

Empty space & packaging The CNE¹ fills a gap

¹ *Conseil National de l'Emballage* (French Packaging Association)

CONTENTS

Foreword: the President's word	2
Summary	3
1. Empty space & Packaging	4
2. Empty space & Packaging functions	5
2.1 Containing and preserving the product	5
2.2 Informing	15
2.3 Grouping	16
2.4 Transporting/Stocking	17
2.5 Facilitating use	26
2.6 Facilitating the product packaging process	28
2.7 Making the product visible and conveying the values of the product and/or those of the brand and the company	30
3. Regulations	31
3.1 Regulations currently in force in France	31
3.2 Regulations in force in France in the future	33
3.3 Regulations in force in industrial countries	34
3.4 Soft law and good practices	37
4. Conclusion and prospect	38
5. Acknowledgements	39

Empty spaces in packaged products and packaging is a real concern.

It is in all likelihood the blind post of regulation 94.62. It is indeed stated that the weight and volume of packaging waste must be diminished. But everything is measured through weight, never volume. The value chain might have historically worked on weight, but the same cannot be said for volume.

There has been mention of "technical empty spaces" in cereals and fries.

The "marketing empty spaces" that inflate the volume of a secondary packaging compared to the content of the primary packaging are questionable.

Empty spaces in e-commerce deliveries are very well known and unfortunately a commonplace, and I experienced as much again last week. Operators are becoming more and more aware of it, but there is still much to do.

I want to mention a kind of "empty space" often forgotten or at least poorly treated. It involves filling pallets with finished products. Big companies often use optimization software that sometimes even adjusts the dimensions of the product itself. But how many of them overlook this aspect?

I also had the opportunity to discover a less known kind of empty space that I'm tempted to call a "favor empty space". When visiting a fresh produce factory, I was surprised to see that most of the products were displayed on half-pallets, themselves placed on full pallets. The aim is to enable retail customers to supply hypermarkets with full pallets, or small city-center stores with half-pallets. This was requested by retailers to avoid handling in their warehouses. As a result, there is between 10 and 25% less product on a pallet. That is to say, empty space for the favor's sake!

I deliberately don't mention the empty space in containers – although sometimes important – because by convention, the work of packaged products and their packaging ends at the pallet level.

Technical, marketing, e-commerce, pallets, favors empty spaces... and many others I must be forgetting.

All of this shows that the empty space in packaged products must be reduced, because it means so much unnecessary volume in flows, stocks, and transportation, with all the negative environmental impacts it entails.

Michel Fontaine
President of the CNE

Summary

This document offers a non-exhaustive inventory explaining for instance the various types of empty spaces encountered.

It questions in a factual and tempered way the reason for this empty space by analyzing the following explanatory factors:

- The product's inherent properties,
- The dimensional variations due to product manufacturing,
- The complete packaging system,
- The use of the product by the user (B to B), and the consumer (B to C)
- The product's entire life cycle (lifespan, packaging as a lever in the fight against waste, etc.)

Based on these examples of investigations sorted by packaging function, a reflection that enables to go beyond the emotional perception of empty space and to reach the rational of a probably functional empty space is established.

As shown in this document, the players are working hard on this subject. The fact remains that the perception of useless empty space exists on some subjects such as:

- Empty space in containers
- Empty space generated by customer needs (mass distribution)
- Empty space in e-commerce parcels or in order preparation logistics
- Etc.

In some sectors, empty space may be strictly necessary (in order to respect critical points) and cannot be reduced in the future (nature of the product, gas injection, dimensional variability of products linked to the process, etc.).

There are solutions but sometimes they require high investment costs and development time.

On this subject, there are inter-professional approaches and commitments. These developments need to be monitored over time, and the achievement of targets needs to be validated (or not).

There are still a number of areas where a **joint** effort is needed, particularly that of empty space linked to product logistics (order preparation, containerization, e-commerce, etc.).

The document offers a section about regulations (France, Europe and worldwide) on this very subject.

1. Empty space & Packaging

Context

Why tackle the perception of empty space by the consumer, the user of packaged products?

The CNE did little documentation on this subject, and it was necessary to make it a full-fledged subject for three major reasons:

- Regulations require optimized packaging both in terms of weight and volume (see chapter 3).
- Pedagogy is key here, and it is important to be didactic to show that there are gaps that don't just happen to be there (which can be described as functional empty spaces) and there are useless gaps, in the sense that actions can be taken to reduce them.
- Articles, studies, and actions carried out on the subject by foodwatch², foodwatch and Zéro Waste France³, CLCV⁴, Créapills⁵, etc.

Introduction

From a regulatory point of view, the European Directive 94/62 lists the essential requirements to be met when designing packaging in the perspective of its treatment once it turns into waste.

The norm NF EN 13428, published for the application of the directive 94/62, defines source reduction as *"the process of ensuring, for identical required functions, that **the weight and/or volume** of primary and/or secondary and/or tertiary packaging has been minimized, while guaranteeing that user acceptability is maintained, thus reducing the impact on the environment"*.

Source reduction is assessed by highlighting *"critical point(s)"*.

Establishing a *"critical point"* means demonstrating that a further reduction in the packaging's weight and/or volume would jeopardize one or more of its functions or *"performance criteria"*.

There is a need to distinguish between technical, functional empty spaces in packaging (reaching a critical point), and empty spaces that are unnecessary because too large, or even misleading.

Still from a regulatory point of view, the PPWR⁶ (which will replace Directive 94/62) will define empty space and the objectives to achieve (see Chapter 3).

Beyond the emotion aroused by the perception of empty space, the CNE reminds that there is reason to be factual on this subject, namely:

- Analyzing empty spaces by taking into account the entire packaging system (primary, secondary, tertiary);
- Identifying risks of product loss or waste;
- Thinking about the reasons behind the empty spaces by questioning the nature of the product itself, its manufacturing and packaging process;
- Studying the packaged product's cycle through life-cycle assessments if required.

² <https://www.foodwatch.org/fr/actualites/2020/produits-pleins-de-vide-7-marques-qui-abusent-sur-lemballage/>

³ <https://www.zerowaste-france.org/suremballage-zero-waste-france-foodwatch-interpeller-5-marques-industrie-agroalimentaire/>

⁴ <https://www.clcv.org/communiqués-de-presse/enquete-emballages-alimentaires-des-efforts-de-sobriete-sont-indispensables>

⁵ <https://creapills.com/compilation-packaging-decevants-20230324>

⁶ PPWR: Packaging and Packaging waste Regulation

2. Empty space & packaging functions

The document is organized around the functions of the packaging system, which are often reminded in CNE publications.

Empty space perception and its causes are analyzed according to each function through examples: they demonstrate the importance of the empty space when functional, while other examples show that the economical players can make progress in terms of useless empty space.

2.1 Containing and preserving the product

The aim of packaging is to protect the content from external constraints (limiting deterioration by mechanical impacts, reducing transfer of off-flavors and odors, preserving from degradation by air or oxygen, preventing germs, insects, or unwanted products from entering, preventing theft or consumption of the content before purchasing, optimizing the shelf life of perishable products, etc.).

Primary packaging

The following examples deal with empty space perception in packaging, an empty space that is needed because of:

- The inherent characteristics of the product itself,
- The packaging of the product in a modified atmosphere (MAP)⁷,
- Regulations.

2.1.1 Food products in modified atmosphere⁸: grated cheese

Some food products need to be packed in a modified atmosphere with a gas (nitrogen and/or carbon dioxide) that, by gas flushing, replaces the atmosphere. Replacing the oxygen in the packaging with these gases limits microbial growth and extends the product's Minimum Shelf Life (MSL).

Over the bagging process, a cannula descends into the bag in which the product was previously dosed. The injection of the gas mixture, particularly in the case of powdered products, can make the food fly into the packaging, thus polluting the sealing zone and creating sealing problems. Hence the need for a functional empty space.

It should be noted that the addition of gas itself, whatever the product type, increases packaging volume. These two technical constraints must be considered when defining the sizes of the bags.

