



Packaging

REDUCTION

Doing more with less



● less energy ● less material ● less waste

INCPEN – the Industry Council for Packaging and the Environment is a research organisation set up in 1974 to study the environmental and social effects of packaging. Its members are international companies that operate throughout the supply chain: raw material suppliers, packaging manufacturers, manufacturers and retailers of packaged goods.

INCPEN works with regulators to help ensure that packaging policy benefits the environment; encourages industry to continuously improve environmental and social aspects of packaging; and informs governments, public interest groups and the media about the role of packaging in society.

The European Union highlights the importance of packaging in its Explanatory Memorandum on the Packaging and Packaging Waste Directive



Packaging plays a very important economic and social role

- *by permitting the safe worldwide transport of products thus enlarging consumer choice*
- *by preserving packed goods in such a way that production and consumption can be matched worldwide*
- *by informing the consumer about the nature of the packed goods and its compliance with legal requirements as well as about health care, price, conservation, use, danger and other useful information*
- *by allowing the portioning of products into the weight and the volume most appropriate to consumer usage*
- *by shaping the product into stackable units so as to ensure optimisation of transport and space use*
- *by allowing the branding of the product in order to assure easy identification by the consumer and to position the product as to price-class, target-group and usage*
- *by facilitating product diversification so as to adapt the product to the different consumer usages*
- *by assuring the most hygienic way to handle and transport the product thus eliminating contamination and illness*
- *by concentrating waste at the packer's plant thus avoiding dissemination at household level.*



Working document (COM 92 278)

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Western consumers buy food and goods when they want them, in good condition and with little wastage. In less developed economies, up to half of all food is spoilt before it reaches consumers. In western Europe and the USA the figure is under 3%.

The difference is largely due to modern distribution and packaging systems – and especially to the wide choice of materials and wide variety of packaging. Manufacturers can now tailor packaging to suit the needs of the product, the transport system, and the consumer. And meet health and safety standards and environmental considerations.

Modern packaging also allows the delivery of goods at a price consumers are willing and able to pay. Contrary to popular thinking, good packaging keeps prices down. It reduces the cost of transport, distribution, storage, retailing and wastage.

Packaging is changing all the time, though often so gradually that we hardly notice. New technology, computer-aided design, new materials, demographic changes and changing consumer needs all fuel this evolution.

This booklet shows a few examples of just one aspect of this never-ending development – the “optimisation” of resources used to make packaging. In other words “doing more with less”.

It is important to note that this does not mean changing from a heavier to a lighter material – weight is not a measure of environmental impact. Used appropriately both “heavy” and “light” packaging materials reduce total waste.

Society has always needed and used packaging. Today’s packaging uses less material and less energy to provide better protection than ever before.



Our store cupboards and fridges contain items our grandparents, even our parents, could only dream of. As well as much greater choice we have fresher foods and higher safety and hygiene standards.



1960s: 2000 product lines in the average grocery



1990s: 15,000 product lines in the average supermarket

While there are many more packaged goods, the amount of packaging used for each pack is much less than it used to be. So much less that the total weight of material used for all packaging today is probably no more than it was 20 years ago.

Some people are concerned about what they perceive as overpackaging; most often on luxury and seasonal products. But this is “gift packaging”, where the outer wrapping or box says almost as much about the product and the giver as the item itself.

Everyday “commodity” products such as milk, meat, cheese, tea, baked beans, flour, detergents, bread, and frozen vegetables are typically packaged in the minimum amount of packaging.

The complete package

Packaging is more than the wrapping or container we see on the supermarket shelf. It is also the box, tray or outer wrapping that protects and groups together products during distribution and the container or pallet that collates the groups into larger loads for transport.



Primary packaging



Grouping packaging



Transport packaging

This, together with the manufacture, filling, distribution, retailing, use and disposal stages is a “packaging system”. A good system is one that uses sufficient resources to make sure products are protected adequately from production to consumption, meets the needs of consumers, and minimises the impact on the environment.

In many instances, manufacturers design primary, grouping and transport packaging from the outset to work together. For example, when soft margarine was first developed for the UK market, the size of its packaging was calculated so that the maximum amount of *product* (ie net of the packaging) fitted into a lorry. This keeps the packaging material to a minimum and helps reduce pollution by reducing the number of lorry journeys required.

