Design Smart Material Guide

No.4

Australian Packaging Covenant

Flexible Plastic Packaging

Australian Packaging Covenant

Contents

Purpose of this Guide

This Design Smart Material Guide for flexible plastic packaging is the fourth in a series of ten guides published by the Australian Packaging Covenant (APC).

It considers flexible and semi-flexible plastic packaging (e.g. bags, film, pouches, tubes, etc.), typically for residential consumer use, and manufactured from fossil hydrocarbon-based plastic polymers.

The purpose of this guide is to help you improve the environmental performance of your packaging system, without compromising on cost or functionality. It provides a 'checklist' of sustainability issues to keep in mind when designing and/or specifying your next flexible plastic based package. The guide will also support your packaging reviews against the Sustainable Packaging Guidelines (SPG), as required by the APC. To facilitate this, the design considerations are grouped under the four principles of the Guidelines.

The information contained in this guide is based on 'life cycle thinking', which considers the sustainability impacts of packaging throughout its supply chain, during use, and at end-of-life. It considers the impacts of the whole packaging system, including primary, secondary and tertiary packaging[1], as well as its performance in delivering the product to the consumer.

You are probably designing your packaging to fulfil a particular function, rather than an intrinsic need to use a flexible plastic as the primary packaging material. If this is the case, then we encourage you to read the first of the guides, which provides information on the comparative environmental and functional performance of the many different packaging material types that are available. Maybe there is another packaging format that will better fulfil your need to optimise cost, function, and environmental performance. Maybe now is the time to consider a bigger change?

[1]Primary packaging contains the sales unit product (e.g. 125 g confectionery pouch), secondary packaging contains the sales units (e.g. a corrugated board tray box, with shrink wrap holding 24 pouches), and tertiary packaging is the freight/distribution-related packaging (e.g. a pallet, with pallet wrap and a heavy duty corrugated board pallet 'slip').

Purpose of this Guide

The focus of this guide is 'flexible' plastic packaging, as distinct from 'rigid' plastic packaging (bottles, tubs, trays, etc., which are the focus of the third guide in this series). Why are we making this distinction? Because most households in Australia have access to a rigid plastics packaging recovery system, while similar services for domestic consumers of flexible plastic packaging are still in their infancy. The objective of designing flexible plastic packaging formats for recycling is therefore less critical than it is for rigid packaging.

Flexible plastics packaging has significant weight advantages that provide life cycle benefits in terms of raw material inputs and distribution efficiencies. These benefits need to be optimised, with attention paid to lightweighting and efficiency at every stage of the life cycle. It is also important to understand and promote the environmental benefits of flexible packaging to consumers, and ensure that they understand what to do with the packaging after use.

The Life Cycle of Flexible Plastic Packaging

Flexible packaging takes many different forms, and its use is increasing (see Table 1). This is largely due to the many cost and efficiency benefits that can be achieved in the supply chain. Significant environmental benefits can also be achieved by switching from a rigid to a flexible format, with savings of over 50% in material and energy consumption helping to drive this trend.

The polymers that are most commonly used for flexible packaging are low density polyethylene (LDPE) and linear low density polyethylene (LLDPE). According to the Plastics and Chemicals Industries Association (PACIA) around 223,000 tonnes of LDPE packaging were consumed in Australia in 2010-11 and 32% of this was recycled. Recycling programs for post-industrial films, particularly pallet wrap, are well established. Collection and recycling programs for post-consumer bags and films are still in their infancy.

Table 1

Applications of flexible and semi-flexible plastics packaging

Polymer	Examples of packaging formats/applications
Polyethylene terephthalate (PET) Biaxially-oriented polyethylene terephthalate (BoPET) Metallised polyester (PET)	Flexible beverage containers, carton windows, metallised foil pouches, metallised lids for yoghurt tubs, twist wrap for confectionery.
High density polyethylene (HDPE)	Lightweight supermarket shopping bags, cereal box liners, snack food bags.
Polyvinyl chloride (PVC)	Labels, cling wrap (mainly food service), blister packs, vacuum packaging for meat and pre-cooked meals, shrink sleeves (for distribution packaging).
Polyvinylidene chloride (PVDC)	Coating on films, e.g. PET and biaxially-oriented polypropylene (BOPP) to improve barrier properties.
Low density polyethylene (LDPE) Linear low density polyethylene (LLDPE)	Boutique retail shopping bags, pallet stretch and shrink film, shrink overwrap, produce bags, tubes, pouches, agricultural mulch and silage film, heat sealable coatings and films, cling wrap (domestic).
Polypropylene (PP) Biaxially-oriented polypropylene (BOPP) Metallised BOPP Cast PP (CPP)	Woven reusable shopping bags (e.g. 'green bags'), potato chip bags, layers in snack food packaging, wrapping films, labels.
Polystyrene (PS)	Labels, carton windows, biscuit trays.
Biopolymers	Shopping bags, rubbish bags, compostable green and food waste bags, confectionery wrap and bags, carton windows, biscuit and confectionery trays.

