Recycling & Stretch Blow Molding

INTRODUCTION:

Students watch videos describing the economic impact recycling has on a community and the recycling process for bottles and caps. Another video is about a company that uses recycled plastics to create new objects to sell.

CONCEPTS:

1. Students will know the process of recycling water bottles and bottle caps.
2. Students will understand that plastics are thermoplastic and can be reheated and reformed to create new products.

MATERIALS:

Videos (links below), cut up PETE bottles, HDPE flake from HOP kit, aluminum foil or pan, forceps, hotplate or oven.

SAFETY PRECAUTIONS

Be cautious when handling boiling water, and hot beaker. Wear protective clothing when handling melted plastic. Hot plastic can burn skin if improperly handled. The excessive smoke and fumes are harmful when melting plastic. This portion of the lesson should only be performed with proper ventilation (a fume hood is best) and under adult supervision.

VOCABULARY:

- **HDPE:** High-Density Polyethylene
- **PETE or PET:** Polyethylene Terephthalate
- **MRF**: Materials Recovery Facility
- **Pelletizing** is the process of compressing or molding a material into the shape of a **pellet**.
- **Polymer:** Polymer is a substance made up of a large number of smaller molecules that link together to form larger molecules.
- A **thermoplastic** polymer is a type of plastic that changes properties when heated and cooled. Thermoplastics become soft when heat is applied and have a smooth, hard finish when cooled. A thermoplastic can be reshaped when heated.
- **Thermoset**, or **thermosetting**, plastics are synthetic materials that strengthen when heated, but cannot be successfully remolded or reheated after their initial heat-forming. This is in contrast to thermoplastics, which soften when heated and harden and strengthen after cooling.
- **Stretch Blow Molding** is the process of inflating a hot, hollow, thermoplastic preform inside a closed **mold** so its shape conforms to that of the **mold** cavity. A wide variety of hollow parts, including plastic bottles, can be produced from many different plastics using this process.

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Recycling Bottles Videos

1. Your Bottle Means Jobs (2.48) **plasticsrecycling.org**
   The video highlights those working in the high-density polyethylene (HDPE) plastics recycling industry in the Carolinas, focusing on the North Carolina recycling supply chain. Featuring employees of NC companies such as ReCommunity, Plastic Revolutions, Crumpler Plastic Pipe, and Burt's Bees, the video shows that recycling is at the intersection of the environment and the economy.

2. Recycling Journey of a Plastic Cap (1.52) **plasticsrecycling.org**
   The video highlights how a typical plastic cap moves through the entire recycling process. In the video, there's a PET bottle is used in the flowchart to illustrate this process, but the same steps can be taken to recycle plastic caps on many other types of containers including: laundry detergent and other cleaning products, shampoo, conditioner, body wash, as well as condiment, snack, and other food bottles.

TEACHER DEMONSTRATION: The HOP Kit contains HDPE Flakes which is the end product of recycling HDPE plastics. The HDPE flakes and PETE bottle (cut up into small pieces) can be melted down and reformed into new objects.

Stretch Blow Molding Videos

Injecting hot PETE plastic into a metal mold and then cooling them produces test-tube-like objects called preforms. These machines produce preforms by the hundreds per minute. The preforms are shipped to the bottling companies. When the bottler wants to fill them with soda, the preform is heated to soften the plastic and then blown with air into the 1-liter size using another metal mold. This is called Stretch Blow Molding. Below are links to two very short videos demonstrating injection blow molding with preforms like the one in the HOP kit.

1. Injection Blow Molding
   https://www.youtube.com/watch?v=pN-MWbcE_vM

2. Blow Molding
   https://www.youtube.com/watch?v=NE4c1gwzPb4

TEACHER DEMONSTRATION: The HOP Kit contains a one liter preform. Since PETE is a thermoplastic, meaning it can be reheated and reused, one can heat the empty preform by pouring boiling water in it as it sits in a beaker so students can observe the deformation. The preform will soften and deform.