Wrapping Up

Contents

1 THE FUNCTIONS OF PACKAGING

Packaging is essential for soft drinks, bottled waters and fruit juices to ensure that all these products reach the consumer in the best possible condition.

The functions of packaging are to:

A Contain	- the correct quantity of product and prevent leakage
B Protect	- from contamination - from atmosphere and sunlight - from pilferage - from damage - the consumer from the product
C Identify	- to the distribution system - to the retailer and consumer - legally required declarations e.g. contents, ingredients, hazards - date marking - production information e.g. plant, shift, batch
D Sell	- to retailers - distribution compatibility - production compatibility - consumer acceptability

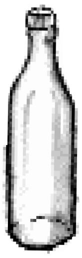
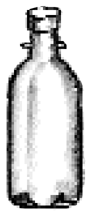
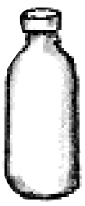
We must also consider:

E Environment	- returnable - recyclable - use of recycled materials - proper disposal
F Cost	- package price - package handling - equipment compatibility - line efficiency - secondary packaging - security - distribution efficiency - disposal or reclamation

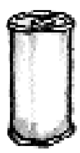
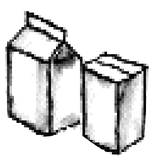
The type of packaging chosen for soft drink products is influenced by:

- the type of drink
- how much of the drink is to be consumed
- where it is to be sold
- how it is to be consumed
- product identity and image

2 TYPES OF PACKAGING

Type of container	Attributes	Disadvantages
GLASS 	• Chemically inert – will not affect quality, odour or taste of product • Available in a number of colours and clear – product visible • Strong and rigid – can be run efficiently on high speed lines • Retains carbonation well • Long shelf-life • Resealable • 100% recyclable • Recycling collection schemes in operation for many years • Re-useable (returnable) • Perceived as high quality • General quality appearance	• Heavy despite lightweighting developments • Breakable and fragile • Special care needed in handling at all stages of production and during consumer use • Rigidity increases potential for product damage in the event of an impact • Expensive
PLASTIC a) PET (Polyethylene terephthalate) 1 PETE 	• Lightweight • Available in a number of colours and clear – product visible • Flexible • Resealable • Can be used for still and carbonated products • 90% recyclable • More resistant to light, humidity and impacts • Compactable • Shatter-proof • Space efficient	• Expensive • Two-step production process • Non-rigidity • Eventual loss or reduction in carbonation • Shorter shelf-life than glass
b) PVC (Polyvinyl chloride) 3 V 	• Chemically inert – will not affect quality, odour or taste of product • One-step production process • Low cost • 50–60% recyclable • Lightweight • Available clear – product visible • Rigidity • Resealable • Shatter-proof • Space efficient	• Can only be used for still or low carbonation products (if biorientated) • Not compactable • Less resistant to light, humidity and impacts • Shorter shelf-life than glass • Translucent • Increased potential for elevated total viable counts (TVCs re waters)
c) HDPE (High density polyethylene) 2 HDPE 	• Flexible rigidity • 100% recyclable • Resealable • Lightweight • Shatter-proof • Low cost	• Translucent – reduces product visibility • Only suitable for still products • Not compactable • May affect taste/smell • Poor gas barrier

Wrapping Up

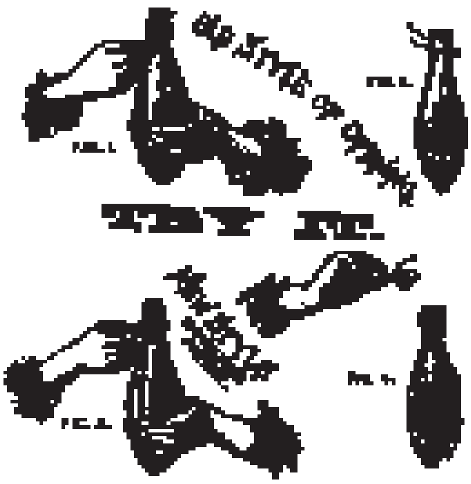
Type of container	Attributes	Disadvantages
d) Cups (Polystyrene and polyethylene) 	• Lightweight • Easily handled • Low cost • Flexible • Shatter-proof • Compactable • 100% recyclable	• Only suitable for still products • Translucent – reduces product visibility • Fragile
e) Pouches (Low Density Polyethylene) 	• Lightweight • Compactable • Flexible • Shatter-proof • Low cost	• Only suitable for still products • Product hidden – packaging is usually opaque, although clear now available • Usually a laminate
CANS a) Aluminium 	• 100% recyclable • Lightweight • Holds carbonation well • Easily handled • Can be run very efficiently on high speed lines • Compactable • Flexible rigidity • Recycling collection schemes in operation for many years	• Product hidden – packaging is opaque • Opaque containers do not let in light which may affect the flavour of the product • Shorter shelf-life than glass • Expensive plant required • Not resealable
b) Steel 	• 100% recyclable • Holds carbonation well • Easily handled • Recycling collection schemes in operation for many years • Can be run very efficiently on high speed lines • Compactable • Flexible rigidity	• Product hidden – packaging is opaque • Shorter shelf-life than glass • Expensive plant required • Not resealable
PAPER CARTONS 	• Low cost • Recycling collection schemes in operation for many years • Lightweight • Space efficient • 100% recyclable • Compactable • Shatter-proof • Opaque container protects product from light	• Currently only suitable for still products but new 'paper can' in development • Non-rigidity increases potential for product damage in the event of an impact • Product is hidden – packaging opaque • Usually a laminate

Adapted from Chemistry and Technology of Soft Drinks and Fruit Juices, 1998

2.1 Glass bottles

Glass bottles are the longest established type of packaging for soft drinks, fruit juices and waters. Glass was first produced in ancient Egypt. Glass bottles have been used for wine and water from medieval times. Spa exported carbonated mineral water in glass bottles with corks from the 16th century onwards. The corks were covered with goatskin or pigskin but even so the water could only be kept for about three weeks without losing its carbonation.

