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How can we achieve the circular economy of plastics recycling?

By Professor Edward Kosior, Nextek and Nextloop founder
December, 2021



Packaging
INSIGHTS

The circular economy of plastics recycling

By Professor Edward Kosior, Nextek and [Nextloop](#) founder

Slashing the world's greenhouse emissions now needs to define the future of pretty much every industry sector around the globe. From a plastics perspective, this means ensuring all future decisions are driven by CO₂e metrics, as it has been shown that material recovery from both recycling and waste streams could result in potential savings of 2.76 billion tons of CO₂ emissions.

So what needs to happen to achieve this?

Some countries, such as Taiwan and the Netherlands, have already achieved a zero-waste economy, but others are way behind in even committing, let alone achieving, such a goal. Certainly, we can no longer continue production without taking responsibility and, as such, we need to shift our global mindset to design for recycling.

This change in mindset means facing the inconvenient truth that we must drastically reduce the growth in plastics production.

According to a report by The Pew Trusts, [Breaking the Plastic Wave](#), the current value of global investments in the plastic industry between 2021 and 2040 could be reduced from US\$2.5 trillion (±US\$800 billion) to US\$1.2 trillion (±US\$300 billion). Achieving this reduction will require a substantial investment shift away from the production and conversion of virgin plastic.

Those organizations producing and using virgin plastics are faced with a transformational choice that could just tip the balance. Companies ahead of the curve will be those who opt to unlock value from a circular economy deriving revenue from the circulation of materials rather than the extraction and conversion of fossil fuels.

Recycling down CO₂ emissions

For some, this may sound like a hurdle too far. Yet, recyclables are the most impactful way to reduce our CO₂ emissions, as they reduce our reliance on the use and discard model that drives exporting, burning and landfilling of plastics and sets us on the more sustainable path of reusing, recycling and closing loops.



Slashing the world's GHGs is now top priority.

As it stands, at least 25% of packaging put on the market worldwide has not been designed for recycling. If we address the complex issue of food-grade packaging, there is still little to no recycling infrastructure built in this prolific polymer category.

Yet in the UK alone, 210,000 metric tons of food-grade polypropylene (PP) packaging is used in pots, tubs, trays and films each year (WRAP, 2018). An equivalent volume of recycled resin, containing 30% recycle, would save 63,000 metric tons of virgin plastics being produced and the equivalent volume of PP food waste packaging being reused to its highest purpose, rather than going to waste-to-energy, landfill or into lesser polymers.

Not all recycle is equal

This brings us to the tricky topic of recycled content ratios because not all recycled plastic is equal.

We need to refer to the intrinsic CO₂e footprint of the base plastics to ensure our choices have the smallest CO₂ footprint. Recycled HDPE and recycled PP have a 25% lower carbon footprint than recycled PET. Meanwhile, when comparing recycled content, a 30% recycled PP or high-density plastic has the same carbon footprint as 73% recycled PET.

So, while PET has been a true recycling success story, from a CO₂ perspective, we should be looking to recycle more HDPE and PP than PET.

This makes it imperative that we commercialize technologies to mechanically recycle LLDPE, HDPE and PP back into food-grade resins and products to create greater circularity and CO₂e savings.



In the UK, 210,000 metric tons of food-grade PP is used in packaging annually.

The sorting challenge

One of the challenges to achieving this is sorting, which is key to enhancing recycled plastics levels.

We are seeing a big focus and a lot of talk around a range of new technologies to facilitate sorting, from digital markers to spectroscopic and digital sorting. Rather than vying for popularity, the world would benefit from a combination of these technologies to tackle the multifaceted sorting issues, not to mention the retailer interfaces brand owners want.

We need to be driving rapid, already-deliverable improvements in packaging waste through mechanical recycling meshed with cutting-edge sorting and decontamination technologies.

At this stage the technologies that can help us achieve this have to be commercially proven and plug-and-play ready. As such, fluorescent markers that only require the addition of one layer of ink on the label to enable it to become fluorescent would already greatly boost the recycling of materials into food and non-food applications.

Furthermore, an inexpensive and simple retrofit to the existing equipment in materials recovery facilities will detect these fluorescent labels, as recent trials at Tomra demonstrated. These trials delivered greater than 99.3% purity and over 99.9% purity in the second pass.



More efficient sorting is crucial to enhancing recycled plastics levels.

Decontamination the next crucial phase

However, the challenges don't stop there. Regardless of how waste is actually identified and sorted, we will only end up with a pile of well-sorted plastic that is of lower value unless it can be properly reused. This issue requires cutting-edge extrusion, filtration and decontamination.

If we are to make better use of our plastic packaging waste, we need to turn it back into high-quality recycled mono-polymers that can be reused in new products. Brand owners and retailers are [desperately short of food-grade recycled plastic](#).

If we create multiple sub-categories of packaging in response to the perception that sorting will have the capacity to create narrower fractions of materials, then the economics will diminish, and issues of cross-contamination will increase.

Decontamination is the next crucial phase to be able to turn our well-sorted waste into valuable recyclates such as food-grade recycled PP, food-grade recycled HDPE and food-grade recycled PET.

Brave new thinking

Achieving the vision of near-zero plastic waste requires technological advances, brave new thinking, innovative business models as well as accelerating upstream innovation.

It has taken nine years of intense research and commercial trials to achieve a powerful and unique decontamination process for food-grade recycled PP that is shortly going for EFSA and USFDA approval. This is in effect

the missing link that will finally close the loop on food-grade plastics that have been “missing-in-action” to date.

If we are to cut our CO2 emissions and stop the flow of plastic drifting into the oceans, we need to take a holistic and sustainable approach to manage our plastics consumption. We have managed to get a helicopter onto Mars, surely creating a circular solution for our plastics is well within our reach.

Carbon Footprint reductions for recycled plastics all plastics are not the same!

- vHDPE and vPP have a 70% lower CO2e than vPET
- rHDPE and rPP have a 25% lower CO2e than rPET
- 30%rPP/HDPE content has the same CO2e as 73% rPET content
- Its always more beneficial to recycle HDPE/PP than PET

