

# History and Importance of Packaging material

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# History of Package Development

- Primitive humans: Primitive people needed containment and carrying devices and out of this need came the First —package which might be
  - a) A wrap of leaves
  - b) An animal skin
  - c) The shell of a nut or gourd
  - d) A naturally hollow piece of wood
- 1. Early packaging materials were Fabricated sacks, baskets and bags, made from materials of plant or animal origin; wood boxes replaced hollow logs; a clay bowl, the fire-dried clay pots.
- 2. The discovery of glass: About 1500 B.C., the earliest hollow glass objects appeared in Mesopotamia and Egypt.
- 3. In China, Ts'ai Lun is credited with making the first true paper from the inner bark of mulberry trees. The name of paper given to the chinese invention made of matted plant fibers.

4. Paperboard cartons and corrugated fiberboard boxes were first introduced in the late 19th century.
5. In 768, the oldest existing printed objects (Japanese Buddhist charms); in 868, the oldest existing book (the *Diamond Sutra*) printed, found in Turkistan.
6. Iron and tin plated steel were used to make cans in the early 19th century.
7. Packaging advancements in the early 20th century included Bakelite closures on bottles, transparent cellophane overwraps and panels on cartons, increased processing efficiency and improved food safety.
8. As additional materials such as aluminum and several types of plastic were developed.

## **The Industrial Revolution and Modern Food Packaging**

- The Industrial Revolution started in England in about 1700 and spread rapidly. It is the change that transformed people with pleasant occupations and local markets into an industrial society with world-wide connections.

# Definitions of Packaging

Packaging is described / defined in various ways:

1. Packaging is best described as a coordinated system of preparing goods for transport, distribution, storage, retailing, and use of the goods.
2. Packaging is a complex, dynamic, scientific, artistic, and controversial business function.
3. Packaging is science, art and technology of enclosing or protecting products for distribution, storage, sale, and use.
4. Packaging also refers to the process of design, evaluation and production of packages.

# Functions of Packaging

Technical functions		Marketing functions	
Contain	Measure	Communicate	Promote
Protect	Dispense	Display	Sell
Preserve	Store	Inform	Motivate

Technical packaging professionals need science and engineering skills, while marketing professionals need artistic and motivational understanding.

## Changing needs and new roles

1. All historical changes have had an impact on the way products are bought, consumed and packaged
2. Packaging is important to food supply because food is organic in nature (an animal or plant source) and one characteristic of such organic matter is that it has a limited natural biological life.
3. Most food is geographically and seasonally specific.

4. In a world without packaging, we would need to live at the point of harvest to enjoy these products, and our enjoyment of them would be restricted to the natural biological life span of each.
5. It is by proper storage, packaging and transport techniques that we are able to deliver fresh potatoes and Apples, throughout the year and throughout the world.
6. We are free of the natural cycles of feast and famine that are typical of societies dependent on natural regional food-producing cycles.
7. Central processing and pre-packaged food has the advantage that it allows value recovery from what would normally be wasted and the By-products of the processed-food industry form the basis of other sub-industries

# STATUS OF PACKAGING IN INDIA

## Indian Packaging Industry

- Early 1950's showed slow pace but 1980-85 onwards greater change was witnessed.
- The market volume of the Indian packaging industry amounts to about Rs. 77,570 crore and has constantly grown by approximately 15 percent year per year.
- The Indian packaging industry contributes nearly 2 per cent to the country's overall GDP.
- Food and beverages which will apply mainly packaging are using some 60-65 per cent of all packaging materials.
- Food retail turnover is expected to grow from the current Rs 3,39,365 crore mark to 7,27,212 crore by 2025.
- There are about 600-700 packaging machinery manufacturers, 95 percent of which are in the small and medium sector located all over India.
- Indian packaging machinery imports are around Rs 606 crore (20-25 percent) while the Indian packaging machinery exports are rapidly growing.
- Germany and Italy are the largest suppliers of packaging machinery to India.

- Indian companies are now placing increasing emphasis on attractive and hygienic packaging. This promises enormous potential for the future
- Today consumer is showing greater awareness towards food packaging for assurance on quality, quantity and hygiene of foods.
- Potential benefits offered by unit packaging in retailing are also well realized.
- Self service groceries, super markets (especially in urban sector) increased the demand for retail packs.
- Changes in purchasing power, family sizes, frequency of shopping, inflation, changed food habits lead to changes in packaging material and pack sizes.
- Every sector of user industry has become package conscious and the need for scientific, functional and aesthetic packaging is being realized.
- Nationwide marketing becoming common trend for processed foods.
- Expanding electronic media unprecedented audience reach (Paper, radio, TV) widen market of packaged food.
- Thus dramatic change is observed bringing overall revolution in packaging concept, style and forms.
- New concepts like aseptic packaging, system packaging, thermoforming, inpack sterilization of foods have taken industrial footing in Indian market.



