PLASTIC PACKAGING

RECYCLABILITY BY DESIGN

2023

The essential guide for all those involved in the development and design of plastic packaging.

RECOUP

Recyclability By Design
Version 10 : Updated 2022

This work has been published by RECOUP in consultation with experts in the plastic packaging industry and the recycling industry.

The information contained within this document is for guidance only. Any details given are intended as a general recommendation based on the best of our knowledge at the time of publication.

The guidance in this document does not imply any endorsement of the recyclability of any given polymer. Guidance does not necessarily guarantee compliance with the different recycling schemes. Users are advised to contact RECOUP to check for specific up-to-date information.

While every effort has been made to ensure the accuracy of the contents of this publication, RECOUP cannot accept any responsibility or liability for any errors or omissions. Opinions expressed by external contributors may not reflect RECOUP positions. Recommendations provided herein are offered for the purpose of guidance only and should not be considered legal advice.

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RECOUP (Recycling of Used Plastics Limited) is a leading authority on plastic packaging resource management, providing expertise and guidance to a wide range of clients across the plastics supply, use and disposal chain. Set up in 1990, RECOUP is a registered charity, built on a network of members and project activities.

RECOUP works to maximise plastic packaging recycling through stimulating the development of sustainable plastics waste management, including the improvement of plastics collection and sorting activities across the UK, undertaking research and analysis to identify good practices and remove barriers to the adoption of efficient recycling systems.

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Introduction

Climate change and sustainable development are recognised as two of the biggest issues facing society today. It is therefore increasingly important for companies to reduce the environmental impacts of products and services through their whole life cycle. Companies failing to address environmental performance in product design and development will find it increasingly difficult to compete in the global market.

As part of these considerations, packaging should be designed to satisfy technical, consumer and customer needs in a way that minimises environmental impact. This means, that amongst other things, packaging should be designed to use the minimum amount of resources for purpose and once it has completed its job, the scope for recovery maximised.

These guidelines focus on the design of plastic packaging to facilitate recycling and represent a small but important aid for the journey to sustainable production and consumption.

Background to Document

This publication is intended as a definitive general guidance document that has wide international agreement. It will provide plastic packaging designers, in particular, with a better understanding of the environmental implications of their design decisions, thus promoting good environmental practices but without unnecessarily restricting choice. Designers can be reassured that through following these recommendations, their plastic packaging should not cause recycling issues in any European country and be acceptable internationally.

This document is intended to address the issues in a way that will encourage packaging designers and specifiers to follow agreed good practice.

The advice contained in the document has been provided both to help users maintain the value of the post-used material resulting from the mechanical recycling of their packaging and to avoid significant interference with established recycling processes and material streams. The chapter beginning on page 55 “Recycling of Plastic Packaging” summarises the key aspects concerning the recycling of plastics.

Document Scope

This practical document seeks to answer in a pragmatic way many of the immediate questions for designers and specifiers of plastic packaging. The guidelines provided here are broadly applicable and internationally consistent at the time of publication.

This document does not attempt to provide a full strategic overview of all issues in plastic packaging recycling. The authors acknowledge that guidance on designing for recyclability is only one component of a larger sustainability challenge. There are wider issues of relevance, both in considering the overall environmental impact of differentiated packaging systems, and in developing efficient operational solutions to recycling and recovery of used plastic packaging. This is covered in more depth in the chapter “Product Protection First” on page 11.

Introduction

It is noted that continuing work will be required by many parties including designers, manufacturers, waste and resource management professionals and governments to address these developing issues.

It is important to note that since the packaging market is characterised by innovation, there are specific circumstances where the relationship of packaging production and recycling continues to develop.

There will also continue to be developments in the use of labels, glues and other packaging components. In addition good practices will develop and, changes in regulations will continue.

European Legislation

The EFSA (European Food Safety Authority) published in 2008 regulation 'Recycled plastic materials and articles intended to come into contact with foods'. The extended regulation covers any recyclable material, rather than specifically PET bottles. This ruling was updated in September 2022 with regulation 2022/1616. This regulation requires traceability of supply chains for food grade recycling and potential future requirements have led to increase demands in this area even more. As a consequence this may lead to additional recommendations for designers as well as for those involved in the logistics of recycling to ensure that compliance with the current and future regulatory standards is achieved.

Following these guidelines will also help European companies demonstrate compliance with the European recycling standard linked to the Essential Requirements legislation and more generally, will aid demonstration of 'due diligence'.

New EU regulations outline support for a circular economy. The circular economy package encourages new measures which will promote the inclusion of repairability, durability and recyclability in initial design.

Aims

The aim of this document is to encourage designers to consider recycling possibilities, provide guidelines for those wishing to make their packaging (more) recyclable and provide everyone with information to prevent their packaging inadvertently interfering with existing plastic recycling streams.

Pursuit of these aims must be proportionate; the guiding principle for any packaging design should be "fitness for purpose". Thus the goal of improving the recyclability of the packaging cannot compromise product safety, functionality or general consumer acceptance and should positively contribute to an overall reduction in the environmental impact of the total product offering.

As the recycling industry grows, collection rates and recycling rates improve, recyclability will more frequently be the most environmentally sound option. Energy recovery or composting are other options to be considered, depending on the nature of packaging and the local solid waste management infrastructure. These recovery routes are complementary and their relative use needs to be optimised to meet local conditions, thereby providing an integrated and sustainable approach to packaging waste management.

Introduction

Is this document relevant to me?

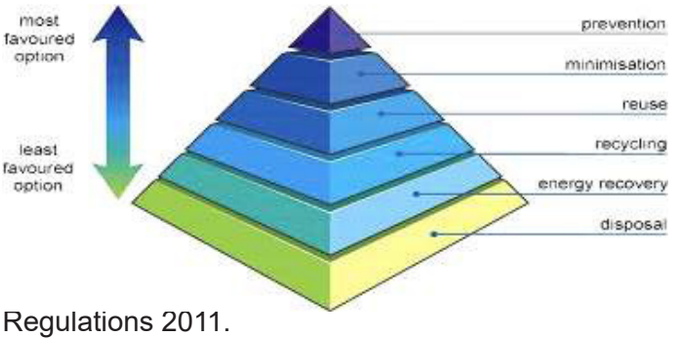
This document is of relevance to anyone specifying, designing or using plastic packaging. The focus is on plastic packaging that ends up in the domestic waste stream but it is also of relevance to commercial & industrial waste streams.

The document gives practical advice and information on environmental considerations to the whole supply chain i.e. designers, packaging technologists, buyers, marketing and retailers but is primarily focused on those responsible for specifying the packaging being used. Any specifier following the guidelines can be reassured that their packaging should not cause recycling issues.

This document consolidates and develops information from RECOUP members in both waste management and the packaging supply chain, together with various sources in Europe to provide a comprehensive guide on plastic packaging design best practice. It is, therefore, particularly relevant to companies selling into markets across Europe but has more general international relevance.

The Waste Hierarchy

The Waste Hierarchy was part of the revised EU framework directive in 2008. This sets out the methods of dealing with waste, ranked in order of potential environmental impact. This is based on life cycle assessment.



Regulations 2011.

Why is Plastics Recycling Important for the Environment?

- Recycling plastics can, in many cases, significantly reduce the consumption of resources and emissions to the environment.
- Plastics recycling can conserve energy and nonrenewable resources as recycling replaces the need for primary extraction and manufacture of new plastics.
- Plastics recycling also reduces the reliance on traditional, and less environmental beneficial, landfill waste disposal.
- The environmental impacts and benefits of recycling plastic products vary significantly depending on the type of product and its condition at end of life.
- Relatively large, clear supplies of plastic products can normally be recycled with a positive environmental gain.
- Creating a circular economy would have a number of benefits for plastics which can be a valuable and circular resource.

Introduction

The economic benefits of recycling are clear; compliance with regulation is mandatory; public image preservation is vital. By ensuring consumer and political demands are met, organisations involved in the plastics waste stream are less likely to come under attack for poor environmental performance, or as polluters. Political backlash to consumer and pressure group complaints will be minimised, with a greater level of dialogue and discussion taking place between sector and political representatives.

Although changes in legislation and policy may appear bewildering, there is an underlying certainty:

- Businesses that understand and act on the fundamental principle of sustainable development will gain competitive advantage.
- Businesses and sectors that fail to recognise the implications of these issues will lose out.

Protecting Your Freedom of Material Choice

Plastic packaging manufacturers understand the demonstrable benefits of plastics as a packaging material. Its lightweight nature is of particular benefit due to transport cost minimisation. In addition, plastic is often the most appropriate material to meet consumer demands of ensured freshness, safety and product visibility.

Companies involved in the packaging supply chain can safeguard their freedom of material choice by engaging with the recycling industry to provide support for the development of effective plastics recycling within the UK. Developing packaging that can easily be recycled by incorporating recyclability into the product development stage, combined with involvement in the development of the recycling industry, will help to protect both the public and political profile of plastic packaging and reduce the risk of material choice restriction via political intervention.

Genuine efforts to minimise environmental impact and maximise environmental benefit through the introduction of efficient plastics recycling programmes both protects and enhances the public image so vital to maintaining competitive advantage.

Following these guidelines will at a minimum, provide an important contribution to help you ensure that your packaging is compliant with relevant legislation /agreements, that recycling costs are minimised and that societal expectations and your company practices are matched in the area of plastic packaging recycling.

The document however is designed to go beyond being a simple aid to legal compliance; it provides up-to-date guidelines that can be used to support a process of continuous environmental improvement, a key element of both Sustainable Development and Corporate Social Responsibility.

Introduction

Are there Benefits to me if I Follow the Guidelines?

The guidelines allow you to maximise the opportunity for your packs to be mechanically recycled whilst avoiding significant interference with established recycling processes and material streams (requirement of European recycling standard linked to legislation) without unnecessarily restricting choice.

Adopting these guidelines at the start of the design phase will ensure unnecessary difficulties are avoided and hence unwanted project delays and associated on-costs prevented.

A number of countries across Europe seek to reward packaging that conforms to specific design rules and / or penalise those that don't. Compliance with these guidelines will help ensure that you obtain any benefits and avoid potential penalties in this area.

Following these guidelines will help minimise the costs to your company in satisfying its recycling obligations under European legislation and national / state agreements by maximising recycling efficiencies and thus minimising reprocessing costs.

What are you Asking me to Do?

For existing plastic packaging, you are asked to review your current portfolio against these recycling guidelines, highlight any aspects where the design could be improved and then implement changes, as the opportunity arises.

For new packaging, you are asked to integrate these guidelines into the design process at the start, to minimise cost and maximise the opportunity for compliance.

More generally, these guidelines should be integrated into any Environmental Management Systems (e.g. ISO 14001) and new product innovation protocols that you have, and become part of your automatic environmental assessment process for new products.

Will it Cost me Money?

Adoption of good eco-design practice should not result in an on-cost provided that these aspects are considered along with the many other business factors at the start of the design process. Conversely, if environmental considerations are only factored in at the end of the design process, then any changes necessary are likely to be costly in terms of both money and project delays.

Following the guidelines should help you reduce costs by:

- Helping to ensure that your company is compliant
- with relevant legislation (e.g. the recycling requirements of the essential requirements legislation of the European Packaging and Packaging Waste Directive) / voluntary agreements
- Minimising company recycling costs
- Matching societal expectations and company practices in the area of plastic packaging recycling.

Conversely, the potential consequences to a business of getting these aspects wrong in terms of legal, market share and corporate image issues can be significant.

Where Can I Get More Information?

Where Can I Get More Information?

The current guidelines provide a good point of entry. This document consolidates and develops information from RECOUP members in both waste management and the packaging supply chain, together with various sources in Europe to provide a simple but comprehensive guide on plastics packaging design best practice. Any specifier following the guidelines can be reassured that their packaging should not cause recycling issues. This document will be periodically updated and the most up to date version will be available for download from the RECOUP website;
www.recoup.org

The document also provides reference to key industry organisations and web sites dealing with the recyclability and recycling of plastics packaging in both Europe. You are encouraged to visit the web sites and if necessary, contact the relevant organisation(s) to discuss any specific issues not covered within the current guidelines or obtain further information on a specific area. These organisations can also help put you in touch with your local organisation should this be desired.

If you are unsure who to contact, or require any further guidance in relation to this document or any issues relating to recyclability of plastic packaging, please contact the RECOUP office.

Conclusion

Following these design for recyclability guidelines will be an important contributor towards helping to ensure that companies are compliant with relevant legislation / agreements, company recycling costs are minimised and that societal expectations and company practices in the area of plastic packaging recycling are matched.

In addition, the production of consistently high quality, post-use plastic material will overcome the quality and consistency supply issues experienced in the past. This will make it commercially a more attractive raw material and thus help to further stimulate sustainable secondary markets. Thus the use of post consumer plastic in packaging whenever possible should be encouraged.

Sector Specific Guidelines and Case Studies

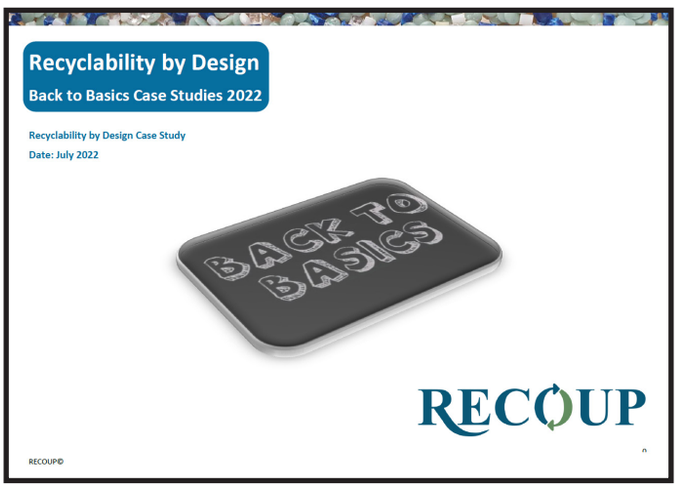
RECOUP work with Members and Stakeholders to develop initiatives and share best practice across the whole value chain. Using case studies; RECOUP illustrates how Recyclability by Design principles can be applied in practice.

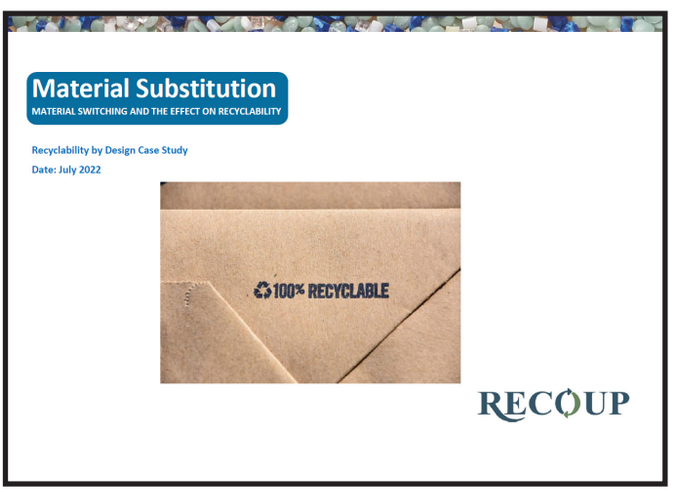
During 2020 there were many different claims and articles on social media platforms relating to new sustainable, eco-friendly, and green packaging designs. When looking at these new innovations and designs in more detail they are not what they always claim to be, and recyclability is often overlooked. Other key principles of packaging highlighted include labelling and how producers can improve the capture rates of plastic packaging without intervention from the consumer.

New case studies for 2022 include Material substitutions, Back to basics and Sharing best practice .

These and previous RECOUP case studies can be downloaded from the RECOUP website.

https://www.recoup.org/p/430/recoup-reports-packaging-recyclability-design-





Product Protection First
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Global megatrends such as climate change and resource scarcity are changing the world we live in. Today's consumer is increasingly aware of the need to re-use and recycle to contribute to a more sustainable society. However, placing the onus on recyclability to meet rising targets (55% by 2025 for plastic packaging) and in response to the drive towards a circular economy should not come at the expense of a holistic approach to sustainable packaging design.

"It would be remiss of us to focus purely on recyclability" says Yui Kamikawa, VP, Sustainability at kp. "To address a range of environmental challenges, we must continue to introduce innovation that enhances the primary functions of packaging; to protect, preserve and present the food inside."

According to WRAP, in the UK, over 2 million tonnes of fresh produce is lost or wasted each year in the supply chain alone. The use of modified atmosphere packaging (MAP) and vacuum skin packaging (VSP) ensures that meat reaches the supermarket shelf in an undamaged state, whilst demonstrating a shelf life of up to 28 days. Without innovative, functional and resource-efficient packaging, most packaged food on shelf today would not last more than a few days, resulting in significant food waste.

Today, the number of plastic packs re-entering the recycling chain at the end of their service life is increasing, thanks to growing consumer awareness. Whilst this is positive news, it presents its own challenges. For example, localised infrastructure constraints can impair the separating and converting of the individually recyclable components of multicomponent MAP and VSP formats for end-use.

"Sustainability is a global concern and all industries must take a unified approach to tackling the issues it presents" continues Mr. Kamikawa. "We must now drive the next generation of change by working together to ensure that resource efficient, lightweight packs with reduced carbon footprints can be converted from a waste material into a valuable resource for re-use, regardless of whether their construction is mono or multi-material."

If plastic packaging is recyclable – great! And if it's innovative, resource efficient and sustainable, that's even better. But to demonstrate holistic environmental credentials that become a real catalyst for change it must stay true to its core protective, preservative and display functionality first and foremost.

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RECOUP
Member

General Guidelines

Introduction

The guidelines have been compiled to help maximise the opportunity for plastic packaging to be mechanically recycled, without unnecessarily restricting material choice, and to help maximise the value of the post-used material resulting from the mechanical recycling of the packaging.

Up-to-date guidelines can be used to support a process of continuous environmental improvement, a key element of both Sustainable Development and Corporate Social Responsibility.

Careful selection of materials at the design stage will help overcome potential legislative issues, reduce cost and help conserve resources by avoiding obstacles to recovery, improving yields, producing less waste and ensuring a higher value of the recovered material.