Competition reduces packaging and keeps cost down

Manufacturers of packaging compete with each other. They aim to cut costs, improve performance and avoid environmental impacts. Making ten containers rather than five from the same amount of raw materials halves one important cost. Since price is an important influence on manufacturers who buy packaging, this gives a significant advantage.

Using less materials has additional advantages because it usually requires less energy in production and transport and reduces associated pollution.



The tubs fit as tightly as possible into the grouping packaging, which itself fits closely into the transport packaging.

Quantities of household waste per week showing total waste and packaging waste



1970 Department of the Environment estimate



1980 Merseyside survey



1990 Sheffield survey
Warren Spring Laboratory

Packaging minimises waste

Fewer materials *in* to make packaging means less waste *out* when packaging has completed its job. But good packaging also reduces waste in other ways. It protects goods from damage and food from spoiling so we don't have to throw them away. It also allows concentration of waste at food processing plants. When we pluck a chicken at home the feathers are waste and go into the dustbin. When a plant is processing thousands of chickens a day the feathers are a valuable by-product.

Studies have shown that a typical Mexican household generates 40% more waste than the average household in the USA. In Mexico much food preparation takes place at home and the trimmings go to waste. In the USA, where food processing is widespread, food manufacturers use trimmings, peels and so on as fuel, animal feed or in other products.

A survey of household waste in a number of countries by the US Chamber of Commerce shows that a 1% increase in packaging produces a 1.6% decrease in food waste.

Generally, though, there is little information available about what we throw away. But what we do have appears to contradict the general feeling that there is now more packaging waste than in the past. The weight of used packaging in household waste in the UK has stayed constant, possibly even gone down, over the last 20 years.

Though there are no exact figures, experience suggests that the volume of packaging in the dustbin has gone up. This means collection lorries may fill up more quickly, but probably does not make a difference in landfill because much modern packaging is thin and squashes down easily. After a short time in a landfill site it is usually completely flattened.

By volume and weight packaging from all sources is around 7% of total landfilled waste and in this context is not a major waste disposal problem. Even so, manufacturers place an increasing emphasis on reducing the amount of packaging going to waste. They do this by cutting the amount of materials used and, where appropriate, by recovering used packaging.

Modern technology helps reduce packaging and product waste

Bulk distribution

It is sometimes possible to do without packaging completely. Bulk delivery is one of the best ways to improve resource efficiency. Many industrial products and basic food ingredients are now delivered in bulk. For example, manufacturers used to deliver the granules used to make plastics in sacks on pallets. Now they use bulk tankers.

However, it is impossible to deliver many products to the consumer without some form of primary packaging – the container in which the shopper takes the product home. Drinks, jam, biscuits, and shoe polish are obvious examples. These products and thousands like them also need grouping and transport packaging during storage and distribution.



Pre-packed and “loose” products

A large number of consumer products are sold “loose”, without any primary packaging (although they still need some form of grouping and transport packaging). Most supermarkets offer the choice of pre-packed or loose fruit, vegetables, fish, meat, cheese and delicatessen foods. The products sold loose are the usually packaged in some way, either by the consumers themselves using the bags provided or by the shop staff.



Consumer choice: “loose”



Consumer choice: pre-packed

Pre-packed foods tend to be more expensive. Why? Usually to cover the labour costs involved in selecting and packaging the items. However, there is a positive trade-off. Generally the products last longer and suffer less damage from handling. Soft fruit in particular is often only available in pre-packed form because handling of loose fruit would cause too much bruising and wastage.



“loose”



pre-packed

In the last decade a more sophisticated type of pre-packaging has been introduced. Controlled or modified atmosphere packaging has contributed to a huge reduction in wastage of fresh product in stores – and at home. It is typically used for fresh meat, fish and salads. For meat cuts, for example, the packaging is usually a clear plastic pack which can appear “excessive” because it must provide enough room for the modified atmosphere. But that atmosphere means that the food does not “go off” as quickly as it otherwise would.



