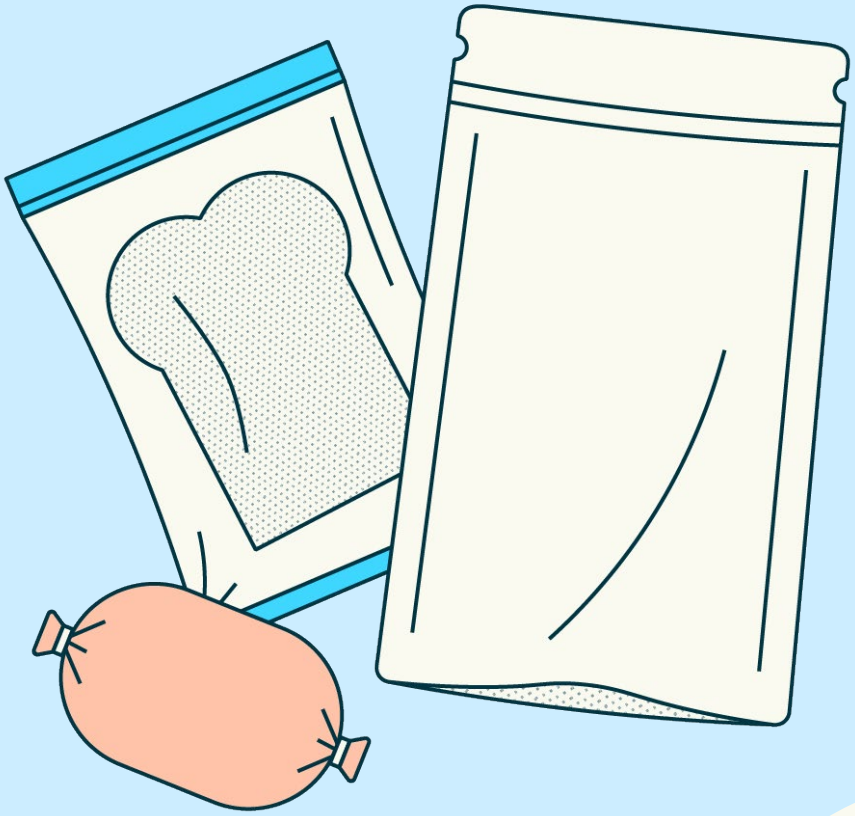
Recycle Check Flexible Plastic Packaging 2027

Background document



verpact

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Background document: Recycle Check – Flexible Plastic Packaging 2027
Publication date: September 2026

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The Recycle Checks are updated annually.
Check the website for the latest version.

Do you have any questions about a Recycle Check?
Please contact Verpact.

Verpact would like to thank trade associations, materials and packaging manufacturers, manufacturers and importers of packaged products, as well as sorters and recyclers, for their contributions to the development of the Recycle Checks.

Verpact has taken the utmost care in compiling this document. Should the document nevertheless contain an error or omission, we would be grateful if you could bring it to our attention.

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Part 1
Basic information

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1.1 Introduction

Recycle Checks help companies assess the recyclability of packaging. This report examines the current situation in the Netherlands with regard to collection, sorting and recycling, and the extent to which recovered materials can be reused.

Recycle Checks have been published for packaging made of flexible and rigid plastics, glass, beverage cartons, metal and paper and cardboard up to the 2026 edition. They have been published since 2018. From the 2027 edition onwards, there will only be Recycle Checks for flexible and rigid plastic packaging, which – where necessary – will be updated annually*, in line with current developments in the packaging supply chain. The remaining Recycle Checks will no longer be published from the 2027 edition onwards and are therefore no longer up to date.

If packaging is assessed as 'optimally recyclable' in the Recycle Check for both rigid and flexible plastic packaging, companies can apply for fee modulation. Fee modulation provides a discount on the waste management levy you pay to Verpact. The discount applies to recyclability, as well as to the use of recycled materials and bio-based drop-ins.

Are you obliged to pay a waste management levy to Verpact? Please check whether your packaging meets the conditions for fee modulation.

The Recycle Checks apply to packaging that ends up in household waste or in similar waste streams, such as waste from the hospitality sector, offices, shops and service providers. Recycle Checks can also be applied to packaging collected via a deposit-return scheme. Commercial waste that is not comparable to household waste is usually collected by waste management companies under separate arrangements. Different quality requirements and design rules often apply in such cases.

The user is asked a short series of questions about the material and about packaging components that affect collection, sorting and recycling. Additional information is provided in the background document for each question.

At the end, the answer becomes clear: the packaging is optimally recyclable, reasonably recyclable, limited recyclable or non-recyclable. This format reflects how well a package fares throughout the recycling process and the extent to which the material can be reused.

It is important to note that the Recycle Check does not guarantee that packaging will actually be recycled, nor is it a comprehensive sustainability assessment. It is a practical tool for assessing recyclability.

Recyclability is one of the factors that determines the sustainability of packaging. Other steps in the so-called R-ladder can also help to reduce environmental pressure. Generally speaking, when it comes to packaging products, it is a matter of striking a balance between protecting the packaged product, the quantity and complexity of the packaging materials, and the effort required to recycle the material (and, where necessary, to separate the materials). This can actually increase the environmental impact. To acquire better insight into this, the Sustainable Packaging Compass can be used.

Packaging can also have implications further down the supply chain, such as the formation of microplastics and the presence of unintentionally added substances (NIAS), particularly in food-contact materials. Scientific research is currently being carried out into this.** Where possible, these new insights have been incorporated into this version of the Recycle Check. In the (near) future), we expect more research to be published, which will be included in future updates of the Recycle Check.

* Pending European legislation.
** European Commission: Directorate-General for Health and Food Safety, ICF, Etienne, J., Bradbury, I., Jaskiewicz, K. et al., Study on sustainability in the context of food contact materials (FCM) with a view to a possible revision of the FCM legislation – Final report, Publications Office of the European Union, 2025, https://data.europa.eu/doi/10.2875/3789818

1.1.1 The Recycle Check

The Recycle Check consists of two parts:

1

The Recycle Check online checklist for assessing the recyclability of packaging (good, reasonable, limited, non-recyclable).
The content of the Recycle Check was updated in September 2026.



2

The background document, consisting of two parts:

Part 1: containing basic information on how to use the Recycle Check, definitions and key terms, and information about identifying disposable units. This section is the same for all documents.

Part 2: containing material-specific information on collection, sorting and recycling processes. This also contains instructions on how to test certain properties of packaging.

Each background document can also be used as a reference guide, providing guidelines on how to improve the recyclability of packaging. These documents are available for the following materials:

- **Flexible plastic**
- **Rigid plastic**

Part 2 can be found from page 18.

1.1.2 Legislation

What legislation must you comply with regarding the recyclability of your packaging? And what else can you expect in the near future? Read more here.

1.1.3 Food safety

Packaging may contain various chemical substances. When such packaging comes into contact with food, substances from the packaging may migrate into the food. This may pose risks to people's health. Some substances are banned (such as virtually all PFASs, for example), whilst others may be used subject to certain conditions (such as BPA, for example). Verpact offers a range of tools to help manufacturers and importers of packaging and packaged products assess their packaging materials in this regard. Please see the food safety dossier.

1.1.4 Complex product-packaging combinations for recycling

There are two reasons why certain types of packaging make recycling more complicated:

- The packaging material causes problems in the process
- The product in the packaging causes problems in the process

Some of these product-packaging combinations must not be collected with household packaging waste because they can seriously disrupt the process.

There are also product-packaging combinations that are permitted in household waste and, where applicable, also in PMD, but which nevertheless pose risks during recycling.

These types of packaging are permitted because it is difficult for consumers to work out the correct disposal method. In practice, this means that such packaging ends up in the recycling streams anyway.

Materials that are NOT permitted in household packaging waste:

- **EPS (expanded polystyrene)** is difficult to process during sorting and recycling because the tiny static plastic beads cause a great deal of disruption. Small EPS packaging, such as cups and trays, should be put in the general waste. Large EPS crates and cushioning material must be taken to the local council's recycling centre. In this case, the material can be further processed by a recycling company.
- There is no separate collection scheme for **wooden packaging**, such as a wine case. Small wooden packaging can be put in the general waste bin, whilst larger items must be taken to the local council's recycling centre.
- **Plastic (fruit) bags** often get caught in the machinery during sorting. As a result, they disrupt the sorting process. The nets must be disposed of with general waste.
- **Ceramics, stone and porcelain** are often mistakenly disposed of in the glass recycling bin by consumers, which disrupts the glass recycling process. These materials are not glass and are not collected as a separate stream in the Netherlands. They must be disposed of with general waste.

Packaging that IS permitted in household packaging waste, including PMD, but which does have an impact on recycling:

- **Household hazardous waste** consists of a specified list of waste substances classified as hazardous and generated in small quantities by households. These include, for example, certain cleaning products, methylated spirits and medicines. Empty packaging for medicines and household hazardous waste may be disposed of with household packaging waste, but if the packaging is not completely empty, it must be disposed of separately, together with its contents, at a recycling centre or a pharmacy.
- **Glue stick tubes** should preferably be taken to the recycling centre.

