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English version

General method for assessing the proportion of recycled material content in energy related products

Méthode générale pour l'évaluation du contenu en matériaux recyclés des produits liés à l'énergie

Allgemeines Verfahren zur Bewertung des Anteils an recyceltem Materials von energieverbrauchsrelevanter Produkte

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/CLC/JTC 10.

If this draft becomes a European Standard, CEN and CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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European foreword

This document (prEN 45557:2018) has been prepared by Technical Committee CEN/CENELEC/JTC 10 "Energy-related products - Material Efficiency Aspects for Ecodesign", the secretariat of which is held by NEN.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a standardization request given to CEN by the European Commission and the European Free Trade Association.

The dual logo CEN-CENELEC standardization deliverables, in the numerical range of 45550 – 45559, have been developed under standardization request M/543 of the European Commission and are intended to potentially apply to any product within the scope of the Directive 2009/125/EC concerning Energy-related Products (ErP).

Topics covered in the above standardization request are linked to the following material efficiency aspects:

a) Extending product lifetime

b) Ability to re-use components or recycle materials from products at end-of-life

c) Use of re-used components and/or recycled materials in products

These standards are general in nature and describe or define fundamental principles, concepts, terminology or technical characteristics. They can be cited together with other product, or product-group, standards, e.g. developed by product technical committees.

This document is intended to be used by technical committees when producing horizontal, generic, and product, or product-group, standards."

Note CEN/CENELEC/JTC 10 is a dual logo TC, and uses either CEN or CENELEC foreword templates, as appropriate. The template for the current document is correct at the time of publication..

Introduction

Beyond the potentials of reusability, recyclability and recoverability, recycled material content of new products is a physical characteristic of a product and its parts and also contributes to material efficiency. For the purpose of an efficient and effective use of natural resources, secondary materials are often able to substitute primary materials, reducing the demand for primary materials, which bring potential environmental, social and economic benefits. Environmental benefits include reduced mining and consumption of natural resources, reduced landfill and emissions as well as energy savings. The overall environmental benefit will depend on the difference in environmental impact of making material from primary sources (oil, ore etc.) vs. processing waste into a secondary material which would directly substitute primary material. The benefit of increasing recycled material content in products incentivises, in many cases, recycling of end-of-life (EoL) waste material by stimulating demand for secondary materials. In other cases, where there is already sufficient demand for secondary materials to use what is already supplied by the market, specification of higher recycled material content will not necessarily incentivise recycling of additional EoL waste material, and so is therefore not always relevant to eco-design e.g. if supply is limited. The rationale for specifying recycled material content, therefore needs to be considered for each material individually depending on the overall market demand/supply situation for each material.

This document helps to give substantiated claims of the recycled content in energy-related products (ErPs). Key for substantiated claims for new products is the recognition of the chain of custody, which allows tracing secondary materials from different sources.

1 Scope

This document provides a general method for assessing the proportion of secondary material in an energy-related product, its parts or material(s).

This document is applicable as the framework to be used for defining the assessment of recycled material content in specific product groups; however in absence of product specific standards it can be applied directly.

This document does not apply to the assessment of reused components.

NOTE Reused components are addressed in prEN 45556:2018.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

prEN 45559:2018, *Methods for providing information relating to material efficiency aspects of energy-related products*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
chain of custody
sequence of responsibilities for, or control of products or materials as they move through each step in the relevant supply chain

[SOURCE: ISO 13065:2015, modified, “chain” replaced by “sequence”, “products or” added and “of the process or product system under assessment” replaced with “in the relevant supply chain”]

3.2
pre-consumer material
material diverted from the waste generated during a manufacturing process excluding reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it

[SOURCE: ISO 14021:2016, 7.8.1.1, modified “stream” replaced by “generated” and drafting rules of CEN/CLC Internal Regulations Part 3 applied]

3.3
post-consumer material
material recovered from waste generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose

Note 1 to entry: This includes returns of energy-related products, and materials therein, from the distribution of finished products.

