

White Paper

Recycled material in plastic packaging

01/2024

Plastic packaging plays an essential role in modern society. It protects products, extends their shelf life, and enables efficient logistics. However, plastic packaging also attracts controversy due to its environmental impact and sustainability. The increasing volumes of plastic waste and their harmful effects on the environment have sparked global interest in recycling and the use of recycled materials in plastic packaging.

This white paper examines the growing importance of recycled material in an environmentally conscious world. It highlights the benefits, challenges, and future prospects linked to the use of recycled materials in plastic packaging. With practical examples and consideration of quality, costs, and the legal framework, the goal of this white paper is to provide an overview and ensure a deeper understanding of the role of recycled material in a more sustainable future.

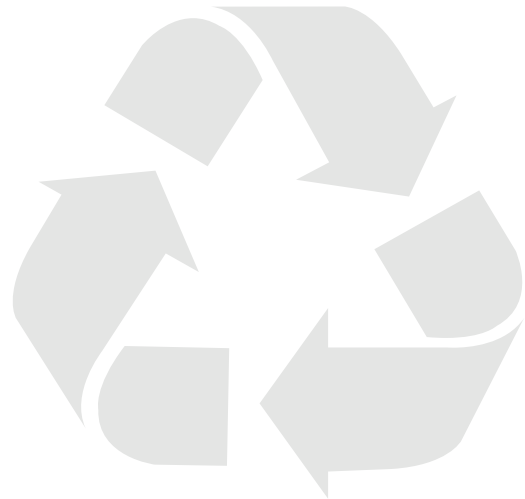
Definition

What is recycled material?

Recycled plastic materials, also known as recyclates, play a key role in reducing the consumption of virgin raw materials and minimizing the environmental impact of plastic packaging. These materials are obtained from recycled plastic waste from various sources, including used plastic packaging and industrial waste.

A well-known example of this is the recycling of PET bottles (PET = polyethylene terephthalate). PET, a plastic that is often used for beverage packaging, undergoes a cleaning process after collection and sorting. It is then processed into flakes or pellets, which can be used to manufacture new products.

The use of recycled materials conserves resources, saves energy, and minimizes waste. These benefits make recycled materials an important building block for a more sustainable and environmentally friendly future.





PCR – PIR

What types of recycled materials are there?

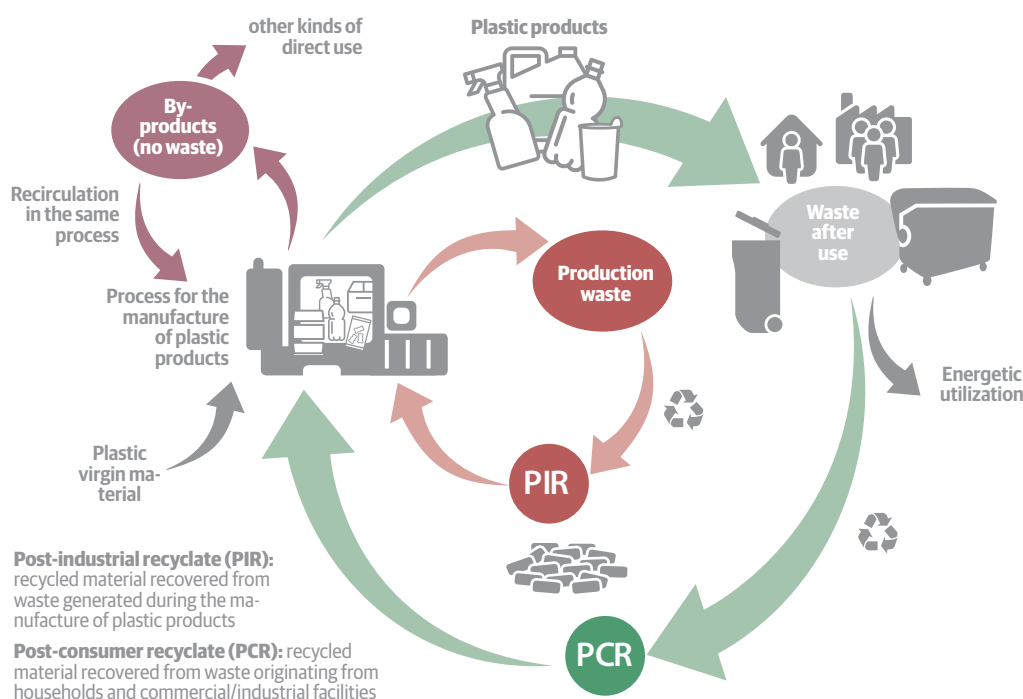
Various recycling systems are used to process the different types of recycled material, thereby making a significant contribution to the sustainable use of plastics.