Milieu Centraal's Waste Sorting Guide is a tool to help consumers check which packaging belongs in which bin. You can check at www.verpact.nl/nl/pmd to see whether your packaging is permitted in the PMD stream.

1.2 Recyclability

1.2.1 Definition of recyclability

The aim of Verpact's Recycle Checks is to help companies make their packaging (more) circular. The Ellen MacArthur Foundation's vision lays the foundations for this:

> ***'A circular economy is one that is restorative and regenerative by design and aims to ensure that products, components and materials retain their maximum utility and value at all times'***

The Recycle Check provides companies with insight into the current status of a packaging item, and suggests ways to improve its recyclability based on the results.

Since the 2027 update, Recycle Check has been using the PPWR definition of recyclability as the basis for assessing recyclability. Recyclability means in this context that **packaging has been designed with material recycling in mind and, once it has become waste, can be collected separately, sorted and recycled in a way that allows the material to be reused instead of new raw materials.**

Compliance with the criteria can be assessed using the Recycle Checks. This involves assessing whether the disposable unit is recyclable or **not**, whereby the assessment *recyclable* is divided into the categories **good**, **reasonable** and **limited**. This is an evaluation of the disposable unit, which examines the likelihood of it operating optimally, taking into account the specific design of that disposable unit.

The assessment of **recyclability** does not guarantee that a packaging item will actually be recycled. The amount of packaging that must actually be recycled is set out in the **recycling target**: a statutory target relating to the quantity of material that, once placed on the market, must be collected, sorted and recycled. For most materials, a higher percentage of packaging – of that placed on the market in the Netherlands – must be recycled each year.

1.2.2 Categories of recyclable materials

The checklist distinguishes between three categories of recyclable items and one category of non-recyclable items. The lowest score on the checklist is decisive for the overall final assessment.

Recyclable

Good recyclability
All aspects of this packaging are optimised for recycling, which ensure 'good recyclability' according to the aforementioned definition by Recycle Check.

Reasonable recyclability
Refers to packaging that requires one further step than packaging with 'good recyclability' These packaging items arrive at the recycler as a stream with a homogeneous composition, but something in their composition has a limited impact on the quality of the recycled material or on the effectiveness of the process. The ideal composition of this stream varies depending on the material and is explained for each material.

Limited recyclability
Refers to packaging that is only partially recyclable, for example because, during sorting, it ends up in a mixed stream (a mixture of various types of materials). The material remaining after recycling has a limited range of applications or because it contains components that (seriously) disrupt the recycling process and are difficult to remove.

Non-recyclable
Refers to packaging containing a contaminant. These are substances that seriously disrupt the recycling process and result in material streams being rejected.

1.3 Select the right Recycle Check

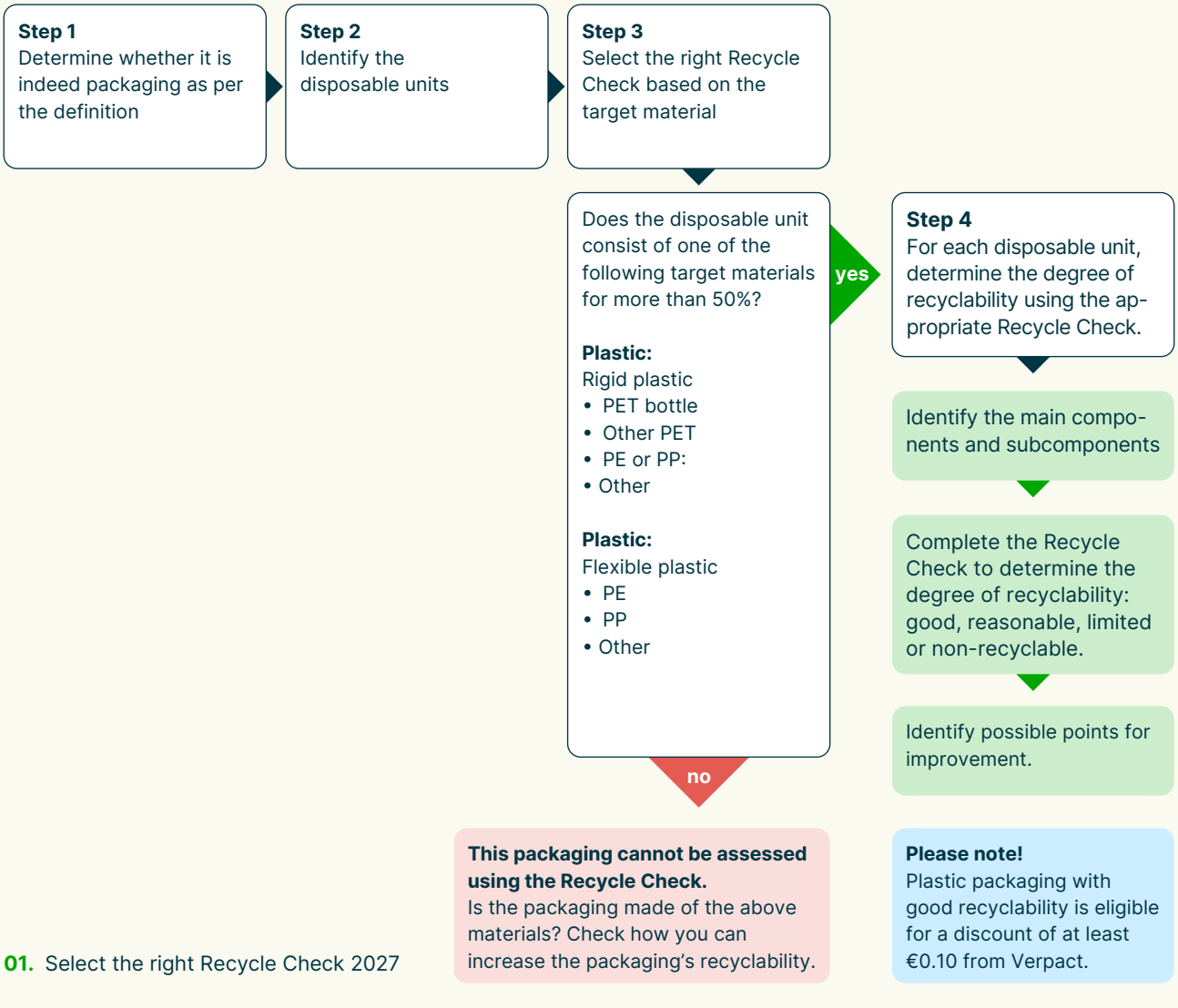
With the introduction of the PPWR, Europe is working towards a single, harmonized system for assessing packaging recyclability. Consequently, Verpact has adjusted the role of the Recycle Checks. From 2027 onwards, Recycle Checks will be available only for rigid and flexible plastic packaging.

You can use these Recycle Checks to substantiate fee modulation for plastic packaging. This means you may be eligible for a discount on your waste management fee if the packaging proves to be highly recyclable. Read more on www.verpact.nl/recyclechecks

The Recycle Checks have been specifically developed to assess the recyclability of packaging. Packaging often consists of various components, possibly made of different materials, which are disposed of by the user at different times. This affects the recyclability of the packaging. In order to assess recyclability, the Recycle Checks break down packaging into disposable units and then into a main component and subcomponents.

To determine which Recycle Check(s) need to be completed, it is important first to identify the disposable units that make up a piece of packaging, and then to categorise these by material. This chapter explains these terms and sets out the steps for choosing the right Recycle Check.

The steps are briefly summarised in the image below and explained in more detail in the sections that follow:



01. Select the right Recycle Check 2027

Step 1 Determine whether it is packaging

The Recycle Checks can only provide a reliable result for assessing **packaging**. It is therefore necessary to first check whether the item in question actually meets the definition of packaging. Verpact applies the PPWR definition of packaging:

Packaging: *"An item intended for the packaging, protection, handling, supply or presentation of products to another trader or to an end user."*

If in doubt as to whether something constitutes packaging, the (non-exhaustive) Packaging Catalogue on the Verpact website can be consulted.

Step 2 Identify the disposable units

Most packaging is discarded in its entirety after use. It is therefore considered **a single** disposable unit. Packaging that is not discarded or processed in its entirety but as separate individual components consists of **multiple disposable units**.

When assessing recyclability, it can make a significant difference whether different components or materials go through the sorting and recycling process together, or whether they are processed as separate units. In practice, it is often the case that some disposable components of the overall packaging are easily recyclable, whilst others are only recyclable to a reasonable or limited degree.

The starting point is the principle that each package consists of a single disposable unit, unless:

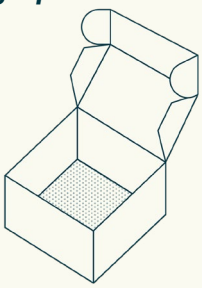
- the packaging consists of several unconnected components.
- part of the packaging must be permanently and completely removed in order to use the product.
- the packaging contains components, such as a lid, which can be detached by applying slight mechanical force

With some types of packaging, it is not always immediately clear whether one or more disposable units are involved. An assessment is then required to determine how many units the pack consists of. On the next page, some examples are explained in detail.

Packaging consisting of a single disposable unit

- ***Packaging consisting of a single piece made from one material.***

Example 1:
A cardboard box that is clean and dry can be discarded with waste paper.



