Final report

Efficient use of resources in breakfast cereal packaging design

A review of breakfast cereal packaging to understand good practice and to develop a vision for the future that will deliver significant benefits through optimising the use of resources within the supply chain.
WRAP (Waste & Resources Action Programme) helps individuals, businesses and local authorities to reduce waste and recycle more, making better use of resources and helping to tackle climate change.
Executive summary

This study provides guidance on understanding opportunities which may exist for optimisation of resources in the breakfast cereals category. It is aimed at packaging developers, buyers and marketers from brands, retailers and converters within the hot and cold breakfast cereals market. The guidance aims to identify benefits to businesses, consumers and the environment, by creating cost savings, improving distribution efficiency and reducing the amount of food and packaging consumers throw away. The good practice identified in this report could also be applied to other grocery sectors to stimulate new thinking and further dialogue.

The study focuses on the largest segments of the category: hot and cold multi-serve cereals. It excludes on-the-go cereals and cereal bars. Examples of current packaging were analysed, and the sector was thoroughly researched – including desk-based research and interviews with representatives of the sector, including gaining feedback on the concepts.

430,000 tonnes of breakfast cereals are sold annually in the UK, using around 60,000 tonnes of primary packaging and generating at least 20,000 tonnes of household food waste (Section 1.3).

Many opportunities were identified within the breakfast cereal category reducing both the amount of packaging used and the food waste produced, which will result in tangible benefits for the businesses involved, including a reduction in the use of raw packaging materials, and improved pallet and vehicle loads. These benefits could result in a reduction in raw material and distribution costs, and an overall reduction in resources wasted throughout the supply chain.

These opportunities centred on the following good practice techniques:

- **Total system:** Consider primary, secondary and tertiary packaging as a total system, avoiding functional overlap between the packaging levels and remembering that packaging which remains within the supply chain is more likely to be recovered for recycling than at a household level. See Section 5 ‘Secondary and tertiary packaging’, Section 4 ‘Techniques for designing out resource waste’ and Figure A, below.

- **Waste prevention:** Consider the waste hierarchy: prevent, minimise, reuse, recycle, recover, dispose. Favour techniques at the top of the hierarchy, which eliminate valuable materials from entering the waste stream in the first place, for example, component rationalisation, lightweighting, volumetric efficiency. See Section 4 ‘Techniques for designing out resource waste’.

- **Food waste:** Is predominantly caused by leftovers and spoilage and can be addressed by considering portion control, helping the consumer to recognise and serve the correct amount and reclosable packaging, which may inhibit or delay spoilage. This is detailed in Section 2.2 ‘Opportunities to reduce food waste from breakfast cereal’.

- **Communication:** Packaging is ideally placed to carry messages to the consumer both graphically and through text, for example, advising on correct packaging disposal, portion sizes, or the brand’s stance on related environmental issues. Communication is discussed in Section 9 ‘Communicating with the consumer’ and a semiotic analysis of the sector can be found in Appendix 4.

These techniques were used to generate concepts which are presented in Sections 6, 7 and 8 – moving from optimising current sector practices in Section 6, to learnings from other sectors in Section 7, and on to more radical concepts in Section 8. Figure A shows examples of these concepts. Section 5 ‘Secondary and tertiary packaging’ highlights the opportunities in improving pallet efficiency, and the impact this may have in reducing storage and distribution costs (see Figure B).

The report concludes that there is both a desire and the potential for optimising packaging within the sector through both incremental and radical changes to current packaging formats and that could generate business benefits as well as environmental benefits. A holistic perspective should be maintained; understanding trade-offs between consumer and supply chain packaging and between packaging and food waste. Finally, product suppliers should always be consulted when considering packaging changes, as they have excellent technical knowledge on both product requirements and production capabilities – which may be unique to each manufacturing site.
Figure A Concepts address (L-R) optimisation of the carton by reducing flaps, seal reduction on cereal bags, reusable crates which can be used at point of sale, and even product developments which enable the cereal to be packed more compactly, or kept fresher for longer. See Sections 6, 7 and 8.

Figure B – How primary pack design can affect pallet and distribution efficiencies (see Section 5)
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1.0 Introduction

This report aims to identify packaging changes that generate an overall reduction in either packaging use or food waste, without compromising product integrity.

1.1 Who should read this document
This study targets packaging developers, buyers and marketers from brands, retailers and converters within the hot and cold breakfast cereals market. However, the analysis and ‘good practice’ examples can be applied to many other grocery sectors to stimulate new thinking and further dialogue on reducing total resource waste through the supply chain.

1.2 Aims
The aim of this study is to:
- stimulate packaging design innovation; and
- provide tools, examples and further information to support optimisation in the breakfast cereal sector.

With the purpose of:
- optimising packaging solutions;
- reducing product waste; and
- reducing the associated environmental and financial costs.

This can be achieved through identifying good practice, highlighting potential for incremental change, and developing concepts for medium and long term change.

Considering the role consumers play in recycling and food waste reduction, this study also addresses consumer communication, and provides guidelines for pack aesthetics to improve consumer engagement in the waste cycle.

The study does not present fully resolved design solutions. Some design concepts presented in this document may have been considered and not implemented previously, due to timing, or lack of buy in. Further collaboration across the supply chain will be required to achieve significant reductions in resource waste, presenting both a challenge and opportunity for the sector.

1.3 Packaging and food waste
Historically, targets for waste reduction have focussed on reducing primary packaging and have helped to achieve significant improvements. For example, under the Courtauld Commitment the grocery sector signatories met objectives to end packaging growth in the sector by 2008 despite an increase in sales. The breakfast cereal category produces around 60,000 tonnes of primary packaging each year. Packaging fulfils important functional and statutory requirements to protect the product and so care must be taken when optimising packaging that product integrity is not compromised.

Focus is now extending to reduce food waste arising, and in the UK, households throw away 6.7 million tonnes of food each year. In landfill, food waste breaks down anaerobically to produce methane, which is 25 times more significant than carbon dioxide (CO₂) as a greenhouse gas. Every tonne of avoidable food waste generates the equivalent of 4.5 tonnes of CO₂. Of the 430,000 tonnes of breakfast cereal sold ever year, at least 20,000 tonnes is thrown away annually.

1.4 About the authors
WRAP engaged 1HQ to undertake this study on their behalf. 1HQ is a brand, product and packaging agency that specialises in trends and semiotic analyses, user and stakeholder research, brand and product innovation, structural packaging and brand graphics communications.

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*A Based on 2007 figures.

*B This figure could be significantly affected by new research by WRAP, due to be available later in 2009.
2.0 Background to packaging and food waste reduction

An outline of key drivers and opportunities for packaging optimisation and product waste reduction in the breakfast cereal sector.

2.1 Drivers for resource optimisation and waste reduction
Drivers for packaging and food waste reductions include:

- **Financial incentives:**
  - Packaging initiatives such as lightweighting and volumetric efficiency can reduce material, storage and transportation costs, and the cost associated with Packaging Recovery Note (PRN) obligations. Reducing product waste within the supply chain prevents financial loss from unsold product.

- **Legislative:**

- **Voluntary agreements:**
  - The Courtauld Commitment, which has been signed up to by all the major UK supermarkets as well as brands and manufacturers, with objectives to reduce packaging and food waste.
  - Food and Drink Federation’s 5 fold environmental ambition.
  - Association of Cereal Food Manufacturers’ (ACFM) members have agreed to minimise headspace for bag-in-box cereals so the settled fill level is no lower than 70% of the total height of the box.

2.2 Opportunities to reduce food waste from breakfast cereal
Most wasted breakfast cereal is due to leftovers (around 73%) and spoilage (around 10%)\(^5\). Therefore, the two key themes to reducing breakfast cereal food waste are:

- **Portioning:**
- **Reclosing.**

This section outlines the principles to portioning and reclosing. Concepts that explore these themes are detailed in Section 8.0.

2.2.1 Portioning
Leftovers may be caused by poor portion awareness, portion control or portion repeatability. That is:

- consumers don't know how much they want to serve;
- consumers are unable to visually assess the serving size; or
- they lack the manual dexterity to serve the correct amount.

Portion control should not focus on the ‘correct’ portion, but instead help people recognise and repeat the right portion for them - particularly children, who make up a significant proportion of the market.

Packaging that offers integral portion control could reduce the amount of cereal thrown away. Sometimes, portion control is dictated by other features such as convenience or variety, e.g. porridge oats in single portion bags (Figure 1). However, designs must not inadvertently over portion or be overly prescriptive, consumers must be free to decide the appropriate serving for themselves and their families and designs should not increase overall waste by significantly increasing packaging.

2.2.2 Reclosing
The WRAP report ‘The Food We Waste’ indicates that around 10% of breakfast cereal waste arises from smelling, tasting or looking bad\(^6\), usually attributed to moisture absorption. Reclosing packaging inhibits moisture
absorption and can reduce wastage. However consumer behaviours vary widely - some meticulously fold down bags and interlock card flaps, whilst others make no effort. This creates opportunity for features that either:

- ensure reclosure for consumers who don’t do it themselves; or
- improve reclosure for those who do.

