

Reuse and recycling of plastic packaging for private use



Design Manual

Developed by the Forum for Circular Plastic Packaging under the Danish Plastics Federation



FORUM FOR
CIRKULÆR
PLASTEMBALLAGE



To be revised annually
This manual is a further development of the manual that was prepared in 2015 as part of the project “Increasing the Reuse of Packaging” under the EU LIFE+ project Plastic Zero – Avoiding Plastic as a Waste.

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Introduction

- ▶ This manual shows how circular plastic packaging for private use should be designed.
- ▶ If you are a designer or packaging manufacturer, you can use this manual as a guide to what materials, colours, covers and forms you should choose so that the packaging can be reused or recycled.
- ▶ The design guide has been developed from the basis of how Danish plastic sorting technologies work now with the aim of achieving as high quality and value from the plastic in household waste as possible.
- ▶ Furthermore, the prioritised plastic types have been chosen on the basis of those that represent the greatest quantity in Danish household waste – corresponding to 75% in all.
- ▶ The design guide will therefore be revised annually to keep pace with the development and implementation of new sorting and management technologies and material types and quantities.
- ▶ There are four concepts for circular plastic, which can be seen on the next page. Before packaging is designed, the actual business model and concept shall be considered, so that the packaging is designed for optimum use and circularity.



Concepts

Refuse

- no use of packaging

Delivery direct from the production container

- seen to a minor extent in agriculture.

Reuse

- reuse of the packaging
as it is

Reuse can be organised in a number of ways.

Reduction of material consumption must not prevent reuse.

Reduce

- less consumption of materials

Reduces the quantity of material used – can be done
at the individual package level.





Recycle

- a new application

Recycling packaging into the raw material for new products,
as far as possible as new packaging for the same purpose.

Concepts for reuse

(non-exhaustive summary)

	Input materials	Main component	Sub-components (Closures, lid, inserts, seals)	Decoration (Cover, print, glue and labels)	Emptying/washing	Examples
To go 	Shall tolerate washing to a suitable degree.	Sold by a shop and taken away by the customer from time to time	Lid should be separable but kept together with the container	Shall not be possible to wash off label/printing	Easy to empty and wash	Coffee mugs, e.g. at Circle K and Starbucks
Sold loose 		Customer takes along the packaging. Or packaging can be bought in the shop			Easy for the user to empty and wash	Packaging-free supermarkets
Packaging for carrying 	Shall have sufficient thickness and reinforcement of handle to be used again and again	Customer takes plastic bags back to the shop - used bags are taken back by the shop or collected by the municipality	The same type of plastic as the main component	The same type of plastic as the main component	Not relevant	Plastic carrier bags
Return system 	Shall tolerate washing to a suitable degree.	Packaging is dropped off in the shop. The shop washes it or sends it back to the food producer, which handles washing.	Lids should be separable. Eventually lids shall also be collected and a minimum recycled	Shall be washable up to 65°C	Easy to empty and wash	Return system



Recycling

Recycling saves resources

The table on the next page shows how plastic packaging that is for private use should be designed so as to create value in recycling. Experience shows that large quantities of the plastic packaging that is currently collected from households for recycling ends up as products of much lower quality. They are designed in such a way that they cannot be cleaned, taken apart or sorted by scanner, for example. The aim should be that, as development proceeds, as much recycled plastic as possible should be used in packaging. By 2030, more than half the plastic waste in the EU shall be recycled, according to the EU's plastics strategy. A further goal of the plastics strategy is that by 2030 all plastic packaging shall be designed for reuse or recycling in a cost-effective way.

How to use the table

The table is divided into three levels of quality of recycling. By comparing your packaging with the criteria in the table, you can see how good the expected quality would be of raw material recycling from the packaging.

Packaging in:

The green level can become new raw materials of high quality.

The yellow level can become new raw materials of lower quality.

The red level is used for energy recovery or as filling in concrete.