Glass is made by melting mixtures of various inorganic substances and then cooling the melt. The largest component of glass is silica sand (50%) followed by crushed glass (cullet – 20%), soda ash (14%) and limestone (11%). The crushed glass is taken from containers that have been rejected at their inspection stage, or returnable containers that have exceeded their useful life or have been collected from bottle banks.



The first commercial ‘soft drinks’ containers were egg shaped. The egg-shaped glass bottle may have been devised by Nicholas Paul, partner to Jacob Schweppe. The molten glass was taken on a blowing tube, placed into a mould and blown by hand to fit the shape. The egg-shaped bottles remained popular until the turn of the century and were still in use until 1916. The crown cork was invented in 1892 and was used on glass bottles.

The modern split bottle started in the 1920s and is still in use today. The lightweight quarter-litre, non-returnable bottle was introduced in the 1970s.

The improvements in bottle manufacture that allowed the introduction of the lightweight bottle were:

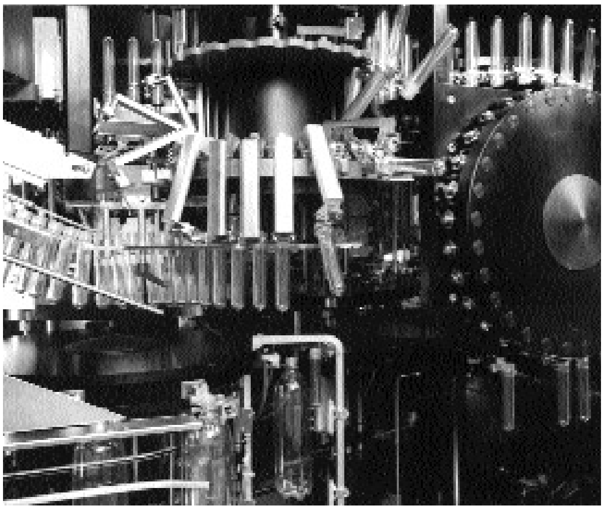
1. Bottle shapes became more spherical: the strongest structure in glass is a sphere.
2. Reduced glass defects.
3. Rounded heel: the weakest point in a glass bottle is the sharp angle joining side of the base.
4. Stippling on the load bearing surface (the bottom) avoids excessive wear on the base.
5. Glass distribution: press and blow allows more controllable thickness of walls, shoulder and base.
6. Surface strengthening: the strength of glass lies in its skin. Chemicals used nowadays increase the surface strength.
7. Plastic sleeves: protect surface of the bottle.
8. Lubrication: sprays at the cold end lubricate the bottle and reduce scuffing.

2.2 Plastic

2.2.1 PET

Polyethylene terephthalate (PET) is a polymer consisting of alternate units of ethylene glycol (a clear, colourless, syrupy, soluble liquid substance) and terephthalic acid (a white, crystalline, water insoluble, carboxylic acid). PET is produced as granules and bottle making is a two-stage process. The preform is produced by high pressure injection moulding at temperatures of about 275ºC. The mould is cooled with chilled water which solidifies the PET. The finish is produced very accurately in this injection mould. The bottle is produced by reheating the preform to about 90ºC and stretching it into shape in the bottle mould. The preform is stretched length-wise with a metal rod and then stretched sideways using air pressure. The bottles can be produced on site at the bottling plant saving on transport and storage costs.

The first PET bottles had a hemispherical base for strength. A separate base cup was glued on to the base so that the bottle could stand upright. Later, moulds were made which had a number of feet set into the base, so base cups were no longer required. PET is not a perfect gas barrier, though much better than polyvinyl chloride (PVC). Carbonated drinks lose carbon dioxide which permeates through the PET walls over a period of time. Depending on the conditions of storage, the loss of carbonation is about 15% over 90 days. The smaller the bottle the greater the ratio of surface wall to volume, hence, the greater the carbonation loss. Bottles of 250 ml have a very short shelf-life.



Injection moulding PET bottles

Returnable PET bottles are now in use in some countries where there is a returnable distribution system. The PET polymer is stronger and the bottles heavier so that they can stand up to multiple trips and repeat wash cycles. The washer conditions must be carefully controlled with reduced alkalinity and temperature. Plastic is more likely to absorb odours and contaminants than glass, so special gas-chromatographic sniffers are installed on the line to check all bottles before they are refilled. Even so, bottles used for lemonade are never used for cola.

