petroleum based inks containing xylene, ketone, and alcohols.	Any liquid hazardous waste dumped in the drains	Waste substrates such as paper, foil, film resulting from rejects and excess quantities.	
Waste ink with solvents and different heavy metals.	Fountain and damping solutions such as isopropyl alcohol.	Rinse from photo processing	Water-based inks without heavy metal constituents.	
Strong alkaline wastes such as sodium hydroxide	Cleaning solvents including acetone, methanol and toluene			
Strong acid waste such as sulphuric and nitric acid.	Various types of adhesives containing ammonia.			
Cleaning rags which contain solvents				

Source: Rochester Institute of Technology

In heat-set web offset printing, reported values show that the quantity of produced ink waste varies from 2 kg up to 6.5 kg per tonne of used ink. During printing, the dampening solution can become contaminated with paper dust and small amounts of ink. These solutions contain AOX and small amounts of metals. Normally, these waste dampening solutions are delivered to a waste recycling company. Large amounts of used cleaning agents may arise, especially in large printing plants where most of the cleaning is done automatically.

The estimated amount is some 100 kt cleaning agents per year in the European offset printing industry, which is disposed of. Wipes from cleaning the press contain organic solvents, ink and sometimes varnish. Other wastes are: photopolymer and rubber printing plates: the steel, polyester or aluminium sleeves are reused repeatedly: the polyester or rubber materials are glued to these; non-returnable metal containers, primarily aluminium, with traces of other metals; reel cores; glue, adhesive and film wastes. Blankets are also discarded. Waste can also contain filters from filtering the dampening solution and discarded UV lamps from the platemaking process.

Wastewater coming from dampening solutions and cleaning agents has also been identified. The total amount of wastewater is highly dependent on the working methods, and on average 2–3 m³/t ink is used and discharged, mainly from interim cleaning and cleaning the machinery after a job. If treated, treatment, the water may be reused and the sludge disposed of as waste.

Waste Framework Directive (2008/98/EC) provides guidance in planning implementation of a comprehensive waste management scheme. A waste management system is a valuable tool that ensures control over the material flow, and drives to waste prevention, and preparing for reuse, recovery, recycling, and safe disposal. One of the limiting factors to implement a comprehensive waste management strategy is the availability of possible routes for waste treatment either internally or externally. Although it is possible to achieve a zero waste to landfill target, this requires access to end markets which should be developed over time and will vary depending on local infrastructure and demand. Therefore no specific waste treatment routes are required under revised criterion proposal. The wording of the criterion was adapted to reflect the main objective which is to ensure the implementation of a long-term waste management strategy.

Waste – printing house

The amount of waste paper from heat-set offset printing is usually higher than from other printing methods. This is due to a significant amount of paper used to reach a proper balance between ink and dampening water. This operation is necessary to ensure (calibrate) the printout's quality. The reported proportion of waste paper is about 15% of the input quantity.

Waterless offset is claimed to produce less waste, given that there is no calibration of ink and dampening water. Lower paper losses associated with waterless offset printing provides an economic advantage, however, only in the case of short runs.

During gravure printing, the ink percentage is estimated less than 0.1 % of the ink input. Waste ink is treated off site as hazardous waste. Leftover coloured ink is normally mixed with black ink and thus reused. Waste ink can also be distilled to recover the toluene. The distillation sludge, which is about 20 % of the original weight of the waste ink, is disposed of. However, because of the small amounts of toluene recovered, distillation is not often applied because of the relatively expensive equipment needed. Wastewater generation at a publication gravure installation has also been identified. Wastewater from the plating department is evaporated and the sludge is treated as hazardous waste.

In Nordic Ecolabel, printing companies are awarded points for the quantity of mixed waste up to 20 kg/tonnes of product, as a measure of the effectiveness of sorting waste

at source. The Nordic Ecolabel also rewards printing companies for implementing technologies that could minimise waste.

Waste – Paper conversion process

The quantity of waste paper generated depends on a number of aspects, including type of product, printing method and quantity of product. The table below illustrates the different percentage of waste paper for the type of converted paper products and the printing method applied. However, there are high variations from these averages when considering the single products, different in size and production runs.

In the case of stationery products resulting from the gravure printing, higher waste paper percentages are registered for small sizes and filing products that require printing on both sides (Table 29). The influence of the product size can increase waste paper production by more than 40 percentage points as can be seen in the case of the folder Colorlife (14% to 63% excluding cutting)

Table 29. Paper waste generated from printing, laminating and cutting

Filing Products	Printed sides	2016 (% waste)	2017 (% waste excl. cutting)
License folders	1	17%	
Binder outside cover A4	1	15%	18%
Binder inside cover	1	8%	
Insert sheets	1	14%	
Box Colorlife	2	25%	36%
Folder Colorlife	2	12%	14%
Box Nomadbox students	2	26%	
Folder Quickfile students	2	29%	
Folder PowerFile students	2	22%	
Folder Colorlife 17x22 (small format)	2		63%
<i>Average</i>		16%	20%

Source: Hamelin Brands

The setting up of the machine also influences the amount of waste paper. There is usually a fixed amount of sheets that are wasted during machine set up. This implies that products with a high production volume per machine run will have low waste percentages in contrast to small production volumes. The production volumes depend on the client order and this is usually low for specialized or niche products. It is therefore proposed to set thresholds according to different types of paper stationery products as follows (Table 30).

Table 30. Proposed threshold for paper waste

Stationery product (excl. envelopes)	Percentage paper waste
Writing and printing	15%
Filing product (printed on 1 side)	20%
Filing product (printing on both sides)	30%

Outcomes from and after 1st AHWG meeting

Regarding the waste management system (*sub-criterion 5a*), the stakeholders agreed with the inclusion of the EMAS and ISO 14001 as a method of verification.

For criterion 5b and 5c the change from *waste paper* to "Paper for recycling" was proposed in order to better reflect the intention of the criterion.

The thresholds proposed should also consider that products with a small production volume per machine can have higher waste percentages. The thresholds that has been proposed might be too demanding.

For envelopes, cutting windows and side flaps generate waste that can hardly be avoided.

- 3,5 to 4% for roll on running and calendar
- 11-16% window and side flaps
- 2 -5% during machine preparations and start (long or short runs)

Stakeholder indicated that Nordic Swan accepts up to 40% of paper waste and pointed out that the reduction of the size of print ups implies that the current threshold is still challenging. The stakeholder added that reaching 15% for heatset paper waste is not realistic.

For diaries each page has to be printed with different kind of information for example dates, this generate higher quantity of waste. Therefore there is a need to consider an exception for diaries, as the rate of paper waste generated was observed by the industry to be close to 30%.

Reporting of the quantity of waste per year was assumed as easier to quantify.

In regards to additional proposals presented following feedback was provided:

- *To set a maximum quantity of total wastes produced by tonne of product. This limit could only refer to unsorted waste fraction or total waste fraction:* It was pointed out that in the Nordic Swan a threshold value for mixed waste unsorted per tonne of product is defined (nevertheless, this criterion is giving points and it is not mandatory). Nordic Swan gives punctuation if the total unsorted waste is \leq 15 kg/tonne product.
- *To set % of waste for different types of products: ink wastage, washing agents, etc.:* stakeholders considered that setting a percentage of waste for different types of products as ink wastage or washing agents is not relevant for the improvement of the Ecolabel.

Further research and main changes

Inclusion of the EMAS and ISO 14001 as a method of verification

Waste Framework Directive (2008/98/EC) provides guidance in planning implementation of a comprehensive waste management scheme. A waste management system is a valuable tool that ensures control over the material flow, and drives to waste prevention, and preparing for reuse, recovery, recycling, and safe disposal. One of the limiting factors to implement a comprehensive waste management strategy is the availability of possible routes for waste treatment either internally or externally. Although it is possible to achieve a zero waste to landfill target, this requires access to end markets which should be developed over time and will vary depending on local infrastructure and demand. Therefore, no specific waste treatment routes are required under revised criterion proposal.

The revised criterion requires applicants to develop a comprehensive waste minimization and management plan that addresses all type of waste generated at the industrial site. There is a potential overlap between the EU Ecolabel criteria and the Eco-management Audit Scheme (EMAS). The companies that wish to participate in EMAS should develop an environmental management system (EMAS) and commit to continuously improving their environmental performance. ISO 14001 could also be used as equivalent to achieve objectives set by EMAS.

The wording of the criterion was adapted to reflect the main objective which is to ensure the implementation of a long-term waste management strategy.

Paper for recycling from manufacturing of stationary paper product and paper carrier bags

A 2013 survey carried out by FEPE involving 13 certified envelope manufacturers indicates an average quantity paper waste at the level of 19% for both roll and sheet production processes. A similar study conducted in 2019 involving companies representing about 60% of the envelope market share in Europe affirmed the same paper waste rates. The main sources of waste are:

- Packaging waste from each paper reel including rindings and the roll kernel
- Technical waste from cutting side flaps and window
- Set up waste from machine preparations including running and start/stops

A breakdown of the waste rates in these categories is provided in Table 31.

Table 31: Average paper waste generation rates in envelope manufacturing

Envelope production paper waste source	Average % (kg waste per ton paper purchased)
Packaging waste from paper reel (rindings + kernel)	1.8%
Technical waste (cutting side flaps + window)	11.8%
Set up (machine running and start/stops)	5.6%

Source: FEPE

Paper for recycling from printing process. Requirements in other ecolabels

The Nordic Swan criteria for printing companies⁸⁵ sets a mandatory requirement that ensures sorting at source and appropriate waste removal. A waste plan has to be in place specifying waste fractions from the production process (film production, printing, finishing etc) their quantities, waste types together with which they are processed and the party responsible for removing the waste. If the printing company is certified ISO 14001, EMAS or has an environmental licence from the authorities, these are considered as proof of the existence of a waste plan.

