

Today's lesson is on the types of plastic. The students will learn about the 7 main types of plastic, and common items that they are made of. We focus particularly on LDPE and HDPE, which are used in the plastic recycling machines.

We will then learn about microplastics, the different types and how they are made. The end of this lesson will involve students sorting the different plastic lids into their 2 type categories.

OVERVIEW

PLASTIC VARIES, DEPENDING ON
WHAT IT IS USED FOR

SOME IS FLEXIBLE, SOME IS RIGID

Plastic can vary in texture and flexibility, depending on what it is used for.

Some plastic is rigid, this includes things like chairs, tables, car parts, storage boxes, etc.

Some plastic is flexible, this includes things like fibres used in clothing, laminated sheets, plastic shopping bags.

The students can be asked to name any rigid or flexible plastics that they see in the classroom

TYPES OF PLASTIC



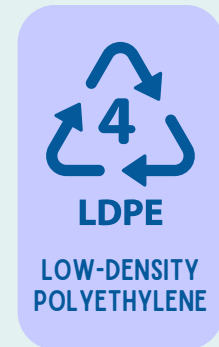
Not all plastic is created equal; it comes in various shapes, colors, and types, each serving different purposes.

Some plastics are reusable, while others are not due to their chemical composition. Likewise, some can be recycled, while others require alternative disposal methods.

In 1988, the Resin Identification Code (RIC) system was introduced by the Society of the Plastics Industry, categorising plastic resins into seven groups. The objective was to establish a consistent national system that promotes post-consumer plastic recycling. Over time, with minor adjustments, the RIC has become the globally recognised standard for classifying plastics.

HOW DOES THIS RELATE TO THE PLASTIC RECYCLING MACHINES?

- WE NEED TO SORT THE PLASTICS INTO SPECIFIC PLASTIC TYPES
- MOSTLY WE USE PLASTIC TYPE 2 (HDPE) AND TYPE 4 (LDPE)
- IT IS IMPORTANT TO SORT THEM BECAUSE THEY HAVE DIFFERENT MELTING TEMPERATURES



In our special plastic recycling machines, we use just two types of plastic. HDPE and LDPE. These are mostly coming from bottle lids, and there should be an example of the triangle with the number inside on the underside of the lid.

It is important that these are sorted prior to recycling as they have different melting temperatures.

HOW DO WE TELL THEM APART?

- OFTEN THEY ARE MARKED ON THE INSIDE OF THE LID
- LDPE (4), TEND TO BE MORE FLEXIBLE THAN HDPE (2)
- LIDS MADE UP OF LDPE (4) TEND TO BE FOUND ON MILK BOTTLES, HDPE (2) LIDS ARE FOUND ON SOFT DRINK BOTTLES



Here, we can show examples to the class, and get them to pass them around.

BUT SOME PLASTICS CAN ALSO BE MIXED TOGETHER

**SOMETIMES IT IS HARD TO TELL WHICH TYPE OF PLASTIC IT IS,
ESPECIALLY IF IT'S NOT MARKED, OR HAS BEEN WEATHERED
WHILE IN THE OCEAN**

**IT'S OKAY IF THEY DO GET MIXED UP SOMETIMES, BUT IF WE
CAN AVOID MIXING THE PLASTIC TYPES, THE MACHINES WILL
WORK BETTER**

Sometimes it is hard to tell which type of plastic it is, especially if it's not marked, or has been weathered while in the ocean.

It is okay if they do get mixed up sometimes, but if we can avoid mixing the plastic types, the machines will work better, and the items made will be smoother and a better quality.

DISCUSSION POINTS

WHAT OTHER TYPES OF PLASTICS ARE COMMON?

WHAT OTHER TYPES OF PLASTIC MAY WORK IN THE PLASTIC RECYCLING MACHINES?

Students can be asked what type of plastics they think are the most common.

What other types of plastics do the students think should be recycled? Perhaps the ones that are larger and common would be a good place to start?



WHAT ARE MICROPLASTICS?