A single disposable unit

- ***Packaging with a secure closure.***

Example 2:
Glass containers with a clip-on closure are regarded as a single disposable unit because the clip permanently connects the main component and the closure. Nowadays, plastic bottles and beverage cartons often have a fixed closure as well.



A single disposable unit

- ***Packaging with adhesive labels.***

Example 3:
Adhesive labels are regarded as subcomponents and are not individual disposable units. Nor is the cap an individual disposable part because it is generally screwed back on again and is now often attached to the bottle.



A single disposable unit

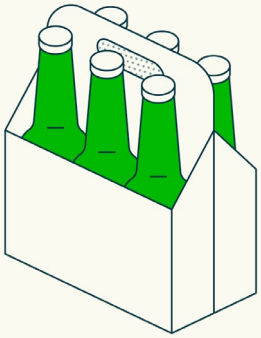
Packaging consisting of multiple disposable units

There are various categories of packaging that consist of multiple disposable units. To clarify this, some examples are given below. Step 3 explains in more detail how to select the right Recycle Check for each type of waste.

- ***Packaging consisting of multiple unconnected components.***

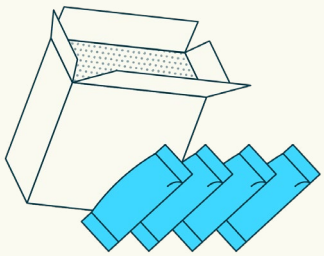
The components are disposed of at different times.

Example 4:
A cardboard tray for 6 small bottles. The cardboard tray and the bottles should each be disposed of in a different waste stream. The crown caps on the bottles also form individual disposable units. So this involves 13 disposable units, made from 3 different materials.



13 disposable units

Example 5:
A cardboard box containing 4 bars, each individually wrapped in plastic film. The user takes a bar out of the box at various times and in various places. The plastic film and the box are therefore discarded at different times and in different places, and must be assessed separately using a Recycle Check.

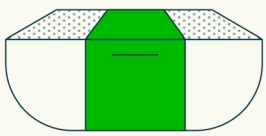


5 disposable units

- ***Packaging containing a component that must be permanently and completely removed in order to use the product***

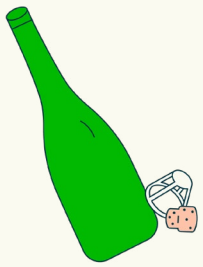
It must be possible to remove this component completely without the use of tools (such as scissors), without leaving any material residue behind.

Example 6:
A cardboard sleeve around a plastic container. The sleeve must be removed in order to open the container and access the product.



Multiple disposable units

Example 7:
A (champagne) bottle with a cork and a muselet (a wire cage). These are three disposable components (bottle, cork and wire cage), each of which belongs in a different waste stream.



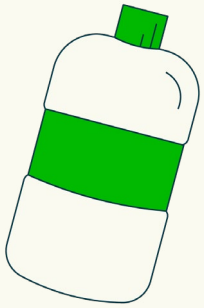
Multiple disposable units

Furtherevaluation

There are also types of packaging consisting of multiple components, which may or may not form individual disposable units. Further assessment is required to determine which disposable components make up the packaging. Some examples are set out below.

- ***Packaging containing a component that does not need to be removed, or does not need to be removed entirely, in order to use the product.***

Example 8:
A plastic vial with a paper sleeve, which is held in place, for example, by a tapered section in the vial. The sleeve is not glued to the bottle and does not need to be removed in order to use the product. The packaging and sleeve together form a single disposable unit, whereby the sleeve is considered a label.



A single disposable unit

Brief self-evaluation

Check whether a sleeve around a package comes loose
Some units of packaging feature a sleeve that is supposed to come off entirely when the packaging is compressed. This includes plastic cups with a perforated cardboard sleeve that is designed to detach when the packaging is compressed. There is a protocol to test whether cup and sleeve do detach from each other behave like independent disposable units. This is called the Pollution and Compression Protocol and is available on the protocols page on the website.

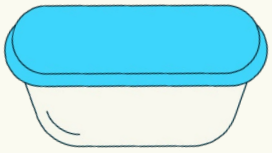
Cardboard sleeve

If plastic packaging comes with a cardboard sleeve around it that consumers do not undo, but which has been shown to come loose during collection and sorting, the sleeve and the package behave as individual disposable units. It must therefore be taken into account that in this case the cardboard sleeve will end up in the wrong sorting stream – that is, not with paper but with plastic, for example – and must therefore be considered non-recyclable.

- ***Packaging containing components, such as a lid, which can be detached by applying slight mechanical force.***

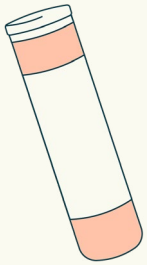
There are types of packaging whose components become detached during the collection and sorting process, such as packaging with lids. These are therefore processed as individual units during the sorting stage.

Example 9:
A tub of margarine with a lid. The lid detaches when slight mechanical force is applied and thus forms an individual disposable unit to be discarded during the sorting of packaging, even if the user has disposed of the entire item in the bag or bin.



Multiple disposable units

Example 10:
Cardboard tube with a plastic cap. The lid detaches when slight mechanical force is applied and is therefore deemed an individual disposable unit in the packaging sorting process, even if the user has placed it in the bag or bin as a single item.



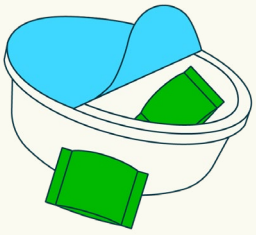
Multiple disposable units

Brief self-evaluation

A simple test to check whether a clamp cover comes loose
You can test whether a lid detaches when slight mechanical force is applied by squeezing the empty packaging with the lid on. If the lid pops off completely, it is deemed an individual disposable unit.

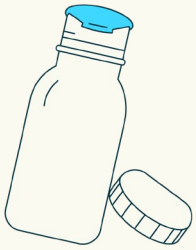
- ***Packaging containing various components, such as release liner***

Example 11:
Sachets or tubs containing ingredients, included in a pack of ready-made meal salads. These separate components are individual disposable units and are discarded as such after use.



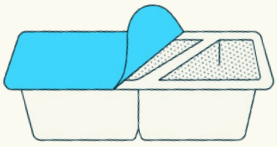
Multiple disposable units

Example 12:
A tamper-evident seal on the neck of a jar or bottle with a diameter of up to 40 mm. The product cannot be used properly unless the film is first removed completely. 'In use' means that the product cannot be poured, spooned out or dispensed, depending on the intended use of the packaging. The cap and bottle together form a single disposable unit, whilst the seal forms an individual disposable unit.



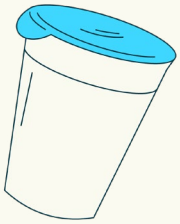
Multiple disposable units

Example 13:
A plastic tray with a release liner that must be removed completely in order to use the tray's dispensing function.



Multiple disposable units

Example 14:
Cups, wide-necked containers and trays where the release liner does not need to be completely removed in order to use the product are also deemed a single disposable unit. The foil can even be used to reseal the packaging.



A single disposable unit

Brief self-evaluation

A simple test to check whether a release liner detaches
You can test whether a release liner detaches when slight mechanical force is applied by grabbling the open, empty packaging by the release liner and shaking it. If the foil comes away easily, it is deemed an individual disposable unit. At the start of the test, at least 25% of the release liner must still be attached to the rest of the packaging.

If the foil does not detach, or only partially, the release liner is deemed a component of the disposable unit to which it is attached and must therefore be taken into account when assessing the recyclability of that component.

If you are unsure whether a package consists of a single or multiple disposable units and the examples above do not provide clarity, please get in touch via the Verpact contact page.

Step 3 Categorise the disposable units

With the Recycle Check, the aim is to complete an individual checklist for each item to be discarded. For each unit, determine the most common general and, where applicable, specific **material type** (see the list below) in order to categorise the unit. The type of material that accounts for at least 50% of the unit's weight determines the category. We also refer to this as the **target material**; see Chapter 1.4.

If none of the types of material account for more than 50% of the disposable unit, the disposable unit cannot be assessed using a Recycle Check. The packaging should then be amended accordingly (see also section 1.1.2 on Legislation in this document).

The types of material:

- **Rigid plastic**
  - PET bottle
  - Other PET products (including PET trays)
  - PE or PP:
  - Other rigid plastics
- **Flexible plastic**
  - PE
  - PP
  - Other flexible plastic

To illustrate this, some examples are set out below.

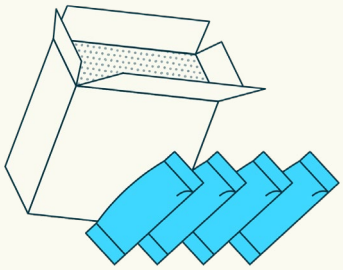
Example 15:
A hand soap container. The soap is packaged in a metal bottle with a plastic pump. The pump cannot be easily removed from the bottle. It is determined that a bottle with a pump constitutes a single disposable unit, as explained in step 2. In this case, only one checklist needs to be completed, whereby steel packaging should be selected because more than 50% of the disposable unit is made of steel.