Hereunder examples of grated cheese packaged with Doypack[®] bags:

Step 1
Filling station



Step 2
Gas injection station



The visible empty space of these bags corresponds to the product protection gas: it is a functional gap.

⁷ MAP: Modified Atmosphere Packaging

⁸ Source: BEL Group

2.1.2 Food products in modified atmosphere⁹: meat

The quality of the meat packaging is crucial to optimize its preservation and ensure the food safety of the consumer. As a result, there is sometimes protective atmosphere packaging that implies an empty space between the meat and its packaging (tray and lid).



The empty space can somehow be considered useless, but it is not the case. This common example involves a thermoformed tray in which the ambient air has been eliminated as much as possible, replacing it with gases such as oxygen O₂ and carbon dioxide CO₂.

What is this protective atmosphere for?

Protective atmosphere helps avoiding the proliferation of pathogens that are dangerous to health (E. coli, salmonella, listeria, staphylococcus aureus, etc.).

- Oxygen O₂ is used to redden or pinken meat in the packaging to seduce consumers. Most importantly, it inhibits the metabolism of pathogens such as salmonella.
- Carbon dioxide CO₂ plays an aseptic role when its concentration is maintained above 20%, because at this level it is lethal to all organisms.

Protective atmosphere packaging in a sealed tray enriched with O₂ and CO₂ is a technique that extends the shelf life of red and white meat.

Why is such a volume necessary?

Meat packaging is a major challenge for the food industry. Meat is indeed a perishable product that needs an appropriate preservation to prevent from microbial proliferation and thus extend its shelf life.

The expiration date of meat is defined by several parameters:

- The type of gas injected,
- The residual rate of oxygen,
- The barrier against oxygen in ambient air with packaging (lid and tray),
- The amount of gas injected.

Structural defects in particular can lead to a quick escape of CO₂, eliminating the aseptic effect, while the meat would still appear red and wrongly assumed as safe by consumers.

For instance, according to the amount of available gas in the packaging:

- For a 1-litre volume, CO₂ falls below the aseptic level in 6 days for a 100 µm-thick film with a defect the size of a hair's diameter (40-100µm in diameter);
- The CO₂ falls below the aseptic level in less than a day for a film perforation the size of an acupuncture needle (300 µm in diameter).

The expiration date of meat is thus proportional to the amount of gas injected into the tray, simply because the gas protects the product.

The empty space perceived is actually a functional one for the sanitary protection of the product.

⁹ Source: Anéolia

2.1.3 Product specificity¹⁰: icing sugar

Icing sugar is made by grinding sugars with larger granulometries.

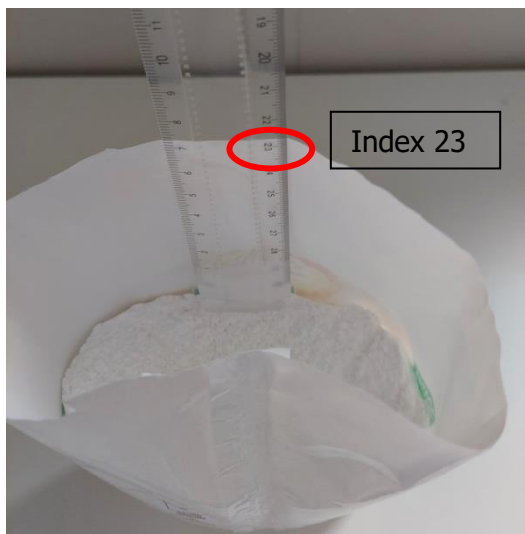
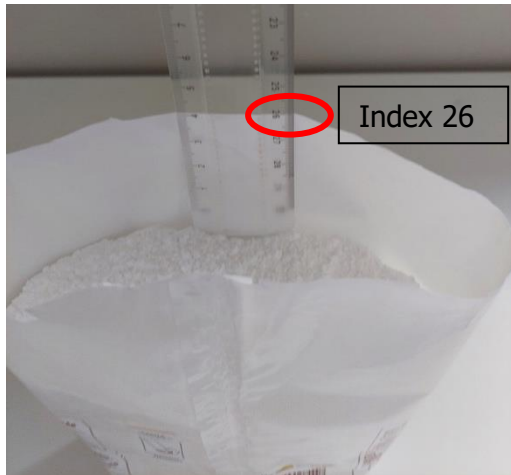
This milling step raises the temperature of the sugar to 43°C and fills it with air, therefore increasing its volume significantly.

As the sugars are continuously grinded just before bagging, the icing sugar is at its maximum volume when bagged.

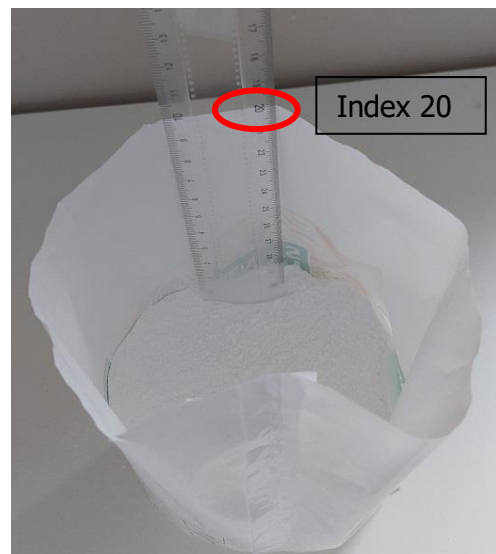
Tamping (vibrating the bag as it is filled) helps deaerate the icing sugar but does not solve everything.

In the 30 minutes following bagging, the volume of the icing sugar will decrease about 20% (as the air is getting colder, its volume decreases and the icing sugar continues to deaerate, thus losing volume).

Bag in bagging output



The same bag 30 minutes later



The same bag 1 hour later

An hour after bagging, the volume of the sugar stabilizes after decreasing a further 10% or so, leaving a gap at the top of the bag that is difficult to avoid thus far.

The empty space perceived by the consumer during use is inherent to the manufacturing properties of the product itself.

¹⁰ Source: Saint-Louis Sucre

2.1.4 Product and manufacturing specificity: pet food's kibbles

Extrusion cooking is the most commonly used technique for dog and cat food's manufacturing. First, the mixture of ingredients is kneaded and cooked by applying heat, pressure, and shear via an endless rotating screw. The mixture is then passed through a die which shapes the kibbles by instantaneous evaporation of the water. Die exit knives combined with extruder speed define the size of the kibbles.



The pressure difference between the inside of the extruder and the external ambient atmosphere expands the product. Therefore, the density of the kibbles can vary.

Different parameters can change the density of the kibbles made by extrusion cooking. In particular the mixture composition (starch content, lipids, proteins, fibers, moisture, etc.) and operating parameters such as temperature and extrusion screw speed.

For instance, the higher the temperature during extrusion, the more the kibbles expand and the more their density decreases.

Controlling these parameters is therefore essential to reduce extruder output density tolerances and meet packaging control requirements.

Kibble bags must be dimensioned to accept variations in density and therefore volume that are linked to the tolerances of the process in question, as well as the technical constraints linked to bagging, filling, and bag sealing.

There are systems to instantly vary the density of the material inside the extruder by injecting steam or generating an empty space.

The more the system can guarantee a reduced density range, the more optimized the packaging size will be.

Any empty space perceived is due to the need for packaging to incorporate the dimensional variations of the product itself.

2.1.5 Product specificity: aerosol generators¹¹

An aerosol generator¹² is a non-reusable metal, glass or plastic container containing a compressed, liquefied, or dissolved gas under pressure, with or without liquid, paste or powder, and fitted with a sampling device enabling the contents to be discharged in the form of solid or liquid particles suspended in a gas, or in the form of foam, paste or powder, or in a liquid state.

As a pressurized packaging, an aerosol packaging requires a regulatory framework handling the security aspect: the European directive 75/324 and its updated French transposition texts (see § 3.1.1 on applicable regulations in France).

