

Food packaging

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Food packaging is packaging for food. A package provides protection, tampering resistance, and special physical, chemical, or biological needs. It may bear a nutrition facts label and other information about food being offered for sale.

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Testing modified atmosphere in a plastic bag of carrots

Functions

Packaging and package labeling have several objectives^[1]

- **Physical protection** - The food enclosed in the package may require protection from, among other things, shock, vibration, compression, temperature, bacteria, etc.
- **Barrier protection** - A barrier from oxygen, water vapor, dust, etc., is often required. Permeation is a critical factor in design. Some packages contain desiccants or oxygen absorbers to help extend shelf life. Modified atmospheres or controlled atmospheres are also maintained in some food packages. Keeping the contents clean, fresh, and safe for the intended shelf life is a primary function.
- **Containment or agglomeration** - Small items are typically grouped together in one package to allow efficient handling. Liquids, powders, and granular materials need containment.
- **Information transmission** - Packages and labels communicate how to use, transport, recycle, or dispose of the package or product. Some types of information are required by governments.
- **Marketing** - The packaging and labels can be used by marketers to encourage potential buyers to purchase the product. Package design has been an important and constantly evolving phenomenon for several decades. Marketing communications and graphic design are applied to the surface of the package and (in many cases) the point of sale display.

- **Security** - Packaging can play an important role in reducing the security risks of shipment. Packages can be made with improved tamper resistance to deter tampering and also can have tamper-evident features to help indicate tampering. Packages can be engineered to help reduce the risks of package pilferage; some package constructions are more resistant to pilferage and some have pilfer-indicating seals. Packages may include authentication seals to help indicate that the package and contents are not counterfeit. Packages also can include anti-theft devices, such as dye packs, RFID tags, or electronic article surveillance tags, that can be activated or detected by devices at exit points and require specialized tools to deactivate. Using packaging in this way is a means of retail loss prevention.
- **Convenience** - Packages can have features which add convenience in distribution, handling, stacking, display, sale, opening, reclosing, use, and reuse.
- **Portion control** - Single-serving packaging has a precise amount of contents to control usage. Bulk commodities (such as salt) can be divided into packages that are a more suitable size for individual households. It also aids the control of inventory: selling sealed one-liter bottles of milk, rather than having people bring their own bottles to fill themselves.

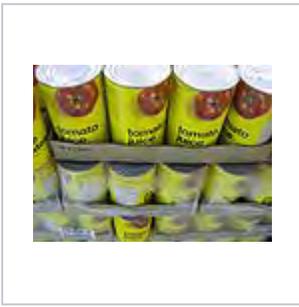
Types

The above materials are fashioned into different types of food packages and containers such as:^[2]

Packaging Type		
Aseptic processing	Primary	Liquid whole eggs or dairy products
Trays	Primary	Portion of fish or meat
Bags	Primary	Potato chips, apples, rice
Boxes	Secondary	Corrugated box of primary packages: box of cereal cartons, frozen pizzas
Cans	Primary	Can of tomato soup
Cartons	Primary	Carton of eggs, milk or juice cartons
Flexible packaging	Primary	Bagged salad
Pallets	Tertiary	A series of boxes on a single pallet used to transport from the manufacturing plant to a distribution center
Wrappers	Tertiary	Used to wrap the boxes on the pallet for transport

Primary packaging is the main package that holds the food that is being processed. Secondary packaging combines the primary packages into one box being made. Tertiary packaging combines all of the secondary packages into one pallet.

Gallery



Tomato juice in steel cans



Aseptic packaging of soy milk



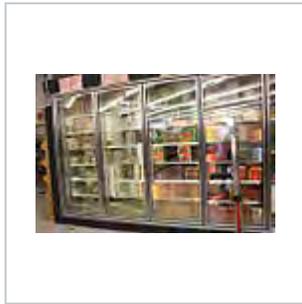
Bagged cake mix



Biscuit components: plastic bottles, paper bag



Container for bulk vegetable oil



Frozen processed food freezer in supermarket



Bag in box; box wine



Glass milk bottle and paperboard milk carton



Silk tea bag



Coffee beans in burlap bags, gunny sacks



Bushel baskets of fruit



Tea tin, can with removable cover



Folding cartons of cereal



Drink boxes



Packaged apples



Fresh fish in plastic shrink-wrapped tray



Shrink-wrapped frozen pork



Military MRE, bean and rice burrito in retort pouch



Condiments and spices



Aluminum can with an easy-open, full pull-out end



A Dip & Squeeze ketchup container

Packaging machines

A choice of packaging machinery requires consideration of technical capabilities, labor requirements, worker safety, maintainability, serviceability, reliability, ability to integrate into the packaging line, capital cost, floorspace, flexibility (change-over, materials, etc.), energy usage, quality of outgoing packages, qualifications (for food, pharmaceuticals, etc.), throughput, efficiency, productivity, and ergonomics, at a minimum.

