Keeping Polypropylene RECYCLABLE

Professor Edward Kosior of Nextek reports

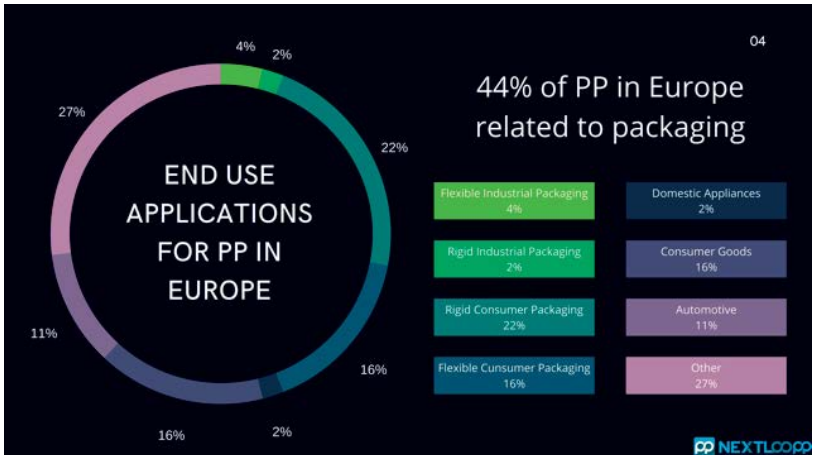
It is a little known fact that polypropylene (PP) plays a fundamental role in the way society meets many demanding applications, from surgical masks to automotive parts, PP also protects our foods, encases our yogurts, soups and ice creams and is contained in the films that wrap many of our fruits and vegetables.

While food-grade PP will claim to be recyclable, the fact is that to date there is no food-grade recycled PP available for re-use into new packaging – as a consequence, we still produce virgin PP for all food-grade requirements.

Yet in the UK alone, about 300,000tpa of PP is used in packaging of which about 70 per cent (210,000tpa) is food-grade packaging.

It is PP's versatility in processing that makes it complex to recycle as a food-grade polymer, yet it encases so many of our foods in its packaging.

Unlike PET and HDPE, that are widely used in foods and beverages as bottles, PP's prolific nature defines it as complex to recycle since recycling systems prefer to target uniform inputs, such as clear bottles of one specific polymer, and PP is made in many grades (homopolymer, copolymer and random copolymer) in many colours and many formats (pots, tubs and trays).



Perhaps the most alarming aspect is that most of these packages have never been designed to be recycled to date. PP has been the ultimate single-use plastic due to its unique and useful properties: low cost, transparent, rigid, tough, filmable, living-hinge, lightweight and easily printed. PP products come in a bewildering range of shapes and sizes, making recycling a challenge.

In fact, PP is currently facing an existential crisis, so much so that some countries are considering delisting it as recyclable.

New era for polypropylene

Now, however, PP is being given a new lease of life. Currently it makes up 20 per cent of global plastics production, a figure that is growing at six per cent. In 2018 56 million metric tons were produced valued at $97 billion (€82bn/£76bn) and it has been estimated that by 2025 we will be producing 83 million metric tons worth $147 billion (€125bn/£114bn). PP is present at a critical percentage of the packaging stream which means it can be readily recycled once it is collected.

As organisations around the world commit to stop inundating our environment with more plastic, we are seeing pledges to make plastic packaging reusable, recyclable or compostable. In fact most are heading for 25 per cent recycled content by 2025.

Now is not the time to ban PP, but rather

we need to turn it into the fantastic polymer resource it has the potential to be. The fact that it is currently either going to landfill or being re-used where other lesser polymers would suffice, is a waste of precious resources.

Why produce virgin PP when we have the knowledge and technology to efficiently identify, sort, decontaminate and recycle the current pots, trays and tubs that are being produced?

As a specialist in plastics recycling, this has in fact been one of the most pressing enquiries I have been receiving from retailers and brand owners alike. All attention is on unlocking the value in PP and turning it into high quality food-grade rPP, and this has been the key driver behind the multi-client Nextloopp project.