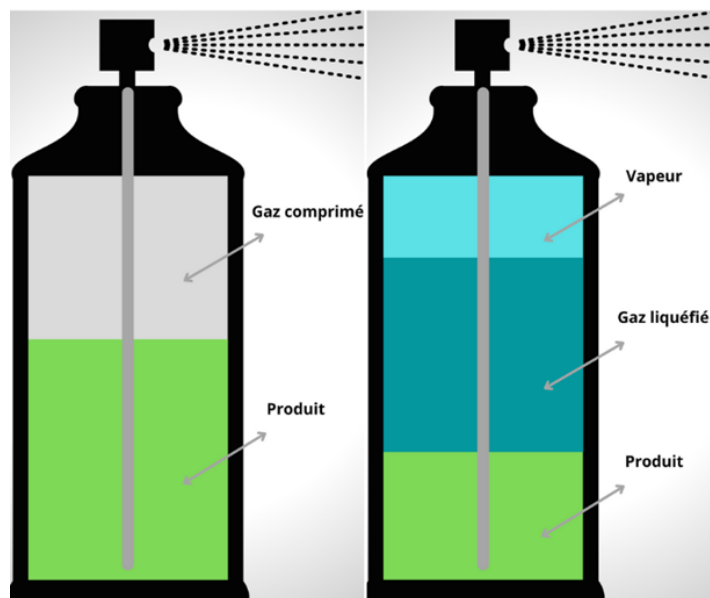
These regulations prohibit overfilling and therefore imposes an empty space. The empty space requirement for this type of packaging is directly linked to the risk of an increase in internal pressure due to a rise in temperature of the aerosol generator (exposure to the sun on the rear parcel shelf of a car, for example).

It is therefore necessary to limit the filling to leave an expansion space that guarantees the safety of the product (in case of high temperature). The regulations stipulate¹³ that:

“At 50°C, the volume of the existing liquid phase must not exceed 90% of the net capacity.”

In order to meet this definition, the maximum filling volume when using liquefied gas is 75% of the volume filled to the brim. It is however 60% when using compressed gas.

The diagram hereunder shows how this works.



The empty space here meets a regulatory safety requirement.

¹¹ Source: *Comité Français des Aérosols* (French Aerosol Committee)

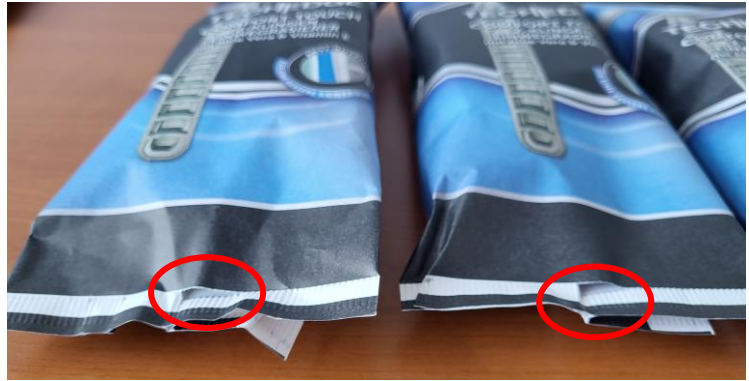
¹² Directive n° 75/324/CEE of 20 May 1975 on the reconciliation of the laws of the Member States relating to aerosol generators.

¹³ See the regulatory references in § 3.1.1 about regulations on aerosol generators.

2.1.6 Product specificity: razors¹⁴

During the razor packaging process, or that of any other rigid product in bags, whatever the nature of the material (plastic or paper), a space is needed to protect the product but also to maintain the integrity of the packaging. Packaging that is too tight at the welds around the product can lead to ruptures in the sealing areas because of the pressure exerted by the products when they are being transported or handled.

Sharp or angular products such as razors can exert mechanical constraints and can tear the packaging (see pictures below) if there is not enough free space to limit friction or pressure.



This need is increased by the use of paper-based bags, which are more fragile because they are less flexible than plastic bags. They are however increasingly popular with consumers.

The empty space between the bag welds and the products is essential to the packaging process: it is a functional gap.

¹⁴ Source: Eggedwell Personal Care

2.1.7 Product specificity: potato chips¹⁵ and snacks

Chips and certain snacks generally come in flexible bags with an inflated appearance (balloon effect). Emptiness or more precisely empty space in bags is a technological solution to many issues:



- The empty space protects the product from damage during transportation from the factory gates to the consumers' table (boxing, palletizing, road-river-rail transport, in-store unloading, shelf placement, transportation to consumers, etc.). The empty space creates a balloon effect, allowing the chips to move and fit together like a jigsaw puzzle, without being crushed or broken.
- The space in the bag makes it easier to close and seal the packaging: overfilled packaging makes it difficult (if not impossible) to seal packages. Without a sufficient empty space, the packaging machine struggles to seal the packaging properly, so the machine equipment has to reduce the production line speed considerably to ensure an airtight sealing.

For chips more specifically:

- The dry matter content of potatoes varies between varieties and over time for the same variety. While potatoes are harvested once or twice a year, chips are produced year-round. A potato harvested in October will be larger and bulkier than an early potato harvested in April. Moreover, dry matter content affects the apparent density or gross density of the chips. Varieties and their size, shape, and tendency to break also influence the final density.

The main goal of an empty space left in a bag is to offset this variability.

For some product ranges:

- The bags can also be filled with nitrogen to preserve product shelf life and prevent oxidation following contact with oxygen. The packaging is thus hermetically sealed to retain gas and prevent the introduction of oxygen.

The gap perceived is actually a functional one. The inert gas content is meant to protect the product.

¹⁵ Source: Fedalim

Secondary packaging

2.1.8 Product cushioning material¹⁶

Examples

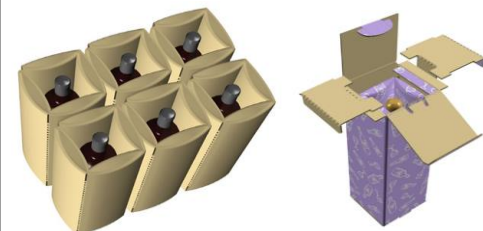
Small appliances cushioning material



Electronic product cushioning material



Bottles cushioning material



Tableware glasses cushioning material



Packaging is essential to protect the product during transportation, stocking, and handling. Sometimes however, there is a need to complete with wedging. Thanks to these packaging elements, there is additional protection.

They keep fragile and vulnerable products (electronic products, home appliances, tableware, etc.) safe from any damage by maintaining them within the packaging throughout the whole supply chain.

More than reducing transit damage, a cushioning system can have numerous functions:

- Filling the gaps caused by the general shape of the product to prevent it from moving and ensure stability and optimal protection during transportation.
- Separating the products and protecting them from impacts and frictions.
- Providing additional compressive strength, particularly for non-load-bearing products.
- Ensuring a better weight distribution and maintaining the integrity and solidity of the packaging.
- Protecting from the vibrations caused by the various logistical steps.
- Protecting more delicate surfaces from scratches.
- Maintaining the integrity of the packaging and protecting people when unpacking objects with sharp edges or sharp items with sections, wedges, and corner pieces.

Empty space and cushioning play a functional role with many attributes.

NB: the draft of the European regulation amending the directive on packaging and packaging waste considers cushioning for empty space¹⁷. It raises the question of distinguishing between cushioning elements that fulfil a functional role and those that unnecessarily fill the empty space.

¹⁶ Source: *Carton Ondulé de France* and Saica Pack

¹⁷ See § 3.1.2 on the draft of the European regulations

2.1.9 Washing doses

Doses of compact washing powder are sometimes sold in bulk and sometimes packaged in a case. The consumer may consider there is empty space in the packaging when opening the case of bulk doses (see pictures below).