Archer Farms (Figure 1, right) uses a sophisticated closure, with an injection moulded polypropylene hinged top facilitating easy pour and reclosure. Alternatively, products such as pegs, clips, and food storage containers can be used to reclose breakfast cereal.

Figure 1 Quaker multipacks prescribe portion size. The Archer Farms pack features easy pour and reclose lid.

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\(^{c}\) Information obtained through interviews with industry experts; February 2009.
3.0 Market context

With an estimated value of £1.28b, the breakfast cereal market is characterised as a mature market with high penetration and stable frequency of use. Despite a 17% growth over the past five years, industry analysts suggest that further growth will be more difficult. “Breakfast cereals will need to deliver more in terms of health benefits, provenance and green issue awareness, if they are to increase consumer engagement.”

3.1 Types of cereal

This report focuses on:

- **cold** cereals, usually prepared with cold milk; and
- **hot** cereals, including porridge, oatmeal and instant hot oat products.

Portable single serve formats such as Rumblers and Kellogg’s To Go and cereal bars are not covered by this report.

3.2 Growth drivers

More than 23 million UK adults eat breakfast cereal every day - over 47% of the adult population - and 15% of these also eat cereal as a snack or replacement for other meals. 51% of children eat cereal. Drivers for market growth include:

- the 15% of consumers who do not currently eat breakfast cereals;
- the aging population, as older people are more likely to make time for breakfast, and are particularly keen on wholesome, unadulterated food; and
- higher frequency of use, since market penetration is already high.

3.3 Category trends

- **Customisation**: When consumers blend their own combinations of cereals and extra ingredients.
- **Premiumisation**: ‘Trading up’ to quality and health through whole grains, dried fruit, super foods, and functional ingredients such as pre and probiotics.
- **Organics**: Health and ethical motivations make the small market for organic cereal ripe for further development.
- **Provenance**: An increased emphasis on locally sourced products.

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**Figure 2** My Muesli, where customers order personalised cereals online, choosing from oats, grains, fruits, seeds, gummi bears and alfalfa (left). A page from the “Weetabix Week” interactive website encouraging customers to add their own ingredients to optimise variety (right).

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D ‘Breakfast Cereals, Market Intelligence, February 2008’

E [http://www.weetabix.co.uk/weetabixweek/](http://www.weetabix.co.uk/weetabixweek/)
4.0 Techniques for designing out resource waste

The following structural design techniques can be used to optimise packaging and reduce food waste in the breakfast cereal sector and are ordered in relation to their impact on the waste hierarchy:

![Figure 3 Priority of techniques for waste reduction](image)

Techniques may affect more than one point on the hierarchy. Techniques that prevent resources from entering the waste cycle in the first place are preferable to those that only enable recycling. These techniques are developed into concepts in Sections 6.0 – 8.0:

### 4.1 Waste prevention

- **Lightweighting**: Reducing packaging weight across all materials, using production improvements, finite element analysis and improved quality checking procedures. WRAP has a number of reports\(^8\)\(^9\)\(^10\) on these techniques.
- **Volumetric efficiency**: Enabling units to be packed more compactly, thereby getting more onto a pallet, into a vehicle and onto shelves, generating significant cost and CO\(_2\) savings. This includes headspace.
- **Total packaging system reduction**: Rationalising material use by considering primary, secondary and tertiary packaging as a system (including shelf ready packaging). (See Section 5.0)
- **In-store merchandising fitments**: Can be used to display and communicate product information, enabling primary packaging to be reduced where appropriate.
- **Self-dispensing**: Offering loose products to the consumer, who can choose the quantity to buy and pack directly into their own re-usable containers (see Section 8.5).
- **Format selection**: Switching packaging formats to reduce overall waste.
- **Material selection**: Selecting materials which are fit for purpose, and optimising material use.
- **Material technology**: Using new technologies to reduce food waste:
  - for example, antimicrobials have been used in food containers, but not yet in food packaging\(^11\); and
  - developing smart packaging materials that can absorb oxygen, detect pathogens, and alert consumers to spoiled food. Many of these are expected to be commercially available within a few years\(^12\).
- **Performance specifications**: Basing specification on performance rather than material composition ensures that packaging is fit for purpose and not over specified. Performance specifications should be developed in conjunction with suppliers to take advantage of their expertise. See section 6.1.4.
- **Intelligent portioning**: See section 2.2.1. Any increase in packaging as a result of portioning features should generate a greater reduction in food waste.
- **Reclosable packaging**: See section 2.2.2. Any increase in packaging should be counterbalanced by a greater reduction in food waste due to the higher embedded carbon and total resource used in the product.
4.2 Reuse

- **Primary packaging elements**: Reusing packaging for its original purpose, with no reprocessing:
  - in the past, returnable primary packaging used to be more prevalent – for example the doorstep delivery system for milk\(^{13}\) and refillable beer and soft drink bottles\(^{14}\); and
  - reusable packaging creates opportunity to enhance the brand experience, for example through a desirable and robust reusable pack.

- **Secondary and tertiary packaging elements**:
  - Use of reusable secondary and tertiary packaging is increasing, e.g. pallets, roll-cages, beer kegs, crates, and trays for bread, vegetables and other products\(^{15}\) (see section 5.3).
  - In-store merchandising fixtures may be used to enhance the shopping and brand experience, whilst providing opportunity for primary packaging to be optimised (see Figures 24 & 25).

- **Alternative reuse**: Providing primary packaging with an alternative and ongoing reuse for consumers:
  - For example, a dessert packed in a glass ramekin – however, consumers tend to have a limited requirement for such items.

4.3 Recycling

- **Recycled content**: This is a complex area where overall carbon impact should be assessed regarding recycled content and the strength-to-weight ratio of the material. See Section 6.1.4.

- **Design for recycling**: Creating packaging from materials which have a high recycling recovery rate\(^{16}\) and where possible, from a single material.
  - When multiple materials are required, ensuring they are easy to separate for recycling.

- The Packaging Recycling Action Group (PRAG) is due to release some generic guidelines on design for recyclability in Autumn 2009 which will be available via a link on the WRAP website.

4.4 Techniques summary

- Consider the waste hierarchy.
- Favour techniques that eliminate packaging or food from entering the waste stream.
- Techniques can be implemented with or without noticeable visible change to the consumer.
- Waste reduction should be viewed as a total system, with the same techniques being applied to primary, secondary and tertiary packaging, remembering that packaging remaining within the supply chain is more likely to be recovered or recycled than that going in to household waste. Use of in-store fitments as part of this system, for example point of sale displays or self-dispensing areas – can create opportunities for packaging waste reduction.
5.0 Secondary and tertiary packaging

Primary, secondary and tertiary packaging work together and should be considered as a total packaging system in order to reduce waste.

5.1 Balancing primary and secondary packaging weight

"It is a generally held view that the weight of primary and secondary packaging is inversely correlated in order to provide ample protection to the product, at a minimum weight"\(^{17}\).

For example, standalone bags and flexible pouches are non load-bearing, and require robust transit packaging (e.g. Figure 4), whereas a carton, which is load-bearing, can use minimal secondary packaging such as shrink wrap or a skeletal outer (Figure 5). Some specially designed primary packs eliminate the secondary packaging altogether (Figure 6).

When optimising the balance between primary and secondary packaging, consider collection and recycling. Supply chain waste is more likely to be recovered than domestic waste, with very high recovery rates for packaging waste at distribution centres and back of store\(^{16}\), compared to only 34.5% of household waste being recovered\(^{18}\).

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**Figure 4** A flexible stand up pouch containing tea is packed in to a fully enclosed outer.

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**Figure 5** Cartonboard boxes of tea are shrink wrapped (left), while many cereal boxes are distributed in skeletal secondary packaging such as the wraparound case for Shreddies (right).

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**Figure 6** These self-stacking square milk jugs do not require a traditional milk crate. It is estimated that vehicle loads are improved by 9% as a result\(^{19}\).

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\(^{16}\) Information obtained through interviews with industry experts; February 2009.
5.2 Palletisation

Standard ‘best practice’ in palletisation avoids overfill (which can result in product damage) and underfill or voids (which result in inefficiency). According to research, average volume efficiencies are around 50%\(^{17}\).

Improving pallet volume efficiencies can significantly reduce the costs associated with product storage and distribution. This can be done with or without a noticeable visible change to the primary pack. Figure 7 below illustrates how pallet load can be improved for a typical 500g cereal carton; first by optimising the secondary packaging whilst keeping the primary pack the same, and second by altering the primary pack in order to achieve maximum efficiency.

Please note, the volume of each pack is exactly the same – more improvement can be made if headspace was reduced.

**Figure 7** Minor changes to pack dimensions or layout can generate significant storage and distribution benefits (indicative calculations based on pallet envelope of 1200x1000x2400 with 22 pallets per vehicle)
A number of options exist for securing a loaded pallet, which include strapping, stretch films, sleeves, adhesives, or by using stackable crates or pallet boxes.

A recent audit of a household brand’s distribution centre found that with simple modifications to existing equipment, stretch film could be reduced by 30%\textsuperscript{20}. Dramatic reduction or elimination altogether is possible with special non-residue adhesives, such as ‘Lock n Pop’ (Figure 8), an adhesive that temporarily bonds cartons or sacks together to prevent pallet movement\textsuperscript{21}.

