

# Recycling - the foundation of the circular economy

## In conversation with materials expert Jens Huchzermeier and recycling expert Ralf Abeln, as well as sustainability manager Nina Franke.

A functioning circular economy is the major goal of the plastics industry. This can save fossil raw materials and reduce CO<sub>2</sub> emissions.

While the EU-wide target (for 2030) for recycling cardboard & paper is 85%, closely followed by glass with a target recycling rate of 75%, plastic, with a target rate of 55% in 2030, still brings up the rear. In reality this target has already been exceeded for the German region with a value of 60.4% in 2021, but this should not be a reason to stand still. On the contrary, the protection of fossil raw materials and the reduction of CO<sub>2</sub> emissions, as well as many other environmental protection issues, are reason enough to press ahead with recycling and a functioning circular economy for the valuable material plastic. We talked to Jens Huchzermeier (materials expert at SPIES Packaging), Ralf Abeln (recycling expert at LKR) and Nina Franke (sustainability manager at SPIES Packaging) about this important and forward-looking topic.

### What are the prerequisites for recycling plastics?

Nina Franke: A basic prerequisite for the recyclability of a material is its purity. This can refer both to the material itself and to substances that get in contact with the plastic over time. The material itself is only fully recyclable if it is a mono-material, i.e., a type of plastic that is not firmly bonded to other materials, such as another type of plastic, paper, cardboard or similar. Composite materials, on the other hand, which cannot be separated from each other and thus disposed of by type, are little or not at all suitable for recycling.

At SPIES, we produce almost exclusively packaging made of mono-material, where both the packaging itself and the label are made of 100% polypropylene and are therefore ideally suited for a recycling process. However, this is not the case with many packages that we find in supermarkets, for example in the food sector. Often the label is made of a different material than the packaging itself. If these components can nevertheless be separated by hand, it is up to the end consumer to do so and to dispose of the individual components properly to enable a further recycling process.

### What processes are there for recycling plastics?

Jens Huchzermeier: In general, there are two different types of recycling for plastics: mechanical and chemical recycling.

In mechanical recycling, plastic waste is sorted by plastic type, washed, shredded and melted. A new granulate is created, which is then called recyclate. In some applications, it is also possible to process the regrind without re-granulation. A characteristic of mechanical recycling is that the chemical structures of the plastics remain unchanged. The mechanical properties, on the other hand, can be different after the recycling process.

This is different in chemical recycling. Here, the plastics are broken down into their basic chemical building blocks (polymers, monomers & atoms). The final product of this recycling process is therefore first the individual chemical components of the plastic, which are then reprocessed into plastic granulate in virgin material quality. This process is very energy-intensive and at the present time not yet applicable on a broad scale.

The finale product of a recycling process is called recyclate or regranulate, which can be used as a raw material to produce new products.

**Are there different types of recyclate? If so, how are they differentiated?**

Jens Huchzermeier: In the case of finished recyclate, a distinction is made between PIR (postindustrial recyclate) and PCR (post-consumer recyclate). The decisive factor here is the process stage at which they were taken.

Post industrial recyclates consist of rejects and production waste generated during the industrial processing of plastics. The material is already removed from the process at the production plant and is therefore unused or, in the case of packaging, not yet filled content.

In post-consumer recyclate, on the other hand, plastic waste is recycled that has already reached the provisional end of its product life cycle and has been properly disposed of by the end consumer, for example in the yellow bag.

**What happens to the scrap that is produced at SPIES?**

Ralf Abeln: The material is collected in collection containers that meet the standards and requirements of the SPIES company. Subsequently, the rejects are transported by our logistics partner on site to the processing facilities in Vechta. After an intensive incoming inspection by our quality assurance department, the material is fed to the processing plant.

