ADVANCES IN PACKAGING OF PROCESSED FOOD PRODUCTS

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CHARATERISTICS

FOOD	PACKAGE	MICRO ORGANISM
Water	Barriers properties	Micro organism
Carbohydrate	Mechanical properties	Insect
Proteins	Chemical properties	Animals
Enzymes	Sealing properties	Temperature
Lipids	Product compatibility	Humidity
Vitamins	Legal requirements	Light
Minerals	Cost	Oxygen
Volatile		Mechanical demands
		Environmental concerns
		Consumer handling
		Tampering
		Appeal
		Convenience
		price

CHARACTERISTICS

Environmental Factor	Deteriorative Effect of Food	Protective Packaging Property
Oxygen	Lipid oxidation, Vitamin Destruction, Protein loss	Oxygen barrier
Moisture	Nutritional quality loss Organoleptic changes, Browning reactions	Moisture barrier
Light	Oxidation, Rancidity, Vitamin destruction, Protein & Amino acid changes	Light barrier
Micro-organisms	Food spoilage, nutritional/quality loss, health hazards	Hermetic containment
Mechanical Advice (drop, compression, vibration, handling)	Organoleptic changes, spoilage and other quality changes	Sealing properties
Odorous substances & toxic chemicals	Off-flavor formation, taste Deterioration ,chemical changes	Barrier properties, chemical substance
Tampering	Product loss ,quality changes	Tamperproof, tamper evidence, tamper resistance
Consumer handling, abuse	Product loss ,quality changes nutritional changes	Mechanical properties

FOOD PROCESS CLASSIFICATION

- **PRESERVATION**
  - **SHORT TERM**
    - **Refrigeration or combined mild technologies**
  - **LONG TERM**
    - **Freezing**
    - **Sterilization**
    - **Dehydration**

FOOD PROCESS CLASSIFICATION

- **TRANSFORMATION**
  - **FRACTIONATION**
    - **Mechanical Separation**
    - **Physical and Physico-chemical Separation**
  - **COMBINATION**
    - **Simple Mixing**
    - **Mixing with Texturization**
  - **CHEMICAL TRANSFORMATION**
    - **Heat-induced reaction**
    - **Chemical and enzymatic reaction**
    - **Microbial action**

FOOD PRESERVATION TECHNIQUES

METHODS	TYPE OF PACKAGING MATERIAL
Cool storage and cold storage Cool storage- 5-12^{o}C Cold storage- 0-5^{o}C Deep freeze – 15^{o}C flow	Flexible pouches, bags & sacks treated cartons, boxes triplet containers etc.
Heat preservations Balanching-100^{o}C Pasterisation-60-75^{o}C Sterlisation-110-130 ^{o} C Aseptic processing-130^{o}C	Hermetically sealed glass and metal container aseptic cartons and pouches.

FOOD PRESERVATION TECHNIQUES

METHODS	TYPE OF PACKAGING MATERIAL
Dehydration Concentration Evaporation Drying Increase of salt content Increase of solid content Freeze drying	Flexible, rigid and semi-rigid container.
Use of inert gas Vaccumisation Gas flushing –CO_2,N_2 alone or in combination and ozone	Rigid tinplate flexible laminates
Chemical preservation Benzoic acid, sorbic acid sulphur dioxide etc	Rigid , flexible
Other Irradiation	

PACKAGING MATERIALS FOR MAJOR FOOD PRODUCTS

FOOD PRODUCTS	PACKAGING MATERIAL/ PACKAGES
Bakery Products	Tinplate containers, wax papers, paperboard cartons, polyethylene bags, cellophane pouches or aluminium laminates.
Beverages	Glass bottles, PET bottles.
Breakfast Cereals	Plastic bags, cellophane, wraps, tinplate containers, glass bottles.
Cashew Kernels	Tinplate cans, polyethylene pouches.
Food grains	Gunny bags and polyethylene bags.
Confectionery	Plastic bags, cellophane wraps, tinplate containers, glass containers
Coffee	Glass bottles, tin cans and lined cartons

