Polypropylene – the perfect polymer for recycling

Polypropylene (PP) may be one of the most popular and versatile polymers to date, but it also happens to be the most problematic to recycle. So much so, in fact, that some countries are considering delisting it as recyclable. Yet PP could be coined the wonder plastic, as its high rigidity-to-weight ratio, strength, transparency and toughness means it is used everywhere from packaging to textiles and cars.

By Professor Edward Kosior (NEXTEK)

Even the surgical masks we are all wearing as well as many of our banknotes are made from polypropylene.

And it's this versatility that has meant PP has been missing from the recycling streams. The fact that PP is used in so many applications such as pots, tubs and trays and not predominantly in bottles like PET and HDPE is the reason it is hardly recycled, even in developed countries.

To make matters worse, to date there is no food-grade recycled PP available for recycling into new packaging. Yet in the UK alone some 300,000 tonnes per annum of PP is used in packaging, of which about 70% (210,000 tonnes) is food-grade packaging.

Now, however, the tide is turning on PP. Currently, PP makes up 20% of global plastics production and this figure is growing at a rate of 6% per annum. In 2018, 56 million metric tonnes were produced globally, valued at $97 billion, and it has been estimated that by 2025 we will be producing 83 million metric tonnes worth $147 billion. PP has finally reached a critical percentage of the packaging stream, which means it can be readily recycled once it is collected.

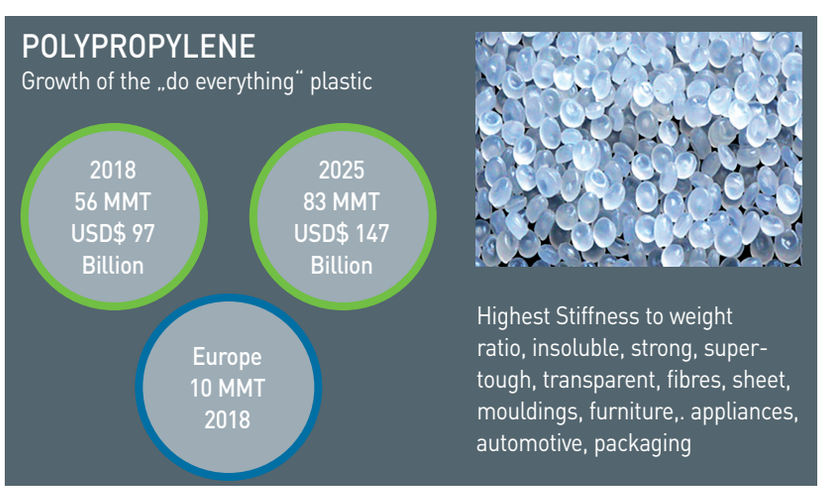
As organisations around the world commit to stop inundating our environment with more plastic, we are seeing pledges to make plastic packaging reusable, recyclable or compostable. In fact most are heading for 25% recycled content by 2025.

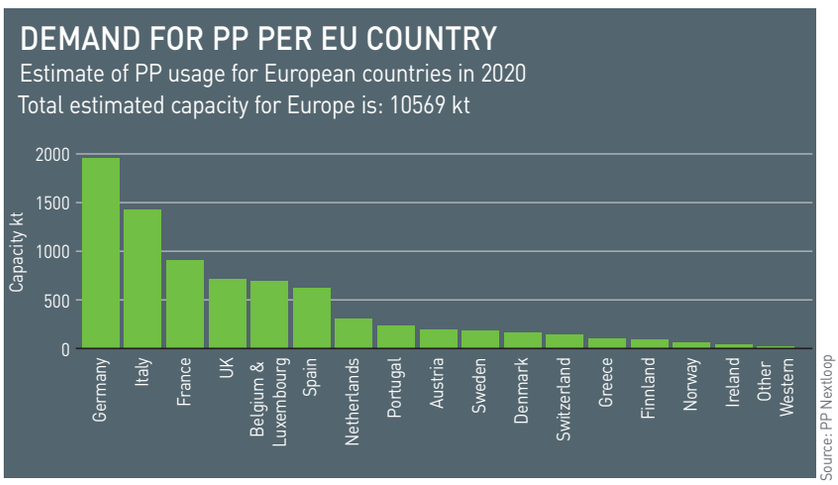
But before we decide that the likes of PP should be banned, we need to take into account that it could be turned into a fantastic polymer resource. The fact that it is currently either going to landfill or being reused, although other lesser polymers would suffice, is where we need to place the focus. It is a waste of precious energy to produce virgin PP when we have the wherewithal to efficiently identify, sort, decontaminate and recycle the pots, trays and tubs that are currently being produced.

And, yes, we do have the technology, which is plug-and-play ready, to finally close the loop on PP.

As a specialist in plastics recycling, one of the most pressing enquiries I regularly receive from retailers and brand owners alike relates to unlocking the value in PP and turning it into high-quality, food-grade rPP. This requirement has been the key driver behind the multi-client NEXTLOO-PP project.

Whilst the UK Plastics Tax that applies to packaging with less than 30% recycled





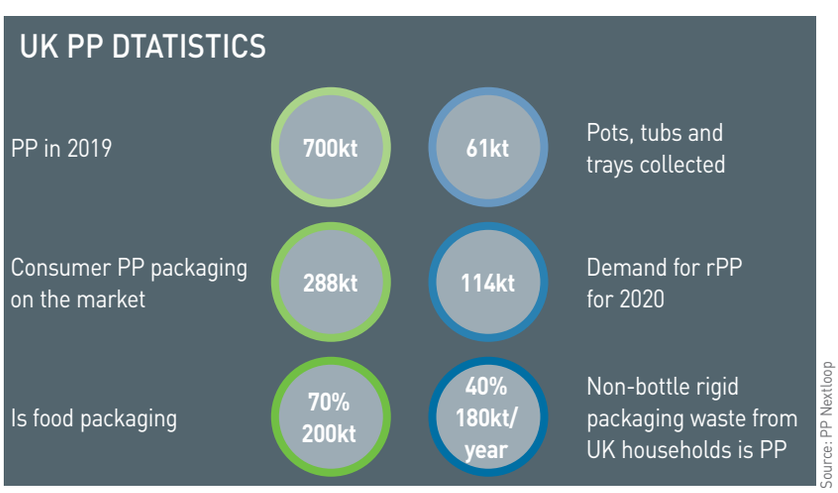
content has been a major incentive, we are also seeing a real appetite to face the plastics waste issue head on and find real, sustainable, long-term solutions to this crisis.

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 collecting, sorting and re-processing food-grade PP packaging. From there we aim to efficiently manufacture high-quality, food-grade PP.

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

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 a very high level of 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.

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



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

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

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 goal.

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

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plant. Furthermore, we are still some years away from seeing any large-scale plants going into 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.

The next key steps towards producing food-grade rPP for reuse 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.