At the plant, the rejects are sorted according to color specifications, with potential impurities being removed. Subsequently, mechanical processing including fine screening takes place. Afterwards, the material is passed on to melt filtration via homogenization. Within this process, the material is vacuum degassed, and subsequently post-homogenized and cooled. The finished regranulate is then filled into the designated packaging and a final inspection is carried out to ensure quality.

Finally, the finished material is returned to Spies by the company's own forwarding agent.

**What are the special features of using recyclate in the food industry?**

Jens Huchzermeier: Since the process of mechanical recycling is currently the only one that is established and suitable for mass production, the issue of purity is of great importance in contact with food.

Polypropylene is not only used for food packaging, but also for chemicals and other substances. As a result of the fact that material purity cannot be guaranteed, there are strict requirements regarding the use of recycled material for food packaging and other sensitive fields. For safety reasons, recyclate may not generally be used for products in these areas. There are exceptions, for example, for recycled PET, as this material comes from a closed, food-safe cycle, the bottle deposit system, and can also be used in the injection molding sector thanks to new technologies.

Consequently, the crucial point is a closed loop, where traceability of packaging use and its contents can be ensured. This is important in order to rule out the possibility of old motor oil canisters, for example, becoming new ice cream packaging after the recycling process and possibly endangering food quality.

In the non-food sector, on the other hand, both PIR and PCR materials can be used, as well as in surfaces or layers of plastic packaging that are not in direct contact with the food content.

**For a food-compliant circular economy in the polypropylene sector, a just mentioned traceability of the product life cycle of each individual package is necessary. How can this be achieved?**

Nina Franke: There are several approaches to this. Together with many partners, we have developed an "intelligent" packaging design as part of the HolyGrail 2.0 initiative, which makes a significant contribution to taking a big step toward the circular economy. This involves integrating special codes containing detailed material information into the imprint of the label or incorporating them into the entire surface of the packaging so that the plastic parts can be sorted accurately and efficiently. Barely visible, these codes do not affect the appearance of a package. However, in the future, so-called "digital watermarks" will play an essential role in the handling of plastics and in Europe's sorting facilities when it comes to the issue of recyclability. There, thanks to the code, even the smallest plastic parts can be assigned to their previous use and thus, for example, food packaging and packaging of cleaning agents can be distinguished from each other. This sorting consequently makes it possible to select food-safe packaging and thus forms the basis for the further use of the resulting recycle in the food sector.

**What role does recycling play for the SPIES company?**

Nina Franke: The topic of recycling with the goal of a circular economy is very close to our hearts and we are convinced that it is one of the most important future topics for the plastics industry. That's why we always pay attention to the recyclability of our products and work closely with our partner LKR in the field of recycling. Due to the former mentioned specifications and guidelines for the use of recycled materials, their use is unfortunately only possible to a very limited extent at our company at present. However, we do use both PIR and PCR materials for specific projects, such as the packaging of a well-known animal feed manufacturer or a cartridge for use in a dishwasher of a renowned household appliance manufacturer.

By our ISCC Plus certification, we are also able to process bio-based or chemically recycled plastics, this has so far only been applicable in individual projects and not on a large scale.

**What happens to the recycle that the company itself cannot continue to use?**

Ralf Abeln: The recycle produced is reused in various forms of application, such as in the field of automotive applications, as well as the furniture industry or industrial packaging.

Likewise, the recycle is processed so that it can be used as a blend material for customer-specific compounds.

Ralf Abeln continues to explain the work of LKR: "We deal with holistic recycling concepts on a daily basis and have the ambition to support and complement companies like SPIES in their efforts to operate a viable recycling economy".



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(Sources: <https://www.nabu.de/umwelt-und-ressourcen/abfall-und-recycling/22033.html#:~:text=Nur%20etwa%2060%20Prozent%20der,36%20Prozent%20bereits%20%C3%BCberf%C3%BCllt%20wurde.>; <https://de.statista.com/statistik/daten/studie/1077942/umfrage/eu-weite-zielvorgaben-fuer-recycling-von-verpackungsabfaellen-nach-materialart/>)