

# Next Goal: Circular Economy

## *Recyclable Mono-Material Composites and rPET in Direct Food Contact*

Sustainability is the megatrend of our times. It is a challenge that often leaves us feeling powerless when it comes to achieving any quantifiable change. But time and again in the past the plastics industry has shown just how much innovative power it possesses. And the hype surrounding the circular economy is not mere utopia, it is a realistic goal.

Plastics have a reputation that has nosedived, especially with short-lived consumer products, such as packaging. In the eyes of the general public, it has become synonymous with environmen-

tal pollution. It is futile to remind people of its many advantages, such as in the foodstuffs, hygiene, or medical care sectors, or to point out that plastics can even reduce CO<sub>2</sub> emissions as they very light

and therefore more efficient to transport. The real problem here is that plastics are simply not recycled enough and, above all, there are almost no high-quality recycling processes that can restore plastics to anywhere near the same or equivalent quality for a particular application. There are two essential requirements to achieve high-quality recycling: fully recyclable end products and highly developed waste sorting and recycling processes. This is the basis for processing plastic waste into high-quality recyclate to allow for further cycles. Through its specialized business units, the Reifenhäuser Group has already placed various "Circular Economy Solutions" on the market and also cooperates with partners along the entire value chain.

Reifenhäuser Ultra Stretch gives PE films completely new mechanical properties and can replace PET films in the material composite. This results in fully recyclable mono-material composite films © Reifenhäuser

### *Ultra Stretch: the Technology for Sustainable All-PE Films*

Flexible packaging, such as stand-up pouches for soap, cereal or pet food, are high-tech products that provide protection against contamination and germs, and guarantee the safe transport of goods from producer to consumer. In order to meet the requirements, the pouches, or the films used in them, usually consist of several layers of different plastics. However, at the end of a package's life cycle, this becomes a problem because the more materials used to make a package, the more difficult it is to recycle them. Once materials are combined, they are almost impossible to separate, let alone recycle efficiently on an industrial scale. Until now, PE and PET have generally been processed in individual



Reliable recyclate processing, even with fluctuating raw-material quality, Reiloy screws and barrels from Reifenhäuser are coated with a special wear protection for this purpose © Reifenhäuser



as a raw material after the waste has been recycled. However, one problem with recycling was that the use of recyclates and direct contact with foodstuffs were long forbidden due to strict regulations.

The Reifenhäuser Cast Sheet Coating business unit specializing in flat film, offers a solution for the production of sustainable PET film from up to 100% PET bottle scrap for direct food contact. Customers process post-consumer recyclate (PCR) on Reifenhäuser Mirex PET sheet lines, not only as an intermediate layer between two outer layers of virgin material, as widely used in the food packaging sector.

If required, the film can also be made exclusively from PCR-PET. The end product safely meets the strict FDA (USA Food & Drug Association) criteria and can be used in direct contact with foodstuffs.

Mark Borutta, Sales & Marketing Manager at Reifenhäuser Cast Sheet Coating, explains: "At Reifenhäuser CSC, we have a ready-to-market technology that bears the crucial FDA LNO (Letter of No Objection). We therefore open up a major field of application for high-quality, high-volume plastics recycling for our customers. It also provides tremendous leverage to push forward an effective, functioning circular economy."

### Wear-Resistant Machine Components for Recyclate Processing

The use of recyclate also places new demands on the extrusion process machinery, since material quality often »

layers to achieve specific properties. To replace this recycling-unfriendly material mix, Reifenhäuser Blown Film has developed a special stretching process for its blown film lines. By harnessing this technology, PE films obtain properties comparable to those of PET films and can replace them in products. The result is, for example, that all-PE pouches are produced as a mono-material composite and are therefore fully recyclable. At the end of the life cycle, recyclers then obtain a pure PE recyclate that can be used to produce a new product.

Reifenhäuser EVO Ultra Stretch is the name of the technology behind this all; it stretches film by up to 10 times and endows the PE film with new mechanical properties. The patented position of the stretching unit directly in the haul-off of the blown film line makes the process particularly stable and efficient. Eugen Friedel, Sales Director at Reifenhäuser

Blown Film, explains: "The special thing about our solution is that we stretch the film while it is still hot from extrusion so it requires no reheating. In addition, this also extends the natural annealing phase until the film is wound and gives the film the time it needs to take on its new properties." The distance from the EVO Ultra Stretch unit to the winder is 2.5 times longer than other solutions on the market. This offers a significant advantage over conventional film stretching processes between haul-off and winder.

### Hundred Percent Recycled PET in Direct Food Contact

Whereas PET is deliberately avoided as part of the material mix in flexible packaging, it is the (mono)-material of choice in other areas, such as disposable bottles. What is referred to as PET bottle scrap is widely available on the market



The R-Cycle System saves recycling relevant data in a Digital Product Passport to allow precision waste sorting for high-quality recycling © R-Cycle

### Info

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fluctuates and the machine must also process impurities or abrasive ingredients reliably.