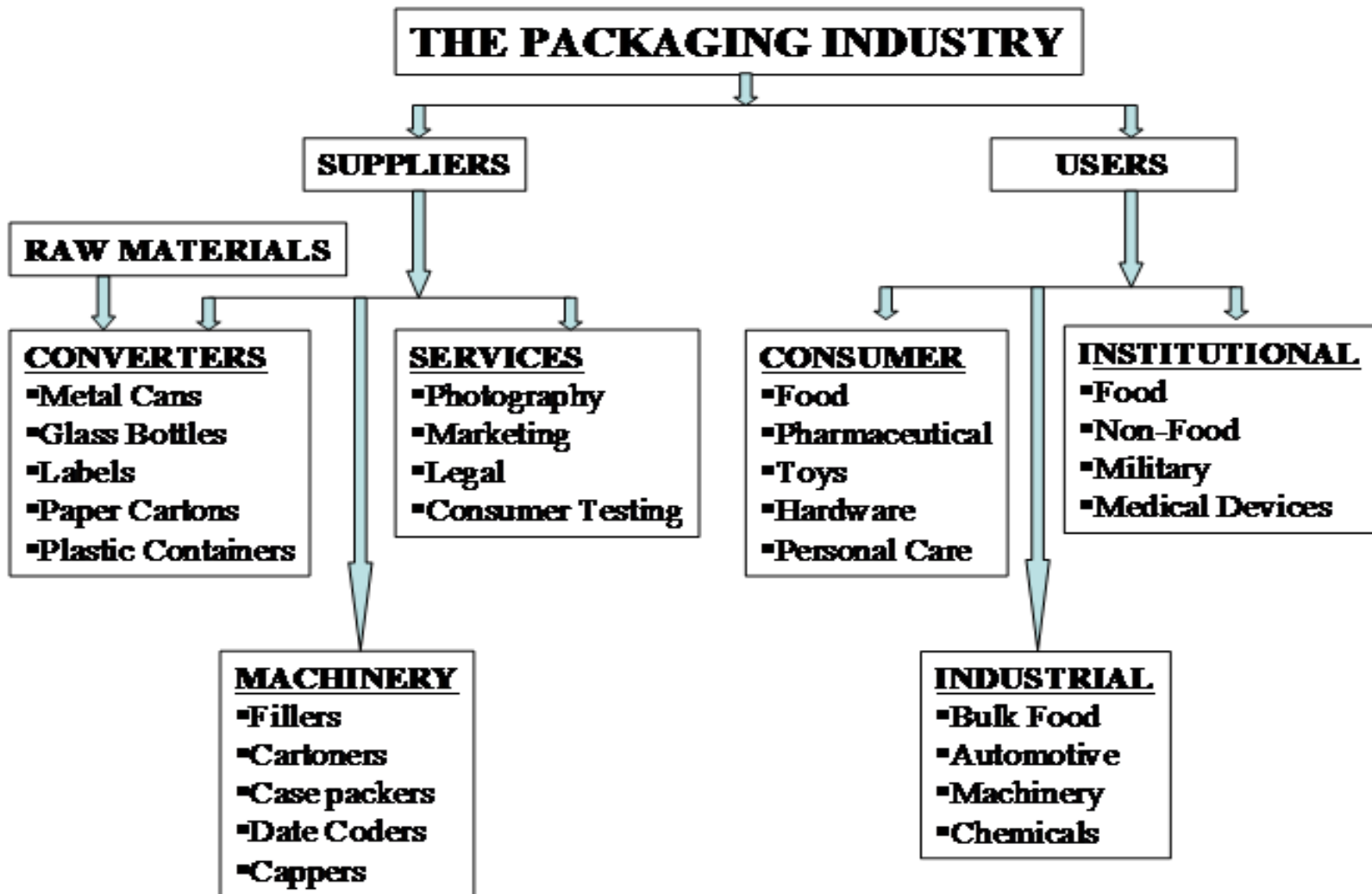
## Professional packaging associations

- 1. **IoPP**: Institute of Packaging Professionals, Illinois, USA
- 2. **PAC**: Packaging Association of Canada, Toronto
- 3. **PMMI**: Packaging Machinery Manufacturers Institute, Reston, VA, USA
- 4. **FPA**: Flexible Packaging Association, Linthicum, MD, USA
- 5. **WPO**: World Packaging Organization, Stockholm, Sweden.