The information contained within the guidelines implies no criticism of any material and merely seeks to point out that certain combinations should be avoided to maximise the recyclability of the plastic packaging in question. Plastic materials that cannot be processed with the main material at best reduce reprocessing yields and can, unless care is taken in the design, significantly reduce process efficiency and introduce unacceptable costs. Matrices summarising material compatibilities are provided within each material specific guideline.

Following the recommendations provided in these guidelines should avoid the necessity to evaluate component compatibility. However, if use of nonrecommended material combinations is desired, then the user may arrange for more definitive compatibility evaluation tests to be carried out. In addition, specific applications (e.g. food contact) may stipulate more demanding requirements than provided in these general guidelines.

General Principles for Container / Components

In an ideal world, use of mono-materials or mixed materials of the same type are the preferred choice from a recycler's point of view. In this context, type means materials that for all intents and purposes act as if they were a homogeneous material i.e. they are fully compatible, do not downgrade the properties of the recycled plastic and can be sorted and subsequently processed as if it were a single material.

It is recognised that to provide both the technical properties required and to satisfy user needs, sometimes a combination of different types of material is required. Under these circumstances, materials of different densities should be used to facilitate the separation of incompatible materials during mechanical shredding or crushing, or during the subsequent waterbased washing process. Combinations of different types of plastic with the same density ranges should be avoided.

Unpigmented polymer has the highest recycling value and the widest variety of end uses. Therefore, use of unpigmented plastic containers is preferred to pigmented.

For food contact applications, the additional specific requirements of traceability, guarantee of the use of qualified processes and producer responsibility for recyclates would ensure that specifiers use only food approved additives, to maintain the potential for the recyclate to be subsequently used in food applications.

General Guidelines

Residues

To help ensure packs are emptied to their maximum, packaging designers should carefully consider what good design features can be incorporated to aid the emptying of packs.

For example:
- Design the pack with a wide neck.
- Consider using a pack that can be stood inverted to ease emptying.

Non-stick additives can be used to reduce the cling of contents to the container to ease emptying. Such additives should not, however, affect the ultimate recyclability of the pack.

No firm target figures can be provided as to what constitutes acceptable residue levels as these will be very dependent upon pack size and product viscosity. As a rough guide however, for non-viscous products (i.e. where thickness is similar to water) aim for 50ml-99ml bottle residues <10%, 100ml-499ml bottles < 5% and 500ml+ bottles <2% bottle resides of declared contents when considered empty. For viscous contents it is not practical to set target residue guidelines as the amount of residue depends in part on the properties of the contents.

Composite Materials / Barrier Layers

Where a composite material is necessary to provide the requisite properties (e.g. provide a barrier function) and cannot be designed in such a way that the different types of materials can be separated mechanically or are compatible with the recycling stream, consideration should be given to the use of thin layers.

Colour of Plastic

Colour interferes with the mechanical recycling process in two main ways: Firstly, strongly coloured plastic material has a much lower economic value than nonpigmented plastic. Secondly, heavily coloured (and hence strongly light absorbing) plastic may interfere with automated sorting machinery that uses NIR spectroscopy to identify the nature of the plastic. Such equipment relies on the reflection of NIR radiation and thus there is an issue in identifying plastic items containing carbon black pigment.

The amount of colour to be used should be minimised as much as possible within the constraints set by technical considerations, branding and consumer acceptance.

Avoid direct printing onto natural (not coloured or opacified) plastics.

Readily separable attachments allow reprocessors to remove associated contaminants such as pigments, inks and residual adhesives, hereby raising the quality of the recyclate. This is particularly significant when the primary packaging polymer is colourless or ‘natural’. When the primary packaging polymer is pigmented, e.g. coloured HDPE, the reprocessor specification is less sensitive to low levels of ink contamination and in this case the polymer type of the label, cap and other attachments should be matched to that of the container.

General Guidelines

Closures / Closure Liners / Cap Sleeves / Seals

Closures, liners and cap seals should not interfere with the recyclability of the material to be recycled and ideally be recyclable themselves, preferably in conjunction with the plastic of the main container. Unfortunately, this does not mean PET closures on PET bottles. Ideally, HDPE closures are used on PET bottles for carbonated applications.

Closure systems that contain no liners and leave no residual rings or attachments when removed are optimum. Designers should assume seals may be pushed back into empty containers and choose materials accordingly.

Avoid use of metal caps. They are more difficult and more costly to remove in conventional reclamation systems compared to preferred plastic closure systems. Metal residues cause unacceptably high plastic rejection rates with the metal detectors installed in sortation lines and residues can catalyse polymer oxidation and block injection nozzles. Automatic sortation equipment such as eddy current units or electrostatic separation equipment can remove aluminium closures from recovered polymer. However, not all reprocessors have such equipment. In addition, most reprocessors use a caustic wash and any aluminium residues will be converted to aluminium hydroxide, which will then become a contaminant in the recycled material, that could prevent its suitability as a food grade material (e.g. in the case of PET). Use of threaded / snap-on metal closures should be avoided, as these can be difficult and relatively expensive to remove. Prised off (crown) caps are acceptable provided they are completely detached from the bottle on opening and cannot be pushed back on / into the container.

In certain circumstances, seal residues and minor components of a different type of plastic if present in very minor amounts, may not significantly interfere with the recycling process or the quality of the recycled material. However, this should not be assumed and further guidance should be sought in these instances.

In applications where tamper-resistance is required, integration into the design feature is preferable. Provided functionality can be maintained, sleeves and safety seals should be designed to completely detach from the container or be easily removed in conventional separation systems. Otherwise they will act as contaminants.

Where a removable sleeve is used on a bottle, instruction to remove the sleeve should be included on the labelling text.

If a full sleeve was to be left on, there is a risk that the bottle may not be correctly recognised by automated Near Infrared (NIR) sorting equipment, in which case the bottle could be either mis-read, or at worst possibly rejected and sent to landfill.

General Guidelines

Labels / Safety Seals / Adhesives

The type of labels and adhesives used has important implications for ease of container recycling. Amount of adhesive used and surface coverage should be minimised to maximise yield and ease reprocessing. Water releasable at 60 to 80°C (140 to 180°F) and hot melt alkali soluble adhesives are the adhesives of choice as they are the most readily removed during reprocessing. Label adhesives that can't be removed can coat the plastic regrind and embed unwanted contaminants.

The European Plastics Recyclers (EuPR) have produced a list of hot melts acceptable for mechanical recyclers that can be found on their web site. This list is not exhaustive and other adhesives may also be suitable. APR in the USA have also developed testing protocols for adhesive manufacturers to use to evaluate the impact of any adhesive product on conventional PET and HDPE bottle reclamation systems. The European PET Bottle Platform also has developed similar protocols to test acceptability of adhesives in conventional European bottle recycling systems.

For bottles; sleeves and wraparound or collar labels that are only glued to the container at only a few points are optimum.

Foil safety seals that leave remnants of the foil and / or adhesive should be avoided.

Labels should not delaminate in the washing process. Use of paper labels on bottles is not ideal, as some fibres can be carried over into the recycled plastic, causing problems such as surface defects and pinholes during the blow moulding of the recyclate. Paper labels also may pulp in the wash tank. They are acceptable, however, provided they are attached using water soluble adhesives and are not coated in such a way that prevents separation and removal from occurring during reprocessing. For this reason use of decorative / protective finishes (e.g. foil, lacquers, coatings, etc.) should be minimised.

Metallised / foil labels increase contamination and separation costs and should be avoided whenever possible.

Deposition techniques that provide a very thin layer of metal (only atoms deep) are acceptable however and are the method of choice to provide a metallised effect on labels.

Where in-mould labelling is desirable (e.g. to protect containers frequently coming into contact with oils or water) the same plastic as the container should be used wherever possible.

Reference should be made to the specific material sheets to obtain more detailed information about acceptable options for label materials.

The choice of label or sleeve polymer should not have the potential to lead to an error in the identification of the material used for the container itself. This is why various published guidelines for bottles often stipulate that the sleeve labels should cover no more than 40% of the bottle surface.

For pots, tubs and trays and other plastic items, a label should not cover more than 60% as presented for sorting.

General Guidelines

Pigments / Inks

Inks and pigments selected to colour and print the container and label already have to comply with existing restrictions on the use of heavy metal components and, although beyond the scope of these guidelines, also with relevant health and safety regulations.

In any case, hazardous substances should be avoided in the interests of good manufacturing practice and heavy metal inks not used for printing as they may contaminate the recovered plastic. For these reasons, it is recommended that the regularly updated exclusion list for printing inks and related products, provided by the European Printing Ink Association (EuPIA) is followed.

Inks that would dye the wash solution should be avoided as this may discolour the recovered plastic diminishing or eliminating its value.

Heavily pigmented containers should be avoided. They can result in a significant increase in the density of the polymer thereby causing separation problems and can also cause problems for automated sorting equipment using NIR sensors.

Other Components

The use of other components of a different material (e.g. handles, pour spouts) is discouraged as they may reduce base resin yield and increase separation costs. When required, compatible materials (preferably unpigmented) should be used.

Material Identification

In Europe, material identification is voluntary, but if it is to be used then Commission Decision 97/129/EC should be followed, although the widely adopted and substantially similar SPI system, developed in the US for plastic, seems also to be acceptable.

When used, the symbol should be shown clearly and ideally moulded into the container / component.

On containers, the marking should be clearly distinct from any other letter or cavity reference number to avoid confusion. For consistency, material identifiers should generally be embossed on the base of a container. Exceptionally, the identifier can be located on an alternative position close to the base (e.g. to avoid the risk of cracking due to bottle design).

Printing the material identifier on a label should be avoided, as this is likely to lead to confusion as it could refer to the label material, the container plastic or the full container.

With the use of automated sorting for household waste, the recycler’s need for material identification has become less important.

General Guidelines

Markets for Recycled Plastics

Recycling benefits and economics are maximised when the quality of the recyclate is appropriate and there are strong and diverse market outlets for the secondary material recovered. Today, there are opportunities to manufacture a range of plastic packaging products, including food grade applications such as containers and trays, with a proportion of recycled plastic. In this latter case, traceability is a critical parameter. Designers should consider the possibility of including recycled plastics in their packaging for both environmental and commercial reasons.

Integration of Environmental and Legal Aspects into the Packaging Design Process

The design of packaging is a complex process and is often a key element of product change / new product introduction. If environmental and regulatory assessments are included with the wide range of inputs that have to be taken into account at the start of a project they can become part of the process of maximising the product opportunity. Where environmental considerations are an afterthought issues are invariably more difficult to resolve and can lead to significant on-costs and serious time delays.

It is recommended that companies adopt a new product innovation process that automatically includes an environmental assessment. Ideally, this environmental assessment becomes part of a recognised environmental management system (e.g. ISO 14001). The European CEN standards provide an excellent management approach for carrying out this environmental assessment. Following these standards should ensure that companies automatically cover the key environmental aspects that need to be addressed for packaging. Use of this document by packaging designers / specifiers should help ensure that the key criteria covered in these standards concerning plastic packaging has been satisfied.

Material Specific Guidelines

General guidelines apply to all plastic materials used for packaging. Specific guidelines have also been produced for plastic packaging. These material specific guidelines complement the general guidelines and should be used in conjunction with them where appropriate. In the unlikely event that the general and specific guidelines appear contradictory, the material specific guidelines should take precedence.

The compatibility matrices contained in the material specific guidelines are divided into three columns, namely:

- **COMPATIBLE** for recycling in most applications
- **MAY BE SUITABLE** for recycling for some applications
- **NOT SUITABLE** for recycling

The meaning of these three columns is as follows:

COMPATIBLE for recycling in most applications	MAY BE SUITABLE for recycling for some applications	NOT SUITABLE for recycling
Generally the material is compatible with or separable from the main material and is acceptable in industrialised recycling processes in large volumes.	Use of material could cause severe recycling issues if used in large volumes. Under certain specific conditions the material may be recyclable, but this would need to be confirmed with the appropriate recycling organisations and/or recyclers.	Material is generally not compatible with or separable from the main material in current industrialised recycling processes and will therefore cause severe recycling issues/ cause rejection of recyclate if present even at low volumes.

It should be noted that under certain circumstances suppliers may require, for a specific application, recycled material that conforms to the most demanding requirements outlined in the material compatibility matrices supplied in this document, as evidenced by the following example:

Example - Polyethylene

For the manufacture of polythene bottles from recycled HDPE, one UK manufacturer highlights the importance from a recyclability perspective of the HDPE material stream including only containers made from HDPE, linerless HDPE caps, labels made from only HDPE and that any inserts or other minor components are also manufactured from only HDPE.

Material Specific Guidelines - PET

Material Specific Guidelines - PET

General

The recommendations given in this section were originally written to cover PET bottles. As explained earlier, these guidelines are driven by the requirements of the mechanical recycling process. Some of the current restrictions (especially for barriers / opacity / colour) may be relaxed as more recycling plants come into commercial operation. These benefits are likely to be realised with PET bottles, as these plants focus first on PET bottles as the source material. For efficient separation and removal in conventional density separation processes, parts of the packaging system that are not compatible with PET should have a density < 1 g / cm3.

Material / Material Combinations

Contaminants which generate acidic compounds during extrusion cause problems when recycling PET, as these catalyse ester depolymerisation reactions, decreasing intrinsic viscosity.

A range of contaminants including PVC, rosin acids from label adhesives and EVA cap liners can act as sources of acids. PVC contamination is a potentially major problem as the similar appearance and overlapping range of densities make the two polymers difficult to separate. PET melts between 250°C and 260°C, and at this temperature PVC begins to decompose producing HCl. The presence of very low levels of PVC (ca50- 200ppm) in recycled PET results in measurable deterioration in chemical and physical properties and can render large amounts of PET useless for most recycling applications. For this reason, the use of PVC components of any kind with PET containers should be scrupulously avoided. These components generally include, but are not limited to closures, closure liners, labels, sleeves and safety seals.

Other types of PET that share the same material identifier may cause problems in separation and conventional recycling. Use of PLA (a biodegradable material) with PET should be avoided as the polymers are incompatible and not readily separable (both have a density > 1g/cm3). The presence of very low levels of PLA in PET causes haze and a deterioration of physical properties with the recycled PET. MXD6 also will reduce clarity.

In addition, PLA causes processability problems in the drier as it melts at the drier temperature. Blends of PET with other resins are undesirable unless they are compatible with PET recycling. Inclusion of nucleating agents, hazing agents, fluorescers, scavengers and other additives for visual and technical effects should be examined on a case by case basis for their impact on the overall plastic recycling stream. Such additives which cause the PET to discolour and/or haze should be avoided unless means are readily and economically available to minimise their effect.

Barriers / Coatings

New PET bottles incorporating additives or barrier materials to further improve barrier performance are continuously being developed and will at some time challenge existing recovery schemes. Non-PET multilayers or coatings are not always fully compatible with current recovering technologies and may reduce recoverability of PET bottles. Indeed, constituents can be difficult to separate. (It is accepted that newer containers and containers for oxygen sensitive contents may be multi-layer and will, therefore, require additional attention during recovery operations). The European PET Bottle Platform has published guidelines to help the PET production, filling and recovery chain evaluate the impact of such bottles. EVOH barriers in particular have a history of causing significant issues during recycling if residual levels are >= 500ppm. This could include haze and colour issues at low levels and deterioration of mechanical properties at high residual levels. Hence EVOH as a potential barrier material with PET is not recommended at this time.

Material Specific Guidelines - PET

Product manufacturers and their suppliers would need to ensure that levels employed are minimised and that data to show that the proposed packaging provides a recyclate that satisfies all technical requirements (especially discolouration and haze) and that recyclers in general can achieve the separation efficiencies required. Alternatively, where performance enhancing barrier layers are used which could interfere with current recycling, for example in PET beer bottles, it is important to ensure that the container is easily distinguished and sorted from conventional PET bottles.

Clear plasma coatings in general cause no recycling issues, although use of high levels of carbon should be avoided. Other external coatings (e.g. O2 or CO2 barriers) can cause issues. To be acceptable the barrier needs to flake off the PET and be efficiently removed during reprocessing. European PET Bottle Platform protocols have been developed to test suitability.

Colour

Non-coloured, unpigmented PET not only has the highest value and the highest recovery rates but also the widest variety of end markets. At present, tinted (other than light green and blue tints) or opaque PET bottles are not desirable to many PET recyclers because the quality of their end products are colour sensitive. As a result, strongly coloured PET is rejected by many recyclers and can interfere with the recycling process and therefore clear PET should be used as much as possible. The use of opacifiers should be avoided as they significantly reduce the value of the PET recyclate. The presence of TiO2 in particular causes breakage during fibre production and thus use of this opacifier in particular should be avoided.

Closures / Closure Lines

EVA liners are only acceptable in combination with plastics. When combined with aluminium they cause contamination and thus should not be used.

Conventional silicone seals (density >= 1 g/cm3) are neither compatible with PET or easily separable and therefore should not be used in combination with PET. Seal manufacturers have recognised this problem and are now designing silicone seals with a density < 1 g/cm3. These seals should be separable from the PET and avoid potential issue. Potential users are recommended to check that the supplier can provide proof of the compatibility of the seal with conventional PET recycling. It is also worth noting that whilst this development was designed to overcome potential issues within the PET recycling stream, these lower density silicone seals have the potential to end up in the polyolefin stream and adversely affect the quality of this stream.

Closures made from PS or thermoset plastics are undesirable and should be avoided. In general the use of aluminium closures should be avoided, as they are more difficult to separate from bottles compared to the preferred closure systems (PP and HDPE) and add both capital and operating costs to conventional reclamation systems. Foil safety seals that leave foil or remnants or attaching adhesive on the PET bottle should be avoided.

Material Specific Guidelines - PET

Labelling

Polypropylene and polyethylene are the preferred label materials. Foil, lacquered and coated labels become contaminants and are undesirable. While PS sleeves are tolerated by many PET recyclers, to ensure that they can be separated easily in the floatation or wind sifting processes, they should only be used where the PS material is of low-density form (i.e. < 1 g / cm3) such as a foam. Presently all direct printing and decoration contaminates recovered PET in conventional reclamation systems and discolours the conventional base material.

Colour and printing therefore (other than date coding) should be confined to labels.

Other Components

It is preferred that base cups, handles, transportation aids and other attachments are avoided but if used, they should not be welded to the container. If attachments are glued on, they should separate in hot aqueous detergent or caustic solution (60 to 80°C).

