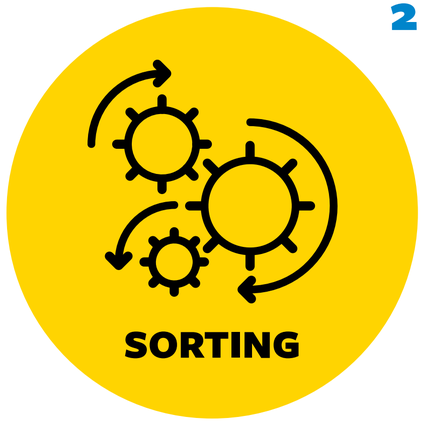
Packaging & Design for the Circular Economy

Challenges & Opportunities in Irish Packaging Recycling

REPAK

CONTENTS



1. INTRODUCTION TO THE CIRCULAR ECONOMY

WHAT IS THE CIRCULAR ECONOMY?

As humans we adopt a linear economy model where we take a raw material from the earth, make something from it and then dispose of that item (take, make, dispose).

In a circular economy, growth is separated from the use of scarce resources through production models based on long life products that can be renewed, reused, repaired, upgraded or refurbished.

Circular economy systems:

- keep the added value in products for as long as possible and aim to eliminate waste.
- keep resources within the economy when a product has reached the end of its life, so that they can be productively used again and again and hence create further value.

Our economic model is linear to the extent that current estimates suggest we live in a world which is only 8.6% circular[1].

A transition to a more circular economy requires significant changes from product design to new business and market models, new ways of turning waste into a resource, to new modes of consumer behaviour.

This will involve innovation in:

- technologies
- society
- policies[2]
- organisation
- finance methods

The EU's Circular Economy Package aims to help address these challenges in Europe and in broad terms it focusses on durability, repair, reuse and the sharing or leasing of products as a means to extend the use of products or their components for as long as possible. The theory being that by doing so you reduce both resource extraction of virgin raw materials and reduce residual waste.

PACKAGING IN A CIRCULAR ECONOMY

Designing packaging for a circular economy is about "adopting a systemic perspective during the design process, to employ the right materials for appropriate lifetime and extended future use[3]". However creating a circular economy for packaging is about more than just the material selection, it requires fundamental changes to business models and how we use packaging. One of the key challenges is addressing the single use models we have created and ensuring that the alternatives used address some of the reasons those models exist (hygiene, safety, convenience).

The Ellen McArthur Foundation suggests that replacing just 20% of single use plastic packaging for example would create an opportunity worth more than 10 billion US Dollars[4].

PACKAGING COMPLEXITY

In order to achieve a circular economy we must take the opportunity to connect all stakeholders so that there is improved awareness of what increases or decreases the potential circularity of packaging. It is important to note that the EU's Circular Economy Package recognises that we are unlikely to completely eliminate single use packaging for example during the packing of certain foods where food safety is a significant concern.

This raises the continuing need for efficient recycling processes where reuse or repair is not a practical option.

However to achieve a circular economy we must challenge how we design packaging from both a business model and material perspective to ensure that we:

A. Maximise the chances of capturing packaging for either reuse or high quality recycling and

B. Have a material that can be recycled without significant technical challenges when we do capture it.

From a material perspective this is not as simple as just understanding the materials we use within a pack so that we can place a claim on the pack that it is 100% recyclable.

It is about moving beyond that to understand the material combinations that are likely to create unfavourable conditions for the recycling industry during the sorting or reprocessing stages which can make the entire pack either very challenging to recycle or not recyclable at all.

In fact material complexity is one of the key barriers to creating a circular economy and this is still a challenge for many polymer based materials in particular.

However it is critically important that our decision making processes to increase packaging circularity, take into account the consequences of removing barrier materials in favour of others which may not be able to provide the same shelf life.

HOW TO USE THIS GUIDE

In order to understand the challenges posed by packaging design, this guide aims to help the reader understand how recycling processes work from collection through to reprocessing in relation to the main packaging materials - paper/cardboard, plastic, metals and glass.

The guide is therefore divided into the three main stages of recycling

1. Collection from a residential or commercial premises
2. Sorting at the Material Recovery Facility (MRF)
3. Reprocessing into new materials

Where relevant it outlines where packaging design can have an impact on the recycling of that material and what you can do to eliminate or minimise that.

1. INTRODUCTION TO THE CIRCULAR ECONOMY

EU CIRCULAR ECONOMY PACKAGE & FEE MODULATION

One of the key tools cited within the CEP Plastics Strategy is the Eco-modulation of Extended Producer Responsibility (EPR) fees. EPR has been used as a policy tool by the European Union since the mid 1990's and has proven to be an effective tool in assisting member states to meet recycling targets for numerous materials such as Waste Electronic & Electrical Equipment, Batteries and Packaging.

However in addition to delivering environmental benefits, improved approaches to EPR could make existing schemes more efficient and effective.

With this in mind, Eco-modulation of fees is being introduced along with the Repak Members' Plastic Pledge to improve the recyclability and to incentivise the eco-design of products.

It is therefore viewed as a key element in helping to achieve the ambition of the EU's Plastic Strategy for 100% recyclable packaging by 2030. From a packaging perspective, under Eco fee modulation, non-recyclable packaging will command higher EPR fees to schemes such as Repak or equivalent across the EU whereas those packaging materials that are recyclable will command lower fees. As part of the CEP package, plastic recycling targets in the new Packaging & Packaging Waste Directive will:

- Increase plastic recycling targets from the current target of 22.5% to 50% by 2025
- Increase plastic recycling rates to 55% by 2030
- Exclude recovery from plastic recycling rates (e.g. by Waste to Energy)

Ireland's plastic packaging recycling rate was 35% in 2018.

SINGLE USE PLASTICS DIRECTIVE

A second significant development will be the introduction of the Single Use Plastics (SUP) Directive. This passed all stages in Europe in June 2019. Member States now have two years to transpose this into national law.

- SUP targets for beverage bottles (up to three litre in capacity) will have recycling targets of 77% in 2025 and 90% in 2029.
- PET bottles producers will be required to have 25% Recycled PET in beverage bottles by 2025 and 30% in 2030.
- Extended Producer Responsibility schemes will be required to financially contribute toward the cost of awareness-raising measures, waste management and litter clean up proportional to the packaging.
- In addition a recycled content of 25% will be required by 2025 for PET Bottles rising to 30% by 2030.
- Beverage Caps will also require tethering to plastic bottles by 2024 if the container capacity is under 3 litres in volume.

REPAK FEE MODULATION: GUIDANCE FOR PLASTIC GROUPINGS

CATEGORY	EXAMPLES	GUIDANCE
RECYCLED RIGID PLASTIC	- Pots - Tubs - Trays* - Plastic Pallets - Crates - Plastic Strapping 	This category includes any rigid three dimensional plastics disposed of at the back door of a business or by the consumer. This however excludes plastic bottles which are reported separately. In general, rigid plastics will be seen as recyclable.
RECYCLED FLEXIBLE PLASTIC	- Pallet wrap - Plastic sheeting - Shrinkwrap from cases of beverages 	This category includes outer soft plastics and single polymer films that are recyclable. In general, flexible plastic disposed of at the back door of a business will be seen as recyclable as it is baled and collected separately for recycling.
NON RECYCLED PLASTIC	- Foamed plastics such as expanded polystyrene or polyethylene** - Flexible plastic films and bags that will be disposed of at kerbside - Toothpaste tubes 	This category includes mixed plastic laminates in film form and foamed polystyrene packaging. In general, flexible plastic bought by the consumer will be seen as non-recyclable as it is mixed and contaminated, not made from simple materials and not collected separately for recycling.
PET BEVERAGE BOTTLES* **	- PET Soft Drink Bottles - PET Water Bottles - PET Beer Bottles 	As there will be a separate recycling target for these, we will need to record the number of bottles placed on the Irish market. Under the new Single Use Plastics Directive, EU member states must collect 77% of PET bottles for recycling by 2025, increasing to 90% by 2029. Full sleeved labelling and caps on PET bottles are also declared here (i.e. the bottle components are not split out). NOTE: The SUP Directive takes precedence over other directives. It is more important to declare the bottle, than the recyclable components.
OTHER PLASTIC BEVERAGE BOTTLES	- HDPE Milk Bottles - HDPE Juice Bottles 	This category includes all plastic beverage bottles not made from PET.
PLASTIC NON BEVERAGE BOTTLES	- Detergent Bottles - Washing Up Liquid Bottles - Shampoo Bottles 	This category includes any plastic bottles that are not used for beverages.

*Please note that black plastic trays are accepted in recycling bins in Ireland.
**Deemed Non Recycled Plastic unless evidence can be provided that it is being recycled. Please note that Expanded or Extruded Foam Plastics will be viewed as Non-Recycled unless evidence is provided that they are being compacted and recycled.
***Note that a bottle must always be categorised as PET Beverage Bottles, Other Plastic Beverage Bottles or Plastic Non Beverage Bottles even if known not to be recycled as we are required to understand beverage bottles on the Irish market in line with the requirements of the Single Use Plastics Directive.

REPAK FEE MODULATION: GUIDANCE FOR PLASTIC GROUPINGS

CATEGORY	EXAMPLES	GUIDANCE
RECYCLED COMPOSITES	- Beverage Cartons - Other mixed material laminates where the materials are mechanically separable for recycling 	This category includes composites that are recycled in Ireland and consist of more than one material type (e.g. paper and plastic) where the main material is less than 95% of the overall package weight. This category excludes composite materials that contain more than one type of plastic polymer.
NON RECYCLED COMPOSITE	- Foil Laminate films such as crisp bags or pouches - Other mixed material laminates where the materials are not mechanically separable for recycling 	This category includes composites that are not recycled in Ireland and consist of more than one material type (e.g. paper and plastic) where the main material is less than 95% of the overall package weight. This category excludes composite materials that contain more than one type of plastic polymer.

