

Recycling Plastics

Introduction

The main ingredients of plastics are the elements hydrogen and carbon. The hydrocarbons used to create plastics are most often obtained from fossil fuels such as crude oil and coal, both of which are finite resources, i.e. there is a limited amount and once it is all used, there is no more.

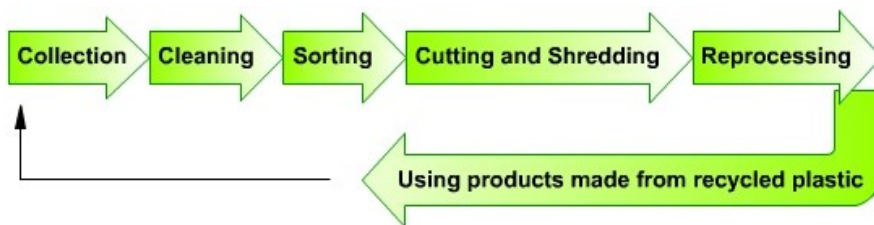
Plastics are used to make millions of tons of products each year. Some plastic products are used for years, others such as plastic packages and carrier bags are often used only once before they are discarded.

This creates millions of tons of plastic waste each year, most of which is non-biodegradable and remains intact for very long periods of time, littering the environment and filling land fill sites.

What is recycling?

Recycling is a strategy used to sustain our use of plastics and to reduce environmental pollution.

"Recycling plastics" is the process of reusing plastics to make new products. The plastics recycling process involves the following stages:



The Mobius Loop

The Mobius Loop is the universal symbol used to identify a product that may be recycled. The three arrows represent stages in recycling.

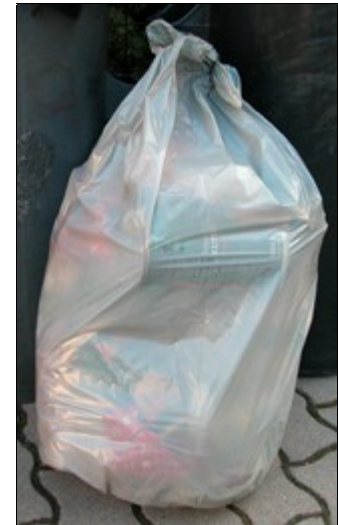
The **first arrow** represents collection of plastic waste, cleaning and sorting into the various types, i.e. all the high density polyethylene (HDPE) products together, all the polystyrene (PS) products together etc.

The **second arrow** represents the next stage in recycling, which is reprocessing waste plastic and using the material to make new products.

This involves cutting waste products into smaller pieces, then:

- using the plastic bits to charge plastic moulding machines, e.g. injection and extrusion moulding machines, which are used to make new products, or
- feeding the plastic pieces into an extruder, extruding plastic rods and cutting the rods into short lengths called pellets, then using the pellets as feed stock in plastics moulding machines, which are used to make new products.

The **third arrow** represents the last stage in recycling which is reuse, i.e. the newly formed plastic products, made from recycled plastic, must be used. If there is no demand for products made from recycled plastics, then there is not much point in recycling them.



Plastic rubbish bags - used only once.



Plastic ketchup bottle - used for a short period.



Plastic cup - could be used for years.

The reasons why we should recycle plastics

By recycling plastics we reduce the amount of:

- crude oil used to make plastic products
- energy used to convert oil into polymers
- carbon dioxide (CO₂) emissions and other waste gases produced during the conversion of oil into polymers
- plastic waste littering the countryside and in land fill sites.

Which plastics can be recycled?

All plastics can be recycled one way or another, however few places have the facilities to recycle all types of plastic. The most common types that are recycled are labelled so that they can be recognised easily.

Recycling symbols on plastic products

There are a variety of symbols used to indicate the type of polymer used in products. The symbols may include:

- a number from 1 to 7,
- various versions of the mobius loop that is made up of 3 arrows
- letters that abbreviate the name of the polymer.

The symbols illustrate below are the symbols most commonly used in Europe and the USA to indicate the type of polymer used in products. Various countries around the World have their own designs.

Polyethylene Terephthalate (PET or PETE)



A product with one of the symbols shown above on it is made from polyethylene terephthalate and *may be recycled*.



A product with this symbol on it is *made from recycled polyethylene terephthalate*

High Density Polyethylene (HDPE)



A product with one of the symbols shown above on it is made from high density polyethylene and *may be recycled*.



A product with this symbol on it is *made from recycled high density polyethylene*

Polyvinyl Chloride (PVC or V)



A product with one of the symbols shown above on it is made from polyvinyl chloride and *may be recycled*.



A product with this symbol on it is *made from recycled polyvinyl chloride*.

Low Density Polyethylene (LDPE)



A product with one of the symbols shown above on it is made from low density polyethylene and *may be recycled*.



A product with this symbol on it is *made from recycled low density polyethylene*.

Polypropylene (PP)



A product with one of the symbols shown above on it is made from polypropylene and *may be recycled*.



A product with this symbol on it is *made from recycled polypropylene*.

Polystyrene (PS)



A product with one of the symbols shown above on it is made from polystyrene and *may be recycled*.



A product with this symbol on it is *made from recycled polystyrene*.

Other



A product with one of the symbols shown above on it is made from a resin that is not categorised as resin 1, 2, 3, 4, 5, 6 or any combination of these resins and it *may be recycled*.

Variations



There are many other variations of the mobius loop recycling symbol used on products in various parts of the world.

Designs may have:

- more or less arrows than the usual three
- different arrow designs than the original design of the mobius loop
- letters inside the mobius loop indicating a polymer not covered by numbers 1 - 7
- special characters, e.g. Japanese
- illustrations of recyclable products and a mobius loop.

How are plastics recycled?

Waste plastic products go through the stages mentioned above, i.e. collection, cleaning, sorting, cutting and shredding, then reprocessing into new products.

Reprocessing is carried out using:

- extruders to form rods, tubes, pellets and shaped sections
- extrusion blow moulding techniques to make bottles and other hollow containers
- injection moulding machines
- compression moulding techniques using a heated plug and mould (yoke)
- plastic coating using the fluidised polymer powder or flock spraying technique
- rotational moulding
- blown film and calendaring processes to make plastic film.

Products made from recycled plastics

The quality of recycled plastic is not usually as good as new, virgin polymers that have not been used to make products before. Recycled plastic tends to be used for products that do not require polymer purity, such as:

- bags and sacks
- buckets and bins
- outdoor furniture etc.