Why…

Products are packed in the way they are?

Foreword

Very often, the CNE has read comments about packaging that are vague, stereotypes, and sometimes even false. Some of these comments can be misleading for consumers. However, the CNE's role as a packaging expert is to make sure that all stakeholders have the correct information.

To this end, this work gathers factual information explaining WHY PACKAGING is THE WAY WE KNOW IT. It could have been called "*Packaging for Dummies*" if we had wanted to mimic the famous book collection.

Our goal is very simple: EXPLAINING and trying to provide pedagogical information.

We want people to understand that the packaging of a product is not there by accident.

It stands at the crossroads of two needs:

- The need to pack a product for the purpose of direct use or consumption in a given cultural and competitive environment
- The need to fulfil all the functions the product needs, i.e. containing/preserving/transporting/making it easier to use/informing/, etc.

Some of the stakeholders may even think that packaging itself should be different or not exist at all. For instance they question the use of bottled water instead of tap water; however, this is not the subject of this document.

Even though some people disagree, we need packaging because of the market, and it is up to us to explain in a simple way the reasons for the design of the packaging we use.

These various reasons stem from people's consumption habits, the technical and economic potential of industrial tools, the need to preserve and transport products, the quality status of materials as well as from rules and regulations.

The methodology that was used to draw up this document leads us to focus on packed products of our daily life (among which the products dealt with in the study "*watch over 10 markets*"[1]) since they are the ones that consumers see and use every day.
However, we will also deal with all other types of packaging; because it should be recalled that the tonnage of household packaging waste only accounts for 50% of total packaging, pallets excluded.

The President

Michel Fontaine

[1] Household packaging from ten mass market products: 1997-2009 evolution, CNE, July 2012

Summary

Packaging, as a central element of the product/packaging pairing, fulfils many functions[2], such as giving a product to users and consumers, preserving it, protecting it, transporting it, etc., whether it is consumed by households, craftsmen, industrials, etc.
Throughout history and thanks to packaging, men have been able to free themselves both from time and from space:

- Time because, thanks to the preservation of a packed product, men no longer need to consume immediately what they just produced.
- Space because, thanks to transportability, men can access the packaged product anywhere and modern men can consume products wherever they want. Thanks to packaging, the production sites are separated from the consumption sites.

The goal of this publication is to provide easy understanding of packaging and its product, to shed new light on the benefits of packaging, because, as we need to remember, users and consumers buy packaged products and not the packaging on its own.

This document gets back to the ten markets analyzed in the document "*Household packaging from ten mass markets products: 1997-2009 evolution*". This guide is organized according to the kinds of market and everyone will be able to find the answers they expect.

This document is a reminder of the basic principles of packaging, which depends on the standards of its product, its production, its preservation, its distribution, its use and its end of life. The packaged product has various goals:

- Protect the product appropriately,
- Minimize the global impact of the product/packaging pairing on the environment,
- Provide the consumer with a product matching his needs (use, quantity, etc.),
- Inform the user/consumer;

and all this should be at a reasonable price.

[2] See the functions of packaging in chapter 5

Table of contents

1. Goals and limitations

➔ Our goals and challenges

Usually, the users or consumers of any packaged products forget about the packaging until they have to get rid of it. Everything the packaging did before that is normal, expected, maybe appreciated, but once separated from the product, the empty packaging is seen as bulky and useless.
The French Packaging Council (CNE) thinks it is important to shed some light on the debates confronting the use of the packaged product and the annoying waste.

This is why the CNE chose to contribute pedagogically by (re)explaining the functions of packaging linked to the product, its distribution and its use. Its goal is to explain in concrete terms what packaging, this unknown product, is exactly.
This document also highlights the good practices and the relevant initiatives adopted by professionals.

In a nutshell, **the CNE will tell you everything you always wanted to know about packaging without ever knowing whom to ask!**

This document was prepared collectively and in cooperation with all the stakeholders of the packaging chain, and especially the representatives of the different CNE associations.

➔ The limitations

This document does not claim to be exhaustive. However, based on the study carried out by the CNE/ADEME/ECO-EMBALLAGES on household packaging waste of mass consumption products of the ten markets[3], the observation covers about 25% of household packaging and maybe the same proportion for secondary and tertiary packaging.

[3] Household packaging from ten mass market products: 1997-2009 evolution, CNE, July 2012

2. Context/challenges

➔ Social context

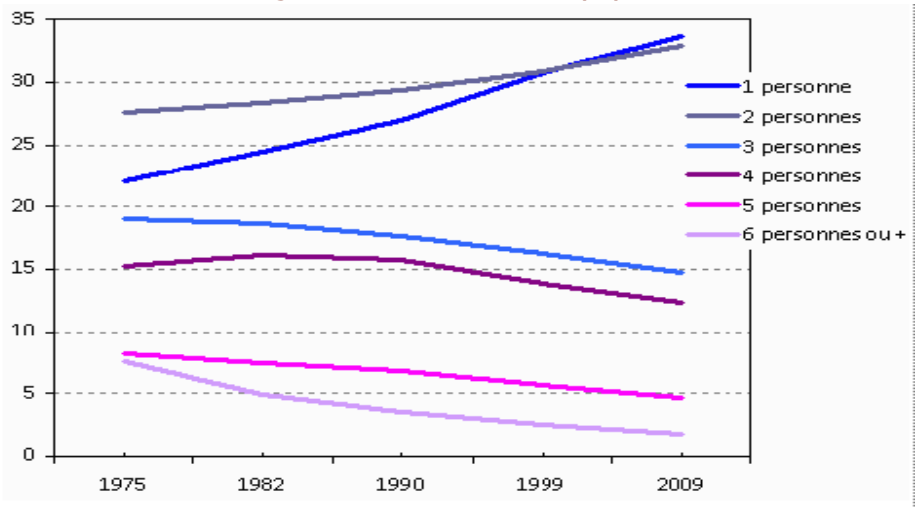
Usually, packaging is treated as waste more than it should be. As it forms an integral part of the consumers/users' daily life, it is also very visible and thus an object of controversy. To explain the role of packaging, it is important to consider some social elements.
The quantity of packaging on the market is particularly linked to demographics, and thus to the increase of French population. Besides, the size of French households tends to decrease.
These social factors include the analysis of the reasons of the existence of packaging and its nature itself (smaller containers adapted to individual consumption because of the size of households).

Table: Evolution of the composition of households (France)
Households with only one person have increased by 1.7 million in ten years, from 7.5 million (1999) to more than 9.2 million (2009).

	Number of households				Number of people in the households	
	1999		2009		1999	2009
	In thousands	%	In thousands	%	In thousands	In thousands
Total	24 332	100	27 533	100	58 836	64 305
One-person households	7 492	30,8	9 238	33,6	7 492	9 238
Single men	3 023	12,4	3 852	14	3 023	3 852
Single women	4 469	18,4	5 385	19,6	4 469	5 385
Other households without family	503	2,1	748	2,7	1 107	1 862
Households with family/ies	16 337	67,1	17 546	63,7	50 238	54 250

Source: INSEE

Diagram on the evolution of households' size (France)
Evolution of households according to their size since 1975 (%)



Champ : France, population des ménages.
Source : Insee, recensements de la population 1975 à 1990 dénombrements ; 1999 et 2009 exploitations principales.

The number of households increases faster than the number of inhabitants (1.25% vs 0.5%) and the number of persons per household decreases (by 0.74% between 1975 and 2009). Thus, two thirds of French households are composed of only one or two people.
Given that we need to avoid waste in terms of consumption, it is important to adapt packaging to the size of households. If portions and packaging are disproportioned to the household's needs, the problem of the waste linked to unconsumed products becomes even more important and high-impact than the packaging one.

➔ Challenges

The 94/62/CE directive transcribed into French law in the Environmental Code reminds us of the priorities regarding the development of packaging and its end of life. The first priority confirmed by the Grenelle laws is prevention. Thus, every marketer has to take this priority into account provided they do not increase the risks of potential damage to the product, or even its waste.
These prevention actions are measured thanks to the performance criteria listed below. By analyzing them, we can identify those which prevent any extra reduction of the weight and/or volume of packaging without impacting the expected functions of packaging in the current state of the art: those are the critical points.
Those major critical points have been summarized by market.

The performance criteria (non-exhaustive list):

- Protection of the product,
- Packaging manufacturing process,
- Packaging/filling process,
- Logistics (transportation, storage, manipulation),
- Presentation and marketing of the product,
- Consumer acceptance,
- Information,
- Safety,
- Regulations,
- Other aspects.

3. The markets

➔ Preamble

Every selected market is presented as follows:

- The main characteristics of consumption and of packaging types,
- "*Why?*" questions are answered. Many of them come from the document "*To be or not be packaged*"[4] published by the CNE in 2007. Other questions come from interrogations expressed by users and consumers,
- "*Did you know?*" boxes are displayed in order to remind you the context of the market, the history, the use of the packaged product, etc.

The goal is to answer the most frequently asked questions and to introduce data which seem so obvious that even consumers do not see them anymore, because the product/packaging pairing is so rooted in their daily life.

[4] http://www.conseil-emballage.org/Img/Publications/7.pdf (in French)

a) Yoghurt and other dairy products

Evolution and consumption patterns

Consumption of yoghurts and other dairy products (yoghurts, yoghurt drinks, fermented drinks associated to yoghurts except for cream cheese and fresh dairy desserts) evolves the same way as demographics. Per capita consumption decreased between 2003 and 2009 after a significant increase between 1997 and 2003.

While consumption increased on the whole between 1997 and 2009, household packaging tonnage in 2009 is 7.8% less than the 1997 tonnage. The main reason of this decrease in packaging tonnage is the materials' evolution (glass has been replaced by plastic) and the prevention actions by source reduction carried out by the marketers (see examples below).