One single element in the packaging, such as the colouring or label, can decide the quality of the raw material made from the packaging. It is therefore the packaging's weakest link that determines the quality. For the quality to be rated as "High", all components of the packaging must fulfil the green level criteria. Thus, packaging that meets the green level on four areas but on one single level only meets the yellow level must be classified as yellow.

At the back of the manual you can read more about what the individual criteria mean for recyclability. There is also an explanation of abbreviations and technical expressions.

Design manual for plastic packaging for private use

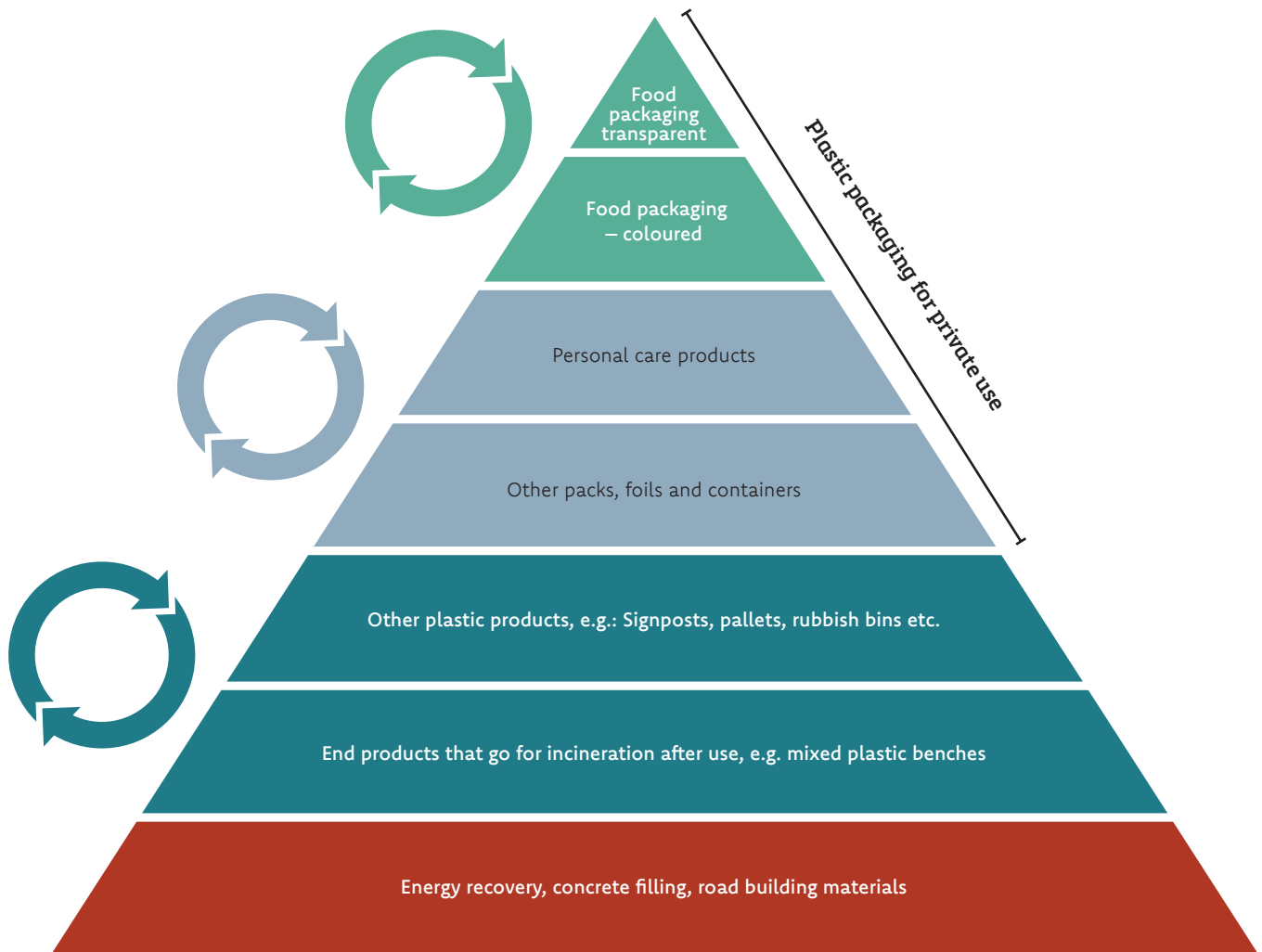
To be revised annually

Criteria Quality	Main component (Container, bucket, tray, bottle, foil)	Sub-component (Closures, lid, inserts, seals)	Decoration (Cover, print, glue and labels)	Emptying (By consumer)	Examples
High	<p>Main component is in mono-material: PET, PE or PP.</p> <p>Shall tolerate washing to a suitable degree.</p>	<p>Sub-components are in the same material as the container or completely separated from the container in use.</p>	<p>Cover and labels are entirely removed in use or simple dismantling.</p> <p>There is no coloured print on the container, only on the cover or labels.</p>	<p>The packaging can easily be entirely emptied of residues after normal use. Only needs a light rinse with water (e.g. meat tray).</p>	<p>rPET can for example be used for new bottles, food trays and food tubs.</p> <p>rPE and rPP can for example become pipes, buckets or containers for non-food products.</p>