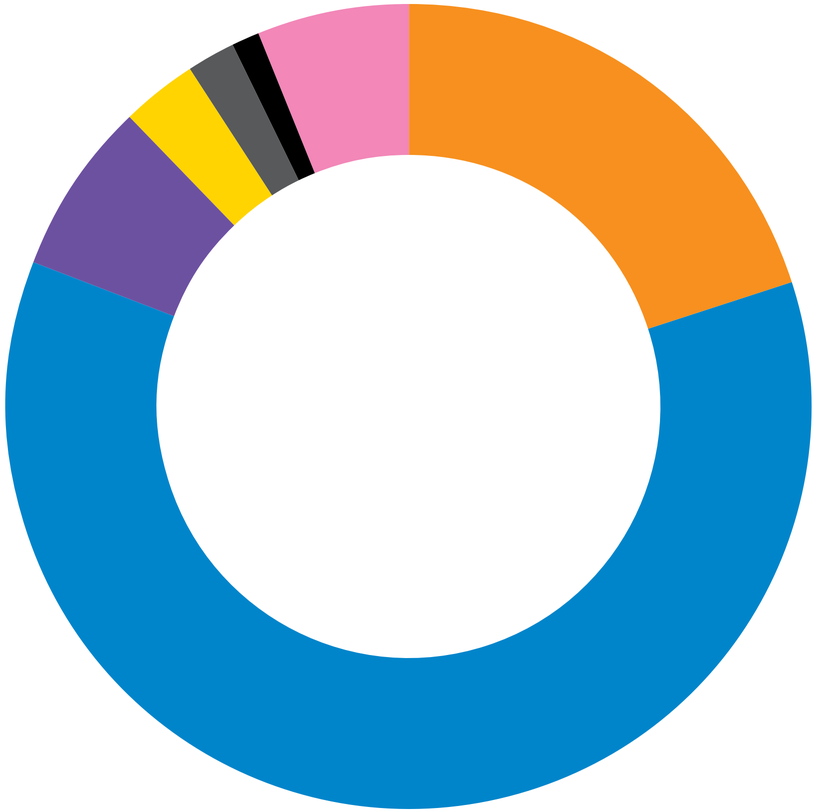
2. COLLECTION

Collection is the first and most critical stage in any recycling process. The way in which a household or business segregates recyclable materials from non-recyclable materials or heavily contaminated packaging can impact on both the quality of the other material in the bins and the health and safety of MRF staff. This is due to odours, pests and other potential hazards such as sharps from non-recyclable waste.

From a household point of view, in Ireland the materials that can currently be recycled are listed on a national recycling list.

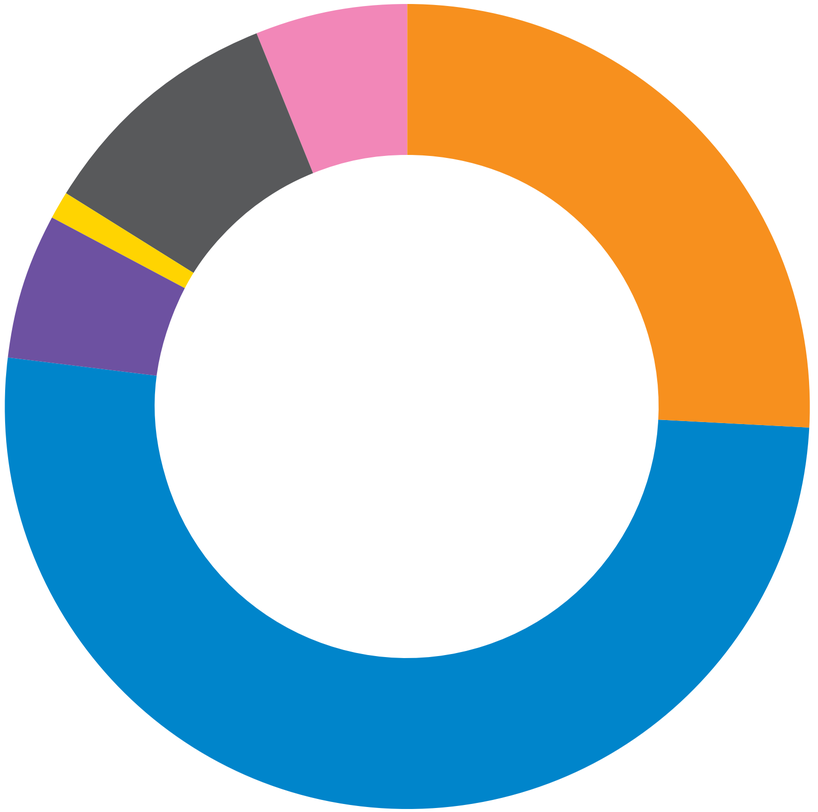
This list is designed to apply from Malin Head to Mizen Head and can be found at www.mywaste.ie.

In the case of businesses it is a legal requirement to make your packaging materials available for recycling and recovery. If you need any support in doing this effectively, please do not hesitate to contact your current waste contractor or Repak's packaging technology team who can support you in the prevention and management of packaging waste. See www.preventandsave.ie for more information.



What's in our household recycling bins?[5]

- 20% Plastic
- 7% Metal, Glass & Wood
- 2% Organic Waste
- 6% Other
- 61% Paper, Card & Beverage Containers
- 3% Textiles
- 1% Hazardous Waste



What's in our business recycling bins?

- 26% Plastic
- 6% Metal, Glass & Wood
- 10% Organic Waste
- 51% Paper, Card & Beverage Containers
- 1% Textiles
- 6% Other

3. SORTING: PAPER, METALS & PLASTICS

CONTENTS

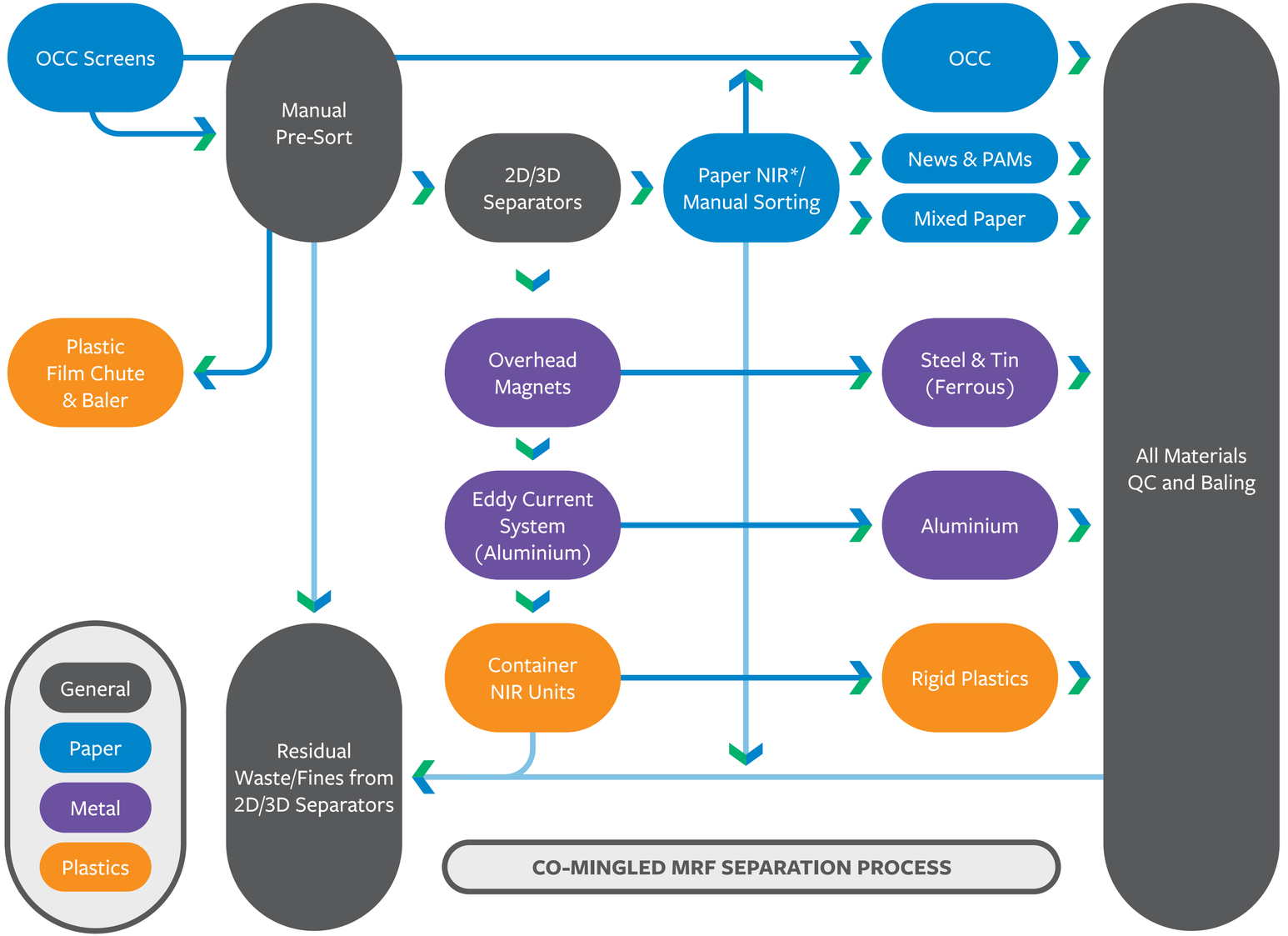
THE MATERIAL RECOVERY FACILITY PROCESS

Material recovery facilities or MRFs use a number of manual and mechanised processes to sort and bale the material to be sent for recycling. These processes are explained below in the context of paper and cardboard, rigid plastic packaging, and metals and how packaging design can influence these processes.