Major critical points

- Cold storage (+2/+4°C).
- Fermentation (+35°C/+40°C) and cooling stages during the process.
- Preservation of live lactic ferments.
- Hygienic packaging.
- Legal information.

Packaging typology

> Primary packaging

It usually includes a yoghurt cup (usually plastic-made), a banner or a label (usually paper-made) and a lid to make sure the product is airtight (usually made of paper/PET (metallic or not) or of lacquered aluminium).

NB: You can also find glass cups as well as cardboard cups coated with polyethylene (PE) on "premium" product markets.

Did you know?

Throughout the years, materials for yoghurt cups have evolved. In the 20s, they were made of porcelain and could be reused. In the 50s, before the refrigerator market boom, there was a yoghurt market boom. At the same time, cups were made of returnable glass and then paraffin cardboard. By the end of the 60s, the cups were made of plastic (preformed, thermoformed and then bannered cups).

French people are among the largest yoghurt consumers in the world: 20kg/year/inhabitant

> Multi-pack

Designed to put together various consumption units (i.e. the yoghurt cup), multi-pack is usually made of solid cardboard, most of the time printed. Thus, it creates a variety of yoghurts adapted to the buyers' consumption habits.

> Transport packaging

It is usually made of corrugated cardboard and has to ensure the transportation from the production site to the distributor's warehouse and then to the store. It can also sometimes be used as a display directly on the shelves (also called "ready to sell" products).

Why do we use mostly plastic for primary packaging?

Every year, 7.9 billion of cups are sold in France[5], that is to say a little more than 900,000 cups per hour. This is why many cups are made out of plastic spools directly on Form/Fill/Seal (FFS) lines (see chapter 4.) This technology allows high production rates (40,000 cups per hour), a reduction in the packaging costs (less material losses), as well as a reduction in the upstream logistics costs (transportation and storage of polystyrene (PS) rolls, lid and label instead of preformed cups, more bulky) and the respect of hygiene standards.
Industrialization allows economies of scale and thus, makes products more accessible for everyone.

The most commonly used plastic is polystyrene because it is breakable. The consumer can separate the cups by folding the link between the cups.
Besides, PS is easier for the marketer to implement in an industrial process (through thermoforming) than other plastic materials (especially polypropylene (PP)), and allows high rates of production. Today, you cannot break polypropylene, which is why this kind of cups is usually presented individually.

NB: Glass, stoneware and cardboard cups are usually used for traditional or local products which are less widely distributed.

Why do many cups have a large paper label?

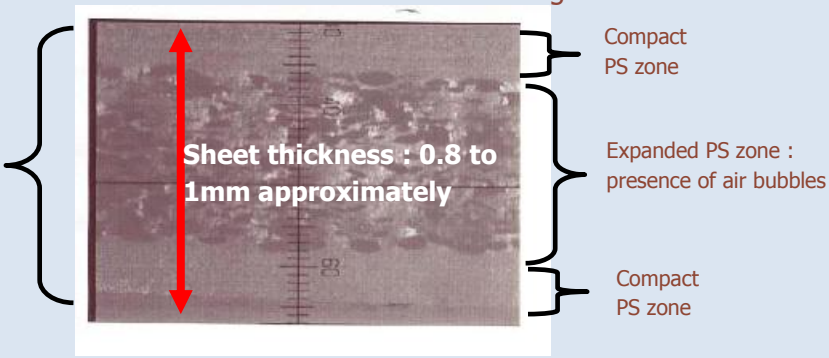
In France, most cups are presented as a plastic cup with a (paper) banner printed and glued on it. This banner is a way of giving information (especially regulatory information: weight, list of ingredients, etc.) to the consumer.
It mostly contributes (at around 80%) to the plastic cup's resistance to vertical compression. It plays a crucial part in the cup's resistance during palettisation and transportation. Having a label optimises the quantity of plastic used for the cups.

[5] Source: Syndifrais

Did you know?

Manufacturers never stopped trying to reduce the weight of this PS yoghurt cup, while maintaining the product's functions of protection and integrity. Once they reached a stage where it started to get difficult to reduce it more, they managed, in 2005 and in collaboration with their suppliers, to insert air bubbles in plastic in order to lighten it by 14% between 2005 and 2009 (the PS plastic density was reduced, it is thus called EPS Expanded Polystyrene).
Investments for suppliers and manufacturers, as well as adjustment times, allowed this lighter cup to be put on the market, with a material (EPS) which now represents 41% of the PS being used (Source: Syndifrais 2013).
It is one of the best practices[6] the CNE had identified and encouraged.

Microscopic section of the PS sheet



Why do we need multipacks for cups?

The French market code for yoghurts is a selling format gathering 4, 8, 12 or 16 cups of approximately 125g each. In other countries (Germany, UK, etc.), the market code is rather a selling format of individual cups of 150g to 500g each.
French consumers buy according to their need and their purchasing frequency (usually weekly). This is why we need to ensure the cups' gathering thanks to a packaging, usually made of cardboard. This packaging is also a communication medium, since it reads the legal and compulsory terms.

Many economic stakeholders have decided to remove multipacks for 4-cup formats, in order to reduce the environmental impact of their products.

As far as family-sized products (x12, x16) are concerned, it is important to gather them in order to ensure handling in the distribution operations and make the sales unit's handling and transportation by the consumers easier.
The surface and weight of these packs have nonetheless been reduced in the past few years[7]: an approximate 30% reduction, from about 30g to 20g for a 12-cup multipack and an approximate 25% reduction, from around 40 to 30g for a 16-cup multipack.

[6] Prevention in action*; towards a breakthrough* dynamic, CNE, December 2010
[7] List of prevention examples, CNE : http://www.conseil-emballage.org/Prevention.aspx

Why are there holes on the transport trays?

During production, yoghurts go through a drying chamber at a temperature of about 35 to 40°C. During this fermentation stage, the milk can curdle in the cup. Then, there is a cooling stage in order to stop the activity of lactic ferments. These drying and cooling stages are made on full palettes. Thermal exchanges between ambient air (hot and then cold air) and cups are operated through the transport trays, which explains the holes on them. The marketer has to find the best compromise between the tray design by integrating the yoghurt manufacturing process, and the tray resistance during the palettes transportation (the holes weakened its resistance).

Nowadays, why don't we recycle yoghurt cups?

In France, people throw yoghurt cups and their lids away in the household trash and do not sort them. Thus far, the collection and recycling system for this kind of packaging mostly made out of PS does not exist, and the potential openings for this material have not yet been identified.

NB: Eco-Emballages is carrying out an experiment on around four million people in order to expand the sorting instructions, so as to assess the technical and economic feasibility of recycling all plastic household packaging, including yoghurt cups.

b) Beer

Evolution and consumption patterns

Beer consumption (of all kinds) decreased between 1997 and 2009 (-8%). This is due to a strong reduction of per capita consumption for this period.
The decrease in consumption partly explains the reduction of household packaging tonnage (-20%).
The other reasons of this reduction of tonnage are related to packaging characteristics, especially the evolution of the capacity (creation of bigger formats: 50cl instead of 25cl), even if the 25cl packaging accounts for the major part of the market (62% of the sales volume in 2009).

Major critical points

- Preservation of the product: it is oxidation-sensitive.
- Pasteurisation stages in the packaging process.
- Internal pressure in the packaging because of a carbonated product (presence of carbon dioxide).
- Legal information.
- Consumer usage: on-the-go consumption.
- User safety during use (opening without risks).

Packaging typology

The beer market is characterized by two distribution channels which determine packaging: food channel (especially large-scale distribution) and the out-of-home consumption channels (CHD), with Coffee shops/Hotels/Restaurants (CHR) channels.

The food channel accounted for 15.08 million hectolitres in 2010[8], i.e. 78.3% of the volumes using mostly glass bottles for primary packaging (91% of household packaging tonnage put on the market in 2009).
Primary packaging also includes metal tins.

- Mini-barrels appeared in 2005.

- Transport packaging is often ensured by multi-packing various consumption units (bottles or tins).

The CHR/CHD channel accounted for 4.65 million hectolitres in 2010[8], among which 4.28 million hectolitres distributed in barrels.
The beer sold in stainless steel barrels thus accounts for 21.7% of the distributed beer volumes.
In the CHR channel, beer barrels (from 20 to 50 litres) represent 3 million barrels.

[8] Source: Brasseurs de France (French Brewer Association)

Why do we mostly use glass and metals for primary packaging?

Beer is a carbonated drink (it contains carbon dioxide), which is full of flavours and thus very sensitive to oxygen. The following constraints are taken into account during the development of the product/packaging pairing in order to protect the organoleptic qualities of the beer throughout its lifespan:

- Barrier to the ambient air oxygen:

The packaging must resist the ambient air oxygen in order to prevent oxidation of the product. This oxidation is favoured by light and would damage the organoleptic qualities of the beer and create a bad taste.

- Barrier to carbon dioxide contained in the beer:

The packaging has to resist the carbon dioxide contained in the beer so as to maintain a nice head until the use-by date (usually 12 months minimum).

- Resistance of the primary packaging to a 6-bar internal pressure.

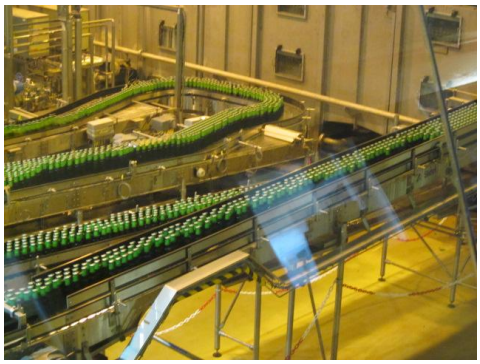
NB: The polyethylene terephthalate (PET) plastic can also ensure these preservation functions in the form of a bottle made of multiple layers, among which one is a natural barrier to gas. The quality of preservation will however be less reliable and implies offering a shorter use-by date.