Two main categories of recycled materials play a key role here: post-consumer recyclates (PCR) and post-industrial recyclates (PIR).

Post-consumer recyclate (PCR) consists of packaging waste recovered from households and commercial/industrial facilities. In Germany, this packaging waste is collected by end consumers in a yellow garbage can or the "Yellow Bag" and fed into the recycling loop. There are different standards worldwide for the collection of used plastics. Therefore, it is possible that the processed recycled material will exhibit some differences

in terms of its purity and color – depending on the process used and/or degree of sorting.

Post-industrial recycled material (PIR) is recycled plastic recovered from industrial waste or production residues. This type of plastic waste accumulates during the manufacturing process in factories, workshops, and other industrial operations, and can no longer be used for its original purpose. It may consist of rejects, plastic residues, or waste from injection molding, extrusion, or other production processes. PIR is highly suitable for recycling as it is unmixed and usually free from severe contamination.



THE RECYCLING LOOP FOR PCR AND PIR

The collected packaging waste is separated from other materials via repetitive processes, sorted by size and plastic type, shredded into flakes, washed, melted, filtered, and processed back into plastic granulate.

The recycled material is then reused to produce high-quality packaging solutions. It thus remains within the material cycle.

Benefits

What are the advantages of using recycled materials?

The use of recycled materials in plastic packaging offers a number of advantages, both in ecological and economic terms. The following aspects illustrate the relevance and benefits of recycled material.

1.

Environmental protection: The use of recycled material reduces the demand for crude oil and other natural resources needed for the production of plastics. This, in turn, saves raw materials and helps to protect the environment.

2.

Energy saving: Less energy is needed to produce recycled material compared to virgin plastic, which helps to reduce greenhouse gas emissions and combat climate change.

3.

Waste avoidance: The use of recycled material minimizes the amount of plastic waste that ends up in landfills or polluting the environment. The volume of generated waste is thus reduced, solving some of the associated problems.

4.

Sustainability and image: The use of recycled material in plastic packaging signals a commitment to sustainability and environmental protection. This can have a positive effect on customer loyalty and can encourage consumers to make environmentally conscious purchasing decisions.





Carbon footprint

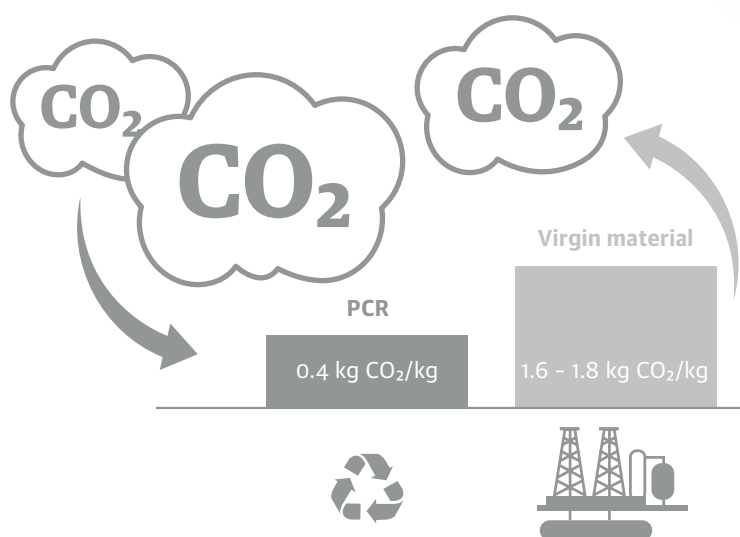
Emission reduction and resource conservation

The use of recycled material in plastic packaging plays a key role in reducing greenhouse gas emissions and conserving natural resources by significantly reducing the demand for virgin plastics made from petroleum products. This directly shrinks the packaging's carbon footprint, as the production of virgin plastics is linked to high energy consumption and the associated emissions. Compared to the production of virgin material, therefore, greenhouse gas emissions can be significantly reduced by recycling plastics. For example, recycling 1 tonne of plastic saves around 1.2 to 1.4 tonnes of CO₂ compared to producing the same amount of plastic from fossil sources.

The use of recycled material closes the material cycle by returning existing materials to the production process. This reduces the amount of waste and also saves resources, as fewer raw materials need to be extracted in the first place. Overall, recycled material offers a com-

elling opportunity to reduce the ecological footprint of plastic packaging and minimize the packaging industry's environmental impact.

Nevertheless, there are certain types of plastic packaging for which virgin plastics are a better option than recycled material. Indeed, the use of virgin plastic is often essential, especially in packaging for products with extremely strict hygiene standards; for example, in the field of medical devices.