Here in Ireland a MRF is designed to accept mixed dry recyclables collected from the household in a co-mingled system. This means that paper and cardboard, plastics and metals are all accepted in a single recycling bin. This process is explained in section 3 below.

Glass is not accepted in household recycling collections and is collected from a system of bottle banks. Glass goes through a separate MRF process (see section 4 below for more details).

Most wooden packaging consists of pallets and crates that are collected from businesses and at home it is not accepted in recycling bins. Wood can be placed in a compost bin along with garden waste unless heavily treated or painted. If you are unsure it is best to bring wooden items to your local civic amenity site.



*NIR = Near Infrared

OCC SCREENS (METAL STAR SCREENS)

WHAT THEY DO?	MAIN OUTPUT	CHALLENGES	WHAT TO DO?
The system uses a number of rotating screens to sort large cardboard boxes from smaller items. The larger cardboard boxes (typically A3 size or larger) are propelled along the top of the screen while the smaller items fall to a conveyor below.	Old Corrugated Cardboard (OCC). These are large cardboard items separated from all other components which are then baled for reprocessing.	Either larger non-recyclable items or items that are recyclable but do not belong in a kerbside bin cause problems here. Large plastic films and bags can often wrap around these screens and if allowed to build up can eventually interfere with the ability of smaller items to fall through the screens. Other items commonly found here include carpet, clothing and textiles and items that have been bagged.	Packaging design does not have a significant impact on this process step.

MANUAL PRE-SORT

WHAT THEY DO?	MAIN OUTPUT	CHALLENGES	WHAT TO DO?
After OCC screening input materials are sorted by hand. This has the immediate function of removing contamination from the incoming material - particularly anything that can damage the 2D/3D Separators. Examples include food waste, electrical goods, nappies, films, wood, textiles and bagged items.	1. A cleaner paper and containers stream. 2. Films and bags that are suitable for recycling to film chute and baler. 3. Contaminants that may damage or jam equipment diverted to residual line (waste).	Health and safety of staff. Materials are found here that can act as a hazards to staff - nappies, food waste, garden waste, glass, sharps and even dead pets. Larger MRFs will have more than 100 staff so please respect what MRF staff may need to handle when segregating your waste for recycling.	Packaging design does not have a significant impact on this process step.

2D/3D SEPARATORS

WHAT THEY DO?	MAIN OUTPUT	CHALLENGES	WHAT TO DO?
After manual sorting, material goes through another series of conveyors. This conveyor system is designed so that 2D (flat) items move up the conveyor while the 3D (rigid) containers do not.	1. A cleaner paper (mixed paper and smaller cardboard) and containers stream. 2. Films and bags that are suitable for recycling to film chute and baler. 3. Contaminants that may damage or jam equipment diverted to residual line (waste).	Other flat items made from non-paper materials such as plastic and laminated films and bags are not possible to pick during manual presorting. Easily flattened items such as aluminium trays may be picked up here. In MRFs with no further downstream Near Infrared (NIR) Detection systems, this can increase the chances of paper remaining contaminated.	It should be noted during design that very small packaging items with dimensions below 20mm x 20mm are unlikely to end up on either the container or paper line. These items will fall through the separators and into fines.

PAPER LINE: NIR DETECTION OR QUALITY CONTROL (QC) CABIN

WHAT THEY DO?	MAIN OUTPUT	CHALLENGES	WHAT TO DO?
In MRFs where the technology exists, NIR detection is used to remove any polymer based materials remaining in paper after 2D/3D separation. Where a MRF does not have this capability it will use a manual sorting process to achieve this.	High quality mixed paper. Polymer based contaminants are removed here and sent to the residual line. This provides for a higher quality mixed paper grade product with reduced contamination. This paper is then baled for reprocessing.	Carbon black containing plastics are generally invisible to most NIR equipment. In the paper stream any black bags or black films not identified during manual sorting can therefore escape detection and removal where this process stage is included which can contaminate paper.	If you must use black plastic it is advised to discuss non - carbon black options with your supplier or allow sufficient clear spaces or other colours to maximise the opportunity to identify bags and films and prevent contamination of paper with non-detectable polymer based materials.

CONTAINER LINE: OVERHEAD MAGNETS – FERROUS

WHAT THEY DO?	MAIN OUTPUT	CHALLENGES	WHAT TO DO?
Overhead magnets extract the ferrous metal packaging from the conveyor for recycling (mostly steel cans e.g. for soup and canned vegetables)	Steel and tin cans. This creates a separate stream for these materials which can then be baled and sent for reprocessing.	Any composite packaging if it contains enough steel can be picked up by these magnets. This can result in contamination of the steel bales. Examples include cardboard tubes with a steel base for crisps, salt and certain types of cereals.	It is best to minimise the use of mixed materials. Even if such a package is picked up by the magnets and makes it to a reprocessing plant, whereas the metal component may be possible to reprocess, the remaining materials will be burnt off in the furnace. An example here would be to ask consumers to separate the plastic biscuit tray before recycling the biscuit tin.

CONTAINER LINE: EDDY CURRENT SYSTEM (ECS) – NON FERROUS

WHAT THEY DO?	MAIN OUTPUT	CHALLENGES	WHAT TO DO?
An ECS captures aluminium packaging such as cans and bottles. The system works by creating a magnetic field which has the ability to repel aluminium. During the sorting process this lifts aluminium on to a specific conveyor as the non-aluminium packaging drops on to a conveyor below.	Aluminium cans and containers. As this removes the aluminium cans from the other containers it creates a separate waste stream for these materials which are then baled and sent for reprocessing.	Contamination is a challenge here with regard to aluminium containing composites and foil trays that often contain burnt on residues. Examples include: 1. Aluminium trays for ready meals and cook in tray meat and poultry products 2. Plastic beverage cans with a traditional aluminium can lid. Aerosols can be aluminium or steel and can be a fire and safety hazard in a MRF particularly during compaction and baling.	1. Although theoretically recyclable, aluminium trays are often not washed by the consumer leaving burnt on grease and food residues. Consider this message to the consumer when designing packaging of this type. 2. Use glass or plastic for bottles and aluminium or steel for cans. Do not mix materials as you will render the entire pack non- recyclable. Metals for example can damage equipment used in plastic recycling facilities.

CONTAINER LINE: NIR DETECTION – PLASTICS

WHAT THEY DO?	MAIN OUTPUT	CHALLENGES	WHAT TO DO?
NIR Detection systems use infra-red light to detect the subtle differences in density between plastics to identify them as different polymer types.	1. PET and HDPE Bottles. 2. Mixed Plastics - Pots, Tubs and Trays (PTT). Most MRFs are configured to collect and bale HDPE and PET bottles separately. All other rigid plastic types are baled in a grade called mixed plastics that mostly consists of PTT.	The challenges associated with this process are extensive which is reflected in the lower recycling rates for household plastics. 1. Black Plastic Packaging: In a similar manner to the NIR Detection used to eliminate plastic contamination from paper, non-detectable black plastic containers can be missed for recycling. 2. Full body beverage bottle sleeves: Full body beverage bottle sleeves are usually produced from a different plastic to the bottle itself. As the bottle is completely covered by this other material, this can fool the detector into thinking that the sleeve material is the main material. For example a PP sleeve on a PET bottle may be seen as a PP package rather than a PET one. 3. Rigid and flexible plastics are often made up of polymer blends. This is often for the purposes of heat sealing (e.g. skin pack trays) or enhancing shelf life (vacuum pack meat bags). Such materials can be problematic to plastic recyclers and impact on the finished recycled product. 4. Lidding films: Plastic processors will often have sifters that can remove unwanted light fraction plastics. However some lidding films are not single polymer so it is best if they are removed and discarded by the consumer or be the same material as the tray where possible. 5. Plastic containers covered with non-plastic materials: Plastic containers covered with cardboard sleeves such as yogurt pots may not be picked up as either plastic or cardboard as the detectors may see one or the other. 6. Non-recyclable contaminants: Plastic packaging items often contain non-recyclable components such as absorbent pads in trays. Generally consumers don't remove these, particularly when used in meat packaging. These are problematic in a plastic recycling facility and the non-recyclable component cannot be removed in the MRF.	1. There are some innovations now available such as Quinn Packaging's Detecta™. 2. If you must use a sleeve rather than a label, minimise the size so that it does not cover more than 50% of the container surface area or instruct consumers to remove them and provide a means to do so. 3. Use a single polymer rather than a blend or laminate where possible. 4. Instruct your customer to remove and discard lidding films completely where possible. 5. Minimise the size so that it does not cover more than 50% of the container surface area or instruct consumers to remove them and provide a means to do so. 6. Eliminate absorbent pads if this is possible to do without impacting product quality. If not then use pads that are not adhered to trays where this is feasible (e.g. mince papers).