## Other organizations having a major impact on packaging activities

- 1. **ISO**: International Organization for Standards, Geneva, Switzerland
- 2. **ASTM**: American Society for Testing and Materials, Pennsylvania, USA
- 3. **TAPPI**: Technical Association of the Pulp and Paper Industry, Norcross, GA, USA
- 4. **ISTA** : International Safe Transit Association, Michigan, USA
- 5. **FSSAI**: Food Safety and Standards Authority of India, New Delhi

The packaging industry can be divided into those that use packaging for their products and those that supply to these users



# Importance of packaging

## **FUNCTIONS OF PACKAGING**

- The functions of a package are “to preserve the quality and freshness of food, to add appeal to the food to attract consumers, and to facilitate its storage and distribution.”
- The basic functions required of a package can be grouped under five major categories..
- **To Contain the Product**
- **To Protect the Product**
- **Medium of communication**
- **Means of minimizing costs**
- **Means of selling product**

# 1. To Contain the Product

- The primary function of any package is to contain the food and facilitate handling, storage, and distribution all the way from the manufacturer to the ultimate user or even the time the rest portion is utilized by the consumer.
- The following are considered in this regard.
  1. Adequate size and shape (biscuit package, tubs for detergent)
  2. Proper constructional features. No leakage, spillage, diffusion, i.e. loss prevention.
  3. Package: Must contain the commodity in natural form (biscuits packed in Pillow pack, prevent damage)
  4. Package must be strong enough to contain the commodity as it is.
  5. Optimum compatibility (nontoxic, non soluble with product... No physical, chemical or biochemical changes/alteration... i.e. inert to the product.)
  6. Containment or agglomeration - Small objects are typically grouped together in one package for reasons of efficiency. For example, a single box of 1000 pencils requires less physical handling than 1000 single pencils. Liquids, powders, and granules need containment.

## 2. To Protect the Product

- One of the most important function of any container is to protect the product contained against any form of loss, damage, deterioration, spoilage, or contamination that might be encountered throughout the distribution chain.
- Proper packaging may also protect the product against microbial spoilage by bacteria, yeasts, and molds.
- Packaging protects the product against damages which may be due to different hazards viz. (a) Mechanical, (b) Environmental (c) Microbial and Biochemical hazard. (d) Social Hazards.

# Hazard, damage and protection of packaging material

SN	Storage	Hazard	Damage	Protection
I	Handling and transportation	Drop, shunting, shocks, vibrations, stack load, compression etc.	Breakage, loss of shape, dusting, seepage	Cushioning, blocking.
II	Storage	Stack load, compression,  Attack by rodents and insects	Crushing, distortion sticking, spillage, contamination, spoilage	Adequate compression strength of package. resistance and repulsiveness to insects
III	Environment during storage transportation and distribution	Biological or otherwise	Contamination	Toughness of packaging material (to resist penetration).
		High/low humidity moisture/water.	Physical, chemical and biological deterioration due to loss/gain of moisture	Efficiency of closure providing.  Water vapour barrier properties.Package desiccant etc.
		O <sub>2</sub>	Oxidative rancidity	O <sub>2</sub> BARRIER  VACUUM – O <sub>2</sub>  N <sub>2</sub> /CO <sub>2</sub> flushing  packaging in impermeable package

### 3. Medium of communication

- An important function of any food package is to identify the product and its origin
- Inform the consumer how to use the contents
- Provide any other information needed or required
- Very importantly, to attract the user and encourage purchase of the product.

## The information a package can convey to the consumer may include the following:

- Product manufacturing and best buy dates
- Proper storage conditions
- Cooking instructions
- Size and number of servings or portions per pack
- Nutritional information per serving
- Manufacturer's name and address
- Cost
- Suggested recipes
- Country of origin
- Information transmission - Packages and labels communicate how to use, transport recycle, or dispose of the package or product.



