

FROM WASTE TO VALUABLE RESOURCES

Chemical recycling explained

In chemical recycling, the negative fraction of mechanically recycled plastic waste goes through a process where polymers are broken down into individual building blocks.

HERE'S HOW IT WORKS

1. COLLECTION

Plastic waste is collected separately, with other plastic or mixed with metal and paper. It is then sorted based on the different types of plastics.



An example of negative fraction can be multi-layer packaging! Design for recycling is key to reducing this fraction.

Chemical recycling is more energy-intensive than mechanical recycling due to the nature of its process. When choosing the recycling route to take, environmental benefits, yield, efficiency, input/output quality of material, and final application need to be considered.

2. PRE-TREATMENT

Plastic waste undergoes steps similar to mechanical recycling, such as sorting, size reduction, washing and extrusion. Pre-treatment removes contaminants that could hinder the chemical recycling process.

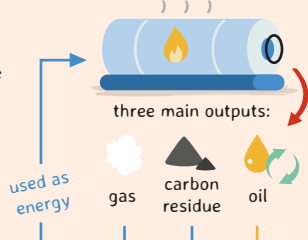
3. Chemical recycling technologies are diverse. The most common are:

3.1. PYROLYSIS

Pyrolysis is a thermochemical process used to convert plastic waste into different outputs, such as oil, gas and carbon residue.

a. Pyrolysis unit

Plastic waste enters a pyrolysis unit where the plastic molecular structure is broken down into molecules under controlled temperature and pressure conditions, as in an oven!



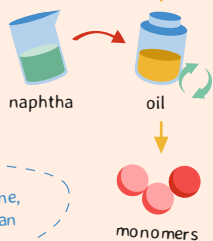
b. Purification

This step covers only the oil fraction which undergoes additional cleaning steps to remove non-targeted materials. One of the processes to purify it is hydrotreatment.



c. Cracking

The purified pyrolysis oil is thermally cracked to produce monomers, the building blocks for new plastics.



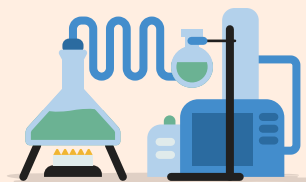
The other outputs of the cracker (e.g. methane, butadiene) will be used in products other than plastics such as paints, medicines, etc.

3.2. DEPOLYMERISATION

Depolymerisation is the process of converting a polymer into a monomer or a mixture of monomers for subsequent polymerisation.

Depolymerisation plant

Here the plastic is broken down into building blocks. At this step, colourants and additives can be removed.



4. POLYMERISATION

The different monomers head towards a polymerisation plant where they are put together as pieces of a puzzle to create new polymers, ready to be used in new plastic products!

