

Plastic – a valuable material

Plastics are truly multi-talented. Depending on the type of material, the manufacturing process and the additives used, the properties of the material can be adapted almost at will. Plastics can be for example, hard, elastic, break-proof, flexible, tear-proof, transparent, colored, temperature-resistant, heat-insulating, sound-absorbing, flame-retardant, UV-resistant or food-safe. This makes plastic a versatile material that we can no longer imagine our everyday lives without. Whether for living, medicine, packaging, clothing, communication, school, transportation or sport - plastic is present in almost every area of life in one way or another.

Plastics are too valuable to be used just once. When carelessly thrown away or not disposed properly, they are lost as a reusable material. However, to preserve resources, the environment and the climate, plastics should be used for as long as possible. At the end of a product's useful life the valuable material can be recovered and recycled if disposed of correctly.

Further information on the circular economy can be found in the "Window profile" and " top" modules.

WRITING TOOLS MADE FROM RECYLCED PLASTICS

The black caps of STABILO highlighters are an example of successful recycling of plastic waste. To achieve this, the polypropylene waste (PP) that STABILO generates during production is collected and recycled.

PP Profile:

NAME: polypropylene

TYPE: thermoplastic

PROPERTIES: solid, flammable, electrically insulating, ...

USE: synthetic fibers, packaging, small molded parts, ...

MATERIAL

is a substance from which something is made. Examples include glass, wood, metal and plastic. Recyclable materials are components of waste that can be reused as raw materials through recycling - such as used plastic packaging.

TASK

Look around the classroom and think about which objects would disappear if there were suddenly no more plastics. Enter the objects in a table. Think about what materials these products could be made from as an alternative (i.e. without plastic) and what advantages there would be if certain things were made of plastic and not another material.

Plastic object in the classroom	Alternative material	Advantage of the plastic product

What insights did you gain from this thought experiment? Where would the use of alternative materials make more sense than plastic and why? What significance does plastic have for you personally? Present your results to the class.

Recycling Options

There are various ways of returning used plastics to the economic cycle:

MATERIAL RECYCLING:

Plastic recycling is currently mainly carried out mechanically. The polymer structure of the plastic is retained.

1. First, the plastic waste is sorted by type during mechanical recycling.
2. they are then shredded, cleaned and dried.
3. The resulting material (e.g. regrind, flakes, shredded film, etc.) is melted down to produce granulate.
4. This granulate is used to manufacture new products.

Granulates are...

small plastic grains that are free flowing, like sand or gravel. In this form, the granulates can be easily transported, for example, in bags, from plastic manufacturers to the plastics processing industry. The granulates are utilized in the production of various plastic products.

Regranulate is a special form of granulate made from plastic waste.

CHEMICAL RECYCLING

In chemical recycling processes, plastic waste is broken down by (thermo-)chemical processes into chemical building blocks that can be reused to produce new plastics. This technology can be used when mechanical recycling is not possible - for example, in the case of contaminated plastics, multilayer packaging or composite plastics.

RECYCLING MACHINERIES

Mechanical recycling is based on innovative machines and systems that process the various types of plastic waste. Such source materials can be clean waste from plastics production, but also soiled plastic packaging from the Yellow Bag or Yellow Bin.

You can see how such mechanical recycling machines work in this video: <https://youtu.be/HdmPwXwMrsM>

This shredder-extruder machine from PURE LOOP produces regranulates for caps for STABILO highlighters.

Digital Watermarks

It is often challenging to reliably distinguish fully recyclable plastic packaging from poorly recyclable composite materials. However, precise waste sorting is crucial for producing high-quality recyclate. Digital watermarks are a relatively new technology aimed at improving sorting accuracy. These watermarks are markings applied to the surface of the packaging. Waste sorting systems can read the code and retrieve detailed information about the composition of the processed plastics, among other things.

TASK

Write a short newspaper article that introduces this new technology of digital watermarking.

