Specific requirements for recycling processes in the chemical industry

Version: RC² 1.1

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1 Introduction

To confront the challenges of climate change, the greenhouse gas emissions caused by the consumption of fossil-based raw materials need to be reduced as rapidly as possible. The chemical industry in particular makes an indispensable contribution to the maintenance of prosperity, but in so doing it also generates considerable quantities of greenhouse gas emissions and is directly or indirectly responsible for damage to the environment.

Reducing emissions and protecting natural resources are important objectives which can be partially achieved by recycling substances that are already in circulation. Organic and inorganic materials can be recovered either chemically or mechanically; in both cases, the stipulations in sections 5.3 and 5.5 of the scheme document "Scheme principles for the certification of sustainable material flows in the chemical industry" apply. The definition of "recycled materials" is in alignment with the definition of terms set out in ISO 14021:2016.

The requirements criteria sketched out in the present document apply to suppliers and conversion businesses – including upstream and downstream companies – in the chemical industry. With regard to the companies and production units to be certified, see the REDcert^2 scheme document for the chemical industry. The minimum quantity of mineral or fossil-based raw materials to be substituted in the production process is identity to the requirement for raw materials under the REDcert^2 scheme for the chemical industry (20%).

Chemical recycling can consist, for example, in pyrolysis of used plastic, solvolysis of polymers or extraction processes. Chemical recycling usually results in virgin-quality intermediates or, in the case of pyrolysis or gasification, feedstock (pyrolysis oil or synthesis gases).

Mechanical recycling includes, for example, granulation and compounding, distillation and sublimation. In general, the term "mechanical recycling" is used whenever recovery is achieved by physical rather than chemical methods and the process does not permanently alter the chemical identity of a substance. Mechanical recycling results in intermediates which usually lose some of their physical properties as a consequence of the process. In subsequent production steps, mechanically recycled compounds need to be kept track of in a mass balance system in line with the requirements set out in the REDcert-EU document "Scheme principles for mass balancing".

2 Optional: Recycling in line with EN 15343:2008

The following requirements concern the production and traceability of recycled materials (intermediates) resulting from a dedicated production process based on EN 15343:2008 as well as their further processing into recycled products in a downstream value chain.

All provisions apply in addition to the general requirements for materials certified under the REDcert² system for the chemical industry.