Optional waste related requirements are based on a waste minimisation point system. The point system rewards printing houses that implemented technologies for reducing ink waste, preventing the occurrence of washing agent or dampening solution waste and recovering used washing agent solution or dampening solution that can no longer be circulated (Table 32).

Table 32. Waste minimisation point system

One of the following technologies is used to minimise ink waste in the production of printed matter: Automatic pumping from tank, drum or the like, chamber doctor blade or automatic transfer from colour, toner or ink cartridges. If printing ink cans are also used, these are weighted with zero points relative to the purchased/received weight:	5 points
Technology is used to recover used washing agent solution or dampening solution that can no longer be circulated (e.g. evaporator):	5 points
Washing agent solution/rinsing water is used to dilute new printing ink (e.g. a system for washing agent solution for diluting new water-based printing ink in flexography):	5 points

⁸⁵ Nordic Ecolabelling for Printing Companies, Printed matter, Envelopes and other Converted Paper Products. 2011.

Other technology is used to prevent the occurrence of dampening solution waste and/or washing agent solution waste (e.g. encompassing thorough filtration of dampening solution or printing machines without circulating dampening solution such as dry offset and digital printing):	5 points
Dampening solution and/or washing agent solution is filtered before it is released into the sewage system (e.g. using charcoal filters or particle filters):	2 points
Washing agent solution is circulated (e.g. automatic washing):	1 points

Source: Nordic Ecolabelling

Nordic Swan also has an optional requirement to address unsorted solid waste that is incinerated or goes to landfill, awarding more points to the lower amounts of waste generated. The following equation is used to calculate points for mixed waste in kg per tonne of product:

$$\text{Points} = 5 - \text{quantity mixed waste}/4$$

In calculating the points and allocating waste generation in multiple printing methods, average waste paper figures are provided. A maximum of 10 points can be awarded.

Blue Angel has no requirements on paper waste generated from converted paper products manufacturing in the basic criteria for office and school supplies⁸⁶ and recycled cardboard⁸⁷. In the case of printed products, the Blue Angel for Printed Matter⁸⁸ provides requirements for waste paper management and thresholds for printing technologies. As a minimum, the following key figures of previous three years need to be included in the waste management plan:

- Annual amount of waste based on the paper waste code numbers (These include the waste code numbers: 15 01 01 paper and cardboard packaging or 20 01 01 paper and cardboard).
- Disposal routes for paper waste code numbers.
- Annual percentage mass of waste paper on total paper quantity purchased.

In addition, there is a threshold for maximum paper waste allowed per year as illustrated in **Table 33**.

According to the [New Zealand Ecolabelling Trust Criteria for Office Paper and Stationery \(EC-26-15\)](#)⁸⁹, the applicant must have effective waste management policies and procedures and/or a waste management programme. Annual reports on waste generation, minimisation and management are required to be submitted including waste quantities recovered for reuse, recycled internally or externally, burnt for internal energy recovery and sent to landfills. It is also required to document initiatives taken to reduce waste generation and improve recovery/recycling of waste.

[The Australian Good Environmental Choice standard \(GECA\)](#), compliant with ISO 14024, has developed environmental performance criteria for Paper and Stationery products⁹⁰. Under waste management, the manufacturing site is required to have a system for handling waste and there are restrictions on amount of waste paper produced for envelopes and stationary products. The waste handling system is required to address the handling, collection and disposal of hazardous and non-hazardous waste. This includes

⁸⁶ Finished products made from recycled paper for office and school supply, Blue Angel. 2018

⁸⁷ Blue Angel. Basic Criteria for Award of the Environmental Label Recycled cardboard; RAL-UZ 56. 2014

⁸⁸ Blue Angel. Basic Criteria for Award of the Environmental Label Printed matter Edition February 2015, 49(January); RAL-UZ 195. 2015

⁸⁹ The New Zealand Ecolabelling Trust. Office Paper and Stationery Specifications.2015

⁹⁰ Good environmental Choice Australia. Environmental performance standard. Paper and Stationery products. 2017

the separation of recyclable materials from the waste stream and their possible recovery for other uses.

In the case of waste paper, the standard sets a threshold of 20% (annual kilos of waste paper per annual tonnes of paper purchased and used) for envelopes and stationery products.

Proposed Criterion for paper for recycling

As a summary of waste generation rates provided by related ecolabels, converted and printed industry and the competent bodies, **Table 33** indicates possible thresholds for the EU Ecolabel.

The revised proposal is based on the data collected from license holders (manufacturing of 13 products in 4 Member States), as indicated in the table **Table 33** and **Table 34**.

Table 33. Summary of requirements for the quantity of paper for recycling generated in function of the printing technique

Printing method	Waste paper requirement (%)					Revised proposal	
	Current EU Ecolabel	Nordic Swan average ⁹¹	Blue maximum amount waste ⁹²	Angel of	Data reported from license holders		
					Average		Maximum
Sheet offset	23	23	20		17,2 (5 prod)	22,5 (5 prod)	20
Cold-set, newspaper	10	10	10		-	-	10
Cold-set rotation (except newspapers)	19	19	18		17,4 (1 prod)	17,4 (1 prod)	18
Heat-set rotation	21	21	20		12,5 (2 prod)	16,3 (2 prod)	18
Gravure printing	15	12	15		10,4 (4 prod)	12,4 (4 prod)	12
Flexography	11	15*	11		-	-	11
Digital printing	10	10	10		7,2 (1 prod)	7,2 (1 prod)	10
Screen printing	23	-	-		-	-	23

Table 34. Summary of paper for recycling rates per product type

	Related ecolabels (highest %)	Industry	Competent bodies (from license holders)	Current threshold	Proposed thresholds ¹
Products %(kg of paper waste/tonnes of paper purchased)					
Envelopes	15%	19%		20%	17%
Paper bags and gift paper				10%	10%
Folders/binders		20%		20%	20%

⁹¹ Data is from Nordic Background report for ecolabelling Printing companies, printed matter, envelopes and other converted paper products Version 5.0 15 December 2011. Average data is based on literature data and licence/pilot data from 2010.

⁹² Data is from Basic Criteria for Award of the Environmental Label for Printed matter (RAL-UZ 195) of Blue Angel. January 2015.

(one-sided print)				
Folders/binders (two-sided print)	30%		20%	30%
Writing stationery products (excl. Diaries)			20%	15%
Diaries	15%	20%	20%	18%

A comparison with thresholds in existing criterion show the general trend to increase the ambition level with the exception of Folders/binders printed on both sides, aligned to industry feedback on common practice.

Points for discussion

- 1. Acceptability/feasibility of the proposed thresholds for the maximum quantity of waste paper from printing and conversion processes*
- 2. Are waste minimisation trends (verification by means of EMAS or ISO 14001) suitable and feasible considering current industry practice?*

5.6 Criterion 6 - Energy use

Current criterion

- 6). The printing (printing/converting) house shall establish a register of all energy consuming devices (including machinery, lightning, air conditioning and cooling) and a programme consisting of measures for improvement of energy efficiency.

Assessment and verification: the applicant shall provide the register of energy consuming devices together with the improvement programme.

Revised proposal for criterion on Energy

The site where the EU Ecolabel product is produced shall have established an energy management system addressing all energy consuming devices (including machinery, lighting, air conditioning, cooling). The energy management plan shall include measures for the improvement of energy efficiency.

Assessment and verification: the applicant shall provide a declaration of compliance for the production site, supported by a description of the energy management system.

Applicants certified according to ISO 50001, EN 16247:2012 or an equivalent standard/scheme shall be considered as having fulfilled this requirement.

Applicants registered with EMAS shall be considered as having fulfilled this requirement if the inclusion of energy management in the scope of EMAS is documented in the EMAS environmental statement.

Rationale

The key energy form used in manufacturing is electricity from grid. In the case of envelopes electricity contributes up to 20% impacts especially: global warming, ozone depletion, acidification and eutrophication. The electricity consumed during printing/conversion operations could be considered when analysing the environmental performance of a product. Energy costs represent a significant contribution to total production costs, so there is an inherent incentive for the sector to improve energy efficiency.

Energy consumption in printing houses

Energy consumption encompasses electricity, gas, and fuel consumption. It is calculated as kWh per tonne of product.

Nordic Swan has set a threshold of 3,500 kWh/tonne of product. The calculation of energy consumption per tonne of product is obtained by the division of the total annual energy consumed, including administration and normal building operation (from the electricity meter) per annual production. The Nordic Print Portal undertakes to distribute the energy consumption on each printing method in relation to the market average (Table 35) for each method and makes all the calculations. The calculation is based on the assumption that the distribution of energy consumed at the individual printing company is the same as the distribution of the average market values. The data are compiled by Nordic Ecolabelling from 68 printers using different technologies.

Table 35. Average energy consumption per printing technology (Nordic Ecolabel)

Printing method	Average energy consumption (kWh/tonne of product)
Sheet fed offset (except packaging and offset printing of envelopes)	1253
Cold-set, news print	365
Cold-set, forms	997
Cold-set rotation (except news print and form printing)	825
Heat-set rotation	965
Rotogravure printing	864
Flexographic printing (except envelope production)	486
Digital printing	2799
Offset printing, envelopes	436
Envelope production with flexography	552
Offset, packaging	1564

Digital printers are characterised by a higher than other printing methods energy consumption, followed by sheet-fed offset printing. Based on the data compiled by Nordic Swan from licensed printers and pilot printers in 2010, around 85 to 90% of printing houses would accomplish the threshold of 3,500 kWh/tonne. Reported values for specific energy consumption associated to gravure printing vary between 0.4 MWh and 0.75 MWh per tonne of substrate or from 10 MWh up to 30 MWh/million m² of substrate (all coated slides). The toluene recovery system (local extraction, steam generation, cooling water pumping) represents a significant share (in some cases close to half) of the total energy consumption of the installation.

