KEY INFORMATION ON PLASTIC PELLETS

Cedre

General characteristics

Plastic pellets, also referred to as pre-production plastic pellets, plastic resin pellets, or more commonly as "nurdles", are typically between 0.01 mm and 1 cm in size.

General definition of plastic pellets: raw material used in the plastics processing industry to produce all types of plastic objects.

Global annual production: between **300 and 400 million tonnes**.

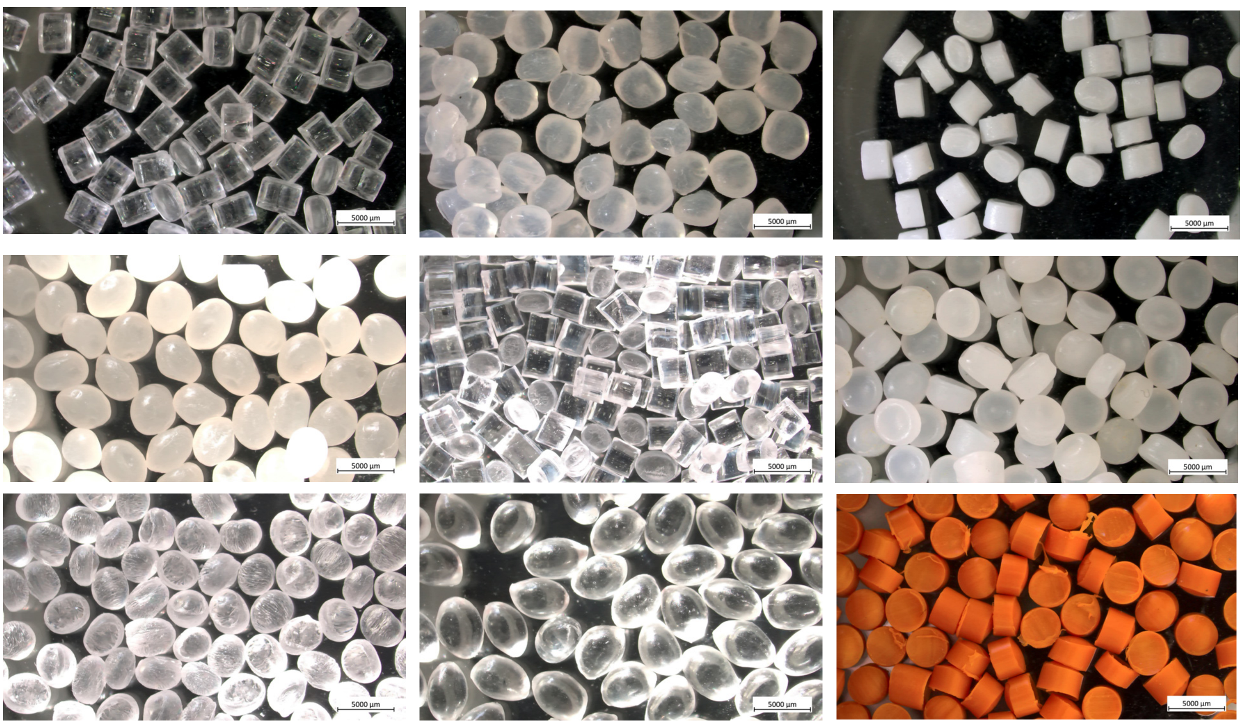
The majority of pre-production plastics come in the form of **pellets**, generally **2 to 5 mm** in diameter.

Pre-production plastic pellets exist in a **wide range of shapes and colours**.

Composition of plastic pellets = **Polymer** (~90%) + **Chemical additives** (~10%).
More than 10,000 different additives are used by the plastics industry.

Six main polymers (>80% of total annual production):

- low density polyethylene (LDPE),
- high density polyethylene (HDPE),
- polypropylene (PP),
- polyethylene terephthalate (PET),
- polystyrene (PS) and expanded polystyrene (EPS),
- polyvinyl chloride (PVC).



Photographs illustrating the variety of shapes and colours of plastic pellets

Transport of plastic pellets:

- 4 modes:

25 kg bags on a palette of 60 bags	500-1300 kg octabins
500-1000 kg big bags	in bulk in trucks/containers

one 25 kg bag contains approximately **1 million pellets**.

- Transport by land (road or rail) and sea.

Plastic pellets are **classified as "non-hazardous materials"** with the exception of **pre-expanded pellets classified as "miscellaneous hazardous materials"** (class 9) for rail/road transport (ADR/RID), air transport (IATA) and maritime shipping (IMDG) as their manufacturing method leads to the potential emission of pentane that can create a flammable atmosphere.

Bag (up 20 kg) to be stacked on pallets, with a total of up to 1500 kg per pallet

Octabin (contents 500-1300 kg)

Big bag (contents 500-1000 kg)

Containers (up to 25 MT)

Silo truck (up to 35 MT)

Main packaging types used for plastic pellets

Releases into the environment

Operational losses occur, caused by handling incidents in the supply and use chain (losses estimated by Eunomia at between 16,888 and 167,431 tonnes per year in 2018 in Europe). These operational losses into the environment cause ambient contamination of aquatic ecosystems; plastic pellets are omnipresent in coastal areas and certain rivers.

Accidental losses also occur, causing sporadic but potentially large-scale releases (e.g. road or rail accidents, loss of containers overboard, container ship incidents). Example: Loss of 11,000 tonnes of plastic pellets in the coastal waters of Sri Lanka after the *MV X-Press Pearl* sank in 2021.

