

# The Dawning of the Circular Economy

## *A Stock-Take of K2019: The Plastics Sector Has Owned up to Its Responsibility*

The beneficial processing and service properties of plastics are increasingly determining the ecological fate of the world. The plastics industry has now realized that it is not enough to put the blame on consumer behavior. As K2019 showed, numerous initiatives and technical developments are paving the way for the urgently needed establishment of a circular economy.

The triumphal march of plastics began back in the day when it became possible to produce long-lasting materials for long-lived applications from perishable natural materials such as natural latex, vegetable oils, casein, and cellulose. However, in the intervening years, the precious long-lived polymer materials have often been used for short-lived products for which there is no guarantee that they will be properly disposed of.

A further factor in the success of plastics is the ability to adjust the polymers' property profile within wide ranges. Accordingly, polymer manufacturers and converters developed a large number of inexpensive materials of variable properties. But here again, the very success of plastics has more than likely contributed to their downfall at the same time.

### *A Blessing and a Curse*

It is becoming increasingly evident that the beneficial processing and service properties come with ecological disadvantages and difficulties in environmentally sound disposal. For example, with chemical resistance in use comes lasting durability after use and persistence in the environment; ease of processing and myriad shaping possibilities eventually lead to mountains of waste; and the wide availability of inexpensive grades of materials and additives makes it possible to tailor materials that ultimately hamper high-grade single-polymer recycling.

However, polymer materials will remain key to satisfying human needs in the future, and there is no alternative but



The motto of K2019, printed on a stand-up pouch (© Messe Düsseldorf/ctillmann)

to establish a circular economy for plastics. So, it was only logical that the circular economy, the main theme of this year's K2019 trade fair, was omnipresent –

at almost every booth in almost every hall and in every outdoor space. Discussions centered not so much on whether the circular economy would dominate »

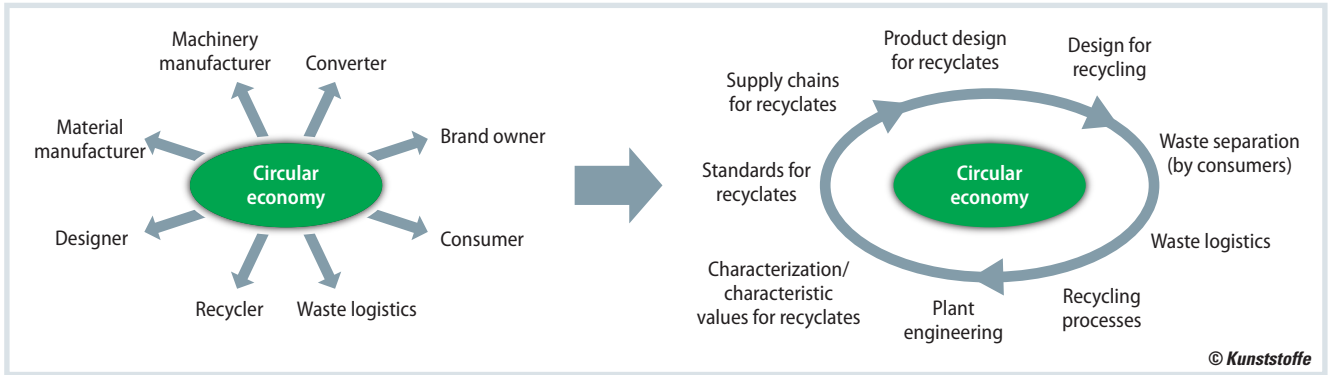


Fig. 1. All links in the value chain are responsible for maintaining the loop between product design and recycling (source: H.-J. Endres)

the plastics agenda in the future. Instead, they had already moved on to the next agenda item, with an emphasis very much on progressive questions as to “how”, “who” and “who with whom”.

There is nothing new about the idea of making plastics recycling a keystone of a circular economy. What is new, though, is an awareness that the responsibility rests not just with the entity doing the recycling or the disposing, but with every link in the value chain (Fig. 1). Instead of going it alone or producing “island solutions”, players from all areas are increasingly joining forces. In this way of thinking, the mantra “design for recycling” only makes sense if the resulting products are indeed recycled and if a product design exists for the resulting recycled materials so that they in turn can be used again.

### Wide-Ranging Commitment

Many of the platforms over the duration of K2019, such as the PlasticsEurope booth or the VDMA pavilion, were thronged with players presenting a wide range of solutions for a functioning circular economy. These included specific applications for more recycling-ready designs and the reuse of recycled materials. One example is detergent bottles that derive their color not from the material itself, but rather from shrink-fit sleeves that are easy to remove after use.

Also in evidence were numerous new networks, foundations, alliances and partnerships seeking to journey together away from linear economic thinking and toward a circular economy. These alliances, with the involvement of forward-looking material manufacturers and brand owners, are targeting consumer awareness, waste logistics and politics in

particular. Examples of regional and global foundations are the Ellen MacArthur Foundation, the Oak Foundation and The Ocean Cleanup.

They have all adopted different approaches and touch on different aspects of the circular economy. Since 2014, for example, the Oak Foundation has been working with numerous NGOs such as WWF, Zero Waste Europe, Greenpeace, Alliance to End Plastic Waste and Ocean Conservancy to reduce the number of disposable plastic products, while the Trash-Free Seas Alliance has set up an investment fund to drive waste management and recycling systems in Southeast Asia.