	Material Guidelines - PET Bottles			
		COMPATIBLE for recycling most applications	**MAY BE SUITABLE for recycling for some applications**	**NOT SUITABLE for recycling**
BODY	**Colour**	**Clear/Light blue/light tints**	**dark blue / dark green / brown / strong tints**	**Opaque / solid colours Carbon Black**
	Barriers/ Coatings	**Clear plasma coating**	**External coating / PA - 3 layers**	**EVOH / PA monolayer blends**
	Additives		**UV stabilisers / AA blockers**	**Nanocomposites**
CLOSURE	**Caps**	**PP HDPE, LDPE - Europe only**		**Steel / Aluminium / PS / PVC / Thermosets**
	Seals	**PE/PP**	**Silicone (density <1 g/cm $_3$)**	**PVC / Aluminium / Silicone (density >=1 g/cm$_3$)**
DECORATION	**Direct Printing**	**None / Embossed / laser printing (minimal)**	**Minimal direct printing, e.g. production or expiry date**	
	Labels	**HDPE / LDPE / PP / OPP less than 60% coverage on face**	**paper over 60% coverage on face**	**PET PVC Metalised**
	Sleeves (incl. tamper resistance)	**PE / PP / OPP / EPS (density <1 g/cm3) Foamed PET / Foamed PET-G**		**PET PVC PS PS (density > 1 g/cm$_3$) / PET-G**
	Adhesive for labels	**removeable water releasable in 60 - 80oC**		**not removable in water**
	Ink	**EuPIA good manufacturing practices (for non food applications)**		**Inks that bleed and dye wash-solution**
OTHER	**Trigger sprays**	**PP / HDPE / LDPE**		**Glass components Metal springs / ball bearings**

Material Specific Guidelines - PET

Material Guidelines - PET Trays				
		COMPATIBLE for recycling most applications	MAY BE SUITABLE for recycling for some applications	NOT SUITABLE for recycling
BODY	Colour	Clear / uncoloured	NIR detectable colours*	Non-NIR detectable colours e.g containing carbon black*
	Barriers/ Coatings	None		PE seal Layer EVOH PA (Nylon)
	Additives	Minimal silicone surface coating (de-nest)*	O_2 scavengers / UV stabilisers / AA blockers / Anti-block	
CLOSURE	Lidding film	Easily removed by end user or easily removed early in the recycling process; or; as main polymer (PET)	Removed later in the recycling process (washing process)	
DECORATION	Direct Printing	None / Embossed / laser printing (minimal)	Minimal direct printing, e.g. production or expiry date Printing inks that do not lead to NIAS after the washing process	Extensive colour printing with printing inks that result in NIAS
	Labels	HDPE / LDPE / PP / OPP Less than 60% coverage on face Labels that are removed in or before the wash step*	paper over 60% coverage on face In Mould label	PET PVC Metalised Labels that cannot be removed Labels that result in detection error
	Adhesive for labels	Removeable Water releasable in 60 - 80oC		Not removable in water
	Ink	EuPIA good manufacturing practices (for non food applications)		Inks that bleed and dye wash-solution
OTHER	Inserts	Must be fully removable without leaving a trace*	HDPE / LDPE / PP / PET / paper	PVC / PS / EPS / PU / PA (Nylon) PC (Polycarbonate) / PMMA (Acrylic) Thermoset plastics / Metallic

*No additives or processes should result in not intentionally added substances (NIAS) as this would contaminate food grade recycled content

All small PET bottles are in 100% rPET Coca-Cola Europacific Partners

For many years Coca-Cola's bottles have been 100% recyclable and in September 2020, CCEP announced it had achieved a further significant milestone towards creating a circular economy. All small PET bottles (500ml) are in 100% rPET and all large PET bottles are in minimum 30% rPET, significantly reducing the amount of virgin PET used and consequently the carbon footprint of packaging used.

2021 has seen us take further exciting steps on our packaging journey:

- We have launched Capri-Sun Squash, in 100% rPET bottles. This follows the lead taken by Glaceau Smartwater, which moved to 100% rPET at the end of 2019.

- We have also now removed coloured PET from all of our core Favoured Carbonate bottles. Having moved our iconic Sprite from green to clear in 2019, we have recently followed suit with Lilt. This is an important step as clear bottles are much easier to recycle through mechanical methods, and deliver a higher value compared to coloured PET.

Coca-Cola EUROPACIFIC PARTNERS

RECOUP Member

Packamama's 100% recycled, and recyclable, PET wine bottle

Packamama is the climate tech packaging business (spun off from Garçon Wines) that offers packaging protecting Mother Earth. With the goal of reducing carbon footprint in the wine industry, we have created an eco-flat wine bottle made from 100% recycled PET (rPET). rPET is a wonder material for a product like wine that travels vast distances across the world; it is lower carbon, lightweight, shatterproof, food-safe, scalable, and the most widely recycled plastic on the planet. It is also fundamental in creating a demand for plastic that's already in circulation, which in turn gives it a value, funding and fuelling its collection, and helping mitigate against the material ending up as waste in landfill or litter in our environment.

Packamama believes in being plastic-smart, taking into account the entirety of the product's lifespan. We have innovated in shape, use best-in-class material, and design with recyclability in mind. This is done to slash financial costs and carbon footprint but also to reduce plastic waste and ease recyclability. This is why, since commercially launching product in May 2018 with wine industry standard aluminium screw caps and paper labels, we have worked with RECOUP and business customers to substitute both the caps and labels, to be consistent for recycling with the bottle. We have also extensively worked with label manufacturers to understand and recommend adhesives that separate cleanly from the bottles. Now all three components can enter the PET recycling stream without contamination. This would have not been possible with paper labels and the aluminium screw cap collar which remains on the bottle, even when the cap is removed, negatively impacting the quality of the recycling stream. Swiftly implementing these adaptations in the early days, thanks to input from industry experts, has allowed the bottles in the market to be fully, easily and widely recyclable. In the UK, 100% of councils collect PET bottles for recycling in kerbside collections. For other markets we actively collaborate with waste management organisations and our customers to ensure our bottles are recyclable within the existing infrastructures.

Packamama provides our multi award-winning, rPET bottles to wine producers and wine brands. We have collaborated with LVMH's Château Galoupet to provide an eco-flat bottle made entirely from Prevented Ocean Plastic for their Galoupet Nomade brand. In Australia our bottles for our recent launch with Accolade Wines and Taylors Wines were made from 100% rPET sourced and produced in Australia. Our collaboration with Accolade Wines has also been ongoing in the UK since 2020 where their brands in our bottles have been available at the Commonwealth Games, Edinburgh Fringe, Co-op, Tesco, and many more stadiums and events. This has helped spread the positive message of recycled and recyclable PET being used for an emotive and enjoyable product like wine. The bottles are supplied to our business customers with PP & PE screw caps, and we encourage them to use PP labels with an adhesive that allows easy separation from the bottle in the sink-float process. We also encourage our business customers to put clear and accurate recycling messaging on the back label.

We believe in making the recycling as simple and hassle-free for the consumer as possible, without expecting them to need to separate individual components. Packamama is also looking into ways to improve our circularity further, including bottle to bottle recycling through depolymerisation, and interception models.

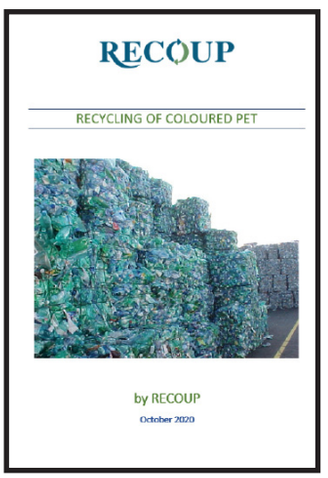
PACKAMAMA

RECOUP Member

Coloured PET Fact Sheet

- Polyethylene Terephthalate (PET) is one of the most recycled plastics used in household packaging. PET is viewed by many as the most recyclable polymer, mainly due to the use of PET for drink bottles.
- Most coloured PET is from PET Pots, Tubs and Trays (PTTs).
- The estimate is that PET trays not collected for recycling go to incineration (75%) and landfill (25%).
- When mixed with bottle flake, PTT material will have an effect on the IV level
- The demand for both clear and coloured rPET appears to be increasing, however infrastructure may limit the recovery of non-bottle coloured PET
- Coloured PET is less valuable than clear PET, and so is not targeted in the same way by UK MRFs.
- In EU countries, there is a marked decrease in coloured PET, especially driven by the decision of Coca-Cola to remove green colour from Sprite.
- To improve recycling rates for PET from PTT's, UK local authorities need to be encouraged to collect this material. For this to happen, PTTs needs to be seen as a recyclable fraction.
- It is generally accepted that material from PET trays is more brittle that PET from bottles. Compared to PET bottles reprocessing, significant yield losses are expected. The washing process used for bottle PET may be too harsh for PTT material, and lead to flake becoming too fine.
- Trials undertaken have proven that recycling of PET trays is technically possible, typically through blending with rPET bottle/ virgin plastic in the manufacture of a range of products. However, clear PET is still a preferred material for re-processors, both bottle and tray material.
- A coloured PET bottle would not go back into a packaging application and would be of much lower recycling value - so eco-modulation may penalise coloured PET vs clear in most systems.
- The most significant UK market for coloured PET up until recently was black sheet for thermoforming into trays. However, the recent negative publicity surrounding the recyclability of these products has led to several retailers specifying no black trays. Consequently, these products have shifted to clear or non-black coloured packaging which has reduced significantly the outlets for coloured PET flakes.
- Green (or predominantly green) bottles can be separated and reprocessed for supply into the strapping market. The strapping is high tensile and used in demanding applications such as bale ties, securing construction products and securing consumer goods.
- rPET is used to produce fibre. Other smaller markets exist for coloured products such as injection moulding compounds, but these are very small; a few thousand tonnes per year, typically from post-industrial supplies into niche automotive applications, supplied by specialist compounding companies.

More information is available in the RECOUP Report "Recycling of Coloured PET".



Material Specific Guidelines - HDPE

Material Specific Guidelines - HDPE

General

For efficient separation and removal in conventional density separation processes, parts of the packaging system that are not compatible with HDPE should have a density > 1 g / cm3.

Colour

Applications using clear, natural, colourless polyethylene have the highest recycling value, therefore use of unpigmented containers is preferred. Coloured containers, tubes and films are acceptable.

Barriers / Additives

Some applications require the use of additional barrier layers for specific applications. The use of non-PE layers should be minimised (to maximise PE yield and reduce potential contamination and separation costs), but when required they should be compatible with or easily separable from PE in conventional recycling systems. Current HDPE recycling systems can tolerate the use of low levels of EVOH layers. Similarly MXD6 and other nylon-based barrier layers are tolerated, particularly if the layers are readily separated from the HDPE in conventional reclamation systems. In all such cases their content should be minimised to the greatest extent possible to maximise HDPE yield and reduce potential contamination and separation costs. PVdC barriers should be avoided.

The use of additives / fillers such as calcium carbonate, talc, etc. in concentrations that alter the density such that they cause the HDPE plastic to sink in water or alter the properties of the regrind are undesirable and should be avoided. For this reason, the HDPE density should be kept at <= 0.995 g/cm3.

Other Components

Use of PVC components should be avoided as they can cause discolouration and malodour.

HDPE Bottles - Material / Material Combinations

Unpigmented, homopolymer HDPE bottles generally do not use a multi-layer construction at present. It is possible that future bottle designs, however, might require the use of layers for specific product applications and then the barrier advice given should be followed. The principal polymer contaminant of recovered HDPE is PP from bottle caps and bottles. HDPE and PP are opaque and less dense than water and consequently difficult for reprocessors to separate. Even in the small number of reprocessing plants able to separate PE from PP, this is not common as it is costly to carry out. PP has a higher melting point (160-170°C) than HDPE (ca130°C), and so does not disperse readily in the HDPE recyclate mix. PP contamination can limit the recovered HDPE specification to lower value applications. In general, a level of PP contamination up to 5% can be tolerated in the total mix and levels of PP cross contamination in finished product are frequently at around 5%. Higher levels e.g. 10% in the total mix can be tolerated for certain lower specification applications. When designing packaging, it is recommended that PP levels are restricted to a maximum of 5% to avoid potential end use issues. This is in line with US recommendations. Higher levels may be possible but this would require the difficult task of investigating the likely effects on the total mix during recycling.

HDPE is very susceptible to contamination from the contents e.g. pesticides, motor oil, etc.) which can result in colour and odour problems. Whilst recyclate derived from milk bottles can result in malodour issues, this should be avoidable using a hot washing stage during reprocessing. HDPE containers used for mineral oil based products (e.g. motor oil) are not generally mechanically recyclable as they can cause residual malodour issues but more importantly, the oil migrates into the plastic and is not removed during normal reprocessing operations.

Material Specific Guidelines - HDPE

Colour

In general homopolymer bottles are unpigmented whilst copolymer HDPE bottles (detergent bottles) are pigmented. Indeed, some plastic recyclers use pigmentation as the basis for distinguishing and separating copolymer from homopolymer containers. For this reason a communication program to alert recyclers to the potential confusion should accompany any use of unpigmented copolymer bottles. In multilayer HDPE bottle designs, the use of inner layers of the same colour as the outer layer is preferred to maximise recyclability but inner and outer layers of different colour can be tolerated.

Closures

The use of closures that are the same colour as the bottle is desirable (although not essential). Foil safety seals that leave foil or remnants or attaching adhesive on the HDPE bottle should be avoided.

Labelling

In applications using unpigmented, homopolymer HDPE, all direct printing other than date coding, used either for product labelling or decoration, presently contaminates the recycled unpigmented HDPE in conventional reclamation systems. Use of PVC labels should be avoided as during the density separation the foil is so thin that it is carried over with the PE and does not sink as would be expected from its intrinsic density.

Other attachments

The use of any other attachments is discouraged, as they reduce base resin yield and increase separation costs. If attachments are added to a bottle, they should be made from either materials that are easily separable from HDPE in conventional separation systems or are compatible e.g. PP, LDPE or preferably, unpigmented, homopolymer HDPE. Use of PP or LDPE attachments, if necessary, should be limited to less than 5 percent of the total bottle weight wherever possible as higher percentages can contaminate the HDPE for many recycling applications. If pour spouts are added to a bottle they should allow for complete removal of product contents and be designed to leave virtually no product residue when the bottle is empty. If adhesives are used to affix attachments, they should be water releasable or dispersible at temperatures between 60°C and 80°C in order to be removed in conventional washing and separation systems. The use of attachments that contain metallic and other non-plastic components is discouraged and should be avoided.

Material Specific Guidelines - HDPE

		COMPATIBLE for recycling most applications	MAY BE SUITABLE for recycling for some applications	NOT SUITABLE for recycling
BODY	Colour	Natural	Light blue / green / light tints Opaque / Heavy colours	Carbon Black
	Barriers/ Coatings	EVOH	PA (incl. MXD6)	PVDC
	Additives			talc / CaCO3 / other fillers that increase the density of HDPE abover 0.995 g/cm$_2$
CLOSURE	Caps	HDPE / LDPE / PP		Steel / Aluminium / PS / PVC / Thermosets
	Liner	HDPE / LDPE / PE + EVA / PP		PS / PVC / EVA with aluminium
	Seals	PE / PP / OPP	Aluminium	PVC / Silicone
DECORATION	Direct Printing	Minimal or moderate direct printing, e.g. production or expiry date laser printing (minimal)	Excessive direct printing	
	Labels	HDPE / MDPE / LDPE / LLDPE PP / OPP less than 60% coverage on face	Paper over 60% coverage on face In Mould label	PVC / Aluminium / Metalised PET
	Sleeves (incl. tamper resistance)	PE / PP		PVC / PS
	Adhesive for labels	water releasable in ambient conditions	water soluble up to 80oC	not removable in water
	Ink	EuPIA good manufacturing practices (for non food applications)		Inks that bleed and dye wash-solution
OTHER	Trigger sprays	PP / HDPE / LDPE		Glass components Metal springs / ball bearings

Material Specific Guidelines - PP

Material Specific Guidelines - PP

General

For efficient separation and removal in conventional density separation processes, parts of the packaging system that are not compatible with PP should have a density > 1 g/cm3.

Colour

The use of unpigmented PP is preferred to pigmented as the recyclate from unpigmented bottles will have a greater value due to the larger number of potential applications. Clarified PP is acceptable when bottles are shown to be compatible with end uses for recyclate.

Material Combinations

The principal polymer contaminant of recovered PP is HDPE from bottles, closures and attachments.

PP and HDPE are opaque and less dense than water and consequently difficult for reprocessors to separate. Since HDPE has a lower melting point (ca 130°C) than PP (160-170°C) the overall PP mix will be more tolerant to HDPE contamination than the converse.

Nonetheless, when designing packaging, it is recommended that PE levels are restricted to a maximum of 5% to avoid potential end use issues. This is in line with US recommendations. Higher levels may be possible but this would require the difficult task of investigating the likely effects on the total mix during recycling.

Barriers

Current PP recycling systems can tolerate the use of EVOH layers. Similarly MXD6 and other nylon-based barrier layers are tolerated, particularly if the layers are readily separated from the PP in conventional reclamation systems. In all such cases their content should be minimised to the greatest extent possible to maximise PP yield and reduce potential contamination and separation costs. PVDC barriers should be avoided.

Closures / Closure Liners

The use of closures that are unpigmented or the same colour as the bottle are desirable (although not essential). Foil safety seals that leave foil or remnants of the attaching adhesive on the PP bottle should be avoided.

Labelling

In applications using unpigmented PP, all direct printing other than date coding, either for product labelling or decoration, presently contaminates the recycled unpigmented PP in conventional reclamation systems.

Other Components

Use of PVC components should be avoided as they can cause discolouration and malodour.