Companies have been trying to reduce the weight of packaging[9]. What are the constraints limiting the reduction at source of glass bottles or metal tins?

- Beer is often pasteurised in its packaging in the packing plant: this operation is carried out in a pasteuriser (the air temperature rises up to 60°C, which reduces the solubility of carbon dioxide). The internal pressure then can increase up to 10 bar. Packaging have to be able to resist these conditions (to compare, the pressure of a car tire corresponds to 2 bar).

- Besides some products are transported in container for exportation. Sometimes, they are stored under the sun, which provokes a rise in temperature and thus increases the internal pressure, which can damage the packaging. It is the same for packaged products staying under the sun in the consumer's car trunk.

- The industrial packaging lines fill up to 100,000 bottles or tins per hour with accumulation zones (see pictures below). So we need to design glass bottles or metal tins that can resist the lateral compression and thus avoid any damage.



Excessive drinking is dangerous for your health. Please drink with moderation.

[9] Household packaging deposit in France, 1994-2009 evolution, Ademe, Adelphe, Eco-Emballages

- Bottles and tins should not be deformed nor exploded during the transportation but also when in the consumers' hands, still because of the internal pressure. However, a tin is 73-micrometer thick[10], i.e. no thicker than a hair[11].

- The product/packaging pairing resists the vertical compression and thus supports the palettes of packaged finished products.

- The bottles' caps have to be thick enough in order not to undergo any deformation and to ensure its protection against oxygen spoiling. The consumers' safety is essential.

Despite these constraints, as far as the beverage packaging is concerned, the raw materials (steel and aluminium) manufacturers have been making developments on finer and more malleable metals since its appearance in the 30s. This is what made this constant reduction of weight possible for the industrials.
Thus, the average weight of a 33cl aluminium box decreased by more than 16%, from 15.34g in 1992 to 12.79g in 2009 and the weight of a steel box decreased by more than one third, from 36.4g in 1973 to 21g in 2012 while maintaining the same resistance qualities[12].

Why is usually cardboard-made multi-packing so rigid?

Multi-packing bottles and boxes (from 25cl to 50cl) require extra packaging. In the plant, the bottle packaging is carried out in humid atmospheres and cardboard must be resistant to any water absorption.
Although this packaging is mostly used for product transportation, it should also make the filling of the shelves easier for the shelf manager, as well as the handling of the product when the consumer buys it. In order to meet all the requirement of these stages, the nature of the cardboard is essential: it usually is Kraft cardboard (new fibres because those are more resistant than recycled fibres).
Besides, in order to protect the product from the light (see above), these multi-packs for glass bottles, are often without windows.

NB: the secondary packaging can sometimes be made of opaque plastic film, for metal bottles as well as for glass bottles.

[10] A micrometer represents one-millionth of a meter
[11] Source: BCME
[12] Source: BCME

Did you know?

Brewers are constantly developing ways to make their products easier to use for the consumer or user. Here are a few examples on three themes:

> Multi-packing

- Multi-packs are pre-cut to make the product easier to access.
- In order to make transportation easier for the consumer, there are handles on maxi packs.
- In order to prevent any musculoskeletal disorder for cashiers, there are removable bar code labels.

> Format

The new barrel format enables people to consume together and to have a better taste experience.

> Caps

Some bottles can be opened without a bottle-opener. In order to achieve that, marketers either use:

- A screw cap closure, also called "twist crown",

- A ring called "Ring pull cap",

Not to mention that the metal packaging has an easy opening

feature.

c) Fruit juices and nectars

Evolution and consumption patterns

Fruit juice consumption (non-chilled and refrigerated, nectars) significantly increased between 1997 and 2009 (+46%). This growth, which is far higher than that of the population, is due to an increase in per capita consumption.
Despite this growth in consumption, the tonnages of household packaging decreased over the period considered (-20%). This decrease was essentially due to changes in the materials used (for example, the consumption of PET and carton grew at the expense of glass), but also to a decrease in base weight and the optimization of packaging design.

Major critical points

- Preservation of the product: it is oxidation-sensitive.
- Heat treatment of the product.
- Aseptic packaging.
- Legal information.
- Consumer usage: compact size for on-the-go consumption.

Packaging typology

> The primary packaging can be:

- a multi-material carton (cardboard, aluminium, PE) with or without a cap (stuck on the pouring opening of the carton). The legal information is printed directly on the carton.


- or a bottle (glass or plastic) and a cap which limits potential leaks, protects the product from the environment and carries out the pouring. The legal and marketing information is printed on the label (paper or plastic) or the heat shrink sleeve label (plastic),


- or a printed metal can with an easy-opening feature in the top surface,

- or a flexible carton made of multi-material plastic (PE / aluminium) with a straw fixed to it. The volume of the contents varies from 15cl to 2 L.

> Multi-pack:

Its purpose is to put together several packaging units to form the consumer sales unit. It is mainly made of plastic film or printed cardboard.

> Transport packaging:

Most of the time, it is made of plastic film, but it can be made of solid, corrugated or mixed (tray with plastic film) cardboard. Its purpose is to make the transportation of products possible from the bottling plant to the distributor's warehouse, and then to the store, ensuring product integrity.

In 2009, fruit juice packaging was split as is follows (in percentage of the volume of sales in litres):

- Carton packaging: 63%
- PET packaging: 25%
- Glass bottles: 10%
- Metal tin: 2%

Did you know?

In France the market is highly diversified, and producers often have to propose different types of packaging to meet the consumer demand.
When pasteurisation started to be used for fruit juices, at the beginning of the 20th century, the products were sold to the consumer in a glass packaging (in a bottle, and then in a jar). The carton packaging, which came from the Scandinavian countries, started to be used in the 60s, and rapidly developed. Then the first aseptic filling process lines in PET bottles were created. Glass bottles were mainly sold on premium markets and in cafés, hotels and restaurants.
Metal tins appeared in France in 1937, and were designed for on-the-go consumption. The market evolved in 1962 with the invention of easy-to-open lids, which started to be used in France in the 70s.

Market codes, preservation treatment choices, industrial capacity, shelf-life and consumer habits are taken into account as decision-making criteria to define the packaged product as it is when it gets to the consumer.

Why are some fruit juices sold at the refrigerated section and others at the room-temperature section?

These two types of product do not have the same shelf-life: it is shorter for the fruit juices which are sold at the refrigerated section (several weeks) than for those which are sold at the ambient temperature section (several months). This distinction is based on the fact that these types of juice don't have the same stabilization treatment.
Food cartons are a multilayer packaging which consists on average of 75% cardboard, 21% polyethylene (plastic) and 4% aluminium. Each one of these layers assumes a specific role: cardboard is a printable space to inform the consumer and gives stiffness to the packaging; polyethylene is the food contact surface and prevents potential leaks and welding properties; as for aluminium, it protects the juice against oxygen and light, preserving its nutritional and organoleptic qualities (colour, taste and vitamins).
NB: cartons which are sold at the room-temperature section are the only ones which have an aluminium layer: those which are sold at the refrigerated section do not have any.

Did you know?

Some fruit juice manufacturers add a drop of liquid nitrogen on the surface of the product. At the ambient temperature, nitrogen returns to its form of vapour, occupying a much greater volume. It pushes the air above the juice just before the product is sealed. Being an inert gas, nitrogen has no interaction with the juice. Thus, as the juice has no contact with the air, it is far less likely to become oxidized, and its taste and vitamins are preserved. Most of the time, a surplus in nitrogen in the bottle causes a slight excess pressure which explains the slight inflation of the packaging, and provides greater resistance of the product/packaging pairing during the transportation.

Did you know?

The different juice preservation treatments

Pasteurisation is the most common technique for the treatment of fruit juices. It uses rather low temperature-time scales, which preserve fruit juices' taste and nutritional qualities while ensuring their preservation up to several weeks or months. Pasteurisation scales are specific to each company and are defined according to production facilities and processes.

Both hot filling and cold filling are possible, depending on the properties of the packaging material used:

- Hot filling is carried out with heat-resistant packaging (mainly glass bottles). The liquid temperature allows the sterilization of the packaging and then the lot is rapidly cooled.
- Cold filling is carried out when products cannot sustain the heat. It is mainly used with plastic bottles and cartons. Packaging needs to be sterilized before the filling, which is conducted aseptically.

d) Pre-sliced / pre-packaged cooked meats

Evolution and consumption patterns

The consumption of pre-sliced and pre-packaged cooked meats (pale ham, sliced poultry, salted and smoked lardoons, and other sliced cured meat) increased between 2006 and 2009 (17%), which was due to a strong growth in per capita consumption.
This growth in consumption largely explains the increase in the tonnage of household packaging (19%). Other contributing factors, with the evolution of contents and the decrease in some products' unit weight, lead to a reduction in tonnage.
In this market, the core material is the polyvinyl chloride (PVC) plastic.

Major critical points

- The product needs to be kept in a cool place: it is sensitive to oxidation and microorganisms.
- Legal information.
- Consumer usage: spread out consumption after the opening.

Packaging typology

The primary packaging is essentially made of a thermoformed plastic tray and a covering sheet sealed to the tray (see pictures below).



Did you know?

In this market, the carbon footprint (expressed in kg of CO2 equivalent) due to packaging is particularly low (about 8% of the packaging) as compared with the content.
NB: Even in the case of small containers (for example, in the case of a consumption unit of two slices of ham), packaging is only responsible for 15% of the packaged product's carbon footprint.