### Recycling as an Opportunity for the Plastics Industry

Furthermore, the circular economy is increasingly being viewed as an opportunity that the plastics industry must seize. Consequently, new alliances, company networks and partnerships are being forged among plastics manufacturers, brand owners, waste disposal companies and plastics recyclers with a view to establishing more recycling solutions or, in their capacity as technology leaders, to jointly developing appropriate solutions. Not uncommonly, it is start-ups, flushed with idealism, that are coming up with thought-provoking recycling solutions. Bureo, for example, recycles used fishing nets (Fig. 2).

Material manufacturers are increasingly tackling the end-of-life issues of plastic products, e.g. and revealing approaches that will promote the buildup of waste-logistics systems in developing countries. On the technical side, they are driving various chemical or feedstock recycling techniques. The acquisitions of re-

cycling companies mtm plastics by Borealis, QCP by LyondellBasell and Wipag GmbH by Albis illustrate how material manufacturers are integrating companies engaged in mechanical recycling into their structures.

### Digital Solutions for the Recycling Chain

Manufacturers of clean-up and recycling systems are continually working on optimizing the processes and on more intelligent machines capable of better analyzing the composition of input streams, of

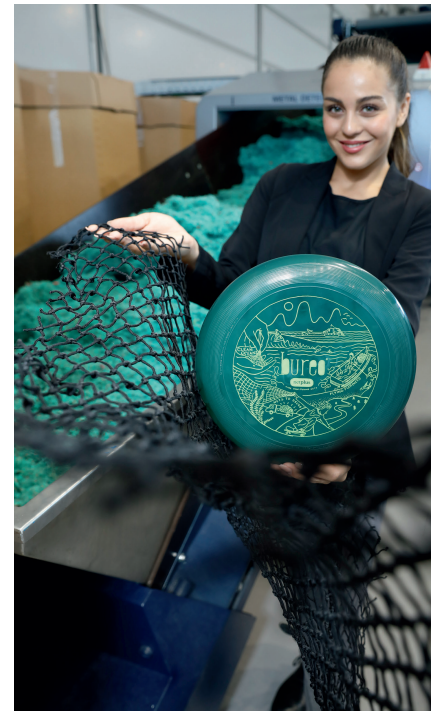


Fig. 2. In the recycling pavilion run by Erema, an injection molding machine from Engel produced slip boxes from processed fishing nets. The nets came from a collection point in Chile (© Messe Düsseldorf/ctillmann)

using inline diagnostics to reproducibly diagnose the processes occurring inside the machine, and of boosting the quality of the output streams. In addition, traditional machine manufacturers such as KraussMaffei, Reifenhäuser, and Erema have had the courage to step outside their comfort zone by developing new recycling approaches, e.g. trading platforms for suppliers and users of recycled materials ("Polymore"), and cell-phone apps for determining the content of recycled material, the recyclability of packaging ("cheqpass") and documenting the products' previous incarnation in the recyclers' input stream ("R-Cycle").

Innovative methods are also being further developed alongside plant technology in the field of recycling processes. Research institutes such as the Fraunhofer Institute for Process Engineering and Packaging (IVV) and recycling companies such as APK are looking into the question of how to broaden the input streams, and are increasingly exploring the recycling of engineering plastics or multilayer films with the use of solvents, i.e. through a combination of physical and chemical process steps aimed at recovering the polymers.

### Ideas from Research

New approaches from research were also presented at the trade show, specifically for marking plastics or packaging. For example, special marking techniques, such as Polysecure's tracer-based sorting technology for plastics, and printed holograms, make it possible to identify specific products or one's own material in the waste stream.

Another example of research aimed at optimizing recyclability is IR-compatible inks for coloring plastic products black (Fig. 3). The scientific community is developing black coatings that permit material identification by means of IR spectroscopy. Research is also ongoing in the field of recycling processes, e.g. waterless washing, and mobile recycling plants.

There is also a growing awareness of the need for corresponding quality standards for recycled materials. These are still very patchy at the moment, yet at the same time they also form the basis for quality assessment and for trading in high-quality recycled materials. For this reason, new partnerships are increasingly



**Fig. 3.** In collaboration with Ampacet, Henkel is working on implementing a solution for black plastic packaging that is fully recyclable (© Henkel)

being formed in this area with the involvement of the scientific community.

### Conclusion

This is just a selection from a plethora of positive and inspiring circular economy examples that were presented at K2019. In summary, it can be said that the recyclability of a plastic product is increasingly evolving into a performance indicator, alongside its mechanical properties, barrier properties or suitability for injection molding. K2019 showed that not only have politicians and consumers become sensitized, but that the plastics industry too is prepared to grapple with the task of developing recycling concepts just as successfully as it did when developing plastics and their processing technologies over the last 100 years.

With the trade fair now over, it is a matter of taking this positive momentum for sustainable economic activity back home with us. The circular economy represents an opportunity for the plastics industry and for society as a whole, because it will enable the needs of tomorrow to be met as sustainably and econ-

omically as possible without any loss of quality of life in either the industrialized or the newly industrializing and developing countries. The industrial nations can and should live up to their role as technology leaders here as well as promote the responsible use of plastics from an ecological and technical point of view. ■

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