

Plastics

Where Do Plastics Come From?

Plastics used for packaging are mainly made from oil. They mainly entail carbon, hydrogen, oxygen and sometimes chlorine and nitrogen. There is a great variety of plastics with different properties. Just think about the difference there is between the plastic used for ship hulls and clean wrap.

There are two types of plastics:

- **Thermoplastics:** these plastics soften when heated and harden again when they cool down. It is e.g. the case for plastic bottles used to hold water.
- **Thermosetting products:** these plastics do not soften anymore once they have been formed. It is e.g. the case for Bakelite used for frying pan handles.

For packaging, the types of plastics mostly used are thermoplastics:

- **PET** (polyethylene terephthalate): coloured or clear water or soda bottles;
- **HDPE** (high density polyethylene): opaque or translucent milk bottles, shampoo bottles, foam bath bottles, etc.;
- **PS** (polystyrene): butter, margarine containers, or ice cream containers. Used as foam, PS can also be a protective material: packaging material for hi-fi equipment;
- **PP** (polypropylene): yogurt pots, flasks.

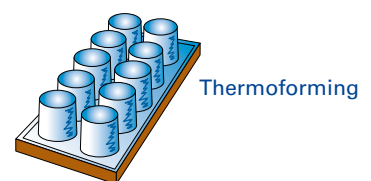
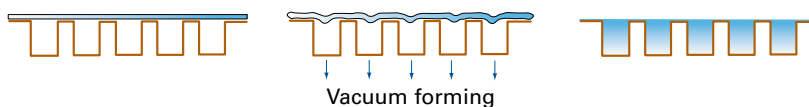
Why Are Plastics Used in Packaging?

Because they are light, resistant, air- and watertight, and inert, i.e. they do not react with the bodies they are in contact with. Plastics can be soft or stiff, formable or brittle, clear or opaque depending on the needs. Additionally, plastics are also easy to process.

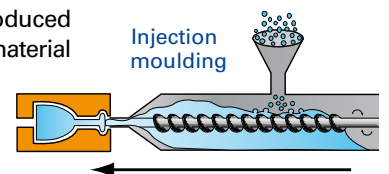
How Are Plastics Given a Shape?

There are different processes:

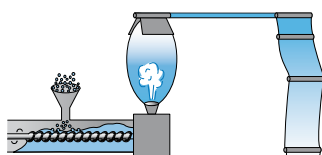
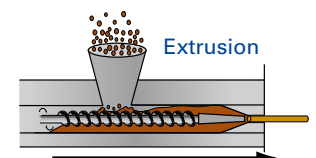
- **Thermoforming:** plastic arrives in plates; it is then soft-heated and inserted in moulds of simple shapes. Through vacuum forming, the product is distorted to match the shape of the mould. This technique is therefore used to produce hollow items, like yogurt pots or egg boxes.



- **Injection moulding:** the raw material in powder or granulated form is introduced into a heated cylinder in the centre of which a worm screw is rotating; the material is mixed and homogenized. The softened material, which has accumulated in front of the screw, is pushed into a sealed mould, which will then open and release the part. This technique is used to manufacture small dishes, beakers, toys, shoe soles, etc.



- **Extrusion:** this technique is similar to injection moulding except that the material is softened at the end of the worm screw and ejected through a die. A simple groove in the die will give flat products like boards or slats; a ring-shaped groove will give pipes or tubes and a T-shaped groove will provide valleys or sections for window frames.

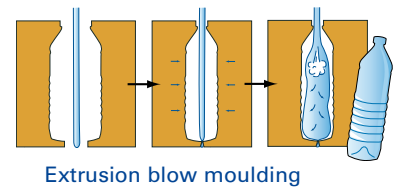


- **Film blowing:** if during the extrusion of a tube air is blown inside the tube at the level of the die, the plastic tube will turn into a bubble with thin walls. After cooling, the endless sleeve is cut and sealed at regular intervals to make plastic bags for instance.

Film blowing

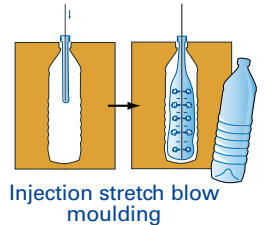
How are Plastic Bottles and Flasks Manufactured?

- Extrusion blow moulding:** this technique is generally used for the production of opaque flasks and bottles – milk bottles, detergent bottles, etc. Step one is the extrusion of a hot material tube that goes through an open mould. Then, the hollow mould closes on a section of the extruded tube and cuts it. Pressurized air is then blown into the tube that is still hot, which makes it stick to the walls of the mould. Once cooled off, the mould will release the end product, which will be a hollow object.