Optimizing the packaging process is a positive step for the environment but reducing it too much would imply a risk for the product to be badly preserved, which entails food waste. By ensuring the preservation of the product, the packaging reduces losses and the frequency of food purchases.

Why do pre-packaged slices of ham have a longer shelf life (before the opening) than the slices of ham you can buy at the butcher's?

If rules governing the composition of the products are the same, whether it is industrial or traditional, pre-packaged or sold by the piece, a hermetically pre-packaged product will be preserved from contaminations from the outside air. Moreover, products sold through self-service are pre-packaged in the absence of oxygen, under a protective atmosphere, which slows down the product's oxidation by air, as well as the development of alteration flora. Thus, the product's shelf life is longer. However, once opened, the packaging loses its ability to protect the product, which therefore has to be eaten quickly.

Why are all packaging not sold with a re-closing system?

When you open a tray, the product comes in contact with air and the oxidation phenomenon begins inexorably. A re-closing system slows the contamination down, but not the oxidation; so in any case, the product has to be eaten. When a tray is difficult to open, it means that it has been hermetically sealed. Thus the product is better protected.

Why cannot packaging be recycled after use?

Lids and plastic trays need to be thrown with the household waste and are not recycled. It is difficult to recycle this packaging for several reasons: they are too light, dirty and made of a great diversity of materials.

However, this situation is expected to evolve: an experiment on the extension of recycling instructions is currently carried out on around 4 million people by the non-profit company Eco-Emballages. The aim consists in assessing the technical and economic feasibility of the recycling of these flexible plastic packaging. The progress made will most certainly make it possible to recycle these materials.

e) Washing powders and liquid detergents

Evolution and consumption patterns

Laundry detergents come in different types: dry or liquid and, for each category, those you need to measure, ready-measured capsules and various concentration levels:

> Liquid ones
- Classic
- Super concentrated
- Gel
- Ready-measured capsules

> Dry ones
- Powder
- Ready-measured washing tablets

Liquid detergent wildly dominates the market, with 80% of the market shares in 2012. Liquid single-dose capsules, which appeared in the early 2000s, count for about 14% of the market shares.
If the sales are expressed in doses of detergent placed on the market per year, there was a 4% drop in consumption between 1997 and 2009.
Packaging tonnages have been sharply reduced (-24% between 1997 and 2009). This is mostly due to the detergent compaction programs developed by A.I.S.E. (*Association Internationale de la Savonnerie, de la Détergence et des produits d'Entretien*, International Association for Soaps, Detergents and Household Products) and applied by the large majority of the industry. Thus, washing powder doses decreased from 150 g in 1997 to 80 g in 2009 (-47%) and liquid detergent doses decreased from 180ml before 1996 to less than 75ml in 2011 (-58%). Thus, the weight of the packaging per dose decreased.
Marketers have also significantly reduced their packaging unit weight. Concrete examples of measures on packaging prevention carried out by producers are available on the CNE[13] and Eco-Emballages[14] websites (in French).

Major critical points

- Protection of the product: mechanical protection, storage, etc.
- Acceptability and consumer usage: optimum quantity of detergent to use.
- Filling of liquid detergent: foaming.

Packaging typology

Since liquid detergents dominate the market (80%), primary packaging materials are mostly plastic (HDPE for liquid detergent bottles and POL or PS for liquid single-dose capsules).



Washing powders are packed in moisture resistant cardboard packaging.

[13] http://www.conseil-emballage.org/Prevention.aspx
[14] http://reduction.ecoemballages.fr/

Why do marketers offer single-dose detergent capsules?

Liquid single-dose capsules appeared on the detergent market in 2001. They accounted for 14% of the market in 2012. The large diversity of detergents and the variety of dosages due to different compaction processes sometimes make it difficult to dose the detergent. Liquid single-dose capsules are both pre-dosed and easy to use.

Why does an empty space remain between the product and its packaging?

There is indeed an empty space, which is called "technical empty space", between the surface of the product and the top of the packaging. This is due to different parameters related to the nature of the product and to the packaging process.

In the case of liquid detergents, there is a 15% constraint which is due to their foaming properties (foam forms during the filling).

In the case of powders, the empty space is significant because of:

- the filling technique (the powder forms a cone)
- change in the powder density
- the inevitable packing down of the powder which occurs during the different stages of the packaging lifecycle (filling, storage, shelving, transportation and consumer usage).

However, there are solutions[15] to reduce this technical space, such as deep dosing pipes for liquids and vibrating conveyors for powders.

Did you know?

The concentration / compaction of detergents, encouraged by A.I.S.E., started at the end of the 90s. Keep in mind that boxes of detergent weighed up to 15 kg in the 60s.

The concentration / compaction reduced the associated packaging, which was adapted to the dose. For example, thanks to the latest operation of liquid compaction in 2011 (the dose decreased from 110ml to 75ml), about 16 000 tons of packaging materials were saved in Europe.

[15] Eco-refills, technical space, overpacking of household and personal hygiene products (CNE, May 2007)

Why is single-dose packaging made of plastic?

PVA films which are used to pack liquid single-doses are entirely water soluble. This type of film can be used because these products' formulas contain very little water. So the film dissolves during the washing. Moreover, it is biodegradable (in accordance with EN 13432 regulations).

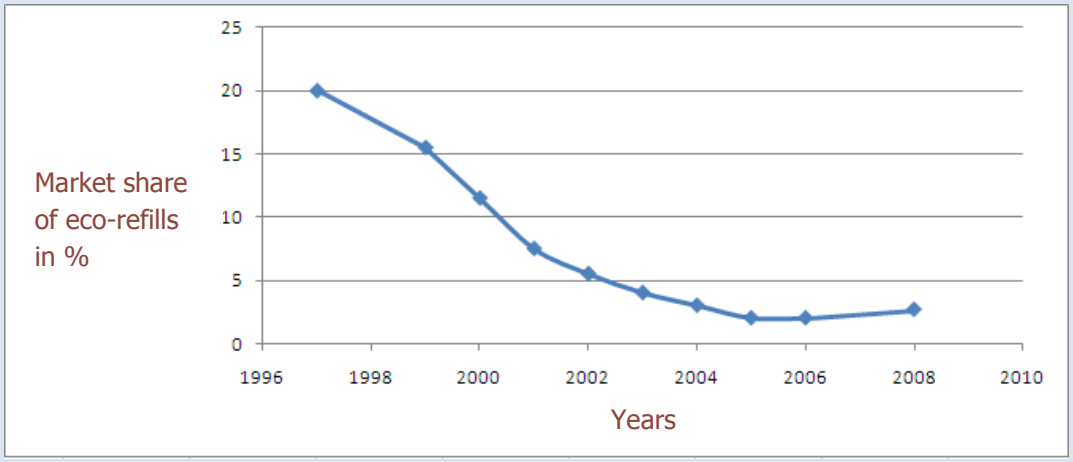
Did you know?

The reality of the eco-refill market

The market share (in volume) of powder and liquid eco-refills had been decreasing steadily since 1997: they covered less than 1% of the market in 2009.

This is the reality of the market. However, the perception of consumers as expressed in surveys is different and seems to overestimate the attractiveness to eco-refills.

The emergence of liquid single-doses in 2001 (14% of the market in 2012) and the concentration of detergents are certainly responsible for this lack of interest for eco-refills.



f) Fresh and UHT milk

Evolution and consumption patterns

The overall milk consumption (fresh, pasteurised, sterilized and UHT milk, including flavoured milk but not infant formula) decreased between 1997 and 2009 (- 20%).
In France, pasteurised milk accounts for a marginal market share, since UHT milk represents the vast majority (97% of the volumes).
The average French consumer buys 41 litres of milk per year, while the average Finnish consumer buys 111. Per capita consumption in the developed countries is falling overall[16].

Major critical points

- Preservation of the product: oxidation-sensitive product.
- Heat treatment of the product.
- Aseptic packaging.
- Legal information.
- Consumer usage.

Packaging typology

Packaging tonnages decrease less (- 9%) than consumption does, partly because the different materials are used in different proportions, partly because of the evolution of the unit weight.

> Primary packaging:
It is either a plastic bottle with a cap or a carton, generally with a cap. In 2009, the distribution of market shares for the 1 litre format was 57% carton / 43% bottle.

> Multi-pack:
Its purpose is to put together several consumer sales units. It is often made with a retractable polyethylene film with a handle for carrying. For products with long shelf lives, the consumer can generally buy a six-bottle pack.

[16]Source: Syndilait, 2012

Did you know?

Formerly, consumers bought their milk from a farm[17], bringing their own milk jug. The milk had to be boiled before drinking and had to be stored in a cold place (only for a few days).
Nowadays, market stakeholders offer several types of milk (fresh pasteurised milk or UHT milk)[18].

- Fresh pasteurised milk

Fresh pasteurised milk is sold in the chilled food section in retail stores. "Pasteurised" means that it is heated at 72-75°C during 15 to 20 seconds, an operation followed by a rapid cooling under 4°C. Thus, the milk is rid of undesirable micro-organisms. It can be whole or semi-skimmed and can be kept for a maximum of 7 days at a temperature of 4°C.

- UHT milk

UHT means "ultra high temperature". It is a sterilization process during which the milk is instantaneously heated to a very high temperature (between 140°C and 150°C) for a very short period of time (only 2 to 5 seconds), just before being packed into sterile packaging. This treatment is very brief, so the milk keeps its good taste - more than with pasteurisation, which takes far longer. So micro-organisms are destroyed in an effective way and the milk can be retained for a long time (three months at room temperature). After opening, UHT milk has to be kept refrigerated like pasteurised milk at a temperature of 4°C, and consumed quickly.