Controlled atmosphere packaging means less food wastage in stores and at home

Before pre-packing, stores wrapped meat and then often had to re-wrap it after trimming off the dried outside – wasting as much as 25% to 30% of the meat. Modified atmosphere packaging avoids this wastage.



Mixed salads provide variety

An increasingly popular product is mixed salad leaves packed in a bag that allows the product to continue to “breathe”. It gives variety without having to buy much larger quantities of different kinds of salad.

Refill systems

A number of countries use returnable and refillable containers for some products. In Germany, for example, consumers predominantly buy beer in refillable bottles sold by the crate. Doorstep delivery of milk is still available in the UK and in France some wines are sold in refillables.

Refillables appear to offer environmental benefits. However, they require more resources in their manufacture and distribution to enable them to withstand the rigours of being used a number of times. This initial extra use of energy and resources can be offset by re-use of the container, but only in local distribution networks.

In a returnable system the resource and financial cost of collection, washing and refilling should be less than producing a new container if there is to be any benefit. In many instances, non-refillable containers have less environmental impact.



Return rates for some products have declined over the years, but consumers have welcomed a new kind of refill system – refilling at home. One of the most dramatic developments in retailing in recent years has been the reduction in packaging size of detergents and fabric conditioners. New technological developments have allowed these products to be produced in a concentrated form. This results in less packaging per “dose” of product. It makes transport more efficient and means better use of storage space in warehouses, supermarkets and at home.

Clean sweep: Concentrates and refills now dominate the detergent market

In addition, shops now retail these products in two very different types of containers: one strong and robust, the other lightweight – and typically saving over 70% of materials. Consumers buy one strong container to keep at home and refill this from subsequent purchases of the lightweight container.

This is not a new idea. We have handled biscuits, dried herbs and ground coffee in this way for years but it may now be tried in other new product areas.

Bigger sizes

Large containers are another way to reduce the ratio of packaging to product.



Large sizes

This suits consumers who have a large family, plenty of storage space and who can afford to buy a large quantity at one time. However, demographic trends suggest the need to move in the opposite direction as well. Increased life expectancy, higher divorce rates and other influences mean that more people live alone or in households of only two people. They tend to need smaller portions. As in many other areas, the variety of packaging types available should be able to meet both needs.



Choice of size

Changing shape

Changing the shape of a container can reduce environmental impact by making better use of space during distribution and even on the shop shelf. For example, Sainsbury's has re-designed its 2 litre plastic drinks bottle to make it taller and thinner. It still uses the same amount of material but 25% more bottles fit on a pallet, which in turn means fewer lorries are needed to deliver the product.



Space saving taller, thinner bottle

Packaging reduction continues

If the makers of packaging can go on reducing the amounts of materials used, why have they not done so before? And doesn't it mean that in the past products have been over-packaged? It is true that many products are now packaged in less material but each reduction is only possible when a new development is made in materials and packaging technology.

In addition to complying with the law in areas such as health and safety and labelling, packaging is designed to meet a range of other requirements, such as:

- product protection
- food preservation
- filling speeds
- shelf-life
- stacking ability
- tamper-evidence
- environmental impact
- product information
- ease of storage in distribution, sale and at home
- ease of use
- ease of opening and reclosure

As these requirements change, manufacturers respond by finding the best form of packaging for each situation, within accepted guidelines.*



Heavy ceramic jar

Sometimes more packaging is needed. For example, a few years ago, when the use of preservatives was reduced in some products, the packaging had to be increased to provide additional protection to ensure a sufficient shelf-life. Similarly there is an increasing demand for tamper-evident features which usually mean the use of an additional piece of packaging.

Packaging reduction should not be enforced. It would reduce the ability of manufacturers to respond to differing needs and demographic changes – over which they have no control. These in turn would reduce the environmental gains achieved by tailoring packaging to use minimal resources and would stagnate development.