Bulk doses



Tidy doses



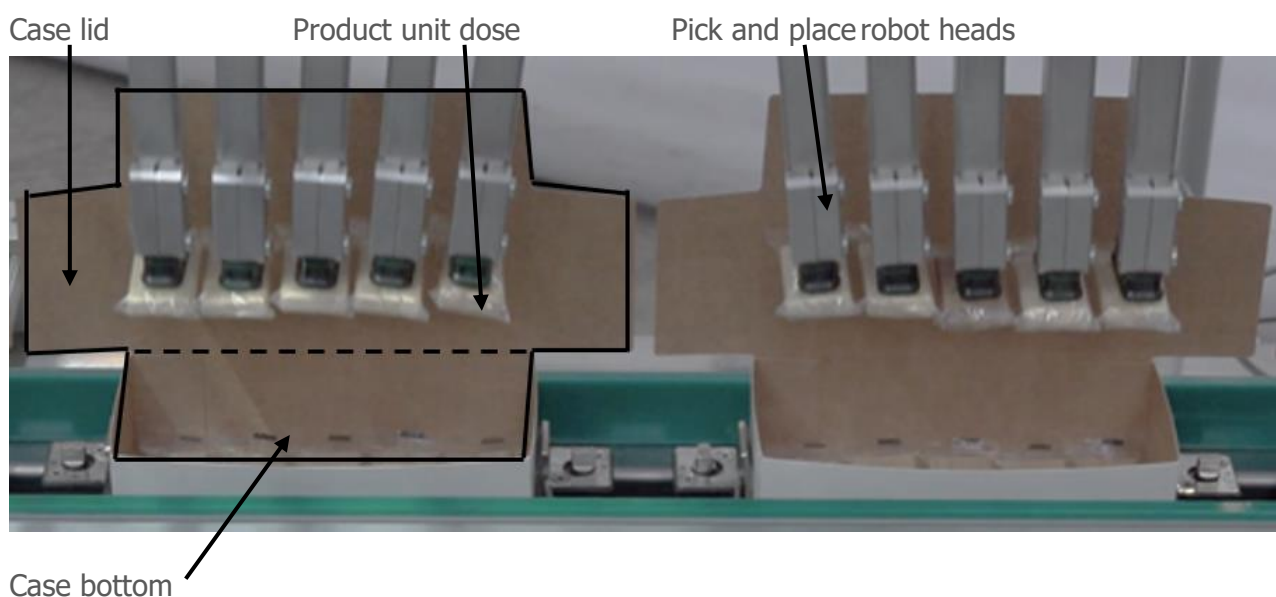
The packaging process of the doses implies a case designed for this high-speed filling operation at between 500 and 1,500 doses per minute.

Packaging tidy doses offers:

- Space saving with optimization of the occupied volume, and therefore less empty space visible;
- A redesigned case with smaller dimensions;
- A denser pallet (more consumer sales units per pallet);
- An opportunity to develop e-commerce sales (case dimensions compatible with standard letterbox formats (see example below)).



However, one of the obstacles to the opportunity of optimizing packaging weight and volume by tidying the doses is the required investment (namely pick and place robots), which is estimated at €1.2 million per line (see below).



Limiting the empty space in these packaged products is conceivable, but investment constraints can be an obstacle.

2.2 Informing

- Providing general and legal information (expiry date, storage temperature, instruction manual, dosage/unit dose, composition, allergens, price, quantity, weight, etc.),
- Providing information on production conditions and product traceability (Ecolabel, *Label rouge*¹⁸, fair trade, Protected Designation of Origin-PDO, etc.),
- Spreading information related to the specific characteristics of the product in its market environment (brand, nutrition and/or health claims, recipes, cooking methods, history of the product, etc.).

There is little perception of empty space linked to this function. However, the CNE reminds that the “information” function should not be used as an excuse to develop packaging that is oversized compared to the product it contains and that could generate impact transfers in transportation packaging (from empty spaces for example).

It must be possible to justify the dimensions of the packaging carrying the information thanks to a critical point for this performance criterion (for instance regulatory obligations).

¹⁸ Literally: Red Label

2.3 Grouping

- Gathering several consumption units together to match product consumption and frequency of purchase (packs of yoghurts or beer bottles),
- Assembling products into manageable units (bags of several biscuits) to meet different consumption patterns (nomadism, etc.),
- Promoting products (promotional kits),
- Being easy for consumers to pick and carry,
- Making shelving and handling easier for operators.

The CNE thinks grouping can create empty space in the transport case. This can be justified for the following reasons:

- Optimizing the packaging process and facilitating logistics. A single transport case can contain several consumer sales units¹⁹ and therefore several outers (consumer sales units per case). There can be empty space in the outer if the marketer wants to put all outers in a single case format (to optimize the packaging lines for example). When using the same packaging for different product quantities, the conditioner avoids production stoppages to adapt the packaging machines to the format change.
- Complying with specifications and the mass distribution's desire for specific sales unit formats in order to stand out from the competition or offer promotional sales units. Depending on the sales volume, the packaged products supplier can compromise on outers based on the cases available on the line. As a result, there will be empty space because it's not always possible to optimize every specific request. That is an economic issue.

¹⁹ For instance, a single transport case can contain 3 sales units of 12 jars, 8 units of 4 jars, or 2 units of 16 jars. Therefore, there will be empty space in one of these combinations because the case dimensions remain identical regardless of what's inside.

2.4 Transporting/Stocking

- Ensuring damage-free delivery from the production site to the point of sale (protecting the product-packaging pair against mechanical damage) using wooden pallets, corrugated cardboard covers, corner pieces, metal, or plastic ties, shrink or stretch film, etc.,
- Protecting against malicious intent,
- Informing logistic centers about the content of the transport cases (logo, brand, content, barcode, etc.),
- Ensuring that products can be transported to the consumer's home,
- Providing storage options for the consumer.

Product and logistics

2.4.1 The spirits compression chamber²⁰

Spirits often are transported in containers, within which the temperature can rise above 70°C. They also have a high alcohol content (for instance, 40% for cognac) and alcohol has a coefficient of expansion 4 times greater than that of water – volumes of alcohol are closely monitored by customs.

In the case of products made from alcohol of a certain value, **the consumer's perception of a well-filled bottle** at the time of purchase is a key element of the marketing requirements. For instance, in the case of spirits, where the expansion of alcohol by temperature can be significant (3.5 to 5.5% expansion), this must be integrated into the development of primary packaging to avoid subsequent logistical worries.

There is therefore a need to find a compromise between marketing and technical constraints.

A bottle of 40%-alcohol spirit whose cork rises to 70°C.



The compression chamber (the air between the cork and the fill fluid) of the bottle on the left is 3.5%, that in the middle 4%, and that on the right 4.5%. The dilatation of alcohol makes the cork rise. This cannot be undone, and the bottle therefore cannot be sold.

Potential solutions:

- Active ones: using temperature-controlled containers (15°C)
- Passive ones:
 - Increasing the value of the compression chamber (and thus the “gap” in the bottle), which conflicts with marketing because it feels like “thieving packaging”.
 - Putting a sleeve on the cork’s head in order to maintain it firmly.
 - Isolating the container to use day/night thermal inertia.

The empty space above a product is needed to understand the logistics vagaries (temperature) and therefore prevent the cork from rising because of the spirits’ alcohol expanding.

²⁰ Source: FS PACK Cognac

Palletizing and product process

2.4.2 Palletizing sugar cube boxes

To make sugar cubes, the *Saint Louis Sucre* group uses crystal sugar and adds water to it. Once kneaded, the mixture is used to fill small moulds in the shape of sugar cubes, into which it is strongly compressed.

Once removed from the mould, the sugar cubes contain around 0.8% water and are not yet solid. To solidify, they need to be dried at around 130°C.

At the moment of canning, just after drying, the temperature of the solidified sugar lumps is around 45°C and they still contain around 0.3% moisture.

In order to stabilize the sugar cubes in their final form, they have to go through a maturing phase of several days. This lowers the temperature of the cubes and evaporates the residual moisture it contains to get it stabilized at around 0.03%.