Why is the packaging usually opaque?

The light destroys the milk's organoleptic qualities.
UHT milk bottles are generally made of multilayer HDPE. The internal layer contains a carbon black layer which protects the product from the light, so it does not oxidize.
Plastic bottles for pasteurised milk are generally made of HDPE and often have only one layer.
In the case of cartons, the aluminium foil acts as a light barrier. So the milk is preserved from any oxidation, and fats and vitamins are preserved as well as possible.
NB: milk can be sold in a transparent bottle. The product shelf life is short, so this type of packaging is generally used for pasteurised milk.

Why are there different packaging formats?

The format is related to the way of consumption and the type of consumer:

- 1 litre: it is the biggest-selling format (around 95% of the volumes[19]). Most of the time, it has a cap for spread out consumption.
- 20 or 25cl: these are for "on-the-go" (or "take away") consumption, flavoured milk cartons for example.
- 50cl.

Thus, consumers have the choice between different types and sizes of milk, and can adjust their frequency of purchase according to the size and consumption of their family.

[17]Decree of 13 July, 2012 on the conditions for production or placing on the market of bovine, small ruminant or domestic soliped raw milk, supplied in its existing state to the final consumer.
[18]http://www.produits-laitiers.com/
[19]Source: Syndilait, 2012

g) Edible oils

Evolution and consumption patterns

It is a mature market. Edible oil consumption in 2012 was lower than in 1999 (-10%). This reduction is due to a decrease in per capita consumption at home.
The sociological evolution of consumption (increase in the consumption of olive oil and in the sales of small formats) has entailed an overall increase in the tonnages of household packaging since 1997.

Major critical points

- Preservation of the product: oxidation-sensitive product.
- Legal information (the label has to stay clean and legible).
- Consumer usage: clean pouring system (anti-drip pourer-cap), re-closing, and handiness.

Packaging typology

There are four major categories of packaging:

- Glass bottles from 0.25L to 1L;



- PET bottles from 0.5L to 5L;
- Metal containers from 0.25L to 1,000L;
- Cartons.


Did you know?

The oil volume sold in France is estimated at:

- 40% for industry (bulk containers from 1,000L to 25-ton tanker trucks);
- 20% for catering industry (large containers: drums or tins);
- 40% for mass distribution to consumers.

Why are bottles coloured or opaque?

In specific cases of prolonged exposure to light, some types of oil (rich in omega-3) may lose their original qualities. Thus, opaque bottles are designed to preserve them efficiently from light. In the case of linseed oil, it is even a regulatory obligation[20]: "*Virgin flaxseed oil must be submitted in a packaging of opaque material of a maximum volume of 250ml, which has undergone inerting with nitrogen before the filling, and the optimal best-before date must be shorter than nine months*".

[20]Decree of 4 December, 2008 on the conditions for food use of flaxseed oil (recognition of flaxseed oil suitability for contact with food), modified by the decree of 12 July, 2010 (for pure oil marketing)

Did you know?

The origin of the first disposable plastic bottle[21]

In the late 50s, the Lesieur firm and Astra-Calvé, seeing consumers were more and more reluctant to buy returnable bottles, started considering disposable containers for oil conditioning. After a thorough and unsuccessful market prospecting to find a supplier who could provide a cheap plastic material for food contact use (PVC) as well as a high-throughput machine supplier, Leisure decided to set up its own structure and asked Antoine Di Settembrini, who had invented the polystyrene four-mould barrel for yoghurt cups with a mechanical blower, to design a manufacturing process for these plastic packaging.
A year and a half later, the first DSL (Di Settembrini Lesieur) was ready to make 1,800 bottles an hour. Its extrusion blow moulding process was the key to success. Meanwhile, another specific team developed specific PVC for food contact use. That is how the first disposable plastic bottle for edible oil entered the market in 1963, under the brand Lesieur.
Then, Lesieur, associated with a company based in Pont-à-Mousson, founded SIDEL (*Société Industrielle des Emballages Légers*, Industrial Light-Weighting Packaging Company) for DSL manufacture and marketing. Milk marketers and then mineral water producers were the first clients.
Later on, SIDEL adapted their machines to offer PET preforms, since this material provides a better mechanical strength.

Why are bottles essentially made of PET?

PET's intrinsic properties preserve the contents of the bottles against oxygen, which assure optimal conservation of the product over its entire life cycle. Its mechanical properties meet distribution channels' requirements to give consumers a high quality product.

Why are square glass bottles heavier than the round ones (with the same capacity)?

The glass manufacturing process for bottles is the same, no matter the shape or size of the bottle (see chapter 4).
The shape and thickness of the bottle are the two main parameters ensuring the bottles' longevity and quality during the upstream logistics, on the filling lines and over distribution channels.
Square-designed bottles require more glass than round ones for the same oil volume, because the solidity of angles needs to be strengthened with more glass.

[21]Source: Lesieur

h) Body wash products and shampoos

Evolution and consumption patterns

The consumption of body wash products and shampoos increased between 2006 and 2009 (+4%) slightly more than demography, due to an increase in per capita consumption.

Major critical points

- Consumer safety.
- Professional use.
- Ease of use (dosing and upside down storage).
- Take away use.
- Ergonomics (handling, etc.).

Packaging typology

Consumption increased but tonnages of packaging remain even. The decrease in the amount of packaging per product unit is partly due to the reduction of some packaging's unit weight, partly to the evolution of contents.

> Shampoo's and shower gel's primary packaging is a container which has a cap: flask, tube or bottle made of polyethylene, high, middle or low density polyethylene and polypropylene. The product is often accompanied by instructions.


> The secondary packaging is essentially made of corrugated cardboard. It gathers several consumption units. Sometimes, a plastic film gathers a product batch for promotional purposes.

Since these products are not perishable, why are their containers not bigger?

There are a lot of formats for shower gels and shampoos, from "family size" (500ml, 650ml, 750ml, 1000ml), to 200/250ml flasks and smaller containers (hotel products, derivatives sold with perfume in promotional box sets, etc.) and eco-refills (200/250ml). This diversity meets market codes reflecting:

- Consumers' ways of life:
    - ° according to the composition of the household (number of persons), equipment in shower tall(s)/bathtub(s), storage capacity;
    - ° according to the family habits (a different product for everyone);
    - ° depending on how often the family buys shower products and on the budget in this area.
    - ° according to the storage capacity.
- Their needs and desires:
    - ° according to the existing product categories and their properties (type of hair/skin, specific products for children, products for body and hair, products for showers and baths, etc.)
    - ° products designed to be easy to carry and used anywhere: on a trip, during the holidays, after sport, etc.

The biggest shampoo bottle formats (1,000ml, 1,250ml, 1,500ml…) are essentially used by hairdressing professionals.

Why are shampoo and shower gel packaging essentially made of plastic?

Plastic is the most frequently used material for shampoo and shower gel bottles. It is mainly used for the following reasons:

- Plastic meets safety requirements: it is suitable for use in a shower or a bathtub, with no risk of breakage or damage.

- It ensures protection, preservation and transportation of products:
    - ° Guarantee of safety requirements with regard to contact with materials;
    - ° Preservation of the product's qualities;
    - ° Guarantee of the product quality over the supply chain (shock resistance);
    - ° Protection of the product against environmental strains (humidity, UV), from its place of production to the place of consumption.

- It makes the application of the product easy:
    - ° Dosage which reduces wastage (pumps, upside down bottles, etc.);
    - ° Convenient use, lightness, easy opening and closing (dispensing cap, upside down bottles, etc.).

i) Still and sparkling waters

Evolution and consumption patterns

The consumption of sparkling waters increased between 1997 and 2009 (+11%), slightly more than demographic growth. While consumption increased, packaging tonnage in 2009 was lower than in 1997 (-58%).
The consumption of bottled still water (spring water, mineral water) was higher in 2009 than in 1997 (+2%). This growth is less significant than demographic growth, due to a sharp decrease in per capita consumption, after an increase between 1997 and 2003.
Bottled water consumption in France represents 113 litres a year per capita, behind Italy, Germany, Belgium and Spain.

Still waters

The tonnage of household packaging in 2009 was lower than in 1997 (-10%), which is essentially due to the reduction of unit weights. The material most frequently used is PET, which accounts for 91% of primary packaging tonnages.

Sparkling waters

The sharp decrease in tonnages (58% between 1997 and 2009) is essentially due to a change in the relative division of the packaging materials (switching from glass to plastic).
Materials used for primary packaging are PET (67%), glass (27%), LDPE (for caps) and aluminium (for tin packaging).

Major critical points

- Preservation of the product.
- Legal information.
- Consumer usage: take away use, handling.

Packaging typology

> Primary packaging:
It can be a plastic bottle with a cap, a glass bottle with a lid or a cap, or a metal tin. Volumes range from 25cl to 5L (25 and 33cl for tins).

> Multi-pack:
Its purpose is to put together several packaging units. It is often a retractable PE film with a handle. Corrugated cardboard multipacks are also available.

Did you know?

In order to avoid any musculoskeletal disorder for cashiers, removable bar code labels have been developed in recent years.

Did you know?

History of the bottle of water[22]

The genesis of the bottle has been punctuated with innovations essentially driven by material substitutions. In the 19th century, terracotta containers were used. Then, water was packaged into glass bottles and transported in wooden boxes. The first PVC plastic bottle was created in the 60s, when plastics started to be massively used; it quickly became a new market standard.
The introduction of the 1.5 litre PET bottle in 1992 was a major event since this new plastic polymer quickly replaced PVC. This evolution reduced the bottle weight by 33%. Afterwards, it went on decreasing gradually (-15% between 1997 and 2009 for 1.5 litre bottles).