Increase of the renewable energy input

In the 2020 climate & energy package, the EU introduced goals for the year 2020 in a number of different sectors. In the energy sector the European 20-20-20 targets include 20% of the energy, on the basis of consumption, coming from renewables. In addition, the 2030 climate & energy framework sets a binding target at EU level to boost the share of [renewables](#) to at least 27% of EU energy consumption by 2030.

The RES Directive ([2009/28/EC](#)) promotes a substantial increase in the proportion of electricity generated from renewable energy sources across the European Union. Individual Member States have all been required to take appropriate steps to encourage greater consumption of electricity from renewables, in order that the overall EU target 2020 can be met.

Under the quota obligations support scheme for RES the government requires electricity distributors to obtain a fixed proportion of their electricity from renewable non-fossil sources. If they do not produce enough renewable electricity themselves, they must obtain tradable certificates from RES producers. This creates demand for certificates. Therefore, Member States are required to give producers the opportunity to obtain electronic guarantees of origin (GOs) for electricity generated from renewable sources. A GO is issued on request by producers of electricity from eligible renewable energy sources, as defined by the RES Directive. The system is purely voluntary, and individual producers can decide whether or not they wish to make such a request.

Statistics from the Association of Issuance Bodies (3rd quarter of 2017) show an increase of GOs generated and cancelled in the past years (Figure 20). The increase in cancellation implies that more of these certificates are being used.

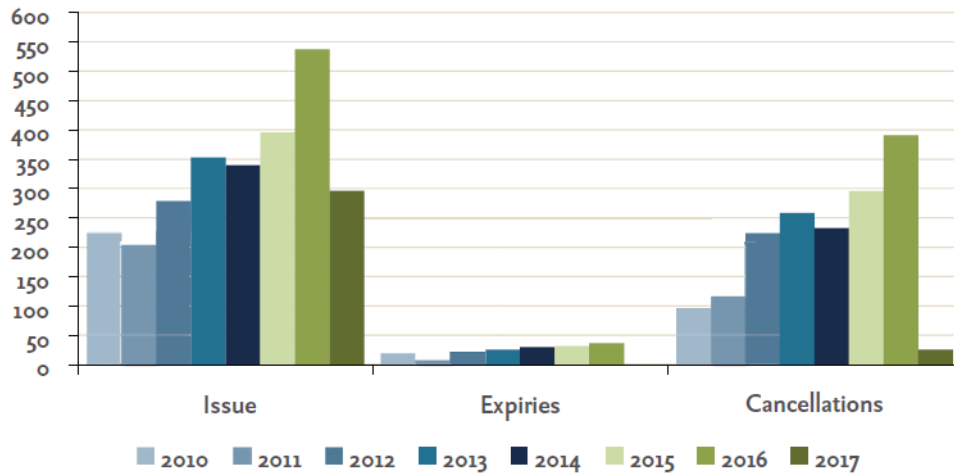


Figure 20. Generated and cancelled GOs
Source: Association of Issuance Bodies (2017)

Issue = GOs created in a month for electricity produced in an earlier month

Cancel = GOs which have been made non-transferrable by the holder of the account in which they reside (or its agent)

Expire=GOs which relate to electricity produced more than a year ago, and which have consequently been cancelled.

The number of cancellations in 2017 has already exceeded the previous years' record levels, considering that most cancelations occur at the closing of the financial year. Issuing tends to be 20% understated over the past quarter, due to delays in capturing metering data, so the number of issued GOs will doubtless top last years.

The possibility of setting requirements on the consumption of electricity from renewable sources could be explored in line with the 20% EU target for energy consumption from renewable sources. According to the Commission communication entitled 'Renewable Energy Roadmap – Renewable energies in the 21st century: building a more sustainable future', the 20% target is equivalent to 34% electricity consumption from renewable sources. It is proposed to set a 10% threshold for renewable electricity, which corresponds to the minimum national overall target for the share of energy from renewable sources in gross final consumption of energy in 2020, included in the RES

Compliance to this requirement can be verified through the purchase and obtainment of renewable energy certificates generated by a quota based renewable energy support scheme, prior to verification of their reliable registration and cancellation tracking system.

Outcomes from and after 1st AHWG meeting

It was recommended to target energy criterion mainly through 1) the requirements on paper substrate, 2) introduction of ISO 50001 certification (or compliance check) to ensure energy efficiency management.

The energy consumption from the printing company was noted to be an important environmental parameter. However, defining the key performance indicators (KPIs) that provide realistic and fair energy consumption comparison across companies was assumed as very complex. Ahead of all, the scope of the KPIs should be carefully defined. The easy choice is to define the total energy consumption of the plant but this KPI may be influenced significantly by activities that are not covered by the criterion. Furthermore, there are differences in the energy consumption for space heating and cooling across Europe which must be considered. The second important issue to consider is the size of

the printing companies and the average size of the print jobs. For instance, higher productivity operations involves less start-stop operations, what is in general related to lower energy consumption in comparison with lower productivity operations.

Additionally, collecting information on singular energy consumption (for a printing or converting line, and for a singular Ecolabelled product) was assumed as highly complicated due to the nature of the process. On the other hand, type of energy used is very dependent on the location of the plant and related weather conditions. A quantitative analysis such as those used for Energy Star systems⁹³ seems not to be directly applicable to large scale industrial printing technology. It includes energy-related products placed on the market or put into service, i.e. the same product might require different energy consumption when including different printing systems. The energy-to-end-product ratio is too variable to be useful for printing installations, as the amount of printed paper input/output does not always relate to the energy use. This amount of printing and drying varies with the amount of ink coverage and the processes used. It also can be more complex if the variable productivity is included.

In general the feedback collected from stakeholders does not recommend setting the energy consumption threshold. Factors such as the scope of energy consumption calculated from any real case, different location, weather, productivity, etc. should be taken into account in order to achieve suitable comparison between different companies.

Further research and main changes

The data on energy consumption was collected in order to analyse the energy consumption across the current licenses. Nevertheless, data provided is not sufficient to build up the database that could serve as a reference for quantitative energy requirement. There is also a high discrepancy between energy consumption data. Following information was collected from two Competent Bodies:

- 315 kW/t and 917 kW/t of printed paper are consumed using heatset rotation and coldest offset, respectively;
- 6000 kW/t and 4500 kW/t of printed paper are consumed using offset and heatset rotation, respectively. Moreover, 8500 kW/t and 83000 kW/t of converted paper

Energy management systems

An Energy Management system (EnMS) defines energy policy, objectives, energy targets, action plans and processes. The EnMS support the achievement of a company's overall goals providing an organisational basis for improved energy and carbon efficiency through the measurement, monitoring, control, and improvement activities.^{94,95}

The international standard for energy management systems in companies is the ISO 50001:2018 (Energy management systems – requirements with guidance for use). ISO 50001 focuses on reducing the usage of energy by organizations or companies.⁹⁶ It provides a framework for creating a successful energy management system (EnMS) and detailed guidelines on how to integrate the EnMS into an organisation. It is a process standard and does not prescribe performance levels nor provide thresholds for energy performance⁹⁷

⁹³Directive 2010/30/EU and its replacement (EU) 2017/1369: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2017.198.01.0001.01.ENG#ntc12-L_2017198EN.01000101-E0012

⁹⁴Jaffe, A.B., Stavins, R.N., 1994. The energy-efficiency gap what does it mean? *Energy Policy* 22, 804e810.

⁹⁵Ates, S.A., Durakbasa, N.M. Evaluation of corporate energy management practices of energy intensive industries in Turkey, *Energy* 2012;45:81–91.

Thollander, P., Ottosson, M., 2010. Energy management practices in Swedish energy-intensive industries. *J.Clean. Prod.* 18, 1125e1133.

⁹⁶https://www.emspi.eu/images/deliverables/pdf/publishable_report_09-05-2017_def.pdf

⁹⁷Böttcher Christian and Müller Martin. Insights on the impact of energy management systems on carbon and corporate performance. An empirical analysis with data from German automotive suppliers. *Journal of Cleaner Production*. 2014.

In particular, the organization must set and implement energy action plans for specified goals for relevant functions and levels. Following criteria need to be met:

- be according to the energy policy;
- be measurable (if feasible);
- be monitored;
- take into account Significant Energy Uses (SEUs);
- be updated as appropriate;
- take into account applicable requirements.

ISO 50001 requires the organization to carry out an energy assessment at fixed intervals or after major changes in plants, facilities, systems or energy using processes. This is aimed at analysing the energy use and consumption, identifying SEUs, investigating opportunities for energy-related performance and future energy use and consumption. Improvements in energy-related performance can be demonstrated using defined energy performance indicators.

The establishing and implementing an energy data collection plan is required. The information to be collected and documented must include:

- the relevant variables relating to SEUs;
- energy consumption in relation to SEUs and the Organization;
- operational criteria for SEUs;
- static factors, if applicable;
- data set out in action plans.

Prior to or in the course of implementing an energy management system, such as ISO 50001, energy audits according to EN 16247:2012⁹⁸ are performed in order to identify energy flows and the potential improvement areas⁹⁹.