Moderate	<p>Main component is of mono-material: PET, PE or PP.</p> <p>Or a minimum content of compatible material (cf. Appendix A).</p> <p>Main component is coloured.</p>	<p>Sub-components are not separated in use but are of materials that are compatible with the main component (cf. Appendix A).</p> <p>Sub-components are coloured.</p>	<p>Cover and labels are not separated from the container but are of the same material as the container or compatible materials (cf. Appendix A).</p> <p>There may be printing on the cover, labels or container.</p>	<p>The packaging is only partly emptied of residues after normal use.</p> <p>However sub-components are easily separated so that the consumer can rinse the packaging. (e.g. ketchup bottle)</p>	<p>rPET can for example be used for fibres for textiles.</p> <p>Can also be used for fleece sweaters, blankets etc.</p> <p>rPE and rPP can for example become pipes, buckets or containers for non-food products.</p>
Low	<p>Main component consists of laminated materials that are not compatible (cf. Appendix A)</p>	<p>Sub-components contain incompatible plastic types, metal, paper etc.</p> <p>Sub-components are not separated in use.</p>	<p>Labels and cover are incompatible with the main components and cannot be removed. There is a great deal of ink printing on the packaging.</p>	<p>The packaging cannot be emptied of residues after normal use. (e.g. toothpaste tube).</p>	<p>Mixed plastic can for example be used for concrete filling, RDF and plastic to diesel.</p>