Why are sparkling water plastic bottles generally thicker than still water bottles?

Sparkling waters contain carbon dioxide. Since packaging is not fully efficient to retain it in the bottle, it "disappears" during the product's shelf life. Thus, sparkling water bottles need to have a thicker wall to keep the carbon dioxide inside during the product's shelf life.
Moreover, the bottle must resist the carbon dioxide pressure. Pressurized bottles generally have "petaloid" bottoms designed for that function.

Did you know?

In order to increase the level of collection and recycling of PET bottles, bottlers have been associated with Eco-Emballages for several years to raise awareness of sorting practices by adding an icon on bottle labels.
Recycled PET is used in many different products: textile, smart cards, automobile parts, carpets, etc. but also to make new bottles.

Why are there so many different formats?

The different formats for water bottles have a practicality purpose. They meet the consumers' different ways of life.
The evolution of eating habits, especially the growth of out-of-home consumption, was the main reason for the creation of 33 and 50cl bottle formats.

[22] Source: CSEM

j) Tinned food

Evolution and consumption patterns

With a production capacity of around 1,500,000 tons (net weight) of tinned products (vegetables, fruit, fish, precooked dishes, meat, etc.), which amount to over 3 billion sale units, French tinned products inner market is a "mature" market.
Since these types of products' shelf lives are quite long (several years), they are easier to export. That is why an important part of French production is exported (around 30%).

The production of tinned food aims both catering industry and retail trade.

Out-of-home catering[23] (for metal tins)

The part of out-of-home catering in tinned food consumption varies according to the products:

- 17% for tinned vegetables.
- 5% for tinned precooked dishes.

Major critical points

- Pressure/temperature scale during the sterilization/tinning.
- Parameters of preservation: shelf-life (use-by date of 2 to 5 years) and ambient temperature.
- Protection against water or oxygen spoiling.
- Consumer usage: easy opening.

Packaging typology

Metal tin (see operation technology in chapter 4)
It accounts for about 90% of the French market in volume and it is made of two materials: steel and aluminium (aluminium tins: about 300 million consumer sales units per year).

> The 3-piece tin

It is the most common, with a curved body, a bottom and a lid. It is made of steel.

> The 2-piece tin for small contents

It is a stamped body with lid, made of steel or aluminium.
The reference size for tins is 4/4 (850ml), but there are also 1/2 tins (425ml), 1/4 tins (212ml), trays and bowls for individual portions.
The out-of-home consumption uses 4/4 tins, but also 3/1 tins (2250ml) and 5/1 tins (4250ml).

Glass tins

They account for about 10% of the French market in volume (sales in France: about 300 million consumer sales units a year)[24].
They are made with a glass container (pot or jar) and a metal lid.

Carton tins

[23]Source Statistics: FIAC / ADEPALE – UNILET - SNFBM
[24]Source: CNE

Did you know?

A bit of history…

Food preservation has always been a major concern for mankind. In 1795, Nicolas Appert discovered a revolutionary food preservation process: appertisation (or tinning). Food is put into hermetically sealed containers, and then heated to destroy microorganisms. After two centuries, appertisation is still one of the most used food preservation processes in the world.

Appertisation preserves food's nutrient contents such as proteins, lipids and sugar, as well as its initial taste and nutritional qualities, without adding preservatives. The metal tin, which perfectly shields from light, preserves fruits and vegetables' photosensitive vitamins.

Preventing wastage:

There are no storage constraints for these products and they have a long shelf life at room temperature (between 2 and 5 years). The use-by date indicates how long the product keeps all its specific properties. Tinned food is one of the solutions to prevent wastage, at the consumer's home as well as in stores.

Tinned food can be defined as perishable food products (of animal or vegetable origin), whose preservation is ensured by a process which combines:

1) Packing in a watertight, gastight, microorganism-tight container, at any temperature under 55°C.
2) Heat treatment[25]

Why are there mouldings in most of the metal food tins?

The purpose of the mouldings you can see on many tins consists in strengthening and rigidifying them, since metal has become less thick with the eco-design strategy for packaging. Thus, the thickness of metal tins has decreased by 21% in 30 years.

[25]Decree n°55-241 of February 10th, 1955

Did you know?

99.7% of French households buy tinned food and consume over 50kg a year per capita (compared to 22.6 kg a year per capita en Europe).

Did you know?

In France, the recycling rate of steel packaging amounts to 77.5%; it is about 50% for aluminium[26] packaging and 70% for glass packaging.

Metal tins can be recycled without losing their properties (technical performances): whether made of steel or aluminium, they are easy to extract and to separate from household waste packaging (with a magnetic stripe for the steel, with "eddy current" for aluminium). Once separated and recycled into a new steel or aluminium product, the metal can be used for many purposes (car and construction industry, household products, packaging, etc.)

Glass packaging can be recycled without losing their technical performances: glass is collected, separated and used to make a new glass packaging.

[26]Source: SNFBM

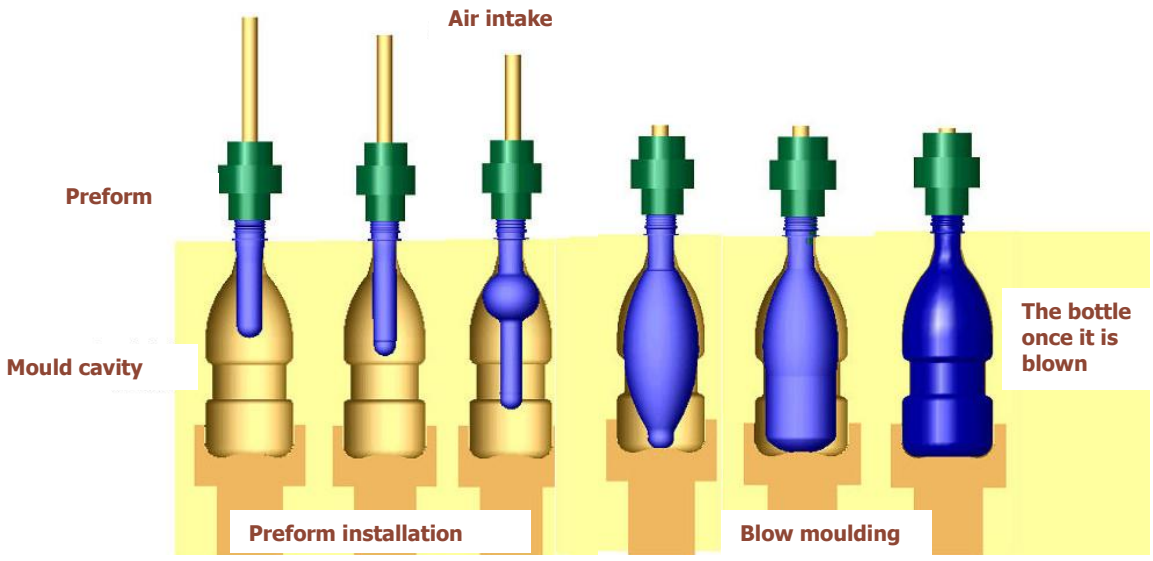
4. A few packaging and preservation technologies

In order to provide a better understanding of packaging, we wanted to explain briefly which technologies are used in the packaging process.

a) Blow moulding: PET bottle

PET bottles are generally made through blow moulding from preforms, on-site or near the bottling place.
Thanks to this technology, you can:
- optimize the bottles' weight
- achieve a high productivity (20,000 to 25,000 bottles per hour)
- ensure a perfect quality, especially for fragile goods.

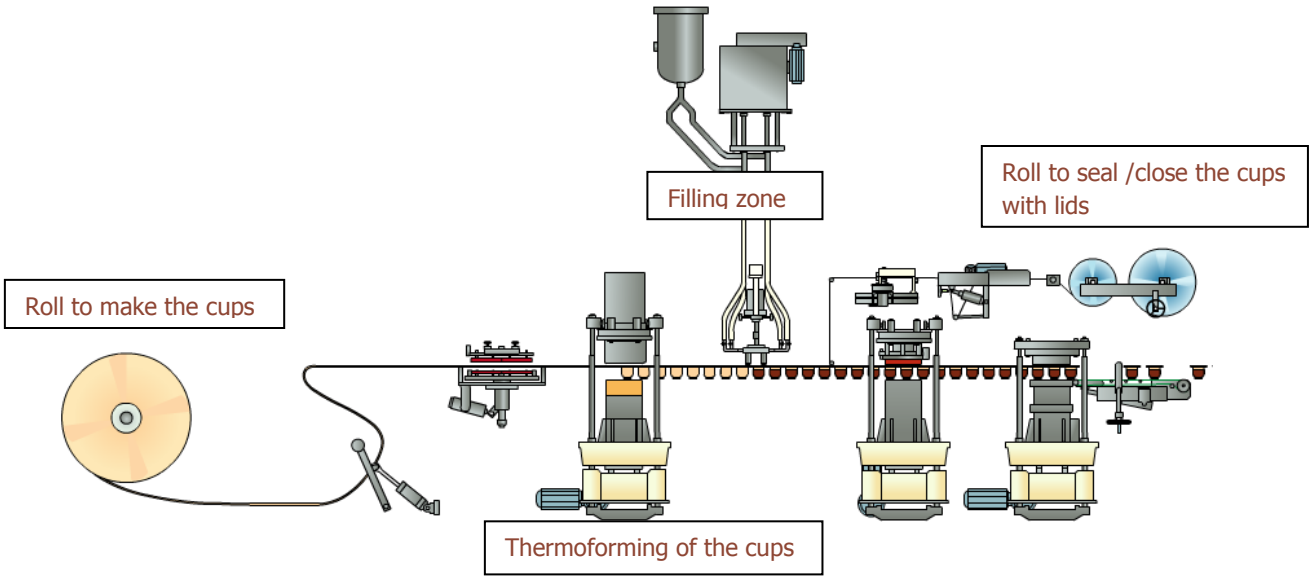
Schematic diagram



b) Thermoforming: yoghurt cups

Most of the time, yoghurt cups are made from plastic rolls (generally in PS), directly on the FFS lines (Form/Fill/Seal).
After a pre-heating phase of the plastic film to make it flexible, the film is trapped in a forming mould and air is injected through it: the plastic takes the shape of the mould, which is then cooled down so the plastic is solid when it is taken out of it. Afterwards, the yoghurt is poured into the cup, which is then hermetically sealed with a welded lid. Then, cups are cut, gathered and crated.