\textbf{Figure 8} ‘Lock n Pop’ adhesives being applied manually to cartons. The process can also be automated.

5.3 Reusable transit packaging

Returnable transit packaging (RTP) is common in the fast moving bakery, fresh produce and dairy categories (Figure 9). When well-applied, RTP can prevent product damage and divert material from both supply chain and domestic waste streams – see Figure 25, Concept 5. When developing single-trip or reusable transit packaging, factors such as raw material use, energy in manufacture and reconditioning, trip rates, transportation distances, pool size, vehicle utilisation, initial investment, cost benefit, product damage, hygiene, brand value and customer convenience should be considered.

During 2009 WRAP undertook research that reviewed existing life cycle analyses (LCAs) that covered reusable packaging to examine the benefits of these systems, and factors that need to be considered when deciding whether the adopt reusable packaging. This work will be available on the WRAP website after publication, towards the end of 2009.

\textbf{Figure 9} Reusable tertiary packaging is common at point of sale in fast moving bakery and dairy categories

5.4 Secondary and tertiary packaging summary

- Avoid functional overlaps between primary and secondary packaging.
- Supply chain packaging is more likely to be recovered for recycling than domestic waste.
- Improved volumetric efficiency in palletisation can generate significant environmental and cost benefits.
- 30% stretch wrap reduction is possible using pallet wrapping technologies and elimination of stretch wrap can be achieved if pallet adhesives are used; however such technologies should always be tested thoroughly to ensure that they are adequate for the particular needs of a business and its supply chain.
- A research project on reusable transit packaging will be published by WRAP towards the end of 2009.
6.0 Optimising existing breakfast cereal formats

This section was informed by interviews with retailers, brands and converters in the sector during February 2009, and by sampling and analysing a selection of existing packaging during that same time period. It demonstrates ways to reduce waste from common cereal formats, primarily (though not exclusively) to achieve a lighter packaging weight. New concepts are also illustrated. The formats addressed are:

- bag-in-box;
- standalone form, fill, seal (FFS) bags; and
- hybrid bag and box solutions.

6.1 Bag-in-box

When considering traditional cereal boxes, both the outer box and the inner bag can be optimised and can work together to fulfil the total requirements specification for the primary pack. This section explores the following:

- volumetric efficiency;
- carton joint reduction;
- liner bag seal reduction;
- material choice, weight and recycled content of cartons and liner bags;
- removal of material from the carton; and
- removal of the liner bag.

6.1.1 Volumetric efficiency

Reducing the overall size of a box not only eliminates material, but can also generate significant financial and environmental benefits through more efficient palletisation, storage and transport. Reshaping the primary packaging for maximum volume efficiency could improve pallet load quantities by up to 40%; dramatically improving vehicle loads (see sections 4.1 and Figure 7, Section 5.2).

Nature’s Path’s ‘Envirobox’ programme achieved a 10% reduction in total packaging material, and the removal of 400 articulated lorries from US highways. Kellogg’s are currently trialling a new shape box with retailers in Detroit, USA, which may yield similar benefits. The new box contains the same amount of product, yet has allowed them to make an 8% reduction in material.

![Figure 10](image-url) Kellogg’s new box trial is expected to achieve material, distribution and storage efficiencies. Note customer facing “space saving” promotion.

Premium ‘Doves Farm Organics’ and value ‘Sainsbury’s Basics’ wheat biscuits both have a very simple approach to improving volumetric efficiency; the biscuits have square corners rather than the traditional lozenge shape, which reduces lost space in the pack. The Basics range also utilises a more efficient box shape, further enhancing its material and volume efficiency, whilst the Doves Farm cereal biscuits themselves are denser than other varieties of wholewheat biscuit, therefore allowing for a smaller overall biscuit volume.

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>G Information obtained through survey of products in the marketplace, February 2009.
Figure 11 Square corners, e.g. Doves Farm Organics and Sainsbury’s Basics wheat biscuits (centre and right), enable a more compact pack size compared to the traditional lozenge shape (left)

Table 1 Comparison of lozenge and square shaped cereal biscuits

<table>
<thead>
<tr>
<th></th>
<th>Lozenge</th>
<th>Square</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biscuit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biscuit weight:</td>
<td>18g</td>
<td>18g</td>
</tr>
<tr>
<td>Biscuit thickness:</td>
<td>20mm</td>
<td>18.5mm (7.5% thinner)</td>
</tr>
<tr>
<td><strong>Carton</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>188 x 55 x 248mm</td>
<td>188 x 55 x 230mm</td>
</tr>
<tr>
<td>Cartons per pallet*</td>
<td>500 (12,000 biscuits)</td>
<td>600 (14,400 biscuits)</td>
</tr>
</tbody>
</table>

* Indicative calculation based on pallet envelope of 1200x1000x1600mm

Headspace is determined by both machinery capabilities and the extent to which the cereal ‘settles’ after filling. Filling in excess of 70-90% using current processes can distort the bag and inhibit the cereal’s ability to take the shape of the box during packing. Opportunities to reduce headspace exist, such as speeding up the settling process using vibration, or post compression after the bag is loaded into the box. Although these require changes to the processing line and may incur capital expenditure, this may be offset by the cost savings associated with improved storage and distribution efficiency.
Figure 12, Concept 1: Reducing headspace through vibration and post-compression

There may be opportunity to reduce headspace through introduction of a vibrating line, or post compression after the bag is loaded into the box, thus allowing a shorter box.

Figure 13, Concept 2: Packing dense cereals like rice or pasta

Dense cereal, such as oats, muesli, and puffed grains, could be packed like rice and pasta, which are compacted and have virtually no headspace. The filled bag may then be packed in to a tight fitting carton.
6.1.2 Carton joint reduction

Carton ends have flaps that either overlap to provide surface-to-surface glue joints or interlink to provide mechanical closure. Reducing flap size reduces primary pack material use by reducing the blank size. This could reduce cost if the change results in greater sheet usage at the converter\(^{31}\) which may require cooperation from other brands to ensure that the sheet size is optimised at the converter.

**Figure 14** Joint overlap. The box on the left shows quite a large overlapping section, while Natures Path 375g (right) had the lowest ratio of joint overlap (18%) of those analysed.

During the sample analysis, the area of flap overlap was measured and expressed as a percentage of the box footprint. Using a ratio allows comparison between different box sizes to identify best practice.

**Figure 15** Measure the area of joint that overlaps (shaded area on left) and divide by the total area of that pack face (shaded area on right).

Of the boxes measured, Nature’s Path 375g had the lowest joint overlap ratio (18%) with a weight of 420gsm (grams per square metre) - Figure 14. The joint overlap of the Kellogg’s Cornflakes 750g box also performed very well (18.5%) with a weight of 411gsm. For further information and opportunities around joint reduction, see WRAP’s Duchy Originals case study, which details how an 11% reduction in carton material was achieved\(^{24}\).

**Figure 16, Concept 3**: Gable Top Flap Reduction

A single-flap, gable-top carton can be more materially efficient than standard cartons, so long as the overall height of the carton is not increased. The gable folds into the headspace, and the overlap can be reduced almost entirely, leaving only a residual flap to provide a glue seam.

\(^{31}\) Cost price reductions will be limited to how many more cartons can be cut from each sheet, if any. Resulting trim waste would remain with the supplier / converter and be reprocessed.
6.1.3 Liner bag seal reduction

It is possible to reduce some of the material used in the liner bag by reducing the size of the seal at either end.

Historically, excessive reduction has resulted in an increase of seal failures\(^1\). However, a new sealing approach - the 'Integrity seal system,' has been developed by Ceetek in partnership with WRAP and International Food Partners (IFP), and is capable of reducing the standard seal size of 15mm down to 1.5mm wide\(^2\). This technology has been used successfully by Marks & Spencer for salad packaging, generating a 10-15% packaging material reduction\(^3\) and is suitable for use with both liner bags and standalone cereal bags.

Figure 17 Marks & Spencer salad package, which uses Ceetek's 'Integrity Seal System'\(^2\)

6.1.4 Material choice, weight and recycled content of cartons and liner bags

The weight, recycled content and source (e.g. accredited forests) of materials should be considered holistically, as each can affect another. When optimising primary packaging, remember that secondary packaging can be modified to compensate (see section 5.0, 'Secondary and tertiary packaging').

Whether choosing virgin or recycled materials, reductions are limited to readily available gauges. Maintaining good communications with material suppliers is critical to understanding the opportunities available. Developing a packaging performance specification is an ideal way of doing this which focuses on performance requirements rather than material specification; considering the likely conditions the packaging will have to perform under (for example stacking strength, climactic conditions, product interaction, etc) and ensuring it is fit for purpose.

Cartons

Cartonboard used in the packs sampled included a 323gsm recycled board for a non-flake product (Weetabix) and a 411gsm recycled content\(^2\) board for a flaked product (Kellogg's)\(^1\).