2.2.2 PVC

Polyvinyl chloride (PVC) is derived from common salt and oil. It has been in wide commercial use for over 50 years. Six percent of PVC production is used for bottles containing a wide variety of products including bottled waters and dilutable drinks. PVC bottles can be supplied blown or be blow-moulded on site, reducing transport and storage costs. Stretch blow moulded bottles and bottles made using recycled PVC (c.25%) as opposed to 100% virgin powder are strongest. The process of bottle making generates ‘tops and tails’ which are reground and added – factory returns – but are not classed as recycled material. PVC can be moulded into more interesting shapes than can PET but is not as resistant to impacts. PVC can also feature cut through handles because of its extrusion blow moulding process as opposed to the injection-stretch blow moulding process utilised in PET bottle production. It is not generally used for carbonated soft drinks but is popular for dilutable drinks and bottled waters.

PET bottles

2.2.3 HDPE

High density polyethylene (HDPE) containers are used mainly for milk with some used for juice drinks or fruit juice although they are also utilised for bottled waters (in some countries). If used for juice the product must be chilled, as the HDPE resistance to oxygen diffusion is low and oxygen quickly spoils the flavour of juices. Hence, short-life products often use HDPE.

HDPE bottles are produced by extrusion blow techniques and can be made with a through handle to make the bottle easier to grip. The bottles are flexible and do not shatter when dropped.

2.2.4 Cups

Plastic cups with plastic lidding pierced with a straw to drink from are another popular way to package still drinks. The plastic cups are made of two layers, polystyrene and polyethylene, which minimises the deterioration of the drink over a shelf-life of approximately nine months.

Manufacturing these drinks is one process only, called a Form, Fill, Seal, process. The plastic for the cups is fed into the machine as flat plastic sheets, heated and then moulded into the desired cup shape normally round or square. The cup is then filled with a flavoured drink and the lid is sealed to the cup by means of heat and pressure. The web is then cut into individual cups or groups of six. It is an economical process and once the product has been consumed the carton can be flattened easily to reduce waste volume. Flavoured drinks manufactured in this way can be stored at ambient temperatures. Cups are often used for children's drinks.

2.2.5 Pouches

These packs offer new opportunities for many still drinks. The main material is metalised PET laminated to aluminium foil. Low density polyethene (LDPE) is used as the sealing medium. A free-standing pouch is used for one trip usage. This has a straw piercing as a specially formed area of the pouch. In Europe, re-sealable pouches have been developed based on developments in Asia. This is possible because an injection moulded neck is sealed into the top portion of the pack. The pouch is made from four pieces of film joined at the edge. They are popular for sports and children's drinks.

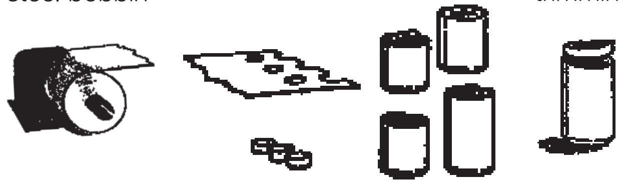
2.3 Cans

The original beverage can was the three-piece tinplated steel can used for packaging foods for many years. The cylindrical wall was made by curling a rectangular piece of metal, hooking the edges together and then soldering them to give a thermetic (airtight) seal. The cylinder had the base seamed on to one end. These cans were then shipped to the filling plant, filled and a second end seamed on to the top.

The consumer needed a piercing tool to make a hole in the end through which the contents could be dispersed. This was a considerable drawback and limited the popularity of the can as a beverage container.

In the early 1960s the easy open aluminium end was invented and the popularity of the can improved. The three-piece can has now been replaced by the two-piece 'drawn and wall ironed' (DWI) can. The bottom and sides are made from a single disc of metal and they can be made both in steel and aluminium.

1 Feeding the steel bobbin | 2 Punching | 3 Stretching | 4 Edge trimming



Cans are made of tin-coated low-carbon steel or a special aluminium alloy. After the cans are formed they are decorated on the outside and lacquered internally.

5 Lacquering the base | 6 Applying the first coat of lacquer | 7 Drying

The lacquer may be solvent or water based and one or two coats may be sprayed on with each coat being dried by passing through a curing oven. The lacquer prevents direct contact between the metal of the can and the beverage, which may be corrosive. The importance of achieving a continuous pinhole-free internal coating is paramount.

The first easy-open end was the ring-pull. The end is partially scored round the opening and a rivet formed at the centre. The ring pull is then attached to the rivet so that when it is pulled upwards the can end tears around the opening, which comes away with the ring pull. It has now been discarded in place of the stay-on tab because of concern about thoughtlessly discarded tabs contributing to litter. The stay-on tab is designed to tear open the can without becoming detached.

Both these types of opening can only be made with aluminium. The steel makers have now designed an easy-open push-button end in steel. Two circular tabs are formed in the end which can

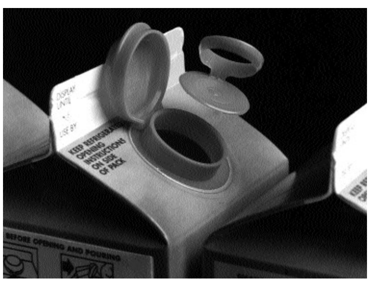
be pushed in by the consumer. The larger tab is to disperse the beverage and the smaller opening is there to vent the head-space gas pressure.

2.4 Paper cartons

Laminated board cartons have been available and used for liquid products for around 60 years. Developed from the dairy market, they are now a major packaging format for still drinks and fruit juices. Some products are dominated by single-serve cartons whilst others favour the multi-serve version. The aseptic technology often attached to these systems has resulted in longer shelf-lives for many perishable liquids. Aseptic cartons bring significant benefits to the soft drinks sector because they can be stored and distributed without refrigeration, they keep for a long time without preservatives and the product quality remains consistently high.