[SOURCE: ISO 14021:2016, 7.8.1.1, modified "generated" replaced by "recovered from waste generated", "this includes returns of material from the distribution chain" replaced by "This includes returns of energy-related products, and materials therein, from the distribution of finished products" and moved to Note 1 to entry and drafting rules of CEN/CLC Internal Regulations Part 3 applied]

3.4
recycled material content
proportion, by mass, of secondary material in a product

3.5
primary material
material made from virgin raw material sources extracted from a renewable or non-renewable resource

3.6
secondary material
material recovered from pre-consumer or post-consumer material

3.7
part
hardware, firmware or software constituent of a product

[SOURCE: prEN 45554:2018]

3.8
waste
substance or object of any kind, which the holder discards or intends or is required to discard

[SOURCE: Directive 2008/98/EC]

4 General assessment procedure

Primary and secondary material is often physically or chemically indistinguishable and there are currently no analytical methods available for directly measuring the recycled material content in a product. For the purpose of this document, the verification of recycled content therefore relies on documental proof (see Clause 6) provided by the relevant operator in the chain of custody. Recycled content is expressed as the average ratio of secondary material used in the total production output over a specified time. Those materials constitute the inputs to a product manufacturer, which are transformed into parts of an energy-related product.

The assessment of recycled material content requires:

1) Definition of the scope of the assessment (see Clause 5.1);

2) Assessment of materials composition of a single product (see Clause 5.2 and 5.3);

3) An open, easy to follow management system to trace the type of material inputs, both primary and secondary materials (see Clause 6);

4) Performing a mass balance calculation, linking secondary materials of a part/product to total material quantity in a part/product (see Clause 7).

5 Assessment of materials composition

5.1 Scope of the assessment

The user of this document shall define the scope of the assessment and select its appropriate elements detailed below. The assessment shall be applied either on:

- the whole ErP (e.g. vacuum cleaner), or
- a specified unit of the ErP (e.g. electrical motor of a vacuum cleaner), or
- an intermediate product in the value chain that leads to a unit of the ErP or the product (e.g. copper winding of the stator in an electrical motor of a vacuum cleaner).

It is possible to perform the assessment at pre-consumer and/or post-consumer recycled content and at different levels:

- parts included in the product, e.g. motor, housing etc., or
- type of material in the product or in parts of the product, e.g. the fractions of plastic, metal, glass etc. (more details provided in Clause 5.2), or
- a subgroup of the type of material, e.g. polypropylene, aluminium, float glass etc. (more details provided in Clause 5.2).

The scope description shall contain the position in the supply chain of the company executing the assessment:

- material supplier, and/or
- part supplier, and/or
- ErP manufacturer.

Which of the elements of the scope are best applicable shall be determined by the user of this document and shall be reported in the final project report (see Clause 8.2).

5.2 Material declaration clustering and unspecified materials

The material declaration is a way to express the composition of the materials contained in a product or any part of it. To establish a material declaration, each part of the product shall be assessed for the weight of its constituent materials, according to the scope of assessment (see Clause 5.1). The masses of the respective material fractions of all parts shall be summed up to obtain the material composition of the whole product.

In many cases a given material type represents different grades of the same material that are not identical but very similar and thus share the majority of physical and chemical properties.

EXAMPLE Steel or polypropylene (PP) are produced in different grades for specific applications. The Society of Automotive Engineers lists among others different grades of Nickel-chromium steels with varying proportion of Nickel and chromium, e.g. 31xx, 32xx, 33xx, 34xx. For Polypropylene, the three main grades are homopolymer PP, random copolymer PP, block copolymer PP.