PACKAGING MATERIALS FOR MAJOR FOOD PRODUCTS

FOOD PRODUCTS	PACKAGING MATERIAL/ PACKAGES
Fruits & Vegetables (Processed)	Gunny bags, bamboo and other baskets corrugated boxes, plastic films and bags
Fish • Fresh • Dried • Canned	 • Bambo basket or plywood baskets. • Gunny bags, baskets, plastic film bags. • Tinplate containers.
Meat and Meat Products • Fresh • Canned • Frozen or smoked • Canned	 • Plastic film and paper bags • Tinplate containers • Plastic film bags • Tinplate containers
Milk and Milk products	Aluminium cans, glass bottles, plastic pouches, tin cans, lined gunny bags.
Ice creams	Waxed paper board cartons and cups

WHAT IS PACKAGING

- **Integral part of Production**
  - **Means a system of preparing goods for transport, distribution, storage, retailing and end-use.**
- **Part of Physical Distribution**
  - **A means of ensuring safe delivery to the ultimate consumer in sound condition at minimum overall cost.**
  - **A techno-economic function aimed at minimizing cost of delivery while maximizing sales.**
  - **A tool for Marketing**

FUNCTIONS OF A PACKAGE

- **Containment**
  - **Keep its contents secure between end of packaging and consumption**
- **Protection and Preservation**
  - **It is required from both mechanical damage during handling and deterioration by climate(s) during distribution and storage**
- **Communication**
  - **It must identify the content, legal requirement, promotion of sales, instruction for handling and storage, display etc.**

FUNCTIONS OF A PACKAGE

- **Machinability**
  - **Smooth movement of packages, material economics and ability of packaging material during packaging operation are important**
- **Convenience and Use**
  - **Easy to Open, close, dispensing, disposal, recycle, information, eye appeal, warnings, distribution etc.**
- **Other Packaging Needs**
  - **Age group, Impulsive or irrational buying practices, follow of competitors general line or different, distributors and retailers needs, possibility of pilferage, tampering or stealing, possibility of after use of packaging, development of brand identity**

TECHNICAL DEVELOPMENT

- **Availability of newer material and improved construction. Improved flexible barrier through metallizing and co-extrusion and changes in thermoforming techniques etc.**
- **Development in food processing and/or packaging machinery. Aseptic processing and modified atmosphere packaging.**
- **Changes in methods or storage and distribution.**
- **Improvement in methods of management and control, bar codes and just-in-time deliveries.**

MARKET DEVELOPMENT

- **Marketing is defined as 'the identification, anticipation and satisfaction of customer needs profitability'**
- **Effect of customer lifestyle is also important. In many times, improved packaging can also change life-style.**
- **Malicious tampering**
- **Green issues such as organic farming**
- **Eco friendly i.e. reuse and recycling of packaging before disposal.**
- **Health awareness such as low fat, low calories**
- **Reduction in preservation, artificial colouring, sugar diets etc.**
- **Desire to reduce meal preparation time to a minimum.**

DESIGNING SUCCESSFUL PACKAGING

- **FOUR STEPS**
  - **Product assessment**
  - **Hazards of Distribution**
  - **Marketing Requirements**
  - **Packaging Machinery selection and Machinery consideration**

PRODUCT ASSESSMENT

- **Nature of Product**
  - **Material from which it is made and the manner by which these can deteriorate.**
- **Physical State**
  - **Gas, Mobile liquid, Viscous liquid, Paste, Liquid+solid, Powder (free flowing?), Granules, Tablets, Capsules, Solid block**
- **General Nature**
  - **Corrosive, toxic, Volatile, Odourous, Perishable, Sticky, Fragile, Abrasive, Easily scratched.**

REASONS FOR DAMAGE

- Mechanical shock - Fragility factor
- Abrasion - Surface finish
- Vibration - Frequency range
- Crushing - Safe load
- Temperature change - safe range
- Moisture and RH - Critical values

REASONS FOR DAMAGE

- Oxygen - how much
- Odours - which odour
- Light - fading
- Spoilage - Chemical change
- Non compatibility with material
- Rodents or insects

UNSATISFACTORY PACKAGE

- Admits dirt
- **Leaks**
- **Not sift proof**
- **Not compatible**
  - **Transfer of odour, flavour to product, corrosion of product, chemical reaction, loose strength in contact with product)**
- **Easily pilfered**
- **Stains easily**