ALL MATERIALS - QC AND BALING

WHAT THEY DO?	MAIN OUTPUT	CHALLENGES	WHAT TO DO?
After materials have been separated at the MRF and prior to dispatch there is a final QC station which allows for further missed materials to be captured or missed contaminants to be removed.	Sorted and baled materials of different grades for shipping to reprocessors.	Reduction of contamination to acceptable levels within a co-mingled system. Difficult to sort or detect materials such as non-detectable black trays can be picked up here but at a reduced yield.	Use detectable colours for black plastic packaging.

Once sorted into a single material type and baled at a MRF, the baled material is then sent on for recycling. As a small market, Ireland has quite limited infrastructure in terms of reprocessing as a lot of this depends on the presence of packaging material manufacturers that use recycled content in their products. Therefore most of our recycled material must be shipped to other markets in order to recycle it.

Although this might seem like a barrier to creating a circular economy in Ireland there is still a lot of the material that remains in Europe and can find its way back to our shelves here in Ireland when sold back to manufacturers in packaging.

A key aim of the EU's Circular Economy Package is to acheive a four fold increase in recycling infrastructure across Europe by 2025.

4. SORTING: GLASS

In Ireland we have good glass recycling infrastructure and our glass recycling rate is one of the highest in Europe.

For mostly health and safety, cost and technology reasons, glass is not accepted in household recycling collections in Ireland and must be brought to one of the 1,900 bottle banks or civic amenity (local authority recycling) sites funded by Repak's Members.

These bottles are therefore transported to a dedicated MRF designed to handle material from these bottle banks. Most of Ireland's glass is sorted for reprocessing by two facilities on the island of Ireland.

1. Glass is collected from Repak Member funded bottle banks throughout Ireland

2. Incoming glass is weighed at weighbridge

3. Material is deposited in the corresponding colour bay under visual inspection

4. Single colour stream is loaded to hopper and on to processing plant

5. Material is screened for size and passed under a magnet to remove steel items.

6. All heavy contamination e.g. plastic bags, cardboard, etc is removed by hand.

7. Roller/crusher breaks glass down to a uniform particle size

8. 2nd magnet is followed by Eddy current which captures aluminium

9. Suction system removes small paper and plastic pieces

10. Optical sorting systems remove non glass items such as ceramics, stone and porcelain and colour sort glass

11. The resulting glass cullet is QC checked and shipped to the glass bottle manufacturer

5. MATERIALS REPROCESSING: PAPER

INTRODUCTION

We might assume that paper is always easy to recycle. However as packaging has evolved over the years, many material combinations have been developed to facilitate the different functional requirements of packaging.

This is often achieved by combining paper with another material to form a multi-layer laminate. This provides properties such as moisture resistance or gas barriers to extend product life. These materials provide challenges for recycling and in many instances can increase the costs of reprocessing and of waste disposal.

High presence of contaminants and other unwanted materials from co-mingled systems such as from Irish household recycling collection can impede paper processing equipment and impact on the finished recycled paper product. Therefore in order to avoiding adding further to this challenge, the paper industry is anxious to minimise the amount of non-paper material originating from packaging design.

According to the UK's Confederation of Paper Industries around 3% of paper packaging is considered difficult to recycle and this includes beverage cups, beverage cartons and plastic laminated food packaging.

The highest acceptable quantity of non-paper components such as plastic and metals depends on the paper grade involved. This is set out in the EN643 standard.

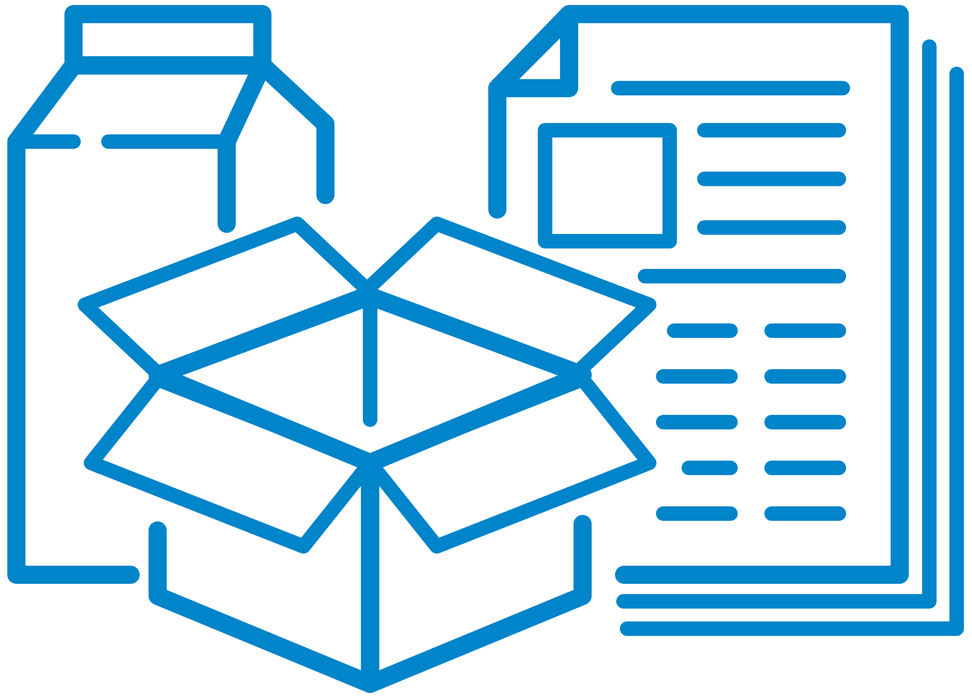
PAPER RECYCLING PROCESS

The vast majority of paper products are considered recyclable and in Ireland almost 80% of paper and board is collected and recycled. Ireland will need to recycle 85% of paper packaging placed on the Irish market by 2030 as part of the Circular Economy Package.

Paper makes up over 40% of packaging waste placed on the Irish market and 61% of material in Ireland's household recycling bins. With the pressure to do more on plastics it is important that we continue our work to increase paper recycling rates to meet the new Circular Economy Package targets.

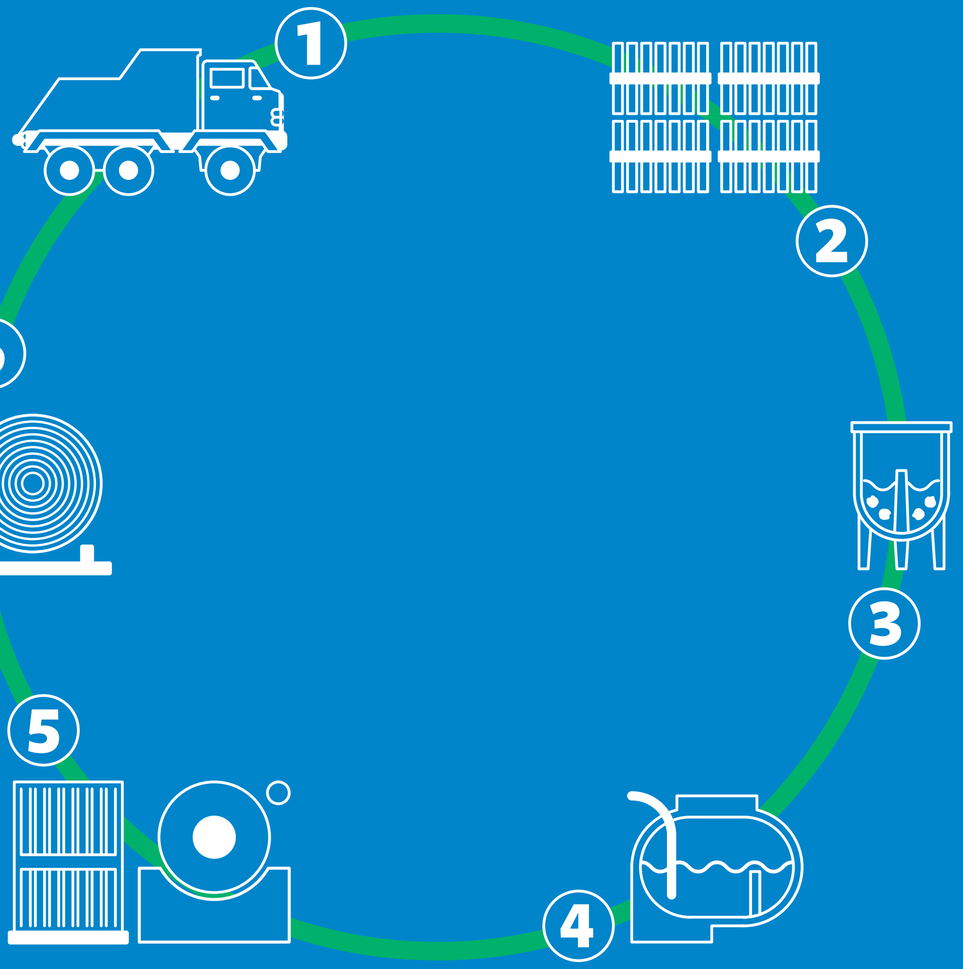
Paper is sent to Paper Mills to be recycled. There are currently no paper mills in the Republic of Ireland and only very limited capacity in Northern Ireland.

Paper must therefore be sent to various markets such as the UK, Europe, India and China.



RECYCLED PAPER LIFECYCLE

Collection
Paper is collected from homes, offices/factories and Civic Amenity Sites and taken to a Materials Recycling Facility (MRF).



Sorting and Baling
The paper is sorted and graded according to type. It is then compressed and baled.

Pulping and Screening
The paper is mixed with water in a large vat, making a mushy mixture called pulp. The pulp is then screened to remove any contaminants.