Plastic packaging in Australia is almost entirely made from hydrocarbons sourced from non-renewable sources (i.e. natural gas and crude oil). Most of the raw materials for polymers are by-products of petroleum refineries. For example, natural gas straight from the ground includes a mixture of gases including ethane, propane and butane. These are removed before the gas (mostly methane) is used in homes and industry for heating and cooking. Ethane and propane are used to make polyethylene and polypropylene respectively.

The Life Cycle of Flexible Plastic Packaging

Various additives are combined with the polymer to control the properties of the plastic. Additives in an LDPE film for example, are likely to include an antioxidant, slip agents and fillers.

The hydrocarbons for plastics can also be sourced from renewable sources, such as plant sugars. However the focus of this guide is on packaging manufactured from either mined hydrocarbons or recycled plastics. The ninth guide in this series considers packaging made from renewable sources; see the Degradable, Biodegradable and Compostable Plastic Packaging Guide for further information.

The most common types of plastic film are manufactured using an extrusion process. The plastic pellets are mixed with pigments and any other required additives, then melted in the extruder and forced through a die to produce a continuous tube of film. Air is then blown into the tube to stretch and increase the width of the film. Co-extrusion can be used to extrude more than one polymer into the die to produce a multi-layer film with additional properties, such as an enhanced oxygen or moisture barrier. Different coatings can also be applied during the manufacturing process.

What makes a packaging type 'recyclable'?

Understanding what makes any packaging type 'recyclable' helps to inform the packaging design process. For a packaging format to be recyclable there have to be systems in place for collection, sorting, and reprocessing, and markets available for the recovered recyclate. These systems are in place for most post-consumer rigid plastic packaging, but not (with some exceptions) for flexible plastic packaging.

However, even if a flexible plastic product is not recovered, it tends to generate less waste.

Rigid vs. flexible packaging – which is better?

Consider a flexible packaging format that is a quarter of the weight of the equivalent rigid format; lighter packaging generally means less resources have gone into producing and transporting the packaging. The recycling rate of the flexible packaging is 0%, and the rigid packaging is around 40%. In this situation, for every kilogram of rigid packaging sold into the market, 400 grams will be recycled and 600 grams will be disposed to landfill, compared with 250 grams of flexible packaging that will probably all be disposed to landfill. Assuming the age and location of the plant required to produce the two formats are similar, it is reasonable to suspect that the flexible format will have a lower environmental impact than the rigid format.

The Life Cycle of Flexible Plastic Packaging

Collection and sorting

Most domestic rigid plastic packaging in Australia is collected as part of a mixed (commingled) stream, consisting of plastics, glass, paper/cardboard, steel and aluminium. This commingled material is then sorted at a Materials Recovery Facility (MRF) into the different material streams.

However, most MRFs are not set up to sort flexible plastics, so the vast majority of councils ask residents to recycle rigid plastics (containers) only. This is because of the difficulties involved in sorting and processing films, and the lower value of the recovered materials compared to rigid plastics.

Many supermarkets have drop-off bins for plastic shopping bags, and a national program to collect mixed plastic films through supermarkets is being established. This system is less convenient for consumers than kerbside collection, but produces a cleaner and more uniform stream than mixed films from households. Trials are also underway to collect post-consumer films in kerbside bins, and to separate them from residual household waste at alternative waste facilities for reprocessing. The APC is providing funding support for both of these flexible plastics recovery trials.

Plastics reprocessing

There are a series of processes that could be used to convert a bale of recovered flexible plastic packaging into a usable raw material, which can then be used in the manufacture of new products. The actual processes used by a particular recycler will depend on the intended end market for the material and its value. For example:

- Mixed LDPE, HDPE and PP films can be processed into moulded products such as bollards and outdoor furniture
- LDPE films can be processed back into builder's film or garbage bags, creating a higher value market for recovered materials.