Hand soap packaging

Example 16:
A packet of muesli bars. The bars are individually wrapped in foil and come in packs of four in a box. As explained in step 2, it has been determined that this packaging consists of five disposable units: the box and the four foil wrappers. To assess the packaging, a checklist is completed for each disposable unit. In this case, a checklist for the cardboard box and a checklist for the flexible plastic foils are selected.

For several of the same disposable units, such as four identical sheets of foil, a single checklist is sufficient.



Multi-pack

If you are unsure which category a disposable unit falls into, please get in touch via the Verpact contact page.

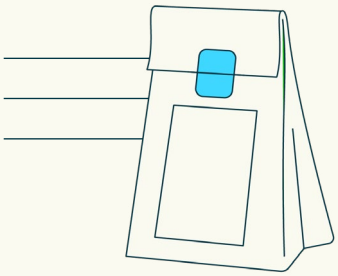
Step 4 Determine the degree of recyclability

Once the right Recycle Check has been selected, the **main component** and any **subcomponents** must then be identified in order to assess the recyclability of the disposable unit.

The main component of a packaging is that which holds the product, and is usually the component that makes up most of the packaging's weight. Besides its main component, a disposable unit often also has one or more subcomponents. These are added components, such as labels and closures, which are processed along with the main component in the recycling process.

The table on the following page sets out several examples illustrating how to identify the main and subcomponents. Further information on this can be found in the material-specific background documents for each type of material.

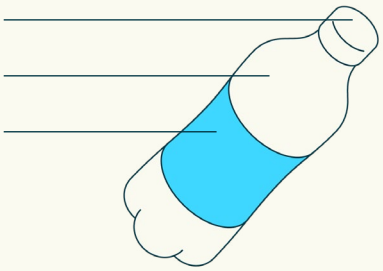
Subcomponent = tape
MAIN COMPONENT = box
Subcomponent = window



A single disposable unit

Example 1:
Box (main component) with window and tape label (subcomponents).

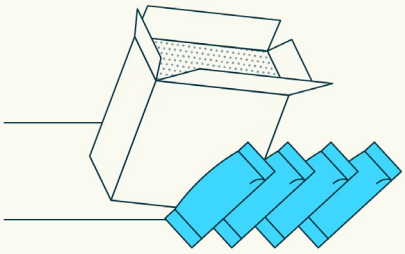
Subcomponent = closure
MAIN COMPONENT = bottle
Subcomponent = label



A single disposable unit

Example 2:
Vial (main component) with cap and label (subcomponents).

MAIN COMPONENT = box
MAIN COMPONENT = wrappers



Five disposable units

Example 3:
Box (main component) containing 4 muesli bar wrappers (also main components).

If you are unsure about the difference between the main component and subcomponents of the disposable unit, and the examples above do not provide clarity, please contact us via the Verpact contact page.

1.4 Target material & secondary material

What is the target material?

Target material is the material that is ultimately to be recycled into a new raw material. Usually, this is **the material which makes up most of the weight** in the disposable unit, often the material of the **main component**.

Exception: if a subcomponent (such as a heavy steel cap) is heavier than the main component, then the subcomponent constitutes the target material.

If a subcomponent **is made of exactly the same material** as the main component (e.g. a paper label on a cardboard box or a PE cap on a PE bottle), then it is deemed part of the target material. Properties such as colour, additives and printing on these subcomponents must be taken into account in the assessment.

When does packaging contain sufficient target material?

The target material must make up at least 70% of the total weight of the disposable unit:

Target material weight / Total weight of disposable unit × 100% ≥ 70

Secondary material

Materials that **are not the target material** constitute the secondary stream. These can affect the processability of the target material, but can also be recycled themselves if they are properly designed (design for recycling).

Example: returnable bottles made from PET with caps and labels made from PE or PP. The caps can be easily separated from the PET and can themselves be effectively recycled as a secondary stream.

In Part 2 you will find the material-specific information relating to the checklist.

1.5 Checklist guide



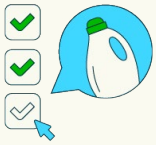
Step 1 Create a package

Open the Recycle Check dashboard, add a packaging item, enter some details about the packaging being assessed and click ‘Save’ at the bottom of the page.



Step 2 Create the disposable units of the packaging

Click on the play button labelled ‘edit packaging’. Below the green button, you will find an explanation of how to identify disposable units. Next, add the disposable unit or units that make up the product-packaging combination. Each disposable unit of the packaging must be assessed individually.



Step 3 Complete the checklist

Next, work through the relevant checklist for each item to be disposed of by clicking on the ‘Start checklist’ play button. When you open the checklist, some general information is displayed, which you can close once you have read it. Links to further explanations for each material in the background document have been added to the questions.



Step 4 The final score

Once all the questions in the checklist have been answered, the ‘Finish’ button at the bottom of the list takes you to the summary page, which shows the final recyclability score for the disposable unit. Under the heading ‘Final score’, it shows how many questions on the checklist have already been completed. If, for example, it says 8/10, this means the checklist consists of ten questions and eight have been answered. Once the entire list has been completed, the ticked box will change colour to reflect the result of the checklist (**good**, **reasonable**, **limited** or **non-**recyclable). If the packaging consists of multiple disposable units, please proceed to the following checklist.

Please note: data is saved as you progress. If you close the checklist whilst you are halfway through it, you can continue at a later time from the same computer; the details you have already entered will remain available. You can only finalise the list on another computer if you download the entire portfolio (see step 5).



Step 5: Save and share results

You can export the results from the overview page to a PDF file using the ‘Download PDF’ button. If a packaging consists of multiple disposable units, the checklists for all units within each package are combined in a single PDF export.

Tip: You can download a blank Recycle Check by creating a packaging item and adding a disposable unit, but without starting the list. When the PDF is downloaded, the checklist appears as an empty list.

There is also the option to download the entire portfolio, comprising all the completed checklists, so that, for example, a colleague can upload the whole set to their computer. You can do this by clicking the 'Export packaging' button in the top right-hand corner of the dashboard. A .json file is downloaded. You can then import an entire set by clicking on 'Import packaging' and uploading the .json file here.

In some checklists, questions marked with this symbol are identified as complex. Here, it is more difficult to arrive at the correct score in one go (**good**, **reasonable**, **limited** or **non-**recyclable). In such cases, further investigation may lead to a higher degree of recyclability. For example, a test may need to be carried out to answer such a question. For this type of question, two scores are possible. Recycle Check automatically selects the lowest score. Following a positive test result, the higher score may then be ticked. It is important to have proof of a positive test result to hand. Where possible, a reference to an existing protocol is provided; in some cases, a protocol still needs to be developed. Updates on this can be found on the protocols page.

Tip: First, answer all the questions and decide whether taking a test could improve your final score. Some of the criteria listed later in the checklist mean that a positive test result does not lead to an improvement in the final score of the check. For example, if it is a test relating to sortability and the disposable unit does not already score highly on recyclability. Of course, it may still be a good idea to carry out the test in order to gain a better understanding of this specific aspect.

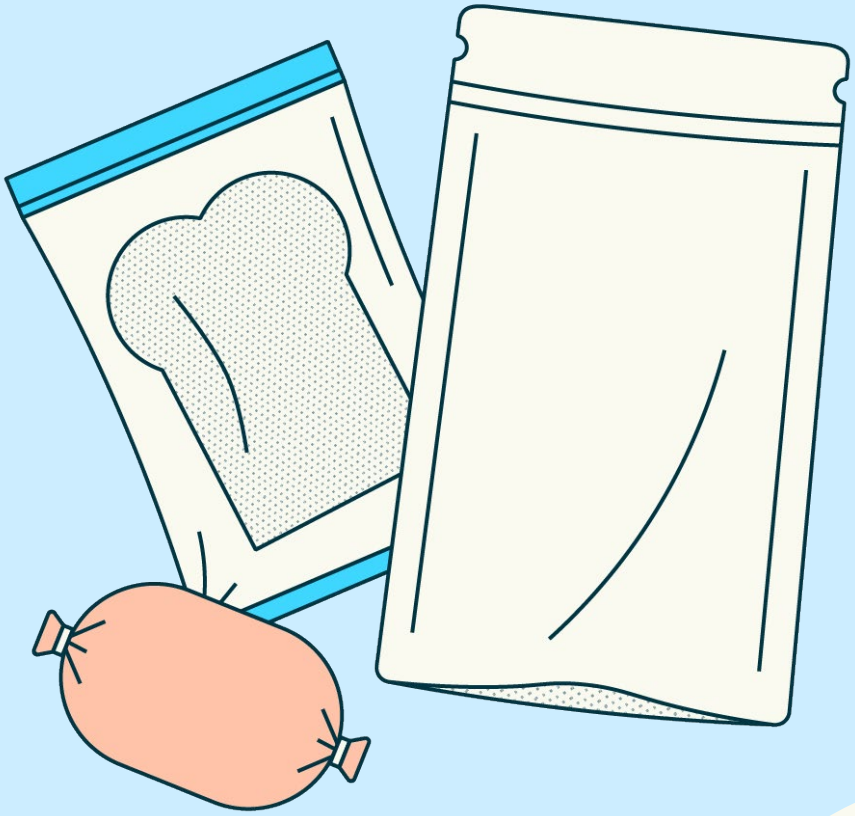
E-learning courses

To find out more about recycling and sorting processes in the Netherlands, the following e-learning modules provide background information.