In the next part of this lesson students are going to learn about microplastics.

Begin by asking the students if they know what microplastics are?

Ask them if they can think of any types of microplastic?

DEFINITION OF MICROPLASTIC

PLASTIC LESS THAN 5_{MM}

Microplastics are tiny pieces of plastic that are less than 5mm in size. The upper size category of microplastics can be seen with a naked eye, while the lower size category likely requires a microscope.

There are some difference in the scientific world as to the smallest size a microplastic can get before it is termed a 'nano plastic'. But the general consensus is that this is 1 micron in size. Which is 1/1000 of a millimetre. Tiny!

TYPES OF MICROPLASTIC

PRIMARY MICROPLASTIC

PLASTIC PIECES THAT WHEN PRODUCED ARE <5MM



SECONDARY MICROPLASTIC

PLASTIC PIECES THAT BREAKDOWN INTO MICROPLASTICS



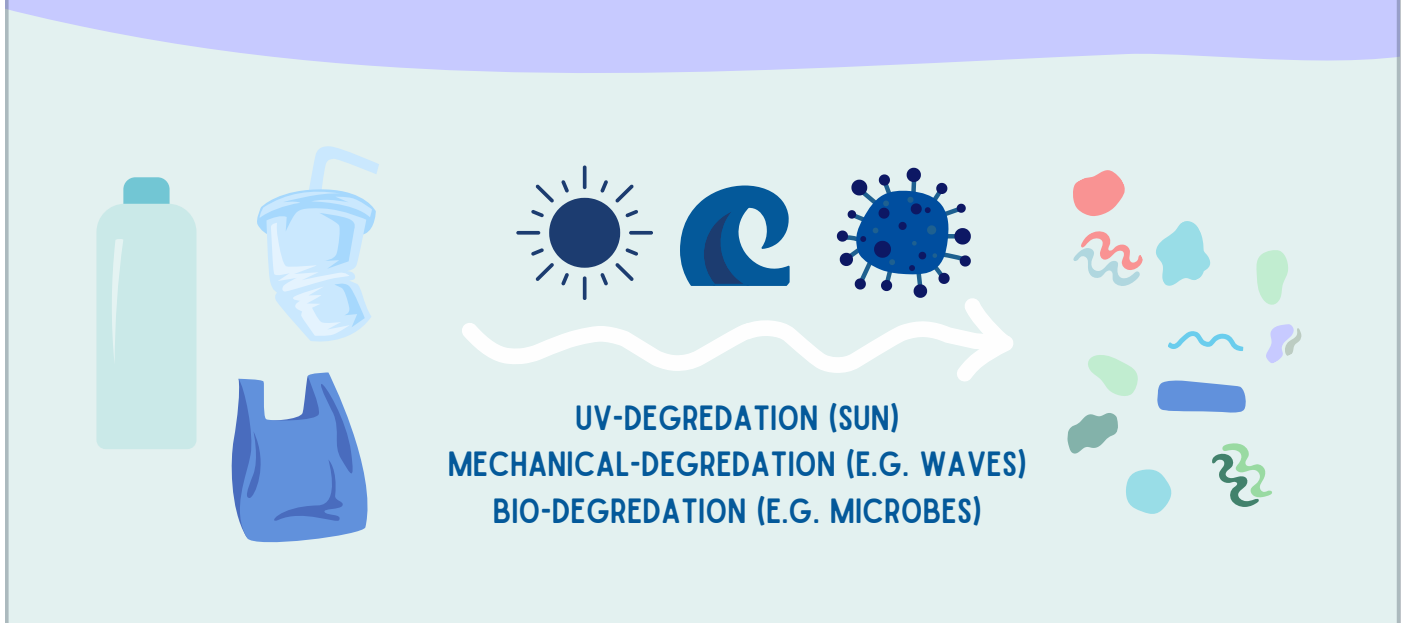
Microplastics are classically broken up into two main types. This is primary microplastics and secondary microplastics. The two groupings are typically a reflection of how the microplastics are created.