Material Specific Guidelines - PP

		COMPATIBLE for recycling most applications	MAY BE SUITABLE for recycling for some applications	NOT SUITABLE for recycling
BODY	Colour	Clear / Natural, or lightly tinted	Opaque / Heavy colours	Carbon Black
	Barriers/ Coatings	EVOH	PA (incl. MXD6)	PVDC
	Additives		clarifier	
CLOSURE	Caps	HDPE / LDPE / PP		PS / Thermoset plastics / Aluminium / Steel / PVC
	Lidding film	No residue after removal by consumer; or; as main polymer (PP)		
DECORATION	Direct Printing	Minimal or moderate direct printing, e.g. production or expiry date laser printing (minimal)	Excessive direct printing	
	Labels	HDPE / MDPE / LDPE / LLDPE PP / OPP less than 60% coverage on face	Paper over 60% coverage on face In Mould label	PVC / Metalised PET
	Sleeves (incl. tamper resistance)	PE / PP		PET / PVC
	Adhesive for labels	water releasable in ambient conditions	water soluble up to 80oC	not removable in water
	Ink	EuPIA good manufacturing practices (for non food applications)		Inks that bleed and dye wash-solution
OTHER	Inserts	PP	HDPE / LDPE paper PET (light)	PVC / PS/ EPS / PU / PA (Nylon) PET (Heavy) PC (Polycarbonate) / PMMA (Acrylic) Thermoset plastics / Metallic
	Trigger sprays	PP / HDPE / LDPE		Glass components Metal springs / ball bearings

No barriers to plastic recyclability
Berry Global

Packaging provides a reflection on how we live. It responds to market trends and consumer demands. In the food sector, for example, our busy lifestyles are contributing to the continuing popularity of on-the-go eating, while at home, time-pressed consumers are increasingly seeking the convenience of pre-prepared foods – either complete meals or ready-to-use ingredients to speed up the cooking process.

Barrier plastics offer excellent opportunities for the development of a variety of convenience pack solutions. Barrier technologies can be allied to different plastic manufacturing techniques – blow moulding, injection moulding and thermoforming – so that packaging manufacturers and designers can tailor a solution to precise product and brand requirements. Therefore, whether the focus is on the need for reclosability, intricate eye-catching designs, or a large family-size pack, plastic has the flexibility – in both materials and processes – to meet any or all of these requirements.

At Berry, for example, customer requirements have ranged from a thermoformed pack to resemble a traditional French cooking pot to large-size containers with indented handles for easy handling in the busy food service sector.

However, there is still a common misconception that barrier plastic packaging is not recyclable and for this reason some designers tend to focus only on monolayer packs in the development stages.

The fact is that barrier plastics are recyclable and can form part of a mixed plastics recycling stream. The current use of barrier material, such as EVOH, is minimal and for this reason does not act as a major contaminant in a bale of PP or mixed plastic to be recycled. Current PP recycling systems, for example, can tolerate the use of EVOH, particularly if the layers are readily separated from the PP in conventional reclamation systems. This helps to maximise the PP yield.

And there is high demand for this material – from re-use in non-food packaging, such as paint containers, to second life applications including fencing and benches. So it is vital that manufacturers and retailers continue to promote the recycling message and that more local authorities make facilities available to recycle plastics.

At the same time, a sustainable pack design needs to take into account more than just the recyclability of the pack. It is important to consider the entire lifecycle, covering factors such as the manufacture and transportation of the pack, and its ability to provide product protection and reduce food waste.

No barriers to plastic recyclability
Berry Global

Food waste, in particular, is currently generating a lot of coverage. The SAVE FOOD initiative, a joint campaign organised by the Food and Agriculture Organisation of the United Nations and Messe Düsseldorf GmbH to highlight and fight global food loss and waste, says that each year, worldwide, a third of all food is thrown away or lost, while at the same time around 842 million people are suffering from hunger. Excessive food waste also has a negative impact on the environment, a point underlined in the UK by WRAP's 'Love Food, Hate Waste' campaign.

The advent of barrier plastic technologies is one way in which we can reconcile the demand for convenience and the need to preserve food and minimise waste. They enable many different products to enjoy extended shelf lives – up to 24 months and in some cases even beyond this – while maintaining their freshness, quality and taste.

Barrier portion packs offer another solution to minimising food waste by ensuring the right amount of product for individual servings.

The light weight of plastic packs also makes an important environmental contribution in terms of energy savings during transportation. Barrier packs offer a further energysaving advantage since products can be hot filled, pasteurised or sterilised in the pack (like other more traditional materials) to enable them to be stored at ambient temperatures without the need for chilling. In addition, these products do not need preservatives to deliver long shelf life, enhancing their quality.

For pack designers, barrier plastics' versatility gives them the flexibility to create a pack that meets both brand objectives – in terms of on-shelf image and appeal, and practicality and functionality – while being tailored to the precise characteristics of individual products. And the packs' recyclability is just one element in a strong environmental profile that can make an important contribution to a company's sustainable image.

Berry

RECOUP
Member

The Recyclability of Post-Consumer Polypropylene (PP) Fact Sheet

RECOUP Statements

- PP is one of the two most common plastic types used in producing consumer pot, tub and tray packaging. There are also a small number of plastic bottles manufactured from PP.
- From the 175kt of post-consumer plastic pots and trays collected for recycling in 2017, an estimated 35% or 61kt is PP.
- There are PP reprocessors in the UK and Europe and it can be recycled into a wide range of products.
- PP is currently the most valuable element within the post-consumer pot, tub and tray fraction. The markets for PP accept a mix of colours which means different colours do not need separating out before recycling.
- Some PP is used for food contact packaging, but PP pots and trays cannot currently be recycled back into food contact packaging again in a practical or commercially viable way.

Evidence and References to Support Statements

- Collection data is referenced from the RECOUP annual collection survey.
- Composition of pots and trays taken as an average from a range of published reports plus unpublished UK MRF and PRF data made available to RECOUP.
- UK recycler 1 – Once baled, good quality sorted PP pots, tubs and trays have a market value of £200 - £250 per tonne. We reprocess this type of material into a high quality PP regrind which is sold into a range of applications and has a market value currently over £500 per tonne.
- UK recycler 2 - Post-consumer PP has a value, there is market demand, and it is the highest value / polymer with the most established recycling value chain within the post-consumer pot and tray mix (subject to normal quality requirements). Bale prices are £220 or more per tonne, and flakes have a market value of over £500 per tonne.
- UK recycler 3 –We currently buy several thousands of tonnes per year of postconsumer PP for reprocessing in the UK and it is utilised in many end product categories including Automotive, Construction, Packaging and Horticultural. Baled post-consumer PP is widely reprocessed throughout the world and has become a key feedstock for the plastics reprocessing industry with demand outstripping supply for several years. In the UK It has historically had a positive value between £150 and £250 per tonne (for bales) and a flake value between £350 and £500 per tonne. We support the continued & expanded use of PP in rigid household packaging applications as its use has proved highly sustainable and led to the decline in use of lower volume, commercially non-viable materials.
- UK waste management company 1 - Polypropylene is recyclable. What makes a polymer recyclable is the successful combination of its collection and sorting, but also the existence and strength of its end markets: someone needs to buy the material to give it a new life. And there are very good end markets for both clear and coloured PP. The industry wants to use recycled PP, it has got a value and thanks to recycled PP, less virgin material is used.
- UK waste management company 2 - We are seeing increasing demand for recycled PP from packaging sources and have invested accordingly in PP recycling for such grades which are being sold back in to a number of moulding applications such as crates, containers, furniture and pails.

Material Specific Guidelines - PS

Material Specific Guidelines - PS

General

Applications using clear, colourless polystyrene have the highest recycling value. Therefore use of unpigmented containers is preferred. Coloured transparent containers are acceptable however, but their recyclability and the value of the recyclate are reduced.

In principle aluminium lids are acceptable on PS, especially peel-off ones.

Tubs that have a clear or colourless body and where the information is presented on the lid are particularly suitable for recycling.

Direct printing is acceptable provided attention is paid to ink types to avoid interference with quality of regranulate.

Excessive paper content can cause issues during recycling and thus use of paper labels is less desirable. If used, they should be lightweight and cover only a minor area of the container.

		COMPATIBLE for recycling most applications	MAY BE SUITABLE for recycling for some applications	NOT SUITABLE for recycling
CONTAINER				Multi-layer material (unless based on PS with polymers of the same type in limited quantities)
	Colour	Clear / Natural, or lightly tinted	Heavy colours	Opaque / solid colours Carbon Black
LID	Lidding film	No residue after removal by consumer PS PS with PE insert PS with EVA insert OPS	Lightweight Aluminium foil PE PP	Heavyweight Aluminium foil PET / Heavy paper
DECORATION	Direct Printing	Minimal or moderate direct printing, e.g. production or expiry date laser printing (minimal)	Excessive direct printing	
	Labels	PE / PP / OPP / PS PS / OPS less than 60% coverage on face	Paper over 60% coverage on face In Mould label	PET PVC Metalised
	Adhesive for labels	water releasable in ambient conditions	water soluble up to 80oC	not removable in water
	Ink	EuPIA good manufacturing practices (for non food applications)		Inks that bleed and dye wash-solution

Sustainable Packaging for Food-To-Go
kp

kp Infinity™ is a high-quality material made from a single form of plastic. This means it is easily recycled and can be used to create a variety of new products: from packaging to furniture, flooring and textiles – which gives our food-to-go packaging a second life and more.

To fully understand how recyclable kp Infinity™ is, we collaborated with several key partners across Europe leading comprehensive trials, as well as conducting our own trials in a series of key tests. Ensuring the basics our research began with an extensive trial, set up by Borealis, with recycling specialists Veolia and MTM. This first test required the recycling of 20 tonnes of EPP cups to check that it could be easily sorted and recycled using the technology and processes available in UK and European facilities.

Testing the full cycle after these successful trials, MTM took a further eight tonnes – in the form of pressed clamshell boxes commonly used for takeaway food – to determine whether recycled kp Infinity™ could be processed into pellets that meet regulation standards for being recycled and reprocessed into new products.

During the trial, a mix of 20% kp Infinity™ and 80% standard post-consumer polypropylene (PP) was processed into plastic flakes. Despite the EPP component, higher than that usually processed by MTM, there were no impacts to the efficiency and the end product was of the same quality as a standard batch. The trial determined that kp Infinity™ was highly recyclable. We also conducted a test with UK waste management specialists Biffa. Using a one tonne sheet of kp Infinity™ as input material, Biffa also confirmed that kp Infinity™ is fully recyclable within its infrastructure.

The final phase of the test was to blow-mould the resulting polymer resin into non-food grade bottles, such as those traditionally used for household bleach.

Preventing contamination at plastics recycling facilities (PRF), sink–float technology is commonly used to separate out the PP waste stream (70%) from the mixed waste stream (30%). Foamed or expanded PP has a density lower than one and floats in water. Other plastics, such as EPS and expanded polyethylene terephthalate, also have a density lower than one, meaning there is the potential for contamination of the profitable PP stream. It is for this reason that they are difficult to recycle within the current system. kp Infinity™, however, being a monomaterial, will have the benefit of adding more high-quality PP into the reprocessing stream.

kp

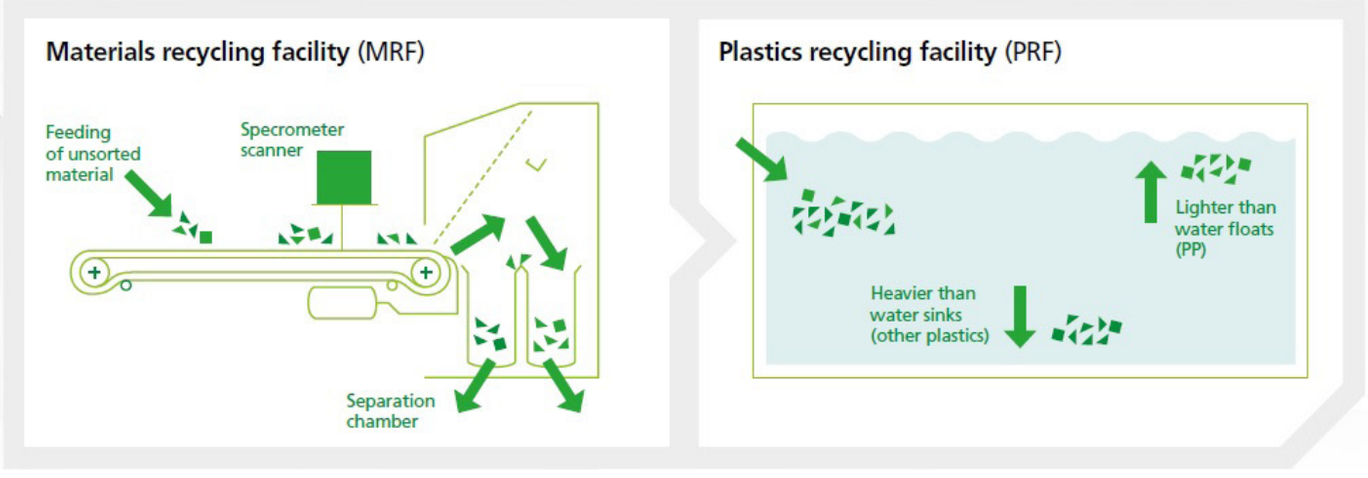
RECOUP Member

Sustainable Packaging for Food-To-Go
kp

The partner trials concluded the kp Infinity™ performs as expected in all existing recycler processes and is therefore fully recyclable

Conclusive approval was achieved in working closely with RECOUP, who kp regard as the UK's leading authority on plastics waste and resource management. Samples were supplied for trial at a local materials recovery facility (MRF) to see if they would be separated easily into the correct recycling stream. A MRF collects all different types of materials and sorts them into defined streams. The results were decisive and successful, with kp Infinity™ easily being diverted to the correct stream.

For further validation, samples were sent to TOMRA in Germany to determine whether kp Infinity™ could be scanned by near infrared (NIR) AUTOSORT technology, which is designed to detect the exact chemical and material makeup of objects. All samples were fully recognised and sorted by AUTOSORT.



Guidelines - Other Plastic Packaging

The term ‘mixed plastics’ has been used to cover all non-bottle plastic packaging sourced from the domestic waste stream. This includes rigid and flexible plastic items of various polymer types and colours that are typically found in the household waste bin. It excluded plastic bottles and nonpackaging items. It is now widely believed that the term is too general, and even misleading.

With an increasing range of materials being recovered in domestic waste recycling systems, non-bottle plastic packaging items form some of the most visible remaining components of the domestic waste bin.

In addition, for those countries in Europe that collect all packaging waste within their respective recovery schemes (e.g. Germany, Italy and Spain), the same fee scale is used for all plastics. Hence the manufacturers who have to pay the fees for plastic packaging expect a progressively higher percentage of the material to be recycled. There is, therefore, a growing need to develop sustainable waste management options for non-bottle plastic packaging in Europe and there are signs that plastic packaging collection streams in the USA are expanding beyond rigid bottles / jars to cover all plastic packaging.

Where a range of plastic packaging is collected for recycling, the flexible packaging is first separated from the rigid plastic packaging and then the bottles are extracted from the rigid mixed plastic components.

The rigid mixed plastic component (pots, tubs and trays - PTTs - form the bulk of this packaging type) is generally then separated into a polyolefin stream (PE+PP or PE & PP separately) and a PET stream using near NIR detectors.

General

The basic design principles for PTTs are no different to those given in the general guidelines section and in the specific polymer sections. However, the processes used for the recycling of other plastic packaging containers are not identical to those used for plastics bottle and hence exactly the same rules may not apply.

Rigid Mixed Packaging Material / Material Combinations

As with rigid bottles, use of mono-materials or mixed materials of the same type are the materials of choice from a recycler’s point of view. Mixed plastics however very often require the use a variety of plastic materials to provide both the technical properties required and to satisfy user needs. In the absence of any other specific guidance, designers should follow the recommendations provided in the corresponding polymer table when designing a plastic rigid container. Alternatively, components that were known to be readily separable could be used.

Guidelines - Other Plastic Packaging

Contamination

Plastic containers are generally lightweight. Product contamination can therefore represent a significant proportion by weight of the collected material (e.g. the weight of product residues in yoghurt pots can be as much or more than the weight of the container itself).

Contamination lowers the efficiency of the recycling process as polymer weights are much less than weights of material collected and the residues themselves (often oily food) can interfere with the washing process. It is therefore important that containers are designed in such a way as to ensure levels of contamination are minimised as much as possible. This not only provides a benefit to recyclers, but also to the consumer. To further facilitate recycling, consumers / end-users should remove any plastic film, paper, cardboard and foil present and as much food residue as possible before putting the container out for collection.

PET/PE Trays

Rigid PET packaging represents a significant fraction by weight of the domestic plastic waste stream. One particular difficulty is the widespread use of PET/PE multi-layers (e.g. in the processed meat sector). As already indicated, use of mono-materials or mixed materials of the same type are the materials of choice from a recycler's point of view. Hence the current efforts by some producers, encouraged by RECOUP, to switch from PET/PE blends to monolayer PET for trays should further facilitate recycling. However, it should be restated here that it is appreciated that use of multi layers in this way may have a greater environmental benefit, in extending shelf life, than consideration of recyclability.

As with other PET packaging formats, it is vitally important that contamination by PVC is avoided. PVC trays and blisters represent an important potential contaminant of the PET tray and blister stream and every effort needs to be made to try and ensure that such contamination is avoided either through design and / or at the recycling stage.

PE - Tubs / Dishes

Tubs and dishes are often made of injection grade HDPE, exhibiting higher melt flow rates than blow moulding grade HDPE. Mixing the two types of HDPE together decreases the value of the mixture. Do not mix HDPE bottles with HDPE tubs or dishes.

In principle aluminium lids are acceptable on PE, especially peel-off ones. Adhesive should stay with the aluminium lid.

Tubs that have a clear or colourless body and where the information is presented on the lid are particularly suitable for recycling.

Direct printing is acceptable provided attention is paid to ink types to avoid interference with the quality of regranulate.

Excessive paper content can cause issues during recycling and thus use of paper labels is less desirable. If used, they should be lightweight and cover only a minor area of the container. Paper labels are liable to pulp in a hot caustic washing step.

Guidelines - Other Plastic Packaging

PE - Tubes

Cap and tube should be manufactured from the same type of plastic and ideally from the same polymer (in this case HDPE). An elevated percentage of PP lowers the quality of the recycled plastic.

Direct printing is acceptable for marking tubes provided the printing is in compliance with the EuPIA Exclusion list. Paper labels also can be used, provided they are easily removed in water and leave no adhesive residue that is difficult to remove.

PP - Tubs / Dishes / Trays

In principle aluminium lids are acceptable, especially peeloff ones. Adhesive should stay with the aluminium lid.