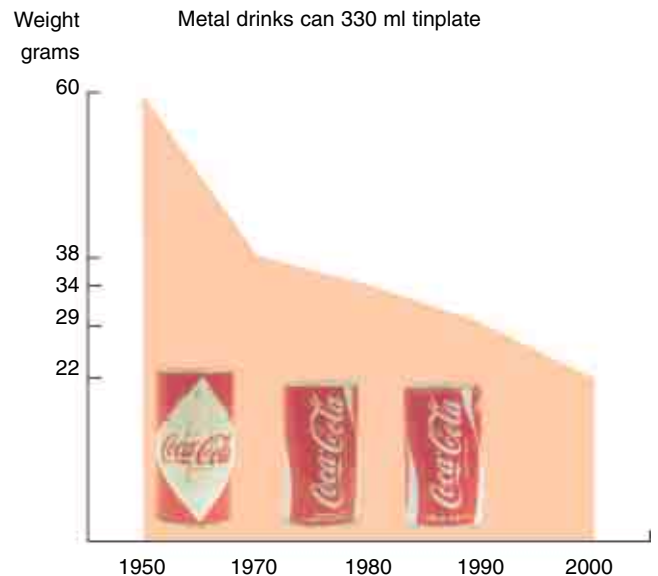
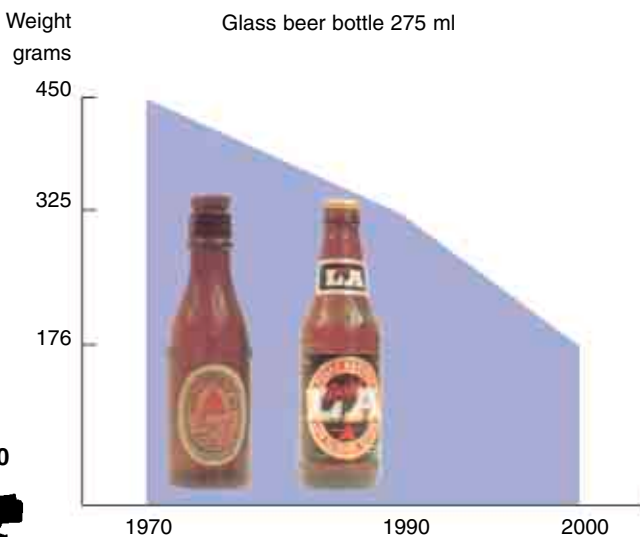
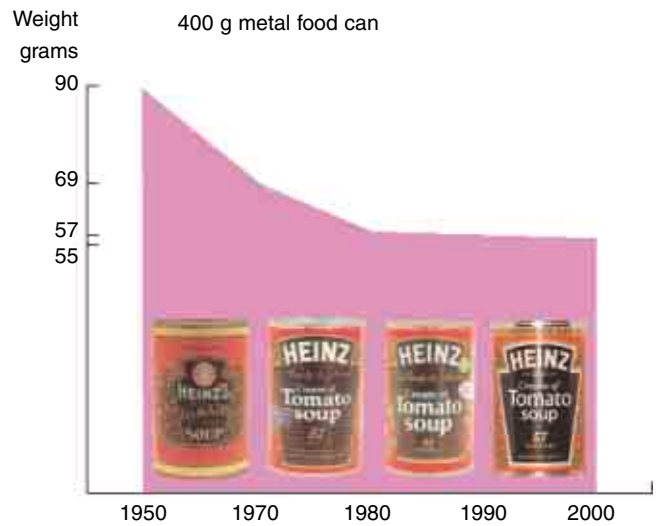
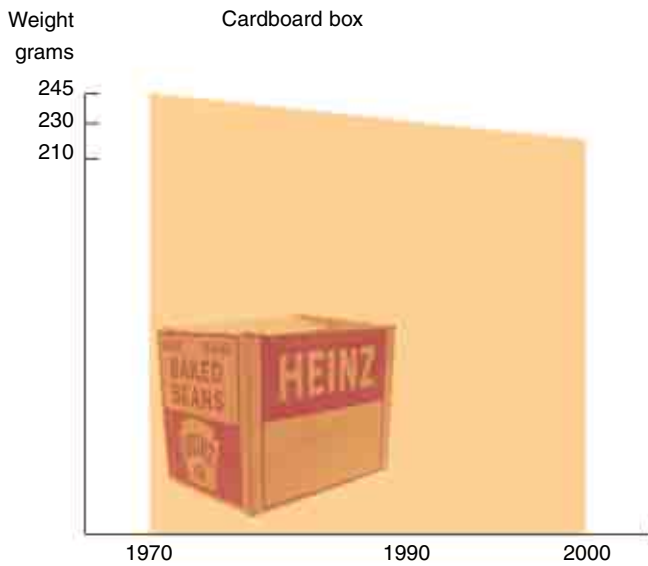
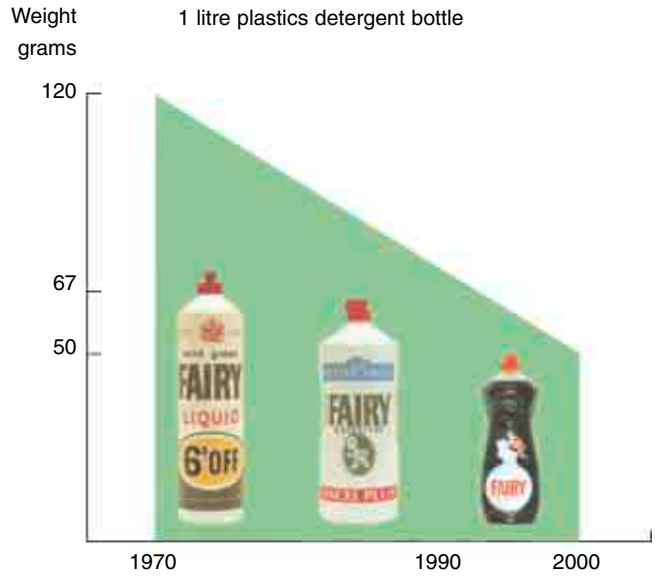
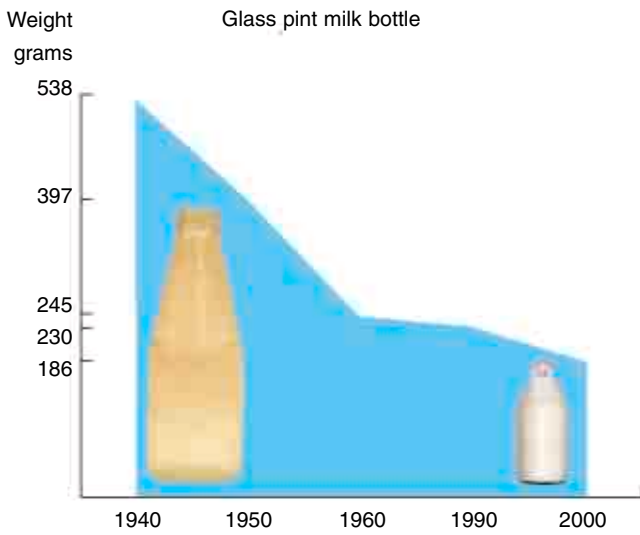
Some changes are easily noticed, such as the change from ceramic to glass jam jars. However, most changes are small incremental steps that become significant over time.