Primary microplastics are manufactured to be that size. They are produced as microplastics. This includes things like beads, glitter, microbeads in cosmetics and nurdles.

Nurdles are the building blocks for most plastic items. Nurdles are melted down and made into many plastic items, from clothes to cars, food wrappers to artificial Christmas trees. It takes around 600 nurdles to make one plastic drink bottle.

Secondary microplastics are microplastics that used to be large pieces of plastic but have been broken down into smaller pieces. We will learn more about this process on the next slide.

MICROPLASTIC DEGRADING



When large bits of plastic enter the environment, they can break down (or degrade) in 3 main ways.

The first is through UV-degradation which is when sunlight hits the plastic and over time makes it more brittle, eventually breaking.

The second is through mechanical degradation, when a force such as a wave hits the plastic and eventually breaks down.

The third is through bio-degradation. During bio-degradation, microorganisms like bacteria and fungi feed on plastic materials, breaking them down into smaller parts.

Students could be asked to think about how these processes occur in the marine environment. Could all three be occurring at once? Will this change the speed at which the plastics are broken into microplastics?

All three of these degradation processes require time. Commonly, in the marine environment all three processes can occur at the same time.

TYPES OF MICROPLASTICS FOUND



Microplastic pieces can be categorised into 5 main types. Fragments, foam, filaments, film and pellets.

Students can be asked to think about what type of plastic may originally have made up the microplastic. Below, we have included examples of each, to help guide the student answers.

Fragments originate from the breakdown of larger hard plastic objects, like bottles or containers. These fragments can take various shapes and sizes, often with irregular edges. Fragments are hard pieces of plastic.

Foam are expanded plastic foam materials, like foam cups, packaging, and insulation. These particles are lightweight and will compress if squeezed.

Filaments are strands of synthetic materials, commonly polyester, nylon, and other textile-related plastics. These tiny threads shed from clothing, textiles, and fabrics during washing and wear.

Film originate from larger soft plastic materials, such as plastic bags and packaging. They are typically thin and flexible, resembling miniature sheets or films of plastic.

Pellets are small, bead-like plastic particles often used as raw materials in plastic production.

MICROPLASTIC IN THE ENVIRONMENT

MICROPLASTICS ARE EVERYWHERE, THEY HAVE BEEN FOUND IN THE MARIANA TRENCH,
ANTARCTICA, AND EVEN IN THE CLOUDS...



MICROPLASTIC ON THE BEACH IN WANUWUY (CAPE ARNHEM) AND DHAMBALIYA (BREMER ISLAND)

Microplastics have been now documented pretty much everywhere on the planet.

This includes in the deepest ocean trenches (the Mariana Trench is more than 11km deep), and the ice in Antarctica.

If students have learnt about the water cycle, here is a great place to tie in that evaporation means that microplastics can now also be found in the clouds.

Here are some examples of microplastics found on beaches around NE Arnhem Land.

HOW MICROPLASTICS AFFECT YOUR HEALTH



This video can be played to provide another style of learning for the students. Audio will be required, although there are audio cues. The video goes for 2 minutes.

https://www.youtube.com/watch?v=aiEBEGKQp_I

PRACTICAL: SORT PLASTICS INTO DIFFERENT GROUPS

- 1. SORT INTO COLOURS**
- 2. SORT INTO PLASTIC TYPES (2 AND 4)**

**CALL TO ACTION:
KEEP COLLECTING PLASTIC**
**PLEASE CONTINUE COLLECTING PLASTIC
BOTTLE LIDS, BREAD TAGS ETC.**

Today's practical aspect of the lesson will involve sorting plastic lids into different plastic types and colours.

Students can choose what colour break downs they would like to use. Typically we suggest red, blue, green, yellow, orange, white and black. Any colours that don't fit in these categories can go into a mixed box.

Sort the plastics into LDPE and HDPE, based on triangle number on the bottom.

CALL TO ACTION. Ask students to continue collecting bottle lids for the machines.