Plastics, Packaging and the Environment

By **Joe Genova**, Vice President at Poly Print

It is no doubt that packaging plays a vital role in our lives and modern society. It protects and keeps food safe throughout every stage of the distribution line and extends the shelf life of food products, which leads to less food waste and lower food cost. Flexible packaging is in fact the lightest form of packaging, accounting for just a small percentage of landfill waste. Despite these and many other benefits that food packaging provides, consumer perception of plastics, a chief component of many forms of flexible packaging, continues to be a problem. Plastics in packaging have received scrutiny for many years because food packaging is one of the most visible forms of waste, requiring a clean-up effort and infrastructure to handle what people see littered in the streets and filling our disposal bins. Many average consumers have no sense of the various intrinsic benefits that plastics in packaging provide and are therefore quick to blast them with negativity.

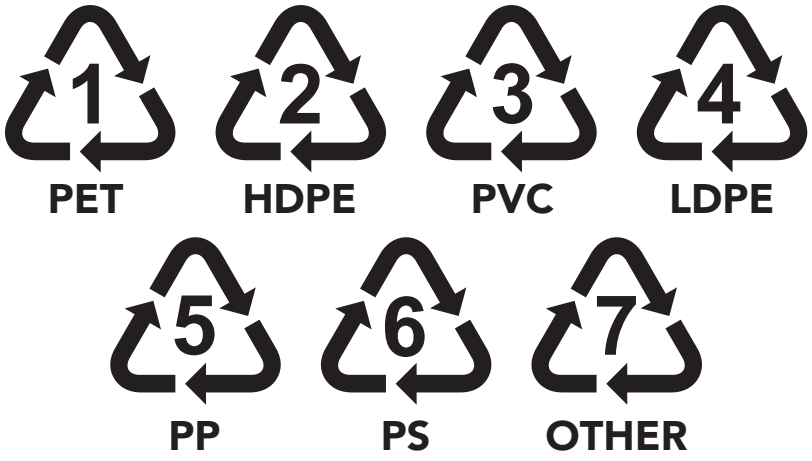
Interestingly, the initial public uprising about plastic packaging was not inspired by litter in our streets and oceans; rather, the consumer market began to demand transparency in food packaging. Consumers believed that they were being cheated by brands and retailers who concealed bad food in packaging like paperboard and aluminum; for this reason, transparent plastics in food packaging became popular. Despite this, plastic and paper packaging have had a history of negative consumer perception dating back to the 1960s: some states even imposed packaging taxes and bans on single-use packaging. Banning all plastics in packaging may seem like a simple solution even in today's market, but one of the main challenges of this approach has always been developing a suitable alternative.

In response to the negative public opinion surrounding plastics, the packaging industry

overall has recognized the value of developing recyclable, reusable and compostable forms of packaging. Each of these characteristics presents its own set of unique challenges, and ongoing industry efforts have led to many progressive solutions. For example, in the 1980s the plastic packaging industry created the Council for Solid Waste Solutions (CSWS), which eventually become the American Plastics Council (APC), later known as the Society of Plastics Industry (SPI) and today as the PIA (Plastics Industry Association). One task of this group was to educate the public about plastic packaging and its capabilities for recycling and reuse. To further this aim, members initiated pilot programs to demonstrate plastic's recyclability and collaborated with communities to develop curb-side pickup programs and collection centers, efforts that continue even three decades later.

Recycling

The most popular, logical and seemingly practical method for handling plastics is to recycle them after use, turning a used package into another useful consumer product. This course presents challenges, however, the most notable being the development of infrastructure to handle and sort the vast array of packaging plastics for recycling. To the average consumer, all plastics may look the same, but in reality, the packaging industry utilizes a mind-boggling array of distinct types of plastic, each used for a very specific purpose, depending on the application. To help distinguish between different types of plastics, the SPI developed a seven-category coding system based on the



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different resins in the plastic. This system was designed for mainly to categorize rigid plastics, as shown in the example above.

As technologies and plastics have developed, these seven resin code identifiers are sometimes not enough to fully identify what a package is made from; this is particularly true for multi-layer constructions and laminations.

In the modern food packaging environment, many industry innovations have solved complex food packaging issues, like extending a product's shelf life through controlled OTR, WVTR, aroma, and more. In addition, developments have been made to increase packaging production volume, enhance package sealing properties, and allow packages to withstand various processing and distribution methods. To this day, there is no "one-size fits all" substrate that can solve all of food packaging's complex issues. This fact has led to the development of multi-layer constructions and laminations, where combining two or more substrates will allow a package to attain all of the characteristics necessary to perform a specific application. While these developments and the combination of multiple substrates have solved many complex issues, the combination itself often negatively impacts the package's ability to be recycled. In other words, combining two different resin materials complicates, and in some cases even prohibits, a package from being recycled.

It used to be that when a package was recycled, it could not be used again for an identical purpose, due in large part to food safety concerns. However, there have been many developments in this area: by undergoing a proprietary process, some forms of post-consumer packaging can be recycled and a portion of the original package reused for its original intended purpose. For example, packaging made using PCR (Post-consumer recycled resin) is gaining popularity and has an array of benefits.

PCR (Post-Consumer Recycled) Resin

To state the obvious, recycled plastic is less wasteful than new

plastic, requiring less energy and fewer non-renewable resources to manufacture. The resin in recycled plastic gains a new life and a new use, which prevents it from permanently residing in a landfill.

