# The Many Challenges of Plastic Recycling

http://www.sustainablebrands.com/news_and_views/waste_not/tom_szaky/many_challenges_plastic_recycling

Upwards of 100 million tons of plastic are manufactured annually across the globe. That's 200 billion pounds of new material on-market every year, ready to be thermoformed, laminated, foamed and extruded into billions of products and packages. In the past decades, it has been widely adopted by industry, and plastic has become one of the most ubiquitous and versatile materials in the world – and, subsequently, one of the most difficult to reliably collect and recycle.

In the United States, our recovery rate for all plastic rests at 9 percent, according to the most recent Municipal Solid Waste report from the EPA. Most of what is recovered consists of PET and HDPE, as they clearly dominate the plastic recyclables market. Still, the recovery rates for PET and HDPE are only 31 percent and 28 percent, respectively. Even for our most valuable plastics, what are the challenges that prevent us from reaching higher overall recovery rates?

## Pigmented Plastic

If plastic products were consistent in their resin composition, color, transparency, weight and size, we probably wouldn't be having this conversation, as everything could be recycled together; this is more or less the case with aluminum, which enjoys the highest rates of global recycling. With millions of different plastic products and packages on the market, clearly this is not the case. Dyed and pigmented plastics, for example, can be troubling for materials recovery facilities (MRFs) as they have a much lower market value.

Clear plastics are always preferred in the recycled materials market, and have the highest material value. This is because transparent plastic can typically be dyed with greater flexibility. The next best is white, as its only limit is that it cannot become clear, but can be made into any other color. However, the colored plastics (especially opaque varieties) are often limited to become darker shades of the original dye, or black. For this reason, some recycling facilities consider certain pigmented plastics contaminants to the recycler stream, and subsequently dispose of them instead of recycle them. This issue is extenuated with the low cost of oil, as that makes it even harder for recyclers to compete with the price of virgin polymers.

Manufacturers who hope to ensure their post-consumer packaging can be properly recycled should consider the pigment and translucence of their bottles and containers. Even a PET container may not be recycled by some recycling facilities if it is colored and/or opaque.

## "Sustainable" Packaging

Many manufacturers have turned to packaging alternatives lauded for their eco-friendly or sustainable properties. Multilayered and other forms of lightweight packaging are one increasingly popular example. While source reduction is typically a great idea (and can certainly have practical applications), the light weighting trend does have some long-term side effects. For the most part, the sachets, flex-packs, and laminated plastic pouches manufacturers are turning to are universally considered non-recyclable. This is less of a concern when recycling rates are low (sending a lightweight pouch to landfill is better than sending a heavy rigid plastic with more mass), but once recycling rates start to increase, non-recyclable lightweight options make little sense from a sustainability perspective.

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Then there are bioplastics produced with renewable materials, such as plant biomass. While some varieties, especially the durable ones, can be regularly recycled alongside conventional plastics, others are viewed as contaminating materials and, as such, must be sent to landfill. Some even make claims of biodegradability, which can be misleading when you consider that many should typically be sent to industrial composting facilities to fully break down.

## Consumer Confusion

In the late 80s, the Society of the Plastics Industry developed the resin identification code (RIC) to help recycling facilities identify the plastics they were processing. These small codes, printed on plastic bottles, containers and packages, have helped many recycling facilities and MRFs collect, sort and process higher volumes of plastic materials with greater accuracy. This is great, but came with new drawbacks to consider.

The chief concern is that current RICs look strikingly similar to the universal recycling symbol, causing many consumers to mix non-recyclable plastics into the recycling bin. The responsibility then falls on the consumer to be aware of which resins are and are not accepted by their local municipal recycling program. In fact, many consumers have indicated that they are confused about which plastics they can and cannot recycle. Saturating MRFs with non-recyclable plastics can increase overhead sorting costs (only to be sent to landfill anyway).

There is good news ahead of us, however. In 2013, it was announced that revisions to the resin identification code would eliminate the use of the "chasing arrows" symbol in favor of an equilateral triangle, and some #7 plastics (or "Other" for miscellaneous resins) will have to identify the resin type in addition to the code. This could help limit some of the confusion for consumers, especially as the new revisions continue to be adopted by manufacturers moving forward.

GreenBlue's *How2Recycle* Label is another possible way forward, and is already being adopted by many of the world's largest brands and product manufacturers. By providing simple images and recycling instructions on each individual label, consumer-side confusion can be greatly mitigated. It all comes down to providing consumers with enough information to make the proper disposal choice for each component of the product or package.

## The Future of Plastic Recycling

In today's market, the only way to ensure plastics will be properly recycled is for manufacturers to make all of the above considerations when designing their products and packaging. This can be particularly challenging for products with strict packaging requirements, such as food or beverages that must use certain packaging formats to increase shelf life and preserve the product.

Recovery rates for plastic bottles are improving; single-stream recycling has helped increase recovery rates for many previously non-recycling communities; consumers are demanding packaging be made with more sustainable materials, and manufacturers are starting to listen; exciting innovations in plastic recycling are being developed; many states have enacted extended producer responsibility legislation for certain forms of waste; and a growing number of municipalities are banning certain difficult-to-recycle plastic products and are developing their own waste reduction and recycling goals initiatives.
We are on the right path toward better recovery rates and more efficient recycling processes.