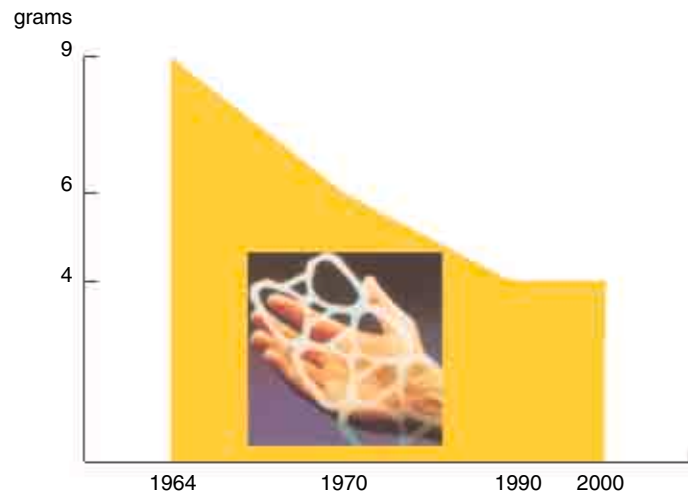
Light glass jar

* For more details see the Responsible Packaging Code of Practice. Available in the publications section of the INCPEN website www.incpen.org or as a hard copy from INCPEN.