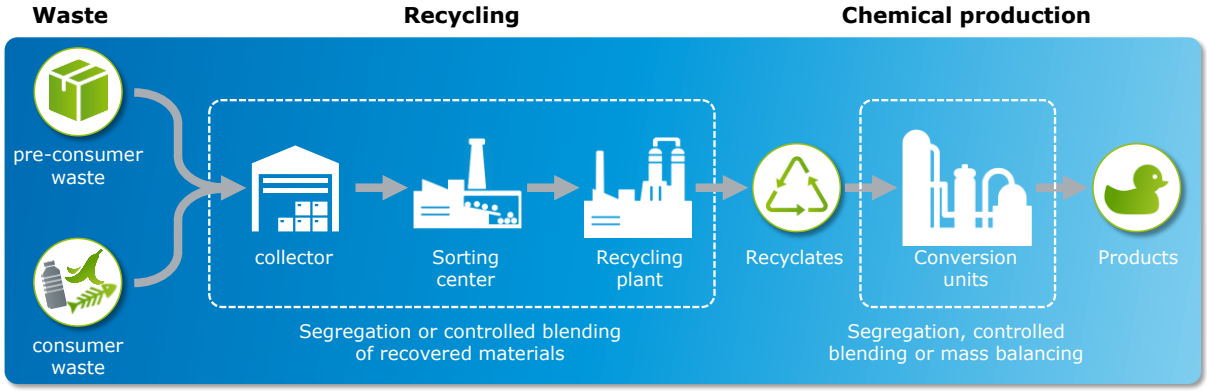


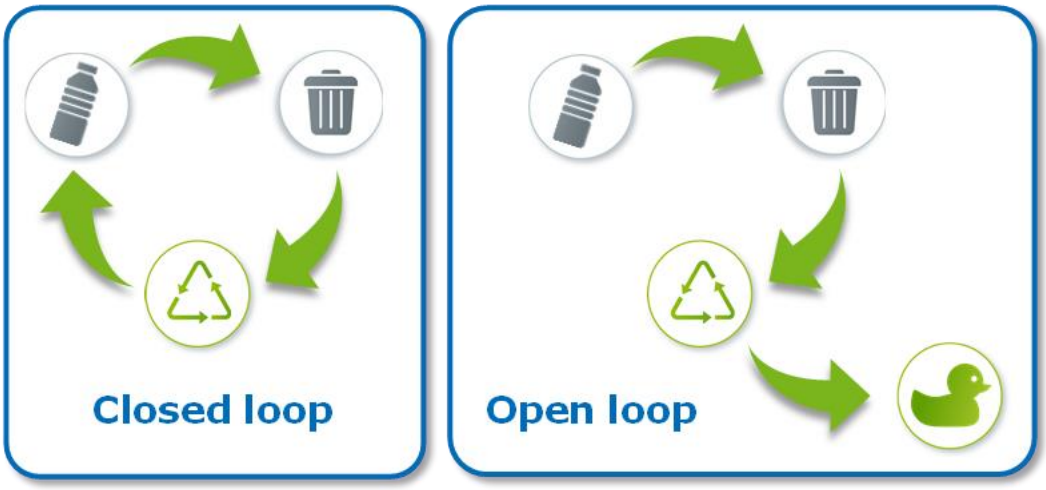
Figure 1: Intermediates directly resulting from recycling processes must contain a physical proportion of recycled materials that can be verified and traced either analytically or by a dedicated production facility. In the case of later conversion into end products in the context of an integrated production facility, mass balance systems are also permissible.

2.1 Requirements for recycling processes

When a recycling process is to be certified, the scheme participant must ensure that the scheme requirements of the REDcert² chemistry standard are met. It must be ensured that the subsequent use of the recycled material and the associated savings in fossil-based resources result in an overall saving in fossil-based resources.

The following assessment criteria apply:

1. basic suitability of the recovered materials for recycling processes (quality, purity)
2. efficiency and suitability of the qualified recycling process; for a given category of waste, the most efficient available recycling method must always be used
3. planned use of the material; materials can either be channelled towards the same application (“closed loop”) or, e.g. when some of their material properties are lost, used for a different purpose (“open loop”)



Additives or controlled blending with virgin-quality material can be used to ensure that recycled materials have the quality required for a particular use, although the product of that process is then considered only partially recycled material (<99% recycled content).

2.1.1 Calculating the physical recycled content

The physical recycled content of a product or intermediate expressed as a percentage (X) corresponds, with account taken of any additives employed, to the sum of the relevant portions by weight (X_i), which is calculated using the following formulas:

$$X = \sum_i X_i \ (in\ \%)$$

and

$$X_i = \frac{mass\ of recycled\ content}{total\ mass\ of\ product} \times 100\ \%$$

X_i here refers to the individual share of one type of waste (domestic waste, industrial waste, etc.) within the product as a whole. That physical recycled content must be communicated in the context of the delivery documentation throughout the value chain of the recycling process.

The physical recycled content is not to be confused with the degree of substitution of certified sustainable materials for fossil-based materials, which is established for a product by certification under the REDcert^2 chemistry standard. In particular, the physical recycled content thus attested to takes into account the presence of inorganic materials.

The calculated proportion of recycled materials and the documentation of incoming and outgoing materials need to be thoroughly reviewed during audits.

2.1.2 Traceability requirements for materials

To guarantee the complete and transparent traceability of the materials used, scheme participants must use the delivery documentation throughout the value chain to pass on information about any proof of sustainability to downstream companies (see table). Proof or partial proof of sustainability can be issued using a template made available by REDcert.

Information	**Explanation**
Waste category	Designation of the material (waste code) under Directive 2008/98/EC or national law
Type of waste	Categorisation as consumer waste, industrial waste, building waste, agricultural waste and residues, waste from landfill, marine plastic or other.
Origin	Upstream companies: address of the originating operation Downstream companies: country of origin
Transport	Means of transport used (ship, train, HGV, aircraft...)
Sorting	Type of pre-sorting
Storage	Storage conditions (indoor space, container, outdoor space – covered, outdoor space – uncovered)
Preparatory treatment	Type of preparatory treatment (e.g. washing, crushing, melting...)
Sequential number	Identification number assigned by the recycling facility
Date	Upstream companies: day when the collector received the material Downstream companies: day when the collector received the material

2.2 Downstream production

In downstream production, materials can be treated as sustainable if they have been certified under the REDcert[2] chemistry standard in line with the stipulations of section **Fehler! Verweisquelle konnte nicht gefunden werden.** of that document and

the present supplement. Likewise, materials can be used that are covered by certification schemes which are both REDcert-recognised and compliant with EN 15343:2008.

For downstream companies, the value chain models defined in ISO 22095:2020 as segregation, controlled blending and process-specific mass balancing are permissible. However, in derogation from the provisions of the REDcert scheme documents "Scheme principles for the certification of sustainable material flows in the chemical industry" (REDcert²chemistry) and "Scheme principles for mass balancing", the requirements listed in section 2.1.1 for the recycled materials to be traceable by means of proof-of-sustainability documentation remain in effect.