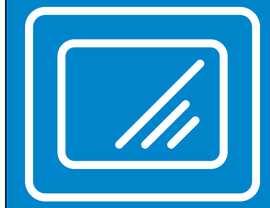
Removal of Ink
Air is passed through the pulp, which produces foam, removing at least half the ink. Chemicals can also be used to separate the ink from the paper and is then washed away.

Drying
The pulp is then poured on to a wire screen, to drain and form a sheet. This is then passed under heavy rollers to squeeze out more water, heated rollers to dry and iron rollers to straighten the paper.

New Paper
The paper is rolled into one giant roll, up to 9 metres wide, which can weigh as much as 20 tonnes and then cut into smaller rolls.

Adapted from https://www.suez.com.au/en-au/sustainability-tips/learn-about-waste-streams/general-waste-streams/paper-and-cardboard-recycling

PAPER DESIGN CONSIDERATIONS 6/7

MATERIAL	ISSUE	WHAT TO DO
PLASTIC 	Plastic is a contaminant that must be removed during pulping and polymers that have a density similar to water (0.95 - 1.15g/cm3) are impossible to separate in paper mills.	Avoid paper packaging with more than 5% plastic but ideally no more than 3%. Avoid PVC. If you must laminate do so on one side only if possible and avoid two sided laminates, they are generally not accepted in standard paper mills. Plastic windows - If required allow them to be peelable/removable where possible, use water based adhesive and inform the consumer to remove it. Avoid oxo-degradable materials - these will be banned under the EU's SUP Directive. Compostable or biodegradable plastics - no benefit to paper mills.
COATINGS BARRIERS AND VARNISHES	These can be hard to break down during pulping as they prevent moisture getting at the paper fibres.	Avoid cured Ultra Violet (UV) Varnishes, UV Inks and metallised films. Use water soluble coatings such as starch.
WATER RESISTANT PAPER	Wax papers can be problematic in the pulping process and can contaminate finished product or be removed as waste.	Avoid wax coated, siliconised and greaseproof papers. Products treated with starch to make them resist moisture are more compatible with the pulping process.
FOOD CONTAMINATION	Food contaminated packaging is problematic and can lead to exported material being rejected.	Avoid hot melt and pressure sensitive adhesives that are not soluble in water. They soften in the pulper and can stick to paper. Use cold set, curable or water soluble adhesives that do not plasticise (soften) at above 35°C.
ADHESIVES	Adhesives from tape, labels and binding can stick to equipment and cause holes in finished paper.	It is best to use cold set, curable or water soluble adhesives that do not plasticise (soften) at above 35°C. Avoid hot melt glues that are not fully water soluble.
METALLIC	Foil in paper can be difficult to separate and the particles can clog equipment. Glitters and metallic shapes used in gift wrap can make it non-recyclable.	Limit foil blocking to under 30% of the external surface of the pack. For foil laminates follow the guidance for plastic above. Keep the paper content to a maximum. If glitter is used then mark the paper non-recyclable.
OTHER FIBRE BASED MATERIALS	Materials such as palm leaf, bagasse and other plant fibres are usually designed to be compostable rather than recyclable, with most mills designed to process paper derived from trees.	Ensure that the item is compatible with recycling and is repulp certified. If packaging materials are certified EN13432 and verified as suitable for Irish composting conditions then consumers should be instructed to compost them in food waste bins rather than recycling them.

PAPER RECYCLING – FAQS

WHAT IS RECYCLED FROM THE PROCESS?

The target material in a paper mill is the paper fibre which is converted to sheets and sold in reel form. This is then used by convertors to create a finished recycled paper or cardboard product.

WHAT ABOUT CONTAMINANTS?

In a paper making process any non-paper component such as plastic or metals can become a waste in the process or can impede or interfere with the process itself.

If removable it will be dealt with either through waste to energy or may need to be landfilled.

WHAT ABOUT COMPOSTABLE OR BIODEGRADABLE MATERIALS?

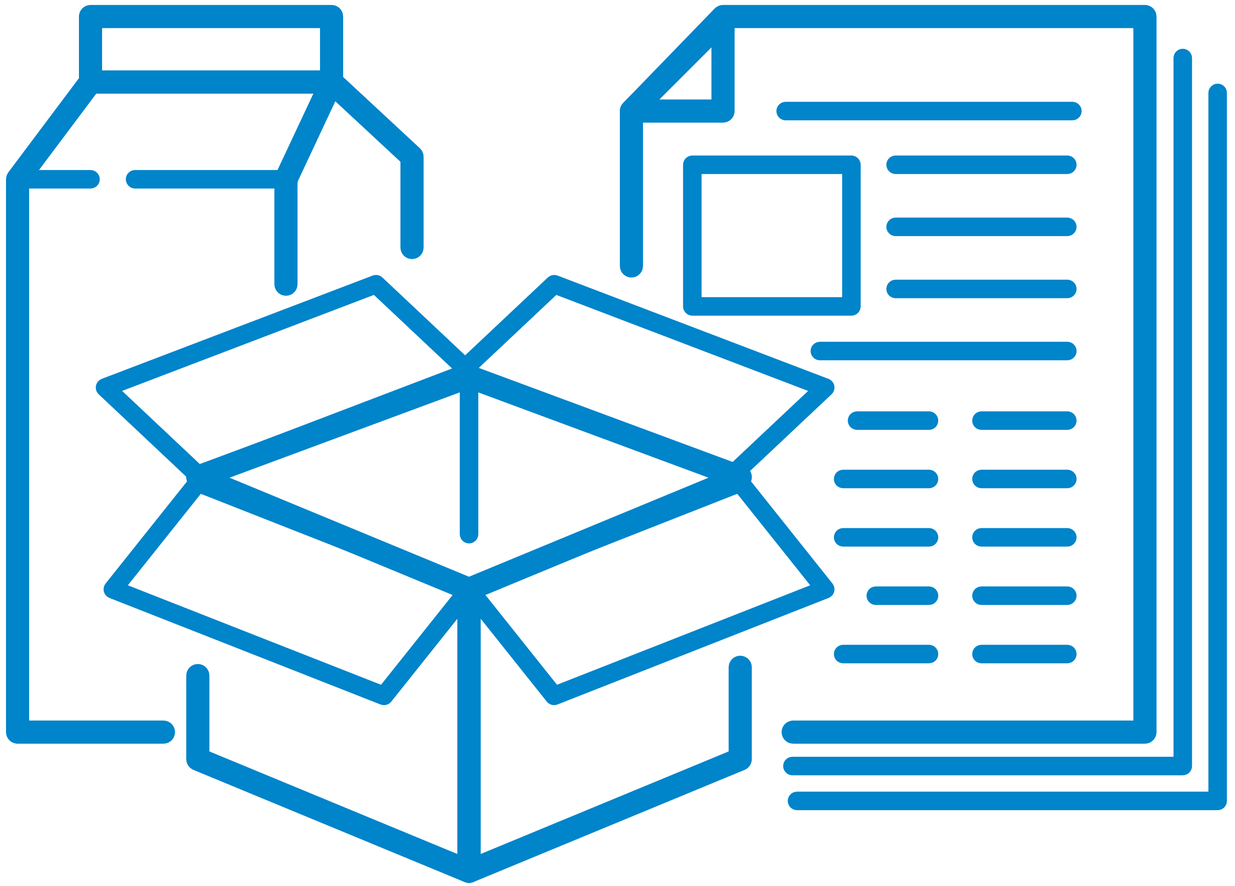
The paper industry are interested in paper resulting from tree sources. Therefore compostable packaging made from other plant sources is not for recycling and is viewed as a contaminant.

Most compostable packaging is suitable for industrial composting. To be classified as industrially compostable, packaging should meet EN13432 standards and ideally be tested to Irish conditions.

For more information on composting in Ireland visit www.cre.ie.

Biodegradable is a vague term from the perspective of waste management. Currently there is no timeframe, process or waste management option specified in most cases.

If you want your customer to dispose of your packaging correctly, it is best to specify which waste management option they should use to do so and avoid using the term biodegradable.



6. MATERIALS REPROCESSING: METAL

METALS RECYCLING PROCESS

Incoming Bales → Bale Dismantled → Shredding → Decoration Removal → Furnace → Casting & Ingot Formation → Inspection & Packing → Hot & Cold Rolling

INTRODUCTION

A number of estimates suggest that up to 80% of the metal ever extracted from the earth is still in use today, making metals a significant success story when it comes to recycling.

Both aluminium and steel go through similar recycling processes although the process parameters will differ due to the different materials.

On arrival at a steel or aluminium recycler, bales of cans are dismantled and the cans are shredded into smaller pieces. Once decorations have been removed the material is then fed into a furnace.

Once molten, the metal is then cast into large pits and cooled to form ingots. These ingots are then preheated and hot rolled. Depending on the thickness required by the customer, these sheets are then cold rolled to the required specification.