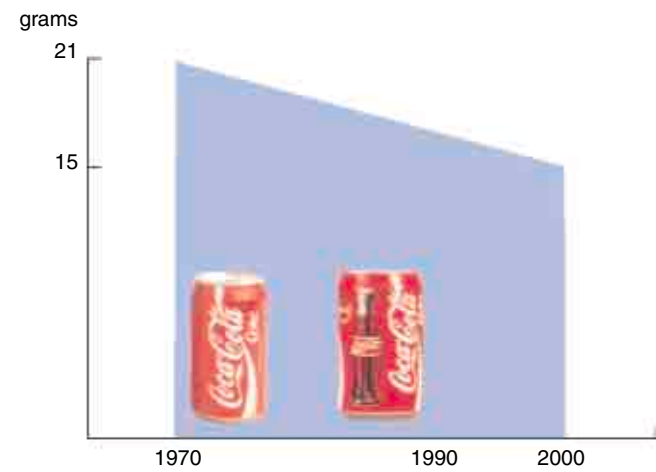
Progress in packaging reduction over the years



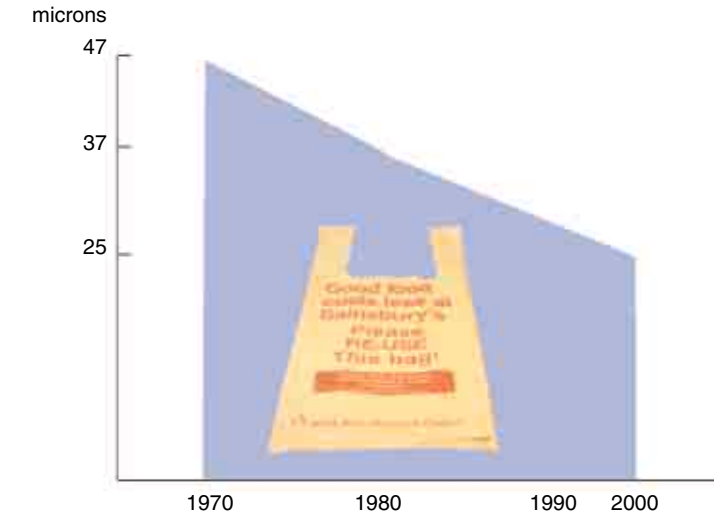
Plastics rings for grouping 6 cans together