Recycled paper, cartonboard and corrugated packaging can be weaker than board made from virgin fibres, and so recycled boards tend to be heavier than virgin equivalents in order to achieve the same strength. However, high quality, lightweight, recycled board grades are available.

Depending on its traceability, virgin board can be used in direct contact with food without a liner bag (see section 6.1.6). However on average, manufacturing one tonne of virgin paper generates 1.32 tonnes of CO\(_2\) equivalent more than manufacturing one tonne of recycled paper\(^2\).

Liner bags

Cereal liner bags are typically made from an HDPE laminate with an internal layer to help the bag peel open. See also section 6.2.3 'Standalone bags, Material selection' for further discussion of recycled and recyclable bag materials.

The gauge of the liner bag can be as low as 30 microns, and as high as 60 microns\(^2\) for sharp cereals where puncture is an issue. When specifying the liner bags, machine capabilities and product/pack integrity should always be considered. Further thinning can prevent filling lines from being run at high speed, as thinner materials are more prone to snapping and stretching. Materials which are too thin may be more prone to bursting and can begin to lose integrity (pin-holing) and barrier properties, resulting in reduced shelf life\(^1\).

\(^1\) Information obtained through interviews with industry experts; February 2009.

\(^2\) Information obtained through survey of products in the marketplace, February 2009.
6.1.5 Removal of material from the carton

Cutaways within the carton don’t reduce blank size, but do reduce the weight of the consumer pack. Sometimes a clear film is glued to the cut away aperture to create a ‘window’ – alternatively the bag itself is used (Figure 18). If the liner bag is exposed, consider material properties including transparency and puncture resistance, but avoid increasing the amount of material used as liner bags are not currently widely recycled.

If a ‘window’ film is added to the aperture, consumers may need additional instruction on how to recycle the pack. Alpen Luxury High Fruit has on-pack guidance asking the consumer to “please remove the window before recycling” (Figure 20).

Figure 18 Dorset Cereals ‘Simply Delicious’ Muesli uses the bag as the window.

Figure 19, Concept 4: Removing material from the carton

Cut aways can perform an aesthetic function, or can be placed discreetly, e.g. the base or back of pack.

Figure 20 Alpen High Fruit on pack communication encourages removal of windows before recycling
6.1.6 Removal of the liner bag
Cereal can be packed directly into a carton, with no liner bag at all. Care must be taken when specifying cartonboard that is to be used in direct food contact as some recycled fibre may not be suitable for use in direct food contact. The European Paper and Board Food Packaging Chain have developed a voluntary industry guideline on the use of paper and board in direct food contact, which is available from their website. Linings or laminates may be required for greasy or moist foods, or those that are especially vulnerable to moisture ingress.

It is always important that a dialogue is maintained between raw material supplier, packer filler and brand owner before any packaging changes are committed to.

6.1.7 Bag-in-box summary
Table 2 summarises good practice amongst the bag-in-box products sampled and analysed. It is important to remember that each attribute has an effect on the others; overall best practice must combine and balance these attributes, being based on a performance rather than a material specification. Always consult your packaging supplier to get the most appropriate material for your application.

Table 2 Examples of bag-in-box good practice in the marketplace

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Brand</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Carton</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Volumetric efficiency</strong> (cm³/g)</td>
<td>Nature’s Path 375g</td>
<td>1 cm³/g</td>
<td>* Changing pack volume reduced packaging material by 10% and improved palletisation</td>
</tr>
<tr>
<td><strong>Joint overlap</strong></td>
<td>Nature’s Path 375g</td>
<td>18%</td>
<td>* Calculation illustrated in Figure 14.</td>
</tr>
<tr>
<td><strong>Material weight</strong> (non flake product)</td>
<td>Weetabix</td>
<td>323gsm (100% recycled content)</td>
<td>* Rigid format of product may offer some strength, enabling packaging to be optimised</td>
</tr>
<tr>
<td><strong>Material weight</strong> (flake product)</td>
<td>Kellogg’s 750g</td>
<td>411gsm (92% recycled content)</td>
<td>* Material gauge affected by product weight</td>
</tr>
<tr>
<td><strong>Liner Bag</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Seal size</strong></td>
<td>Ceetek</td>
<td>1-1.5mm wide</td>
<td>* Currently in use by Marks &amp; Spencer</td>
</tr>
<tr>
<td><strong>Material thickness</strong></td>
<td>Nestlé</td>
<td>37 microns</td>
<td>* 30-40 microns sufficient for most cereals</td>
</tr>
</tbody>
</table>

* 50-60 microns for sharper cereals
6.2 Standalone (FFS) bags

Some cereals are sold in a standalone form, fill and seal (FFS) bag, without the outer carton. Cereals packed in standalone bags are more susceptible to damage, and for this reason the format tends to be used for denser cereals (muesli) or economy varieties of delicate products such as flakes - however some premium flaked products are also sold in this format (Figure 21). See also section 7.1 “Stand up Pouches”.

Priorities for standalone bag optimisation are:
- seal reduction;
- material lightweighting;
- material selection;
- volume efficiency; and
- secondary packaging and point of sale.

Standalone bags may be clear, translucent or opaque, printed directly or labelled, to achieve a variety of design effects.

*Figure 21* Examples of standalone bag finishes, including clear with paper label; translucent; and opaque.

6.2.1 Seal reduction

The same techniques outlined in section 6.1.3 can be applied to standalone bags to optimise seal sizes. See Figure 17 for an illustration of the Ceetek ‘integrity seal system’ which can reduce standard seal sizes of 15mm down to 1.5mm wide.

6.2.2 Material lightweighting

Standalone cereal bags tend to be thicker than the bag-in-box liner bags, as they have to be more robust. However, secondary or shelf ready packaging can be used to protect the product whilst it is in the supply chain (see section 5.0, ‘Secondary and Tertiary Packaging’ and Figure 25, Concept 5).

ASDA launched a lightweight bag weighing only 9.2g, for its 500g ASDA Vitality flakes line. Although many standalone cereal bags are heavier than this example, it achieves a primary packaging weight reduction of over 88% as the equivalent box with liner bag weighed a total of approximately 74g.

*Figure 22* ASDA Vitality standalone bag

* Examples from Peter Rabbit Organics, Waitrose and Jordan’s standalone bag packaging.
6.2.3 Material selection

Plastic bags

The physical and barrier properties required for standalone bags can be provided in a lightweight multi material laminate, and generally include one or more of the following: HDPE, LDPE, OPP, CPP and PVC and coatings such as PVdC. For paper bags see section 6.3 ‘Paper bags’.

Although flexible materials are not currently widely collected through kerbside recycling schemes, some supermarkets accept cereal liner bags back along with carrier bags in their in-store recycling points. Recyclers prefer mono materials or mixed materials of the same type. The priority is to use our resources more efficiently and to use less material in the first instance through material lightweighting, seal reduction and volume efficiency.

Biodegradable polymers, such as PLA, have been used by Jordans for its premium organic Muesli. Some issues complicate the use of biopolymers, including risk of contamination to recycling streams. Detailed information on the implication of biopolymers in packaging can be found on the WRAP website, from which the following excerpt is taken:

“The principal risks arise at end of life. Instead of being composted, biopolymers may find their way into the recyclables stream, which would increase the cost of recycling or prevent it completely. Alternatively biopolymers could be added to the residual waste stream and increase the biodegradable waste sent to landfill... increasing the amounts of methane gases generated.”

Sourcing recycled content increases demand for the material and encourages collection from the waste stream. Any application of recycled plastics that come into contact with food must gain approval from the European Food Safety Agency to ensure any risks of contamination or chemical degradation have been resolved.

Paper Bags

Paper bags can have a more premium connotation than a plastic bag, and are used in the luxury, ethical and organic markets. For oxygen and moisture barriers and heat-sealing, paper bags tend to be laminated with a plastic lining. As long as the lining makes up a very small proportion of the overall packaging, and is on one side of the paper only, then these would be classed as “widely recycled” in the On-Pack Recycling Label scheme.

Figure 23 Eat Natural paper bag with PE lining, Sharpham Park paper bag with PP lining and Marks & Spencers paper bag with window.

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1 HDPE: High density polyethylene, LDPE: Low density polyethylene, OPP: Oriented polypropylene, CPP: Cast polypropylene, PVC: Polyvinyl chloride, PVdC: Polyvinylidene chloride, PLA: Polylactic acid or Polylactide.

29 In-store promotion, Tesco, February 2009 and on-pack labelling of Sainsbury’s own label cereals.

N PE: Polyethylene, PP: Polypropylene
6.2.4 Secondary packaging and point of sale

Secondary and tertiary packaging can be used to support the flexible packaging format of standalone bags, both in distribution and at point of sale, and can be used itself as shelf ready packaging, or in conjunction with in-store merchandising fitments. See also section 5 ‘Secondary and tertiary packaging’ and section 4 ‘Techniques for designing out waste’.

**Figure 24:** Point of sale display for bagged cereals

Stand alone paper or plastic bags are packed into load-bearing, reusable secondary cases which are also used at point of sale. Bag and case size can be optimised to fit pallet and shelf dimensions.