**Plastic Contamination in Recycling**
From: https://www.brentwoodplastics.com/blog/topic/ric

Cradle-to-Cradle, Recyclability, Sustainability and reclamation have historically been low priorities in design considerations. The biggest obstacle to these goals is dissimilar materials in the same product. Just as form follows function, selection of raw materials teamed up to do a job is determined by the properties raw materials can deliver.

Recycle Across America correctly attributes the recycling collapse and crisis to contamination.
**"... the collapse of recycling is primarily due to high contamination levels in the recycling stream. Contamination cripples the economics of recycling. The process to remove contamination reduces profitability, driving up the cost of recyclables, thereby preventing many manufacturers from reusing recycled materials. As a result, they continue to deplete finite resources at alarming levels."**

Note how economic sustainability dovetails with environmental sustainability. The recycling business is tough at best because prices drop when there are more recycled materials are on the market. There is not enough margin to absorb the additional cost of sorting.


The more dissimilar materials are contained in a product, the more difficult it is to recycle for practical purposes. If a product contains more than one polymer, it should be labeled with a resin identification code (RIC) symbol 7.

So just make the product out of the same resin. Simple solution, right?
Problem: one resin can't deliver all the attributes needed.

An example of several resins in one product is a soft drink cup with a straw and lid. It has three different polymers with three different job descriptions: The stiff and pliable straw is polypropylene, the rigid lid is polystyrene and the paper is coated with low density polyethylene. One resin is not versatile enough to do all three jobs.

Often the resolution to a problem is meeting halfway. This mailing envelope solves the debate over paper or plastic. Instead of an all polyethylene #4 recyclable envelope, it is made from both polyethylene bubble pack and kraft paper. This brilliant example of an **unrecyclable #7 envelope** satisfies all demographics. Proof that it satisfies the demands of the consumer for green products is its ubiquitous presence in UPS stores.

The recycler gets the cast-offs for free. The cost of goods is the cost of hauling and sorting.
The bad news is that even if products could be made with only one resin, it would not be a solution.
The major obstacle to recycling is indifference and confusion from the general public.

## Examples of misuse of resin identification codes


This bag is comprised of about equal parts LDPE #4 and polypropylene #5. For practical purposes, it is not recyclable.


This bag is ostensibly high density polyethylene #2 HDPE. The mesh is #5 polypropylene and the film is low density polyethylene #4 LDPE.


This is an example of a properly executed resin identification code. The RIC #7 indicates the use of 2 dissimilar polymers which make it a #7

| Symbol | Polymer Name | Product Examples | | |
|---|---|---|---|---|
| 1 PETE | Polyethylene Terephthalate (PETE or PET) | • Soft drink bottles<br>• Water bottles<br>• Sports drink bottles<br>• Salad dressing bottles<br>• Vegetable oil bottles | • Peanut butter jars<br>• Pickle jars<br>• Jelly jars<br>• Prepared food trays<br>• Mouthwash bottles |  |
| 2 HDPE | High-density Polyethylene (HDPE) | • Milk jugs<br>• Juice bottles<br>• Yogurt tubs<br>• Butter tubs<br>• Cereal box liners | • Shampoo bottles<br>• Motor oil bottles<br>• Bleach/detergent bottles<br>• Household cleaner bottles<br>• Grocery bags |  |
| 3 V | Polyvinyl Chloride (PVC or V) | • Clear food packaging<br>• Wire/cable insulation<br>• Pipes/fittings<br>• Siding<br>• Flooring | • Fencing<br>• Window frames<br>• Shower curtains<br>• Lawn chairs<br>• Children's toys |  |
| 4 LDPE | Low-density Polyethylene (LDPE) | • Dry cleaning bags<br>• Bread bags<br>• Frozen food bags<br>• Squeezable bottles<br>• Wash bottles | • Dispensing bottles<br>• 6 pack rings<br>• Various molded laboratory equipment |  |
| 5 PP | Polypropylene (PP) | • Ketchup bottles<br>• Most yogurt tubs<br>• Syrup bottles<br>• Bottle caps<br>• Straws | • Dishware<br>• Medicine bottles<br>• Some auto parts<br>• Pails<br>• Packing tape |  |
| 6 PS | Polystyrene (PS) | • Disposable plates<br>• Disposable cutlery<br>• Cafeteria trays<br>• Meat trays<br>• Egg cartons | • Carry out containers<br>• Aspirin bottles<br>• CD/video cases<br>• Packaging peanuts<br>• Other Styrofoam products |  |
| 7 OTHER | Other Plastics (OTHER or O) | • 3/5 gallon water jugs<br>• Citrus juice bottles<br>• Plastic lumber<br>• Headlight lenses<br>• Safety glasses | • Gas containers<br>• Bullet proof materials<br>• Acrylic, nylon, polycarbonate<br>• Polylactic acid (a bioplastic)<br>• Combinations of different plastics |  |