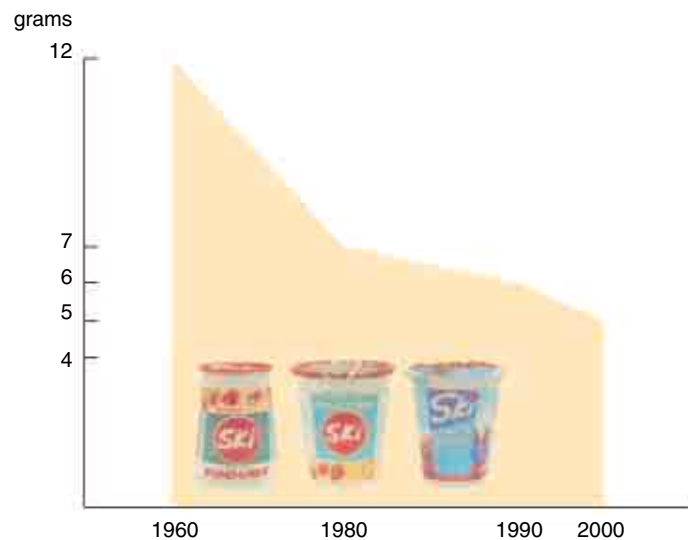
Metal drinks can 330 ml aluminium



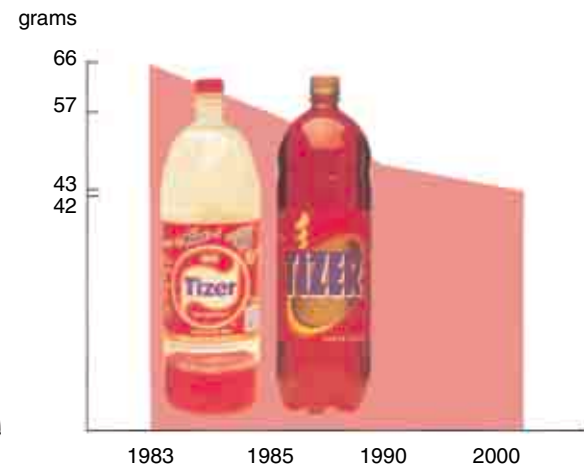
Plastic carrier bags



Plastic yoghurt pot 165 gms



2 litre PET soft drinks bottle



Progress in packaging reduction over the years

Predicting future trends in packaging reduction is not easy. Packaging manufacturers are understandably reluctant to reveal what is commercially sensitive information. Also the effects of future developments in technology are not known.

However, it can be useful to look to the past and present to see what has already happened and it is reasonable to assume that similar developments will continue.

The companies that provided examples for this booklet see packaging reduction as a continuous process aided all the time by developments in packaging technology and packaging design.

Whether it is a glass bottle, a cardboard box, plastics container or metal can, **all types of packaging materials have evolved to contain the same volume of goods with less weight of material.** Within the industry, this development is known as “source reduction” or “lightweighting”.

Toothpaste

Toothpaste used to be packed in metal tubes which were packed in board cartons to prevent the sharp ends denting or puncturing other tubes during transit. The cartons were grouped together in large cardboard boxes.

Technical innovations then led to tubes made from layers of plastic, metal foil and paper. The foil was still needed to retain the volatile oils used in flavouring and to allow the tube to be rolled up as it was used.

Further developments led to tubes made from a “sandwich” of different plastics. Their combined “barrier properties” can retain the flavouring. In many cases the top of the tube has now been made larger to allow it to stand on its head and the tubes are displayed on shelves in a notched plastic tray.

This system was first introduced in Canada where it won an award for its overall 30% reduction in materials. It is now being used in the UK.



Plastic tubes on head



Kaliber non-alcoholic beer
Technology has led to a gradual reduction in materials used for glass bottles. Over the last few years, the weight of the 330ml bottles used for alcohol-free lager Kaliber has gone down by 19%, from 236 grams to 190 grams.

Kaliber bottle – 19% reduction



Before



After – 28% less material

Aquarian fish food

The closure has been changed from an aluminium “complete aperture” ring-pull end weighing 6.7 grams to a lightweight aluminium film weighing 1.2 grams. The sides of the pot are also thinner. Overall the weight of the pack has been reduced by 28%.

Display trays for Boots sandwiches

Ready-prepared sandwiches have traditionally been delivered to shops in cardboard boxes. The wrapped sandwiches are removed from the box and stacked in the chill cabinet.

Boots have now introduced a system of PVC trays, ready stacked with sandwiches, that are placed directly in the chill cabinet with no need for re-stacking. The trays are reusable and on average each makes 4 journeys, saving over 200 tonnes of packaging each year.

Boots is now considering similar schemes for other products.



Reusable sandwich tray

Outspan orange juice

Over the last 10 years, the carton board for long-life products has become 16% lighter, over the last 30 years the aluminium foil layer 30% thinner and at the same time the stiffness of the board has increased by 20%.



16% light carton



31% weight reduction

Tomato ketchup

In the last 12 months, the glass bottle has been reduced by 31%.



17% less board, 4% less primary packaging

Kit Kat chocolate bar

In the last 12 months both the display box and the primary packaging for Kit Kat bars has been reduced. The board for the display box has been reduced by 17% and the “flowpack film” for the bar itself reduced by 4% by using less material in the back seal.

Potato crisps

The pack is made from layers of different materials which together provide the exact “barrier properties” to keep the crisps in good condition but use only a very small amount of each material. The pack has recently been further reduced by making the outer paper layer 25% thinner.



25% thinner outer layer



Glass-lidded "tin"

Biscuits

The packaging for biscuits has undergone many changes over the years. All biscuits used to be sold loose and even in the 1950s many were still sold from large glass-lidded "tins". They were also available – and still are – packaged in beautifully printed "tins" which are then used for storage at home.