**Figure 25, Concept 5:** Stand alone cereal bags displayed in returnable transit display trays
6.3 Hybrid bag and box solutions

When the carton and bag are considered together, dramatic material reduction can be achieved, stripping back to the essentials while maintaining they key functional properties of each element.

Figure 26, Concept 6: Hybrid solutions

Carton is reduced to a tray (top left) or sleeve (bottom left) and bags can be premiumised with a card gable (‘Wally’s Food Company’, top left) or card wrap (‘Spicentice’, bottom right). Structural requirements can be transferred to appropriately designed secondary packaging.
7.0 Introducing packaging formats from other applications

Alternative formats already in use in either the cereals sector or other sectors, covering:

- stand up pouches;
- rigid PETE or rPET;
- box-in-bag (rather than bag-in-box); and
- paper bags.

7.1 Stand-up pouches (SUP)

Figure 27 Examples of cereal packaged in stand up pouches: Alixir 4 portion SUP, Grancereale paper/foil SUP, and Signature Range SUP with bead seal.

Grancereale (Italy) produces a 350g pack of flaked cereal in a paper/foil stand up pouch (SUP) with a bead seal for freshness. The packaging weighs 11.73g. DHL ‘Packaging Benchmarking’ good practice data suggests that if the product were packed in the bag-in-box format, the equivalent packaging would be 56g - of which 50g is ‘widely recycled’ cartonboard. Although this format increases the non-recyclable element of the packaging, overall primary packaging weight is reduced by 79%. The optional bead seal facilitates reclosure.

Whilst a pouch is heavier that a standalone bag, the format allows good on shelf presentation and the shaped, heavier material may provide additional protection for more delicate products. These pouches are not load bearing and require structural secondary packaging.

7.2 PET or rPET

Woolworth’s (Australia) cereal container is a “widely recycled” PET jar/bottle. Similar packaging could be made from recycled PET (rPET). Food packaging using rPET is now well established in the UK and there are many successful case studies including Innocent Smoothies and Co-op own label carbonated drinks and mixers.

Figure 28 Woolworths (Australia) PET oats bottle. Sketch shows portion graduations in cap

The screw top lid on the Woolworths product doubles as a measuring cup to encourage controlled portioning. The combination of the rigid PET construction and a screw top closure offers excellent prevention of moisture absorption. The rigid material is structural, potentially reducing secondary packaging, and provides excellent product visibility whilst preventing damage to delicate cereals. It is also durable enough to be reused by consumers in conjunction with a refill system.

However, at 112g, of which 12g is the lid, the packaging is significantly heavier than the equivalent bag-in-box weight, estimated as 74g. To offset this, lightweight refill packs should be made available to ensure reuse, and reductions in food waste and secondary packaging should be captured.

\(^{O}\) PET: Polyethylene terephthalate, rPET: Recycled polyethylene terephthalate
7.3 Box-in-bag
Kellogg’s has eliminated the bag inside their variety packs and instead use a more lightweight overwrap to provide a seal. If the product is particularly sensitive and is not consumed quickly, its shelf life may be affected after the seal collating the multipack is opened. However, this approach is commonplace for other dry goods, such as tea bags (Figure 29).

Figure 29 Kellogg’s and Dorset Cereal multipacks and Clipper fair trade tea bags

\[\text{Based on figures obtained through survey of products in the marketplace, February 2009.}\]
8.0 Innovating revolutionary cereal packaging systems
Sections 1.0 and 2.0 outlined the issue of food waste in the cereals sector, and identified two key opportunities to reduce waste through portioning and reclosing. This section explores these concepts and where possible does so without increasing packaging:

- controlled pour;
- single serve packaging;
- dosing;
- reclosures; and
- self service.

8.1 Controlled pour
These concepts seek to improve control when pouring cereal, to reduce over portioning. Both provide a focused ‘stream’ of cereals, reducing spillage.

Figure 30, Concept 7: Bag with spout

A simple modification to the liner bag creates a spout without increasing packaging waste.

Figure 31, Concept 8: Adjustable opening

Reusable, adjustable mechanism. Set the slider for slower flow and smaller portions (left), or for faster pouring and larger portions (right).

- Adjustable ‘spout’ slows down or adjusts the rate of pour;
- mechanism could be incorporated into carton design; or
- ideal for a re-usable / refillable packaging system.
8.2 Single serve packaging

Individual portions of cereal could be sold in lightweight, FFS bags, similar to crisp packets (Figure 32) and merchandised in a variety of unique product offerings (Figure 33).

**Figure 32** Nature’s Path single serve portion of cereal in a lightweight FFS bag.

**Figure 33, Concepts 9, 10 and 11:** Merchandising options for individual FFS bags

- **Multipack:** box or bag, jumble packed with individual portions. The box or bag could contain a variety of flavours or cereal types, similar to multipack bags of crisps boxed variety packs;
- **Mix ‘n’ match:** distinctive point of sale experience allows consumers to create their own multipacks;
- **Linked pouches:** strings of bags, bundled and collated into shelf-ready packaging.
Figure 34, Concept 12: Half serving bespoke breakfast

Half servings packed in lightweight sachets and sold as ‘pick and mix’ or in multipacks.

- Lightweight packaging format
- Flexible portion size, dictated by consumer (use one, two or three sachets);
- Enables customisation (see section 3.3 ‘Category Trends’).
- Reduced food waste – consumer has a variety to choose from without having to store large packs for long period of time
- Opportunity to increase customer loyalty with add-ons such as branded caddies, or a range of ‘additions’ such as dried fruit, chocolate chips, nutritional supplements, etc.

8.3 Dosing
Anecdotal evidence describes how people break a Weetabix biscuit in half to achieve the exact portion size – especially for children. If cereal came in units, or ‘doses’ no bigger than half a Weetabix, consumers would be able to accurately measure as many doses as they required, and repeat the same portion size day after day; for example two ‘units’ or doses for a small child, 3 for a larger child, 5 or 6 for an adult.

The following concepts show how this theory could be put in to practice.

Figure 35, Concept 13 Optics

Mechanism delivers a controlled dose into the bowl. The dose is not equal to a portion size: 2-6 doses may be required. The dose size can be unified across a range of cereals to help consumers achieve portion consistency when trying a new variant. The mechanism could be reusable or integrated in to the pack. The mechanism also recloses the pack.
Figure 36, Concept 14: Home Dispensing

Branded, gravity-fed hoppers (already commonplace in hotels), merchandised alongside cereal.

- Used in conjunction with cereals packed in very minimal, lightweight packaging.
- Turning handle delivers a fixed ‘dose’ - which can be repeated to achieve correct portion size.
- Multi-cereal dispensers provide choice and ability to customise.
- Counter-top convenience may encourage consumption of cereal as a snack.

Figure 37, Concept 15: Bitesize

Product formulations similar to existing ‘bitesize’ cereals could reduce both packaging and food waste. Compressed ‘units’ of cereal optimise volume efficiency and are easy to dispense without spillage, and disperse once milk is added.
8.4 Reclosures
Development of reclosable packaging can prevent moisture absorption that leads to spoiling (see section 2.2.2). Any advanced or automatic reclose solution improves reclosure for those who already take care to fold down bags and flaps, and ensures reclosure for those who do not.

Figure 38, Concept 16: Subdivided liner

Divide the inner bag into two, so that the whole contents are not exposed on initial opening. This could also be done vertically to result in two long thin bags.

- Minimal additional packaging.
- Prolongs life of the contents of 2nd bag and it remains unopened until required.
- Enhances customer perception of product freshness.
- Can be implemented without dramatic change to packing lines.

Figure 39, Concept 17: Wire reclosure

Wire closures, commonly seen on ground coffee packets, can be used to roll down and secure packaging between uses, e.g. Fiona’s All Natural Granola, packed in cellophane lined paper bags with wire closure.
**Figure 40, Concept 18: Bead seals**

A bead seal ‘zip’ can be easily used by both children and adults, e.g. Signature’s Rice Poppas, packed in a vertical form fill seal HDPE/LDPE bag with a reclose bead.

**Figure 41, Concept 19: Branded accessories**

Brands can encourage consumers to reclose through on-pack guidance and through branded items such as pegs, clips, and reusable canisters with associated refill bags. Retailers could further encourage use by placing and promoting these items in the appropriate aisles.
8.5 Self-dispensing

Self-dispensing offers consumers the opportunity to choose ‘loose’ product in minimal or refillable packaging (see section 4.1). Although well established in the United States, Canada, Australia and New Zealand, in the UK self-dispensing is typically limited to fresh produce. However, an increasing number of small, independent or premium retailers in the UK are beginning to using high quality self-dispense fixtures.

Figure 42: Example of in-store self dispensing fitment for a variety of cereals and dried goods

Self-dispensing is a big step, and some retailers are currently seeking direction to determine which categories would be best suited to this merchandising technique. As a long term approach to packaging reduction, larger grocers may trial self-dispensing in some categories before rolling it out more widely. Currently the advantages of self-dispensing systems are most clearly seen at the high end of the market, from boutique stores in London such as ‘Unpackaged’ to the food halls of Kensington’s Whole Foods Market.