RECYCLATE IS ...

an umbrella term that refers to 'secondary raw materials,' specifically plastics that are produced by recycling plastic waste.

The cycle of a recyclable shampoo bottle

This is how shampoo bottles with a digital watermark could be recycled in the future:

Further information on the cycle of a PET bottle can be found in the "PET-Preform" module



Digital watermarks in the plastics value chain.

Another life for plastic, because we care!

The Upper Austrian EREMA Group is the world's number one in the development and production of plastics recycling machines. Founded in 1983, at a time when plastics recycling was still a marginal topic, the group now comprises seven companies with a total of 660 employees. Around 7,000 machines from EREMA are currently in operation in more than 100 countries worldwide. In the 2020/21 financial year, the EREMA Group generated a turnover of 250 million euros. The following interview with the CEO of EREMA Group GmbH, Manfred Hackl, provides a brief insight into the world of plastics recycling.

TASK

Read the interview with CEO Manfred Hackl.

- 1) Mark the technical terms used in the text and use the internet to clarify any unfamiliar terms.
- 2) Discuss phrases that you did not understand with others.
- 3) Which ideas and problems in plastics recycling are addressed? Write them down in keywords from the text.
- 4) Note down what you find particularly interesting in the text.

INTERVIEW MANFRED HACKL

What different recycling technologies are being developed in your company?

Our mission is "Another life for plastic. Because we care." This means that our technologies are aimed at processing plastic waste in such a way that the regranulate obtained at the end of the recycling process can be reused for the manufacture of plastic products, therefore closing plastic cycles. Depending on whether the source material is clean production waste, contaminated waste or food-grade PET packaging, this poses different challenges for the recycling process. For these different applications we produce the respective recycling machines.

How does Upper Austria compare to the rest of the world in the production of recycling technologies?

Upper Austria is unique when it comes to plastics know-how. In no other region in Europe is the entire value chain of the plastics industry so densely represented and consequently the know-how so concentrated. From raw material and recyclate manufacturers to mold and tool making, plastics mechanical engineering, plastics processing and research and development. The circular economy is only possible if all these players work together, which is what is happening here. This is why Upper Austria, as a model region for sustainable plastics solutions can become a role model for other regions in Europe and beyond.

To what extent do you think are sustainability and economy linked?

In our modern society, one cannot be separated from the other. Finding solutions for dealing with plastic waste is one of the great challenges of our time, but they must be ecologically and economically reasonable solutions. There is no point in producing recyclate from plastic waste for which there are no sales markets. In order to create such markets, we not only need suitable technical solutions, but also framework conditions that politicians must create, e.g. through legal requirements for the minimum use of recycled plastic in new products. However, sustainable management also means reinvesting in the company and keeping the needs of employees in mind.

What are sensible measures and solutions against climate change for a company?

This depends on the business area of the company, its size and other company-specific factors, so there is no general answer to this question. Basically, everyone is concerned with conserving natural resources and minimizing their ecological footprint. The EU has defined climate targets and countries and companies are now challenged to find solutions to achieve them.

CHANGE THE WORLD OF PETRA

In this video you can experience the circular economy interactively: <https://erema-group.com/kreislauf-wirtschaft-interaktiv-erleben>

Plastics-Teaching-Materials – Highlighter

The EREMA GROUP, based in Ansfelden (Upper Austria), develops solutions and builds machines and components for plastics recycling. This allows plastic products to be reused as raw materials for new products after use. This reduces waste, saves natural resources and protects the environment. Around 14.5 million tons of plastic are recycled worldwide at the plants of the internationally active group of companies per year. The group of 7 companies has around 660 employees. More information at www.erema-group.com

Apprenticeships at EREMA/ EREMA Group

- Electrical Engineer
- In-house logistics services clerk
- Office clerk
- Metalworking technician
- Machining technician

EREMA Group GmbH is currently training 22 apprentices in these professions.