HAZARDS OF DISTRIBUTION

- **Type of transport i.e. rail-road-sea or air.**
- **Private or Public transport**
- **Form of transport - break bulk, roll-on/roll off, freight container, unitized load, postal, passenger train etc.**
- **Mechanical conditions and duration of storage**
- **Nature and intensity of the mechanical and climatic hazards in transport, storage, retailing and use.**

HAZARDS OF DISTRIBUTION

- **Handling aids for loading and offloading**
- **Minimum volume in relation to transport cost**
- **Vertical drops and horizontal hazards**
- **Strainer package impact i.e. vibration, compression, deformation, puncture, tear etc.**
- **High temperature, low temperature, low pressure, light, liquid water i.e. fresh polluted, dust, water vapour.**

OTHER HAZARDS

- Biological hazards
  - Micro-organism, fungi, moulds, bacteria beetles, moths, flies, ants, termites, rodents contamination by other goods, leaking content of adjacent packs, radio activity.

PACKAGING MATERIAL SELECTION

- Production Methods
- Display Requirements
- Economic Consideration
- Marketing Needs
- Product Characteristics
- Properties of Packaging Material

PROPERTIES & FORMS OF PACKAGING MATERIALS

- **WOOD**
  - **Withstands tremendous pressure and keeps its shape**
  - **Offers a cheap way of shipping oddly shaped heavy equipment**
  - **Enhances food and beverages in gift boxes**
  - **Offers good impact strength**
    - **Used for solids**
    - **More expensive than other raw materials**
    - **Inappropriate for high speed packaging**

PROPERTIES & FORMS OF PACKAGING MATERIALS

- **METAL**
  - **Offers the best barrier properties after glass**
  - **Can be micro-waved when coated or sandwiched between vinyl**
  - **Provides the tensile strength needed to operate aerosol sprays**
  - **Can be reused as a container and offers 'collectible' image**
    - **Limits reusability (sardines, nuts, cat food)**
    - **Can affect taste of food or beverages**

PROPERTIES & FORMS OF PACKAGING MATERIALS

- **GLASS**
  - **Offers tremendous barrier properties**
  - **Reinforces consumer security**
  - **Conveys the ‘feel’ of crystal and creates a good impression**
  - **Provides the impermeability necessary for certain medical uses**
    - **Weighs more than any other packaging material**
    - **Can break in filling, shipping, palletizing, storage or use**

PROPERTIES & FORMS OF PACKAGING MATERIALS

- **PAPER**
  - **Billboards the product**
  - **Makes aseptic paperboard packaging possible when laminated with plastic**
  - **Microwaveable**
  - **Contain a variety of geometric shapes**
    - **Degrades quickly**
    - **Offers few barrier properties**

PROPERTIES & FORMS OF PACKAGING MATERIALS

- **PLASTIC**
  - **INJECTION MOULDING**
    - **Gives the widest possible variety of crisp shapes**
    - **Allows for greater detail**
    - **Conveys a quality impression and is reusable**
    - **Can hold spring and check valves, making pump dispensers possible**
      - **Needs high tolerances to function correctly**
      - **Requires larger expenditures in tooling**

PROPERTIES & FORMS OF PACKAGING MATERIALS

- **PLASTIC**
  - **THERMOFORMING**
    - **Offers cost benefits over glass and injection moulding**
    - **Requires less development time than other methods**
    - **Allows many packages to be immediately filled at any temperature**
      - **Can make a given item seem inexpensive**
      - **Generates waste in the production process**
      - **Generally less attractive than injection moulding**

PROPERTIES & FORMS OF PACKAGING MATERIALS

- **PLASTIC**
  - **BLOW MOULDING**
    - **Can often be manufactured quickly with a small amount of material**
    - **Offers greater versatility in shapes than glass or paperboard**
    - **Can hold a wide variety of liquids**
    - **Does not allow corners to be crisp**

PROPERTIES & FORMS OF PACKAGING MATERIALS

- **PLASTIC**
  - **FLEXIBLE PACKAGING**
    - **Offers the advantages of plastic, metal and paper**
    - **Maximizes barrier properties**
    - **Increases shelf life over certain other plastics**
    - **Can be shipped in light weight sheet form**
      - **Involves high start-up manufacturing costs**


THANK YOU