The basic material for cartons is paper. To contain a liquid, a carton must be coated with an impervious layer such as polyethylene. The paper board must be made in such a way and be of sufficient thickness to have the strength to maintain the shape of the container.

Paper is made from wood which is received at the pulp mill in the form of logs. It can be processed either mechanically or chemically. Pulp invariably contains colour, mostly from the residual lignin (a polymer which occurs in some plant cells helping to make the plant rigid). In order to obtain white paper the lignin must be removed or bleached. Additives are incorporated into the pulp, such as fillers (e.g. china clay), which increase the yield and improve the surface for printing. Up to 30% may be added. Other additives can further improve printability, wet strength and dry strength.



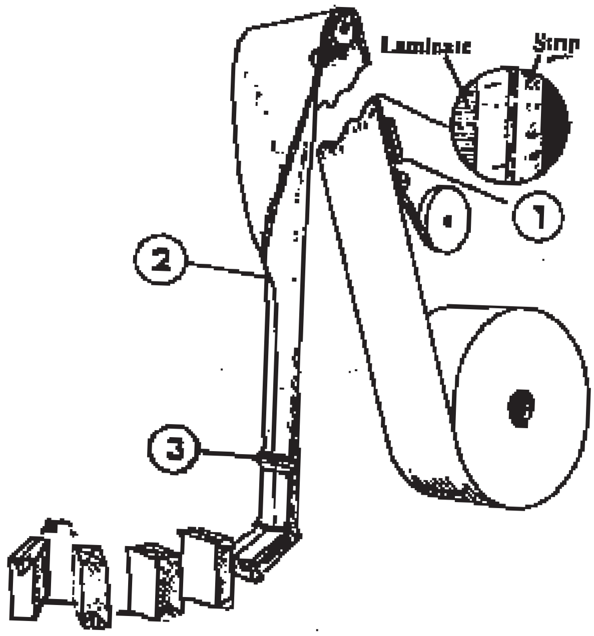
The simplest carton is the original gable-top design in which the paperboard is coated on both sides with polyethylene. The product, a soft drink or fruit juice, may be flash-pasteurised beforehand but the filling is not aseptic so the soft drink would require a preservative and a fruit juice must be stored under chilled conditions at about 6ºC. Even so the fruit juice will only have a shelf-life of 7–10 days because there is a high rate of penetration of oxygen through the paper and polyethylene laminates. Increased shelf-life up to 4–5 weeks is obtained if the carton includes a layer of aluminium foil which prevents oxygen permeation.

The laminate layers are present to fulfil certain functions:

1. EXTERNAL PLASTIC LAYER (E) – to protect the print and enable seals to be made
2. PRINTED DESIGN (D)
3. PAPER BOARD (PB) – gives rigidity to the finished carton and gives a surface for printing
4. LAMINATING PLASTIC LAYER (L) – used to hold the aluminium foil on to the paper board
5. ALUMINIUM FOIL (A) – to impart light and gas barrier properties to the carton which will help to prolong shelf-life
6. INTERNAL PLASTIC LAYER (I) – to prevent product coming into direct contact with the aluminium foil and to help with making the seals. For juice products an additional adhesive layer is needed so internal coating is a special polymer layer.

The most popular way of packaging fruit juices and soft drinks in cartons is with aseptic filling. With no microbiological problems and no permeation of oxygen, such packs will retain their acceptable quality for several months even when stored at ambient (room) temperatures. This principle has become synonymous with the name ‘Tetra Pak’ in much the same way as vacuum cleaners have with ‘Hoover’.

Aseptic cartons are formed by the Carton Aseptic filling machine from reels of laminated material.



1 Strip of plastic applied to one edge of the laminate
2 Laminate formed into tube (longitudinal sealing)
3 Transverse sealing

Pack openability is an important consideration. Over recent years a great deal has been done to make the packs resealable or easier to open. This has resulted in the inclusion of plastic closures and foil pull-tabs.

3 CLOSURES

3.1 Cork

The cork was the first closure used for soft drink containers. The Romans knew of cork, which came from their provinces on the northern rim of Africa and Spain. Its flexibility was ideal for sealing the irregular openings of their handmade vessels for liquids. By squeezing a piece of cork into the opening they could effect a fair fit and a final touch of pitch made it airtight.

England had access to Spanish cork and had its own glass making industry, so Elizabethan wines and ales, for example, were kept in corked glass bottles. Elizabethan wines were still, so they did not generate gas as ale did – the cork stoppers of ale bottles were tied on with pack thread. The package was ready for the advent of the highly carbonated artificial mineral waters invented by Jacob Schweppe in 1783.

Hand corking continued into the 20th century, although machines had been invented which filled the bottle, applied the cork and hammered it home, delivering the bottle ready for wiring on by hand. The drinks were called ‘pop’ because of the noise which was made when the cork was removed.

Something less tedious was needed to replace the stopper. A number of ingenious ideas were put forward including an internal marble stopper. Internal stoppers had serious draw-backs – they were difficult to clean, the exposed seal harboured bacteria and the pouring lip was not clean. Their costs were also expensive. What was needed was something cheap, quick to apply and remove, yet which was still gas tight. A top seal was needed.