- Recycling of packaging in the Netherlands
  Using specific real-life examples, this section provides insight into the collecting, sorting and recycling of various types of packaging. The e-learning module covers all types of packaging materials: rigid and flexible plastic, glass, metal, paper and cardboard.

- Sorting and recycling processes for plastic packaging
  This more technical module has been developed as a follow-up to the e-learning module 'Recycling of packaging in the Netherlands'. This module gives a more detailed explanation of the basic techniques used in the sorting and recycling of plastic packaging. Among other things, the report examines the impact of packaging design on the various sorting and recycling processes.

Part 2
Flexible Plastic Packaging



verpact

2.1 Introduction

Part 2 of this document contains background information to support the Recycle Check for flexible plastic packaging.

Here is some further information about collection, sorting and recycling. Topics that are common to all materials have been grouped together in Part 1: Basic information and are the same in every background document. Thes are topics such as the definition of recyclability, how to select and use the Recycle Check correctly and how to make packaging more sustainable.

The Recycle Check for flexible plastic packaging is aligned with the recycle checks and guidelines of other countries and international organisations, such as Plastic Recyclers Europe (RecyClass) and Ceflex.

2.2 Collection and sorting

Below are a number of definitions specifically intended for flexible plastic packaging.

Part 1 contains all the definitions that are important for carrying out a Recycle Check.

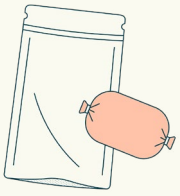
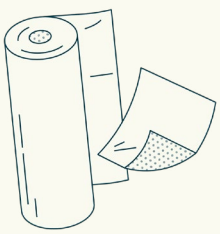
For an overview of all the terms mentioned in this document, please see the Glossary of Packaging Terms on the website.

2.2.1 Definition of flexible plastic packaging

This Recycle Check is intended solely for flexible plastic packaging. For more information on what a package is, see Part 1, Chapter 1.3.

Unlike rigid plastic packaging, flexible plastic packaging can easily be crumpled into a ball without much effort. The material of the main component is usually thicker than 100 µm. This type of packaging is more two-dimensional than three-dimensional.

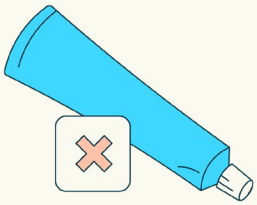
03. Table of flexible packaging

Flexible packaging		
	Structure	**Specific features**
	**Moulded packaging:** • Bags • Sausages • Flow wraps • Pouches • Pillow packs	**Inside and outside** A moulded package has an inside and an outside. The inside is often made of a different material from the outside. Because only the outer surface is scanned, this determines the material identification.
	**Sheets, wrappers and individual films:** • Top films • Wrapping paper • Wrapping films • Interleaves	**Front and back** In the sorting plant, the material is scanned from above. The identification of the material therefore depends on its position on the sorting belt. If the front and back of the main component are made of different types of material, they may be sorted incorrectly, which could affect the recycling.

04. Table of borderline cases for flexible plastic packaging

Some flexible packaging materials can *behave* as if they were rigid. These can cause problems in the recycling process.		
	Structure	**Specific features**
	**3D-moulded packaging:** • Trays • Blisters *For this type of packaging, you must use a sorting test to determine whether it is flexible or rigid packaging. See section 2.7 for possible test centres.*	Vacuum forming can give a relatively thin sheet a 3D shape with greater rigidity. Very thin blisters and trays may behave like flexible packaging during sorting, while thicker versions behave like rigid packaging. The boundary cannot be determined theoretically; the behaviour must be established experimentally.
	**Flexible packaging with rigid components:** • Spouts • Valves • Zips • Hangers *These types of packaging can be assessed using the Recycle Check for flexible plastic packaging.*	Packaging is considered flexible with rigid components if the material enclosing the product is made of flexible plastic. The flexible material is the main component. This type of packaging often behaves differently during the sorting and recycling process than comparable flexible packaging without these components. The rigid component can only be recycled effectively if is very lightweight compared to the main component, is made of the same material and has a density of less than 1 g/cm³ (such as a zip). Heavier rigid components can disrupt the sorting process, causing the disposable unit to end up in the wrong material stream.

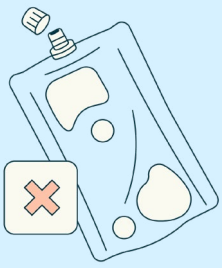
05. Table of exceptions for flexible plastic packaging

There are types of flexible plastic packaging that do not behave like flexible plastic packaging, but rather like rigid plastic packaging. In such cases, the packaging must be assessed in accordance with the Recycle Check for rigid plastic packaging.		
	Structure	**Specific features**
	**Packaging that consists largely of flexible materials but behaves like rigid packaging:** • Tubes	A plastic tube often consists of a relatively stiff film, a nozzle and a cap. Because of its shape, a tube retains its shape better. The tube springs back to its original shape and behaves like rigid packaging during sorting. For this packaging, the Recycle Check for rigid plastic packaging must be used.

Product residue

Too much residue makes the packaging heavy. This shifts the packaging's centre of gravity, which means it may behave differently and end up in the wrong sorting stream. Furthermore, the residue will have to be removed by the recycler, which will disrupt the flow of the recycling process.

This is not yet taken into account in the Recycle Check assessment. Verpact is currently developing a robust assessment method in collaboration with other organisations, such as RecyClass. If the product residue weighs more than half the weight of the disposable unit, there is a very high risk of disruption.



06. Product residue

2.2.2 Dimensions and shape of a disposable unit

In a sorting plant, disposable units are sorted by size. This takes place in a large rotating drum with holes of various sizes, which sifts through the packaging. In this way, components that are too small or too large for the sorting process are separated from the rest of the material. Disposable units that are too large or too small are usually not sent for recycling, even if their material composition is technically recyclable.

Smaller than 3 cm

Small disposable units, which can fall through a round opening with a diameter of 3 centimetres in the drum screen, are usually not recycled. This refers to the disposable unit as it is used, in its flat (or filled) form. These are removed from the sorting stream, because the small aggregate often contains a lot of contamination. Furthermore, the aggregate consists of many different materials, which are difficult to separate using conventional techniques. In most cases, these smallest materials are incinerated with energy recovery.

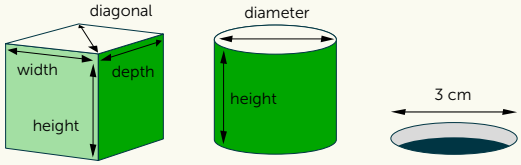
Disposable units ≥ 3 centimetres are included in the waste stream for recycling.

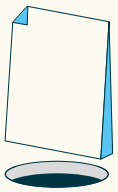
A4 size

In previous versions of this Recycle Check, a requirement was set regarding the minimum size (A4) of flexible packaging in order for it to be assessed as 'easily recyclable'. This requirement was included because large flexible plastics usually consisted of PE films, which could be separated out fairly easily using extraction systems.

Most sorting machines are now also capable of sorting out smaller sizes using ballistic separators and the latest NIR (Near-Infrared) technology. The size is therefore less relevant; flexible disposable units smaller than A4 (but larger than 3×3 cm) can also be readily recyclable, provided they meet the other criteria as well.

7. Packaging size





Sortable waste
Height, width, depth, diagonal and/or diameter greater than 3 cm



Non-sortable waste
Height, width, depth, diagonal and/or diameter smaller than 3 cm

2.3 Points to consider regarding recyclability

This chapter describes the extent to which the main component of a packaging item is recyclable. A distinction is made here between PE and other plastics. The difference between mono and multi-materials is also explained. For information on the recyclability of subcomponents, see section 2.5.

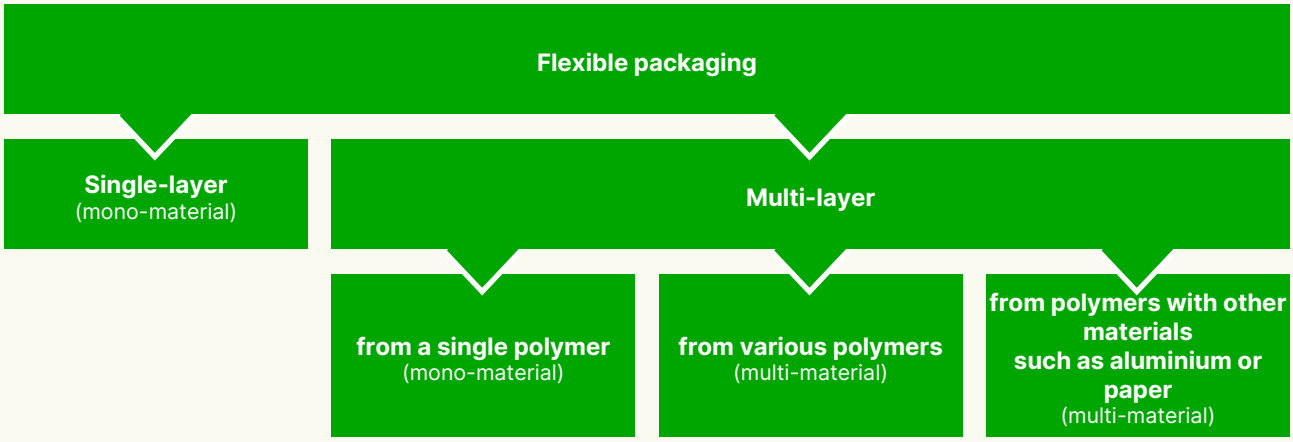
2.3.1 Material composition of the main component

The composition of the material of the main component affects the recyclability of the disposable unit in question. The use of different types of material, as well as coatings, fillers and additives, affects how the material can be processed by recyclers.