Energy requirements in other EU Ecolabel type I schemes

The Blue Angel addresses energy efficiency in the RAL-UZ 195 by requiring energy management systems to be established by the printing company¹⁰⁰. Due to the high amount of energy and resources consumed during printing process, RAL-UZ 195 requires that the energy management of a printing company, using rotogravure, flexographic, headset and newspaper coldset web offset printing processes, either follows ISO 50001, European Eco-Management and Audit Scheme (EMAS:2009) or the DIN EN 16247 Part 1: General requirements. The latter is relevant in the case of an annual electricity consumption of <10 GWh. RAL-UZ 195 requirements on list of energy consumers (machines) and key energy figures of the printing process are considered automatically fulfilled if the printing house is certified according to ISO 50001, EMAS or DIN EN 16247 Part 1.

The EMAS, though focusing on environmental management systems, also addresses energy-related aspects of a company. In particular, energy is one of the core environmental indicators for which total annual input/output has to be reported in EMAS. Therefore, in case of EMAS certification, the Blue angel ecolabel for printed matter requires that it should also include an energy management system.

⁹⁸ EN 16247-1:2012 Energy audits – Part 1: General requirements

⁹⁹ Javied T., Rackow T., Franke J. Implementing energy management system to increase energy efficiency in manufacturing companies. 12th Global Conference on Sustainable Manufacturing. PROCEDIA. 2015

¹⁰⁰ Blue Angel. Basic Criteria for Award of the Environmental Label Printed matter Edition February 2015, 49 (January); RAL-UZ 195. 2015

Furthermore, requirements are set to improve waste heat recovery and energy efficiency measures in some steps or units involved in the printing process. For the waste heat from the heatset web offset dryer possibilities of recovery for combined heat and power systems, burning of expelled solvents and air conditioning and hot water generation have to be evaluated through an economic viability check. Energy efficiency of compressed air systems are required to be monitored on a regular basis as follows:

- Monthly: Inspection of the compressed air system for leakages.
- Every 5 years: Checking the efficiency of the centralisation of the compressed air system.
- Every 5 years: Checking whether it is viable to amend the compressed air network for the separate supply of power units with higher and lower pressure requirements.
- In the case of a planned or existing room humidification system with compressed air: Checking the efficiency of an energy-efficient room humidification system that uses a high pressure water system instead of compressed air.

Austrian Ecolabel UZ 24 requires that the printing / bookbinding department creates a list of all energy consumers (including lighting, air conditioning and cooling) and constructs a catalog of measures to improve the efficiency of energy use.¹⁰¹

Nordic Swan¹⁰² requirement for printing houses considers energy consumption as energy used in the form of electricity, district heating/cooling and fuel for a printing. The energy consumption should not be more than 3500 kWh per tonne of product and year. Nevertheless, for digital printing the energy consumed cannot exceed 5000 kWh per tonne of product/year is used. For sheet offset printing the limit value is 4000 kWh per tonne of product/year is used (Table 35).

In the absence of a direct settlement with an electricity supplier, the printing company is required to install electricity meters, if necessary on every printing machine, and determine the annual consumption. The printing house is also expected, if unable to document their heat/cooling energy use, to calculate the related total energy use on the basis of the heat consumption of the building and adding this to the electricity consumption.

Best Available Techniques

BAT 21 specifies that an energy efficiency plan is part of the EMS and entails defining and calculating the specific energy consumption of the activity, setting key performance indicators on an annual basis (e.g. MWh/tonne of product) and planning the periodic improvement targets and related actions. The plan should be adapted to the specificities of the plant in terms of process(es) carried out, materials, products, etc.

Table 36. BAT-associated environmental performance energy efficiency levels (BAT-AEPLs) for specific energy consumption of the plant

Sector	Product type	Unit	BAT-AEPL (yearly average)
Heatset web offset printing	All product types	Wh/m2 of printed area	4-14
Flexography and non-rotogravure printing	All product types	Wh/m2 of printed area	50-350
Publication printing	rotogravure All product types	Wh/m2 of printed area	10-30

¹⁰¹ Österreichisches Umweltzeichen, Austrian ecolabel. Druckerzeugnisse UZ 24. 2013.

¹⁰² Nordic Ecolabelling for Printing Companies, Printed matter, Envelopes and other Converted Paper Products. 2011.

The associated monitoring is conducted through energy efficiency plan and energy balance record that should be adapted to the specificities of the plant in terms of process(es) carried out, materials, etc. The energy consumption covers areas of activities that are addressed by the scope of STS BREF. The energy consumption is allocated to the general production (covered by the scope of the STS BREF). The allocation of the energy consumption to the specific production (EU Ecolabelled) based on BATs might therefore not be feasible, unless case by case analysis is performed. Specific energy efficiency levels associated with the best available techniques are related to specific energy consumption notified as as yearly averages and calculated using the following equation:

Specific energy consumption=energy consumption activity rate

Where:

Energy consumption: means, unless otherwise specified, the total amount of heat (generated by primary energy sources) and electricity consumed by the plant, as defined in the energy efficiency plan (BAT 21), in MWh/year;

Activity rate: total amount of products processed by the plant or plant throughput, expressed in the appropriate units depending on the sector (e.g. kg/year, m2/year).

It is proposed to establish energy criterion based on the energy management system that specifies the areas of potential improvement.

The possible criterion for energy consumption threshold (subject to be discussed during the 2nd AHHW Meeting), could be formulated in line with the Nordic Swan requirement as follows:

The specific energy consumption of the printing house should not exceed the following thresholds:

- 14,000 kWh/tonne of product for sheet offset printing
- 5,000 kWh/tonne of product for digital printing
- 3,500 kWh/tonne of product for all other printing technologies.

Assessment and verification: *The applicant shall provide invoices for the purchase of electricity, fuel and heating in relation to the volume of output on an annual basis.*

Points for discussion

1. Are there other energy management approaches that form part of industry practice beside working towards the establishment of an energy management system?
2. Should there be energy consumption thresholds at least for printed paper products?

5.7 Criterion 7 - Training

Current criterion (*printed and converted paper products*)

7). All members of staff participating in day-to-day operation shall be given the knowledge necessary to ensure that the Ecolabel requirements are fulfilled and continuously improved.

Assessment and verification: the applicant shall provide a declaration of compliance with this criterion, together with details of the training programme, its content, and an indication of which staff have received what training and when. The applicant shall provide to the Competent Body also a sample of training material.

All relevant members of staff participating in the day-to-day operation of the production site shall be given the knowledge necessary to ensure that the Ecolabel requirements are fulfilled and continuously improved.

Assessment and verification: *the applicant shall provide a declaration of compliance with this criterion, together with details of the training programme, its content, and an indication of which staff have received what training and when. The applicant shall provide to the Competent Body also a sample of training material.*

Rationale

The knowledge of processes and requirements of EU Ecolabel by all printing houses employees is a key aspect in order to guarantee that the requirements from EU Ecolabel are accomplished in the different manufacturing steps. Most of stakeholders agree on keeping this criterion (40%-63%).

5.8 Criterion 8 - Fitness for use

Current criterion (*printed and converted paper products*)

8). The product shall be suitable for its purpose.

Assessment and verification: the applicant shall provide appropriate documentation in compliance with this criterion. National or commercial standards, where relevant, may be used by the applicant to prove the fitness for use of the printed paper products.

Second proposal for the Criterion Fitness for use

The product should be suitable for its purpose.

Assessment and verification: *The applicant shall provide a declaration of compliance with this criterion supported by at least one letter/document/statements issued by clients for a specific product, assuring that the product met their specifications and works correctly in its intended application. Alternatively, the producers shall guarantee the fitness for use of their products providing appropriate documentation demonstrating the paper quality, in accordance with the standard EN ISO/IEC 17050-1:2004, which provides general criteria for suppliers' declaration of conformity with standards.*

Rationale

Compliance with EN conformity requirements should be required for all products, though national standards and tests existing at national levels.

Specific EN test standard is available for paper carrier bags but were not identified for the other converted paper products under study.

If compliance with a reference standard of quality for printed paper such as ISO12647 or a standard based on ISO 12647 is required, the requirement for quality and fitness for use would be more objective and checking of compliance will be easier to be done by Competent Bodies.

In Nordic Ecolabel, the practicing company can obtain points by having a certified quality system for print quality in accordance with ISO12647 or a standard based on ISO 12647.

The ISO 12647 specifications includes standard process control for various printing methods and processes. ISO 12647-2 for instance covers the offset printing process. Standardizing production means that a number of production parameters need to be clearly defined, along with a specific tolerance on each. In the case of ISO 12647 these definitions include:

- the colour and transparency of printing inks
- definitions of paper types
- solid tones, which are described with CIELAB values
- tone value increases (TVI), per paper type and colour

The ISO 12647 standard is split up in different parts, which each have a different number. Their names also include the year when the standard was established or last modified. Because the standard covers various printing methods, a printer only needs to implement a part of the full specifications.

- ISO 12647-1:2005 describes the parameters and measurements methods. Essentially 12647-1 provides the basis for the subsequent print related settings.

- ISO 12647-2:2004 defines the process control settings for offset lithography.
- ISO 12647-3:2005 defines the process control settings for newspaper printing, more specifically cold-set offset lithography on newsprint.
- ISO 12647-4:2005 defines the process control settings for publication gravure printing, which is used for high volume magazines, catalogues, etc.
- ISO 12647-5:2001 defines the process control settings for screen printing.
- ISO 12647-6:2006 defines the process control settings for flexographic printing.
- ISO 12647-7 is still being work on. It will cover off-press proofing processes.

Outcomes from and after 1st AHWG meeting

Fitness for use should address the specificity of a product group. A product cannot be sold if it is not fit for use. It is many times a customer that designs the product and therefore can tell if it is fit for use. If the customer is the one designing the product, choosing the paper and layout, the reference standard should be able to certify.