How the criteria affect the packaging's recyclability

Main component (Container, bucket, tray, bottle, foil)	Main component (Container, bucket, tray, bottle, foil)	Sub-component (Closures, lid, inserts, seals, labels and cover)	Decoration (Cover, print, glue and labels)	Emptying (By consumer)
<p>The endeavour to design for recycling should not compromise the packaging's ability to ensure the product's shelf life, food safety etc.</p> <p>The quality and value of recycling of household plastic waste is increased by standardising the use of plastic types. Packaging in the main polymer types PET, PE and PP should be chosen, since these already represent more than 75% of the plastic waste coming from Danish households.</p> <p>By demanding recycled materials for your packaging, you are helping to support the market for recycling.</p> <p>Bio-based PET, PE and PP plastic can be recycled in exactly the same way as fossil based PET, PE and PP.</p>	<p>Avoid oxo-degradable and biodegradable plastic since these "contaminate" the other plastics going for recycling.</p> <p>The best way of ensuring high quality recycling is to design the entire packaging in one material so that the individual parts of the packaging do not need to be separated during the recycling process.</p> <p>Colours affect the packaging's recyclability. Uncoloured or clear plastic is to be preferred because it has a better palette of possibilities for recycling than strongly coloured plastic.</p> <p>Packaging that is laminated with layers of different types of plastic "contaminates" the recycling and lowers the value of the entire flow of materials.</p>	<p>If sub-components in a different type of plastic from the main component are not separated in the recycling process (or preferably by the consumer), they "contaminate" the final raw material. This lowers the value and reduces the number of products that can be made from the raw material.</p> <p>As with the main component, any sub-components shall be made of PET, PE or PP, which helps to standardise the use of plastic and create value and economy in recycling.</p> <p>It shall be possible to 100% remove seals from the packaging in use/opening.</p> <p>Sub-components made of cardboard or metal, for example, that are not separated in use considerably deteriorate the quality in recycling.</p>	<p>Sleeves and covers of plastic that cover the whole packaging basically have no influence on the automatic sorting of the product at a sorting plant. They can also be easier to separate from the packaging than paper labels where more glue is used.</p> <p>Labels, covers etc. lower quality and value in recycling if they cannot be automatically separated from the packaging either by the consumer or when the packaging is milled. Paper labels often stay on the plastic, even after milling, and create problems in the washing and preparation process.</p> <p>Avoid direct printing on the container because this lowers the value in recycling. If colour and printing are wanted, for marketing purposes for example, these should be confined to sub-components or covers.</p> <p>If the packaging is reused in a closed cycle, it is possible to apply paper labels with glue made of milk or potato starch and inks without heavy metals. These can then be washed off and used to make biogas.</p>	<p>Residues of the contents of packaging deteriorate quality in recycling. It is therefore important that packaging can be emptied and washed.</p> <p>In the optimal design, consumers need do nothing to empty the packaging. We are familiar with this situation with thin liquids such as soda water and dry, solid products such as fruit and vegetables.</p> <p>Fatty and viscous products, such as yoghurt and ketchup, need a wide opening or a package that stands on its head. There will often be a need for the consumer to lightly rinse the packaging with water when it is empty.</p> <p>Packages that cannot be fully emptied risk "contaminating" the flow of material with organic residues. They give off gas in the production process and in the worst case they create bubbles in the new plastic.</p> <p>Packaging that can be emptied completely also has other environmental and financial advantages because wastage is avoided.</p>



Material quality hierarchy

- ▶ Packaging approved for food products requires the highest quality plastic due to health and hygiene requirements. It is therefore very difficult to use plastic that has been recycled for other purposes in packaging approved for food products.
- ▶ When food packaging is recycled for other purposes after use, this is termed downcycling. It is sustained saving of resources but not exactly circular recycling of the plastic raw material.
- ▶ Packaging for personal care products, for example, can be reused and recycled as packaging for personal care products. This is part of circular plastic.



About the design manual

The design manual is intended for plastic packaging for private use. It therefore applies first and foremost to the type of packaging that is bought in retail stores and supermarkets.

The manual as you see it here has been updated in connection with the Danish Plastics Federation's Forum for Circular Plastic Packaging, which was set up in late 2017 and fully developed in early 2018. The first version of the manual was prepared in 2015 as part of the project "Increasing the Reuse of Packaging" under the EU LIFE+ project Plastic Zero – Avoiding Plastic as a Waste, which is a private-public innovation measure.

Created by

The working group "Design for Recycling" under the Danish Plastics Federation's Forum for Circular Plastic Packaging: Arla Foods, COOP, the Danish Technological Institute, the City of Copenhagen, UPM Raflatac, Plus Pack, BEWI, RPC Superfos, Trioplast, Kellpo, Ecolabelling Denmark, the Danish Society for Nature Conservation, Circle Development and Stena Recycling.

Comments and suggestions for improvements

Feel free to send comments, suggestions for improvements or your experiences of using the guidelines to: Danish Plastics Federation via pd@plast.dk, so that they can be included in the next revision of the guideline, which occurs in late summer each year.

Participants in the Forum for Circular Plastic Packaging



Aage Vestergaard Larsen A/S
Mere end 45 års erfaring med genanvendelse



Within the Forum for Circular Plastic Packaging a decision-maker group has been set up, as well as a number of working groups. Results from the working groups have been evaluated and prioritised by the decision-maker group, since it has been important for the Forum for Circular Plastic Packaging to have one common approach. The combined recommendations and measures written in this publication have been sent for consultation to all participants in the Forum for Circular Plastic Packaging and amended to reflect the comments received.