The Life Cycle of Flexible Plastic Packaging

Both of these markets require some sorting to remove contaminants, which may include (depending on the process and end market):

- **PVC and PVDC**
- **Polystyrene**
- **Metallised films**
- **Black or very dark films**
- **Biopolymers and degradable films**

Sorting is often done in a number of ways. Some preliminary sorting may be done by hand, followed by:

- Shredding of the plastics into large pieces (flakes); and
- A float-sink washing process to separate plastics with different densities (see Table 2); and/or
- A near infra-red (NIR) optical sorting process to separate films by polymer and colour

The outline of collection, sorting, and particularly, plastics reprocessing systems, provided here will help you to interpret and apply the specific design considerations discussed later in this guide in the context of your particular design requirements and constraints.

Table 2

Specific gravities of polymers

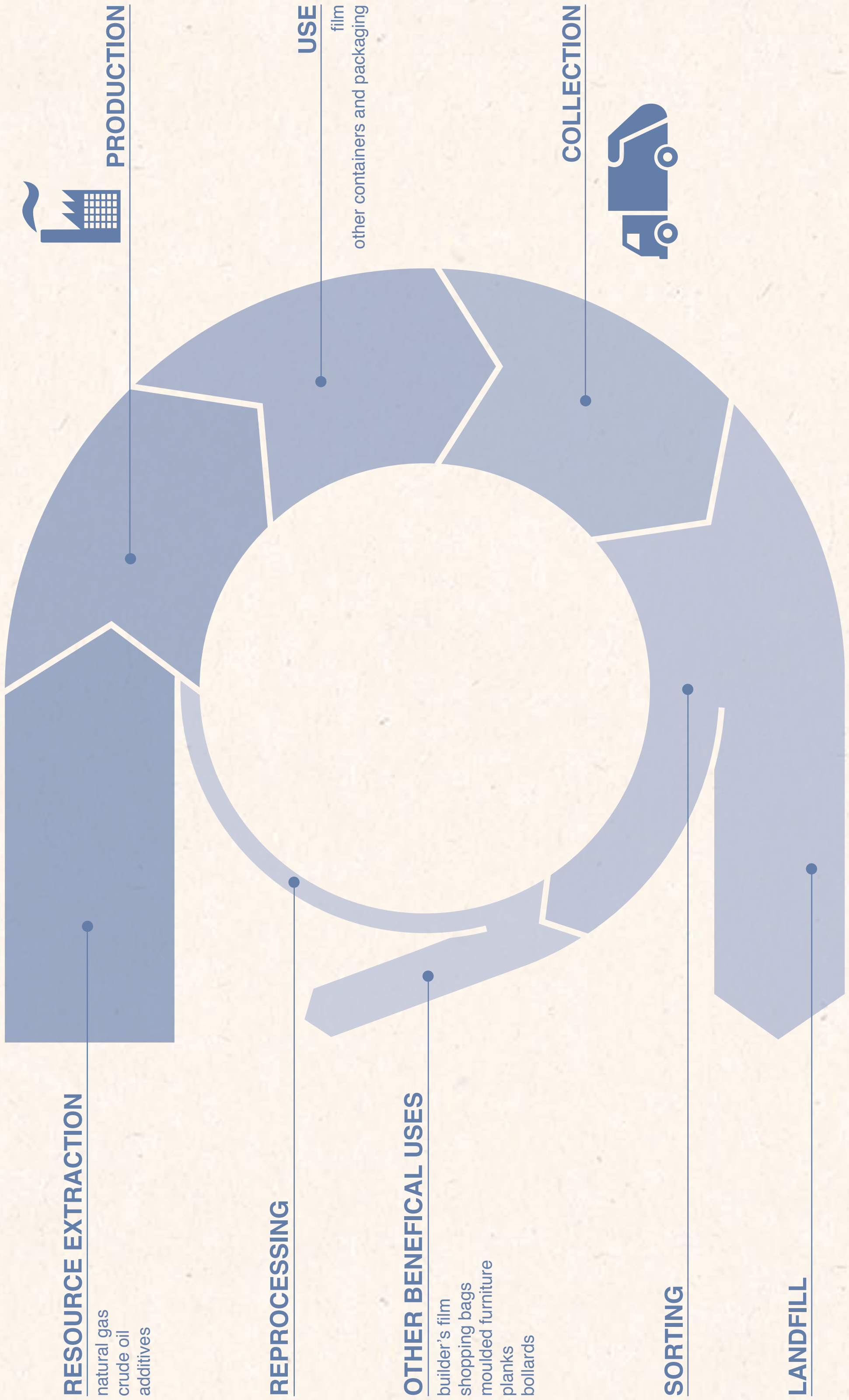
Polymer	Abbreviation	Specific Gravity
Polyethylene	PP	0.90
Poly (Ethylene-Co-Vinyl Acetate)	EVA	0.92
Low-Density Polyethylene	LDPE	0.92
High-Density Polyethylene	HDPE	0.96
Water	H_2O	1.00
Acrylonitrile Butadiene Styrene	ABS	1.05
Polystyrene	PS	1.06
Polyvinyl Chloride	PVC	1.35
Polyethylene Phthalate	PET	1.38