The boxes are made to facilitate the exchanges between gas (varnish, no printing at the bottom, etc.) and the palletizing is designed with ducts (empty space) to enable the air to circulate through the core of the pallet and water to evacuate.

In case of wet, water droplets are formed, and the sugar cube, thus wet, disintegrates. There is no other way to do it than creating empty space within palletizing.

During the few days of the maturation phase, approximately one tone of water per day will be evacuated for every 1,000 tones of pieces being stabilized.



Assembling sugar cube boxes. Ducts can be seen clearly.



1st row of a pallet of 5 boxes making the ducts visible.



Finalized pallet of 5 boxes where the ducts are visible.

The empty space is essential to cool down the products once on the pallets. It is a functional gap.

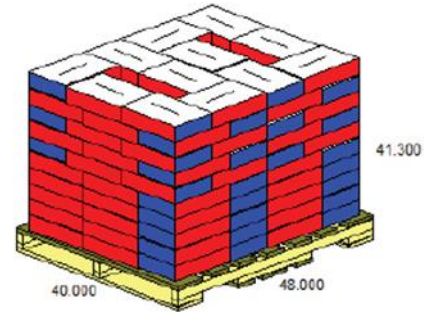
2.4.3 Palletizing melted cheese²¹

The making of melted cheese requires “ducts” in the pallets in order to cool them after packaging.

Melted cheese and fresh melted cheese are poured hot in their packaging (between 70 and 80°C depending on the products). Cooling the cheeses is therefore a key point in the process in order to control their texture and avoid condensation on the pallets.

Regarding melted cheese, shipping pallets are made up at the end of the line by incorporating ducts that enable air circulation. However, the pallets remain well optimized, for the payload is close to the maximized authorized payload. To maximize cooling and avoid condensation, the banding film is usually added afterwards.

The empty space in the pallets is essential to cool down the products. It is a functional gap.



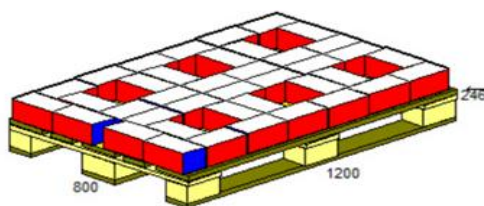
2.4.4 Palletizing soft cheese with bloomy rind²²

Soft cheese with bloomy rind contains living ferments (Geotrichum for instance) that can continue to ferment after production, therefore generating heat that has to be evacuated by the ducts, also within the pallet.

Yeast-type ripening flora are used in the making of certain cheeses. These micro-organisms need O₂ to live. As a result, they release energy that has to be drained away from the pallet to prevent it from heating up. The higher the temperature, the longer micro-organisms live and the more energy they produce...

To drain this energy away as efficiently as possible and avoid warming, ducts (empty columns without cases) are set up on the pallets, as well as ventilation holes on the cases.

Palletizing layout



Pallet with its “ducts” seen from above



The empty space in the pallet is essential to control product fermentation. It is a functional gap.

²¹ Source: BEL Group

²² Source: BEL Group

Logistics

2.4.5 Palletizing with Slip Sheet²³

The Slip Sheet system is made of pallet-sized Kraft sheets. The surface area of a standard Slip Sheet is 1,200 x 800mm, with two strips each 75mm wide. The process involves simplifying container unloading as follows:

First of all, a specific equipment is needed to use the slipsheet: a forklift truck equipped with a 'push pull' system (see diagram below).

- Placing the slip sheet on a wooden pallet,
- Placing the transport cases above (to make layers, use additional slip sheets),
- Pulling out and placing the cases-slip sheets pair on a pallet during the unloading with the push-pull trolley.

For the shipper, the advantage is a significant increase in the product volume in a container, as well as an economic gain.

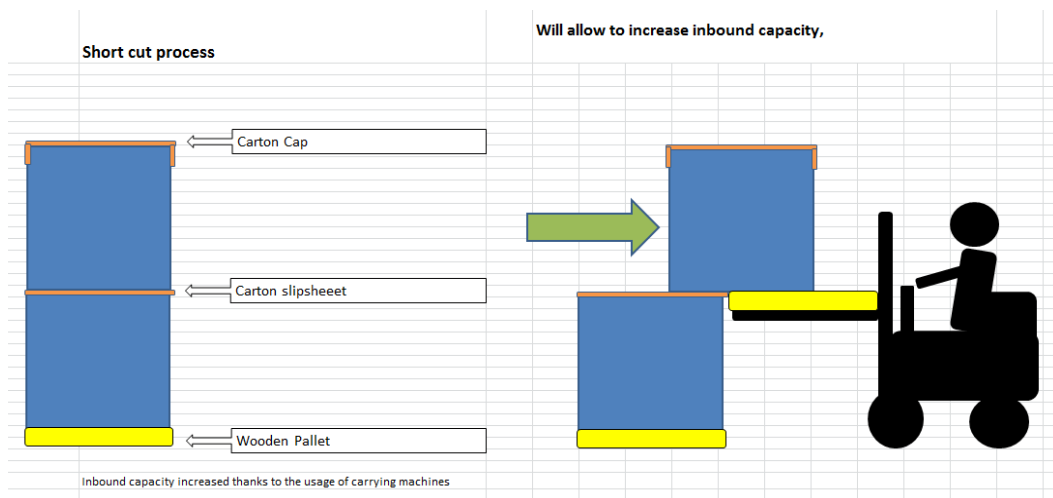


Diagram of the push-pull system on a forklift truck (in red below): Corpal source



Replacing pallets in containers (when possible) with this slip sheet system saves up to 15% in space.

²³ Source: [Packaging as Key Element in Product Logistics - CONSEIL NATIONAL DE L'EMBALLAGE \(conseil-emballage.org\)](https://conseil-emballage.org/)

2.4.6 Palletizing and order picking

Orders are prepared in logistics centers in such a way that the shops can pick up the products on separate pallets to make it easier for the various department managers to put them on the shelves directly in the shop. Therefore, on a logistics center's delivery truck, from the distributor to its shops, several wooden pallets can be seen on the same pallet, and each of these pallets corresponds to a shop order.

These order pickings involve different products on a same pallet. The intrinsic properties of the products (their mechanical fragility, size and format) mean that pallet heights need to be limited. As a result, the truck is not filled to full capacity, making it harder to optimize its volume.



Logistics centers can also deliver products in quantities that are not large enough to take up the maximum surface area of each pallet (dispatching), which can lead to empty trucks because the pallet height is not optimized.



Transporting and stocking in e-commerce

There is a great diversity of packaged products in e-commerce, whether it being in size or in variety: clothes, shoes, beauty products, phones, wine bottles, and even fresh products.

Each type of products has its own specific requirements: fragility, moisture and temperature sensitivity, health safety requirements, etc. Numerous adapted packaging models can be designed to this end. However, there is an additional difficulty for e-traders: they often do not know in advance what their parcels will contain, yet it is sometimes difficult to keep a large number of packaging references. The difficulty also lies in defining the range of packaging required in order to have the most accurate reference for the parcel to be sent.

Adaptable packaging has also been developed by tearing or folding the sides or flaps to fit the format of the product(s), thereby limiting the empty space, but not necessarily eliminating it. To guarantee the product integrity, it must not be able to move inside the pack: hence the need for cushioning.

The demands of this logistical circuit all the way to consumers are high, and the packaging must be able to meet them. There can be up to 15 bulk breakings²⁴ for a parcel. This considerably increases the number of times the product is handled, the number of times it passes through several logistics platforms and the number of means of transport (truck, train, car, etc.), which means there are plenty of opportunities for falls, knocks, etc. Not to mention the possibility that the parcel can failed to be delivered to its recipient (due to absence) and therefore have to be delivered a second time. The empty space can then be used to protect the transported products.