The ISO 12647 is used in printing sector in different ways. Often some customers using different special paper or layout do not want to meet the requirements or thresholds of the ISO 12647. So it might not be suitable to use this standard as a reference for fitness for use.

It was assumed that fitness for use is difficult to be verified. There is an agreement among CBs that the requirement is met if the company has a procedure to register complaints from customers. This would allow the verification on customer satisfaction from registered feedback.

Further research and main changes:

The assessment of "fitness for use" and common quality of the product differs along markets and needs to be adapted to a contract specification (customer expatiations). Fitness for use is therefore linked with market conditions, regulated by specific quality specifications (internal) and/or by general technical specifications which are the core of the contract between producers and distributors. The verification for this criterion should be made by controlling the compliance between internal quality controls and external (tender/technical/...) specifications, and checking the grounds for claim. A product that is not fit to be used will not be chosen by consumers.

ISO/IEC 17050-1:2004 specifies general requirements for a supplier's declaration of conformity in cases where it is desirable, or necessary, that conformity of an object to the specified requirements be attested, irrespective of the sector involved.

Feedback received after the 1st AHWG Meeting indicated that ISO 12647 establishes quality control for various printing methods, and therefore it should not be proposed as an appropriate tool to verify EU Ecolabel fitness for use requirement of the final product. This is due to the individual requests of some customers that might turn a product not compliant with ISO 12647 (due to i.e. selected paper great, size, finishing or layout). This could result in having a product that is fit for use for the customer but not compliant with ISO 12647. As there is no standard in place that could indicate the level of customer satisfaction with an order, commercial sales could potentially be proposed as an internal prove of fitness for use requirement.

Another possible way to verify fitness for use that was proposed by stakeholders is to have in place a system for handling complaints from the customers. Similar approach

was used during EU Ecolabel revision for Lubricants¹⁰³ that establishes the terminology of the applicant's clients' approval' as a possible tool to verify fitness for use. Accordingly, 'Applicant's clients' approval' means a letter/document/statements issued by clients for a specific product, assuring that the product met their specifications and works correctly in its intended application.

Points for discussion

Is the proposed formulation of the revised assessment and verification feasible to be established?

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¹⁰³ Commission Decision (EU) 2018/1702 of 8 November 2018 establishing the EU Ecolabel criteria for lubricants (notified under document C(2018) 7125), OJ L 285, 13.11.2018, p. 82–96

5.9 Criterion 9 - Information on the product

Current criterion

The criterion refers to printed paper and paper bags.

The following information shall appear on the printed product or paper bag:

'Please collect used paper for recycling'.

Assessment and verification: The applicant shall provide a declaration of compliance with this criterion, supported by an image of the product bearing the information required.

Proposal for criterion: Information on the product

The following information shall appear on the product:

'Please collect used paper for recycling'.

The following statement shall optionally be added on the writing stationary products:

"Optimise the use of writing space in the product"

Assessment and verification: The applicant shall provide a declaration of compliance with this criterion, supported by an image of the product packaging bearing the information required.

Outcomes from and after 1st AHWG meeting

The requirement was adopted from the criteria for printed paper. The stakeholders further indicated that this requirement is not applicable for products without printing and the use of different languages is an issue for European products, so this statement should not be mandatory but optional.

One of the CBs pointed out that important information for the end user should be on the product and not on the packaging. Another CB requested that the sentence should be shortened also because in other languages it can take much space. A phrase stating that the product is recyclable should be enough.

Further research and main changes

Given that sometimes there might be very little space to place the logo plus mandatory text on a final product we should also discuss the opportunity only to use the logo and the licence number because otherwise licence holders may be forced not to use the logo at all. The information is proposed to be allocated on a product in order to raise the consumer awareness, and not a product packaging.

Points for discussion

How to accommodate the information placed on the product to the limited space available? Is the proposed solution adequate?

5.10 Criterion 10 - Information appearing on the EU Ecolabel

Current criterion (*printed paper products*)

10). The optional label with text box shall contain the following text:

This printed product is recyclable

It is printed using paper with low environmental impact

Emissions of chemicals to air and water of paper production and printing process have been limited.

The guidelines for the use of the optional label with the text box can be found in the 'Guidelines for the use of the EU Ecolabel logo' on the website:

<http://ec.europa.eu/environment/ecolabel/promo/pdf/logo%20guidelines.pdf>

Assessment and verification: the applicant shall provide a sample of the printed paper product showing the label, together with a declaration of compliance with this criterion.

Current criterion (*Converted paper products*)

10). The optional label with text box shall contain the following text:

This product is recyclable.

Emissions of chemicals to air and water of paper production, printing and converting processes have been limited.

In order to avoid the risk of providing confusing messages to consumers between an EU eco-labelled bag and its non EU eco-labelled contents, paper carrier bags shall be designed to be open and to be filled either at the point of purchase or afterwards so that consumers understand that the EU Ecolabel is only valid for the paper carrier bag, and not for the goods added. The EU Ecolabel logo displayed on the bag shall bear the following text 'EU eco-labelled paper carrier bag'.

The guidelines for the use of the optional label with the text box can be found in the 'Guidelines for the use of the EU Ecolabel logo' on the website:

<http://ec.europa.eu/environment/ecolabel/promo/pdf/logo%20guidelines.pdf>

Assessment and verification: the applicant shall provide a sample of the converted paper product showing the label, together with a declaration of compliance with this criterion.

The applicant shall follow the instructions on how to properly use the EU Ecolabel logo provided in the EU Ecolabel Logo Guidelines:

http://ec.europa.eu/environment/ecolabel/documents/logo_guidelines.pdf

If the optional label with text box is used, it shall contain the following three statements:

—Low process emissions to air and water

—The product is recyclable

—Paper with low environmental impact used

Assessment and verification: *The applicant shall provide a declaration of compliance with this criterion, supported by an image of the product packaging that clearly shows the label, the registration/licence number and, where relevant, the statements that can be displayed together with the label.*

Outcomes from and after 1st AHWG meeting

The brief discussion indicated the agreement of the stakeholders to maintain the criterion in its current form.

5.11 Additional requirements

Following the feedback collected, no additional criteria are proposed to be included.

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6 Impact of changes to criteria

With the objective to ensure coherence between different product groups, and to avoid unnecessary redundancy, the existing EU Ecolabel product groups "Printed Paper" and "Converted Paper Products" have been merged to form a single product group provisionally titled: "Printed paper, stationery paper, and paper carrier bag products". The proposed change to the name of the product group is due to the fact that the term "converted paper" corresponds to a much larger number of products than is actually covered by the scope.

The majority of the existing criteria are still relevant and they are proposed to be kept with minor or major corrections, such as adjusted thresholds that better highlight the best performers on the market. Additionally, some criteria are proposed to be deleted, added or restructured in order to harmonize the different product group criteria.

The main changes proposed compared to the existing criteria are:

1. Criterion 1: Requesting EU Ecolabel substrate is consistent with current criterion for printed paper and aims at simplification of the verification process. It has a potential increase the market share for EU Ecolabel for C&G Paper used as substrate. The harmonisation with graphic paper requirements benefits from the consensus built and knowledge gained during the revision of EU Ecolabel criteria for graphic paper and leads to the compatibility across the scheme. EU Ecolabel for graphic paper does not make a grammage distinction therefore it also applies to paper board and cardboard. The increase in EU Ecolabel certification for substrate across board manufacturers is expected.
2. Criterion 2: The structure of the horizontal hazardous substance criteria (a) SVHC restriction and b) CLP restrictions) follows the general recommendations of the EU Ecolabel Chemicals Task Force and now clearly focus on the final product instead of consumables. Other specific criteria have now been inserted that relate purely to consumables, taking inspiration from industry best practice. The criterion promotes the choice of more environmentally friendly inks and other consumables (with benefits for workers and the broader environment) while placing a restriction on the potential presence of the hazardous substances in the final product (with benefits for users and downstream recyclers).
3. Criterion 3: The aim of the criterion is to improve product recyclability. The criterion aims at ensuring easy separation of non-paper components from paper components. It regulates the use of substances that might hinder re-pulping process, and cause problems during deinking.
4. Criterion 4: Two alternative options have been proposed. The overall objective of the requirement is to reduce the VOCs emission from printing processes.
5. Criterion 5: According to LCA review, between 24 and 88% of contribution depending on the impact category comes from the printing process residues. The quantity of paper waste (paper for recycling) generated during the production process have been reduced by 0-3% based on the feedback collected, and case by case analysis. The revised thresholds proposed for stationery paper products consider products with a small production volume that can have higher paper waste percentages.
6. Criterion 6: Verification by means of an Energy Management System (EnMS) has been proposed. It defines energy policy, objectives, energy targets, action plans and processes. The EnMS support the achievement of a company's overall goals providing an organisational basis for improved energy and carbon efficiency through the measurement, monitoring, control, and improvement activities.

APPENDIX I

Board Substrate (EU Ecolabel criteria for converted paper products 2014/256/EU)

Criterion B1 – Emissions to water and to air

(a COD, Sulphur, NO_x, Phosphorous)

For each of these parameters, the emissions to air and/or water from the pulp, the laminating papers and the board production shall be expressed in terms of points (PCOD, PS, PNO_x, PP) as detailed below.

None of the individual points PCOD, PS, PNO_x, PP shall exceed 1.5.

The total number of points (P_{total} = PCOD+PS+PNO_x+ PP) shall not exceed 4,0.

The calculation of P COD shall be made as follows (the calculations of PS, PNO_x, PP shall be made in exactly the same manner).