The Life Cycle of Flexible Plastic Packaging

Figure 1

Life cycle of flexible plastic packaging

Adapted from diagrams developed by GreenBlue (2009)



The Life Cycle of Flexible Plastic Packaging

In favour

Life Cycle Related Considerations in Favour of Flexible Plastic Packaging

- Plastic packaging has high strength-to-weight ratios, and can provide excellent packaging-to-product weight ratios.
- Plastic packaging manufacturing usually generates little solid or liquid waste.
- In general, life cycle studies comparing the use of flexible plastic containers with rigid plastic, fibre, glass or metal alternatives, have found that the flexible packs perform as well or better across most areas of environmental impact.
- Bags and pouches use a lot less material than rigid alternatives, resulting in significant energy and water savings in production (often up to 75%).
- Flexible plastic packaging is lightweight and saves energy in transport. Empty flexible packaging can be transported to fillers with excellent space efficiencies.
- Flexible plastic packaging is versatile and inexpensive and provides reasonable product protection.
- There is a low risk of food contamination from the packaging. However, the use of recycled plastic is avoided for some food contact applications out of caution.
- Plastic packaging, if disposed to landfill, will not decompose. This results in the continuing long-term sequestration (storage) of the fossil carbon in the plastic, rather than this being released to the atmosphere as a greenhouse gas.

Against

Life Cycle Related Considerations Against Flexible Plastic Packaging

- Plastic packaging is generally made from non-renewable gas and oil resources.
- The extraction of non-renewable hydrocarbons results in the direct emission of greenhouse gases, and is a significant source of risk for pollution of the local environment (e.g. from oil spills).
- Flexible plastic packaging is not collected by most kerbside collection systems in Australia.
- Plastics films and bags are generally more difficult to sort from commingled kerbside recycling streams at Materials Recovery Facilities (MRFs).
- Flexible plastic packaging is more challenging to recover because it often involves multiple polymer layers and/or a layer of aluminium, which are difficult to separate.
- Being lightweight and more likely to be influenced by wind, flexible plastic packaging has a higher tendency to become part of the litter stream, particularly when disposed of in public places.
- Most plastic packaging is not biodegradable, increasing the hazard that littered items can present to wildlife, and litter-related amenity issues (see the ninth guide on degradable plastic packaging for more detail on polymers that will degrade in specific environments).
- Virgin polymer production is energy- and chemicals-intensive.
- Flexible plastics containing recycled content are uncommon and difficult to source.
- If plastics reprocessing is undertaken, it can be water-intensive (due to the washing and float separation process step).

Design Considerations for Flexible Plastic Packaging

Packaging design should be guided by the resource efficiency design hierarchy[1].

The hierarchy of preferred packaging design changes is: avoid, minimise, reuse, recycle, recover (energy) and dispose.

The robustness of this general hierarchy is backed by a very significant body of evidence, based on packaging life cycle assessments (LCAs).

Embedded across the resource efficiency design hierarchy are the requirements to maintain or improve the packaging system functionality (fitness for purpose), and to minimise product losses. The environmental impacts associated with the packaged product are usually much greater than the packaging itself. Don't compromise functional performance (e.g. through down-gauging) to reduce the environmental impacts of the packaging, if it could lead to greater overall environmental impacts due to product loss and wastage.