Tubs that have a clear or colourless body and where the information is presented on the lid are particularly suitable for recycling.

Direct printing is acceptable provided attention is paid to ink types to avoid interference with quality of regranulate.

Excessive paper content can cause issues during recycling and thus use of paper labels is less desirable. If used, they should be lightweight and cover only a minor area of the container. Paper labels are liable to pulp in a hot caustic washing step.

PP - Tubes

Cap and tube should be manufactured from the same type of material and ideally from the same polymer (in this case both from PP). Direct printing is acceptable for marking tubes provided the printing is in compliance with the EuPIA Exclusion list. Paper labels also can be used, provided they are easily removed in water and leave no adhesive residue that is difficult to remove.

Film - Material / Material Combinations

As with rigid bottles and mixed plastics, homogeneous films can be recycled optimally. Use of mono-materials or mixed materials of the same type are the materials of choice from a recycler's point of view and combinations with a different type of plastic of similar density should be avoided wherever possible.

Packaging film very often requires the use of a variety of plastic materials, to provide both the technical properties required and to satisfy user needs. Designers should follow the film guidelines now available: for example the Recyclass guidelines from Plastics Recyclers Europe. In the case of films, as some film recyclate is used in applications that have a more tolerant specification e.g. furniture, bin liners, etc, plastic film users can feel less restricted to use material combinations in the MAY BE categories than with rigid containers. Combinations in the NOT SUITABLE category should still be avoided.

Film Recycling

There is more and more interest surrounding plastic films and its options for recycling which goes in hand with the growing increase of flexible packaging and film used across industries. It is estimated that there is 395k of household film placed on the market with an increasing demand from industries and consumers to make this material mechanically recyclable. Household collection of plastic films are in decline due to current infrastructure and little financial benefit, alternative options for collections are required.

This year has seen an increase in front of store collection schemes at major retailers for flexible materials. This material is sent for industrial recycling with other post-industrial films. These schemes are not always a success and issues such as the decline in carrier bag use and high levels of contamination have contributed to the collected material not reaching the film recyclers. There has also been much attention around refillable pouches/doy packs. These pouches remove the need for rigid packaging, but attention should be paid to the choice of materials used and if there is currently any feasible recycling route for such items at the present time.

The packaging industry along with recyclers continue to collaborate and inform with CEFLEX and other groups developing initiatives and sharing best practice. With flexible packaging being difficult to recycle and investment required into the infrastructure it is imperative that the industry are placing flexible packaging onto the market that can be recycled.

The design of plastic flexible film controls to a large extent the degree to which a packaging can be recycled. The structures and materials which are incompatible with mechanical recycling cause a number of disruptions in a recycling line. This may vary from clogging and damaging recycling equipment to heavy input material losses and downgrading of the recyclate (i.e. discoloration, loss in performance and chemical properties, impact on the visual aspect).

The incompatibility of certain structures or innovations of flexible packaging with recycling will hamper the transition towards circular plastics and eventually the circular economy. Without quality recycled material that can be used in loops, circularity of plastics cannot be achieved.

Improving packaging design and matching its functionality with recyclability would improve the recyclate quality and offer to the market a standardized raw material comparable, application per application, with virgin resins.

The following tables are from RecyClass film guidelines. More details available at:
https://recyclass.eu/recyclass/design-for-recyclingguidelines/

Film Recycling

PE Transparent Flexible Film			
	COMPATIBLE for recycling for most applications	MAY BE SUITABLE for recycling for some applications	NOT SUITABLE for recycling
POLYMER	PE-LD; PE-LLD; PE-HD	multilayer PP/PE	any other polymer
COLOURS	unpigmented; trasparent	light colours; translucent colours	dark colours /BLACK AND CARBON BLACK
BARRIER	barrier in the polymer matrix	<5% EVOH (in polyolefinic combnation film); metalized layers; 'Ecolam High Plus'; 'VO+ LLDPE'	>5% EVOH (in polyolefinic combination film); barrier layer PVC, PVDC; PA any other barrier layer foaming agents used as expandant checmical agents; aluminium
ADDITIVES	Additives that do not increase the density higher than 0,97 g/ cm^3		Bio-/oxo-/photodegradable additives Additives that do increase the density higher than 0,97 g/cm3 ($CaCO_3$, talc, glass fibers, etc.)
LABELS	PE label	PP label; paper label without fibre loss	metalized labels; any other label with fibre loss
ADHESIVES FOR LABELS	water soluble (less than 60°C)		Adhesives non-soluble in water or non-releasable in water at less than 60°C
INKS	Non-toxic (according to EUPIA guidelines)	non toxic (follow EUPIA Guidelines)	inks that bleed; toxic or hazardous inks
DIRECT PRINTING	laser marked; production or expiry date	printing covering < 50%	printing covering ≥ 50%

Film Recycling

PE Coloured Flexible Film			
	COMPATIBLE for recycling for most applications	MAY BE SUITABLE for recycling for some applications	NOT SUITABLE for recycling
POLYMER	PE-LD; PE-LLD; PE-HD	multilayer PP/PE	any other polymer
COLOURS	light colours; translucent colours	dark colours NIR detectable colours (sorting test)	Non NIR detectable colours
BARRIER	barrier in the polymer matrix	<5% EVOH (in polyolefinic combnation film); metalized layers without coatings; 'Ecolam High Plus'; 'VO+ LLDPE'	>5% EVOH (in polyolefinic combination film); barrier layer PVC, PVDC; PA any other barrier layer foaming agents used as expandant checmical agents; aluminium
ADDITIVES	Additives that do not increase the density higher than 0,97 g/ cm^3		Bio-/oxo-/photodegradable additives Additives that do increase the density higher than 0,97 g/cm3 (CaCO3, talc, glass fibers, etc.)
LABELS	PE label	PP label; paper label without fibre loss	metalized labels; any other label with fibre loss
ADHESIVES FOR LABELS	water soluble (less than 60°C)		Adhesives non-soluble in water or non-releasable in water at less than 60°C
INKS	Non-toxic (according to EUPIA guidelines)	non toxic (follow EUPIA Guidelines)	inks that bleed; toxic or hazardous inks
DIRECT PRINTING	laser marked; production or expiry date	printing covering < 50%	

Film Recycling

PP Transparent Natural Flexible Film			
	COMPATIBLE for recycling for most applications	MAY BE SUITABLE for recycling for some applications	NOT SUITABLE for recycling
POLYMER	PP	multilayer PP/PE	any other polymer
COLOURS	unpigmented; trasparent	light colours; translucent colours; white	dark colours/BLACK/ CARBON BLACK
BARRIER	barrier in the polymer matrix	barrier layer EVOH (in polyolefinic combination film); metalized layers without coatings	barrier layer PVC; PA, PVDC; any other barrier layer foaming agents used as expandant chemical agents; aluminium
ADDITIVES	Additives that do not increase the density higher than 0,97 g/ cm^3		Bio-/oxo-/photodegradable additives Additives that do increase the density higher than 0,97 g/cm3 (CaCO3, talc, glass fibers, etc.)
LABELS	PP	PE label; paper labels without fibre loss	metalized labels; any other label with fibre loss
ADHESIVES FOR LABELS	water soluble (less than 60°C)		Adhesives non-soluble in water or non-releasable in water at less than 60°C
INKS	Non-toxic (according to EUPIA guidelines)	non toxic (follow EUPIA Guidelines)	inks that bleed; toxic or hazardous inks
DIRECT PRINTING	laser marked; production or expiry date	printing covering < 50%	printing covering ≥ 50%

Film Recycling

PP Coloured Flexible Film			
	COMPATIBLE for recycling for most applications	MAY BE SUITABLE for recycling for some applications	NOT SUITABLE for recycling
POLYMER	PP	multilayer PP/PE	any other polymer
COLOURS	light colours; translucent colours	dark colours/NIR detectable (sorting test)	Non NIR detectable (sorting test)
BARRIER	barrier in the polymer matrix	barrier layer EVOH (in polyolefinic combination film); metalized layers without coatings	barrier layer PVC; PA, PVDC; any other barrier layer foaming agents used as expandant chemical agents; aluminium
ADDITIVES	Additives that do not increase the density higher than 0,97 g/ cm^3		Bio-/oxo-/photodegradable additives Additives that do increase the density higher than 0,97 g/cm3 (CaCO3, talc, glass fibers, etc.)
LABELS	PP	PE, paper labels without fiberloss	metalized labels; any other with fibre loss
ADHESIVES FOR LABELS	water soluble (less than 60°C)		Adhesives non-soluble in water or non-releasable in water at less than 60°C
INKS	Non-toxic (according to EUPIA guidelines)	non toxic (follow EUPIA Guidelines)	inks that bleed; toxic or hazardous inks
DIRECT PRINTING	laser marked; production or expiry date	printing covering < 50%	

Film Fact Sheet

- 80% film placed on the market is PE and PP (40% PP 40% PE); the remaining 20% is PET and anything else

- **PE** - thinner than most resins with high heat resilience needing more heat to mold – primarily used in film applications such as; Bread bags, fruit bags, carrier bags, outer wrap for multipacks and vegetable bags

- PE and PP film and flexible material is collected with carrier bags at larger stores.

- **PP** – Less brittle with a high melt point making it more suitable for food packaging, meat packaging, cereal liners, cheeses, pasta and rice bags

- Mixed PE/PP films are difficult to separate.

- **EVOH** – is a EVOH barrier (ethylene vinyl alcohol) it provides protection against oxygen and bacteria so often used in meat packaging. To be recycled the EVOH barrier in packaging must be no more than 5%, although recyclers would prefer this to be kept as minimal as possible. If all packaging contained EVOH this would be an issue.

- **Crosslinked Films** – A method of manufacturing film, where a combination of two or more polymers, e.g., PE and PP, are fused together to build layers making the material stronger and rigid. It means thinner layers can be used building it up to the desired density. Highly crosslinked materials will not melt and therefore could not be recycled. Lightly crosslinked material may melt but will limit applications and end markets.

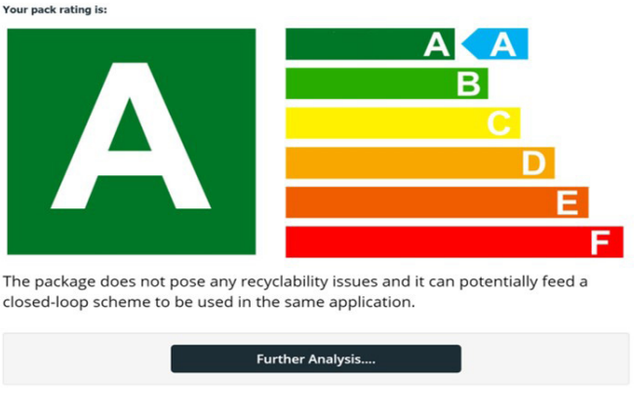
- **Laminated Films** – Laminating is a bonding process of two or more layers, which could be the same polymer or different polymers. Laminates of the same polymer are generally not seen as a problem if low quantity but if everything on the market was laminated 2 or 3 layers it could be an issue.

PackScore
BPF

Packscore is an easy-to-use online interactive tool to score plastic packaging designs in terms of their recyclability.

The tool was launched by the British Plastics Federation (BPF) and supported by RECOUP and is available to use for free at www.PackScore.co.uk

PackScore has been developed for brands, retailers and designers to use at the earliest stages of packaging design, for them to assess whether the packaging can be easily recycled. This allows the users to adjust features of the packaging design to improve recyclability.



The system allows users to answer a series of simple questions in order to receive a recyclability rating from A – F.

The tool's development was informed by RECOUP's Recyclability By Design guidelines, alongside the Recyclass system developed by Plastics Recyclers Europe. It has been developed as a quick, highly simplified tool to give an initial insight into recyclability. Users are encouraged to consult more comprehensive guidelines after using PackScore.

More than 500 companies have used the tool to assess their packaging, including some of the world's biggest brands, and over 2,000 products have been scored through the PackScore system.

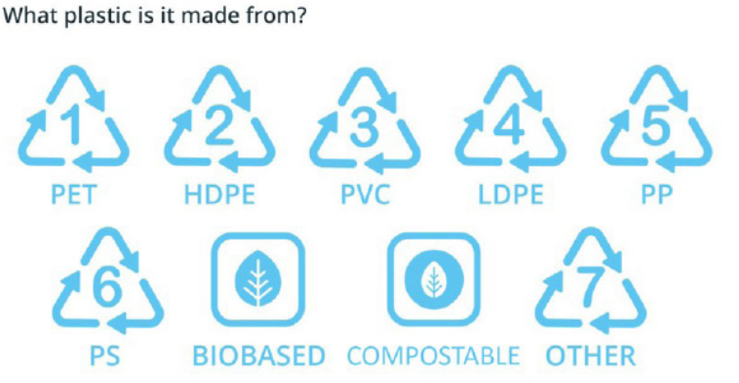
The tool includes questions such as:

- Is the pack plain or decorated?
- What material is the label?
- What colour is the container?

These questions are related to key aspects of plastic packaging that can often affect how easy the item is to sort and recycle at a mechanical recycling facility.

The design of packaging often involves collaboration between designers, manufacturers, and brands. PackScore has been created to sit at the earliest stage in this often lengthy process, particularly for individuals without extensive technical knowledge, or for where exact material specification is not known.

The tool is designed to be easy to use, and works also to educate, and to help steer the final design to ensure sustainability is part of the conversation between all involved in the creation of plastic packaging.



BPF British Plastics Federation

Compostables Summary

The demand from consumers for more ‘green’ and ‘eco-friendly’ options has seen biodegradable or compostable alternatives to everyday conventional plastic items become more popular in the market today. However, confusion over terminology and how to dispose of these items correctly can create a range of problems, including to mechanical recycling facilities.

Common terms used in this space are ‘bio-based’, ‘biodegradable’, and ‘compostable’.

A ‘bio-based’ plastic gains its name through the feedstock that is used in its manufacture, for example it is made from plants or biological materials rather than fossil fuels[1].

‘Biodegradable’ refers to the ability for a material to be broken down by bacteria or organisms under precise conditions in a natural environment. The use of the term ‘biodegradable’ in isolation should be avoided as it does not specify the conditions, environment or time frame needed in order for an item to biodegrade, and therefore can cause confusion among consumers.

A biodegradable plastic could also be a ‘compostable’ plastic. To be classed as such it must either meet home or industrial composting requirements. There is currently no widely recognised standard for home composting, however the product must be certified through an independent scheme or self-assessment and compliance with ISO 14021. For industrial composting, the product must be compliant with European Standard BS EN13432. Where necessary, a product must also be able to be collected and sent to an appropriate site that accommodates the specific conditions needed for treatment and processing. All compostable plastics are biodegradable, but not all biodegradable plastics are compostable. It is also important to bear in mind that not all bio-based plastics are compostable and not all compostable plastics are bio-based .

‘Oxo-degradable’ plastics include additives that hasten the process of fragmentation. In 2019, the UK voted in support of the EU Single-Use Plastics Directive (Directive (EU) 2019/904) which includes a ban on single-use plastic products made from oxo-degradable plastic, and this ban is due to come into force in summer 2021. An explanation on why oxo-degradable plastics are considered an issue within the recycling industry can be found on page 55.

When used in relation to food waste, compostable plastics can be collected and sent to specific industrial composting sites, and as a result do not reach a mechanical recycling facility. However, with the increase in usage of compostable plastics in other packaging situations (for example carrier bags, food pots and trays, etc.), there is a higher risk that these items will be placed for recycling with other conventional plastics. Here they can contaminate otherwise recyclable materials as well as potentially congest machinery. It has also been noted that the presence of any biodegradable material in recycling streams could compromise the quality of the recyclate, and in turn the end market product[2]. Due to this it is highly important compostable plastics are disposed of in a way in which they are able to reach their intended end of life destination, and to ensure this happens all compostable packaging should have clear disposal instructions to consumers. Contamination of recycling streams is of high concern and needs to be addressed if further compostable items and packaging is introduced.

The BBIA have also recently published a report titled ‘Biodegradable and Compostable Polymer Materials’ that outlines biodegradability, composting and other relevant topics. This report can be viewed and downloaded here: https://bbia.org.uk/wp-content/uploads/2021/05/Biodegradable-and-Compostable-Plastics-April-2021-1.pdf.

1. WRAP Considerations for Compostable Plastic Packaging
2. https://www.bpf.co.uk/press/biodegradable-and-oxo-biodegradable-plastics.aspx

What is the problem with Oxo Degradables?

Why are the European Plastic Recycling Trade Associations opposed to Oxo material?

The debate surrounding the use of Oxo degradable additive materials in plastic packaging products such as carrier bags has been ongoing for many years. More recently one of the original proposals in the draft Government legislation introducing a charge for single use polythene bags – known as 'the carrier bag tax' – included the option for an exemption from the charge for bags manufactured with an Oxo degradable additive included in the raw material blend. This proposal resulted in a fierce debate between the supporters of Oxo degradable material, primarily the Oxo Degradable Manufacturers Association, and those opposed to the use of Oxo materials in plastic packaging including the British Plastics Federation, INCPEN, Foodservice Packaging Association, RECOUP together with European Plastic Packaging Trade Associations including Plastic Recyclers Europe and EuPR.

When the charge for single use plastic bags was introduced in July 2015 no exemption was included in the Regulations. However, the debate surrounding the use of Oxo degradable additives in plastic packaging continues. One sector of the plastic manufacturing industry which is the most vociferous in its opposition to the use of Oxo degradable materials is UK plastic films recycling businesses. Why is this, after all there do not appear to be any immediate business conflicts between the suppliers of a plastic additive which can be included in the raw material blend for polythene extruders, and the recyclers of waste polythene film? The answer to this question is simple – the risk of Oxo degradable contaminated plastic entering and thus contaminating the waste stream. If this were to happen plastic recyclers fear for the integrity of their products, especially with their end use customers some of whom have already expressed concern stating that merely 'the risk' that a finished product could contain an oxo degradable additive would be too great, thus the raw material specifications for the manufacture of these products, including building and construction polythene films and membranes, would revert to using 100% virgin/prime polythene raw materials.

In order to successfully compete with the demand for waste polythene film for the export market, UK plastic film recyclers have to be both efficient and provide guaranteed high quality recyclate to their customers for manufacture into a new product, both of these key business requirements could be compromised if the plastic waste stream becomes contaminated with Oxo degradable materials.