3 Recycling of polymers by depolymerisation

If a waste polymer is converted back into monomers or oligomers using a suitable chemical process, this constitutes a form of chemical recycling under the REDcert²chemistry system. As alternatives to the conventional mass balance approach, procedures to determine the final chain length and thereby quantify the saving in fossil-based raw materials, such as monomer counting or carbon counting, are particularly suitable. It is permissible for materials recovered in this way (e.g. oligomers) which are not included in the conventional bill of material to be input into the process as feedstock. This is on condition that the product of the chemical reaction makes it possible to determine unmistakeably how much raw material has been saved.

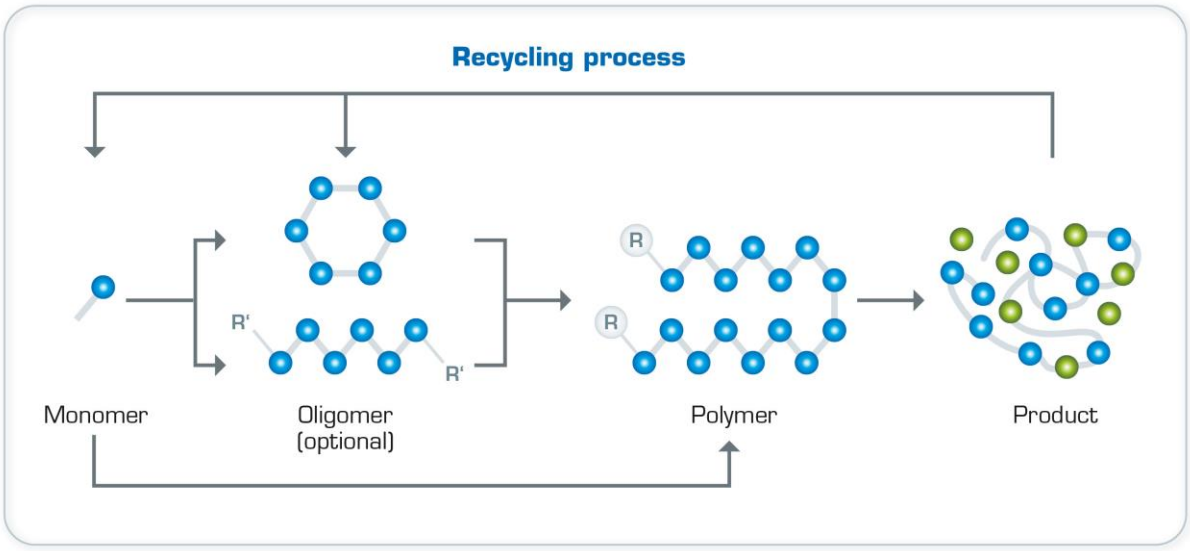


Figure 2: Diagram representing the production process of a polymer and subsequent chemical recycling by monomerisation or oligomerisation.

When determining the recycled content of a polymer, the provisions of section 5.2 of the general scheme requirements apply. In the case of polymers, the paragraph on negligible additives applies to end groups and fillers. In concrete terms, this means that potential end groups and fillers are assessed as to what proportion they would represent of the mass of the polymer; if the answer is less than 1%, they can be considered negligible. If it is between 1% and 5%, they must be compensated for either according to the actual value or according to the product-specific average plus an additional 10%.

4 Recycling of carbonates from waste materials

Metal carbonates are not only important feedstock for building materials, glass and paints but also neutralising agents in the chemical and agricultural industries. The implementation and certification of suitable recycling processes therefore has potential to advance the conservation of naturally occurring mineral resources.

Along the entire production and supply chains manufacturing recycled metal carbonates or using them as materials, traceability must be guaranteed by means of a mass balance system run according to the requirements of the REDcert-EU scheme document "Scheme principles for mass balancing". In such cases, the information and traceability scheme applies from the moment when the waste containing metal carbonates, collected separately or from a sorting facility, is used to produce recycled metal carbonates.

Recycled metal carbonates certified as sustainable can replace their equivalents from mineral sources in conventional products. Additionally, they can be used on a case-by-case basis to replace related metalliferous carbonates and bicarbonates of mineral origin, if their function in the product to be certified corresponds exactly to the function that the metal carbonate of mineral origin fulfils in the conventional product ("*function-based substitution*", e.g. for fillers or to regulate the pH level).

If the metal carbonates have been recovered from biogenic waste (e.g. eggshells or bivalve shells), they are considered biogenic in accordance with the REDcert-EU scheme document "Scope and basic scheme requirements". It is generally permissible for the metal carbonates to undergo chemical transformation during production of the recycled carbonate (e.g. into hydrogen carbonate or intermediary CO_2); this does not constitute a separate conversion process.

Regarding the use of additional advertising claims, see the REDcert^{2}chemistry scheme document "Logos and claims".

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