Reifenhäuser Reiloy, the screw and barrel specialist, regularly sets new benchmarks when it comes to wear protection. The business unit offers a verifiable, longer barrel life, precise tuning to raw materials and additives, exclusive alloys with powders developed in-house, and process-optimized surfaces. Ralf Pampus, Managing Director of Reifenhäuser Reiloy, explains: "We offer our customers highly wear-resistant screws and barrels. In fact, we are the only manufacturer that develops and produces hard-metal alloys for wear protection in-house. This helps us to achieve extremely long service life – a crucial factor affecting the economic efficiency of production lines." Manufacturers of extrusion and injection-molded products can therefore profit from the best cost-benefit ratio in the industry.

### **Sorting and Separating Waste by Type to Obtain High-Quality Recyclate**

Whereas many factors governing a functioning circular economy are directly attributable to the production lines for plastic products – which are the core business of the Reifenhäuser Group – a major part of the problem is to tackle present-day waste management and sorting processes. For example, fully recyclable packaging is not sorted or separated precisely enough to permit high-quality recycling. Even in the "recycling



**Ulrich Reifenhäuser, CSO of the Reifenhäuser Group:** "Our technologies assist producers to meet future sustainability requirements."

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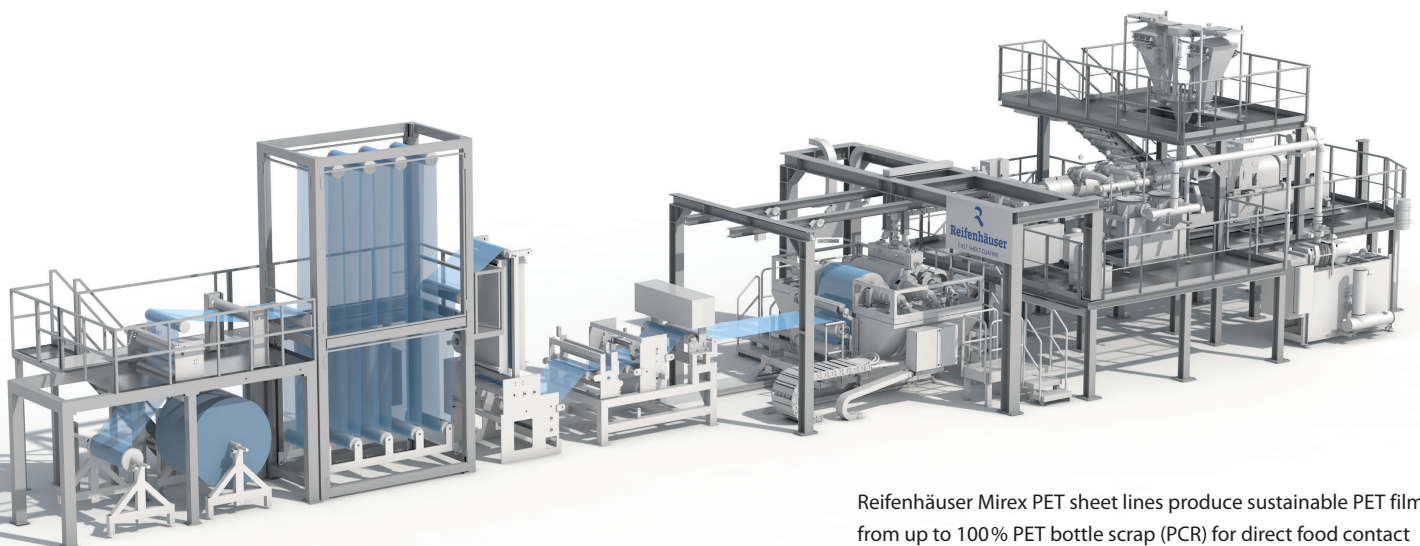
bastion" of Germany, only about 6% of plastics from domestic garbage are recycled as post-consumer recyclate (PCR) for reprocessing into equivalent new products. The major percentage of over 65% is thermally disposed (source: Conversio Study 2017; Material flow chart of plastics in Germany/Plastic Atlas Heinrich Böll Foundation).

For this reason, the Reifenhäuser Group, together with other leading technology companies and organizations along the entire plastic-packaging cycle, launched the R-Cycle Initiative ([www.r-cycle.org](http://www.r-cycle.org)). R-Cycle creates the

basis for a highly developed recycling process by automatically recording recycling-related properties in a so-called digital product passport during the manufacture of plastic packaging and identifying them by a marking (e.g. digital watermarks or QR codes). Based on this additional information, waste-sorting plants can identify recyclable packaging and form pure fractions that are easy to recycle. The combination of fully recyclable packaging and precise waste management is the key to obtaining high-quality recyclates to close the loop and turn the value chain into a value cycle.

### **Leveraging the Opportunities of Sustainability**

Despite all the uncertainty that future challenges pose for the plastics industry, changes always offer opportunities to open up new markets with innovations and clever products. The Reifenhäuser Group therefore sees the growing commitment to sustainable products and production processes as a positive driving force for its business. Ulrich Reifenhäuser, CSO of the Reifenhäuser Group, explains: "Plastic products such as packaging must be recyclable. They must have a high recyclate content and guarantee their function with the lowest possible material input. This is where we, the Reifenhäuser Group, have a leading technology edge. Our technologies help producers meet future sustainability requirements." ■



**Reifenhäuser Mirex PET sheet lines produce sustainable PET film from up to 100% PET bottle scrap (PCR) for direct food contact in compliance with FDA-LNO** © Reifenhäuser