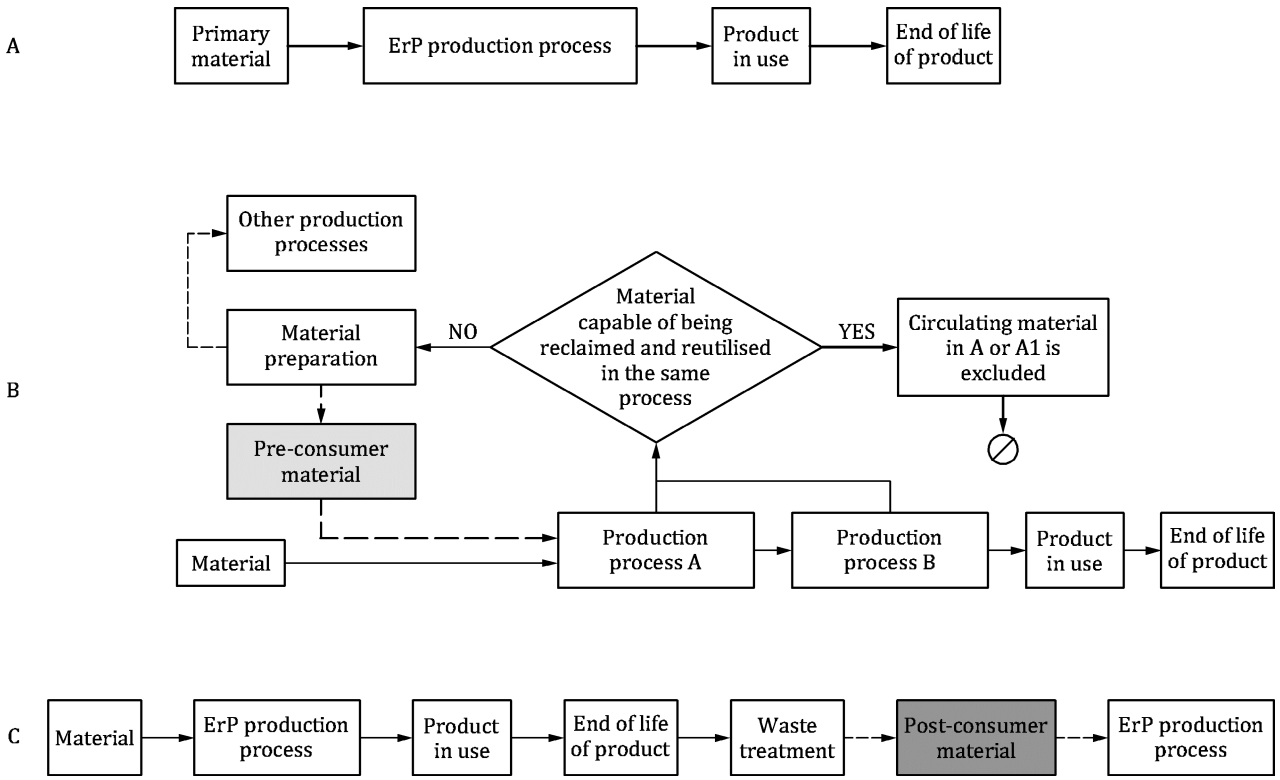
Various grades of a material type shall be treated as one material to determine the proportion of recycled material content of a product. Alloys may require the allocation to a certain material. Users of this document shall define the applicable material clusters for their respective product group.

It may be necessary to exclude parts from the allocation to specific material clusters due to their small size, their complexity of material composition or other, e.g. administrative or legal reasons. To keep the mass balance even, these unspecified parts/materials shall be classified as “other materials” and be accounted for in the total mass of the product. These “other materials” shall be treated as primary material. Users of this document may determine limits for materials classified as “other materials” if applicable.

5.3 Pre-consumer material and post-consumer material distinction

Only pre-consumer materials and post-consumer materials shall count towards recycled material content, in accordance with their definition provided in Clause 3, as well as with specific guidelines provided in Annex A for different material types. Material, which is reclaimed or capable of being reclaimed within the same manufacturing process that generated it, is referred to as circulating material and shall not count towards recycled material content.