In order to assess recyclability, a distinction must be made between single-layer and multi-layer packaging (two or more layers of material).

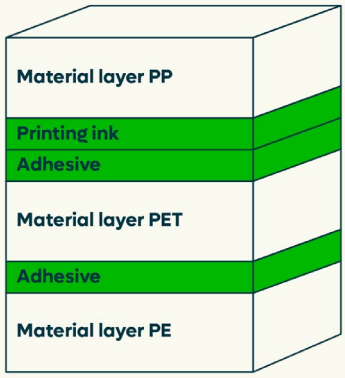
If a main component contains layers of different materials, or elements such as coatings, barriers or additives, then the impact these have on recyclability must be determined in more detail. To this end, it is important to be able to distinguish between a layer of material and the addition of material. A layer usually has a thickness of more than 1 micrometre (1µm=10-^{6}m). A coating is usually several nanometres thick (nm=10-^{9}m). This is important for determining whether something is a mono-material item or not. This is discussed in more detail in the next chapter.

08. Overview diagram for single-layer and multi-layer flexible packaging



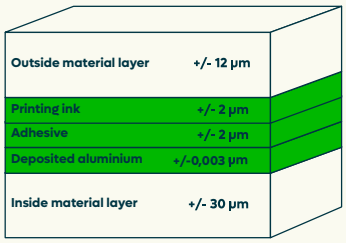
09. Table showing the difference between a material layer and material additive

Material layer



A packaging film may consist of one or more layers of material. A material layer consists of a single base material or type of polymer which, on its own, forms a film layer. In the example on the left, the aluminium foil is a layer of material with a thickness of 7 µm.

Material additive



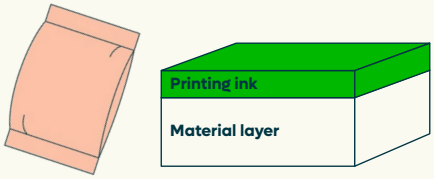
An addition is a component which does not form a film layer on its own, but is added to a layer of material. These may be additives incorporated into the layer, or substances applied to the surface of a material layer. This might involve vacuum-metallised materials or a coating.

In the example on the left, the sputtered aluminium is a material deposit with a thickness of 0.003 µm, which is 3 nanometres.

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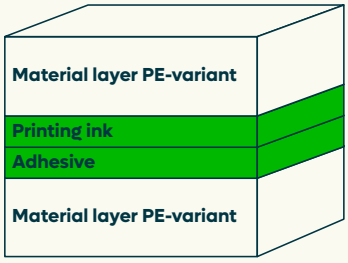
10. Table showing a diagram of the material composition of flexible packaging

Single-layer film



A single-layer film consists of a layer made from a single type of polymer (mono-material). This layer may be supplemented with an material additive, such as a print.

Multi-layer film (continued on the next page)

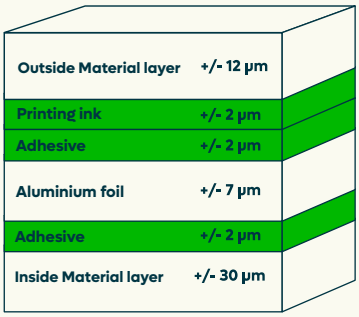


A multi-layer film may be made up of several layers of a single type of polymer (mono-material). An example of this is a multi-layer film, made up of different types of PE, such as CPE, BOPE, HDPE and LDPE.

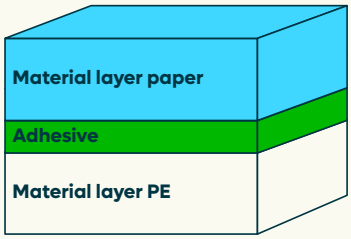
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10. Table showing a diagram of the material composition of flexible packaging

Multi-layer film (continued)

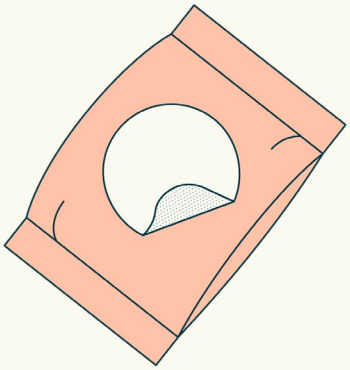


A multi-layer film may be composed of layers of different types of polymer (multi-material). An example of this is a multi-layer film, made up of a combination of PP, PET and PE.



There are also multi-layer materials made up of layers of materials other than polymers. Examples of these include multi-layer films, composed of combinations of LDPE and paper and/or combinations of OPP with a 7 µm-thick aluminium foil layer.

Subcomponent



When assessing a disposable item for the Recycle Check, a distinction is made between the material layer and the label. A label is attached to the packaging at a later stage of the packaging process using adhesive bonding.

A label never covers the entire surface of the disposable unit and does not form an integral part of the main component. The label and the adhesive used to attach it are subcomponents.

2.3.2 PE and PP mono-materials without additives

A main component made of PE or PP as a pure single material, without any additions such as coatings, barriers or additives, does not normally interfere with the recycling process.

In plastic sorting plants, disposable units are first sorted by shape (flexible or rigid) and by material type (plastic, metal, beverage cartons), and then by type of plastic.

Flexible plastic disposable units are sorted by plastic type, based on main component analysis. Only flexible plastic packaging made from PE or PP is collected separately. Bio-PE and bio-PP are also included here. These have the same molecular structure as PE and PP, respectively. This Recycle Check therefore makes no distinction between bio-based and fossil-based PE and PP.

The proportion of other types of flexible plastic in the total household waste stream is relatively small. Examples of these include PET, PA and PLA. It is difficult to sort and recycle these materials cost-effectively, which is why this is not done on a large scale. These materials cannot therefore be recycled to their full potential.

PE is the flexible material that is widely recycled into new film. It is mainly used to make bin liners. For the sorting process at the PE recycler, it is important that foreign materials can be identified as non-PE. These materials can then be sorted into either the mixed waste or the residual fraction.

PLEASE NOTE! From now on, the Recycle Check will be based on the definition of recyclability set out in the PPWR. One important consequence of this is that the criterion of 'industrial-scale recycling' will no longer be taken into account for the time being, as this provision will not come into force under the PPWR until 2035. As a result, some packaging may receive a higher rating than before, for example where it is technically recyclable but is not yet recycled on a large scale. This also applies to flexible PP packaging.

If this meets all the criteria in this Recycle Check, it can now also achieve an overall score of 'Good'. This was already the case for flexible PE packaging.

2.3.3 Materials that affect recycling

Additives in flexible plastic disposable units can reduce the quality of the recycled material, even when present in relatively small quantities. These include barrier layers (such as EVOH or vacuum-metallised aluminium), inks, coatings and/or fillers, for example. There are many combinations of these applications. Only disposable units consisting of at least 90% PE are suitable raw materials for recycling.

Various organisations, such as RecyClass, CEFLEX and the National Test Centre for Circular Plastics (NTCP), are investigating the impact of different material additives on the quality of the recycled material. This includes the addition of a limited amount of EVOH or the effect of vacuum-metallised aluminium on the recycling of PE and PP. The use of PA as an additive has also been extensively studied.

The organisations mentioned above are currently conducting various studies to determine which additives can be permitted, and in what quantities, without adversely affecting the recycling of plastic packaging. Should further information on this become available, it will be incorporated into this Recycle Check.

Further information on the impact that different materials have on recycling is provided below.

Barriers, fillers and additives

Barriers, fillers and additives are substances added to the plastic to impart certain properties to the material. Examples of barrier layers include EVOH, SiOX, AlOX and metallised aluminium.

Examples of fillers include minerals (such as limestone or talc for their barrier properties), fibres (e.g. from paper, grass or glass for reinforcement), mica (for a pearlescent effect for decorative purposes), metal flakes (for a metallic effect for decorative purposes) and iron oxide (for a terracotta colour for decorative purposes).

The additives themselves are not always plastics and have different properties, such as their melting behaviour. This difference in properties makes the recycling process more difficult, for example because melt filters become blocked. Whether the properties of the recycled material are affected, making it less suitable as a raw material for producing new packaging or products. These additives affect the quality of the recycled material to a greater or lesser extent.

Polyamide (PA) is often added to PE to provide greater strength and act as an oxygen barrier. At present, PE copolymers containing up to 10% PA6/66 cause little disruption to the recycling process when co-extruded with 0.5 g/g PE-MAH. Other examples of oxygen barriers

include EVOH, SiOx and AlOx. Of these, SiOx and AlOx do not have a negative impact on recycling, provided that no additional coatings are applied for this purpose. EVOH in flexible disposable PE packaging, up to 5% of the total film weight – provided it is made compatible with maleic anhydride (MAH) during co-extrusion in a MAH/EVOH ratio of 1:1 or higher – has virtually no adverse effect on recycling.