The first "roll wrap" packaging consisted of a corrugated paper inner and waxed paper outer wrapping with two end labels. This went through a number of changes from the printed parchment with Cellophane film to polypropylene and metalised films.



Old "roll-wrap" with end labels

In the past few years an opaque film has been introduced. It still looks metalised but the shiny effect is achieved because the film is full of tiny bubbles that reflect light. This development has also led to a 19% weight reduction.

Recent "roll-wraps" have also been made easier to open with the addition of tear-strips.



Modern "roll-wraps"

Today a typical 400 gram packet of biscuits is wrapped in just 2 grams of packaging. To keep them fresh these are normally transferred into a "tin" at home.



Decorated steel package

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Frozen vegetables

A bag made from a single type of plastic has been replaced by one made from layers of 3 different types. The new bag provides better protection and uses 23% less material.

23% less material

Coffee

The 100 gram glass jar for Nescafé instant coffee has recently been reduced by 15%.



15% weight reduction

Baby wipes

Boots has recently introduced a “refill pack” for both the flat pack (illustrated) and a canister pack of baby wipes. The refill pack uses 80% less material than the refillable parent pack.

80% material saving





1970s

Kitekat cat food

There are many different methods of making cans. Before the 1970s all cans were made from 3 separate pieces of metal – two ends and a soldered body. The “2 piece can” was then developed – the bottom and sides are made as one piece and the top added – using 15% less material.

The quality of the metal has also been steadily improved so the cans can be made thinner and lighter. In addition, handling conditions have improved, for example more racks are used for stacking and this has allowed further weight reduction because cans do not have to be as strong.



1990s – 20% saving

Prepared fish

This sort of product used to be packed in plastic trays with a separate lid and a film overwrap. The trays and lids were sent from the packaging manufacturer to the food manufacturer who had to store them until needed – and obviously the trays and lids themselves had to be packaged for distribution and storage.



On-site production reduces packaging

Now with a thermoforming machine and a roll of plastic film, the food manufacturer makes the packaging on site. This uses much less material and removes the need for transport of the empty packs and expensive storage space.

Evaporated milk – 6oz can

Food cans also continue to get lighter. This can has been reduced by 12% in the last year.



12% weight reduction

This page shows 3 new packs that are currently under development but not yet in the marketplace.

Egg carton

Even the humble egg carton can be reduced. A foamed polystyrene 12 egg carton in the 1980s weighed 20 grams. It is now 18 grams and is available made with recycled material.



Egg carton

Collapsible bottle

50% lighter than equivalent bottles used for products such as household chemicals and personal care products, this bottle also folds flat for easier handling when empty.



Collapsible bottle

“Ultimate” can

New technology has produced a 330ml steel drinks can weighing 30% of that typically sold in the UK. Commercial trials are in progress.



Lighter can

And it doesn't stop here

This is a tiny snapshot of developments. Progress has been impressive and in some areas packaging will not reduce much further until new developments in technology or new materials trigger it. In any case, take lightweighting too far and more breakages and spoilage will result.

Neither should progress be measured only in terms of weight. The trade-offs that have to be made between function, environmental concerns, consumer needs and cost, mean there will always be a need for the widest possible range of types of packaging materials – from the heaviest to the lightest. Both have pros and cons. For example, heavier packs are more easily collected for recycling; investment in resources for collecting lighter packs for materials recycling often cannot be justified. On the other hand, lighter packs have environmental advantages in areas such as reducing the number of lorries on the roads.

Manufacturers are always seeking the right balance of product and packaging design to fit the manufacturing process, the machinery, the distribution system, environmental concerns and not least consumers' needs.

In general, packaging saves far more resources than it uses, by preventing products from being damaged or spoiled. After use, some packaging can be refilled at home or returned for refilling. Other packaging can be recovered for re-use as materials or energy. In all European Union countries over 50% of used packaging is recovered. There are also many examples of packaging made from recycled materials.

All packaging can be handled safely in modern controlled waste management systems. Whether it has been recovered or not, the vast majority of today's packaging is environmentally responsible and benefits the consumer and the economy – and manufacturers are continually seeking to make it better.





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