The general concept of primary material, pre-consumer material and post-consumer material is visualized in Figure 1.



197

198 **Key**

- primary material
- pre-consumer material
- post consumer material
- potential mix of materials

199 **Figure 1 — Visualization of primary material, pre-consumer material and post-consumer material**

Pre-consumer material

Production process A – typically this is the process where primary material is substituted by pre-consumer or post-consumer material and the point of substitution is reached where the different properties of the input materials become part of a homogenous material output of defined properties.

Material, which is recovered within the same manufacturing process that generated it, is referred to as circulating material and shall not count towards recycled material content (see Figure 1 B).

EXAMPLE 1 For most materials the recycled material content is fixed in a process where the material is transformed from a liquid to a solid. This would be defined as material production process A. In the case of steel making, the recycled material content is fixed after melting and casting into a solid slab/bloom/billet or ingot. Scrap originating from the meltshop, such as solidified steel from steelmaking vessels (skulls) or rejected castings, would be excluded from the calculation of pre-consumer material, because they can be reclaimed within the same melting process that generated them. This is regardless of the fact that the scrap may need to be further processed in order to make it suitable for use in process A, such as cutting to size. In the case of plastic injection moulding, rejects from this process are also capable of being reclaimed and reutilized within the same process, after making processing into the correct size, and so would also be excluded from the calculation.

It is also important to describe where process A ends. Being part of the same process A can include continuous processes (i.e. material or product cannot be diverted to different processing steps until the end of that process step). At the end of the process (A), the output can no longer change its inherent recycled content (i.e. it is frozen / fixed). Material recovered from further processing after process A (Process B) could be included as pre-consumer material, because it is not capable of being reutilized within process B, and has to go back to process A (see Figure 1 B).

EXAMPLE 2 Process B, an assembly process of several plastic parts (injected by process A) can generates a final assembly which doesn't meet technical requirements. The parts coming from this assembly cannot be reworked in process B but have to go back to Process A as a pre-consumer material. For steel, process B would be a rolling process, where scrap has to be returned to the melting process prior to rolling.

Post-consumer material

Once products have reached the end of their life, they undergo a treatment process and recovered materials are considered post-consumer. Products may reach the end of their life shortly after being traded commercially or having left the final manufacturing facility. This might happen when products are damaged or cannot be sold from their distribution chain (e.g. a new version of a product replaces the previous one which cannot be sold anymore). Materials used in ErP can only be considered post-consumer after they have become part of end-of-life products and are subsequently scrapped. Prior to this, materials scrapped from the material distribution chain are considered pre-consumer.

6 Traceability

6.1 General considerations

The implementation of a traceability system means that the secondary material can be tracked from the moment it is identified as secondary material to its final application. Traceability information from at least the secondary materials is needed to calculate the recycled material content.

A technical method to measure the recycled material content in a product, which is reliable, accurate and reproducible, is not available. Therefore, the verification of recycled material content is based exclusively on documentation. Thus any study about a possible requirement on proportion of recycled material content as market entrance criteria for ErP should take into account the maturity level of control methods and the feedback of professionals, producers and recyclers.

6.2 Material provisions

The whole secondary material supply chain including suppliers of material with recycled material content shall provide information allowing traceability. The type (pre- or post-consumer) and the quantity of secondary material shall be documented. Also procedures for the identification and the recording of the data shall be appropriately documented and recorded. Provided information can include additionally:

a) Identification (e.g. batch), collecting and sorting (if batch of input material is labelled and stored in dedicated area);

b) Monitor/check of recycling process of the input material, i.e. if process variables are recorded, if secondary material produced is kept in batches and details of date production is recorded, and if quality management system of the secondary material delivered by the process is implemented;

c) Specification of material before and after processing, e.g. characterization of incoming material.

The information a) - c) should be available for verification. The required level of detail will depend upon the type of material (e.g. glass, plastics, metal, etc.). The level of detail for this information shall be defined by users of this document.