Schematic diagram



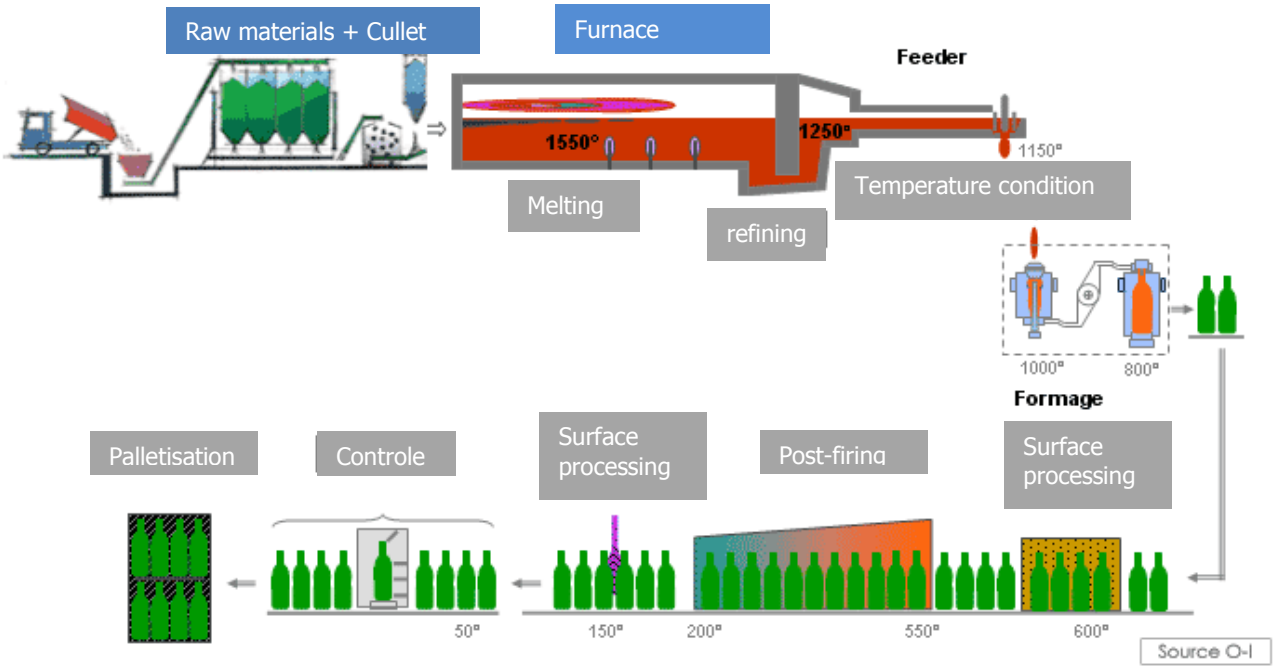
c) Glass packaging production

Glass packaging can be made of sand, limestone, sodium carbonate or cullet (the latter derives from collected, separated and purified glass). Raw materials are combined in the batch house, following specific proportions. The mix is then poured onto a high-temperature furnace, between 1,300° C and 1,550° C.

The resulting drop of molten glass, which is called "blank", is blown with air in a "pre-form" mould, and then in a "final" mould put on the glass-making machine. Then, the glass is cooled in specific conditions in order to prevent sharp temperature changes which would weaken the packaging materials.

The quality of packaging is checked by various machines. Those with defects are thrown away and transformed in cullet again. The glass bottle manufacturing process is the same no matter the shape or volume of the bottle.

Schematic diagram



d) Metal tins production

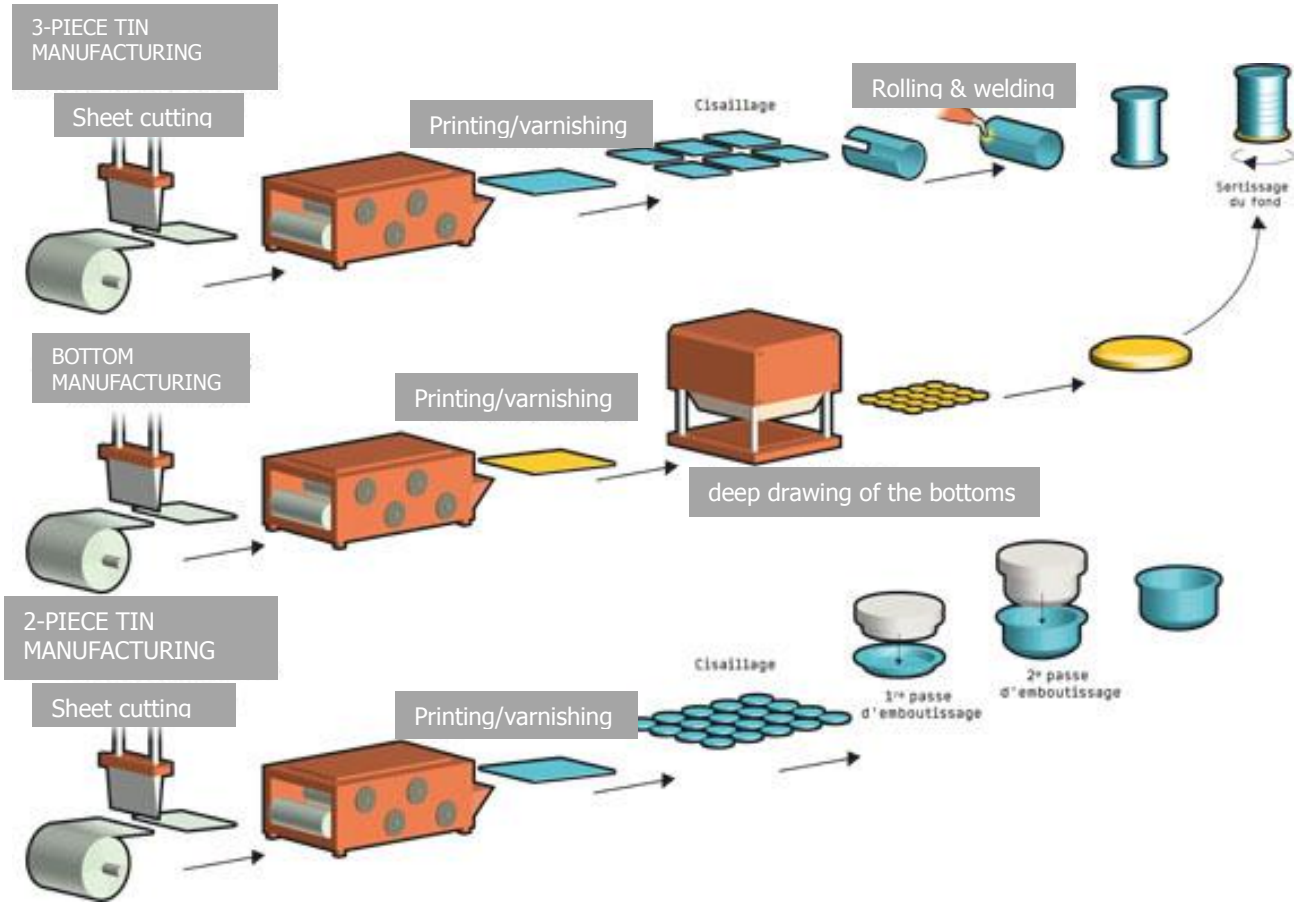
3-piece tins (circular body, bottom, and lid)

During the first stage, a steel or aluminium roll feeds a moulding press which cuts sheets which are then varnished and printed. Afterwards, these sheets are rolled up and welded on the side to form the body of the tin (see diagram below). Meanwhile, the bottoms are manufactured by deep drawing and cutting varnished – and sometimes printed - sheets: these bottoms are then sealed on the bodies. The marketer will then seal a lid on the body after filling.
Finally, the product/packaging pairing undergoes pasteurisation treatment.

2-piece tins

The body of the box is manufactured, undergoing several deep drawings[27] and stretchings[28] (see diagram below) and the lid is sealed at the marketer's place after filling.

Schematic diagram



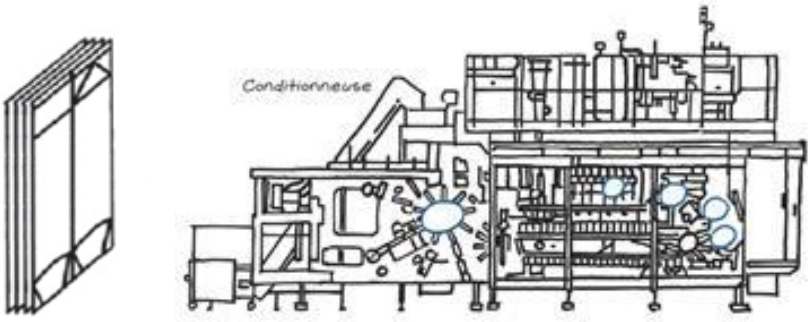
[27]Deep drawing: Process consisting in manufacturing a metal piece between a hollow shape called "matrix" and a punch in order to give the packaging a hollow shape (source: Ciemra).
[28]Stretching: Process consisting in passing the stamped sheet in stretching rings in order to lengthen and thin down the metal, so the body becomes progressively thinner than the bottom (source: Ciemra).

e) Cartons production

Cartons are put into the packaging machine already shaped into cases or rolls, which reduces the volumes transported upstream of the plants. The packaging machine gives the cartons their shape, seals them and fills them in an aseptic[29] area and puts a cap when needed. The production speed of packaging machines meets the current manufacturers' needs for cartons.