When possible, food packagers should consider using materials made with PCR - an entire package does not need to be made with PCR to designate it "recycled packaging," but it is important to clearly state what percentage of the package is made with PCR.

Using PCR may not be a practical choice for some applications, so it is recommended to consult with the experts at Poly Print to understand if it is appropriate for your brand's application. Not all substrates can be made with PCR, but some of the common films that can are PET, LLDPE and OPP.

Source Reduction

While PCR may not be viable for a given application, another way to reduce overall waste is to reduce the overall amount of packaging that a product requires; while not a new concept, this idea is one that sometimes gets overlooked. Many brands have seized this opportunity, though, through relatively simple measures like eliminating folding cartons around the primary package (i.e., cereal), reducing substrate thickness (aka downgauging), and replacing rigid plastic containers with flexible alternatives.

In addition to reducing the overall cost of packaging, such measures have a direct positive impact on the environment: less material used in the manufacturing process means less material in the finished product, which ultimately leads to less material being thrown away. Various advancements in flexible packaging films have made these source reductions possible, and food packagers should try to consider them at least periodically.

Preformed pouches have also become a popular means of source reduction; primarily used in food packaging applications, pouches have gained quite a bit of traction in other applications such as coffee, pet food, household chemicals, powdered cleaners, detergents, soaps, salts, and garden care products, to name just a few. Pouches have successfully replaced rigid containers in many of these applications, due to the wide variety of pouch styles currently able to be manufactured.

Compostable Packaging

Compostable packaging has also earned a spot in the conversation; recent years have seen cutlery and numerous other single-use plastics, such as cups and plates, converted to a compostable form. The field of compostable packaging has many buzzwords, however, that can be distracting and/or confusing; just understanding what some of these words and phrases mean will clarify the compostable picture and explain how it fits into modern packaging.

- **Compostable:** For plastic to be considered compostable, it must be able to break down into carbon dioxide and water; it also needs to "look" like compost, should not produce any toxic material, and should be able to support plant life. Compostable items are made from plant materials such as corn, potato, cellulose, soy, and sugar. To earn the classification of "compostable," a package or any item must undergo specific testing, which is outlined by ASTM D6400. To meet this standard requires heat, the correct organic compounds, and the ability to disappear completely into the earth within 140 days. Right now, most packaging can only be composted at certified industrial composting facilities and will not compost naturally into the earth or a landfill.
- **Biodegradable:** Typically made from plants, foods, or animal sources, biodegradable products break down over a period of time through the action of a naturally occurring microorganism, such as bacteria, fungi, etc. The concept of biodegradable packaging has been around since the 1960s, but in practice is a complex challenge to solve. Packaging's primary purpose is protect and preserve the product inside. Over its lifetime, though, a flexible package is exposed to numerous external forces, such as manufacturing processes, distribution channels, handling, and consumer usage, before ultimately being disposed of. As a result, the challenge of creating a biodegradable package that can withstand all of this and still do its primary job has been difficult to solve. Recent developments in coatings have led to processes that will make a package biodegrade in a landfill, which sounds attractive, but this too is ultimately a complex process. Such landfills must be properly equipped to

incite biodegradation, which involves applying a chemical "wash" to packaging that will react chemically with the coating; only at that point would the plastic successfully decompose. Therefore, a more accurate term for this type of packaging might be "degradable," rather than "biodegradable," since it requires the application of an external (non-biological) catalyst to start the actual breaking-down process.

- **Degradable:** Degradable plastics are oil-based and break down through chemical reactions, so they can degrade in an anaerobic (non-oxygenated) environment into water, CO2, biomass, and trace elements. Anaerobic digestion is a series of processes in which microorganisms break down material to generate methane, which is captured and burnt for energy; the residual solids can then be used as compost.
- **Sustainable:** Generally applied to a manufacturing process or resource, the definition of sustainability may be summarized as "able to continue indefinitely with minimal negative impact." Sustainable resources are those whose collection and manufacture is not damaging to the environment, while sustainable manufacturing practices avoid the depletion of renewable resources and can safely continue for generations to come.
- **Renewable:** Used to describe resources gathered for use in manufacturing, this term applies to most natural resources, such as sunlight, wind, water, or plants; a more precise definition says that a renewable resource must be naturally replaced at the same rate or faster than humans consume it.
- **Carbon Footprint:** Generally applied to an individual person, event, group, or product, this term refers to the amount of greenhouse gasses emitted into the air as a result of various activities. Most relevant to the food packaging industry would be activities like the burning of fossil fuels and production/consumption of food and other manufactured goods, wood, roads, buildings, transportation, and other services. Typically expressed in terms of carbon dioxide (CO2) emissions, greenhouse gases in general are a major contributor to global warming.

The modern packaging environment also offers film substrates derived from cellulose and PLA (polylactic acid), which can make viable candidates for compostable packaging; advanced developments in these substrates have even made barrier and metallized versions available. These films are available in a diverse array of thicknesses and product variations, and we highly recommend consulting with an expert at Poly Print to determine the best substrate or combination of substrates for your application.

Although no film is perfect, and the recycling process is complex and riddled with challenges, recyclable packaging and sustainable manufacturing will be the way of the future. As global awareness increases and demand grows for a more sustainable planet, we can expect local and national governments to implement various recycling programs; film suppliers recognize this "green" movement and are making ongoing efforts to increase the renewability of all of their packaging films. ■