6.3 Chain of custody

The traceability of information may be achieved through the implementation of different Chain of Custody (CoC) models as:

a) Mass Balance

The mass of secondary materials entering the operation in a period of time is controlled and an equivalent mass of material leaving the operations may be claimed as recycled. The physical mixing of recyclable and non-recyclable materials is allowed. Balance of material mass may be applied at batch level or production line level. The recycled material content claim may be allocated to any physical product leaving the production chain, independently from its physical composition, as long as there is a corresponding quantity of secondary material originating from the same consumer of that product e.g. via a take back agreement and the masses are appropriately balanced.

b) Physical Segregation

Secondary material is kept separate from non-secondary materials through each stage of the supply chain allowing assurance that the parts within a particular product originate from secondary materials, though it may not be possible to identify which material came from which batch of recycled source.

c) Identity Preservation

Each batch of secondary material shall be uniquely traced through the production process from the point of origin to the last point of transformation.

Considering the complexity of implementation of a traceability system, mass balance is the most feasible of the above-mentioned methods. Users of this document shall establish a chain of custody based upon the models introduced in a)-c), taking into account:

- traceability of each individual item of waste is not economically feasible. The traceability should start from the treatment and recycling plants for EoL products (post-consumer material). In case of industrial waste (pre-consumer material), traceability should start from collection or material/product producer or converter, where the waste originates from.

- each economic operator in the chain of custody is responsible for the data supplied in the product declarations submitted to the next economic operator. The validity of these declarations may be assessed by a third party. Alternatively, a supplier declaration may be used.

7 Calculation of recycled material content

7.1 General considerations

The manufacturer of the ErP shall verify and calculate the mass balance as described in Clause 7.2. The calculation will be limited to the scope of the assessment, see Clause 5.1.

In order to do so, the supplier of materials shall give information of recycled content based in calculations described in Clause 7.3. Whether the recycled content shall be divided into pre- or post-consumer recycled material will depend on the scope of the assessment, see Clause 5.1.

7.2 Verification and mass balance process

Calculation and verification of the recycled material content in an ErP consists of balancing the mass of production output over a certain accounting period, with the material inputs, corrected for changes in material stock and conversions during processes:

Output = Input + Change in stock + Internal conversions – Waste

Where

Output	is the amount of material in finished products in the accounting period;
Input	is the amount of material coming to the production in the accounting period;
Change in stock	is the change of stock of material in materials and/or as materials in parts in the accounting period;
Internal conversions	are the losses in material flows due to production technology (e.g.: polymerization) in the accounting period;
Waste	is the waste of materials from the production in the accounting period.

Where a process has more than one input, the inputs are attributed to the outputs based on the average composition of the inputs.

EXAMPLE 1 When mixing equal masses of recycled and primary material, the output has 50 % recycled material content; when using equal masses of secondary material on day one and primary material on day two, the average output over the specified time period has 50 % recycled material content.

Where more than one process produces the same output, the average output shall be used in the assessment of the recycled material content.

EXAMPLE 2 When process A produces 1 kg of output with primary material and process B produces 1 kg of output with recycled material, the average output over the specified time period has 50 % recycled material content.

The input may start as early as reagents or constituent materials used, e.g. monomers, or it may be any part or intermediate product. This depends on the position in the value chain of the manufacturer assessing the recycled material content of his product(s).

The output may be a material, part, intermediate product or product. This depends on the position in the value chain of the manufacturer assessing the recycled material content of his product(s).

The output shall be calculated by:

1) Unambiguously identifying materials involved in production of the parts or products being assessed;

2) Tabulating the weight of the parts and/or materials being assessed;

3) Counting production of the parts and/or materials being assessed over a certain accounting period not exceeding one year;

4) Summing up total weights of materials being assessed per type for production output over a certain accounting period not exceeding one year.

