



## **THE STORY OF RECYCLING – PART 1: AS ILLUSTRATED BY PLASTICS**

*Brought to you by the Education Committee*

The story of recycling is complex and always changing, which makes it a hard story to tell. Let's look at plastics – one of the most confusing of all recyclables – to try and tell the story of recycling.

### **From Petroleum to Plastic:**

Plastic comes from oil.

1. Petroleum is pumped out of the ground and then transported to a refinery, where it is refined into hundreds of different petroleum products, including fuel for our vehicles.
2. Ethane and Propane, two of those products and two main precursors to plastics, are “cracked” using very hot furnaces, into ethylene and propylene.
3. Catalysts are then added to create “fluff,” a powdery material. The technical term for ‘fluff’ is polymer – which is a long chain of molecules joined together. Depending on the base and the catalysts, the molecules can join to form many different polymers, with a variety of useful properties such as strength and flexibility.
4. The fluffy polymer is melted, cooled and then cut into pellets.
5. These pellets are shipped to customers, to be turned into bottles, tubs, toys or any of the thousands of other plastic products we use.

Plastics are always evolving as scientists and engineers experiment with the molecular structure of the polymers and manufacturers and processors add fillers and reinforcements to the stock.

### **Plastics Polymers**

There are two groups of polymers – thermoplastics and thermosets. Most plastic resins are thermoplastics, meaning the polymer can be heated and reformed repeatedly, a necessary requirement for recycling. The other plastics are thermosets, which are set in their ways, and cannot be reformed once heated.

### **Types of Plastics**

You've seen the symbols on the bottom of your plastic bottles and yogurt tubs - a recycling logo with a number inside. This symbol does not mean that the plastic is made from recycled material or is recyclable. It merely tells you what resin the product is made from. There are hundreds of types of resins, but they are grouped into 7 main categories for common use....

- #1 - PET: Polyethylene Terephthalate.** Includes beverage bottles (e.g. 2 liter pop bottles), frozen food boil-in-the-bag pouches and microwave food trays.
- #2 - HDPE: High Density Polyethylene.** Includes milk jugs, trash bags, detergent bottles, bleach bottles and aspirin bottles.
- #3 - PVC: Polyvinyl Chloride.** Includes cooking oil bottles and packaging around meat.
- #4 - LDPE: Low Density Polyethylene.** Includes grocery bags, bread bags and food wrap.
- #5 - PP: Polypropylene.** Includes margarine and yogurt tubs, syrup and shampoo bottles and straws.
- #6 - PS: Polystyrene (better known as Styrofoam).** Includes hot beverage cups, fast-food clamshell containers, and meat trays.

#7 – **OTHER.** There are many other plastics beyond the most common ones above, such as Nylon.

### **Molding Methods**

There are three main methods used to shape plastics into the forms we use.

With **extrusion molding**, heated plastic is forced through a mold (extruded) in the desired shape and then cooled. Plastic film and fibers are made in this way.

With **Injection molding**, heated plastic is injected into a mold under high pressure, and then cooled quickly. The mold is then opened and the final product is removed. Cups and yogurt tubs are made via injection molding.

**Blow molding** is used to form hollow products – including all those bottles we deal with in our industry. A partially shaped heated form is inserted in a mold and air is blown into it, forcing it to expand to the shape of a mold.

It is the difference between the blow-molded bottles and the extrusion-molded cups, and the additional chemicals in the resin, that same-number bottles and tubs can't be recycled together....

Next month, we will learn about the markets for recycling plastics.