Q Information obtained through interviews with industry experts; February 2009.
Prefilled hoppers are delivered to store and placed in merchandising unit. A tamper-evident seal (like on ink cartridges) is torn off immediately prior to use. Branded lightweight bags or reusable containers are provided for transport and long-term storage at home.

- Driven by trends for increased customisation and blending (section 3.3).
- Staffed or automated units offer a variety of grains, flakes, pulses, fruit, chocolate chips, yoghurt etc.
- Customers can buy as much or as little as they require.
- Convenience could increase frequency of consumption, e.g. lunches or after school snacks.
9.0 Communicating with the consumer

Many techniques discussed in this report achieve significant packaging waste reduction whilst being almost imperceptible to the consumer, leaving the decision with the brand owner as to whether or not to make an environmental statement about the change.

However, given that packaging recycling and food waste reduction relies upon the behaviour of the consumer, a partnership must be created. This involves a greater level of communication to ensure that consumers understand how to play their part.

In this chapter, we explore aspects of communication:
- consumer misconceptions;
- on-pack communication and consumer behaviour; and
- semiotic (visual signs) guidelines.

9.1 Consumer misconceptions

Currently, consumers are aware of the issues surrounding packaging but are only starting to hear messages about food waste and its implications. Further there is often little understanding of packaging’s role in preserving food and its role in protecting the embedded carbon within the product (the carbon cost of growing/manufacturing/transporting it).

To raise consumer awareness of the issue of food waste, WRAP launched the ‘Love Food, Hate Waste’ campaign which highlights the issue and encourages consumers to adapt their habits by offering simple tips on how to maximise the use of the food they buy. It also encourages brands and retailers to ‘add their voice’ to the campaign.

Mintel suggests that as packaging already plays a role in communication, it is well placed to become the principal educational tool, yet must do so without being over prescriptive, alienating, or patronising the consumer.

9.2 On-pack communication and consumer behaviour

A Mintel survey suggests that, whilst consumers are environmentally concerned and accept recycling as a social responsibility – three quarters claim to care how much packaging there is on food and drink – packaging recyclability is not itself a key behavioural or purchase driver. Typically, packaging recyclability is checked at point of disposal rather than point of purchase and it is only at this stage that the recyclability of the packaging will affect repeat purchases.

To date, communication of packaging recyclability has been characterised by a plethora of symbols that do not give a clear or consistent message, for example, the Society of Plastics Industry (SPI) material identification system (Figure 45).

Figure 45 SPI symbols simply identify the material, but the mobius loop may appear to suggest recyclability and could confuse consumers about what action should be taken.

New UK-wide packaging symbols from the On-Pack Recycling Label scheme were launched in 2009 to help consumers to differentiate between packaging types that are ‘widely recycled’, ‘check local recycling’ and ‘not currently recycled’.

“Research shows that consumers are often frustrated that they don’t know what packaging can and cannot be recycled and are looking for much clearer on-pack guidance to improve their understanding. The On-Pack Recycling Label scheme aims to deliver a simpler, UK-wide, consistent, recycling message on both retailer private label and brand-owner packaging to help consumers recycle more material, more often.”
To quote the Mintel ‘Food Packaging - Market Intelligence report’, “In future, defining and labelling packaging in the UK should not just be a case of ensuring materials fit certain criteria, but of educating consumers to understand and undertake correct disposal habits.”

9.3 Semiotic guidelines and trends
Semiotics is the study of how cultural meaning gets encoded into everyday objects, through elements such as pack format, material, finish, colours, artwork and iconography. See appendix 4 for a summary of trends affecting the sector, and a full semiotic analysis of cereal packaging (physical samples and product images) from the UK, plus interesting examples from Europe and the US, which was carried out in addition to this report. Attention was focused on format, materials and finish, but graphic elements were considered when relevant, with specific interest in how eco and ethical meaning is communicated within the category.
10.0 Summary

Around 430,000 tonnes of breakfast cereals are sold in the UK annually, using around 60,000 tonnes of packaging and generating around 20,000 tonnes of food waste each year; both of which have financial implications and environmental costs.

This report has explored the context of the breakfast cereal market and relevant trends in order to inspire packaging in the category to reduce not only packaging, but also food waste and to present opportunities to engage with consumers in new ways.

Packaging materials have embedded environmental and financial costs. Reducing material usage therefore reduces the associated cost of the material. Recovering the value of these materials after use, through recycling or reuse, ensures that these embedded costs are not lost to landfill. This report has presented concepts and techniques to aid in optimising primary, secondary and tertiary packaging, which illustrate waste reduction opportunities throughout the supply chain.

It is recommended that stakeholders across manufacturing and retail consider the following:

- Take advantage of continued opportunities to reduce packaging material entering the waste stream and the associated cost savings from optimisation, material reduction, volumetric efficiencies and other industry good practice.
- Target the top causes of breakfast cereal waste; leftovers and spoiled product.
- Maintain a holistic perspective on waste reduction; understanding trade-offs between consumer and supply-chain packaging and between packaging and food waste.
- Engage with consumers through relevant communication, and assist them in achieving their personal desire to reduce waste.

This report identified significant opportunities across the category to reduce waste through adoption of best practice, incremental changes, and more holistic and revolutionary innovation. These approaches may or may not be visibly obvious to consumers and the decision whether to use the changes to communicate environmental positioning is left with the brand owner.

Although revolutionary changes could require significant investment and collaboration across the industry, addressing customer and consumer demand will provide business opportunity for companies in the breakfast cereal sector and position them for the future in a changing climate.
Appendix 1

1.0 Study methodology
1.1 Initial research
Initial desktop research was undertaken and collated to identify:
- sources of useful data, resources and expertise;
- marketing intelligence to inform the scope of the study;
- key packaging formats in the sector;
- definitions of good practice; and
- established design approaches to waste reduction.

1.2 Initial ideation
This research informed a creative workshop session that generated an initial draught of concept ideas for the revolutionary category. Over the following week, these ideas were worked up into a set of line-drawing sketches.

In parallel to this work, on going desktop research revealed examples of good practice for the most common packaging formats used in this and analogous market sectors. In the course of this research, images of products were selected to provide examples of good practice for the telephone interview guides.

Further research discovered packaging innovations that address some of the design approaches established in the initial research including innovative closures, portioning solutions, more radical material changes, cube reduction solutions, and alternative approaches to sealing and collation. Again images were sought to represent all of these.

1.3 Development of interview collateral
All of the above were drawn together into a PowerPoint presentation covering incremental, step change and revolutionary approaches and designed to be a focus for a round of telephone interviews each of approximately one hour duration held with stakeholders representing retailers, brands and converters.

1.4 Telephone interviews
The interviews were digitally recorded and all significant contributions regarding each image were transcribed.

1.5 Interview analysis
Basic positive/neutral/negative responses were collated onto a master response sheet to develop a picture of consensus. A second creative workshop was held in which all the responses were discussed and a picture built up of those concepts that had received most favour and in which creative directions the concepts should be taken.

1.6 Concept development and finalisation
The selected concepts were developed further visually and a narrative was developed around each concept, drawing on both the feedback from the interviews and from ongoing contextual research into consumer habits, market drivers etc. The images and the text were presented back to the interviewees who were asked to critique the ideas in question and answer tables contained within the documents.

Alongside this work, the feedback on the incremental approaches was added to the body of knowledge available in the public domain and fed into a matrix for each market sector covering all of the common packaging formats in each sector. These were also presented back to the interviewees for review and to offer them the opportunity to fill in gaps in our knowledge.

All of the responses received have been used to augment the desktop research and incorporated into this report.
Appendix 2

1.0 Legislative drivers - further information on Section 2.1

The European Union framework, **Packaging and Packaging Waste Directive 94/62/EC** was adopted at the end of 1994 and subsequently amended by Directive 2004/12/EC. In the UK, the following two laws have implemented it:

- **Producer Responsibility Obligations (Packaging Waste) Regulations 2008.** Most EU countries have adopted a ‘Green Dot’ system to implement the Directive’s recovery and recycling targets. The UK has taken a ‘shared approach’ where companies in all parts of the supply chain, from raw material suppliers through to retailers take a share of the financial obligation to meet the targets through the PRN system; and
- **Packaging (Essential Requirements) Regulations 2003 (amended 2006).** These Regulations require companies to ensure that their packaging is designed to be fit for purpose and is the minimum weight and volume needed for safety, hygiene and consumer acceptability. The packaging may be reusable and it must be capable of being recovered through at least one of material recycling, incineration with energy recovery or composting and biodegradation.

The Government set out the UK vision for sustainable waste management in **Waste Strategy for England 2007** on 24 May 2007. This sets a new target to reduce the amount of household waste not reused, recycled or composted from 22.3 million tonnes in 2000 to 12.2 million tonnes in 2020, with an interim target of 15.9 million tonnes by 2010. It also sets higher targets for recycling and composting of household waste - at least 40% by 2010, 45% by 2015 and 50% by 2020.

The **Climate Change Act 2008** introduces the world’s first long-term, legally binding framework to tackle the dangers of climate change. It requires a reduction in greenhouse gas emissions of at least 80% by 2050 and 26% by 2020, against a 1990 baseline. In 2009, the government will issue guidance on the way companies should report their greenhouse gas emissions. The act has also given powers to introduce pilot financial incentive schemes in England for household waste.