For each pulp 'i', or each laminating paper, 'i' used, the related measured COD emissions (COD_{pulp, i} or COD_{paper, i} expressed in kg/air dried tonne – ADT), shall be weighted according to the proportion of each pulp or laminating paper used (pulp 'i', or paper 'i', with respect to air dried tonne of pulp, or paper), and summed together. The weighted COD emission for the pulps, or laminating papers, is then added to the measured COD emission from the board production to give a total COD emission, COD_{total}.

The weighted COD reference value for the pulp production or laminating paper production shall be calculated in the same manner, as the sum of the weighted reference values for each pulp or laminating paper used and added to the reference value for the board production to give a total COD reference value COD_{ref, total}. The reference values for each pulp or laminating paper type used and for the board production are given in the Table 1.

Finally, the total COD emission shall be divided by the total COD reference value as follows:

Reference values for emissions from different pulp types and from board production

Pulp grade/Board	Emissions (kg/ADT) (4)			
	COD reference	S reference	NO _x reference	P reference
Bleached chemical pulp (other than sulphite)	18	0,6	1,6	0,045 (4)
Bleached chemical pulp (sulphite)	25,0	0,6	1,6	0,045
Unbleached chemical pulp	10,0	0,6	1,6	0,04
CTMP	15,0	0,2	0,3	0,01
TMP/groundwood pulp	3,0	0,2	0,3	0,01
Recycled fibres pulp	2,0	0,2	0,3	0,01
Laminating bleached kraft paper	19	0,9	2,4	0,055
Laminating unbleached kraft paper	11	0,9	2,4	0,055
Laminating recycled paper	3	0,5	1,1	0,02
Board production (non-integrated mills where all pulps used are purchased market pulps)	1	0,3	0,8	0,01
Board production (integrated mills)	1	0,3	0,7	0,01

In case of a co-generation of heat and electricity at the same plant the emissions of S and NO_x resulting from electricity generation can be subtracted from the total amount. The following equation can be used to calculate the proportion of the emissions resulting from electricity generation:

$$2 \times (MWh(\text{electricity})) / [2 \times MWh(\text{electricity}) + MWh(\text{heat})]$$

The electricity in this calculation is the electricity produced at the co-generation plant. The heat in this calculation is the net heat delivered from the power plant to the pulp/laminating paper/board production.

Assessment and verification: *the applicant shall provide detailed calculations showing compliance with this criterion, together with related supporting documentation which shall include test reports using the following test methods: COD: ISO 6060; NO_x: ISO 11564; S(oxid.): EPA No 8; S(red.): EPA No 16A; S content in oil: ISO 8754; S content in coal: ISO 351; P: EN ISO 6878, APAT IRSA CNR 4110 or Dr Lange LCK 349.*

The supporting documentation shall include an indication of the measurement frequency and the calculation of the points for COD, S and NO_x. It shall include all emissions of S and NO_x which occur during the production of pulp, laminating paper and board, including steam generated outside the production site, except those emissions related to the production of electricity. Measurements shall include recovery boilers, lime kilns, steam boilers and destructor furnaces for strong smelling gases. Diffuse emissions shall be taken into account. Reported emission values for S to air shall include both oxidised and reduced S emissions (dimethyl sulphide, methyl mercaptan, hydrogen sulphide and the like). The S emissions related to the heat energy generation from oil, coal and other external fuels with known S content may be calculated instead of measured, and shall be taken into account.

Measurements of emissions to water shall be taken on unfiltered and unsettled samples either after treatment at the plant or after treatment by a public treatment plant. The period for the measurements shall be based on the production during 12 months. In case of a new or a rebuilt production plant, the measurements shall be based on at least 45 subsequent days of stable running of the plant. The measurement shall be representative of the respective campaign.

In case of integrated mills, due to the difficulties in getting separate emission figures for pulp, laminating paper and board, if only a combined figure for pulp, laminating paper and board production is available, the emission values for pulp(s) shall be set to zero and the figure for the board mill shall include pulp, laminating paper and board production.

(b)AOX

The weighted average value of AOX released from the productions of the pulps used in the substrate shall not exceed 0,170 kg/ADT board.

AOX emissions from each individual pulp used in the board shall not exceed 0,250 kg/ADT pulp.

Assessment and verification: the applicant shall provide test reports using the following test method: AOX ISO 9562 accompanied by detailed calculations showing compliance with this criterion, together with related supporting documentation.

The supporting documentation shall include an indication of the measurement

frequency. AOX shall only be measured in processes where chlorine compounds are used for the bleaching of the pulp. AOX need not be measured in the effluent from non-integrated board production or in the effluents from pulp production without bleaching or where the bleaching is performed with chlorine-free substances.

Measurements shall be taken on unfiltered and unsettled samples either after treatment at the plant or after treatment by a public treatment plant. The period for the measurements shall be based on the production during 12 months. In case of a new or a re-built production plant, the measurements shall be based on at least 45 subsequent days of stable running of the plant. The measurement shall be representative of the respective campaign.

(c)CO2

The emissions of carbon dioxide from non-renewable sources shall not exceed 1 000 kg per tonne of board produced, including emissions from the production of electricity (whether on-site or off-site). For non-integrated mills (where all pulps used are purchased market pulps) the emissions shall not exceed 1 100 kg per tonne. The emissions shall be calculated as the sum of the emissions from the pulp and board production.

Assessment and verification: the applicant shall provide detailed calculations showing compliance with this criterion, together with related supporting documentation.

The applicant shall provide data on the air emissions of carbon dioxide. This shall include all sources of non-renewable fuels during the production of pulp and board, including the emissions from the production of electricity (whether on-site or off-site).

The following emission factors shall be used in the calculation of the CO2 emissions from fuels:

Fuel	CO2 fossil emission	Unit
Coal	95	g CO2 fossil/MJ
Crude oil	73	g CO2 fossil/MJ
Fuel oil 1	74	g CO2 fossil/MJ
Fuel oil 2-5	77	g CO2 fossil/MJ
LPG	69	g CO2 fossil/MJ
Natural gas	56	g CO2 fossil/MJ
Grid electricity	400	g CO2 fossil/kWh

The period for the calculations or mass balances shall be based on the production during 12 months. In case of a new or a rebuilt production plant, the calculations shall be based on at least 45 subsequent days of stable running of the plant. The calculations shall be representative of the respective campaign.

For grid electricity, the value quoted in the table above (the European average) shall be used unless the applicant presents documentation establishing the average value for their suppliers of electricity (contracting supplier or national average), in which case the applicant may use this value instead of the value quoted in the table.

The amount of energy from renewable sources (5) purchased and used for the production processes shall not be considered in the calculation of the CO2 emissions: appropriate documentation that this kind of energy are actually used at the mill or are externally purchased shall be provided by the applicant.

Criterion B2 – Energy use

(a) Electricity

The electricity consumption related to the pulp, laminating paper and the board production shall be expressed in terms of points (PE) as detailed below.

The number of points, PE, shall be less than or equal to 1,5.

The calculation of PE shall be made as follows.

Calculation for pulp or laminating paper production: For each pulp, laminating paper i used, the related electricity consumption (E_{pulp} or laminated paper, i expressed in kWh/ADT) shall be calculated as follows:

E_{pulp} or
laminating paper, i
Eboard
=Internally produced electricity + purchased electricity – sold electricity
Calculation for board production: Similarly, the electricity consumption related to the board production (Eboard) shall be calculated as follows:
=Internally produced electricity + purchased electricity – sold electricity

Finally, the points for pulp, laminating paper and board production shall be combined to give the overall number of points (PE) as follows:

In case of integrated mills, due to the difficulties in getting separate electricity figures for pulp, laminating paper and board, where only a combined figure for pulp, laminating paper and board production is available, the electricity values for pulp(s) shall be set to zero and the figure for the board mill shall include pulp, laminating paper and board production.

(b) Fuel (heat)

The fuel consumption related to the pulp, laminating paper and the board production shall be expressed in terms of points (PF) as detailed below.

The number of points, PF, shall be less than or equal to 1,5.

The calculation of PF shall be made as follows.

Calculation for pulp or laminating paper production: For each pulp, laminating paper i used, the related fuel consumption (F_{pulp} or laminated paper, i expressed in kWh/ADT) shall be calculated as follows:

F_{pulp} or laminating
paper, i
=Internally produced fuel + purchased fuel – sold fuel – 1,25 ×
internally produced electricity

Note:

F_{pulp} or laminating paper, i (and its contribution to PF, pulp or laminating paper) need not be calculated for mechanical pulp unless it is market air dried mechanical pulp containing at least 90 % dry matter.

The amount of fuel used to produce the sold heat shall be added to the term 'sold fuel' in the equation above.

Calculation for board production: Similarly the fuel consumption related to the board production (F_{board} , expressed in kWh/ADT), shall be calculated as follows:

F_{board} =Internally produced fuel + purchased fuel – sold fuel – 1,25 × internally produced electricity

Finally, the points for pulp and board production shall be combined to give the overall number of points (PF) as follows:

Pulp grade	Fuel kWh/ADT Reference	Electricity kWh/ADT E reference
Chemical pulp	4000 ^a	800
Mechanical pulp	900 ^b	1900
CTMP	1000	2000
Recycled fibre pulp	1800 ^c	800
Laminating kraft pulp (Bleached or unbleached)	6100	1600
Laminating recycled pulp	3900	1600
Board production	2100	800

^afor air dry market pulp containing at least 90% dry matter (admp), this value may be upgraded by 25% for the drying energy.

^b this value is only applicable for admp

^c for admp, this value may be upgraded by 25 % for the drying energy

*value for lamination process is equal to sum of energy for pulp manufacturing and board production.

Assessment and verification: (for both (a) and (b)): the applicant shall provide detailed calculations showing compliance with this criterion, together with all related supporting documentation. Reported details shall therefore include the total electricity and fuel consumption.