Schematic diagrams

Continuous packing process from rolls[30]



Continuous packing process from cases[31]

[29]In the case of products with a long shelf life
[30]Source: Tetra Pak
[31]Source: Elopak and SIG Combibloc

5. The product/packaging pairing

Definitions and functions of packaging

"Packaging[32]" means any item - no matter the materials it is made of - used for the containment, protection, handling, presentation of goods, and to enable their delivery from the producer to the consumer or the user. All "disposable" goods which are used for the same purposes are considered as packaging.

Packaging[33] is only made of:

1° Sales packaging or primary packaging (I), i.e. the packaging conceived in order to constitute at the point of purchase a sales unit to the final user or consumer;
2° Grouped packaging or secondary packaging (II), i.e. the packaging conceived in order to constitute at the point of purchase a grouping of a certain number of sales units whether they are sold as such to the final user or consumer or displayed on the shelves at the point of sale. This packaging can be removed from the product without affecting its characteristics;
3° Transport packaging or tertiary packaging (III), i.e. the packaging conceived in order to facilitate handling and transportation of a given number of sales units or grouped packaging, and to prevent handling and transportation damage. Transport packaging does not include road, rail, ship and air containers.

To understand this document, it is necessary to know other definitions:
- **Constituent:** the constituent of packaging is an element which cannot be easily separated from the rest of the packaging. For example, glues, inks, sealing wax.
- **Component**: the component of packaging is an element which can be easily separated from the rest of the packaging, manually or by simple physical operations (see EN 13427 standard).
- **Complete packaging system**: it consists of the primary, secondary and tertiary packaging, including the upstream packaging (which enclose, protect and transport the raw materials/packaging designed to manufacture and preserve the product).
- **Functional unit**: it defines the reference unit in the Life Cycle Analysis (LCA). It expresses the impact on a representative and well-characterized element such as the product, its packaging, or both.
- **Reuse:** any operation by which substances, materials or products that have become waste are used again.
- **Recovery:** any operation by which substances, materials or products that are not waste are used again for the same purpose for which they were first conceived.

[32]Environment Code (Book V, Title IV, Chapter III, Section 5, Article R543-43)
[33]94/62/EC directive on packaging and packaging waste

The **functions of packaging** for the product are stated below (partial list), with a few examples:

Containing and preserving the product

The purpose is to protect:
- the outside environment from the product (reducing the risk of leakage, preventing the evaporation of solvents in order to safeguard the health of the user, banning the use of dangerous products by children, etc.);
- the product from the external constraints (limiting the damage caused by mechanical shocks, reducing the transfers of unwanted tastes and smells, preserving from the air or oxygen-oxidation, acting as a barrier against any germ, insect or unwanted product intrusion, preventing the theft or consumption of the product before the purchase, optimizing the shelf-life of perishable products, etc.).

Informing

- Giving the general and legal information (best-before date, storage temperature, instructions, unit dosage, ingredients, presence of allergens, price, quantity, weight, etc.);
- Giving information on the conditions of production (Ecolabel, "Label rouge", fair trade, controlled origin label, etc.);
- Giving information on the product specific characteristics in its market (brand, information related to nutrition/health, recipes, mode of cooking, history of the product, etc.).

Did you know?

> Some pieces of information are mandatory in a responsible consumption regulatory framework, such as the alcohol content and the risks of alcohol during pregnancy.

> A decree published in the Journal Officiel (Official Gazette) dated October 3rd, 2006 specifies that alcohol bottles have to carry either a logo or a written statement warning women of the risks associated to alcohol consumption during pregnancy. The message is: "the consumption of alcoholic beverages during pregnancy, even in small quantities, may have serious consequences on the health of the child". This measure applies to all marketed or free-of-charge "beverage unit packaging". As the decree says, the health message (text or logo) shall appear on all beverage packaging in a visible, legible manner, must be well comprehensible for the consumer and indelible (source: Légifrance).

Putting together

- Putting together several consumption units to achieve a proper match between the consumption of the products and the purchasing frequency (pack of yoghurts, pack of bottles of beer);
- Gathering the products in easy-to-use units (wrappers for biscuits) in order to meet the various consumption patterns (on-the-go consumption, etc.);
- Promoting the products (promotional packs);
- Facilitating the handling and transportation by the consumer;
- Facilitating in-store display and any handling operation by operators.

Transportation/Storage

- Ensuring the delivery from the place of production to the place of final sale without damage (protecting the product and packaging against any mechanical damage) by using wooden pallets, corrugated cardboard tops, angle brackets, plastic or metal links, shrink or stretch films, etc.;
- Protecting the product against any malevolent act (theft or "bio-terrorism");
- Informing the logistics centres about the transport crates (logo, brand, content, bar code, etc.);
- Making it easy for users to store the product;
- Making it easy for users to take the product home.

Making the use easy

Packaging matches the use of the product, as both are generally inseparable:

- Easy-opening feature for some consumer groups (elderly, children, nomadic teenagers, athletes, etc.);
- Re-closing system with a view to a deferred consumption of the product.
- Multiportions with a view to a fragmented or on-the-go consumption;
- Ergonomics which makes it easy to grip the product and ensures optimal matching between the size, weight, shape and frequency of use;
- Proper dosage to reduce losses;
- Complete restitution of the product; ensuring the whole product comes out of packaging;
- Using the content/container for any preservation (freezing) or any cooking process (regular oven cooking, microwave, bain-marie, etc.).

Facilitating the packaging process of the product

- Matching the mechanization process without any undesired stopping;
- Ensuring the safety of employees in charge of packaging;
- Carrying out the packaging process at acceptable costs;
- Resistance to the packaging unit operations (shock, heat, outlet, vibration, closing, hygiene, tinning, etc.).

Making the product visible and communicating the product/brand/company values

- Inducing the purchase thanks to the packaging, which has to be eye-catching (consumers spend only a few seconds in the department), through a colour reference system (green for bifidus yoghurts, red for cola beverages, etc.), through the shape of the packaging (orange-shaped bottle for orange juice), through the material used and the atmosphere it brings to the consumer's mind (wood evokes tradition), through graphic design and typography, thanks to which the product is instantly recognized by the public;
- Communicating the brand or company values and assets (corporate social responsibility);
- Ensuring acceptance for the consumer at the buying and consumption point[34].

[34]"Acceptance of packaging, for the product, for the consumer and for the user", CNE, October 2010

6. Glossary

Acronyms

ACN	*Alliance Carton Nature*
ADEME	*Agence de l'Environnement et de la Maîtrise de l'Energie* French Environment and Energy Management Agency
AISE	*Association Internationale de la Savonnerie, de la Détergence et des Produits d'Entretien* International Association for Soaps, Detergents and Household Products
BCME	Beverage Tin Makers Europe
CIEMRA	*Centre d'Information sur les Emballages Recyclés en Acier* French Information Centre on Recycled Steel Packaging
CSEM	*Chambre Syndicale des Eaux Minérales* French Association of Mineral Water Producers
FEBEA	*Fédération des Entreprises de la Beauté* French Federation of Beauty Companies
FIAC	*Fédération française des Industries d'Aliments Conservés* French Federation of Tinned Food Industries
FICT	*Fédération française des Industries Charcutiers Traiteurs* French Federation of Prepared-Meat Industries and Prepared-Food Suppliers
FNCG	*Fédération Nationale des industries des Corps Gras* French Oil and Fat Industries Federation
INSEE	*Institut national de la statistique et des études économiques* French National Institute for Statistics and Economic Studies
SNFBM	*Syndicat National des Fabricants de Boîtes, emballages et Bouchages Métalliques* National Association of Metal Tin and Corking Manufacturers
UPPIA	*Union Pour la Promotion des Industries Conserve Appertisée* Union for the Promotion of Tinned Food Industry

Technical terms

CO2	Carbon dioxide
CHD	Out-of-home consumption (*Consommation Hors Domicile*)
CHR	Coffee shops/Hotels/Restaurants
CU	Consumption Unit
EPS	Expanded Polystyrene
FFS	Form, Fill and Seal
HDPE	High-Density Polyethylene
LCA	Life-Cycle Analysis
LDPE	Low-Density Polyethylene
MDPE	Middle-Density Polyethylene
PE	Polyethylene
PET	Polyethylene Terephthalate
PP	Polypropylene
PS	Polystyrene
PVA	Polyvinyl alcohol
PVC	Polyvinyl chloride
RPET	Recycled Polyethylene Terephthalate
UHT	Ultra-High Temperature
VCS	Vertical Compressive Strength

7. Acknowledgements

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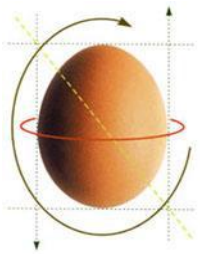
The CNE's Nine Colleges

Packaging materials manufacturers,
Packaging manufacturers,
Companies in the consumer goods sector and their suppliers,
Retail companies,
Companies authorized by the public authorities to organize the collection and recovery of packaging waste on the national level and operators in this sector,
Consumer associations
Environmental protection organizations,
Local authorities,
Other federations and companies



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