3.2 Metal crowns

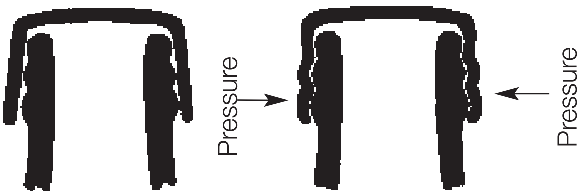
A metal cap top seal with a corrugated edge to crimp into a locking position on the head of the bottle was invented by William Painter. The bottle head had to be designed for the cap and it required a lip that was well rounded on its outside to enable the crown to be fitted. It was called a ‘Crown Cork’.

Today the ‘Crown Cork’ is still the most popular closure for carbonated soft drinks and beers packaged in glass bottles. However, the crown has two major drawbacks – it needs a tool to remove it and it can only be used once (non-resealable). There is a twist-off crown which remains popular in other parts of the world but this has not kept favour in the UK.

There is no disadvantage in a closure that can only be used once if the bottle contains only one serving. However for larger bottles, a simple, hygienic closure is needed which will re-seal, to allow the contents to be used and resealed and still contain the carbonation. The answer was a screw on cap, otherwise known as the 'roll-on cap'.

3.3 Roll-on or screw caps

The screw cap that became commercially competitive to the crown cork was the rust resistant aluminium roll-on cap. The cap was delivered without a thread, which was placed onto the filled bottle and top pressure applied to form a seal between the lip of the bottle and the liners. Rollers pressed the aluminium into the grooves of the screw thread on the bottle. The result was a cap moulded exactly to the bottle. Once the thread has been made in the cap, it remains and can be screwed on and off the bottle as many times as the customer likes, re-sealing the contents each time it is screwed back.



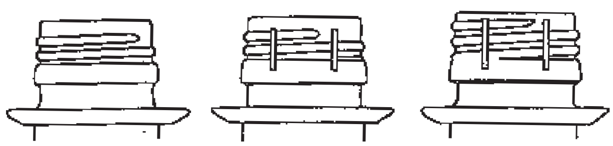
This convenience gave rise to a new problem – there was no way of telling whether the cap had been applied when the bottle was first filled and still contained its original contents, or whether the cap had been unscrewed and the contents partly or wholly used and replaced. Most serious of all, there was no way of knowing whether or not the contents had been deliberately and criminally contaminated.

The tamper-evident band therefore became a new feature of the roll-on cap. A band was added to the skirt of the cap and lightly attached with bridging points. Extra rollers were added to the closure machine, which tucked the band under the base of the finish on the bottle. When the cap is first opened, the band breaks away from the main body of the cap and remains circling the neck of the bottle, clearly indicating that the cap has been removed.

The adaptability of the roll-on design has meant that it can be used for a wide variety and types of bottles. When the PET bottle was developed the roll-on was the natural choice. However, after a short period in commercial use, the industry became aware of a new hazard. Sometimes, when the aluminium closure was opened by turning the screw cap, the gas which would normally be released from the pressurised container did not escape. As a result, if the consumer did not hold the cap, the closure could be forced off quickly by the pressure of the gas. In the interests of preventing any possibility of injury a method had to be found to ensure that all the gas in the headspace of the bottle was released while the closure was still attached to the bottle.

3.4 Plastic

Research was undertaken by packaging manufacturers to solve the roll-on closure release problem. In 1982, the first vent slots were introduced as four simple grooves cut through the threads of the bottle finish. These vertical slots allowed the headspace gas to vent rapidly from the instant the consumer started to unscrew the closure. By 1984, further improvements had been made to the venting system. The slots were cut deeper into the body of the finish and extended through the total height of the thread form into the locking ring (i.e. the area immediately below the thread which retains the tamper-evident band). Also, the thread length was increased by a quarter turn which made it impossible for the cap to be unscrewed in a single motion; the consumer had to release his grip and reposition his fingers to complete the removal. This extra manoeuvre allows more time for the gas to vent completely.



1. Screw thread replica of the glass bottle finish | 2. PET bottle finish with vent slots (MCA 2) | 3. BPF 'C' finish with deeper vent slots and a longer screw thread

While these improvements to the bottle finish were being developed, the industry was also considering general improvements to the closure. The universal application of the aluminium roll-on cap, its resistance to corrosion, and the fact that it can be decorated attractively are its main advantages, but its performance is reliant on the capping machines on each bottling line. A properly set capper produces closures with an impeccable seal; however, each head with its profiled rollers on the capping machine has to be set with very fine tolerances and this requires a considerable degree of expertise in the engineers serving the line. If the rollers are set too tightly, the closure will be difficult to release and the metal may even be cut. If the rollers are set too loosely, the cap may not maintain its seal and hold the carbonation. The tamper-evident band may not be tucked in and not break off properly when the cap is unscrewed.

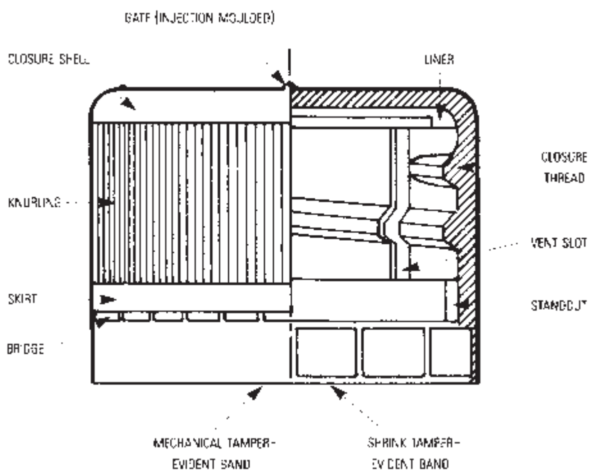
A cap was needed which could be made with the threads already formed. It needed to have close tolerances to fit the threads on bottles which would form a good seal in a very simple manner.