The input shall be calculated by:

5) Unambiguously identifying shipments of materials, fillers, additives, product intermediates and product parts being assessed;

6) Tabulating the weight of the material composition for materials, fillers, additives, product intermediates and product parts being assessed;

7) Summing up total weights of materials per type for production input over a certain time.

Change in stock shall be accounted for by calculating changes in material stock between the start and the end of the period for making the assessment (e.g. a fiscal year).

Internal conversion accounts for any losses, including from chemical reactions (e.g. polymerization) and use of materials for application outside the production system under investigation.

The accounting period of the mass balance will depend on several factors and rely on the production setup:

- If the production is set up as mass production the accounting period shall be defined by the user of this document and not exceed one year. The chosen period of time shall be representative for the production volume. The materials used in a mass production shall be allocated for that period. The mass production can cover several production lines, sites and even product families, provided that they are representative of the material/part/product as defined in the scope of the assessment.

- If production is set up on the basis of made to order or batch production the accounting period shall be defined as the batch.

- When an ErP is new to the market the accounting period shall be defined as the first batch (prototype, pre-production or similar)

- Reflect the most recent available data.

7.3 General method for recycled material content calculation

The pre-consumer recycled material content, rc_{pre}, of a material, as a percentage by mass (mass fraction in percent), shall be calculated using the formula:

$$rc_{pre} = \left(\frac{pre-consumer\ recycled\ material\ mass\ in\ a\ material}{total\ mass\ of\ the\ material} \right) \times 100\% = \left(\frac{m_{pre}}{m_{tot}} \right) \times 100\%$$

Where

rc_{pre} is the pre-consumer recycled material content of a material;

m_{pre} is the mass of pre-consumer material used to manufacture a material;

m_{tot} is the total mass of a material.

The pre-consumer recycled material content, RC_{pre}, of a complex multi-material part or product shall be calculated analogously:

$$RC_{pre} = \left(\frac{sum\ of\ pre-consumer\ recycled\ content\ of\ materials}{sum\ of\ all\ materials'\ mass} \right) \times 100\% = \left(\frac{\sum_k m_{pre,k} \times rc_{pre,k}}{\sum_k m_{tot,k}} \right) \times 100\%$$

Where

RC_{pre} is the pre-consumer recycled material content of a part or product;

rc_{pre} is the pre-consumer recycled material content of the k^{th} material;

$m_{pre,k}$ is the mass of the k^{th} pre-consumer material used to manufacture a material.

$m_{tot,k}$ is the total mass of the k^{th} material

The post-consumer recycled material content, rc_{post}, of a material, as a percentage by mass (mass fraction in percent), shall be calculated using the formula:

$$rc_{post} = \left(\frac{post-consumer\ recycled\ material\ mass\ in\ the\ \ material}{total\ mass\ of\ a\ material} \right) \times 100\% = \left(\frac{m_{post}}{m_{tot}} \right) \times 100\%$$

Where

rc_{post} is the post-consumer recycled material content of a material;

m_{post} is the mass of post-consumer material used to manufacture a material;

m_{tot} is the total mass of a material.

The post-consumer recycled material content $R_{content(post\text{-}cons)}$ of a complex multi-material part or product shall be calculated analogously:

$$RC_{post} = \left(\frac{sum\ of\ post-consumer\ recycled\ content\ of\ materials}{sum\ of\ all\ materials'mass} \right) \times 100\% = \left(\frac{\sum_k m_{post,k} \times rc_{post,k}}{\sum_k m_{tot,k}} \right) \times 100\%$$

Where

RC_{post} is the post-consumer recycled material content of a part or product;

rc_{post} is the post-consumer recycled material content of the k^{th} material;

$m_{pre,k}$ is the mass of the k^{th} post-consumer material used to manufacture a material;

$m_{tot,k}$ is the total mass of the k^{th} material.

