



MEAT PACKAGING

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- Food packaging is not only an art of enclosing or wrapping a food product but it also protects the food from deterioration in a limited manner.
- It must ensure safe delivery of the product at the minimum cost.
- The cost of packaging has to be reasonable
- Packaging may not improve the existing quality of a product but it should help in maintaining its keeping quality during storage, transport and deterioration



TYPES OF PACKAGING MATERIALS

Depending on the hardness, the packaging materials are of three types :

- i) Flexible packaging materials : Plastic films, Paper, Aluminium foil
- ii) Semi-rigid packaging materials : Paperboard/cardboard/containers, PET and PVC containers, Aluminium containers, Moulded containers
- iii) Rigid packaging containers : Glass containers, Metal cans, Fibre board containers, Wooden boxes/crates/barrels



FLEXIBLE PACKAGING MATERIALS

Plastic Films

- A film is very thin flexible plastic sheeting.

Cellophane

- Was first commercial flexible film.
- It is a natural plastic film derived from bleached pulp which is treated with acid and alkali and then plasticized to get cellophane.
- It can be suitably coated on one side to impart various functional properties.
- This is a low cost film.



Various types of this film bear letter designation on the basis of its properties e.g.

- C - coloured
- M - moisture proof
- S - heat sealable
- T - transparent
- D - demi (one side) coated

Thus, MST cellophane refers to a film which is moisture proof, heat sealable and transparent.



Polyethylene (PE)

- It is the most commonly used plastic film of these days due to low cost, easy availability and unique properties
- Low density polyethylene (LDPE) is prepared at a very high atmospheric pressure at about 150-200°C, whereas high density polyethylene (HDPE) is prepared at comparatively low atmospheric pressure and temperature
- Low density polyethylene (LDPE) film is transparent to translucent, highly flexible and has comparatively low permeability to water vapours, but it is fairly permeable to oxygen, carbon dioxide or odours



- HDPE film is translucent to opaque and comparatively less permeable to water vapours and gases. It is fairly oil and grease resistant as compared to LDPE
- Polyethylene is a tasteless, odourless and non-toxic film
- It has the unique property of sealability of itself by the application of heat



Polypropylene (PP)

- Is another plastic film which is also in general use.
- It has a good gloss, high flex strength and resistance.
- It softens at a temperature of 150°C, so it can be used to pack food products at moderately high temperature.
- It is also sometimes used for packaging those raw meat products which are subjected to heat treatment or cooked in the pack itself at a later stage.
- The film is readily heat sealable and has low water vapour permeability.
- It also shows a good resistance to oil and grease. It is used in making laminates also.



Polyamide

- Usually called Nylon film in the trade is inert, heat resistant and has excellent mechanical properties.
- Nylon-6 is a tasteless and odourless film and thus ideal for use in the packaging of fresh and processed foods.
- It can be sterilized by steam.
- It is used for making laminates of good inertness and low permeability.



Polyester film

- Is also inert and has excellent strength.
- It is widely used in lamination as outer, abrasion resistance layer for food pouches

Polyvinyl chloride

- Is a plasticized film for packaging.
- This film has low folding endurance.
- It has good seal property and resistance to oil as well as grease.



Aluminium Foil

- Plain aluminum foil is used for packaging food products.
- Thin gauge aluminum foil with pin holes are generally laminated to paper or plastic film with bonding agent to make suitable laminates.
- These laminates are used to package food products requiring protection against light, water vapour and gases especially dehydrated cooked meat.
- One distinct advantage of using aluminium foil as the outer layer of a laminate is that it provides a very good base for colourful and decorative printing.



Paper Glassine or parchment paper

- Have good grease resistance and high wet strength.
- A plasticizer may be added to make the paper still more soft and machinable.
- These opaque papers are sometimes used to wrapping bacon and other fatty cuts of meat.



SEMI-RIGID PACKAGING MATERIALS

Paper board

- Sheets are cut, folded into desired form and glued.
- Corners can be made stronger.
- The material can be made as set up paper board boxes or folding carton or tray as per the demand.
- It provides convenience, strength and good product protection.



PET (polyethylene terephthalate) and PVC plastic sheets

- Can be moulded in shape, size and colour to suit specific product requirements.
- PET bottles and containers are extremely clear, virtually unbreakable and very light weight.
- They are ideal for the packaging of pickled meat products.
- They provide enhanced visual appeal to the products.