While the UK Plastics Tax that applies to packaging with less than 30 per cent recycled content has been a major incentive, we are also seeing a real surge of interest to face the plastics waste issue head on and find real, sustainable, long-term solutions to this crisis.

Nextloopp's mission is crafted out of this need and aims to create circular food-grade PP from post-consumer packaging. The goal is to establish a supply chain model for the collection, sorting and re-processing of food-grade PP packaging. From there we aim to efficiently manufacture high-quality and food-grade PP.

Over the next 24 months we will shift from pilot to large scale operations to eventually create rPP that can be used across a wide range of applications and products to meet recycled packaging targets.

Plug & play ready technologies

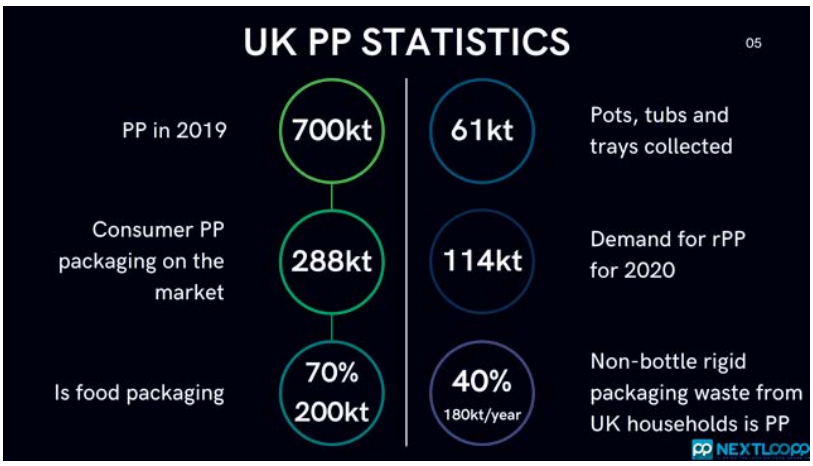
We already have the innovative technologies required to decontaminate and sort. The sorting technology alone is poised to transform the way recycling is managed as it has the potential to identify and sort all waste rapidly and efficiently and at very high purity.

The Prism marker based sorting technology has been proven at full speed even on very soiled and damaged packaging, furthermore Prism can be readily implemented in most recycling plants used in Europe and the US.

We also have developed powerful decontamination technologies with which we aim to re-define what is possible through reuse and recycling of PP. As such one of the first materials Nextloop will manufacture will be 'inert' grade PP.

Unique polymer type

We call it 'inert' as it will have no odour and no migration challenges for many products. This innovative, high-quality polymer will satisfy many demanding applications. ranging from the packaging sector to the cosmetics industry.



While our mission is to get more food-grade material back into food contact, the cutting-edge technology boosts the economics for the recycler through the creation of high value recycled PP for many non-food contact applications, including cosmetics.

Mechanical versus chemical

We now have the opportunity to transform the existing recycling and decontamination processes to boost economic efficiency and reduce cost, and mechanical recycling makes perfect sense to achieve this.

The ongoing debate around mechanical versus chemical recycling has divided many. However, chemical recycling has a higher carbon footprint than mechanical recycling and certainly requires more intensive capital per plant.

Furthermore, we are still some years away before any large scale plants are in operation and we need immediate, functional solutions. Mechanical recycling is the perfect low-cost, highly efficient solution particularly when we are using high quality feedstock.

Next steps

The next key steps towards producing food-grade rPP for re-use in consumer products are the establishment of EFSA and USFDA certification for the manufacturing processes. Nextloopp aims to develop new guidelines for food-grade recycling for brand owners, retailers and converters. There will be no middle measures to ensure that the loop for PP gets better with future cycles.

Creating and then closing the loop on food-grade PP has taken eight years of intense research and commercial trials – now we are poised to finally unlock the value of one of the most versatile polymers yet. FDT