METAL DESIGN CONSIDERATIONS 8/9

CONTENTS

MATERIAL	ISSUES	GUIDELINES
LACQUERS & COATINGS	Coatings and lacquers are thin layers of substances, such as polymers or metals, used to cover the outside (coating) or inside (lacquer) of a steel or aluminium package. These are used to protect metals from scuffing or corrosion or to prevent the package contents from coming into direct contact with the metal. Due to the high temperatures in a furnace, polymer based coatings will be vapourised and are not a concern to the aluminium or steel industries.	N/A
PLASTICS	The inclusion of rigid plastics such as widgets in cans, aerosol or pump spray valves and resealable can ends can be problematic in aluminium recycling. Rigid plastics can cause hot spots in the aluminium, causing it to over-oxidise and reduce its quality. Due to the very high temperatures involved in steel reprocessing (~1650°C) it is more forgiving of non-steel contaminants. Flexible plastic sleeves can cause wear and tear on aluminium shredding equipment.	Omit rigid plastics from aluminium packaging designs where feasible. If they must be included make it easy for the consumer to remove and recycle rigid plastic components separately. Direct labelling is best practice for aluminium packaging decoration.
COMPOSITES CONTAINING ALUMINIUM	Examples of aluminium containing composite packages include beverage cartons. Other examples include metallised films and papers, tablet blister packs and foil laminate induction seals for closures.	Beverage cartons are collected in a MRF and will form part of a paper recycling stream in Ireland. If metallised packaging is not a requirement it may be best to avoid it. Aluminium layers are too thin in this type of packaging to be recoverable and are usually vapourised in the furnace.
BI METAL BEVERAGE CANS	Although most beverage cans are aluminium, some bottlers use steel beverage cans which must be sealed using an aluminium can end. This should end up in steel recycling as overhead magnets are generally first in the process however it can sometimes end up being sorted with aluminium and is problematic for the shredding process at aluminium recycling facilities. Plastic cans consist of a plastic body and a metal can end. These could be problematic as a mostly rigid plastic however it is unlikely that an eddy current separator would positively sort this to the aluminium container stream.	Most beverage cans found in Ireland are aluminium only and this single material package is optimal for recycling. It is best to stick with a plastic bottle or aluminium can/bottle. This type of mixed material package will not be recycled.

METAL RECYCLING – FAQS

WHAT CONTAINERS ARE RECYCLED FROM THE PROCESS?

Aluminium cans are baled and sent for smelting in the UK.

Steel cans and other suitable containers are baled and sent to steel mills in the UK.

WHAT ABOUT CLOSURES AND LABELS?

If present on a metal container and are the same material, closures will be recycled along with that container.

Metal closures that are separated from a package may end up in fines (small material that falls through the 2D/3D separators).

Any labels or adhesives present on metal containers will be vapourised during the metal recycling process due to the high furnace temperatures.

WHAT ABOUT CONTAMINANTS?

Packaging design tends to have more of an influence on aluminium than steel recycling.

A comprehensive guide to the factors influencing aluminium recycling can be found on the KIDV (Netherlands Institute of Sustainable Packaging) website[9].

HOW MUCH OF IRELAND'S METALS ARE RECYCLED?

Metal recycling rates are currently at over 70%.

7. MATERIALS REPROCESSING: PLASTIC

CONTENTS

INTRODUCTION

The Repak Members Plastic Pledge[10] aims to reduce the complexity of packaging in Ireland to help meet the plastic packaging recycling targets of 50% by 2025 and 55% 2030.

Plastic is sent to a number of plastic reprocessors in Ireland, UK and Europe for recycling. A small quantity of high grade flexible plastics are sent to non-EU countries.

Rigid plastic packaging items such as PET bottles are made back in to flake or sheets. In Ireland these are most commonly made back into polyester fibres for clothing and PET trays for fresh produce or meat products.

Unlike other packaging material types, plastic tends to be far more complicated to collect and recycle than the other materials. The term plastic does not refer to a single material and its regular use, with often perishable and high risk foods, makes it more prone to contamination than most other materials.

Plastics have hardly any differentiating physical properties and are identified through subtle differences in density. This raises the cost of identification versus other materials.

When it comes to plastic packaging we normally refer to resin identification codes numbered from 1 to 6 which represent the main polymers used (1-PET, 2-HDPE, 3-PVC, 4-LDPE, 5-PP, 6-PS) and also 7-Other which can refer to any other polymer type or combination of polymers.

A challenge often noted by plastic packaging recyclers is that different polymers are used within the same pack. In an ideal world this would not to be the case, however this desire unfortunately ignores the different properties of plastics and the need to fulfil different packaging functions.

For example it is necessary to make a plastic bottle for a carbonated drink from PET to provide enough barrier to gas to retain CO2 over the shelf life of the product, but a cap made from PET cannot provide a sufficient seal. Either HDPE or PP are therefore required to produce a cap.

In general with containers made from HDPE and PP there is more scope to achieve a single polymer package and this is therefore best practice.

PLASTIC REPROCESSING

During plastics recycling, contaminants and non-target plastics are separated out from the desired plastic material by utilising their different densities in water.
Water has a density of 1g/cm^3, therefore in order to separate plastics from each other you are dependent on the ability of some of those plastics to float in water and some to sink.

Therefore if you have two different plastic packaging components in one package with a similar density, one of which is your desired material, then the other material, if from a different polymer family, can mix with the desired material and cause impurities in the final product. Therefore designing plastic packaging for recycling requires an understanding of what polymers, when combined, increase contamination of the recycled plastic end product.

For Example a company currently uses the following material combinations in their pack:

Packaging Component	Material	Density (g/cm^3)	Sink/ Float	Contamination Risk
Bottle	PET	1.39	Sink	-
Closure	HDPE/PP	0.95/0.92	Float	Low
Non-return valve in closure	Silicone	1.1	Sink	High
Sleeve	PVC	1.3	Sink	High

Contamination of the PET flake/sheet with PVC and silicone inserts is possible in this scenario and can impact on the quality of the product.

7. MATERIALS REPROCESSING: PLASTIC

HOW WOULD YOU REDESIGN THIS?

To effectively separate the materials, the best option here is to eliminate the two components that will sink and contaminate the PET (PVC sleeve and silicone valve).

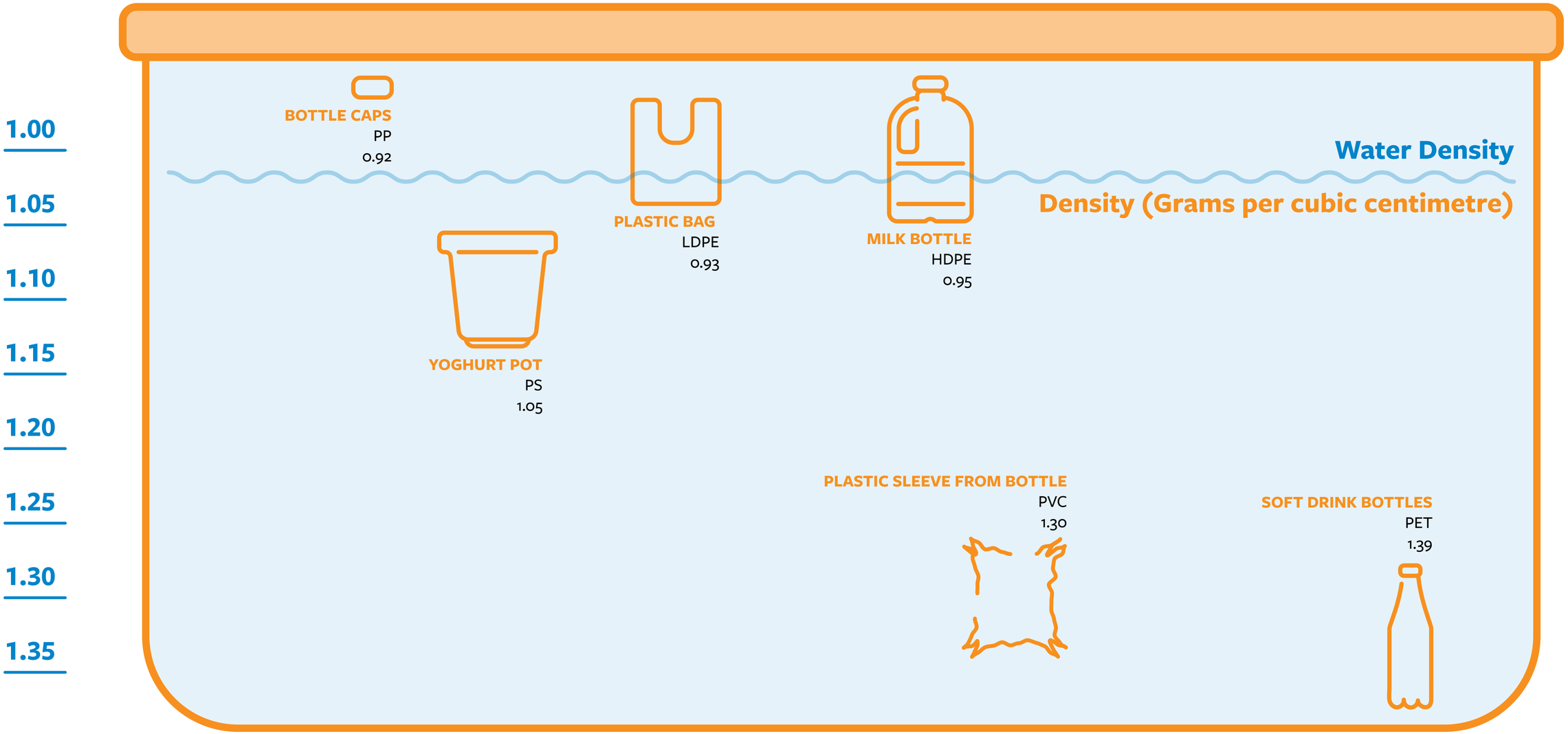
By redesigning this plastic packaging as follows you increase its recyclability:

Packaging Component	Material	Density (g/cm^3)	Sink/Float	Contamination Risk
Bottle	PET	1.38	Sink	-
Closure	HDPE/ PP	0.95 / 0.92	Float	Low
Non-return valve in closure	-	-	-	-
Sleeve	LDPE	0.93	Float	Low

Pots, tubs and trays (PTT) come in various forms including those with hinged rigid lids, separate rigid lids, heat sealed flexible lids, flow wraps and cling wrapping.