Packaging machines may be of the following general types:

- Autocoding label and date verification
- Blister-, skin- and vacuum-packaging machines
- Capping, over-capping, lidding, closing, seaming and sealing machines
- Cartoning machines
- Case and tray forming, packing, unpacking, closing and sealing Machines
- Check weighing machines
- Cleaning, sterilizing, cooling and drying machines
- Conveying and accumulating machines
- Feeding, orienting, and placing machines
- Filling machines for liquid and powdered products
- Package filling and closing Machines
- Form, fill and seal machines
- Inspecting, detecting and checkweighing machines
- Palletizing, depalletizing, and pallet unitizing machines
- Labeling, marking, and other product identification machines
- Wrapping machines
- Converting machines

Reducing food packaging

Reduced packaging and sustainable packaging are becoming more frequent. The motivations can be government regulations, consumer pressure, retailer pressure, and cost control. Reduced packaging often saves packaging costs.

In the UK, a Local Government Association survey produced by the British Market Research Bureau compared a range of outlets to buy 29 common food items and found that small local retailers and market traders "produced less packaging and more that could be recycled than the larger supermarkets."^[3]

Recycling of food packaging

After use, organic matter that is still in the food packaging needs to be separated from the packaging. This may also require rinsing of the food packaging.

Trends in food packaging



Automated palletizer of bread with industrial KUKA robots at a bakery in Germany



Shrink-wrapping trays of bakery goods



Pumping slurry ice onto fresh fish

- Numerous reports industry associations agree that use of smart indicators will increase. There are a number of different indicators with different benefits for food producers, consumers and retailers.^[4]
- Temperature recorders are used to monitor products shipped in a cold chain and to help validate the cold chain. Digital temperature data loggers measure and record the temperature history of food shipments. They sometimes have temperatures displayed on the indicator or have other output (lights, etc.): The data from a shipment can be downloaded (cable, RFID, etc.) to a computer for further analysis. These help identify if there has been temperature abuse of products and can help determine the remaining shelf life.^[5] They can also help determine the time of temperature extremes during shipment so corrective measures can be taken.
 - Time temperature indicators integrate the time and temperature experienced by the indicator and adjacent foods. Some use chemical reactions that result in a color change while others use the migration of a dye through a filter media. To the degree that these physical changes in the indicator match the degradation rate of the food, the indicator can help indicate probable food degradation.^[6]
- Radio Frequency Identification is applied to food packages for supply chain control and has shown a significant benefit in allowing food producers and retailers create full real time visibility of their supply chain.
- Plastic packaging being used is usually non-biodegradable due to possible interactions with the food. Also, biodegradable polymers often require special composting conditions to properly degrade. Normal sealed landfill conditions do not promote biodegradation. Biodegradable plastics includes biodegradable films and coatings synthesized from organic materials and microbial polymers. Some package materials are edible. For example, pharmaceuticals are sometimes in capsules made of gelatin, starch, potato or other materials. Newer bioplastics, films and products are being developed.^[7]
- Barcodes have been used for decades in packaging many products. 2D barcodes used in Autocoding are increasingly applied to food packaging to ensure products are correctly packaged and date coded.
- The ability of a package to fully empty or dispense a viscous food is somewhat dependent on the surface energy of the inner walls of the container. The use of superhydrophobic surfaces is useful but can be further improved by using new lubricant-impregnated surfaces.^[8]

Food safety and public health

It is critical to maintain food safety during processing^[9], packaging, storage, logistics (including cold chain), sale, and use. Conformance to applicable regulations is mandatory. Some are country specific such as the US Food and Drug Administration and the US Department of Agriculture; others are regional such as the European Food Safety Authority. Certification programs such as the Global Food Safety Initiative are sometimes used. Food packaging considerations may include: use of hazard analysis and critical control points, verification and validation protocols, Good manufacturing practices, use of an effective quality management system, track and trace systems, and requirements for label content. Special food contact materials are used when the package is in direct contact with the food product. Depending on the packaging operation and the food, packaging machinery often needs specified daily wash-down and cleaning procedures.^[10]

Health risks of materials and chemicals used in food packaging need to be carefully controlled. Carcinogens, toxic chemicals, mutagens etc. need to be eliminated from food contact and potential migration into foods.^{[11][12]}

See also

- Dietary supplement
- Autocoding
- *Food and Bioprocess Technology*
- Food fortification
- Food grading
- Food preservation
- Food rheology
- Food safety
 - List of food safety organisations
- Food storage
 - Food storage container
- Food waste
 - Food waste in the United Kingdom
- ISO 22000
- Nutraceutical
- Food labeling regulations
 - United Kingdom food labeling regulations

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