Plastic caps fulfilled these requirements. They were made of rigid plastic and came in two forms:

- rigid polypropylene with a liner which, when compressed, formed the seal with the bottle finish
- more flexible high density polyethylene (HDPE) (the cap forms a seal with the bottle without the aid of a liner, but with an inner skirt so that the seal is formed on the top and down the interior of the bottle finish)

Both forms of plastic closure perform equally well, and it is a matter of commercial choice as to which is used. To aid in the escape of the carbon dioxide gas in the bottle, both forms have spaces along the length of the thread which act as venting slots so doubling the venting space. Virtually all carbonated soft drinks in PET bottles use plastic closures.

Plastic closure



4 DEVELOPMENTS

4.1 Containers

Packaging innovation is a key part of the non-alcoholic drinks industry. In the last 10–15 years probably the single most important packaging development has been the introduction of polyethelene terephthalate (PET) – a plastic which cannot only be used to bottle carbonated and still products but which more recently has proved durable enough to be refilled up to 20 times.

Developments and research in the packaging sector continue, with soft drinks applications leading the way in some key areas. Recent publicity has highlighted a number of new innovations which are currently being considered by the industry.
These include:

- The cardboard can – the can is made liquid proof by utilising internal layers of membrane which also keeps the gas in the carton. The carton can withstand pressure up to five atmospheres.
- A self-chilling can – the introduction of a gas which will enable the can to ‘self-chill’ the contents on opening.
- PET and PVC bottle moulding techniques – in order to allow different shapes to be created making them easier to hold or handle.

4.2 Closures

Closure research is continuous with developments mainly focusing upon delivering even better finishes to the plastic design. These aim to increase safety and convenience features. Recent developments include the 'sports cap' which allows the drink to be delivered on the move. Other areas being explored include the hinged cap and further enhancements to the closures utilised with pouches and cartons. In addition, a closure mechanism which will allow cans to be re-sealed is also under investigation.

5 RECYCLING AND RE-USE

The only true measure of the environmental impact of any packaging is to consider the whole life cycle of the pack. This takes into account:

- excavation of any raw materials
- energy production
- product production
- packaging production
- filling of the pack
- the addition of transport packaging
- storage and distribution
- retailing
- consumer use
- disposal

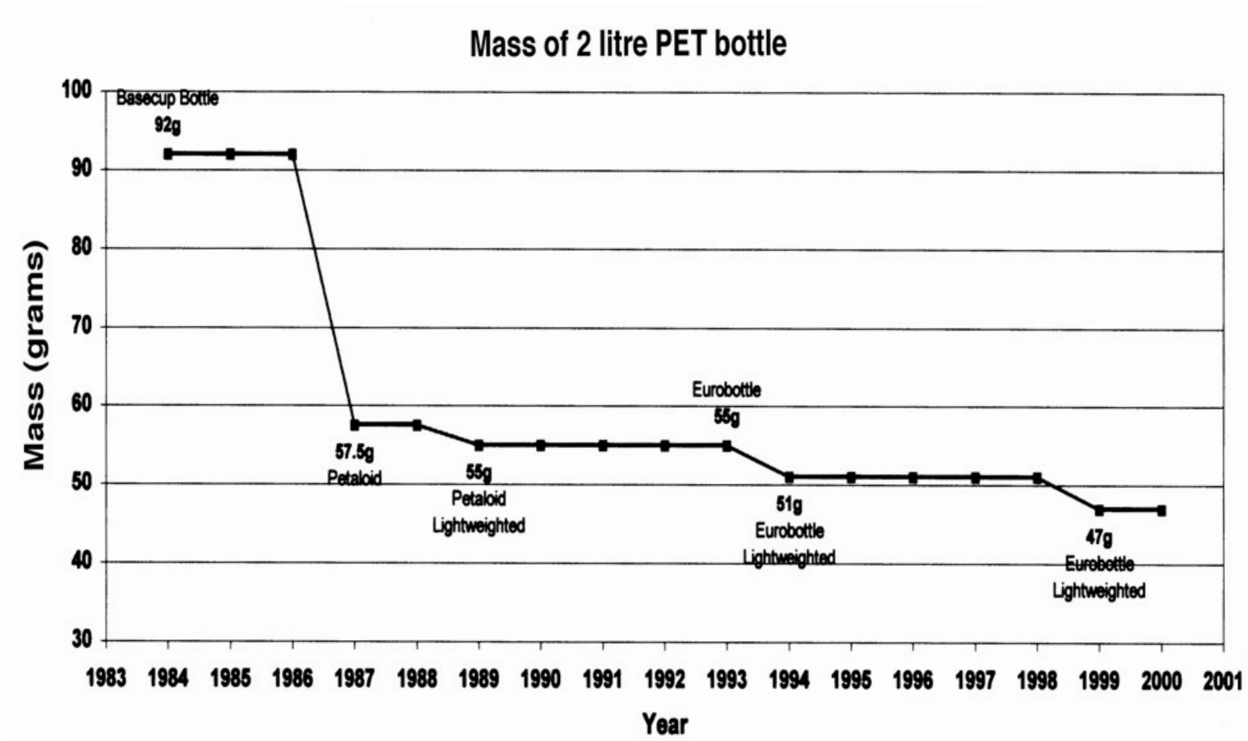
In the case of final disposal, the 'best practicable environmental option' should be chosen. This will very much depend upon the type of packaging and its location. Disposal can include recycling, reuse or energy from waste schemes.