- Of those, the hinged lids are most likely to be made from the same material as the PTT.
- The separate rigid lids and heat sealed flexible lids have a good chance of staying with the PTT when discarded by the consumer. These should ideally be the same material as the tray. Where it is not possible to use the same material or a compatible material, it is best to provide instructions to the customer to separate the tray and lid.
- The flexible flow wrap and cling wrapping are least likely to contaminate the tray as they are most likely to be discarded separately.

WHICH PLASTICS FLOAT AND WHICH SINK IN WATER



PLASTIC DESIGN CONSIDERATIONS – RIGID 11/12/13

	ISSUE	WHAT TO DO
MATERIAL	PVC and PS, although recyclable, have limited value on recycling markets.	Use PET, HDPE and PP where possible as these materials provide the greatest opportunities for plastic packaging recycling. PET and HDPE are the preferred plastic bottle materials. PET is the preferred plastic tray material for consumer foods.
COLOURS	Clear/Light Blue PET bottles have the highest value. Coloured PET bottles have a lower value on recycling markets. Natural HDPE bottles have the highest value and are best used in food applications. For non-food applications it is better to use white or coloured HDPE. Use NIR detectable colours for all plastic bottles or trays of any plastic polymer type.	Avoid opaque and non-standard colours for PET bottles. Avoid white HDPE in food or dairy applications as it contaminates natural HDPE. Avoid non-detectable carbon black containing masterbatches for all types of plastic bottles or trays. Always ask your supplier to confirm that the masterbatch is carbon free.
BARRIERS	Use monolayer PET bottles where possible. If coating use SiOx, AiOx or COx.	Avoid Polyamide (PA) multilayers, tie layers, monolayer PA blends or Ethylene-Vinyl Alcohol (EVOH) in PET bottles. If required keep EVOH <3% mass and PA <5% mass for PET bottles. If multilayer is needed for PET trays use delaminating PET/PE. Barrier systems currently used for HDPE and PP rigid packaging are considered detrimental to recycling.
LABEL/ SLEEVE	For PE or PP bottles/trays, it is best to match the label and container material type. For PET containers it is best to use a PE or PP label/sleeve (density <1g/cm^3). If using sleeves also use PE or PP sleeves.	Avoid paper labels and metallised labels. Avoid sleeves/labels covering more than 50% of the surface area. Avoid PVC labels/sleeves or any other material with density >1g/cm3 (particularly for PET). Avoid toxic/hazardous/metallic inks in labels.
CLOSURES	For HDPE and PP containers it is best to match the material type. For PET containers it is best to use a PE or PP closure (density <1g/cm^3). Metal closures can impede plastic shredding equipment. For PET tray lidding films it is best to ensure ease of removal and density <1g/cm^3.	Avoid liners/inserts/valves with a density >1 when used on PET Bottles. Avoid liners/inserts/valves with a density <1 when used on HDPE or PP Bottles. Avoid metallic parts or metal closures on plastic bottles. Avoid lidding films that are hard to remove and have a density >1g/cm^3.
ADHESIVES	Where adhesive use can be avoided this is the optimum scenario for recycling plastics. If not possible then adhesives that are water or alkaline soluble at 60 - 80°C are preferred.	Avoid adhesives that are not soluble in water or alkaline at 60 - 80°C.

PLASTIC DESIGN CONSIDERATIONS – FLEXIBLE [14]

MATERIAL	ISSUE	WHAT TO DO
PE OR PP FILM Industrial films, Plastic Bags, Numerous Primary Packaging applications - both food and non-food.	Most film for recycling is currently collected from Irish businesses (e.g. pallet wrap) and is produced from LDPE. Sorting technology is not optimised for the collection and recycling of household films and at the time of publication they are not accepted in household recycling bin collections in Ireland.	Developments in this area mean that maximising the recyclability of films is advised. It should be noted that some further design for recyclability guidelines resulting from the project are pending release at the time of publication.
NON PE LAYERS	PVC and PVDC layers will render PE films non-recyclable. Metallised layers may require testing however current guidance would suggest they are placed in general waste.	Due to the difference in melting point, PVC and PVDC layers in PE films can make recycled PE unusable and should be avoided. Don't include metallised layers unless essential to product shelf life. Metallised films may be rejected by metal detectors and discarded. If they do get through into extruders they can cause downtime.
ADDITIVES	High additive concentrations can cause materials to sink rather than float in the recycling process. Recycling of film is intended to make new products. Therefore any film that contains degradable additives (photo, oxo, bio) that are designed to degrade film under certain conditions can seriously impact on the final recycled film quality.	Additive usage should be minimized to maintain the best performance of recycled PE or PP for future uses and should not cause the density to exceed 1.0g/cm^3. Oxo-degradable packaging is subject to a ban under the EU Single Use Plastics Directive and should be avoided. Be clear about the waste management stream you are aiming for. 1. Recyclable: e.g. standard PE packaging or PE manufactured from renewable sources. 2. Compostable: Fully certified compostable film ideally tested in Irish conditions.
COLOURS	Dark Colours can be detrimental to recycling.	Darker colours should be avoided where possible. Non-pigmented films or lighter colours are preferred.
LABELLING	Paper Labels can be detrimental as the fibres can remain on recycled film.	Direct printing is usually preferred for films. Where labels are required it is best to use PE or PP to ensure a single polymer solution.
PVC OR OTHER NON PE/PP FILM Cling films - fresh produce, meat	There are limited recycling streams available for post-consumer PVC flexible packaging.	It is best to use PE or PP film to provide a possible opportunity for flexible plastic packaging recycling. If you have a lot of flexible PVC discarded at your business premises it is best to consult with your waste contractor.

PLASTIC - FAQ

CONTENTS

What containers are recycled from the process?

Plastic bottles, pots, tubs and trays can be recycled into either new plastic bottles or or new PTT. Polyester fibres can also be produced from PET.

Some plastics such as PP are more likely to go to non-food applications such as piping, due to current food contact regulations.

What about closures and labels?

PE and PP caps are possible to capture for recycling.

It is not possible to capture paper labels in a plastic recycling process and these are a waste from the process.

Although plastic label recycling opportunities also tend to be limited, using a plastic label material such as PE or PP on a plastic bottle increases its opportunity to be recycled.

Should consumers remove caps and labels from bottles?

It is not necessary to remove labels and in some cases it is often very difficult to do this.

Although it is best to avoid sleeves that cover more than 50% of the package. If this is viewed as necessary, it is best to provide the consumer with a means and instruction to remove it (such as a perforation).

Plastic caps do not need to be removed by consumers however it is best that metal closures are completely removed as metals can damage reprocessing equipment.

What about contaminants?

Non plastic components are considered a waste from the process.

PVC also interferes with the recycling of other plastics and is best avoided particularly where your main plastic is PET.

I must use black plastic for my premium brand/meat product range - what should I do?

Ask your packaging supplier about their NIR detectable range. This helps to resolve the problems experienced in the MRF Process.

What about other colours?

The main issue with colour is that it can limit applications and mean that the packaging can only be used again in coloured or black recycled plastics. It is important to note that some darker shades can contain carbon black and it is best to check in advance with your packaging supplier or waste contractor to ensure that it can be recycled.

8. MATERIALS REPROCESSING: GLASS

CONTENTS

Cullet Inspection → Batch Preparation → Melt & Condition → Form → Anneal → Surface Coating → Inspection & Packing → Storage & Dispatch

INTRODUCTION

Although there are no glass bottle manufacturers in Ireland anymore since the closure of the Irish Glass Bottle plant in 2002. Most of Ireland's glass is turned back into bottles on the Island of Ireland at Encirc's glass packaging manufacturing plant in Derrylin, Co. Fermanagh with the balance going to other plants in the UK and Europe (closed loop recycling). Most of the remaining material can be used as aggregate (open loop recycling).

GLASS RECYCLING PROCESS

On arrival at the glass bottle plant, sorted glass is inspected before batch preparation to ensure that contamination has been effectively removed.

Batches consist of sand, limestone, soda ash and cullet. Some glass can have up to 85% cullet depending on the properties required[15].

The majority of glass packaging is considered recyclable however there are some challenges associated with package design which are explained in more detail in the design considerations table below.

GLASS DESIGN CONSIDERATIONS [16]

MATERIAL	ISSUES	WHAT TO DO
CLOSURE MATERIALS	**Swing Top closures including ceramics** Any glass packaging which contains ceramic components will add to the contamination found in bottle banks. This is mainly due to household crockery but can also come from ceramic closures on swing top bottles. Ceramics have a different melting point to glass and can impact on glass quality. Tolerance for ceramics in glass can be as low as 2ppm. **Sprayers, Collars and Inserts** Any type of spray mechanism, collar or insert if firmly attached, may remain attached when the glass is broken. The attached portion of glass may therefore be lost.	Use alternative closure materials such as glass, rubber stoppers, cork and metal crown corks which do not cause recycling issues. These should separate from the glass easily when the bottle/jar is broken so that they pose no problem for recycling.
LABEL MATERIALS	**Strong adhesives** This is particularly problematic where plastic labels are used on glass bottles. As glass is broken during the process of sorting, if plastic labels remain with the glass due to the strength of the adhesive, NIR detectors will also reject the glass still stuck to the label. This reduces the amount of glass captured for recycling from the bottle. **Other decorations** Other decorations such as badges or medals that are not easily removed will potentially cause a portion of the glass container to be lost.	Use water based adhesives and check with your glass recycler when specifying label adhesives to ensure that recyclability is not impacted. These should be avoided or kept as small as possible.
BOTTLE COLOURS	**Non-standard colours** Green, amber and clear bottles are the most common colours on the market. Other colours create confusion and risk increasing the mix of colours in collection. **Non-transparent black glass/Painted glass** Detectors at glass sorting plants detect non glass components such as stones and other contaminants on the basis that light does not pass through them. If glass is not transparent due to painting then it will be rejected.	Remain in the standard colours where feasible to do so for the brand involved. Note: Green glass currently incorporates the most cullet (recycled content) making it the least carbon intensive glass packaging to produce. If your bottle is so dark that it is impossible to see through then this may be an issue during recycling. It is worth checking this with your glass bottle recycler.