The applicant shall calculate all energy inputs, divided into heat/fuels and electricity used during the production of pulp and board, including the energy used in the de-inking of waste papers for the production of recycled board. Energy used in the transport of raw materials, as well as conversion and packaging, is not included in the energy consumption calculations.

Total heat energy includes all purchased fuels. It also includes heat energy recovered by incinerating liquors and wastes from on-site processes (e.g. wood waste, sawdust, liquors, waste paper, paper broke), as well as heat recovered from the internal generation of electricity — however, the applicant need only count 80 % of the heat energy from such sources when calculating the total heat energy.

Electric energy means net imported electricity coming from the grid and internal generation of electricity measured as electric power. Electricity used for wastewater treatment need not be included.

Where steam is generated using electricity as the heat source, the heat value of the steam shall be calculated, then divided by 0,8 and added to the total fuel consumption.

In case of integrated mills, due to the difficulties in getting separate fuel (heat) figures for pulp, laminating paper and board, if only a combined figure for pulp, laminating paper and board production is available, the fuel (heat) values for pulp(s) shall be set to zero and the figure for the board mill shall include pulp, laminating paper and board production.

Criterion B3 – Excluded or limited substances and mixtures

Assessment and verification: the applicant shall supply a list of the chemical products used in the pulp and board production, together with appropriate documentation (such as SDSs). This list shall include the quantity, function and suppliers of all the substances used in the production process.

(a) Hazardous substances and mixtures

In accordance with Article 6(6) of Regulation (EC) No 66/2010 of the European Parliament and of the Council the board shall not contain substances referred to in Article 57 of Regulation (EC) No 1907/2006 nor substances or mixtures meeting the criteria for classification with the hazard classes or categories specified below.

List of hazard statements and risk phrases:

Hazard Statement (7)	Risk Phrase (8)
H300 Fatal if swallowed	R28
H301 Toxic if swallowed	R25
H304 May be fatal if swallowed and enters airways	R65
H310 Fatal in contact with skin	R27
H311 Toxic in contact with skin	R24
H330 Fatal if inhaled	R26
H331 Toxic if inhaled	R23
H340 May cause genetic defects	R46
H341 Suspected of causing genetic defects	R68
H350 May cause cancer	R45
H350i May cause cancer by inhalation	R49
H351 Suspected of causing cancer	R40
H360F May damage fertility	R60
H360D May damage the unborn child	R61
H360FD May damage fertility. May damage the unborn child	R60; R61; R60-61
H360Fd May damage fertility. Suspected of damaging the unborn child	R60-R63
H360Df May damage the unborn child. Suspected of damaging fertility	R61-R62
H361f Suspected of damaging fertility	R62
H361d Suspected of damaging the unborn child	R63
H361fd Suspected of damaging fertility. Suspected of damaging the unborn child	R62-63
H362 May cause harm to breast fed children	R64
H370 Causes damage to organs	R39/23; R39/24; R39/25; R39/26; R39/27; R39/28
H371 May cause damage to organs	R68/20; R68/21; R68/22
H372 Causes damage to organs through prolonged or repeated exposure	R48/25; R48/24; R48/23
H373 May cause damage to organs through prolonged or repeated exposure	R48/20; R48/21; R48/22
H400 Very toxic to aquatic life	R50
H410 Very toxic to aquatic life with long-lasting effects	R50-53
H411 Toxic to aquatic life with long-lasting effects	R51-53
H412 Harmful to aquatic life with long-lasting effects	R52-53
H413 May cause long-lasting harmful effects to aquatic life	R53
EUH059 Hazardous to the ozone layer	R59
EUH029 Contact with water liberates toxic gas	R29
EUH031 Contact with acids liberates toxic gas	R31
EUH032 Contact with acids liberates very toxic gas	R32
EUH070 Toxic by eye contact	R39-41
No commercial dye formulation, colorants, surface-finishing agents, auxiliaries and coating materials shall be used on either	R43

pulp or board that has been assigned or may be assigned at the time of application the hazard statement H317: May cause allergic skin reaction.	
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The use of substances or mixtures which change their properties upon processing (e.g. become no longer bioavailable, undergo chemical modification) so that the identified hazard no longer applies are exempted from the above requirement.

Concentration limits for substances or mixtures which may be or have been assigned the hazard statements or risk phrase listed above, meeting the criteria for classification in the hazard classes or categories, and for substances meeting the criteria of Article 57(a), (b) or (c) of Regulation (EC) No 1907/2006, shall not exceed the generic or specific concentration limits determined in accordance with the Article 10 of Regulation (EC) No 1272/2008 of the European Parliament and of the Council [\(9\)](#). Where specific concentration limits are determined they shall prevail over the generic ones.

Concentration limits for substances meeting criteria of Article 57(d), (e) or (f) of Regulation (EC) No 1907/2006 shall not exceed 0,10 % weight by weight.

Assessment and verification: the applicant shall prove compliance with the criterion providing data on the amount (kg/ADT board produced) of substances used in the process and that the substances referred to in this criterion are not retained in the final product above concentration limits specified. The concentration for substances and mixtures shall be specified in the Safety Data Sheets in accordance with Article 31 of Regulation (EC) No 1907/2006.

(b) Substances listed in accordance with Article 59(1) of Regulation (EC) No 1907/2006

No derogation from the prohibition set out in Article 6(6) of Regulation (EC) No 66/2010 shall be granted concerning substances identified as substances of very high concern and included in the list provided for Article 59 of Regulation (EC) No 1907/2006, present in mixtures, in an article or in any homogenous part of a complex article in concentrations higher than 0.10 %. Specific concentration limits determined in accordance with Article 10 of Regulation (EC) No 1272/2008 shall apply in case it is lower than 0,10 %.

Assessment and verification: *the list of substances identified as substances of very high concern and included in the candidate list in accordance with Article 59 of Regulation (EC) No 1907/2006 can be found here:*

http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp

Reference to the list shall be made on the date of application. The applicant shall prove compliance with the criterion providing data on the amount (kg/ADT board produced) of substances used in the process and that the substances referred to in this criterion are not retained in the final product above concentration limits specified. The concentration shall be specified in the safety data sheets in accordance with Article 31 of Regulation (EC) No 1907/2006.

(c) Chlorine

Chlorine gas shall not be used as a bleaching agent. This requirement does not apply to chlorine gas related to the production and use of chlorine dioxide.

Assessment and verification: *the applicant shall provide a declaration from the*

pulp producer(s) that chlorine gas has not been used as a bleaching agent. Note: while this requirement also applies to the bleaching of recycled fibres, it is accepted that the fibres in their previous life-cycle may have been bleached with chlorine gas.

(d) APEOs

Alkylphenol ethoxylates or other alkylphenol derivatives shall not be added to cleaning chemicals, de-inking chemicals, foam inhibitors, dispersants or coatings. Alkylphenol derivatives are defined as substances that upon degradation produce alkyl phenols.

Assessment and verification: *the applicant shall provide a declaration(s) from their chemical supplier(s) that alkylphenol ethoxylates or other alkylphenol derivatives have not been added to these products.*

(e) Residual monomers

The total quantity of residual monomers (excluding acrylamide) that may be or have been assigned any of the following risk phrases (or combinations thereof) and are present in coatings, retention aids, strengtheners, water repellents or chemicals used in internal and external water treatment shall not exceed 100 ppm (calculated on the basis of their solid content):

Hazard Statement (10)	Risk Phrase (11)
H340 May cause genetic defects	R46
H350 May cause cancer	R45
H350i May cause cancer by inhalation	R49
H351 Suspected of causing cancer	R40
H360F May damage fertility	R60
H360D May damage the unborn child	R61
H360FD May damage fertility. May damage the unborn child	R60; R61; R60-61
H360Fd May damage fertility. Suspected of damaging the unborn child	R60-R63
H360Df May damage the unborn child. Suspected of damaging fertility	R61-R62
H400 Very toxic to aquatic life	R50
H410 Very toxic to aquatic life with long-lasting effects	R50-53
H411 Toxic to aquatic life with long-lasting effects	R51-53
H412 Harmful to aquatic life with long-lasting effects	R52-53
H413 May cause long-lasting harmful effects to aquatic life	R53

Acrylamide shall not be present in coatings, retention aids, strengtheners, water repellents or chemicals used in internal and external water treatment in concentrations higher than 700 ppm (calculated on the basis of their solid content).

The competent body may exempt the applicant from these requirements in relation to chemicals used in external water treatment.

Assessment and verification: *the applicant shall provide from their chemical supplier(s) a declaration of compliance with this criterion, together with appropriate documentation (such as Safety Data Sheets).*

(f) Surfactants in de-inking

All surfactants used in de-inking shall be ultimately biodegradable.

Assessment and verification: *the applicant shall provide from their chemical supplier(s) a declaration of compliance with this criterion together with the relevant safety data sheets or test reports for each surfactant which shall indicate the test method, threshold and conclusion stated, using one of the following test method and pass levels: OECD 302 A-C (or equivalent ISO standards), with a percentage degradation (including adsorption) within 28 days of at least 70 % for 302 A and B, and of at least 60 % for 302 C.*

(g) Biocides

The active components in biocides or biostatic agents used to counter slime-forming organisms in circulation water systems containing fibres shall not be potentially bioaccumulative. Biocides' bioaccumulation potentials are characterised by log Pow (log octanol/water partition coefficient) < 3,0 or an experimentally determined bioconcentration factor (BCF) ≤ 100.