More specifically, the key design aspects to keep in mind to minimise the environmental impacts of flexible plastic packaging are:

- Lightweight as much as possible to minimise material consumption.
- Minimise manufacturing inputs (e.g. energy and water).
- Use recycled content if possible.
- Specify inks that generate minimal volatile organic compound (VOC) emissions.
- Identify potential recovery and recycling options for your packaging and design for the effective recovery of your packaging, even if recovery options are currently limited.

As with all other packaging materials, flexible plastic packaging systems have specific design constraints, which may limit the application of the resource efficiency design hierarchy. With this in mind, we have outlined the general design considerations for flexible plastic packaging in Figure 2. During material selection and packaging system design all of the aspects in Figure 2 should be considered.

Each of these design considerations is then discussed in more detail in Table 3.

[1]The resource efficiency design hierarchy is also often referred to as the waste hierarchy.

Design Considerations for Flexible Plastic Packaging

Figure 2

Summary of design considerations for flexible plastic packaging

Design to be fit-for-purpose
SPG principle 1

Design for resource efficiency
SPG principle 2

Design with low-impact materials
SPG principle 3

Design for resource recovery
SPG principle 4

Design to:

- Improve accessibility
- Minimise product waste by consumers
- Manage the trade-offs between primary, secondary and tertiary packaging

Design to:

- Minimise the primary packaging
- Minimise the secondary packaging
- Maximise transport efficiencies
- Minimise the manufacturing inputs of production processes
- Use reusable/returnable secondary packaging
- Reduce consumption related impacts
- Recover filling line packaging losses
- Maximise product to packaging weight/volume ratios

Design to:

- Maximise recycled content in primary packaging
- Maximise recycled content in secondary packaging
- Minimise the use of problematic chemicals during packaging manufacture

Design to/for:

- Increase recovery
- Maximise the value of recovered recyclate
- Minimise contamination by residual food
- Provide clear consumer information

Design Considerations for Flexible Plastic Packaging

Table 3

SPG Principle	Design to	Design Considerations	Life Cycle Importance
1 - Design to be Fit-for-Purpose	Improve accessibility	If using closures or seals with flexible plastic packaging, check the required removal force. The force required to pull or puncture the seal should not exceed 22 newtons. Avoid seals that require a tool to puncture. When using a foil seal pull tab, increase the coefficient of friction by coating the tab so that extensive pinching is not required, and increase the size of the tab to accommodate a pinch. Place directions for opening the packaging directly on the packaging in a clear, easy-to-comprehend format. Zip tracks on resealable packaging can be difficult re-seal properly. These can be improved by using the right zip for the right package, and using a plastic nubbin (zip fastener) that is big enough to grip. Make heat sealed strips, and press-and-seal strips, easier to pull apart by leaving enough room for fingers to grip the two edges, both for opening and closing. Check Arthritis Australia's Food Packaging Design Accessibility Guidelines (see Useful Further Reading list) for more suggestions to improve the accessibility of your packaging.	HIGH
	Minimise product waste by consumers	Ensure that the contents can be fully dispensed, e.g. by avoiding design that makes it difficult for consumers to remove the last bit of product. Product waste left behind in the packaging may also increase reprocessing costs, and decrease the value of the recovered recyclate. The loss of your product as waste is also the loss of a valuable resource with a potentially significant environmental impact. Another approach to consider is modifying the flow characteristics of your product, so it is more easily dispensed. Obviously, there is a trade-off here, as concentrating a product (and potentially increasing its viscosity) leads to a reduction in the packaging requirement. Speak to your suppliers about balancing viscosity and product concentration.	MEDIUM
	Manage the trade-offs between primary, secondary and tertiary packaging	Consider possibilities for minimising the tertiary packaging components that are required to secure loaded pallets, which include the use of: strapping, down-gauged and perforated stretch films, sleeves, 'lock-'n-pop' low residue adhesives, returnable plastic crates that lock into place on pallets with minimal strapping, or pallet boxes.	MEDIUM