Plain aluminium foil of higher guage

- Either alone or in combination with paper or plastic foils can be pressure formed into desired shapes to serve as semi-rigid containers for various types of food products.

Moulded pulp

- Containers are the cheapest packaging for the shell eggs.
- They allow wholesale trading of eggs along with the tray.



RIGID PACKAGING MATERIALS

Glass containers

- Are very old and versatile packages for food packaging.
- It is chemically inert and is an excellent barrier to solids, liquids and gases.
- It can be moulded in various shapes and sizes and also allows excellent product visibility.
- Glass bottles are used for packaging meat pickles etc.
- The main drawbacks of glass containers are the risk of breakage and comparatively heavy weight.



Metal cans

- Are primarily used for commercially sterilized food products.
- Iron sheet used for making can has very thin tin coating on either side.
- It is generally applied to check rusting and corrosion of metal cans on long term storage.
- To make the metal can more suitable for food application, a further very very thin coating of enamel or lacquer is applied to the tin.
- For canning of meat products, a sulphur-resistant lacquer is preferred .
- Can bodies are soldered or welded. The product is hermetically (air tight) sealed in the can.



RETAIL PACKAGING

- In retail packaging, the size of the package is such that the food contents can suffice the requirement of an individual or a family.
- It does not involve any packaging exercise at the retail store
- Retail packaging of food products mostly involves the use of flexible packaging materials - plastic films, aluminum foil, paper etc. or their laminates
- Sample food pouches are also subjected to drop test. In this test, the pouch is made to fall on a platform from a height of 105 cm at the bottom, by the corner sides and edges



BULK PACKAGING

- Bulk or wholesale packaging is done for safe transport of a product from the point of production to wholesale dealer and from there to the retailer.
- Bulk packaging should make an efficient use of transit space.
- The packages should be easy to load or move from one place to the other at transit point either manually or by trolley.



- They should be stackable one over the other to save the space during transit as well as storage.
- Bulk packaging is done in rigid packaging materials.
- Solid or corrugated cardboard boxes are extensively used for food products
- These are not usually used as direct containers but employed as outer packages for a number of retail packages



**THE FOLLOWING PERFORMANCE
EVALUATION TESTS ARE CALLED OUT ON
BULK PACKAGES :**

Drop Test:

- This is most important test especially for fibre board or corrugated fibre board boxes, shipping containers etc.
- The filled-in package is allowed to fall on the bottom by the corner sides and edges.
- The fall should be atleast 60 cm.



Rolling Test:

- Bulk packages may have to be rolled at certain points.

Stack Load Test:

- Bulk containers are tested for the load they can bear by stacking them one over the other upto a height of 2 meters.
- The packages should not suffer any damage during this exercise.



Vibration Test:

- It is conducted to test the bulk packages which are to be transported by train.
- The packages are put on a vibration table which vibrates with the speed of 120 cycles/minute for a known time.
- An hour of vibration on this table represents 1000 km transit by train.
- All these tests are not done on all packages or containers.



ASEPTIC PACKAGING

- Aseptic packaging refers to the process of packaging pre-sterilized food product in the pre-sterilized packages under sterile environment.
- In this process, the product is sterilized by heating at a very high temperature (ultra high temperature) or at high temperature for a short time (HTST) or directly by steam injection.
- There are various aseptic packaging systems which are successfully operating in different parts of the world.
- In India, 'Tetrapak' system is being followed for the aseptic packaging of milk and fruit juices at several places



VACUUM PACKAGING

- Colour is the most important characteristic of fresh meat from the marketing point of view
- In cured meat also, cured meat colour is highly desired.
- Long term storage of these meats in permeable plastic films will alter their colour to undesirable dark brown.
- So these meats are stored for extended period in impermeable film laminates under vacuum.
- It will ensure retention of meat quality for a period of at least 8 weeks in fresh meat and 10 weeks in case of cured meat at a refrigerated storage of 0°C



- Vacuum packaging machine is used to create vacuum in the filled-in package.
- The aerobic bacteria are inactivated.
- The lipid oxidation and consequent rancidity development is checked
- There is saving in the space during transport.
- The laminate pouches should have a good mechanical strength and allow perfect seals
- The polyethylene (PE) layer is invariably used on the inner side



Some of the commonly used laminates are -

- Polyester/PE film laminate
- Polyamide/PE film laminate
- Aluminium foil/PE laminate
- PVDC/PE laminate
- *In the vacuum packaging, superficial spoilage of fresh meat caused mainly by *Pseudomonas sp.* is inhibited. However, lactic acid producing bacteria continue to grow at a slow pace for several weeks without immediately spoiling the meat.*



MODIFIED ATMOSPHERE PACKAGING (MAP)

- The gases and their proportion to be used in modifying the atmosphere inside the package is carefully selected for a particular type of meat product.
- Nitrogen, carbon dioxide and oxygen are the three most important gases.
- Nitrogen is an inert gas and does not react with the various constituents of a meat product.
- Oxygen is used when the development of a desirable colour becomes imperative.