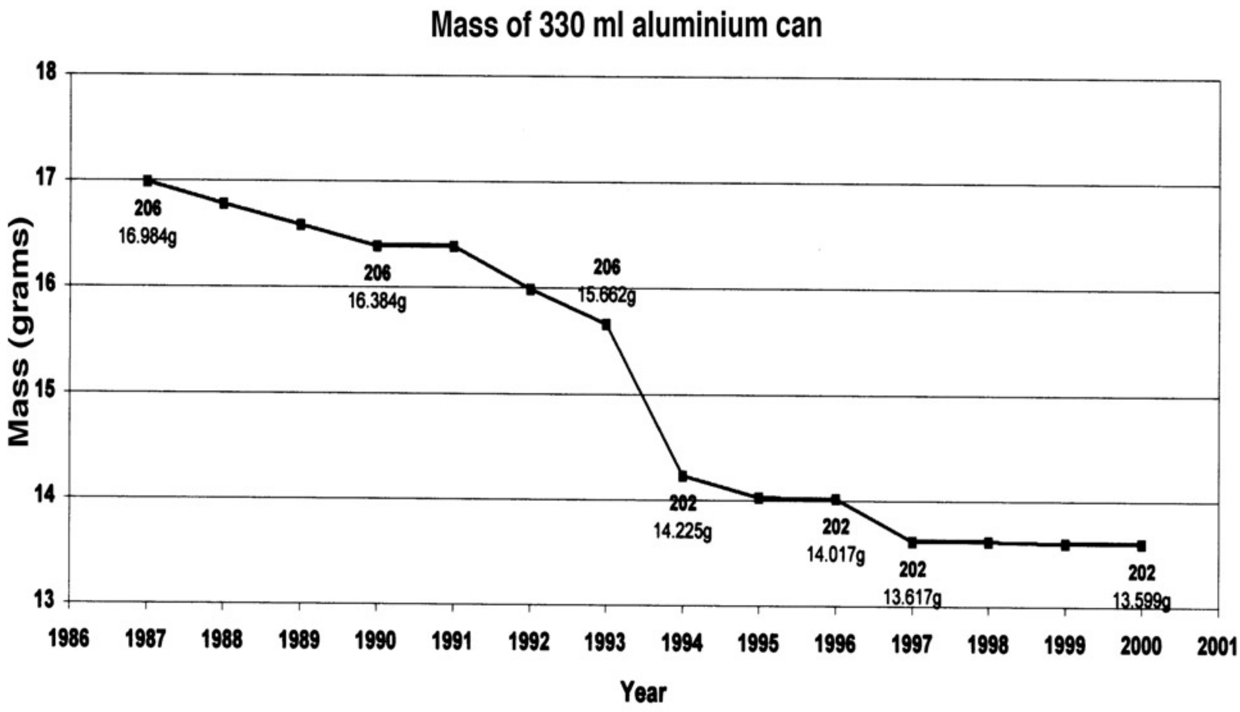
Reduction of the raw materials used in packaging is another way of minimising the environmental impact of packaging. The term often used to describe this reduction is 'lightweighting'.

5.1 Lightweighting

Lightweighting involves fewer materials being extracted from their place of origin. This could be sand for making glass, bauxite for making aluminium, iron for making steel, oil for making plastic bottles or wood for making cartons. The amount of energy used and waste created in processing the materials are also reduced. As the packaging becomes lighter, transport also becomes more efficient. Lighter packs also mean that those packs which are not recovered from the waste stream and must be disposed of in landfill sites actually contribute less to the total amount of waste.

The industry has made significant progress in terms of reducing the amount of materials used to make containers.





5.2 Design

Designing for recycling complements lightweighting. At the design stage companies can optimise recycling by designing containers which are easily recycled.

5.3 Household waste

Methods of reducing waste often focus on the reduction of household waste and in particular packaging waste. Household waste accounts for around 8% of the total solid waste in the UK. Packaging waste is no more than one-third of this. Soft drinks containers make up about 3% of overall waste.

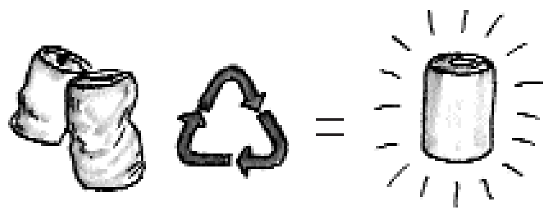
Local authorities are responsible for managing the collection and disposal of municipal waste. In order to promote sustainable development, Government has set local authorities a target of reducing the amount of waste sent to landfill by 25% by 2010. This will be achieved by increasing recycling, composting and energy from waste schemes.

5.4 Recycling

All packaging used by the soft drinks industry can be recycled and used to make other useful products, where the facilities exist. In fact, rather than calling used containers 'packaging waste' it might be more appropriate to call it 'used packaging', as the packaging is not only final waste but an excellent raw material for secondary products.

