

# Better Plastics for Responsible Packaging!

Plastic is one of the most widely used, fastest growing material in the packaging industry. As of 2020, the global plastic packaging market was valued at around USD265 billion, accounting for around 35% of the total packaging industry. This market is projected to expand at a CAGR of 4.1% to USD315.5 billion in 2025. Plastic offers several advantages over other materials that make it a popular packaging material. Plastic packaging protects contents from air and water, and thus helps keep the contents fresh and hygienic for a longer time. Its light weight and relative inexpensiveness are aspects that raise its attractiveness as packaging material. Due to these attributes, plastic is also used in combination with other packaging materials, such as paper and metal.

The attributes that make plastic a preferred packaging material also make it an environmental hazard once the packaging is discarded. Due to its resistance to air, water and most solvents and acids, plastic takes a significantly long time to degrade as compared to materials such as paper, cloth, and cardboard. To address this challenge, the packaging industry is evolving continuously and has come up with several alternatives to limit the environmental impact of plastic packaging.



## 'Bio-Degradable Plastics'

### Are biodegradable, oxo-biodegradable, and compostable plastics the same?

Biodegradable plastics are manufactured from renewable materials such as cellulose and starch, or by using biodegradable additives that break down the molecular structure of plastic into water, carbon dioxide, and biomass over time with the help of micro-organisms. Oxo-biodegradable plastic achieves the same end purpose by mixing pro-degradant additives into the plastic during the extrusion process. The difference between the two is that oxo-biodegradable plastic does not require micro-organisms to break down. Compostable plastics are a sub-set of biodegradable plastics that can be completely composted at a standard industrial composting facility.



EPI Environmental Technologies, Inc. (EPI) of Canada has developed additives that break down the molecular structure of plastics and speed up the biodegradation process. EPI's Totally Degradable Plastic Additive™ (TDPA™) can be used to produce oxo-biodegradable plastic products such as bags, films, and single-use plastic. These products have the strength and characteristics of conventional plastics,

characteristics of conventional plastics, and can be reused and recycled in the existing recycling streams with other plastics.

Similarly, the German supermarket chain, Lidl, started introducing biodegradable and compostable bags at its Spanish outlets in 2020. The company tested the products in the Balearic Islands and has gradually started expanding the initiative across Spain.

 **'Recycled Plastics'**

Recycling plastic is one of the most efficient ways to limit the environmental impact of plastic waste and a key process in creating a circular economy. Several international brands have committed to using recycled plastics in their packaging.

For instance, FrieslandCampina, the Dutch dairy products manufacturer, announced it would start using 100% recycled PET bottles for its brands in the Netherlands, UK, Belgium, and Hungary from February 2021. The move is in line with the company's long-term goal of making its packaging a part of the circular economy. FrieslandCampina's shift to recycled PET bottles is expected to prevent production of 1.9 million kg of new plastic.

The company also introduced a new 'zipper' label designed to make it easier to remove from the bottle at the time of recycling.



Similarly, SABIC'S innovative TRUCIRCLE solutions has helped develop recycled flexible packaging for the food and beverages (F&B) industry. The product, developed through the combined efforts of Plastic Energy, SABIC, Sealed Air, Bradburys Cheese and Tesco, demonstrates that flexible plastics can be recycled continuously into food-grade packaging material. The new packaging will contain at least 30% recycled material obtained through the TRUCIRCLE process. This new pyrolysis-based recycling process addresses the limitations faced by traditional recycling processes when dealing with waste flexible plastics. SABIC is working with its value chain partners, DSM and UPM Biofuels, to expand the capabilities of the TRUCIRCLE process to recycle bio-based feedstock.





## 'Innovative Design for Closures'

As the focus on plastic recycling increases, one area that poses a different challenge is bottle caps and closures. The disposal and recycling guidelines for caps and closures are not clear, which leads to the risk of these items being improperly disposed. As a solution, packaging companies have sought to redesign their packaging to include tethered caps. The Aptar Group partnered with Nippon Closures to cross license the technology for tethered bottle closures. Flip Lid by Aptar is designed to keep the closure attached to the bottle throughout its lifecycle, thus ensuring the cap is disposed appropriately along with the bottle.



The EU issued Directive 2019/904 which mandates tethered caps for single-use beverage bottles. This ensures the caps are disposed appropriately along with the plastic bottle. Following this EU directive, UNITED CAPS, in partnership with LyondellBasell, formed the Alliance for Closure Tethering (ACT) to bring together players in the packaging industry to innovate and assess various tethering solutions that might be required.