More details on DEFRA’s Packaging Strategy 2009 can be found at: [http://www.defra.gov.uk/environment/waste/topics/packaging/strategy.htm](http://www.defra.gov.uk/environment/waste/topics/packaging/strategy.htm)
Appendix 3

1.0 Packaging requirements
The following functions need to be met by food packaging, through a combination of primary, secondary and tertiary packaging:

- protect and secure the contents throughout the product lifecycle;
- preserving the product for a defined time period by providing a barrier between the contents and external environment and preventing contamination;
- communicate relevant information to assist in the handing, choice, use and disposal of the product and the packaging41; and
- promote the product.

Packaging itself must not degrade or taint the food.

1.1 Industry stakeholder requirements
Detailed requirements vary in content and importance amongst stakeholders, as illustrated below.

Table 3 Matrix for packaging performance demands across the supply chain42.

<table>
<thead>
<tr>
<th></th>
<th>Quantitative</th>
<th>Qualitative</th>
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</thead>
<tbody>
<tr>
<td>Packaging manufacturer</td>
<td>Cost</td>
<td>Quality of finish</td>
</tr>
<tr>
<td></td>
<td>Volume/Weight</td>
<td>Runnability on machinery</td>
</tr>
<tr>
<td></td>
<td>Size of design</td>
<td>Printability</td>
</tr>
<tr>
<td>Product manufacturer</td>
<td>Modularity</td>
<td>Safety</td>
</tr>
<tr>
<td></td>
<td>Size of design</td>
<td>Hygiene</td>
</tr>
<tr>
<td></td>
<td>Strength</td>
<td>Trackable/traceable</td>
</tr>
<tr>
<td></td>
<td>Cost</td>
<td>Compatibility with filling lines</td>
</tr>
<tr>
<td></td>
<td>Protection (eg barrier properties)</td>
<td>Storage</td>
</tr>
<tr>
<td></td>
<td>Mechanisation (erecting, filling etc)</td>
<td>Market trend</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anti-counterfeit</td>
</tr>
<tr>
<td>Logistics</td>
<td>Volume/weight</td>
<td>Fit on Pallet</td>
</tr>
<tr>
<td></td>
<td>Truckfill/modularity</td>
<td>Protection</td>
</tr>
<tr>
<td></td>
<td>Use of energy</td>
<td>Trackable/traceable</td>
</tr>
<tr>
<td></td>
<td>Space</td>
<td>Handling facility</td>
</tr>
<tr>
<td></td>
<td>Strength</td>
<td>Stacking issues</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>Stacking issues</td>
</tr>
<tr>
<td></td>
<td>Modular/non modular</td>
<td>Collapsing after use</td>
</tr>
<tr>
<td></td>
<td>Protection (eg shelf life)</td>
<td></td>
</tr>
<tr>
<td>Retail shops</td>
<td>Space/size of unit</td>
<td>Ease of opening</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>Ease of disposal</td>
</tr>
<tr>
<td></td>
<td>Modular/non modular</td>
<td>Anti-theft</td>
</tr>
<tr>
<td></td>
<td>Strength</td>
<td>Added value</td>
</tr>
<tr>
<td></td>
<td>Protection (eg shelf life)</td>
<td>Shelf appeal</td>
</tr>
<tr>
<td>Consumer</td>
<td>Size of unit</td>
<td>Hygiene</td>
</tr>
<tr>
<td></td>
<td>Protection (eg shelf life)</td>
<td>Perfect goods delivery</td>
</tr>
<tr>
<td>Waste Manager</td>
<td>Cost</td>
<td>Safety</td>
</tr>
<tr>
<td></td>
<td>Volume</td>
<td>Storage (shape)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hygiene</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perfect goods delivery</td>
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<tr>
<td></td>
<td></td>
<td>Ease of opening/closing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ease of disposal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Legibility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide product info</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quality + homogeneity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Easy access</td>
</tr>
</tbody>
</table>
1.2 Consumer demands
Ultimately, what the consumer values and purchases drives packaging design. These needs vary significantly amongst different consumer segments, resulting in the range of propositions on offer within the category. For example:

<table>
<thead>
<tr>
<th>Table 4 Packaging demand profile by consumer segment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Involuntarily poor</strong> (Lower education level, unemployed, pensioners – low income, price driven buying)</td>
</tr>
<tr>
<td>- Packaging that contributes to low total cost and price</td>
</tr>
<tr>
<td>- Stimulate impulse shopping (add a golden touch to life)</td>
</tr>
<tr>
<td>- Small packages for low cash expenditure</td>
</tr>
<tr>
<td>- Large packages for lower price</td>
</tr>
<tr>
<td><strong>The thrifty</strong> (Students, young employees, educated – low income conscience driven buying)</td>
</tr>
<tr>
<td>- Lean on resources and environmentally adapted</td>
</tr>
<tr>
<td>- Non pre-packed goods sold by weight</td>
</tr>
<tr>
<td>- Small packages for small household needs</td>
</tr>
<tr>
<td>- Large packages for lower price</td>
</tr>
<tr>
<td><strong>The estate car/Nuclear family</strong> (Largest segment, consisting of family units - child driven buying)</td>
</tr>
<tr>
<td>- Value for money</td>
</tr>
<tr>
<td>- Environmentally labelled</td>
</tr>
<tr>
<td>- Convenience</td>
</tr>
<tr>
<td>- Safety and security through branding</td>
</tr>
<tr>
<td><strong>Dinklot/Sinklot</strong> (Double/single income, cash rich, time poor and child free – lifestyle driven buying)</td>
</tr>
<tr>
<td>- Convenience</td>
</tr>
<tr>
<td>- Modern &amp; fashionable design</td>
</tr>
<tr>
<td>- Small packages</td>
</tr>
<tr>
<td>- Insensitive to price for innovative solutions</td>
</tr>
<tr>
<td><strong>The Privileged</strong> (Cash rich, relatively time rich, retired and working – quality driven buying)</td>
</tr>
<tr>
<td>- High quality</td>
</tr>
<tr>
<td>- Non pre-packed goods sold by weight</td>
</tr>
<tr>
<td>- Small packages</td>
</tr>
<tr>
<td>- Insensitive to price for high quality solutions</td>
</tr>
</tbody>
</table>

Many retailers have adopted a ‘Good, Better, Best’ (GBB) approach to product differentiation to give consumers choice according to their budget. In the past, “best” quality products tended to use higher specification packaging to express quality. For example, thicker materials and larger packs for on-shelf impact and multiple layers and material types to enhance the experience. Increasingly, these products use minimal packaging to express authenticity associated with locally sourced and produced foods, straight from the farm, dairy or bakery.

The perception that more packaging delivers an ‘enhanced value added customer experience’ is fast disappearing. Recent research by Mintel suggests that consumers are relying less on visual appeal and more on functional attributes to make purchase decisions. These attributes are identified as:

- **Ease of opening.** Of highest interest to older consumers, but universally appreciated. People seek convenient, practical solutions that require the least disruption to their primary activities and objective;
- **Freshness and preservation.** Consumers want their products to stay fresh, but often don’t understand the role the packaging plays in this process. This can exacerbate perceptions of over-packaging;
- **Honesty, transparency and integrity.** People scrutinise packaging to understand the product and its source, and on-pack information;
- **Recyclability.** The view that all packaging should be recyclable was held by almost three quarters of the Mintel research respondents. However only two in five actually recycle all the food packaging they buy due, Mintel asserts, to confusion about recycling; and
- **Added Value.** People are still looking to “trade up” to products with added value inherent in the product or in the packaging functions.
Appendix 4

1.0  Semiotic guidelines and trends – continued from Section 9.3

1.1  Semiotic guidelines
Currently, ‘green’ messages are whispered rather than shouted in the cereal category, and actively balanced with other messages, such as premium, healthy or pleasurable. These eco and ethical codes are focused on a relatively small niche in the market, with the core and mass market remaining outside of the eco conversation.

Understanding what the consumer sees subconsciously is crucial for creating the right communications – via colour, graphics, materials and form - around packaging to encourage the ‘right’ behaviours. Hence understanding and controlling visual cues can create consumers who are naturally inclined to recycle to migrate towards packing that they can recycle.

1.1.1  Interesting opportunities
- Currently within the cereal category the core market is least touched by ethical coding, typified by its standard format, proportions and semi-gloss sheen.
- Rough carton-board is a key signifier of ethical intentions, but it can be paired with dense rich tones (even black) and bold cut outs as long as the visual and sensory texture remains.
- With limited format and material finish differentiation across the market, graphical treatment and iconography plays a significant role in communicated positioning. For example, Jordans Organic Granola counterbalances the gloss of the compostable bag with its graphics and colour palette.
- ‘Permanence’ can be portrayed in packaging, which suggests quality, whilst ‘temporary’ suggests a low environmental impact. Visual and material qualities can be used to counterbalance these conflicting cues, to achieve the desired overall effect. For example, lightweight packaging can be combined with waxed and rough finishes. Gold communicates eco-premium better than silver, but should be a more natural dull bronzy gold rather than bright gloss – it should also be used sparingly.
- Replicating graphic cues from the original packaging is good, as is using the packaging to communicate an essence of the product’s raw materials – but these do not have to be literal translations and careful use of colour and form can suggest a contemporary take.
- Visual space and simplicity will connote ‘effortlessly ethical’ versus a pack crowded with ethical icons and banners.