CASE STUDY Gühring packs its products in 100% recydate

The tool manufacturer Gühring delivers 95% of its products in plastic packaging and was looking for an environmentally friendly way to deliver its precision tools safely to customers. In rose plastic, the

company found the right partner for sustainable packaging made from recydate.

This switch saves 234 tons of virgin plastic per year and produces around 1.3 tons less CO₂ in the production of post-consumer recydate compared to conventional plastic. This means a 77% reduction in CO₂ emissions in the packaging sector. The only difference to conventional packaging made from virgin material is the color – the sustainable packaging is grey instead of black, as Gühring deliberately refrains from coloring in the interests of sustainability.

Certification

Quality assurance for recycled materials

The quality of the recycled material is critical in terms of its viability for use in plastic packaging. Strict quality controls and processes are necessary to ensure the recycled material meets the required standards. This includes careful sorting and cleaning of the plastic waste, as well as checking the material's quality and chemical composition.

Quality management and certifications are crucial to ensure the suitability of the recycled material for end applications. Furthermore, the establishment of standards and guidelines promotes confidence in recycled materials as high-quality alternatives to virgin plastics. It also helps to increase their acceptance in the packaging industry and contributes to the achievement of sustainability goals.

EU REACH regulation

Plastic packaging made from recycled material must be REACH-compliant in the European Union. The EU REACH regulation (Registration, Evaluation, Authorization, and Restriction of Chemicals) applies to all chemicals, including those used in recycled materials. Compliance with the REACH requirements ensures that recycled plastic packaging is safe. This helps to increase confidence in recycled products and promote the closed-loop economy.

Differences in the quality of post-consumer recyclates

Post-consumer recycle (PCR) is made from used plastic packaging that has been discarded as waste by end consumers. As these products may consist of different types of plastic, and may have been used and disposed of under various conditions, the composition of the

resulting recycled material and the type of impurities may vary. These factors can lead to inconsistencies in the quality of PCR, which may fluctuate depending on the origin and composition of the material concerned.

Compared to virgin raw materials, products made from recycled material have some distinguishing features. For example, the packaging may contain small, visible inclusions or have a slightly textured surface.

In the case of film hinges, small cracks or breaks in the material (known as stress whitening) are more pronounced, but the hinges still function well. It is also possible that products made from recycled material may smell of detergent. Despite all these differences, packaging made from recycled material protects its contents just as effectively as its counterparts made from virgin material.

Recycled packaging and its characteristic odor

Recycled material sourced from the "Yellow Bag" or deposit machines consists of very different types of packaging, such as plastic bottles, yogurt pots, and packaging films. In some cases, a large proportion of this plastic waste may have originally been used for cosmetics and detergent products, which contain fragrances that become infused in the plastic and cannot be entirely washed out during the recycling process. For this reason, recycled packaging often smells like detergent. However, this odor can also be caused by the washing process during recycling, whereby detergent residues may remain in the material.



Holistic thinking

Sustainability from day one: “Design for Recycling”

“Design for Recycling” refers to the process of designing packaging with a view to its subsequent reusability and recyclability. Packaging that is easy to recycle has a better chance of being returned to the material loop instead of ending up as waste.

This approach ensures sustainability from the outset, i.e., during initial development of the packaging. Ideally, plastic packaging should consist of one type of material (mono-material packaging), which can be easily returned to the material cycle as a technical raw material at the end of its life cycle. If this is not possible, packaging should be designed in a way that ensures the respective raw materials can be easily separated back into mono-materials, thus preserving them as valuable resources. These aspects should also be taken into account when designing label and closure solutions. They should be easily separable from the rest of the packaging in order to simplify the sorting process in recycling plants.

In future, the EU Packaging Directive (PPWD) will stipulate minimum requirements for the recyclability of packaging. The principles embodied in the “Design for Recycling” guidelines could therefore become mandatory.



CASE STUDY

Sustainable packaging concept for CERATIZIT

CERATIZIT was searching for a sustainable packaging solution for PCD ISO cutting inserts – and found it: the InsertBox Connect from rose plastic. The chosen packaging had to offer maximum recyclability in order to reduce the product's carbon footprint. The InsertBox Connect provides optimum protection for the cutting inserts during transportation and storage, without direct contact with the packaging surface. No additional foam inserts are required, both the packaging and the labels are made of PP (polypropylene). The InsertBox Connect features an intelligent plug-in system and is compatible with the Tool-O-Mat tool dispensing system. It fits seamlessly into CERATIZIT's sustainable packaging concept and was specially developed to meet the company's requirements.