Design Considerations for Flexible Plastic Packaging

2 - Design for Resource Efficiency	Minimise the primary packaging	Computerised design techniques, such as Finite Element Analysis, can help minimise plastic use. In addition, technologies are always improving. Speak to your suppliers about different design and manufacturing techniques that can reduce material usage. The movement towards concentrating products (e.g. double or triple concentrated laundry detergents) is now well established in Australia. Concentrated products require less primary, secondary and tertiary packaging, and are also more efficient to transport. Is reformulating your product to reduce its water content (or volume in general) a viable possibility? Consider using in-store shelf-ready packaging more effectively for product communication rather than relying on additional primary packaging components. The secondary packaging can incorporate elements such as external and internal printing to aid brand recognition, while controlling and presenting products in flexible packaging formats consistently. Potentially these types of changes can also lead to less in-store labour as well. Finally, more packaging is often used to signal a premium product. Consider alternative approaches to signal product quality to consumers through reduced printing and primary packaging. For example consider the use of shelf-ready secondary packaging that allows the reduction or elimination of primary packaging.	HIGH
	Minimise the secondary packaging	Optimise your use of corrugated board in secondary packaging by minimising flap overlaps (even to the point that the box contents are visible). Also consider moving the flaps to the smallest end of the box (so there is less overlapping flap material). Discuss the possible options with your supplier and/or converter. You might be using a double-walled corrugated container (with two corrugated medium layers) to fulfil a structural strength requirement. Consider if adequate strength can be achieved with a single-walled corrugated container through the use of thicker gauge liners, but while still achieving a reduction in overall weight. Ask your supplier to assist with identifying the lightest weight corrugated board that will fulfil your functional requirement. Shelf-ready packaging is becoming an important supply chain value-add for many food and grocery items, and this shift may increase the packaging-to-product ratio. When moving to shelf-ready packaging, look for opportunities to minimise material use. Down-gauge secondary packaging as much as possible, while ensuring that the integrity of the primary pack is not compromised. The exception to this is if you are considering moving to a higher level of recycled content in the fibre-based secondary packaging, in which case a degree of 'up-gauging' could well be justified. See the second guide in this series (Fibre-Based Packaging) for more details on optimising the environmental performance of corrugated board-based secondary packaging.	HIGH
	Maximise transport efficiencies	Have a look at your palletisation (volumetric) efficiencies; improving these can significantly reduce the costs associated with product storage and distribution.	HIGH

Design Considerations for Flexible Plastic Packaging

2 - Design for Resource Efficiency

Minimise the manufacturing inputs of production processes	Electricity is usually the primary energy input during the manufacture of flexible plastic packaging, used both for powering equipment and for generating the heat used in forming the packaging. Ask your suppliers about their energy procurement practices, in particular for electricity. Do they source a proportion of their electricity from GreenPower™ accredited sources? What are the measures they have in place to improve energy efficiency? Do they purchase any greenhouse gas offsets? Compared to virgin polymer production, the production of recycled polymer can be significantly more water-intensive (due to the washing requirement). Ask your recycled content packaging suppliers about the activities they undertake to manage and minimise water use during the recycling process, or in their supply chain if they purchase recyclate from other companies. Source your polymers from suppliers with a documented environmental management system and a strong commitment to best practice; for example, check if your supplier is a signatory to PACIA's Sustainability Leadership Framework.	MEDIUM
Use reusable/ returnable secondary packaging	Returnable plastic crates/trays (RPCs) that are collapsible or nesting are now seeing much broader use in the market, particularly by the major supermarket chains. The life cycle environmental and cost benefits of using returnable plastic crate systems, instead of corrugated boxes, are significant. Supply chain product losses are also reported to be significantly lower when using returnable plastic crate systems. However this currently relates more to fresh foods, such as fruit and vegetables, than more robust products commonly found in flexible plastic packaging. The market is moving in this direction, so consider if your product could be supplied in RPCs. Reusable packaging can be particularly suitable for short distribution chains, loose or manually packed products, easily damaged high value products, and large volume fast moving products.	MEDIUM
Reduce consumption-related impacts	If your product doesn't require refrigeration, make sure that this is prominently communicated on the label, to avoid consumers unnecessarily refrigerating the product.	LOW
Recover filling line packaging losses	While plastic packaging losses in the filling line will be low, confirm with line operators that they have an appropriate plastics recycling collection system in place.	LOW
Maximise product-to-packaging weight/volume ratios	Many products packaged in flexible plastic packaging already have close to ideal product-to-packaging weight and volumetric ratios. However, consider doing some 'back of the envelope' calculations on these ratios as part of your packaging system design process. Pre-settling or vacuum packing loose fill product is not feasible for many less dense products. However, consider if one of these techniques is viable for your product. Reducing the product volume reduces the primary, secondary and tertiary packaging requirement, and also reduces the transport requirements.	LOW