## 'Endlessly Recyclable Plastic'

A significant drawback of plastic is that it can be recycled only a limited number of times. The quality of plastic generally degrades with each recycling, and once it degrades below a certain limit, it is disposed of in a landfill. As an answer to this challenge, the Lawrence Berkeley National Laboratory developed a new type of plastic that can be deconstructed into its molecular building blocks; this makes it identical to virgin resin in terms of quality and performance. Scientists have discovered that the degradation in quality is the impact of



additives used to make the plastics. They noted that polydiketoenamine (PDK), a type of polymer that causes this degradation, can be successfully separated from additives by dipping in a highly acidic solution that leaves behind the original monomer. The monomer reclaimed through this process is of high quality, and can be process into high-quality plastics. If the technology is successfully implemented and widely adopted, it would mean plastics can be recycled endlessly.



## 'Alternatives to Plastics: Bioplastics'



Plastic alternatives refer to materials that provide the same advantages and benefits as conventional plastic, but are more environment-friendly and sustainable. In most cases, the plastic manufactured through hydrocarbons is partially or entirely replaced with plant-based derivatives. Some of these innovations include plastic made from the residue of sugarcane, orange, banana peel, and starchy vegetable wastes. Production of bioplastics starts with the extraction of sugar from vegetable starch. Micro-organisms transform the sugar (mainly dextrose, glucose, and sucrose) into molecules of lactic acid, which then becomes the dimer or lactide. This lactide is purified and polymerized to form polylactic acid (PLA) without the usage of chemical solvents. The properties of PLA are similar to that of polypropylene (PP) and polyethylene terephthalate (PET), which makes PLA a good substitute for these conventional plastics.



## 'Alternatives to Plastics: Bioplastics'

Several companies have started replacing conventional plastic packaging with these alternatives as a means of promoting sustainability. For instance, the Agthia Group launched the Middle East's first plant-based water bottle in 2020. The bottle, and its cap, are made from special polymer obtained through the fermentation of plant sugars. The bottle is said to be entirely biodegradable and compostable.



Bagasse, a by-product of sugarcane processing, can be molded into packaging containers and bottles. Since it is made completely from sugarcane by-product, it is compostable. Fonterra of New Zealand recently launched a sugarcane-based bottle for its Anchor brand of milk. The sugarcane-based HDPE plastic is sourced from Brazil, while the bottles are manufactured in New Zealand.

Saltwater Brewery of the US developed a biodegradable, edible six-pack ring for its line of beer products. The rings are made from barley and wheat remnants, the by-products of the beer-brewing process. The packaging is edible and can be source of food for fish if it ends up in the ocean. Through this innovation, the company takes care of its waste management needs as well.



A UK-based start-up, Oohoo, developed an edible, seaweed-based packaging for water. The packaging is currently available in small sizes – similar to mouthfuls of water – that the consumer can eat. Since it is made of seaweed, it degrades quite fast and does not harm animals if they accidentally ingest it.





## ‘Alternatives to Plastics: Bioplastics’

Several other innovative plastic alternatives are being introduced that might significantly impact the future of plastic packaging. Other materials that can be used to make bio-plastics include corn starch; chitosan, made from prawn and crab shells; mushroom roots; and casein, the protein found in milk. These forms of bioplastics are still being developed and have seen some early success.

For instance, a French company, Lactips, developed a process to convert casein (milk protein) into pellets that can be used to create bioplastics. These pellets can be used to make different types of hard and soft materials that mimic plastics, but are completely biodegradable and water soluble. Lactips raised USD14 million in venture capital funding and plans to set up a 25,000-square-meter production facility. It has signed an agreement with the IMCD Group and BASF to market these pellets.



## ‘Limit Impact of Plastics on Environment’

Plastic is one of the most versatile materials invented in the twentieth century, due to which it found applications across activities and industries. Its properties – such as durability and resistance to natural elements – which make it an excellent packaging material, also make it an environmental hazard when disposed improperly. It is estimated that 300 million tonnes of plastic waste is generated every year, 80% of which ends up in landfills or even in the open. The continued relentless use of plastics is not sustainable for the planet. Governments and organizations worldwide are focusing on policies and methods to limit the amount of daily plastic consumption, especially that of single-use plastic.

“ *It is vital to cut the amount of plastic we use and rapidly transition to a circular economy.* ”  
(CEO – Unilever)

“Reduce, re-use, recycle” remains the mantra to achieve this end. However, as technology advances, innovative alternatives to plastics are being developed, which would further boost the move to sustainability, and help create a circular economy.

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