Coatings

A coating is usually a thin layer, measuring a few nanometres (nm = 10^{-9} m), made of a material other than the main component. The coating is so thin and is usually applied in such a way that it is impossible to separate the two types of material. Coatings are used in films primarily to provide a barrier or to protect the print. Coatings can cause colour variations during the recycling process or form small crystals in the recycled plastic.

How barriers, fillers and additives affect density

All materials have a bulk density. Plastics such as PP and PE, for example, float on water (density <1 g/cm^3). Plastics such as PET, PS and PLA sink in water (density > 1 g/cm^3). Recyclers make good use of this property in the sorting process, using sink-float separation tanks. In these tanks, PE and PET can be easily separated from each other. You can easily check for yourself whether a disposable unit will pass the sink-float test by submerging it in water and seeing whether it stays afloat.

For example, when gas bubbles are added to PET (a process also known as 'foaming'), its density changes and the PET may float. In that case, the sink-float stage will no longer work properly and the PET will end up in the wrong material stream. In this example, the foamed PET then contaminates the PE stream.

PE and PP can, in fact, be made denser by adding large amounts of talc or lime, and will therefore sink. In turn, PE and PP contaminate the PET stream.

Adhesive bonding of the main component's laminate layers

Adhesives between laminate layers can interfere with recycling. The impact varies depending on the adhesive used. The *Design Guidelines* issued by RecyClass permit the use of certain types of adhesive in specific quantities. These have hardly any impact on the recycling process. Verpact is working on quantifying this in a future version of Recycle Check. See Chapter 2.6 for more details about adhesive bonding.

Contaminants

PVC and PVdC

If PVC (polyvinyl chloride) and PVdC (polyvinylidene chloride) are used in packaging materials, this disrupts the recycling of other plastics. PVC present in the recycling stream of other plastics (for example, as a label) causes an undesirable chemical reaction. The formation of hydrochloric acid causes damage to the recycling equipment. The same applies to PVdC, which is mainly used as a barrier in films.

PVC used in applications other than packaging – also known as vinyl – is easily recyclable if processed in a separate stream. Recycled material is widely used, for example in PVC sewer pipes.

Oxo-degradable

Oxo-degradable (or oxo-biodegradable) plastics contain additives which, when exposed to ultraviolet light and oxygen, break down into tiny pieces of plastic (microplastics). These additives can be added to all plastics. Oxo-degradable plastics are mainly used in bags and pouches, and sometimes also in flexible plastic applications. If oxo-degradable plastics end up in recycling streams, they compromise the quality of the recycled plastic. This makes it a contaminant.

In accordance with the 2014 Packaging Management Decree, oxo-degradable packaging is prohibited in the Netherlands. The European Union has banned the use of oxo-degradable materials in packaging with effect from 3 July 2021.

Non-plastic material layers in flexible plastic packaging

In general, care should be taken to ensure that non-plastic materials, such as paper and aluminium, do not end up in the recycling stream for flexible plastic packaging. They are undesirable because these materials do not melt during the recycling process. The materials may build up in the sorting filters; paper fibres may catch fire. It is often difficult to remove all materials during the sorting process. Paper fibres, in particular, tend to stick to the plastic, which means they end up in the recycling stream anyway.

2.3.4 Colour

Plastic packaging to which no colourants have been added has more potential uses after recycling than coloured varieties. The colourless, transparent packaging can be recycled into new transparent packaging. Once recycled, white packaging can be turned into new packaging in a wide range of bright colours. Colourless materials can therefore often be recycled over several cycles and reused for new packaging.

The main component can be coloured by mixing a colourant into the material (master batch). These colours may affect sortability and recyclability.

Coloured PET, PE or PP

If coloured plastics are mixed with uncoloured plastics, the material will discolour. Once material has discoloured, it can no longer be restored to a colourless or transparent state using standard mechanical recycling techniques. This means there are fewer potential applications for this material.

Opaque PET

Opaque PET does not let light through. It is often coloured white using, for example, titanium dioxide, calcium oxide, calcium carbonate or tin oxide as a colouring agent. In large quantities, these colourants can disrupt the recycling process.

Black packaging

The most commonly used sorting technique uses Near-Infrared (NIR) scanners. The type of plastic is determined by measuring the spectrum of the reflected infrared light. In the case of black packaging, the infrared light beam is not reflected properly, but is absorbed. The reflection cannot then be 'read' by the NIR scanner. The type of plastic is therefore not detected and the disposable unit is not sorted, or not sorted properly. This is particularly true if the material of the main component is coloured throughout. However, the risk of sorting errors is often high if the product is printed in black, if a black intermediate layer is used, or if a large part of the surface is covered with a black printed label or sleeve. A (small) black cap or lid on a package does not affect detection, because the NIR scanner scans the main component of the package.

There are sorting plants that are capable of detecting plastic with a high proportion of black pigment, but are not yet able to sort it by material type. Because the type of plastic cannot be identified, it ends up in the mixed waste stream. There are alternative black colourants that have less of an impact on sortability, but there is still a risk of sorting errors. Furthermore, the black colour has a significant impact on the colour of the recycled material, which consequently makes it less versatile.

TIP
One advantage of black packaging is that it is easy to incorporate recycled content into it. The original colour of the recycled material is therefore less important. However, it is unlikely that the packaging will be sorted correctly in the next cycle and then recycled. Packaging in a colour other than black is more likely to be sorted correctly. And it is therefore more likely that the packaging in question will be recycled. If black is required for packaging, use as much recycled material as possible.

Shiny packaging

If the disposable unit has a shiny surface (for example, due to metallisation), the NIR cameras may have difficulty identifying the material. Once a layer of ink or plastic has been applied, the material can often be identified.

2.3.5 Future developments

There have been developments in the sorting of black plastic using new techniques. This allows the black disposable units to be detected, but they cannot yet be sorted by material type. Because the type of plastic cannot be identified, these end up in the mixed waste stream.

Specific packaging items can be sorted using markings or codes on the packaging, or with the aid of AI. This allows non-food packaging to be sorted into a separate stream, for example. Techniques such as these can be used to facilitate the recycling process.

2.4 Printing, labels and sleeves

If a disposable unit does not contain any labels or direct printing, these will not affect the recyclability of the packaging.

If a label is applied, to ensure optimal recycling, it is best for it to be made of the same material as the main component.

The size of the label also affects sortability. If a label covers all or most of the material of the disposable unit, it is more difficult to determine the type of material of the main component. When determining the coverage of a label or sleeve, you should consider the side of the packaging on which the majority of the label is visible.

Depending on the type of material the label is made of, the sorter may be unable to sort the item into the correct material stream, meaning it will ultimately not end up with the correct recycler.

TIP
The National Test Centre for Circular Plastics has developed a handy tool for determining the size of labels and sleeves in relation to the main component. In this context, the side of the disposable unit that is most covered is always taken into account. Click here to go to the tool.

Once it reaches the recycling facility, the type of material again affects its recyclability. Certain combinations of materials for the main component and the label are more difficult – or, conversely, easier – to separate from each other.

2.4.1 Label sizes

Labels made from materials other than the main component are difficult to separate from the main component, even if these labels are cold-washable. Labels made from PE, rather than PP or PET, are therefore the preferred choice for use on PE film.

Sortability of oversized labels

Labels and sleeves that are too large do not have a negative impact on sorting if they are made of the same material as the main component. The sub-component is then sorted alongside the main component into the correct stream, and both end up at the appropriate recycling facility.

If completely removing the label is the only way for the consumer to use the product, then the label is an individual disposable unit. In this case, the material will not affect the sortability of the main component. If it is unlikely that the consumer will remove the label, the label constitutes a subcomponent which – if it is too large – may disrupt the sorting process.

2.4.2 Printing

Inks, and sometimes coatings, are used for label printing and direct printing. Provided that this is not entirely black or glossy/metallic, and the prints or coatings do not cover more than 30% of the surface area of the disposable item, its use does not currently affect the Recycle Check score.

TIPS
The use of inks:

- Minimise the use of inks, particularly those based on nitrocellulose.
- Ensure that the inks, labels and sleeves can be separated from the material of the main component. Inks that dissolve in the wash water may settle on the substrate during drying, which can cause discolouration.
- Use inks formulated in accordance with the EuPia Charter.*
- For direct information on the main component, Laser Coding is the preferred method.

* The EuPIA Charter is a positive list of inks that can be used safely and is based on European legislation such as REACH and CLP. The use of non-EUPIA materials limits the potential applications of recycled materials (with regard to food-grade recycling).

For further information, please refer to the Factsheet on Inks – printing on packaging.

2.4.3 Non-plastic materials in labels

In general, care should be taken to ensure that non-plastic materials, such as paper and aluminium, do not end up in the recycling stream for flexible plastic packaging. They are undesirable because these materials do not melt during the recycling process. The materials may build up in the sorting filters; paper fibres may catch fire. It is often difficult to remove all materials during the sorting process.