Note 1 Instead of the whole product, the proportion of recycled material content could be calculated considering the product in sections / assemblies / parts, by amending the formulas for RC_{post} and RC_{pre} respectively. Alternatively, adaptation of the formulas above to cover the proportion of recycled material content for a specific type of material is possible.

There is no obligation to collect all information on all materials, however only documented verifiable pre-consumer material and post-consumer material input shall be accounted for as recycled material content. When information on a material is missing, it shall be assumed the input material is primary material.

Note 2 The pre-consumer and post-consumer recycled content of a material or a complex multi-material part or product is calculated over a specific period of time. The recycled content calculated is an average value for the products manufactured during that period of time and is not specific to a product.

8 Reporting recycled material content aspects

8.1 General

The product or product-group standard writers shall ensure that their standards include requirements for reporting material efficiency aspects as follows:

- The assessment of recycled material content in product(s) / product family <XXX> shall be documented in a report.
- The assessment report itself is likely to be considered as data sensitivity level <3> in accordance to CLC/prEN 45559:2018.
- The assessment report shall also include data and information of importance for any results published in data sensitivity levels < 2 and / or 1 > , for the different stakeholders.

Special care shall be taken to demonstrate transparency and the correlation between information on the results of the assessment and the input data and assumptions used.

8.2 Elements of the assessment report

The product or product-group standard writers shall ensure that their standard(s) sufficiently cover that when reporting material efficiency aspects results, data, methods, assumptions, limitations and conclusions shall be completely and accurately reported. The project report shall follow the following structure:

a) General aspects

   1. Instigator of the assessment;
   2. Date of the report, place, etc.;
   3. List of standards applicable to the assessment.

b) Scope of assessment

1. Description of product/part/material assessed (according to Clause 5.1);
2. Description of material clustering (according to Clause 5.2).

c) Input data and approach for the assessment of recycled material content

1. Information on secondary materials used (according to Clause 6);
2. Accounting period (according to Clause 7.2);
3. Calculations (according to Clause 7).

d) Output of the assessment

1. Result of the assessment covering the quantitative recycled material content that could be reported for different stakeholders;
2. List of applicable references (incl. standards, requirements and policies).

Annex A
(normative)

Additional guidance on specific materials

A.1 Plastics

The recycled plastic content in the product may be calculated as a percentage of the total plastic weight of all the plastic parts in the product. Distinction shall be made between the pre-consumer and the post-consumer secondary material for the calculation of the recycled material content (concepts of pre-consumer and post-consumer material are described in Figure 1).

Various types of processes and plastic flows can be distinguished and help classifying the material as pre-consumer or post-consumer material. Thus, the consistency of the secondary material and its properties should be checked accordingly.

Regrinding, granulating

Regrinding internal scrap from a forming process, e.g. injection moulding, extrusion, etc., producing plastic **parts** or intermediate products and reusing it in the same process ("in-house use") in the form of flakes or granules, shall be considered as circulating material and excluded from the calculation of recycled material content. This also follows the principles of 14021. See Figure 1 B. Regrinding may also be applied to plastics proceeding from damaged or defective products, overstock or obsolete inventories from manufacturers, distributors, and wholesalers[1] which have not been put on the market. In this case, the ground plastic, in the form of flakes or granules shall be considered as pre-consumer material. If the flakes or granules are mixed with primary material as input for the forming process or during the granulating process, the share of primary material shall be identified and excluded from the recycled material content.

Compounding

Compounding results in a combination of one or more polymers with other substances such as fillers, plasticizers or colourings, which may be used in a new manufacturing process[2]. If primary polymers are mixed with pre-consumer or post- consumer recycled plastics, their share of primary polymers within the compound shall be identified and excluded from the recycled material content of the part or product embedding it. If recycled plastics are used which are derived from waste plastics containing fillers, the entire mass of that material shall be counted towards the recycled material content. See Figure 1 B and Figure 1 C.