The economic players in the sector have made a commitment via the **E-commerce Commitment Charter**²⁵ of July 2021:
Excerpt about the empty space issue:

"Reducing packaging volume and promoting re-use:

(5) undertaking actions to reduce the volume of delivery packaging for at least 75% of products and parcels by the 31st of December, 2024. This can be done namely by removing overpackaging when supplier packaging allows it, reducing gaps by using packaging that is purpose-built or adapted to the product size, or by experimenting with solutions for container and packaging re-use, and reporting annually from this date onwards on the optimization of delivery packaging thus achieved."

In addition, in the **Ademe**²⁶ **study of April 2023** "e-commerce, environmental impact of logistics, transportation and transfer April 2023", there is the following recommendation:

"Reduce empty space percentage by better matching packaging (container) to content in order to reduce package volume (and the quantity of packaging material produced)".

²⁴ Source: CNE PACK FOCUS conference, October 2022

²⁵ [Commerce en ligne : 18 nouvelles entreprises signent la charte d'engagements pour réduire leur impact environnemental | economie.gouv.fr](https://commerce-en-ligne.18-nouvelles-entreprises-signent-la-charte-d-engagements-pour-reduire-leur-impact-environnemental/economie.gouv.fr), March 2022

²⁶ [E commerce : modélisation des impacts et recommandations filières et grand public - La librairie ADEME](https://e-commerce.modelisation-des-impacts-et-recommandations-filières-et-grand-public-la-librairie-ade-me)

2.4.7 Dimensional optimisation of e-commerce parcels²⁷

Household packaging waste in this sector is estimated at 100,000 tons²⁸.

In the context of online sales paired with home delivery, packaging is an important brand image vector for the trader. The delivery packaging is the buyer's first physical contact with the brand or store.

Packaging can sometimes be oversized compared to the expected product (see picture) with empty space filled by cushioning material.



E-commerce companies are therefore striving to find shipping packaging solutions adapted to the size of the contents of the parcel (several different products in the same shipment). Choosing the right size for the shipping parcel is however complicated because of the wide variety of products shipped.

Delivery packaging can come from:

- **standard formats** that enable the stock management of just a few references that can accommodate products of different sizes. The product then must be protected with cushioning material.
- **adaptable** formats that allow different degrees of parcel optimization (height adjustment only or adjustment on all three dimensions) and avoid "carrying empty space". The optimized parcel is made from a reduced number of references or sheets of continuous corrugated cardboard. Finally, the optimization of the package size to the contents size helps to limit the final volume of the package.



The **adaptability** can be **manual**: packaging manufacturers have developed solutions that can be adapted to the products by the operators themselves (by easily tearing off the flaps, by preformed folding, etc.) while maintaining ease of use, or by **mechanization where the packaging is produced on demand** at the logistics centers.

There are two mechanized solutions for adjusting cardboard packaging:

The first solution involves height-adjusting preformed cases.

The second solution is achieved with continuous corrugated cardboard. Adjustment is carried out in all three dimensions.

The two solutions show that it is possible to optimize the volume-content ratio (the CNE's Key Prevention Indicator²⁹), which in turn makes it possible to optimize truck loading volumes.

These mechanizations require an investment cost. Optimizing the parcel's size in all three dimensions reduces the amount of cardboard in the parcel for a given content.

NB: from the date of this document, the European Commission, in its draft amendment for the packaging and waste packaging regulations, has proposed that online sellers who use sales packaging as **transport packaging** should be exempt from the ban on excessive gaps (above 40%). However, they will have to ensure that such sales packaging complies with the requirements on minimizing packaging volume³⁰.

²⁷ [Packaging the development of consumption patterns and distribution channels - CONSEIL NATIONAL DE L'EMBALLAGE \(conseil-emballage.org\)](https://conseil-emballage.org/)

²⁸ Source: CITEO in the CNE PACK FOCUS morning "E-commerce et Packaging: challenges and opportunities" of the 18th of October 2022.

²⁹ Key prevention indicators from CNE, December 2010.

³⁰ See § 3.1.2 on the draft of the European regulations.

2.4.8 Cosmetic products and perfumes³¹

E-commerce and empty space study when shipping cosmetic products: 95% of empty space in average*

For instance, there is 82% of empty space between the product and the shipping box for a 100 ml perfume bottle.

With lipsticks, there is 98% of empty space between the product and the shipping box.

E-commerce has become increasingly important for perfume and cosmetics, particularly since the pandemic, when online sales increased significantly.

The unboxing experience has become a key factor, with an increase in the number of “unboxing” videos on YouTube over the last ten years. It is essential to design packaging that is easy to open and allows the customer to choose the size and configuration of their parcel.



In numerous cases, there is a huge amount of empty space in the shipping box. This is due to the small format of perfumes and cosmetics, and this is even more obvious when it comes to online refill orders. Optimizing empty space is all the more of a challenge given the minimum format constraints for shipping boxes.

Figure 1: example of a lip balm order received without any cushioning material, box, or gift card...



Consumers, who are increasingly concerned about the environment, expect recyclable or reusable shipping boxes that make efficient use of space while protecting the product.

However, empty space is sometimes irreducible given the small size of products, particularly in the case of multi-product orders of different sizes (for instance, a 200 ml shower gel and a 10 ml nail polish).

In addition to reducing the weight and size of packaging, there can be an emphasis on making it easier to reuse packaging, using recycled materials and communicating the right sorting gesture upstream.

**Internal LVMH study carried out in Europe in April 2021 on the Beauty Division's Houses and competitors.*

³¹ <https://www.guerlain.com/fr/fr-fr/c/art-of-gifting.html>

2.5 Facilitating use

The use of a product goes hand in hand with its packaging, and the two are often inseparable:

- Easy or facilitated opening for diverse groups of consumers (senior-citizens, children, nomadic youth, athletes, etc.),
- Re-closing mechanism for the purpose of deferred consumption of the product,
- Multi-portions for the purpose of split consumption or nomadic use,
- Product collection ergonomics to ensure optimum balance between weight, size, shape and frequency of use,
- Quantity just as needed to limit waste,
- Product restitution: empty the contents of the packaging as much as possible,
- Use of the container-content pairing for any type of preservation (freezing) or method of preparation (cooking in a conventional oven, microwave, bain-marie, etc.).

2.5.1 Powdered sugar boxes' spout

Example of a 1kg box of brown sugar³²

For technical and practical reasons, the traditional box in cardboard of powdered or brown sugar and its key spout require a small gap in the upper part of the package.

To this day, the posing of spout cannot be technically done on top of the case (too many layers of cardboard are needed to seal the product), nor flush with the top fold of the case (the case fold would weaken, and it would be hard to hold the cardboard in place with the spout insertion system).

Therefore, the spout is put on the vertical section of the case, a little more than 10 millimeters under the case fold.



Practically, filling the gap means sugar above the level of the spout. Once the consumer would first open it, all the sugar situated above the spout would uncontrollably unwind on the worktop or the table. Closing the spout again correctly would be difficult.

The case is therefore designed so that the kilogram of sugar is just flush with the lower base of the spout, which leaves a gap of about 174 centimeters³.

Level of sugar in the case at cartoner output

The empty space in the sugar case is essential to meet consumers' use of the spout and not to waste some of the product when pouring. It is a functional gap.

³² Source: Saint-Louis Sucre

2.6 Facilitating the product packaging process

- Meet mechanisation requirements,
- Guaranteeing the safety of employees working on packaging production and product packaging lines,
- Resisting packaging operations (shock, heat, flow, vibration, sealing, hygiene, sterilisation, etc.).

2.6.1 A single packaging format for several sizes

There is a single packaging format (same dimensions as primary packaging) for different quantities of grated cheese (150g and 200g in the same bag for instance). This prevents format changes on the packaging line.

In the case of finished products manufactured in small quantities, manufacturers face MOQ (Minimum Order Quantity) issues with their raw materials and packaging suppliers. If the quantity of finished products to produce is less than the MOQ, and bearing in mind that packaging has its own expiry date, the manufacturer may have to throw away some packaging. To prevent it, one of the alternatives involves grouping different size of finished products with a single packaging format.

For the smallest sizes, the packaging looks emptier. An analysis of changes in finished products volumes must be carried out to enable a return to specific formats by size, as long as the MOQ is reached or exceeded.