Assessment and verification: *the applicant shall provide from their chemical supplier(s) a declaration of compliance with this criterion together with the relevant material safety data sheet or test report which shall indicate the test method, threshold and conclusion stated, using the following test methods: OECD 107, 117 or 305 A-E.*

(h) Azo dyes

Azo dyes that may cleave to any of the following aromatic amines shall not be used, in accordance with Annex XVII to Regulation (EC) No 1907/2006:

1. 4-aminobiphenyl	(92-67-1)
2. benzidine	(92-87-5)
3. 4-chloro-o-toluidine	(95-69-2)
4. 2-naphthylamine	(91-59-8)
5. o-aminoazotoluene	(97-56-3)
6. 2-amino-4-nitrotoluene	(99-55-8)
7. p-chloroaniline	(106-47-8)
8. 2,4-diaminoanisole	(615-05-4)
9. 4,4'-diaminodiphenylmethane	(101-77-9)
10. 3,3'-dichlorobenzidine	(91-94-1)
11. 3,3'-dimethoxybenzidine	(119-90-4)
12. 3,3'-dimethylbenzidine	(119-93-7)
13. 3,3'-dimethyl-4,4'-diaminodiphenylmethane	(838-88-0)
14. p-cresidine	(120-71-8)
15. 4,4'-methylene-bis-(2-chloroaniline)	(101-14-4)
16. 4,4'-oxydianiline	(101-80-4)
17. 4,4'-thiodianiline	(139-65-1)
18. o-toluidine	(95-53-4)
19. 2,4-diaminotoluene	(95-80-7)
20. 2,4,5-trimethylaniline	(137-17-7)
21. 4-aminoazobenzene	(60-09-3)
22. o-anisidine	(90-04-0)

Assessment and verification: *the applicant shall provide from their chemical supplier(s) a declaration of compliance with this criterion.*

(i) Metal complex dye stuffs or pigments

Dyes or pigments based on lead, copper, chromium, nickel or aluminium shall not be used. Copper phthalocyanine dyes or pigments may, however, be used.

Assessment and verification: *the applicant shall provide from their chemical supplier(s) a declaration of compliance.*

(j) Ionic impurities in dye stuffs

The levels of ionic impurities in the dye stuffs used shall not exceed the following: Ag 100 ppm; As 50 ppm; Ba 100 ppm; Cd 20 ppm; Co 500 ppm; Cr 100 ppm; Cu 250 ppm; Fe 2 500 ppm; Hg 4 ppm; Mn 1 000 ppm; Ni 200 ppm; Pb 100 ppm; Se 20 ppm; Sb 50 ppm; Sn 250 ppm; Zn 1 500 ppm.

Assessment and verification: *the applicant shall provide a declaration of compliance.*

Criterion B4 – Waste management

All pulp and board production sites shall have a system for handling waste (as defined by the relevant regulatory authorities of the pulp and board production sites in question) and residual products arising from the production of the eco-labelled product. The system shall be documented or explained in the application and include information on at least the following points:

- procedures for separating and using recyclable materials from the waste stream,
- procedures for recovering materials for other uses, such as incineration for raising process steam or heating, or agricultural use,
- procedures for handling hazardous waste (as defined by the relevant regulatory authorities of the pulp and board production sites in question).

Assessment and verification: *the applicant shall provide a detailed description of the procedures adopted for the waste management of each of the sites concerned and a declaration of compliance with the criterion.*

Criterion 2 – Fibres: sustainable forest management

The fibre raw material may be recycled or virgin fibre.

Virgin fibres shall be covered by valid sustainable forest management and chain of custody certificates issued by an independent third party certification scheme such as FSC, PEFC or equivalent.

However, where certification schemes allow mixing of certified material, recycled materials and uncertified material in a product or product line, the proportion of uncertified virgin material shall not exceed 30 % of the total fibre raw material. Such uncertified material shall be covered by a verification system which ensures that it is legally sourced and meets any other requirement of the certification scheme with respect to uncertified material.

The certification bodies issuing forest and/or chain of custody certificates shall be accredited /recognised by that certification scheme.

Assessment and verification: *the applicant shall provide appropriate documentation indicating the types, quantities and origins of fibres used in the pulp and the board production.*

Where virgin fibres are used, the product shall be covered by valid forest management and chain of custody certificates issued by an independent third party certification scheme, such as PEFC, FSC or equivalent. If the product or product line includes uncertified material, proof should be provided that the uncertified material is less than 30 % and is covered by a verification system which ensures that it is legally sourced and meets any other requirement of the certification scheme with respect to uncertified material.

Where recycled fibres are used, the applicant shall provide a declaration stating the average amount of grades of recovered paper used for the product in accordance with the standard EN 643 or an equivalent standard. The applicant shall provide a declaration that no mill broke (own or purchased) was used for the percentage calculation.

APPENDIX II

The substances listed here are for ease of reference for applicants, chemical suppliers and competent bodies.

Table 37. Aromatic amines referred to in Appendix 8 of entry 43 of Annex XVII to REACH.

Aryl amine	CAS Number	Aryl amine	CAS Number
biphenyl-4-ylamine (4-aminodiphenyl)	92-67-1	3,3'-dimethylbenzidine	119-93-7
Benzidine	92-87-5	4,4'-methylenedi-o-toluidine (3,3'-dimethyl-4,4'- diaminodiphenylmethane)	838-88-0
4-chloro-o-toluidine	95-69-2	6-methoxy-m-toluidine (p-cresidine)	120-71-8
2-naphtylamine	91-59-8	4,4'-methylene-bis-(2-chloro- aniline)	101-14-4
o-aminoazotoluene	97-56-3	4,4'-oxydianiline	101-80-4
5-nitro-o-toluidine (2-Methyl-5-nitroaniline)	99-55-8	4,4'-thiodianiline	139-65-1
4-chloroaniline	106-47-8	o-toluidine	95-53-4
4-methoxy-m-phenylenediamine (2,4-diaminoanisol)	615-05-4	4-methyl-m-phenylenediamine (2,4-diaminotoluene)	95-80-7
4,4'-diaminodiphenylmethane	101-77-9	2,4,5-trimethylaniline	137-17-7
3,3'-dichlorobenzidine	91-94-1	o-anisidine	90-04-0
3,3'-dimethoxybenzidine	119-90-4	4-amino azobenzene	60-09-3

The dyes listed below are known to cleave during processing to form some of the prohibited substances listed above and should not be used in printing inks or related products for the production of EU Ecolabel printed paper, paper stationary or paper carrier bag products.

Table 38. Indicative list of dyes that may cleave to form carcinogenic arylamines

Disperse dyes		Basic dyes	
Disperse Orange 60	Disperse Yellow 7	Basic Brown 4	Basic Red 114
Disperse Orange 149	Disperse Yellow 23	Basic Red 42	Basic Yellow 82
Disperse Red 151	Disperse Yellow 56	Basic Red 76	Basic Yellow 103
Disperse Red 221	Disperse Yellow 218	Basic Red 111	
Acid dyes			
CI Acid Black 29	CI Acid Red 4	CI Acid Red 85	CI Acid Red 148
CI Acid Black 94	CI Acid Red 5	CI Acid Red 104	CI Acid Red 150
CI Acid Black 131	CI Acid Red 8	CI Acid Red 114	CI Acid Red 158
CI Acid Black 132	CI Acid Red 24	CI Acid Red 115	CI Acid Red 167
CI Acid Black 209	CI Acid Red 26	CI Acid Red 116	CI Acid Red 170
CI Acid Black 232	CI Acid Red 26:1	CI Acid Red 119:1	CI Acid Red 264
CI Acid Brown 415	CI Acid Red 26:2	CI Acid Red 128	CI Acid Red 265
CI Acid Orange 17	CI Acid Red 35	CI Acid Red 115	CI Acid Red 420
CI Acid Orange 24	CI Acid Red 48	CI Acid Red 128	CI Acid Violet 12
CI Acid Orange 45	CI Acid Red 73	CI Acid Red 135	
Direct dyes			
Direct Black 4	Direct Blue 192	Direct Brown 223	Direct Red 28
Direct Black 29	Direct Blue 201	Direct Green 1	Direct Red 37
Direct Black 38	Direct Blue 215	Direct Green 6	Direct Red 39
Direct Black 154	Direct Blue 295	Direct Green 8	Direct Red 44
Direct Blue 1	Direct Blue 306	Direct Green 8.1	Direct Red 46
Direct Blue 2	Direct Brown 1	Direct Green 85	Direct Red 62
Direct Blue 3	Direct Brown 1:2	Direct Orange 1	Direct Red 67
Direct Blue 6	Direct Brown 2	Direct Orange 6	Direct Red 72
Direct Blue 8	Basic Brown 4	Direct Orange 7	Direct Red 126
Direct Blue 9	Direct Brown 6	Direct Orange 8	Direct Red 168
Direct Blue 10	Direct Brown 25	Direct Orange 10	Direct Red 216
Direct Blue 14	Direct Brown 27	Direct Orange 108	Direct Red 264
Direct Blue 15	Direct Brown 31	Direct Red 1	Direct Violet 1
Direct Blue 21	Direct Brown 33	Direct Red 2	Direct Violet 4
Direct Blue 22	Direct Brown 51	Direct Red 7	Direct Violet 12

Direct Blue 25	Direct Brown 59	Direct Red 10	Direct Violet 13
Direct Blue 35	Direct Brown 74	Direct Red 13	Direct Violet 14
Direct Blue 76	Direct Brown 79	Direct Red 17	Direct Violet 21
Direct Blue 116	Direct Brown 95	Direct Red 21	Direct Violet 22
Direct Blue 151	Direct Brown 101	Direct Red 24	Direct Yellow 1
Direct Blue 160	Direct Brown 154	Direct Red 26	Direct Yellow 24
Direct Blue 173	Direct Brown 222	Direct Red 22	Direct Yellow 48

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