Design Considerations for Flexible Plastic Packaging

3 - Design with Low-Impact Materials	Maximise recycled content in primary packaging	Ask your packaging suppliers about the potential to incorporate some post-consumer recycled material in your packaging, particularly if the packaging is not in contact with food.	MEDIUM
	Maximise recycled content in secondary packaging	Specify the highest possible level of post-consumer content in corrugated broad or polyethylene over-wraps and shelf-ready packaging, while maintaining the required functional and strength performance of the secondary packaging.	MEDIUM
	Minimise the use of problematic chemicals during packaging manufacture	Printing processes for flexible plastics packaging often involve the use of high VOC (volatile organic compounds) chemicals, particularly in the solvents. These chemicals can be locally toxic to human health (e.g. to the shop-floor workers) and the environment, and their use requires the operation of significant (and expensive) pollution control measures, such as gas-fired after-burners. They are also a contaminant in recycling processes. Discuss with your packaging material supplier whether alternative low-VOC inks and lacquers are available that will fulfil your requirement. Water-based inks and ultra-violet curable inks have the lowest VOC emissions. This type of change may reduce emission management-related costs, improve the health of the local environment, and will assist your supplier in maintaining a healthy work environment.	MEDIUM

4 - Design for Resource Recovery	Increase recovery	Identify the most viable recovery option at the present time, and design your packaging accordingly. Check whether there is an option to recover your product, either through a retail drop-off scheme, collection from commercial and industrial consumers (e.g. pallet and shrink wrap, bags) or composting, and design your packaging to be compatible with this system. For example, if you sell a consumer food product in a bag or pouch, which could be recovered through the national retail drop-off scheme for plastic films, try to avoid or minimise layers of different polymers and aluminium. Carefully consider your use of pigments, inks and labels. Multi-layer films with aluminium foil or paper components can be problematic in plastics recycling, and are very unlikely to be recovered. As much as possible, metal or paper components should be avoided or minimised. Avoid using a combination of different polymer types, as this inhibits recyclability. New barrier films are being developed with only one material or primarily one material to improve recyclability. If more than one polymer is necessary for your application, then try to use polymers with different densities so that they can be easily separated during the float/sink separation step that is common during reprocessing. As a general rule of thumb, design to keep the sum of the other components to less than 5% of the main primary packaging component. This still assumes that the other components are 'compatible' with reprocessing.	MEDIUM

Design Considerations for Flexible Plastic Packaging

4 - Design for Resource Recovery	Maximise the value of the recovered recyclate	As much as is possible, consider using only one polymer type in your packaging. Match minor components such as labels and seals to the polymer type of the main packaging component to ensure that they are compatible in reprocessing (see Table 2). Avoid multi-layer films if possible, as they generally produce a lower value recyclate that will need to be down-cycled. Avoid polyvinylidene chloride (PVDC) in your barrier film (there are alternatives, such as ethylene vinyl alcohol (EVOH)). PVDC degrades at temperatures very near to typical plastics reprocessing temperatures and turns the recyclate brown. Clear, unprinted films produce higher value recyclate than coloured films. Avoid the use of black films, which cannot be identified by optical (NIR) sorting lines. Minimise the amount of printing on your packaging. Printing inks generate VOCs during the recycling process and reduce the quality of the recycled resin. Avoid or minimise the use of 'fillers' (e.g. calcium carbonate, talc, and titanium dioxide) that change the density of the plastic. Fillers cause reprocessing issues and lower the value of the recovered recyclate.	MEDIUM
	Minimise contamination by residual food	Product contamination in flexible plastic packaging can represent a significant proportion by weight of the collected material (e.g. residual bread in a bread bag). Provide consumer with clear instructions to 'empty packaging before recycling', if your product is one for which food residues are likely to be significant.	MEDIUM
	Provide clear consumer information	If a collection and recycling process for your packaging is not available to a reasonable proportion of consumers, avoid printing the PIC (Plastics Identification Code) in a prominent location on the pack. This may mislead consumers by indicating that the packaging is recyclable. Provide clear advice to consumers on how to recycle or dispose of the packaging. See the Introductory Guide for more on labelling in general.	MEDIUM

Design Example

This design example illustrates some of the sustainability design aspects that could be considered during a packaging development or review. The brief is for a flexible plastic pack for a snack food product. The conventional product is a hang-sell plastic bag, but the retailer is asking for a more efficient shelf-ready packaging system with greater functionality and market appeal.