2.7 Making the product visible and conveying the values of the product and/or those of the brand and the company

- Encouraging the act of purchase through packaging, which acts as a beacon on the shelf (consumers spend only a few seconds in the aisle), through a colour reference, the shape of the product, the material used and the universe the brand wants to evoke, the graphics and typography for immediate recognition of the product,
- Conveying the assets and values of the brand and the company (corporate social responsibility),
- Guaranteeing acceptability³³ for the consumer, during the product purchase and consumption phases.

This is a "marketing" function: highlighting the various properties of the product, the values of the brand and the company, etc.

In today's competitive world, it is essential to be easily identifiable on the shelves, particularly through the media that is packaging.

This can lead to products whose packaging is notoriously oversized in relation to the product inside. This well-known notion of "size impression" can generate unnecessary gaps.

The CNE points out that unnecessary gaps that increase the size of the packaging, false bottoms and other tricks are questionable (even illegal) in terms of the eco-design requirements to reduce the volume of packaging, and are even more so in the draft of the European regulations on packaging and packaging waste (see § 3.2). Any apparently unnecessary volume must be justified in a technical file.

³³ "Packaging acceptability for the product, the consumer and the user", CNE, October 2010

3. Regulations

The few rules on empty space in packaging that are currently in force in France are mainly to be found in the Environment Code. It transposed the European directive on the eco-design of packaging, which requires that volumes are reduced to the minimum necessary. There are also a number of technical regulations, such as those concerning aerosol generators and metrology, which are also in force in France in transposition of European directives (see 3.1.1).

In 2024 probably, the regulations in force in France will be set out in European regulations directly applicable in all Member States. Companies can anticipate future rules from the draft regulation published by the European Commission in November 2022 (see 3.1.2).

These future European regulations are not a lone wolf in the world, as the fight against empty packaging is orchestrated by the World Trade Organization (WTO). As a result, there are similar regulations in the most important countries outside the European Union: Germany, North America, China, South Korea, etc. (see 3.1.3).

3.1 Regulations currently in force in France

A/ The Environment Code (transposition of Directive 94/62)

The directive 94/62 of 20 December 1994 on packaging and packaging waste requires Member States to transpose a number of eco-design requirements into their national legislation. In particular, the obligation to reduce emissions at their source, as set out in article R.543-44 1° a of the French Environment Code:

*"Packaging should be designed and produced in such a way that **its volume** and mass are limited to the minimum necessary, in order to ensure a sufficient level of safety, hygiene and acceptability."*

Although the 1994 requirement concerns the optimum reduction of volume and mass, the eco-designers of the time were thinking mainly in terms of reducing mass and little in terms of reducing volume, as did the European Commission, which pointed out in 2005 that the 1994 directive prohibited the use of excess non-functional materials such as unnecessary padding³⁴.

European standard EN 13428 on source reduction was drafted along the same lines, setting out 10 performance criteria to be considered to ensure that mass reduction does not compromise the packaging functionality (strength during handling, shock resistance during packaging, etc.).

³⁴ European Commission report "Metrological Requirements for Pre-packaged Products", 2005.

B/ Aerosol regulations (transposition of Directive 75/324)

The regulations in force in France are set out in Decree 2010-323 of 23 March 2010 and an Order of the same date, which transcribe European Directive 75/324 of 20 May 1975. All these texts are regularly updated in line with technical developments.

An aerosol generator is a compressed gas packaging which propeller gas can be liquid or compressed. There is an explosion regulation that is settled according to:

- the content nominal volume,
- the nominal capacity of the recipient (net capacity).

At 50°C, the volume of the existent liquid phase should not go beyond 90% of the net capacity.

There is therefore a mandatory reglementary gap³⁵.

Which is why there are two volume indications on aerosol generators. One that is clear, and one for the initiated people:

- the nominal volume of the content written in millimeters, for instance: 600ml,
- the net capacity of the recipient written in number as in a 800 rectangle (it is actually 800ml).

This specific presentation with two information stems from three wishes:

- informing consumers of the quantity they are buying (the content nominal volume);
- writing on the packaging the net capacity of the recipient, a technical safety information which only needs to be known by professionals;
- preventing any confusion between the two volume informations³⁶.

C/ The metrological regulations (transposition of Directive 76/211)

Manufacturers sometimes use artifices so that the packaging looks like the product is bigger than it actually is.

This practice is contested by some, but regarding current regulations on fraud, there is no violation if the product quantity respects that which is indicated in legal notices, as it is pointed out that the real quantity of a product is not exactly that which is indicated. For instance, it is impossible that the quantity of sunscreen in a tube would be exactly 50,000000ml in the thousands of samples on the market³⁷.

The regulations of metrology plans tolerance margins, in excess and shortage, because of the state of the art packaging techniques.

Artifice is not fraud regarding announced and effectively sold quantities, but it is a problem considering the need to reduce packaging volume to the necessary level that is little considered (eco-design requirement – see § A above). This explains the new legal framework implemented by the new regulations on packaging (see § 3.2 below).

³⁵ Decree 2010-323 of 23 March 2010, § 2.3 of the technical appendix (Directive 75/324, § 2.3 of the appendix).

³⁶ Decree 2010-323 of 23 March 2010, article 2 (Directive 2007/45 of 5 September 2007 that set the rules regarding nominal quantities of products in pre-packaging, article 4).). To avoid any confusion, aerosol generators may not be marked with the nominal weight of the product contained inside (Decree 2010-323, article 5 I and Directive 2007/45, article 4).

³⁷ Decree 78-166 of 31 January 1978 and Order of 20 October 1978 (Directive 76/211 of 20 January 1976 on the merging of the laws of the Member States about mass pre-conditioning by weight or by volume of certain prepackaged products).

3.2 Regulations in force in France in the future

The draft of the European regulations on packaging

The European Commission undertook to amend Directive 94/62 of December 1994 on packaging and packaging waste in order to highlight its requirements on 2020 concerns, in particular encouraging the minimization of packaging volume and the fight against empty space.

In November 2022, it therefore published a proposal for the attention of the European Parliament and the Member States, which includes two provisions on these two subjects³⁸.

Article 9 – Reducing packaging to a minimum (fighting marketing volume increase)

1. Packaging is designed in such a way that its weight and volume are reduced to the minimum necessary to ensure its functionality, given the material of which it is made.
2. Are prohibited:
 - Packaging that is not necessary to fulfill one of the following performance criteria:
 1. Product protection
 2. Manufacturing constraints
 3. Logistical constraints
 4. Information requirements
 5. Hygiene and security
 6. Legal requirements
 7. Recycling and reusing
 - Packaging that shows characteristics whose only goal is to increase the perceived volume of the product, such as double layers, double bottoms, and useless layers³⁹ (unless it is used to mention a geographical information of protected origin).
3. Empty space is reduced to the minimum necessary to ensure the packaging functions well, as follows:
 - For sales packaging, in line with the total volume of the packaged product and its characteristics;
 - For grouped packaging and transport packaging, including e-commerce packaging, in line with their total volume.
4. Space filled with craft paper (pieces of craft paper), air cushions, bubble wrap, cushioning and padding foams, wood wool, polystyrene, expanded polystyrene particles or other filling material are considered empty space.

³⁸ Proposal for a regulation on packaging and packaging waste, 30 November 2022, COM (2022) 677 final, 2022/0396 (COD), or PPWR for Packaging & Packaging Waste Regulation.

³⁹ For instance, cases that fit the shape of the packaging, or “sleevers”, enabling the personalization of the manufacturer's brand.

Article 21 - Obligations related to excessive packaging (fight against empty space)

1. Economic operators who supply products to a final distributor or user in grouped packaging, transport packaging or e-commerce packaging shall ensure that the empty space content does not exceed 40%.

NB: e-commerce economic operators who use sales packaging as e-commerce packaging, which is to say packaging designed to be used both as logistical packaging and product packaging⁴⁰, are exempt from this obligation.