Extrusion blow moulding

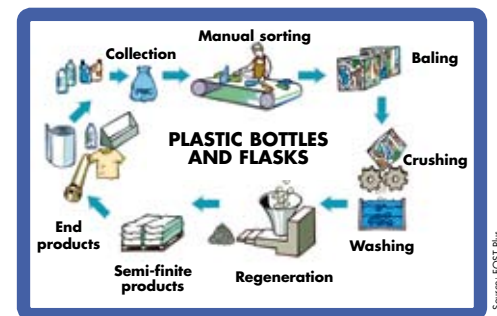
- Injection stretch blow moulding:** the process is in two steps.
 - First, a preform is produced – a small flask in the shape of a tube – using the injection process;
 - The preform heated at about 110°C is then inserted in a hollow mould whose shape corresponds to the shape of the finished bottle. The shaping of the bottle happens through a double simultaneous action: the stretching of the material using a blowpipe introduced in the neck of the preform and a transversal forming of the bottle by blowing compressed air in the preform, hence the name 'stretch blow moulding'. Once cooled off the bottle is ejected from the mould and has – because of the stretch blow process in the thermoelastic phase of the material – higher mechanical properties than the same bottle produced by extrusion blow moulding. The latter technique is therefore used for the production of sparkling beverage bottles and transparent detergent bottles. When reheated the bottle will go back to the size of the preform.



Injection stretch blow moulding

Why Recycle Plastics?

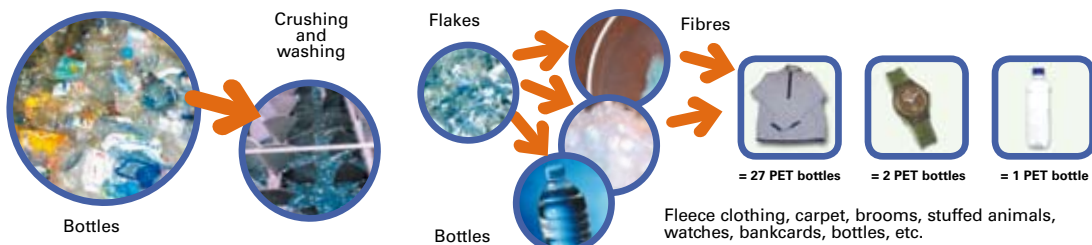
VALORLUX collects PET and HDPE bottles and flasks in blue bags. The content of the bags is sorted in the sorting centre to separate the different types of plastic that will then be sent to different recycling plants. There, the plastic bottles are cleaned up and their paper labels are removed. The bottles are then crushed and turned into flakes and granules, which will be used to make new items just as if they were brand new raw materials. Every ton of recycled plastic allows saving 700 to 800 kilos of crude oil. In 2006, VALORLUX contributed to the recycling of 3,542 tons of plastic packaging, which translates into saving some 2,656 tons of crude oil. Apart from recycling, plastics can also be recovered and turned into heating materials or chemical compounds. The thermal recovery of plastics like polyolefin (HDPE, PP, etc) generates heat that is equivalent to the one generated by domestic oil and its great advantage is not to generate any toxic gases in the process. The chemical recovery of plastics generates – depending on the level of temperature – the presence of reagents or catalysts, of hydrocarbons like paraffin, and of basic chemicals like alcohols, monomers, etc...



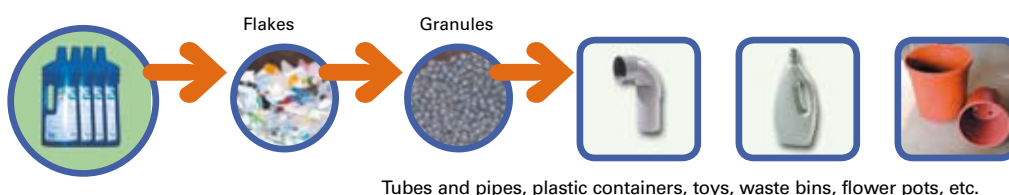
Source: FCST Plus

Plastics represent: 4% of the world's consumption of crude oil
20% of all packaging materials
17% of all domestic waste

What Can be Manufactured with Recycled PET?



What Can be Manufactured with Recycled HDPE?



Tubes and pipes, plastic containers, toys, waste bins, flower pots, etc.