Sustainable design considerations

Design for efficiency

A flexible plastic pack reduces material, energy and water consumption compared to rigid plastics or glass[1]. To improve efficiency further:

- Consider a larger pack size to reduce the packaging-to-product ratio
- Minimise empty space in the package
- Minimise print coverage – use clear film in strategic locations to ‘show off’ the product
- Design the combination of primary and secondary packaging to optimise efficiency in transport

Design for recycling

Plastic films are not widely recycled at present but recovery systems are being established. To support material recycling:

- Choose a 100% plastic pouch rather than a multi-layer film with aluminium foil
- Aim to use one polymer type
- Avoid PVC and PVDC
- Minimise print coverage (and use lighter colours, which are preferred)

Consumer accessibility and convenience

- Provide an easy-tear option that allows the consumer to open the pack without scissors
- Provide clear, visible instructions on how to open the pack
- A re-sealable closure (e.g. a plastic zip) will keep the product fresh and reduce waste. If using a zip, make sure the nubbin is large enough for someone to hold easily

Design with low-impact materials

Some films can incorporate a percentage of recycled material – discuss options with your supplier.

[1]For example, the new Nescafe ‘SMART Pack’ uses 73% less non-renewable energy, 66% less water and emits 75% less carbon dioxide than the glass jar - see rmit.com.au/browse;ID=3cl5vgl263sl

Design Example

Consumer labelling
• Do not use the word 'recyclable' or the Mobius loop recycling symbol on the pouch unless you know that most consumers have access to a collection and recycling service. • If there is a recycling service that accepts this type of packaging, let consumers know where they can find out more about it (e.g. by providing a web address). • Avoid use of the Plastics Identification Code as this has potential to mislead consumers about recyclability.

More innovative ideas that could be explored

Pouches can also be made from a compostable plastic[2]. To optimise compostability:

- Choose a film that is certified to a recognised international or Australian home composting standard
- Minimise print coverage
- Specify heavy metal-free (e.g. mercury, lead, cadmium and hexavalent chromium) printing inks and compatible adhesives
- Provide advice to consumers on how to compost the pack after use.

[2]For example, Ganong in Canada used NatureFlex film for its Easter confectionery range in 2012 – see packwebasia.com/sustainable-packaging/sustainable-packaging-applications/1644-laying-easter-eggs-in-compostable-stand-up-pouch

Useful Further Reading

Reference	What is it?
APC, 2010. Sustainable Packaging Guidelines, Australian Packaging Covenant. 30 pages.	The SPG is the key document for APC signatories and others to use in framing APC-compliant packaging reviews. The objectives of these reviews are to optimise resources and reduce environmental impact, without compromising product quality and safety. Free download from: www.packagingcovenant.org.au/
Arthritis Australia, 2012. Food packaging design accessibility guidelines. 31 pages.	This document provides more detailed guidance on accessibility principles and strategies to improve accessibility of food packaging; prepared in conjunction with NSW Health. For a complimentary copy of the Food Packaging Accessibility Guidelines and several other packaging design reports contact Arthritis Australia at: design@arthritisaustralia.com.au
Plastics and Chemicals Industries Association, 2008–2009. Quickstart Issues 1, 5 and 11. 6–7 pages.	The PACIA Quickstart documents provide lots of great information on sustainable packaging design, using recycled plastics and potential applications. Of particular note, Quickstart Issue 11 is aligned with the four principles of the APC's Sustainable Packaging Guidelines (fitness for purpose, resource efficiency, low-impact materials use and resource recovery). These documents are valuable resources for plastic packaging designers. Free download from: www.pacia.org.au/programs/quickstartpublications
Verghese, K., Lewis, H. & Fitzpatrick, L., 2012. Packaging for Sustainability. 1st ed. Boston: Springer. 384 pages.	This life cycle thinking-based reference book provides extensive detail on just about every aspect of sustainable packaging design. Beyond design, it also contains detailed information on marketing, regulatory and labelling aspects. Order from: www.springer.com/engineering/production+engineering/book/978-0-85729-987-1

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