GLASS - FAQ

WHAT CONTAINERS ARE RECYCLED FROM THE PROCESS?

Glass bottles and jars are recycled into either new glass bottles or are further processed by Glassco and used in applications such as water filtration, shot blasting and for creating equestrian tracks.

Aluminium cans from can banks are baled and sent for smelting in the UK.

Steel cans are baled and sent to steel mills in the UK.

WHAT ABOUT CLOSURES AND LABELS?

Aluminium caps and crowns are sent to a plant in the UK.
It is currently not possible to capture corks from wine bottles and plastic closures in a recyclable condition and these are a waste in the process.

It is not possible to capture labels in a recyclable condition at present and these are a waste in the process.

WHAT ABOUT CONTAMINANTS?

Plastic bottles can be picked by hand and sent to plastic recyclers for further processing.

Other contaminants such as ceramics and plastic bags or films are considered a waste from the process.

HOW MUCH OF IRELAND'S GLASS IS RECYCLED?

The bottle bank system funded by Repak Members has been a huge success with glass recycling rates currently at over 80%.

9. PACKAGING DESIGN AND RECYCLING LABELLING

IS THERE AN ON PACK LABELLING SYSTEM FOR IRELAND?

A labelling system has been developed for Ireland by the mywaste.ie team that developed Ireland's national household recycling list. For more information on this labelling please visit www.mywaste.ie.

CAN I USE ICONS CLAIMING THAT MY PACKAGING IS "WIDELY RECYCLED"?

If the packaging conforms to the mywaste.ie recycling list and is accepted in Irish household recycling bins it may be possible to label it in this manner using the mywaste.ie labelling system.

It is important to note that the use of certain icons can be proprietary such as those used as part of the UK's On Pack Recycling Label (OPRL). OPRL require you to be a member of the scheme and use of the icons is proprietary.

If you plan to use this system you will need to join the OPRL.

IS THE OPRL OK TO USE FOR PRODUCTS SOLD IN THE REPUBLIC OF IRELAND?

The OPRL system relates to collection and recycling in the UK and even though recycling advice aligns in a lot of cases, it is not designed for the Irish market. If you are in any doubt about what is accepted in Irish household recycling collections it is worth cross checking with the up to date advice on www.mywaste.ie.

CAN I CHANGE THE OPRL LABELLING SO THAT IT SUITS IRELAND?

No - the labelling system and its guidelines are operated by the OPRL. You must adhere to their guidelines to ensure that the message remains consistent. Please direct queries in relation to the OPRL to enquiries@oprl.org.uk.

HOW DO I COMMUNICATE THAT MY PACKAGING IS COMPOSTABLE?

Most compostable packaging on the market is industrially compostable and therefore only suitable to be placed in a household brown bin provided by your waste contractor. This means that it is not suitable for composting in a householders back garden.

All compostable packaging should meet EN13432 standard specifically for the packaging item and ideally be tested to verify its suitability for Irish conditions. For more information on how to accurately label compostable packaging, please contact the Composting Association of Ireland (Cré) at www.cre.ie.

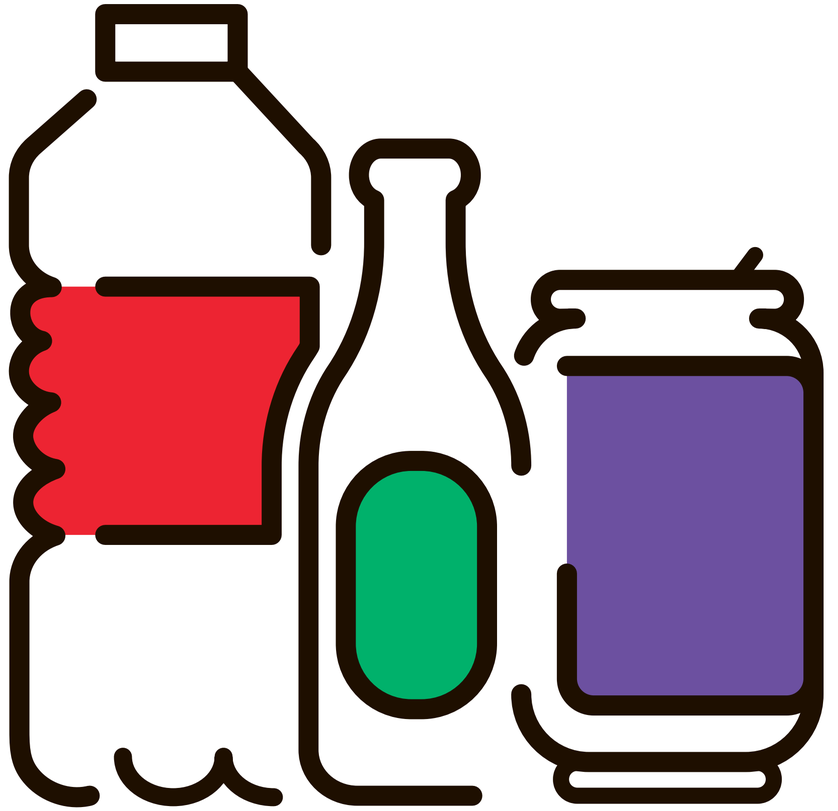
WHAT DOES THE GREEN DOT MEAN?

The Green Dot symbol signifies that the producer pays into a packaging producer responsibility scheme and that the business therefore contributes towards the funding of packaging recycling.

It is important to note that it does not relate to the recyclability of that packaging. As a Repak Member you are entitled to use the green dot on your packaging sold in Ireland.

For more information on the green dot please visit https://repak.ie/for-business/members/current-repak-members/the-green-dot/. If you wish to use the green dot on packaging for exports you must register with the appropriate producer responsibility scheme in that country.

Please visit https://www.pro-e.org/proe-members to find the green dot licence holder in your destination country.



10. ACRONYMS & REFERENCES

CONTENTS

ACRONYMS

2D	Two Dimensional (Flat)
3D	Three Dimensional (Rigid/Container)
CEP	Circular Economy Package
CO2	Carbon Dioxide
ECS	Eddy Current System
EPA	Environmental Protection Agency
EPR	Extended Producer Responsibility
EU	European Union
EVOH	Ethylene-Vinyl Alcohol
HDPE	High Density Polyethylene
LDPE	Low Density Polyethylene
MRF	Material Recovery Facility
NIR	Near Infrared
OCC	Old Corrugated Cardboard
PET	Polyethylene Terephthalate
PS	Polystyrene
PTT	Pots, Tubs And Trays
PP	Polypropylene
PVC	Polyvinyl Chloride
QC	Quality Control
SUP	Single Use Plastic
UK	United Kingdom
UV	Ultra Violet

REFERENCES

1. Circular Gap Report 2020, Circle Economy

2. Transition to a more circular economy, Department of Communications, Climate Action & Environment

3. Sustainable Products in a Circular Economy - Towards an EU Product Policy Framework contributing to the Circular Economy

4. Reuse (Rethinking Packaging), Ellen McArthur Foundation

5. What is in our bins? EPA Municipal Waste Characterisation Study 2018

6. Design for the Future – Paper and Board Packaging Recyclability Guidelines

7. Paper and Card Packaging: Design Tips for Recycling: WRAP and Confederation of Paper Industries

8. Design for Recovery Guidelines: Aluminium Packaging

9. Design for Recovery Guidelines: Steel Packaging

10. Ireland's Pledge on Plastic Packaging Waste

11. Defining what's recyclable and best in class polymer choices for packaging

12. EBPB Design Guidelines

13. Suez Circpack - Design for Recycling Guidelines

14. Association of Plastic Recyclers LDPE, LLDPE, HDPE Film

15. Recycled Content – Packaging, British Glass

16. Maximising the Recyclability of Glass Packaging, British Glass

Repak is a not-for-profit packaging recycling scheme funded by contributions from over 3,000 participating Member companies. Since 1997, Irish businesses have invested over €425 million through their Repak membership to support packaging recycling in Ireland. Working with our Members, Repak has helped to grow packaging recycling and recovery from under 15% in 1997 to an estimated 93% in 2018.

Repak funds the recovery and recycling of packaging waste collected by Repak-approved 'Registered Recovery Operators', who are waste management companies and Local Authorities that provide waste management services to the commercial and domestic sectors.

Increasing packaging recycling rates through supporting our Members is a key part of Repak's Prevent & Save Programme and Plastic Packaging Recycling Strategy 2018 - 2030 and we hope you find this guide useful for packaging design choices.

If you need any more information please do not hesitate to contact Brian or Colm on Repak's Packaging Technology Team.

REPAK

Business *funding* recycling

Repak,
Red Cow Interchange Estate,
1 Ballymount Road,
Clondalkin,
Dublin 22,
D22 HW67,
Ireland

T. +353 (0)1 467 0190
F. +353 (0)1 403 0929
E. info@repak.ie
www.repak.ie