- Carbon dioxide is used to create anaerobic environment inside the package.
- Modified atmosphere packaging is also done with the help of vacuum packaging machine as a second step
- *In modified atmosphere packaging, we do not disturb the package environment at a later stage.*



PACKAGING OF FRESH MEAT

- For short term storage, most learned people in India wrap fresh meat in polyethylene pouches or bag.
- The polyethylene should be food grade, transparent and fairly thick (150-200 gauge).
- In developed countries, fresh meat chunks are kept in a rigid plastic tray and overwrapped with polyethylene.
- Besides this popular film can also use polypropylene, polyvinylidene chloride or cellophane films for wrapping fresh meat cuts.



- This is another type of film called shrink film which is used for wrapping large and uneven cuts of fresh meat and dressed poultry.
- The carcass cuts or dressed poultry are first wrapped in shrink film which is then immersed in hot water (90°C) for a few seconds
- For long term storage, vacuum packaging of fresh meat and storage in refrigerator is ideal.



- Pork is usually not vacuum packaged because it has higher load of bacteria and keeps well for only 2 weeks.
- The laminate for this packaging should have a good strength and proper sealing is necessary
- The gaseous mixture in MAP differs for various species. For mutton, a mixture of 70% oxygen, 20% carbon dioxide and 10% nitrogen is generally used, whereas for pork, 70% carbon dioxide, 20% nitrogen and only 10% oxygen is recommended.
- For dressed poultry a mixture of 50% carbon dioxide and 50% nitrogen is considered ideal

PACKAGING OF FROZEN MEAT

- The meat to be stored in frozen condition must be properly packaged, otherwise it develops “freezer burn”
- For frozen storage of meat, the packaging material should have good strength even at freezer temperature.
- It should have very little permeability to water vapours



- It should also have very good grease resistance.
- Low density polyethylene (150-200 gauge) is the least cost protective film which can withstand low temperature and maintain clarity.
- Polyester or nylon/ PE laminate can also serve as ideal over-wrap.
- Heat shrinkable low density polyethylene also provides all the required functional properties for this purpose.



PACKAGING OF CURED MEAT

- Cured meat products like ham, bacon, luncheon meat and frankfurters are prepared after treating meat with table salt (sodium chloride) and salt petre (sodium nitrite) along with other additives.
- Curing develops a very desirable pink colour and a much sought after cured flavour
- These two specific characteristics need to be protected in the packaging of cured meat products



- The packaging techniques for short term storage are overwrapping in polyethylene or shrink packaging for irregular cuts like hams.
- For long term storage of blocks, luncheon meat etc., vacuum packaging in laminates is ideal.
- Modified atmosphere packaging in gaseous mixture of 85-90% nitrogen and 10-15% carbon dioxide also keeps the cured meat well for about 12 weeks at 0-4°C.MAP



PACKAGING OF COOKED MEAT PRODUCTS

- Most meat products like meat patties, sausages, nuggets, meat balls etc. are cooked to an internal temperature of 75°C to kill most of the microorganisms
- These meat products can be packaged in pouches of polyethylene, polypropylene, PVDC (polyvinylidene chloride) etc. for short term storage lasting 10-12 days in a refrigerator ($0-4^{\circ}\text{C}$)



- Cooking in hermetically (air tight) sealed metal cans makes the products commercially sterile.
- These canned products are shelf stable at ambient temperature for a period of 2 years
- Retort pouches are also available in some markets.



PACKAGING OF DEHYDRATED MEAT

- All the dried meat products are susceptible to ingress of moisture and rancidity development.
- So, the packaging material should not allow any moisture or oxygen inside the product.
- Aluminium foil/polyethylene laminate is ideally suited for this purpose.
- If nitrogen is also filled in the package of a crisp product, it will protect the product against breakage by providing cushioning from all the sides.