Reconstituted plastics

The chemical recycling of plastic waste comprises various thermal, physical and chemical procedures by which polymeric materials are decomposed into basic materials and chemically reassembled. This results in new synthesized polymeric materials which can be purchased under various trade names, and are considered as pre-consumer or post-consumer materials following the same criteria than for the outputs of any other recycling process

[1] Standard for Sustainability for Products Made From Recycled Plastic, UL 2778 - First Edition, Dated September 29, 2011.

[2] Adapted from Glossary of common terms in recovery and recycling for the use of industrials businesses and their regulatory contacts, Association Alliance Chimie Recyclage, 2nd Edition, November 2014

A.2 Metals

The recycled metal content in the product is calculated as a percentage of total metal weight of any metal parts in the product. Distinction shall be made between the pre-consumer and the post-consumer material for the calculation of the recycled material content (concepts of pre-consumer and post-consumer material are described in Figure 1).

In many cases, mainly in the non-ferrous metal industry, primary material is composed of more than one metal. The first step, the smelting and refining process, will separate the metal under consideration from the accompanying metals. In such cases, the other metals will be leaving the process and will be taken into account in other life-cycles.

The smelting and refining processes as well as the melting and casting processes may consume the internal scrap generated during the process. Such circulating scrap (or by-products in the case of the smelting and refining process) shall not be counted as pre-consumer material, but as circulating material. See Figure 1 B.

The downstream processes are combined in the processes “Rolling/forming”, “Finishing /surface treatment etc.” up to the “Finished Product Manufacturing /fabrication /installation”. The scrap generated during those processing steps may not be recycled within those forming and finishing process steps and will be sent as raw material to the “melting and casting” or the “smelting and refining” process steps, depending upon quality and commercial/technical needs for the processes. Therefore, scrap generated from these processes shall count as pre-consumer material. See Figure 1 B.

The final “Finished Product Manufacturing/fabrication/installation” step will combine in many cases different metals at the same time, resulting in residues to be recycled in other life cycles. These residues shall count as pre-consumer material. See Figure 1 B.

All materials collected and treated after the use phase are by definition post-consumer material. Due to the combined use of many metals, the pre-treatment steps can already result in complex residues of a combination of metals, to be counted in other life-cycles. See Figure 1 C.

Depending upon the quality of the post-consumer material, the metallic material can be treated immediately in the melting and casting. For some metals and for some complex materials, smelting and refining processes are needed in order to reach the required metal quality to substitute primary material. The recycled material content is fixed after the metal has been cast into a slab, bloom, billet or ingot, ready for further processing.

A.3 Glass

The recycled glass content in the product is calculated as a percentage of total glass weight of all the glass parts in the product. Distinction shall be made between the pre-consumer and the post-consumer material for the calculation of the recycled material content (concepts of pre-consumer and post-consumer material are described in Figure 1).

Flat glass is manufactured using primary materials mixed with cullet, which corresponds to recycled glass. The cullet comes from different origins and, depending on its origin, may be considered as pre-consumer or post-consumer materials in certain cases:

Cullet originating from flat glass manufacturing, i.e. furnace process, shall not be considered as pre-consumer material, but as circulating material. See Figure 1 B.

Cullet originating from off-cuts and losses occurring during additional processing shall be considered as pre-consumer material even if it has been recognized as a by-product. The processing could be at the same facility as the production furnace but, in this case, it is separated to the flat glass manufacturing process. See Figure 1 B.

Cullet originating from off-cuts and losses happening during the manufacturing of finished products (e.g. insulating glass units (IGU)) shall be considered as pre-consumer material. See Figure 1 B.

Cullet originating from off-cuts and losses during distribution and installation of finished products shall be considered as pre-consumer material. This approach has been validated in prEN 17074:2017 and represents an exception to the pre-consumer material definition in Clause 3. See Figure 1 B.

Cullet originating from glass recycling operations of flat glass wastes after the product reached its EoL shall be considered as post-consumer material. See Figure 1 C.

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