Costs

Prices for recycled material may vary

The cost of using recycled material instead of virgin material depends on various factors. Unlike virgin plastics, whose prices are closely linked to the price of crude oil, the cost of recyclates varies in line with their availability, quality, and the specific type of recycled material. It is important to emphasize that recycled material can often be more expensive than virgin material due to stricter quality requirements. This is not only attributable to the general costs associated with collecting, sorting, and processing recycled materials, but above all to the increased sorting effort and the lower quantities of usable input material in conjunction with higher quality standards. Under certain circumstances, recycled material can actually provide a cost advantage over virgin material, especially if the quality requirements are less stringent and sufficient quantities are available.





Legal framework

Regulatory requirements

The legal framework plays a key role in promoting the use of recycled material in plastic packaging. In recent years, many countries and regions around the world have passed strict laws and regulations to reduce the use of single-use plastic increase recycling volumes. These regulations include bans on certain single-use plastic products, mandatory recycling quotas, and incentives to use recycled materials.

One example of this is the Single-Use Plastics Directive, which was introduced in the European Union in 2019. It prohibits the use of certain single-use plastic products, sets out recycling quotas for plastic packaging, and promotes the use of recycled materials. Similar regulations have been introduced in many other parts of the world.

The regulatory framework is an important factor

Among other things, the proposed EU Packaging Directive (PPWD) includes specific quotas for the use of recycled materials – from 2030, all plastic packaging must contain a prescribed minimum proportion of post-consumer recyclates. This amounts to 10 percent for food packaging, 30 percent for disposable drinks bottles, and 35 percent for all other types of plastic packaging. By 2040, this figure is set to rise to between

50 and 65 percent. The German Packaging Act ("Verpackungsgesetz") mandates that disposable PET drink bottles must incorporate a minimum of 25% recycled material from 2025 onwards.

These legal requirements and regulations are playing a key role in the packaging industry. They are intended to motivate companies to develop more sustainable packaging solutions and integrate recycled materials into their products. They are also raising environmental awareness and accelerating the transition to a closed-loop economy in which resources are better utilized and waste is minimized. This shows that the regulatory framework plays a key role in driving sustainability in the packaging industry and mitigating the environmental impact of plastic packaging.



Availability of recycled materials

Progress and limitations

Attempts to increase the use of high-quality recycled materials in plastic packaging are largely dependent on their availability. In recent years, this has improved significantly in many regions around the world, largely as a result of growing environmental awareness and a rising demand for sustainable packaging solutions.

Both the packaging industry and recycling companies have invested heavily in improved technologies and infrastructure in order to increase the quality and quantity of the available recycled materials. Despite these efforts, the availability of recycled materials remains highly variable from region to region. In some cases, therefore, it is difficult to procure sufficient quantities of high-quality recycled material for use in plastic packaging.

A reliable recycled material market is essential

Generally speaking, however, the availability of recycled materials is influenced by various factors, such as the local collection and sorting infrastructure, consumer demand, and the availability of recycling technologies. In some regions, and for certain materials such as PET and HDPE, the recycling infrastructure has already been established, ensuring a relatively stable supply of recycled materials. For packaging that consists of several materials (e.g., composites), the effort required for collection and sorting remains higher, meaning that they cannot be integrated into the recycling loop as quickly.

In order to further increase the availability of recycled materials, greater effort is needed in the areas of collection, sorting, and processing of plastic waste. The development of quality standards and certifications is also an important factor. A reliable and well-connected recycle market is crucial to promote the acceptance and use of recycled materials in the packaging industry.





Outlook

On the right path to sustainable packaging solutions

The emerging trends regarding the use of recycled material in plastic packaging hold increasing significance for both the packaging industry and wider society. In the coming years, it is expected that the use of recycled materials will continue to develop rapidly. There are a number of reasons for this. For example:

1.

Heightened environmental awareness:

Growing consumer interest in environmental issues and the pressure on companies to act sustainably will continue to drive the demand for eco-friendly packaging solutions.

2.

Legal framework: An increasing number of countries are implementing stringent laws and regulations aimed at curbing the usage of single-use plastics while encouraging the use of recycled materials. Above all, this will significantly increase the demand for – and use of – recycled materials.

3.

Technological innovations: Advances in recycling technology and material science are helping to improve the quality of recycled materials. As a result, they can be used in a wider range of products.

4.

Closed-loop economy: The concept of the closed-loop economy is gaining in importance, thereby bringing both resource efficiency and waste minimization into focus. The use of recycled materials is a key component of this concept.

The future prospects for the use of recycled materials in plastic packaging are promising, paving the way for more sustainable and eco-friendly solutions. In the process, the packaging industry is playing a key role in realizing this vision through its increased use of recycled material.



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GERMANY

rose plastic AG

Rupolzer Straße 53

88138 Hergensweiler/Lindau

Tel. +49 8388 9200-0

info@rose-plastic.de

www.rose-plastic.de

rose  plastic®
protective packaging pioneers