The plastics recycling sector provides many thousands of jobs in UK manufacturing and is ideally placed to support any initiatives to expand the Circular Economy. To do this investment will be needed to increase recycling capacity with high output machines. The final requirement to encourage growth will be markets for the additional tonnages of plastic recyclate produced, with existing customers of UK plastic recyclers already expressing concern at the potential risk of product contamination with Oxo degradable residues, it is difficult to see any benefits an increased use of these materials in plastic packaging could have? However, the negative consequences in the form of a potential reduction in demand for recycled plastic and a consequent contraction of the UK plastic film recycling sector are obvious.

Berry | bpi

RECOUP Member

Alternatives to PVDC for meat packaging
Krehalon

PVDC: Why the fresh meat packaging industry can survive without it.
PVDC (Polyvinylidene Chloride) has been used as a barrier in fresh meat packaging for decades, but increasing environmental concerns are urging packaging producers and retailers around the world to revisit its use and develop viable alternatives.

But why is PVDC bad for the environment?

There are several reasons why PVDC barrier structures are considered harmful to the environment:

1. PVDC packaging is not currently recyclable. This is true both for mechanical and chemical recycling systems.
2. Obstacles for mechanical recycling of PVDC:
   A. PVDC is considered a contaminant to well established recycling streams (such as PE) because it degrades at low temperatures, rendering large portions of the mainstream polymer unusable.
   B. Even relatively small quantities of PVDC are reported to have detrimental impact on the quality of the recyclate.
   C. PVDC causes corrosion and damage to the reprocessing equipment due to its chlorine content. Frequent replacement of such equipment is therefore necessary.
3. Currently the only after-use options for PVDC are either landfill or incineration – neither considered environmentally friendly due to the release of toxic chemicals.
4. When incinerated, PVDC generates considerable quantity of dioxins - a well-known potent human carcinogen. The hydrogen chloride gas evolving from PVDC's incineration also discourages its use in the industry.

Why has PVDC been the preferred barrier for fresh meat to date?
PVDC provides excellent barrier to both oxygen and water vapour. Most alternative barrier polymers offer just one or the other.
Fresh meat is packed in wet and humid environments. It is therefore paramount for meat packaging to maintain its barrier properties when exposed to high moisture environments.

Since PVDC's permeability properties are unaffected by relative humidity, it can deliver consistent protection for dry and high-moisture environments allowing shelf life of fresh meats of up to 100 days.

KREHALON
Preserving Quality Together

RECOUP
Member

Alternatives to PVDC for meat packaging Krehalon

Do alternatives to PVDC exist at present?
EVOH (Ethylene vinyl alcohol) is a non-chlorine barrier alternative for fresh meat packaging and is readily available today. However, EVOH has been thought to be sensitive to high moisture packing conditions, especially at a relative humidity of above 80%. This common perception has limited the wider use of the material so far.

Recent innovations in extrusion technologies, however, provided opportunities for the increased use of EVOH through engineering EVOH-based multilayer barrier structures that offer shelf life maintenance for fresh meats unaffected by high humidity.

A recent study compared such highly engineered EVOH-barrier shrink bags with traditional PVDC based bags and indicated that both packaging solutions achieved similar meat quality levels under controlled storage.

EVOH is also considered recyclable – it can be tolerated by mechanical recycling streams within certain percentages and can be handled by chemical recycling.

Further support?
Krehalon has been the leading producer of EVOH barrier shrink bags for over 40 years. We have a wide array of application knowledge and experience in the development of high barrier non-chlorine grades for fresh meat and cheese applications.

We are happy to offer evidence-based advice and expertise should you have further questions on the topic.

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Recycling of Plastic Packaging

Plastic Packaging Recycling Overview

The development of collection, sorting and reprocessing technology and its techniques is constantly changing. The following information will provide an informative picture of current practices and technologies for the recycling of plastic packaging.

Following the success and interest in recycling plastic bottles other forms of plastic packaging recycling have been developed and introduced into collection streams. These are primarily other 'rigid' plastic packaging such as pots, tubs and trays (PTTs) used for both food and non-food applications, both from households and from commercial and industrial sectors.

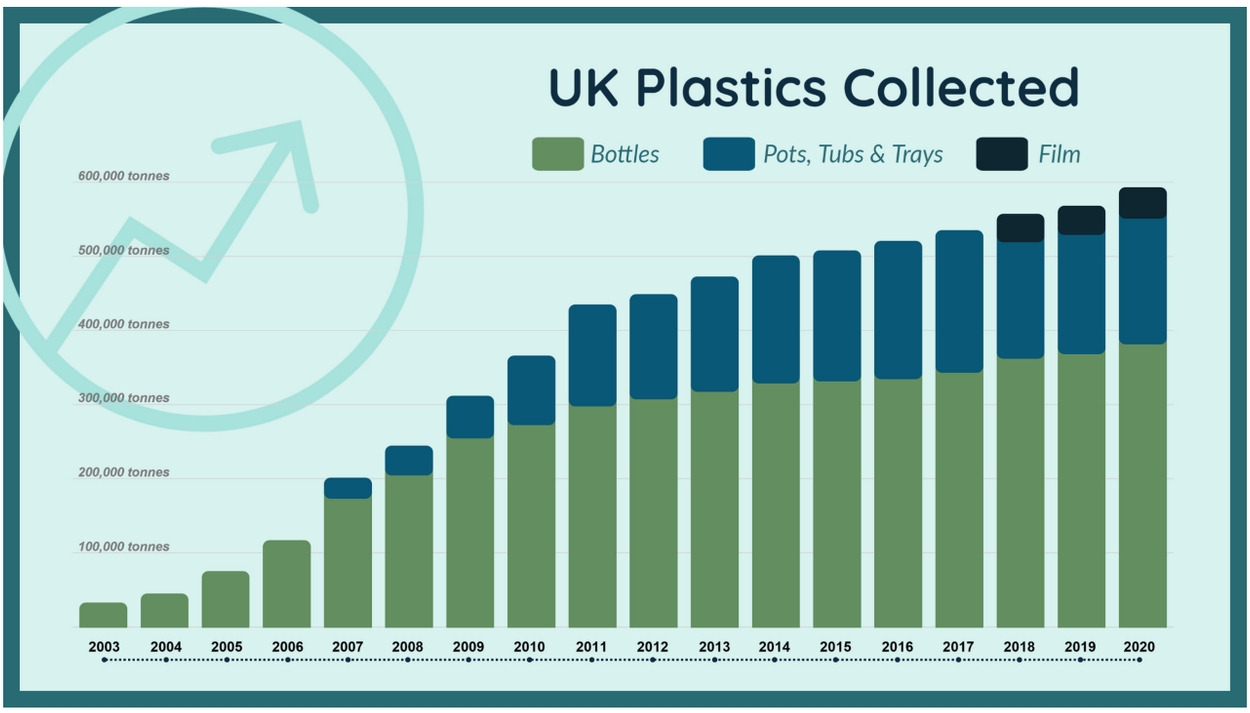
Separate waste collection streams have existed for some time for commercial & industrial waste as recycling of such materials is traditionally more commercially favourable (e.g. cleaner materials, bulk collection). In terms of domestic plastic waste recycling, which is the focus of the current document, the technology and processes for recycling have been designed for rigid plastic packaging, focusing on plastic bottles and PTTs.

Six main types of plastic are found in the domestic waste stream: PET, HDPE, PVC, LDPE, PP and PS. All bottles of a given type of polymer are usually compatible and so may be mechanically recycled together. Technical incompatibilities between a number of these different polymers, however, prevent them being directly mixed and mechanically recycled as high specification products. However, they can be readily separated, provided the simple guidelines given in this document are followed.

Packaging design should facilitate the separation of non-compatible polymers and avoid the risk of them being left unseparated by visual or mechanical recognition systems.

A typical plastics mechanical recycling process involves several distinct steps, these are indicated in the following sections.

Recycling of Plastic Packaging



Household Plastic Collection Data (RECOUP Houseold Plastic Collection Survey 2021)

Collection

There is a wide variety of collection methods used to receive recyclable materials from households. Most of these methods identify particular material types and products that should be deposited. These products are typically newspaper and magazines, cardboard, glass, steel and aluminium cans and plastics packaging.

The two household recyclables collection methods used by Local Authorities are kerbside and bring schemes. Originally most household plastic packaging recycling collections were achieved by asking the public to place their materials into containers placed in public locations such as supermarket sites and car parks. These are termed bring sites.

Since 2003, there has been a significant growth in the use of kerbside collection systems which provide a recyclables collection service on the householders' doorstep, and the landscape of household plastic packaging collection rates began to change. This is illustrated by the graph above. The householder is provided with a bin, box or bag which is then collected every week or fortnight.

Kerbside collection schemes are now the predominant method for the collection of plastic packaging in the UK, with bring schemes used alongside kerbside schemes to form part of the recyclables collection infrastructure which Local Authorities offer. There are a number of variations in kerbside schemes in terms of collection container, service frequency, and communications, and depending on the specific requirements for each Local Authority.

Recycling of Plastic Packaging

Sorting and Separation

Once the recyclable materials have been collected the various material types need to be segregated at the materials recovery facility (MRF), and then bulked or baled ready for delivery to material reprocessors. The plastic packaging is separated either using automated NIR (near infrared) optical equipment for higher volumes and throughputs, manually by picking operatives, or a combination of the two.

Sorting Techniques

Automated optical scanners are used to separate materials by polymer type, using NIR (near infrared) sensors, which are installed above the conveyor and ejecting the targeted material using compressed air jets at the end of the conveyor. This technology is frequently used to separate plastic containers into different fractions, as the market requires clean streams of specific resins and colour types. Typical automatic sort rates are up to 40,000 bottles/hour or 11 bottles per second. Although not without its limitations, auto-sorting greatly improves the quality and efficiency of the separation process.

Many countries still rely on the manual sorting of whole plastic bottles by visual inspection. However, automatic bottle sorting is widespread in Europe, where the larger MRFs have throughputs sufficient to offset the capital cost of the equipment. Manual bottle sorting is based primarily on the physical characteristics of the bottle (e.g. shape, colour and product recognition) and experience. Although this method can lead to inaccurate identification and separation due to human error or distorted containers.

In addition, complications arise when bottles of the same design are made using different polymer types. Although most plastic bottles carry a Material Identification Code, this coding system has limited value to sorting personnel. Manual sort rates are typically 1200+ bottles/hour. Thus sorters have less than three seconds to pick up, identify and sort the bottle. This precludes looking for the code on every bottle.

Sorting Techniques - Plastic Bottles

Dependant on the scale of operation and throughputs being handled the plastics fraction will be sorted either manually or using automated NIR equipment. In the case of plastic bottles these can be all segregated into a single bottle stream, baled and sold as mixed polymer bottles. Alternatively, the bottles can be segregated by polymer and colour to achieve higher sales values. Typical bottle fractions are clear HDPE, coloured HDPE - sometimes referred to as Jazz HDPE, clear PET, and coloured PET. Once the bottles have been segregated they are baled and are then ready to be delivered to plastics reprocessor.

Sorting Techniques - Pots, Tubs and Trays

The sorting of PTTs has increased significantly over the past few years with more and more councils opting to collect these materials at the kerbside. Similar to plastic bottles these materials are segregated using optical equipment into specific polymer streams and colours. Typically at large scale MRFs these materials are baled as a ‘mixed plastic’ grade where they are then further segregated into individual polymer grades at a PRF or plastic recovery facility. At smaller scale MRFs PTTs are sometimes separated manually by negative picking where, after the plastic bottles have been removed, all remaining plastic materials are baled together as a mixed grade. The picking operatives clean the PTTs material by removing any remaining waste or contaminates before it is baled, however this material is usually low quality, low value. Due to the small size and varying polymer types which are difficult to distinguish, automated equipment is usually favoured as manually picking PTTs is a very inefficient process.

Recycling of Plastic Packaging

Reprocessing - Label Removing and Washing

Once the plastic packaging has been segregated into individual polymers and colours, the material is then shredded into 5-10 mm flake to begin the label removing and washing stage. The intense friction and cutting action in the presence of circulating water provides the first washing stage, removing most labels and residual contents. Hot water, alkali solution and detergents are then frequently used during further washing stages to remove more difficult to separate contaminants such as residual labels and adhesives.

Separation by Flotation

Density based sorting, such as sink/float tanks, hydrocyclones and air classification separate contaminants on the basis of density. Use of float tanks is very common (e.g. PET recycling) as they are much simpler and cheaper. The ability to separate materials is much more limited however and restricted to two types, namely those that sink and those that float in water. Thus any mix of plastic types that sink together / float together in water are not capable of being separated. The key density difference is now not so much that between the polymers themselves than the density difference between the individual polymer and water. The density ranges of plastics commonly used for packaging are given in Appendix - Polymer Densities. This table provides intrinsic plastic densities and also indicates how the polymer behaves in a float tank.

Drying Stage

After the wash and flotation processes excess water is removed by, for example, a centrifuge spin drier system. Heat from this is then used to dry the plastic flake. The dried plastic flakes are then transferred to plastic sacks, bulk bags or silos and are either then sold to convertors or further reprocessed into pellets.

Recycling - Plastic Sales and End Products

The values for plastics will fluctuate over time and are dependent on a number of conditions, with a particular focus always on quality levels, and are based on baled material delivered to a plastic reprocessor.

Once the plastic packaging has been dried into a flake or pellet format by the reprocessor the material can be converted into new products. These include food grade plastics such as bottle to bottle and fresh food trays, non-food packaging such as paint pots, and other applications such as building site screens, garden furniture, stationary, and using yarn to produce clothing such as t-shirts, fleeces and jeans.

Sorting technology is key to meeting demand for high quality PCR

In recent years, strong demand for high quality post-consumer recycled plastics (PCR) has resulted in the value of the material increasing which has, in turn, made it more economically viable to recycle many different types of plastics. At the same time, advanced mechanical recycling has made it possible to create virgin-like recycled content which meets the stringent quality requirements for high-grade applications from even the most highly contaminated waste streams.

Technology advances create opportunities

Advances in automated sorting technology, such as the latest plastics sorting solutions from TOMRA Recycling Sorting, for example, are making it possible to achieve exceptional purity results in plastics sorting – from coloured and clear plastics, such as PET, PO and HDPE - to other polymers like polypropylene, polystyrene and PVC.

Today, the technology exists to recover and reuse each polymer stream as many times as practicable, and to achieve previously unfeasible purity levels of over 99.99% on single polymer streams. These recovered materials not only boost overall plastic recycling rates, but also meet the quality requirements of brand owners and converters who are demanding high-purity mono fractions that are sorted by polymer type and colour. At these exceptional purity levels, the recovered polymers can be used in higher grade applications, including food packaging and drinks bottles.

Overcoming barriers

Although the latest technology enables recyclers and sorting plant operators to capture high quality feedstock from both post-consumer and post-commercial plastic waste, there are a few barriers in the way of further improvements in plastics recycling. The volume of infeed material arriving at MRFs is one such barrier as there is insufficient infeed volume to keep up with demand for high quality PCR.

The volume of household plastic being recycled has plateaued and vast volumes of recyclable plastics are still being ‘lost’, partly because the collection and sorting infrastructure in some areas is not as well established as in other areas, but also because of low public awareness of which types of plastics can be recycled. And when plastics get mixed in with ‘black bag’ residual waste, they inevitably end up being landfilled or incinerated. So, there is an onus on all those involved in the plastics packaging chain to improve public understanding of which plastics can and can’t be recycled so that higher volumes of material can be recovered.

Once we have encouraged more businesses and members of the public to help capture more plastics, we will then need more investment in advanced sorting technology to recover high purity polymer fractions that meet the quality requirements of brand owners and converters for reprocessing.

The role of brand owners

Another barrier in the way of further improvements in plastics recycling is plastic packaging design, and this is where brand owners have an important role to play. By adopting a design-for-recycling approach and only using recycled – and recyclable – materials in their product designs, brand owners will inevitably help to increase plastic recycling rates and help to achieve the ambitious plastics recycling targets. Emphasis on the packaging’s end of life during design can help to maximise its recyclability, ensuring that value is maintained throughout the recycling loop, without negatively impacting on the packaging’s aesthetics, cost or practicality.

For more information on TOMRA Recycling Sorting visit www.tomra.com/recycling.

TOMRA

End Products

The Use of Recycled Material in New Products

Awareness of value and versatility of used plastics packaging needs to be developed further. Whether it be post-consumer or post-industrial, the opportunity to recycle this valuable resource into new products and applications is expanding and should be recognised.

Recycled plastics can not only replace or partly replace virgin material and reduce manufacturing costs, but can also add to a companies' environmental credentials and/or deliver an environmentally enhanced product, such as in carbon footprint reductions, lifecycle analysis benefits or in developing its corporate social responsibility agenda.

There are a wide range of products now produced which contain recycled plastics, and these include food grade applications such as bottle to bottle and fresh food trays, and non-food applications such as in construction (e.g. pipes and building site screens), garden furniture, pens and kitchen utensils, paint pots and using polymer yarn and fibres to produce clothing such as t-shirts and fleeces.

Many of these products can be found on the RECOUP end products database on the website. Products can also be entered in the UK Best Recycled Plastic Product Award that RECOUP sponsor at the Plastics Industry Awards, and all finalists get automatically enrolled in the EPRO Best Recycled Plastic Product Award, which is for European entries.

Waddington Europe's commitment to design for recycling and zero to landfill status across all sites

Leading European thermoforming packaging specialists Waddington Europe, a division of Novolex®, have been making significant strides forward in their commitment to environmental sustainability over the last two years.

Following the 2020 launch of Eco Blend ™ Pura and Eco Blend ™ 100, two food packaging material options made of 100% recycled plastic that are also recyclable as competitive and cost-effective options to customers, Waddington Europe then went on to announce that it achieved Zero Waste to Landfill status across all three of its manufacturing sites which are in Arklow Co. Wicklow, Ireland and Milton Keynes and Bridgwater in the UK.

The certification was awarded to Waddington Europe following a rigorous auditing process by Valpak, the official third-party auditor accredited to evaluate facility compliance with the zero waste to landfill criteria.