2. For this calculation, one defines:

- a) "empty space" as the difference between the total volume of the grouped packaging, transport packaging or e-commerce packaging and the volume of the sales packaging it contains;
- b) "empty space rate" as the volume of empty space in the meaning of a) of hereby paragraph compared to the total volume of the grouped packaging, the transport packaging or e-commerce packaging.

3. Once again, space filled with craft paper (pieces of craft paper), air cushions, bubble wrap, cushioning and padding foams, wood wool, polystyrene, expanded polystyrene particles or other filling material is considered empty space.

Nota bene: All these rules in Articles 9 and 21 are only drafts that will be discussed by the European Parliament and the Council of Ministers of the Member States. The adopted version will be European regulations rather than a European directive, which means that the new provisions will apply directly in all Member States at the date stipulated in the text (probably 2024).

3.3 Regulations in force in industrial countries

The measures considered in the draft of the European regulations for the minimization of volumes and against empty space will mainly impact the European Union's internal market. However, they will also harm global trade between countries. If a Chinese trader exports products from his country to a European customer, the packaging would be subject to European measures once it has passed through customs. It is the WTO's role to harmonize technical measures between Member States, and it is indeed the case in these areas. As a result, similar rules exist in other countries that are part of the WTO.

Some examples:

3.3.1 Canada

The sale, importation, or advertisement by a supplier of a pre-packaged product in a container that has been manufactured, constructed, or packaged or that is displayed in such a manner that a consumer could reasonably be misled as to the quality or quantity of the product is prohibited⁴¹.

However, this practice may be acceptable if the product justifiably requires extra space inside the container. In this case, a statement explaining the purpose of the extra space must appear on the label. For instance, a milkshake requires extra space for mixing and should therefore be labelled with a statement such as "extra space"⁴².

⁴⁰ Draft regulations, Recital n° 60. This exemption is based on the rule of waste hierarchy, which places the absence of packaging in a superior position to the reduction of mass and volume.

⁴¹ Canadian Consumer Packaging and Labelling Act, R.S.C. (1985), c. C-38, chapter prohibitions, section 9 Containers of pre-packaged products - [Consumer Packaging and Labelling Act \(laws.justice.gc.ca\)](https://laws.justice.gc.ca)

⁴² Canadian Food Inspection Agency, inspection.canada.ca.

3.3.2 Germany

Volume increase for marketing purposes is prohibited. It is forbidden to produce, sale or make available pre-packaging that, through design or filling, feign a filling quantity greater than that which it contains⁴³.

3.3.3 USA

American law⁴⁴ on packaging for food intended for human consumption and cosmetics considers deceptively filled containers that do not allow the consumer to see the entire content, and within which are deceiving gaps ("slack fill") that are not functional.

The gap is the difference between the actual capacity of the container and the volume of product it contains.

These non-functional gaps correspond to the empty space within a packaging that is filled to a level significantly below its capacity for reasons that do not fall under one of the six following justifications (to be compared with the similar list provided for in the draft of the European regulations – see § 3.1.2):

1. Content packaging protection **and**,
2. Packaging machine requirements **and**,
3. Inevitable settling of the product during transport and handling **and**,
4. Specific and necessary function of the packaging (for instance, when the packaging plays a role in the preparation or consumption of a food), as long as this function is inherent in the nature of the food and is clearly communicated to consumers **and**,
5. Product-packaging pairing consists of a food product packaged in a reusable container that is part of the food product display and whose worth is both significant in relation to the product value and independent of its function of containing the foodstuff. For instance, a gift product with one or more foodstuffs combined with a container destined to be used after consumption of the food product, or sustainable commemorative or promotional packaging; **or**
6. Inability to increase the filling level or to further reduce the size of packaging. For instance, if a minimum package size is required to enable compulsory labelling of foodstuffs (excluding stickers or other non-mandatory design or information), to prevent pilfering, facilitate handling or enable the use of tamper-proof devices.

NB: these US provisions date back to 1994. As a result, they are not relevant to the concerns of the 21st century:

- they apply to packaging as a consumer sales unit, not to e-commerce;
- they aim to protect consumers, not the environment

⁴³ German law about the launch and selling of measuring instruments, their use and calibration as well as pre-packaging. (Mess- und Eichgesetz - MessEG), § 43 Requirements for pre-packaging - https://www.gesetze-im-internet.de/messeseg/__43.html

⁴⁴ [CFR - Code of Federal Regulations Title 21 \(fda.gov\)](https://www.fda.gov/regulatory-information/about-cfr)

3.3.4 China

Since 2021, the country has been gradually introducing various regulations which:

- apply to packaging as consumer sales units or e-commerce packaging for food and cosmetics products;
- aim to protect consumers as well as the environment.

Therefore, "Administrative measures relating to shipping packaging" specific to e-commerce packaging in force since 12 March 2021 fight excessive packaging⁴⁵.

The GB 23350-2021 standard, which comes into force on 1 September 2023, sets out the method for calculating the empty space in consumer sales units for food and cosmetics products.

$$X = \frac{(V_n - \sum(kV_o))}{V_n} \times 100\%$$

X is the volumetric gap ratio between:

- V_n volume of consumer sales units
- V_o content volume
- k is a spatial coefficient linked to the nature of the goods. For instance:
 - $k = 4.5$ for oil and eggs
 - $k = 7$ for meat and fruits
 - $k = 9$ for cosmetics creams
 - $k = 15$ for cosmetics powders

3.3.5 South Korea

There are regulations in force that are specific to e-commerce packaging⁴⁶. They will come into force on 29 April 2024:

- Gap ratio under 50%.
- The number of different packaging components: maximum 1
- Some materials and components are limited. It is namely recommended not to use plastic film, scotch tape, plastic cushioning, etc.

This decree exempts shipping boxes whose sum (width + length + height) is less than 50cm from these obligations.

See diagram below:



⁴⁵ They also require reusable and easily recyclable packaging. An "Implementation plan to fight plastic pollution" for the Shanghai region will ban non-degradable adhesive tapes from the end of 2023.

⁴⁶ Decree N°984 of the Ministry of Environment: in Korean (the CNE has an English translation) <https://www.law.go.kr/lsSc.do?menuId=1&subMenuId=15&tabMenuId=81&query=%ED%8F%AC%EC%9E%A5%EB%B0%A9%EB%B2%95#undefined>

3.4 Soft law and good practices

The AGEC Act rather seeks to combat bad practices by requiring eco-organizations to provide consumers with an electronic reporting system enabling them to report products with packaging they consider excessive. Every year, eco-organizations publish a statement on the reports received the previous year and the actions taken as a result. They must also take these reports into account when adjusting their eco-taxes⁴⁷.

⁴⁷ Environment Code, article L.541-10-18 VI set by the law 2020-105 of 10 February 2020 Anti-Waste and Circular Economy.

4. Conclusion

Consumers and users perceiving gaps is an issue that should be integrated into the eco-design of packaged products for two major reasons:

- Compliance with the rules, and in particular with forthcoming regulations (packaging and packaging waste regulations), even if the ways to reduce empty space are not yet fixed.
- The image risk for companies unable to justify the gap perceived (see context of the document)

The CNE urges economic players to integrate this "gap" dimension into their eco-design approach and to constantly improve on this subject.

The CNE is at their disposal.

5. Acknowledgements

ADMCC (Secimep)	Jean-François MERIOT
ALLIANCE 7	Isaline LAGRANGE
ANEOLIA (Geppia)	Eric SCHALLER
AVOCAT SCM MADELEX	Sylvain MARTIN
BEL GROUP	Marie-Caroline ERARD
CARTON ONDULE DE FRANCE	Kareen DESBOUIS
CARTOON DESIGN	Émilie ROSSI
COMITE FRANCAIS DES AEROSOLS	Jean BLOTTIERE
CITEO	Romane OSADNICK
CITEO	Géraldine GAUVIN
EDGEWELL PERSONAL CARE	Claire SAVORAT
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