Paper labels

With paper labels, fibres may come loose when the material is shredded and during the washing process. These fibres are either impossible or very difficult to separate from the main component material. The fibres can block filters in the recycling plant or burn during the extrusion process. This causes impurities in the recycled plastic and thus disrupts the recycling process.

Fibre-reinforced paper also poses a problem for recycling. This is often used for thermal printing and sometimes contains the contaminant bisphenol A.

Metallised labels

Like metallised flexible disposable units, metallised labels contain vacuum metallised aluminium. These labels and tags can disrupt both sorting (reflection interferes with identification) and recycling (because they cause discolouration of the recycled material). In certain cases, this also applies to inks used in direct printing. If these inks are recycled along with the rest, they can also have a significant impact on the quality of the recycled material.

The extent to which labels or direct printing affect both sorting and recycling is determined step by step in the Recycle Check.

Foamed labels

Injecting gas bubbles to achieve a different texture (foaming a plastic) results in a difference in density. This may have an effect during the sink-float process. This makes it more difficult to separate the foamed PET labels from the PE or PP of the main component.

2.4.4 Future developments

Subcomponents, such as labels and closures, are increasingly being taken into account when assessing the recyclability of packaging. The focus is shifting from removing unwanted materials to safeguard the main component, to using materials for subcomponents that can themselves be recycled as much as possible as a secondary stream. Adhesives and inks are also playing an increasingly important role in this regard. More and more is becoming known about the impact of adhesives and inks on recycling. Further information on the impact of adhesives can be found in section 2.6.

2.5 Closures and other subcomponents

The rule of thumb when it comes to recycling is always: anything that hasn't been added doesn't need to be removed.

If a disposable unit has no subcomponents, it cannot cause any disruption. The impact of various subcomponents is explained below.

Further information on distinguishing between main and subcomponents can be found in Part 1, Chapter 1.3.

2.5.1 General factors

Disposable units with rigid components

Rigid components that form part of packaging, such as caps, spouts, valves, lids, zips, handles or hooks, are sometimes made of a different material to the main component. This other material disrupts the recycling of flexible plastic materials. Furthermore, during the sorting process, these disposable units can behave as rigid disposable units, which means they often end up in the wrong sorting stream and cannot then be recycled properly.

If the non-recyclable component is made of the same material as the main component, it does not pose a problem for recycling, but it may cause problems during sorting.

There are many different types of packaging containing rigid components. The ratio between the flexible part and the rigid part can vary considerably. Take, for example, a small vent valve on a one-kilo bag of coffee beans or a plastic lid on a flow-wrap pack of cleaning wipes. It is difficult to define a clear-cut threshold for the ratio at which the sorting process works well or not.

The rigid component can only be recycled effectively if is very lightweight compared to the main component, is made of the same material (like a zip). All other cases are classified as a risk.

Embedded metal components

Embedded metal components, such as the closures on sausage packaging, clips on bread bags and RFID (Radio Frequency Identification) chips, make recycling more difficult if they are not separated from the plastic.

If the metals are 'trapped' and/or stuck in or on the packaging and cannot be separated using magnets (for ferrous metals) or the eddy current technique (for non-ferrous metals), they often end up in the plastics recycling stream by mistake.

They are fed into the sorting process along with flexible materials, which are then shredded into smaller flakes. The metal parts can damage the blades, and the small metal particles cause contamination during the extrusion process. As a result, disposable units containing an embedded metal component are not easily recyclable.

Non-plastic materials

There are many examples of non-plastic materials used in laminates and other components attached to the disposable unit. Such as:

- aluminium used in laminated packaging, such as soup pouches
- shrink-wrap with a glued-in cardboard insert
- a plastic bag with aluminium press studs

Paper is also undesirable in the recycling of disposable plastic units. Because these fibres do not melt, they can build up in the sorting filters and catch fire. The burnt particles may affect the quality of the recycled material.

It is often difficult to remove all materials during the sorting process. Paper fibres, in particular, tend to stick to the plastic. Parts of aluminium seals may also remain on the adhesive edge of the main component, meaning they still end up in the recycling process.

Wooden, aluminium and paper or cardboard components are undesirable in any case, regardless of whether they become detached from the disposable unit, because they can contaminate the recycling stream, thereby rendering it unsuitable for processing into new raw materials.

Closures containing impurities such as PVC and PVdC

If PVC (polyvinyl chloride) and PVdC (polyvinylidene chloride) are used in packaging materials, this disrupts the recycling of other plastics. PVC present in the recycling stream of other plastics (for example, as a label) causes an undesirable chemical reaction. The formation of hydrochloric acid causes damage to the recycling equipment. The same applies to PVdC, which is mainly used as a barrier in films.

PVC used in applications other than packaging – also known as vinyl – is easily recyclable if processed in a separate stream. Recycled material is widely used, for example in PVC sewer pipes.

Closures containing contaminants such as silicones and/or elastomers

Elastomers and silicones, acrylates and other rubber-like plastics are used for components where elasticity, resilience and tensile strength are important. They are supplied in packaging as components of closures, valves and dosing systems. For example: a membrane may be fitted to a dosing system or valve to ensure accurate dosing of the product. If these components are made of the wrong material, they disrupt the recycling process. Silicones and elastomers generally cause various types of damage, such as surface irregularities and defects, to the surface of a product made from recycled plastic.

Please note! Valves in flexible packaging may also contain small amounts of silicone oil, which can interfere with the recycling process.

Other rigid subcomponents

Material based on PE and/or PP with a density of <1 g/cm³

Using sink-float tanks, PE and PP (which have a lower density than water) are separated from heavier plastics such as PET and PS.

PE and PP can be processed together fairly easily in the recycling process. PE closures and components on PP disposable units are permitted to a limited extent in PP recycling. The situation is slightly more critical when it comes to PP closures and components on PE disposable units. That is why the sorting processes are designed to ensure that not too much PP ends up in the PE.

Other plastics such as PET, PS, PC or PE and/or PP with a density >1 g/cm³

If closures or other subcomponents with a higher density increase the weight of the flakes from the disposable unit to around or above 1 g/cm³, then these flakes will, at best, end up in the plastic mixed-waste stream.

2.5.2 Future developments

The raw materials used in subcomponents are increasingly being taken into account when assessing the recyclability of packaging. The focus is shifting from removing unwanted materials to safeguard the main component, to using materials for subcomponents which can themselves be recycled as much as possible as a secondary stream. Adhesives are also playing an increasingly important role in this regard. We are also learning more and more about the impact of adhesives and inks on recycling. Further information on the impact of adhesives can be found in section 2.6.

2.6 Adhesive bonding of labels, sleeves or other components

The rule of thumb when it comes to recycling is always: anything that hasn't been added doesn't need to be removed.

Most recyclers of flexible PE packaging use cold washing processes. In order to recycle sorted disposable units, the packaging is shredded into flakes. The flakes are washed at a cool temperature (20-25°C) to remove as much as possible of any contaminants, labels and adhesive.

2.6.1 Adhesive bonding of labels and subcomponents

If adhesive has been used, it may interfere with the recycling process. Not enough is yet known about the effect of these adhesives. This is currently being investigated by various organisations. The effect of adhesive is not yet taken into account in the Checklist score.

2.6.2 Bonding between the laminated layers

Co-extrusion is the preferred method for bonding layers together. In co-extrusion, multiple materials are extruded or blown through a die and fuse together in the process, often with the aid of a thin adhesive layer (tie-layer).

Once the layers have been bonded together, the adhesive may interfere with the recycling process. More and more information is becoming available from various organisations regarding the effects of these adhesives.

RecyClass has published a number of test protocols online. These protocols (carried out by RecyClass-certified testing laboratories) can be used, amongst other things, to determine how well the material can be recycled. RecyClass also publishes approved material combinations.

If there are multiple positive test results for certain material combinations, the Recycle Check may be adapted accordingly in future.

2.6.3 Future developments

A new development is the delamination primer. This is a printing layer sandwiched between different plastic layers, which ensures that the layers separate easily from each other during recycling and that each layer can be recycled separately. This has only been tested on a pilot scale.

2.7 Additional sources of information

Relevant organisations and links

- Verpact
- Protocols for the Recycle Check
- Glossary
- Weggooiwijzer disposal guide
- Fee Modulation Plastic 2.0
- Resources for Recycle Checks and Fee Modulation
- PPackaging policy and legislation

Checks and guidelines

- RecyClass
  is a partnership between recyclers and provides various tools for assessing the recyclability of plastic packaging in the European market. As well as an online tool, they publish test results and provide guidelines on design for recycling.
- Ceflex
  A collaborative initiative representing the entire flexible packaging value chain.
- Circpack
  Veolia's research institute, where packaging can be tested and optimised. The Veolia sorting facilities can be used for this purpose.
- Citeo
  French producer responsibility organisation.
- Cotrep
  French institute that draws up 'design for recycling' guidelines for plastic packaging.
- Cyclos-HTP
  German institute which can test and certify packaging materials, amongst other things.
- NTCP
  The National Test Centre Circular Plastics (NTCP) has a pilot sorting line and washing facilities that can be used to simulate sorting and washing processes. Here, it is possible to investigate how these processes and packaging concepts can be optimised.

Contact

+31 (0)85 401 26 60

info@verpact.nl

www.verpact.nl

@verpact

linkedin.com/company/verpact

verpact