The company's move to zero waste policy mirrors other sustainability initiatives the company has introduced across all sites in recent years, including closed loop systems for water used for cooling tools in production and filters on every external drain to prevent plastic pellets from entering the waste-water system. The filters are part of a 'Pellet Retention Scheme' which is linked to Operation Clean Sweep®, an international program adopted by entities in the plastics value chain designed to prevent the release of plastic granules into the environment.

In 2021 Waddington Europe's in-house Innovation team launched several mono-material developments designed specifically to support food grade PET circularity, by making it as easy as possible for consumers to recycle through well understood material waste streams as well as eliminating any plastic contamination.

These included a 100% mono-material protective soft-fruit punnet which no longer needs bubble padding to protect the fruit in transit thanks to its revolutionary MONOAIR™ cushion technology, as well as their ground-breaking high clarity hot fill PET container, which can withstand temperatures of up to 130°C (266 F°), making it a convenient packaging option for sauces, soups, noodles and ready meals, while also being microwavable.

Offering superior shelf appeal and a clear view of the contents within (unlike thicker polypropylene (PP) and crystallised PET (cPET) hot fill containers, which are typically opaque), hot fill PET is available at different levels of rPET content which are UK Plastic Tax compliant material blends and are recyclable back into food grade rPET.

Waddington Europe also developed a hybrid pack, providing a way for branding and recycling information to be displayed on their hot fill PET containers via a patented 'clip on' decoration, making for easy, obvious and correct separation and recycling. RECOUP trials have confirmed that in tests at a Material Recovery Facility all pots were correctly identified as PET and continued into the clear PET stream. The crushing of the pots allowed the card sleeve to easily come away because there is no adhesive, allowing them to slide off.

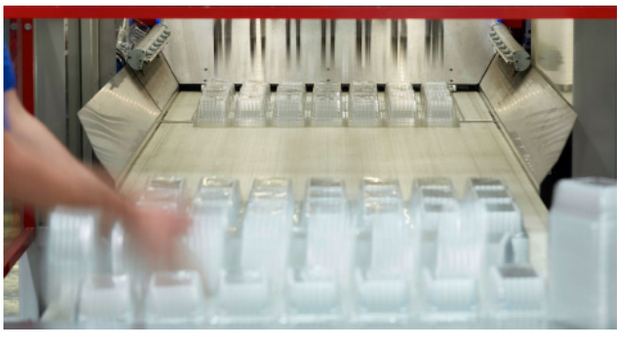
Waddington Europe's commitment to design for recycling and zero to landfill status across all sites

Waddington Europe's latest innovation, Piranha™ was launched at the start of 2022. Piranha™ is a pioneering modified atmosphere packaging (MAP) recyclable container for meat, fish and poultry (MFP) products that doesn't require a polyethylene layer or adhesive coating for heat sealing which means it can be fully and easily recycled back into food grade recycled rPET.

Piranha™ is sealed using a series of raised teeth that run around the sealing flange to maintain the seal's integrity. Any greasy MFP contaminant can be wiped away and forced into the channels between the teeth, leaving the peaks clear and clean to contact the PET top film. Under the same sealing temperatures and dwell time, the top film adheres to the peaks, creating the seal. During filling-line trials of Piranha, the problem of burst seals due to grease contamination on mono-PET sealing was cut to almost zero.
All these innovative products bring to life the ideal practice behind a true food grade PET circular economy, keeping plastic away from landfill by turning today's discarded bottles, pots, tubs and trays into tomorrow's packaging.

"Our commitment to environmental sustainability and supporting the circular economy over the last few years has been heartfelt across our operations. Waddington Europe is in a robust position in that we have secured access to post-consumer waste (PCW) raw material through long term and strong relationships with reprocessors within the UK and Ireland such as leading recycler Shabra" explained Eduardo Gomes, managing director at Waddington Europe.

"Collectively, we hope these agreements will advance our future focus on localised plastics circularity and further carbon footprint reductions. We combine food safety and packaging performance with recycled materials made for the circular economy and we are proud that our mono-material rPET products make no trade-offs"



WADDINGTON EUROPE™
A NOVOLEX BRAND

RECOUP Member

Closing the Circularity gap on Food Packaging Faerch UK

Designing for circularity is a fundamental part of our strategy and we are committed to minimising our impact and ensuring a sustainable future for food packaging. Our packaging solutions are designed to keep food safe and protected, but they are also designed for circularity.

Since the launch of Evolve by Faerch, it has become the perfect example of a packaging concept designed for true circularity. The concept offers food packaging made from collected and recycled mixed coloured bottles and PET pots, tubs and trays. The Evolve by Faerch trays are fully recyclable into new food grade packaging after use.

Rethinking rigid food packaging

Plastic is a valuable resource, but we need to use better and more sustainable materials. At Faerch, we promote PET as the material of choice when it comes to food packaging, as it is the only material allowing for true circularity while meeting the strictest food safety requirements. Faerch is committed to enabling a waste-free future, and the Evolve by Faerch concept is a great example of how to design for circularity

Now more than ever, we need to rethink food packaging. To prevent plastic waste, we need to advance the transition to a circular economy in which plastic products are kept at their highest value throughout their lifecycle, rather than being wasted and downgraded after use. When it comes to making food packaging circular, material choice is key. Without the right materials, we are not able to achieve true circularity.

Evolve by Faerch applications provide our customers with guidance to easily choose food packaging made from recycled content. At the same time, the concept is designed to overcome the limitation of the existing infrastructure.

A unique look

Evolve by Faerch pots, tubs and trays are made from recycled content. No colour is added during the production process, and the pots will therefore have fluctuating colours, reflecting the specific blend of recycled content the trays are made from. This will allow consumers to immediately recognise the circular nature of the packaging which can help them make conscious decisions when making their packaging decision.

The majority of most thermoformed rPET trays on the market consists of clear bottle flake as the primary recycled materials. However, the market is currently seeing a surge in demand for flakes made from recycled PET bottles. The Evolve by Faerch concepts enable circularity with mixed and jazz flakes from coloured bottles and trays, ensuring an additional circular outlet for a valuable material like PET.

Achievements

Evolve by Faerch has achieved a significant increase in sales volumes, and many retailers have successfully moved to this new material platform. The concept continues to grow with further cover over more food packaging categories, ranging from dairy pots to ready meals trays. Going forward, we will continue to launch new products in the Evolve by Faerch concept to support our customers towards fully circular packaging.

Faerch

RECOUP Member

Case Studies

Recycled plastics - A complete solution for home and garden

Many companies seek to incorporate recycled content into their plastic packaging as part of their marketing strategy. It helps to demonstrate their commitment to sustainability and becomes part of their overall CSR policy.

For this reason, the use of recycled plastics is very often proactively promoted and consumers might be forgiven for thinking that this is a relatively new development. The reality of course is that recycled material has long been an important part of the plastic products manufacturing process.

Incorporating recycled plastic into certain types of products and packaging can be a challenge. It is vital to ensure that the physical properties of the both the recycled and virgin materials can be maximised in terms of strength and durability to deliver a finished product that is fit for purpose and reflects the appropriate brand image.

Nevertheless, there are many products which can be made entirely of recycled plastic and still meet all marketing and branding requirements. For example, Strata Products', a Berry Global company, entire ranges of watering cans and water butts, as well as a number of storage boxes, lids for boxes, and various other home and garden products and accessories, are all made of 100% recycled plastic – PP, HDPE and MDPE. Around 55% of the plastic processed annually by the company – in excess of 5,000 tonnes-is recycled material.

The material is sourced from a variety of suppliers, predominantly from post-industrial use as well as some from post-consumer use. Industrially sourced waste includes items such as redundant crates, off cuts and scrap mouldings. Naturally the company also recycles its own off cuts and scrap.

The material is robust and durable and therefore ideal for products that need to withstand heavy usage and storage outdoors. At the same time, careful selection and sourcing of material is still necessary to ensure products are manufactured to the required specification and quality. For example, the melt index of the material is particularly critical for larger-size products – a high melt recycled polymer is needed for an effective spread of the material throughout the mould.

Equally important, the use of recycled plastic makes excellent commercial sense. The material can be more cost-effective than virgin polymer and this is a critical factor for products which are often sold in cost-sensitive and competitive markets.

Recycled plastics have been an important part of manufacturing for a long time. And while their use in garden and home products is well-established, in the current environmentally-conscious climate, this could still provide a useful marketing opportunity.

Berry

RECOUP Member

Ecover Ocean Plastic Project

Cleaning Oceans and Cleaning Dishes

Ocean Plastic is currently the hot topic, as it affects every major body of water, with 46,000 pieces of waste plastic in every square mile of ocean. This plastic damages the marine environment, harms fish and sea mammals and is all out bad news.

Ecover thought this is a cause worth paying attention to and took the first step by creating the first ever bottle made from waste plastic fished out of the ocean. The special edition Ocean Bottle holds Ecover's dish washing up liquid and is made with ten percent recycled Ocean Plastic (the remaining plastic is recycled from other sources). The Ocean Bottle represents a big step both in raising awareness of Ocean Plastic and also beginning the process of prevention and a much needed clean up in our oceans across the world. This new bottle follows an Ecover pledge of using new types of recycled plastic in their packaging. This year, it will be using one tonne of Ocean Plastic and expect to increase to three tonnes next year.

Another important and relevant fact is related with the Bottle Design whose development was fully supported by Biomimicry Thinking methodology. The design of the new Ecover Ocean bottle is directly inspired by the structural design principles of the skeletons of Diatoms and Radiolarians, helping optimise the mechanical performance of the bottle while allowing a weight reduction of 20%. These organisms form a large part of the plankton and zooplankton at the base of the marine and freshwater food chains, and are one of the most important photosynthetic organisms in the ocean. The overall pollution and plastics contamination is having a dramatic impact in their populations and compromising the entire ecosystem balance.

This ground breaking bottle design goes beyond the point where it tries to be 'less bad', and effectively supports the brand's strategy to be positively good for the world.

RECOUP Member

Logoplaste

Improving Recyclability
Enval

Flexible, Mono-layer, Multi-layer and Laminated Packaging Recycling

Enval unlocks the potential of high-performance materials by creating sustainable and economically viable end-of-life solutions. Our microwave induced pyrolysis process is the only method capable of recycling a wide range of 'difficult to recycle' materials including flexibles and laminates (including aluminium laminates).

Our unique solution for this wide range of packaging materials enables FMCG's to make decisions on their packaging that will deliver the lowest carbon footprint for their products.

Enval operates its own plant in Alconbury, UK and is anticipating the creation of further plants by the end of 2021. Our design is completely modular and scalable to suit the needs of individual requirements. Our aim is to develop a distributed network of plants and ultimately enable complex packaging to be widely recycled into high-grade, circular products.

enval

RECOUP Member

Appendix - Legislation and Targets

Politicians are very aware of the negative perception packaging has with consumers and environmentalists. As a result, pressure continues to be applied on packaging through the introduction of legislation in Europe, the USA, and elsewhere in the world.

In the UK, the policy and regulation around plastics packaging remains in transition. Momentum also continues to build around wider global strategies to reduce the impacts of plastic in the environment and move towards resource efficient and circular economy systems with significantly more recycle, reuse and refill infrastructure. Recycling is seen by many to be the most important recovery route and, as a result, the one that should take precedence.

UK Plastic Packaging Recycling Targets

In late 2020, Defra released packaging waste recycling targets for businesses for 2021 and 2022. These are targets placed on the producer value chain from the polymer and packaging producers through to the retailers. The new targets rise by 2% each year: 57% in 2020, 59% in 2021 and 61% in 2022, however actual plastic packaging recycling rates are expected to be lower than this as not all plastic packaging falls within the producer obligation system.

In a change to what has been released previously, the targets are set for recycling only, with Defra stating there is no longer a target for recovery of packaging waste. Due to this, energy from waste sites cannot be accredited and will not be able to issue PRNs (Packaging Recovery Note). The updated targets bring the UK broadly in line with the targets set in the EU Directive.

The Queen's Speech 2021

On the 11th May 2021 the Queen's Speech set out the legislative agenda for the Second Parliamentary Session, including reaffirming the commitment to building a cleaner and greener UK.

There were three mentions of plastic, two of which look to the future around plastic use and the circular economy. These included within the Environment Bill and mentions of extended producer responsibility, consistent collections in England, DRS schemes, and single use plastic charges.

Environment Bill

The Environment Bill will introduce a framework for legally-binding environmental targets with the purpose to: protect nature and improve biodiversity, tackle air pollution, establish an independent Office for Environmental Protection, cut plastic use, and revolutionise how we recycle. It will ensure that the environmental considerations are at the centre of policy development, holding the Government accountable for making progress on environmental issues[1].

2021 Consultations

Building on the commitments set out in the 25 Year Environment Plan and Resources and Waste Strategy, three interconnected Government consultations released in 2021 focussed on packaging producers paying the net cost for the packaging they manufacture or sell. The consultations were:

- Introducing Extended Producer Responsibility for Packaging
- Introducing a Deposit Return Scheme in England, Wales and Northern Ireland
- Introducing Consistency in Household and Business Recycling in England

1. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/986770/Queen_s_Speech_2021_-_Background_Briefing_Notes..pdf

Appendix - Legislation and Targets

Extended Producer Responsibility (EPR) for Packaging

The Extended Producer Responsibility (EPR) for Packaging consultation aims to cover the full net costs of collection, sorting, recycling and treatment of household and household-like (business) packaging waste. It also aims to cover litter and fly-tipping costs, as well as fund communication and education campaigns to increase consumer participation.

The cost of EPR will be paid by producers of packaging Placed on the Market, i.e. brand owners and retailers of own brand packaging as well as importers and online marketplaces. Money raised from EPR will replace the Packaging Recovery Note (PRN) system currently in place.

By 2030, the aim is for EPR targets to have helped achieve a 73% recycling rate for all packaging and a 56% rate for plastic packaging. Implementation of Deposit Return Scheme (DRS) alongside EPR is expected to increase this further to 62% for plastic packaging by 2030.

It is important to note that materials captured within the DRS will not be subject to EPR. The Consistent Collections in England consultation will, however, impact the level at which certain materials and formats are subject to EPR.

Phase 1 will be established in 2023, enabling initial payments for household packaging waste to Local Authorities from October 2023. Phase 2 in 2024 includes modulation of fees based on recyclability of packaging, payments for the management of litter and payments to businesses for the cost of managing packaging waste. However, all dates are subject to change dependent on the outcomes of the consultation.

Deposit Return Scheme in England, Wales and Northern Ireland

The Deposit Return Scheme (DRS) consultation focussed on introducing a DRS in England, Wales and Northern Ireland.

The 2021 consultation acts as something of a reset in terms of identifying the needs and solutions in relation to introducing a DRS, with one of the first questions asking if DRS is still the best way to achieve recycling rates and environmental targets.

A DRS applies to producers who place on the market in-scope branded drinks containers (PET drinks bottles, steel and aluminium drinks cans, and glass drinks bottles), and only includes retailers if they sell own-branded products. A Deposit Management Organisation (DMO) will run the scheme, and the consultation proposes the DMO achieve a collection rate of 90% within three years of the implementation of a DRS.

Amongst other complexities such as the scope of target materials, one key area is deciding on whether the system should be ‘all-in’ (containers up 3 litres) or ‘on-the-go’ (containers up to 750ml) in terms of both cost and benefit. At present, both Scotland and Wales intend to introduce an ‘all-in’ system, with ‘on-the-go’ only an option for England and Northern Ireland. It should be noted that both options have significant setup and operating costs.

Use of alternate technologies, including Digital DRS (DDRS), is also being consulted on, which is seeking ways to enable disposal of materials to be made easier for consumers by recycling at kerbside in addition to away from home.

Appendix - Legislation and Targets

Consistency in Household and Business Recycling Collections in England

The Consistency in Household and Business Recycling Collections in England 2021 consultation details specific policy proposals for increasing consistency in recycling collected from households and businesses. There are two parts to the consultation, with part 1 detailing measures to improve the quantity and quality of household recycling, and part 2 detailing measures to improve the recycling of non-household municipal waste from businesses and non-domestic premises.

For household waste, the requirement is for all Local Authorities to collect the following items separate to residual waste:

- Plastic bottles – including clear drinks containers, high-density polyethylene (HDPE e.g. milk containers), detergent, shampoo and cleaning products.
- Plastic pots, tubs, trays.
- Plastic film and flexible packaging (from 2026/27).
- Glass bottles and containers – including drinks bottles, condiment bottles, jars.
- Paper and card – including newspaper, cardboard packaging, writing paper.
- Metal packaging – steel and aluminium tins and cans, and foil, foil trays and metal aerosols cans, including packaging items.
- Food and drink cartons.
- Food waste – separate to garden waste and collected at least weekly.

Single Use Plastics

The Welsh Government issued a consultation to reduce single use plastics in line with Article 5 of the EU Single-Use Plastics Directive (EU) 2019/904 which closed in October 2020. It is important that any alternatives are not deemed to be less sustainable, contribute to increased littering, or have adverse socio-economic impacts, and therefore it is expected exemptions to the ban will be enforced where products are seen to be a necessity.

Likewise, the Scottish Government, through their Programme for Government 2020 also committed to meet or exceed the standards set out in Article 5 of the European Union Single-Use Plastics Directive. A consultation closed in January 2021.

Plastic Packaging Tax

The key principle to the Plastic Packaging Tax is a £200 per tonne tax rate for plastic packaging with less than 30% recycled content. The UK Government have stated that the key aim of this tax is to: 'Provide a clear economic incentive for businesses to use recycled material in the production of plastic packaging, which will create greater demand for this material. In turn this will stimulate increased levels of recycling and collection of plastic waste, diverting it away from landfill or incineration.'

Initial guidance was published to help businesses prepare for the tax. 'Get your business ready for the Plastic Packaging Tax' provided a high-level overview of the tax and is designed to help manufacturers and importers of plastic packaging understand whether they will need to register, what records they need to keep, and what steps they need to take to begin preparing for the introduction of the tax. In addition to this, a paper titled 'Further information for businesses' was also published, containing additional detail around key definitions, registration, record-keeping, exemptions, and reliefs.

Appendix - Legislation and Targets

EU – European Packaging and Packaging Waste Directive

The European Packaging and Packaging Waste Directive covers all packaging that can be Placed on the Market in the EU, as well as packaging waste management and packaging waste prevention measures[2]. Since the original directive came into force in 1994 (Directive 94/62/EC) there have been many revisions and amendments, with the latest (Directive (EU) 2018/852) updating measures to prevent the production of packaging waste, and promote the reuse, recycling and other forms of recovery over final disposal[3].