5.4.1 Aluminium cans

The Aluminium Can Recycling Association, which organises aluminium can collections, has reported that, in the UK, 40% of aluminium cans are recycled out of a total of 5 billion cans sold each year.



Aluminium cans are 100% recyclable. This recycling saves waste and energy because recycling cans uses as little as 5% of the energy that is needed to make new aluminium cans from bauxite ore. Recycling also reduces the need for the mining of the ore from which aluminium is smelted. Various schemes are now in operation where the cash from collected aluminium cans benefit charities, as well as the environment.

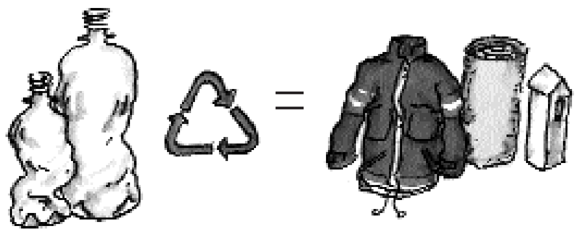
5.4.2 Steel cans

The recycling of steel cans is monitored and promoted by the Steel Can Recycling Information Bureau (SCRIB). SCRIB encourages two complementary steel can collection systems: magnetic extraction of cans from household waste and the Save-a-Can scheme which collects both steel and aluminium cans for recycling.

There are now over 9,000 can banks where you can deposit used steel cans for recycling, including around 2,000 Save-a-Can Banks operated by British Steel Tin Plate. Steel cans are 100% recyclable and it is estimated that each can currently on sale contains up to 25% recycled steel. This is a definite benefit to the environment since it requires 75% less energy to make steel from recovered metal than it does from virgin material.

5.4.3 Plastic bottles

Over 290 plastic collection schemes are now operating in the UK due to close co-operation between local authorities, industry and RECOUP (the organisation responsible for Recycling of Used Plastic Containers). RECOUP is a not-for-profit organisation which provides technical and practical advice, as well as support, to plastic recovery initiatives. Membership of RECOUP is made up of both private companies and local authorities, including several soft drinks manufacturers.



At these centres the collected plastic bottles are sorted into their three polymer types and baled before being sent for reprocessing. The collected plastics can be used to make a variety of useful end products, such as: fleece textile products, fibre filling, multi-layer PET bottles (PET); street furniture, multi-layer containers, drainage pipes (HDPE); textile products and house facia boards (PVC).

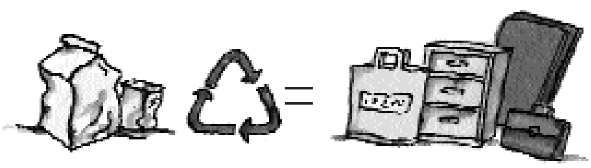
5.4.4 Glass bottles

There has been a rapid expansion in the number of bottle banks from the 17 in existence in 1977 to around 23,000 today. Every local authority now has a bottle bank scheme and 736,000 tonnes of glass were crushed in 2001. This equates to a 34% recovery rate of all glass packaging. This glass, which is know as cullet, is sorted and crushed and used to make new glass.

The advantages of glass recycling are that it cuts waste and disposal costs, reduces the need for landfill space and saves energy. British Glass states that for each tonne of cullet used, there is an energy saving equivalent to 30 gallons of oil, as well as a saving of 2.1 tonnes in raw materials. Non-returnable glass bottles often carry the 'Tidyman' symbol of the Tidy Britain Group to encourage consumers not to throw them away as litter.

5.4.5 Paper and board

Beverage cartons used for soft drinks are made from multi-layers of board, polythene and aluminium. The principle raw material used in the cartons is wood which is both a renewable resource and an excellent source of fuel. In fact, two tonnes of beverage cartons have roughly the same energy content as one tonne of coal. This is why cartons can provide such a valuable fuel in energy from waste schemes.



Beverage cartons can also be recycled to produce useful end products. The different component materials can be separated out and the board used to make a variety of paper products such as tissue and paper bags. Another method of recycling cartons is to produce a chip-board type material from shredded cartons which can be used in products as diverse as briefcases to office furniture. The big challenge for industry is to increase the collection of the cartons from the household waste stream. The carton industry through the Alliance for Beverage Cartons and the Environment is actively working in this area and already the first carton collection schemes are in operation in the UK.

5.5 Re-useable packaging

Traditionally, the refillable bottle was the main pack of the soft drinks industry. People's attitudes and life styles have changed and the use of such bottles is no longer in demand. In fact, it is very much in decline, particularly in southern England. Scotland accounts for the majority of refillable bottles now sold in the UK. Returnable bottles are heavier and stronger than their fellow non-refillables because they have to withstand the process of washing, filling and transit a number of times.

Returnable bottles are used throughout the soft drinks industry, particularly for drinks served in the pub and restaurant trade. In the pub trade each bottle is used on average 12 times. This is a closed loop system in that the soft drinks manufacturer/distributor collect the empty bottles for refilling at the same time as delivering the drinks. The landlord and not the consumer is responsible for collecting and storing the empty bottles.

Studies have shown that no one type of beverage container or method of distribution is more environmentally sound than any other. The various forms of packaging used are chosen in order to meet the various criteria affecting the product and the market.

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Tel: 020 7430 0356   Fax: 020 7831 6014 E-mail: bsda@britishsoftdrinks.com
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