1.1.2  Areas to avoid
- Avoid dense, ‘premium solidity’ unless reuse or secondary use is a core message. These materials create a sense of permanence that is counter intuitive to the ideas of degradation or recycling. Consider glosses or visually thick materials only where protection or containment must be communicated. Overtly powerful forms will also struggle to communicate the ethical.
- Authentic earth code should be avoided unless by real local and regional brands or independent labels, as it may appear un-authentic and greenwashed, and does not have significant mass appeal.
- Large expanses of white will be difficult to use in the communication of eco due to their strong connections with clinical, medical and basics.
Figure 48: Semiotic map; pink line shows the ‘push’ of environmental codes. Care needs to be taken not to push too far too soon.
1.1.3 Semiotic codes in the category

**Ethical lifestyle**
- Cartonboard finishes complemented by strong hues and cut outs.
- Breaking the standard box proportions to suggest something a bit outside of the norm.
- Natural, untreated and rougher card. Despite being untreated, they don't have to fall into muted ‘eco’ shades, but instead use deep intense palette and bold cut outs to suggest a more premium quality.
- Colour blocks rather than gradients maintain the ethical balance due to their inferred simplicity.

**Dictated dose**
- Slim boxes complemented by pharmaceutical codes of white with a limited colour palette of blues and greens.
- Surfaces are solid, with wide expanses of mid-sheen finish.

**Whole food invisibility**
- Using visual elements rather than form and finish to create a transparent vessel for storing the ingredients.
- Full bleed shots of content speak through the packaging – evoking storage jars and tubs of the whole food kitchen.
- Proportion of emphasis on product versus label is important - too much label and it moves towards value and bargain codes.

**Authentic earth**
- Bright plastic bags and twist clips communicate authentic, regional speciality and pride. Does what it needs to in the simplest way it can.
- Imagery of the natural world and health food aesthetics and balanced by a mid gauge plastic that avoids being overly low cost or low quality.

**Simple value**
- Lightweight materials and unstructured formats connote bargain simplicity.
- Basic white and single branded bright tie it to cross category ‘value’ codes.
- Light gauge plastic combined with the wet sheen finish implies ‘cheap’ rather than ‘green.’
- The proportion of opaque label to transparent window reinforces the value message.

**Dry goods original**
- These products tie back to cereals as a food source and ingredient via established dry goods codes, such as flour packaging, through the use of paper materials, proportions and muted colours.
- Plastics or waxed bag finishes suggest some containment of ingredients without being permanent.

**Consumer honesty**
- Muted colour palettes and environmental imagery are balanced with semi-gloss materials, moving the ethical intentions into a more mainstream space.
- Graphics use a light-hearted educational style communicated through visual clarity.
- Mixtures of rough and varnished surfaces on a single pack balance the ethical of honesty with the quality of consumer.
- Muted colours suggest more natural processes, while the contrasting deep green dials up luxury as well as the ethical edge.

**Retro relaxed**
- Signifies something of a simpler time, and therefore more authentic and natural.
- The visual textures within the artwork replicate the textures of more natural packaging, such as the visual variations in densities of brown paper.
- The low density of imagery and messaging on pack also begins to communicate the eco through the connotation of simplicity.

**Authentic premium**
- Contemporary codes for luxury and premium quality within authentic waxed paper bags from the past.
- Gold can provide quality reassurance, but used sparingly, and as dull rather than gloss, bright hues.
- Top edges together in a folded seal, ups the premiumisation over the flour bag style packs.

**Premium solidity**
- Thick, carton finishes and solid, stain sheens suggest strength, permanence, and containment - designed for a long lifespan rather than dissolving into the environment.
- Sophisticated white and black combinations push towards premium, whilst innocent style graphic treatments attempt to pull down towards the ethical.

**Premium performance**

Efficient use of resources in breakfast cereal packaging design 45
Pot and pouch formats paired with dense black, captured lacquer and dull gold cue premium performance. The dense glosses of the black have the visual density and glamour of a Chanel compact. Power is suggested through the stature of the pack, proud proportions, thicker gauge film and a more masculine finish.

**Premiumised push**
- Pairing pouches and boxes with matt lustre on luxury hues, these products balance premium with a touch of natural comfort.
- The denseness of the carton connotes power and premium, despite the rougher and more natural surface finishes.

**Simply better**
- Satin off-white prevents the pack from moving into the basic value or scientific codes.
- The cut outs push back towards ethical lifestyle but the density of surface finish keeps its positioning around the premium side of ‘Consumer Core’.

**Compact convenience**
- Deeper, squatter boxes shift the proportions toward convenience products versus the more traditional, but labour or time-intensive variants.
- If too squat and square, the product may be too static and too processed to suggest eco considerations.

**Consumer core**
- Bright hues in combination with semi-gloss sheens suggest playfulness over the seriousness that is seen in other codings.
- These packs use standard proportions, reinforcing that this product is the norm, and will perform as expected – there will be no surprises.

1.2 Trends

**Greenwashing**
- Consumers are becoming increasing aware of “greenwashing” – the suspicion generated around green claims as authentic claims are swallowed up amongst bogus, misleading claims.
- Simply stating your green credentials on pack is no longer enough. Brands must provide reassurance through multiple channels that their statements are true, and not contortions of facts and figures.
- Further strategies to avoid the perception of greenwashing are detailed in ‘Green metrics.’

**Eco-artisan**
- As consumer trends shift towards “real authenticity,” artisan, craft and handmade aesthetics symbolise the care, attention and inherent value placed within an object.
- Artisan is challenging to achieve within the mass market cereal category, with its commodity pricing and ‘everyday’ values.
- Aspects of eco-artisan could be pulled in to the mass market by picking up on small cues and details to suggest authenticity. But care must be taken to not push these too far - inauthentic representations of the authentic turn into greenwashing.

**Carbon negative**
- Carbon negative is the next step beyond carbon neutral, as brands go further to gain the green advantage, with everything from Mexican coffee to the BMW hydrogen-fuelled 7 series claiming to not only offset their damage to the environment, but actually make it better.
- Calculations must be clearly illustrated and communicated to ensure consumers do not suspect greenwashing, and to provide an educational tool.
- Steps in carbon reduction, from lightweighting, to growth of ingredients, power and transportation must be highlighted in explaining the calculations to the consumer.

**Eco-ease**
- A new spin on ethical packaging is selling it as consumer ease. Who needs to fiddle with those clamshells and twist wires when a single brown box will do?
The cereal category is already one of the simplest in terms material use and product access, but could push further, reducing material complexity and costs, making products easier for people to sort and recycle.

**Green metrics**

- As people become more aware of the complexity underlying green issues, they are actively seeking ratings, education, and reassurance that they are buying the best. Examples include the Greenpeace consumer electronics audit, HP's carbon calculators, eco-highlight labels on Walkers crisps, and Tesco's collaboration with the Carbon Trust.
- Within packaging, there is broad confusion as to what is best. Current cultural conversations highlight over-packaging and unrecyclable materials, with carbon footprint rapidly rising on the mass agenda. Food waste is coming on to the consumer radar, but as this rises, needs to ensure clarity for consumer decision making.
- Amongst this confusion, consumers are likely to respond well to products that spell out the facts to them in a most transparent manner. Even if a product might not be best in all aspects, if it can inform and educate the consumer in all areas and with clarity it is likely to be rewarded. Standardised metrics and labelling, like food traffic lights and the On-Pack Recycling Label may help reduce confusion.

**Size matters**

- As consumers become more aware of the need to understand a product's complete ecological footprint, they are taking more complex factors into consideration: from water content to transportation implications.
- Brands are increasingly moving towards smaller and more concentrated product options, which can improve distribution efficiencies. Whilst concentration is not appropriate for the cereal market, even small changes in pack size, proportions and storability will have an amplified effect, due to the rigid traditional pack format.

**Eco-iconic**

- Eco iconic marks the transition from “grungy eco-warrior” to “green as status symbol.” Visually, these products don’t have to shout green; they must merely speak of their stylish difference. From Method cleaning products to Prius hybrids: eco icons are emerging everywhere.
- Dorset Cereals is an interesting example of eco iconic in the cereal market, and there is room in the category for more brands to use design as flags of their purchaser’s green credentials.

**Consider everything**

- As legislation advances and consumers become increasingly aware, there is mounting pressure on companies to consider every part of their process.
- The concept of cradle to cradle is nothing new, but now it is not just about the product. As the Motorola Renew mobile phone shows, we want to know not only where our product came from, but also where it will go at its end of life. And the same for the phone charger, packaging, instructional leaflets, and even the ink they are printed with.
- Consumers are often unaware of all the factors that need to be considered. Companies that lead the way in providing both education and information will be ahead of the game.
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