There are currently no international or European regulations that specifically address the loss of plastic pellets throughout the supply and use chain, either at industrial sites or during transport. Yet some national regulations exist, at least in Europe.

Plastic pellets (with the exception of pre-expanded pellets, identified as class 9 of the IMDG Code) are not considered hazardous for maritime transport and do not come under international maritime conventions (e.g. MARPOL, HNS). They are therefore not covered by strict rules relating to their packaging, labelling, or declaration in transport documents. The International Maritime Organization has been called upon to address this issue.

Properties and impacts

Plastic pellets are **solid, persistent, non-soluble, non-emulsifiable, non-dispersible, non-evaporating, non-biodegradable, non-adhesive and, for the most part, floating products**.

Given their tendency to float, plastic pellets can travel long distances in aquatic environments, and potentially across borders. On the water, the drift of floating plastic pellets is mainly influenced by the force of the winds and currents.

On land and on beaches, the spread of plastic pellets is influenced by the winds, tides and run-off, which may carry them to watercourses (causing the pellets to spread further) or to vegetated areas (where they become trapped). Plastic pellets can be buried in soft substrates or sediment, up to several tens of centimetres deep, under the influence of wind, tides and trampling.

Three types of suspected environmental impacts can be identified:

1. **physical impacts on habitats**;
2. **ecotoxicological impacts on ecosystems**
3. **risk of colonisation and transfer of species** (e.g. colonisation of plastic pellets by invasive and pathogenic species).

These suggested impacts are taken from laboratory-based studies; as yet no in situ study has revealed the environmental impacts of plastic pellets.

There is currently **no available data on socio-economic impacts** caused by plastic pellet pollution, but several potential impacts have been identified, in particular economic impacts on local activities (e.g. beach closure, fishing bans, disturbance to aquaculture) and the impacts related to the visual deterioration of habitats.

Shoreline clean-up techniques

In the case of large-scale pollution by plastic pellets, **four techniques can easily be implemented**. These different techniques are complementary. It is important to note that the implementation of shoreline clean-up efforts is only effective and efficient in the case of significant quantities of plastic pellets. Past experience has led to the definition of various thresholds above which it would appear relevant to organise shoreline clean-up operations:

- observation of over 150 pellets/m² (method used in New Zealand, following the *MV Rena* incident);
- collection of over 50 g of plastic pellets by an operator in one day (method used on the coast of South Africa, following the *MSC Susanna* incident);
- collection of over 500 mL of plastic pellets by an operator in one day (method used on the coast of Norway, following the *Trans Carrier* incident).

1. **Manual recovery**: use of hand-held tools (e.g. shovels, buckets, brushes) to roughly recover large quantities of plastic pellets. Possible on all substrates (e.g. beaches, rocky shores, vegetated shores, roads)

Examples of manual recovery

2. **Collection by vacuuming**: use of portable vacuum cleaners (e.g. leaf vacuums, household and industrial vacuum cleaners) or vacuum vehicles. Possible on many substrates (e.g. beaches, riprap, vegetated shores, roads)

Examples of recovery by vacuuming.

3. **Screening**: screening involves using a mesh selected according to the size of the particles to be recovered. Screening is possible on different substrates such as fine-grain sand, earth and areas of silt and clay. This technique requires adaptations if the plastic pellets are on the strandline.

Examples of recovery by screening.

4. **Sink-float separation**: this technique draws on the difference in density between plastic pellets, seawater and sand, to recover plastic pellets at the surface while the sand will sink. It cannot be applied to plastic pellets with a density higher than that of seawater. Sink-float separation can be used as a stand-alone technique or in tandem with another recovery method (e.g. screening, vacuuming, manual recovery) to separate the plastic particles from other matter (e.g. sand, earth, gravel). This technique can be implemented at different scales: small (e.g. in buckets), medium (e.g. bins and large tubs) and large (e.g. trenches, watercourses, tanks set into the ground or pools).

Examples of recovery using sink-float separation

Cedre's expertise

2006
Launch of aquatic litter focus

2010
Launch of the French national shoreline litter monitoring programme

2011
Joining of the OSPAR Convention Intersessional Correspondence Group on Marine Litter
Beginning of Cedre's involvement in the MSFD, as a scientific expert

2016
Creation of the French national monitoring programme for microplastics on beaches

2017
Launch of the European CleanAtlantic project

2018
Launch of the European OceanWise project

2019
MICMAC project on plastic pollution in the Scattered Islands

2020
Launch of the French national monitoring programme for litter inputs from watercourses

2021
Franco-American project on coastal pollution of the North Atlantic

Mission in Sri Lanka at the request of the United Nations following the *MV X-Press Pearl* incident (spill of 11,000 tonnes of plastic pellets)

2022
Drafting of a report reviewing current knowledge about plastic pellet pollution

2023
Intervention in Loire-Atlantique and Vendée at the request of the French authorities after plastic pellets washed up on the French coastline in January 2023

Programme of tests to study the behaviour and chemical composition of plastic pellets, and possible recovery techniques

Cedre is mandated by the French Ministry of Ecological Transition and Territorial Cohesion to manage the national monitoring programme for litter (including plastic pellets) on the shoreline and inputs from watercourses and, in this capacity, collaborates with over forty partners.

Emergency hotline (24/7)
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