The latest amendment to the Directive sets the following targets for recycling:

	By 2025	By 2030
All packaging	65%	70%
Plastic	50%	55%
Wood	25%	30%
Ferrous metals	70%	80%
Aluminium	50%	60%
Glass	70%	75%
Paper and Cardboard	75%	85%

The Directive also states that EU countries should guarantee to establish producer responsibility schemes for all packaging by the end of 2024[4].

Directive (EU) 2018/852 has been applicable since 4th July 2018 but had to become law in the EU countries by 5th July 2020[5].

EU – Circular Economy

In 2014 the European Commission put forward an initial Circular Economy Package, which was subsequently replaced in 2015 by a more ambitious and wider Circular Economy Action Plan. 2018 saw these measures complemented by the second Circular Economy Package, including an EU Strategy for Plastics in the Circular Economy, and annexes to transform and measure the way plastic products are designed, produced, used and recycled.

On 4 March 2019, the European Commission adopted a report on the implementation of the Circular Economy Action Plan, which presented the main achievements under the Action Plan and outlined future challenges whilst working towards a climate-neutral, circular economy where pressure on ecosystems is minimised. The Action Plan was communicated as being completed, its 54 actions having been 'delivered or are being implemented', i.e. included or being actioned in legislation, strategy, methodology development, stakeholder platforms and reports, even if the work on some of them continues beyond 2019.

In March 2020, The European Commission adopted the new Circular Economy Action Plan which targets how products are designed, promotes circular economy processes, and encourages sustainable consumption. It also aims to prevent waste and retain used resources in the EU economy for as long as possible. This new action plain is one of the main components of the European Green Deal[6].

The European Green Deal is Europe's new agenda for sustainable growth, outlining an action plan that aims to make the use of resources more efficient by transitioning to a clean, circular economy, as well as restore biodiversity, and reduce pollution[7].

2. https://ec.europa.eu/environment/topics/waste-and-recycling/packaging-waste_en
3. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM:l21207
4. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM:l21207
5. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM:l21207
6. https://ec.europa.eu/environment/strategy/circular-economy-action-plan_en
7. https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

Appendix - Legislation and Targets

EU – Waste Framework Directive

The EU Directive for waste management is the Waste Framework Directive (Directive 2008/98/EC), an overarching legislative structure for the management of waste in EU countries, determining the basic concepts related to waste management, including definitions of waste, recycling and recovery. It establishes the five-step "waste hierarchy", the foundation to EU waste management, which sets out an order of preference for managing and disposing of waste:

Prevention > preparing for re-use > recycling > recovery > disposal[8]

The Directive monitors and sets targets relating to the recycling rate of household and municipal waste, plastics, packaging and landfill use for the EU member states. As of 2019, the target was 22.5% of all household waste to be recycled by EU member states, and for 2020 that was increased to 50%. The UK recycling rate for waste from households in the UK in 2018 was 45.7%.

A revised waste legislative framework entered into force in July 2018 outlining "ambitious yet realistic recycling rates". These include: Recycling 55% of municipal waste by 2025, 60% by 2030 and 65% by 2035; and Recycling 65% of all packaging by 2025 and 70% by 2030[9].

EU – A European Strategy for Plastics in a Circular Economy

The European Commission's A European Strategy for Plastics in a Circular Economy (January 2018) is part of the EU's Circular Economy Package and addressed three interrelated issues: a current high dependency on virgin fossil feedstock, a low rate of recycling and reuse of plastics, and a significant leakage of plastics into the environment. It outlined a vision for Europe's new plastics economy to develop "a smart, innovative and sustainable plastics industry", including:

- Reducing the leakage of plastic into the environment by transforming the way products are designed, manufactured, used and recycled.
- Making better use of taxation and other economic instruments to reward the uptake of secondary plastics.
- Putting in place well-designed EPR schemes, support recovery and recycling schemes including introducing deposit return incentives, particularly for beverage containers.
- The relevant aims and targets in the vision include, by 2030, all plastics packaging placed on the EU market is to be either reusable or can be recycled in a cost-effective manner.
- The strategy describes how the vision can be turned into reality in 4 key areas:
- Improving the economics and quality of plastics recycling – including design for recyclability, boosting demand for recycled plastics, and better and more harmonised separate collection and sorting.
- Curbing plastic waste and littering – including preventing plastic waste in our environment, establishing a clear regulatory framework for plastics with biodegradable properties and dealing with the rising problem of microplastics.
- Driving innovation and investment towards circular solutions.
- Harnessing global action.

8.https://ec.europa.eu/environment/topics/waste-and-recycling/waste-framework-directive_en
9.https://www.eea.europa.eu/data-and-maps/indicators/waste-recycling-1/assessment-1#:~:text=In%202018%2C%20more%20ambitious%20targets,of%20packaging%20waste%20by%202008

Appendix - Legislation and Targets

EU – Single Use Plastic Directive

The Single Use Plastics Directive, finalised and published on 5 June 2019, is part of the EU Plastics Strategy and Circular Economy Action Plan and is primarily targeted at reducing marine litter.

The EU adopted the measures proposed by the Commission to: 'Tackle marine litter coming from the 10 single use plastic products most often found on European beaches, as well as abandoned fishing gear and oxo-degradable plastics.'

Specific targets as part of this directive include:

- 77% of plastic bottles to be collected for recycling by 2025, and 90% by 2029.
- 25% recycled content from 2025 for PET bottles and 30% from 2030 for all beverage bottles (note the HMT Plastic Packaging Tax states 30% recycled content for plastics packaging).
- Ban on selected single-use products made of plastic for which alternatives exist on the market – effective from July 2021.

EU - Packaging Levy

The European Union planned to introduce a levy on plastic waste from January 2021 as part of a €750 billion coronavirus recovery fund agreement. A levy of €0.80 per kilogram (€800 a tonne) will be applied specifically to non-recyclable plastic packaging waste. Proceeds from the levy will go directly to the EU, but it will be down to individual countries to decide how to implement the requirement, possibly in the form of a tax. Producers will be charged per gram of unrecyclable plastic they use, as opposed to minimum recycled content regulations as proposed in the UK.

The New Plastics Economy

The New Plastics Economy is a collaboration between the Ellen MacArthur and UN Environment Framework, focused on the circular economy for plastics, and uniting over 1,000 organisations. The vision is supported by three key actions:

- Eliminate the plastics we don't need.
- Innovate to ensure that the plastic we do need are reusable, recyclable or compostable.
- Circulate all the plastic items we use to keep them in the economy and out of the environment[10].

10. https://www.newplasticseconomy.org/about/the-initiative

Faerch prove recycled content in food packaging with third party audited certification

Circularity is high on the agenda of UK businesses and European governments and high levels of recycled content, combined with full recyclability, illustrates that a material is circular. Evidencing levels of recycled content is important for customer trust, and also for local tax declarations.

Faerch uses third party auditors to certify the amount of post-consumer recycled content (PCR) in all of its PET recipes. Statements are audited by PricewaterhouseCoopers (PwC), ensuring maximum transparency for customers and offering evidence-based documentation for consumers, legislators and other stakeholders.

“The amount of post-consumer recycled content in food packaging is a key indicator for sustainability and circularity”, says Spencer Johnston, CEO of Faerch UK Ltd. “Consumers and legislators expect full transparency. With our audited certification we eliminate any uncertainty and doubt”, he continues. “We apply the strictest calculation method and use ISO definitions as the basis for certification. We very much encourage decision makers in the industry to focus on maximising post-consumer content in contrast to pre-consumer material, which is frequently referred to, but in fact comprises of industrial by-products or virgin regrind that has never been in the hands of the end user”, he concludes.

Audited certificates are available for Faerch’s entire UK PET material range.

Faerch

RECOUP
Member

Appendix - Polymer Densities

The table below shows the density ranges of plastics commonly used to make plastic packaging and components.

Polymer	Density g/cm³	Behaviour in float process*
Ethylene vinyl acetate (EVA)	Less dense than water	Float
Polypropylene (PP)	0.90 - 0.92	
Low density polyethylene (LDPE)	0.91 - 0.93	
High density polyethylene (HDPE)	0.94 - 0.96	
Polystyrene (PS)	1.03 - 1.06	Variable
Nylon (PA)	1.13 - 1.14	Sink
Acrylic (PMMA)	1.17 - 1.20	
Polycarbonate (PC)	1.2	
Polyethylene terephthalate (PET)	1.30 - 1.38	
Polyvinyl chloride (PVC)	1.32 - 1.45	

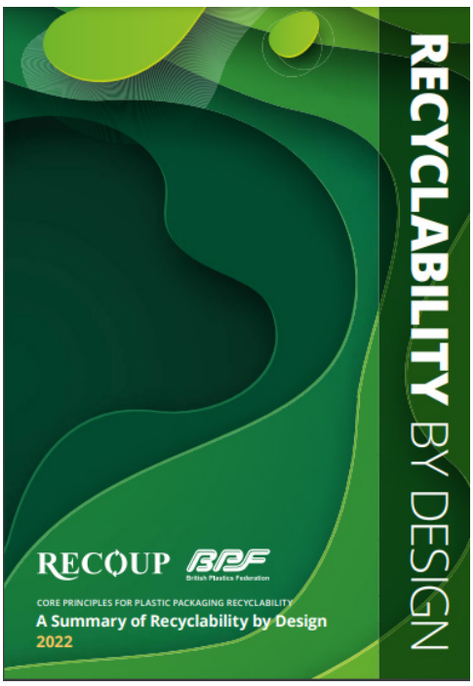
Densities are approximate and relate to virgin unpigmented and unfilled polymer. Colouring with a 4% pigment can raise density by 0.03 g/cm3 which may cause further overlaps of polymer densities.

Hydro cyclones can be fine-tuned to separate plastic materials provided their densities differ by ca > 0.05 g/cm3. The densities of flake derived from PP and HDPE packaging overlap and are difficult to separate. The density difference between PS and HDPE whilst sufficient to permit separation in a hydro cyclone, is not sufficiently large from water to ensure that is fully separable with either the light or heavy fractions and thus can cause recycling issues with for example, PET.

A density difference between the polymer and water of ca>=0.05g/cm3 is required to ensure that the material will either sink or float in a sink/float tank.

Care should be taken with any application which requests the use of foamed or blown plastics as this process will affect the density.

Recyclability By Design - Versions



Core Principles - A summary of Recyclability by Design

RECOUP and the British Plastics Federation (BPF) launched guidance to help packaging designers create easy-to-recycle plastic packaging. The guide outlines which combination of closures, seals, labels and materials ensure recycling plants can easily separate and recycle the plastics.

Big brands are being encouraged to use the guidance to ensure their packaging products can be easily processed at the end of their lives to avoid going to landfill, and instead be recycled into new products in an important move towards developing a circular economy.

Rigid Plastic Packaging - Design Tips for Recycling

This document explains to all who have an involvement in packaging the simple steps which can be taken to maximise the recyclability of rigid plastic packaging products. This version includes detailed guidance from Recyclability By Design; including best practice and tables for PET Bottles, PET Trays, HDPE Bottles, PP and PS containers.

All documents are available to download on the RECOUP website.

Glossary of Terms

APR	The Association of Post Consumer Plastic Recyclers
CEN	The European Committee for Standardisation
CEPE	The European Council of Paint, Printing Ink and Artists' Colour Industry
COTREP	Comite Technique de Recyclage des Emballages Plastiques
EPS	Expanded Polystyrene
EuPC	European Plastics Converters
EuPIA	The printing ink group within the European Council of Paint, Printing Ink and Artists' Colour Industry
EuPR	Plastics Recyclers Europe
EUROPEN	The European Organisation for Packaging and the Environment
EVA	Ethylene vinyl acetate
EVOH	Ethylene vinyl alcohol
FTIR	Fourier Transform Infrared Spectroscopy
HDPE	High density polyethylene
HCI	Hydrochloric acid
HIPS	High-impact polystyrene
IPP	Integrated Product Policy
IR	Infrared (radiation)
ISO	International Standards Organisation
LDPE	Low density polyethylene
LLDPE	Linear low density polyethylene
MDPE	Medium density polyethylene
MRF	Material reclamation facility
NAPCOR	National Association for PET Container Resources
NIR	Near infrared (radiation)
OPET	Oriented PET
OPP	Oriented polypropylene
OPS	Oriented polystyrene
PA	Polyamide (nylon)
PBT	Polybutylene terephthalate
PC	Polycarbonate
PCR	Post-consumer recycled material
PEN	Poly (ethylene 2,6 napthalate)
PET	Polyethylene terephthalate
PETG	Polyethylene terephthalate glycol
PLA	Polyactic acid
PMMA	Polymethyl methacrylate
PP	Polypropylene
PPWD	The European Packaging and Packaging Waste Directive
PRS	PET recycling schweiz
PS	Polystyrene
PU	Polyurethane
PVdC	Polyvinylidene chloride
PVC	Polyvinyl chloride
REPA	Service organisation for all recovery organisations in Sweden (except glass)
RPET	Recycled Polyethylene Terephthalate
SPI	Society of plastics industry
6EAP	European Union sixth environmental action program

Useful Organisations

These organisations encourage the concept of appropriate design for recyclability in the broader context of designing for minimum environmental impact of the packaging system. As such they encourage designers and specifiers of plastic packaging to build the considerations identified in this document into their packaging design process.

The European PET Bottle Platform	
ABC Alliance for plastic Beverage Containers Sustainability Boulevard Louis Schmidt 119 - box 2 B-1040 Brussels Belgium (t)+32 2 559 26 67 (f)+32 2 559 22 96 vandongen@eur.ko.com	**Petcore** PET Containers Recycling Europe Ave E van Nieuwenhuyse 4 1160 Brussels Belgium (f)+32 2 675 39 35 petcore@btconnect.com www.petcore.org
EPRO European Association of Plastic Recycling & Recovery Organisations Konigin Astridlaan 59 bus 5 B-1780 Wemmel BRUSSEL Fon: ++32 2 456 84 49 Fax: ++32 2 456 83 39 secretary@epro-plasticsrecycling.org www.epro-plasticsrecycling.org	**Plastic Recyclers Europe** Avenue de Broqueville 12 1150 Woluwe Saint-Pierre Brussels Tel: +32 2 315 24 60 info@plasticsrecyclers.eu www.plasticsrecyclers.eu
epbp@epbp.org **http://www.epbp.org/**	

COTREP		
Chambre Syndicale des Emballages en Matiere Plastique 5, Rue de Chazelles 75017 Paris (t)+33 (0)1 46 22 33 66 (t)+33 (0)1 46 22 02 35 infos@packplast.org www.packplast.org	**Eco Emballages** 44 Avenue Georges Pompidou 92300 Levallois-Perret (t)+33 (0)1 40 89 99 99 (f)+33 (0)1 40 89 99 88 infos@packplast.org www.ecoemballages.fr	**Valorplast** 14 Rue de la Republique 92800 Puteaux (t)+33 (0)1 46 53 10 95 (f)+33 (0)1 46 53 10 90 infos@packplast.org

Useful Organisations

EuPC
European Plastic Converters
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Brussels,1000 Belgium
(t)+32 2 732 41 24
(f)+32 2 732 42 18
info@eupc.org
www.plasticsconverters.eu

Plastics Recyclers Europe
Avenue de Broqueville 12
1150 Woluwe Saint-Pierre
Brussels
Tel: +32 2 315 24 60
info@plasticsrecyclers.eu
www.plasticsrecyclers.eu

EPRO
European Association of Plastics Recycling and Recovery Organisations
Konigin Astridlaan 59 bus 5
B-1780, Wemmel
BRUSSEL
(t)+32 (0) 2 456 84 49
(f)+32 (0) 2 456 83 39
epro@epro-plasticsrecycling.org
www.epro-plasticsrecycling.org

Petcore Europe
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1150 Brussels, Belgium
(t) +32 (0) 2 315 24 88
info@petcore-europe.org
www.petcore-europe.org

APR
Association of Plastic Recyclers
1776 K Street, NW
Washington, DC 20006
www.plasticsrecycling.org

NAPCOR
National Association for PET Container Resources
3440 Toringdon Way, Suite 205
Charlotte, NC 28277
www.napcor.com

BSDA
British Soft Drinks Association
20-22 Bedford Row
London WC1R 4EB
(t)+44 (0) 20 7405 0300
(f)+44 (0) 20 7831 6014
bsda@britishsoftdrinks.co.uk
www.britishsoftdrinks.com

PACSA
Packaging Council of South Africa
PO Box 131400,
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Technical Support and Guidance for Reviewing the Recyclability of Plastic Packaging Samples

With the growing scrutiny and public interest on plastic packaging it is more important than ever to ensure your packaging meets recyclability criteria and has the best opportunity possible to be recovered, sorted and reprocessed.

In addition to The Recyclability by Design Guidelines, RECOUP can test sample packaging for both design and recovery in UK recycling facilities.

The Process

RECOUP will take sample packaging and review them based on typical UK systems, and test through appropriate sorting and reprocessing sites where required. This will be assessed against accepted recyclability criteria. A report will be provided, and test sheets completed to confirm each step of the recycling process. We will document how the samples react within those systems, with the material types and components assessed against recyclability, this will also include details of the equipment provider. If it is not deemed recyclable, the reasons will be given, and recommendations provided to improve recyclability.

Within this work, the RECOUP team will help with further development and laboratory testing where required and as needed. Working confidentially RECOUP are happy to sign Non-disclosure agreements where required.

What we test for:

1. **Size** - This impacts the recovery of the sample, if too small can be lost during sorting, if too big or heavy may not be detected.
2. **Colour** – Certain colours can impede recovery by not being recognised by the Near IR
3. **Mixed or laminated materials** – combined/ layered polymer types can confuse the Near IR as they set to detect certain materials, testing is recommended to see what polymer type they are identified as.
4. **Sleeves/labels** – These can make a difference to the recovery: how much of the surface area is covered by the label and what polymer the label is derived from. Full sleeves generally impede recovery with ink and colours also impacting.

This service is free to RECOUP members
If you would like to arrange a review of sample packaging or require membership details, please contact RECOUP on T: **01733 390021** or email: **kate.bedford@recoup.org**

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