## 4. Means of minimizing costs

- An important factor often overlooked is that packaging actually reduces costs for the consumer. Packaging reduces food costs by reducing the cost of processing. Foods can be processed where they are grown, waste is treated at the processing plant, and shipping weights are reduced, thereby lowering the cost of transportation.

## 5. Means of selling product

- The packaging and labels can be used by marketers to encourage potential buyers to purchase the product. Packaging is often referred to as the “silent salesman”.
- “A package must protect what it sells and sell what it protects”. Packages can have features which add convenience in distribution, handling, display, sale, opening, reclosing, use, and reuse.

# Functional Requirements of Packaging Materials

No.	Functional Property	Specific Factors
1	Gas permeability	§ O <sub>2</sub> , CO <sub>2</sub> , N <sub>2</sub> , H <sub>2</sub> O vapor
2	Protection against environmental factors	§ Light, odor, microorganisms, moisture
3	Mechanical properties	§ Weight, elasticity, heat-sealability, mechanical sealability, strength (tensile, tear, impact, bursting)
4	Reactivity with food	§ Grease, acid, water, color
5	Marketing-related properties	§ Attractiveness, printability, cost
6	Convenience	§ Disposability, repeated use, resealability, secondary use
7	Aroma	§ Aroma compound barrier property

# PACKAGING TYPES:

- **Terms used:**

1. **Package:** It cuts contact between material and outside influences. Package material comes in direct contact with the product (Packaging).

2. **Pack:** Secondary container. *Packing material never comes in contact with product.*

3. **Packing:** Number of containers/packages put together in big container is called pack...Process of packing.

- **Primary packaging** is the material that first envelops the product and holds it. This usually is the smallest unit of distribution or use and is the package which is in direct contact with the contents (viz. butter in parchment paper).
- **Secondary packaging** is outside the primary packaging – perhaps used to group primary packages together (viz. paper board pack containing butter wrapped in veg. parchment paper).
- **Tertiary packaging** is used for bulk handling, warehouse storage and transport shipping. The most common form is a palletized unit load that packs tightly into containers (viz. Boxes containing 20-25 or 50 butter packs are put together).

# Differences between packaging and packing

No.	Packaging	Packing
1.	Comes in direct contact with the product	Never in direct contact
2.	Called primary packaging material	Secondary / Tertiary / Quaternary
3.	Should be food grade, non-toxic, tasteless, odourless, lowest possible migration	No strict requirements
4.	Generally attractive	Generally not attractive
5.	Materials used: Plastics / glass / metal / treated paper or their combination	CFB / Plastic board boxes, wood, metal, etc. Shrink/ stretch wrapping
6.	Objectives: Mainly to contain, carry, protect. Help in selling, legal aspects, marketing / sale, technical, Transportation	Mainly ease in transportation and protection of packages

# Differences between packaging and packing

No.	Packaging	Packing
7.	Recycled material never used.	Much preferred
8.	Selection of packaging material: Physico-chemical properties of product are considered.	Generally stress / strength properties, puncture resistance / burst strength, folding endurance, environmental factors considered.
9.	Keeping quality is determined by packaging material.	Generally not so.
10.	Single unit packaging.	Generally multi unit packaging. Sometimes single unit also. Butter carton, Bag in box...Here packing materials should be more attractive / effective than packaging material.

## Facts about the transport hazards:

- The type of transport-road, rail, sea or air.
- The degree of control over the transport. Is it private or public transport?
- The form of transport- bulk, freight container, Unitized load, postal, passenger train, etc.
- The mechanical conditions and duration of storage (manufacturer State Distributor District Distributor ... Taluka / CityRetailer. The longer the journey or handling more strength is required in packaging & packing materials leading to higher cost).
- The nature and intensity of mechanical and climatic hazards in transport, storage, retailing and use. Packaging / packing material has to withstand wide range of temperatures and relative humidity
- Whether handling aids are available for loading and off-loading at all points between maker and user. (Viz. Lifts, Trolleys, Slip conveyers etc.)
- The importance of minimum volume in relation to transport costs. Overmpackaging must be prevented.

## **Hazards may be:**

- Mechanical: Impact (vertical, horizontal), stationary package impacted by another, vibration, compression, Racking or deformation, piercing, puncturing, tearing etc.
- Climatic hazard: (High / low temperature / pressure) light, liquid/water (fresh / polluted), dust, and water vapour, R.H.
- Biological: (Microorganisms, fungi, moulds, bacteria, beetles, moths, flies, ants, termites, mites, rodents (rats and mice), birds.

*Thank you*

