Meat Packaging

Packaging is the science, art and technology of enclosing, protecting food items for distribution, storage, sale and use.

Functional requirement of meat packaging

- Containment: Contain food from packaging plant to the consumer's refrigerator.
- Protection: Packaging provides protection form environmental effects such as dust, microorganisms, water, chemicals, gases etc.
- Preservation: Packaging must restrict microbial growth, prevent moisture los and control gaseous exchange between package and atmosphere.
- Apportionment: Packaging reduces industrial output to an appropriate size for further processing or consumer use.
- Unitization: Unitization describes the function by which primary packages are consolidated for shipment. Primary packages are unitized into secondary packages. Unitization allows optimization of materials handling by minimizing the number of discrete packages that need to be handled.
- Convenience: Packaging provides convenience to consumer e.g. Microwaveable packs etc.
- Communication: Labeling provide information about product to the consumer.

Types of Packaging material

Mainly there are three types of packaging material:

1. Rigid (glass jars, cans)
2. Semi-rigid (Plastic, trays, boxes)
3. Flexible (Plastic bags, pouches)- Preferred for fresh and frozen meat

Types of Packaging

a. Non-preservative packaging

b. Preservative packaging

<u>Non-preservative packaging</u>

This type of packaging contains and protects the product form contamination and water loss without creating in-pack conditions very different form ambient. Consequently, unless microbial

growth is prevented by freezing or retarded by chilling, product in such packs is highly perishable-i.e. has a very short product life.

Overwrapped trays are widely used in supermarkets for fresh meat and poultry. Fresh meats are placed on semi-rigid plastic trays that are overwrapped with a plastic cling film of high oxygen permeability. As overwrapped trays are not sealed and because of the high oxygen permeability of the film used, provide aerobic conditions around the product.

Loose filling plastic bags and pouches are not generally used at retail because of unattractive product presentation. However, such packaging are widely used as primary packaging for fresh carcasses and for frozen bulk or individually wrapped cuts and offals. Bags and pouches can be heat sealed, in which case the degree of product protection is determined by the permeability of the packaging material to water vapor and gases.

Preservative packaging

This group of packaging is characterized by an ability to extend product life by modifying or restricting microbial growth. This is achieved by creating and maintaining in-pack conditions that differ markedly from those of the ambient environment.

In vacuum packaging product is placed into a bag or pouch that is evacuated and heat sealed. The packaging material must have a low permeability to oxygen so that the anoxic in-pack environment is maintained. Vacuum packaging is widely used as a primary transport and storage packaging for larger cuts).

In modified atmosphere packaging (MAP), the gaseous environment around the product is modified before heat sealing, and then gradually changes as a result of the interaction between product and packaging.

In controlled atmosphere packaging (CAP) the gaseous environment around the product is altered but is then maintained at a specified composition regardless of the product or microbial respiration, temperature, or other environmental changes.

The principal difference with fresh meat between MAP and Cap is in the gas permeability of the packaging. As plastic materials are not absolute impermeable to gases, the composition of the in-pack atmosphere will change, although very slowly. With CAP, gas-impermeable packaging such as plastic aluminium foil laminates or metallized film have to be used.

Active packaging modifies the in-pack atmosphere and act as barrier between the in-pack and external atmosphere. With meat, active packaging includes oxygen scavengers and carbon dioxide generators. Active packaging systems may also include oxygen indicators and time-temperature indicators.

Frozen meat packaging

A commercial frozen meat storage temperature (less than -12^{o}C), microbial spoilage is completely stopped but meat is till subject to deterioration through desiccation and chemical changes, such as oxidative rancidity and deterioration in color. Apart from protecting frozen product form physical damage and contamination, the major requirement of frozen packaging is control of water loss.

Types of packaging for frozen meat

Boneless beef and lower-value cuts of other species destined for further processing are bulk packed in 27 kg cardboard cartons within low-density polyethylene liner bags. This packaging is cheap, provide good moisture barrier properties. However, the high oxygen permeability of the packaging film results in short quality product life because of color deterioration and oxidative rancidity.

Polyethylene bags may also be used for frozen carcasses.

Another method employs a plastic film that is heat shrunk onto the product in a heat tunnel.

Product deterioration during frozen storage

a. Gross carton deformation and breakdown

The unattractive or damaged appearance of cartons of frozen meat may result from deficiencies in one or more of five areas: handling before freezing, type of packaging used, freezing regimen, materials handling, and temperature control.

b. Freezer burn

During prolonged frozen storage, moisture can be lost. Product lose moisture as a consequence of vapor pressure gradients within the product and between the product and the external environment. When the air temperature is higher than the product temperature, moisture moves from the product into the air, resulting in surface desiccation known as freezer burn.

Freeze burn can lead to accelerated lipid oxidation. Freezer burn can be reduced if product is suitably packaged in a tight-fitting film that is impermeable to water and vapor.

c. Recrystallization

Recrystallization is a physical phenomenon whereby ice crystals in frozen foods increase in size. The formation of large ice crystals can cause considerable tissue damage, leading to increased drip losses on thawing. Recrystallization is temperature dependent.