Food Processing & Packaging Engineering

Course Code: NFE 323

Credit Hours: 3

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Food Packaging

Upon successful completion of the course, you should be able to:

- Demonstrate advanced knowledge and skills relevant to contemporary food packaging systems including packaging-food-environment interaction and packaging and labeling regulations.
- Evaluate new and emerging technologies and related underpinning science in food packaging subsequently gathered knowledge about different packaging machines used.
- Demonstrate advanced knowledge and skills in selecting packaging materials and technologies based on the characteristics of food product and characteristics of packaging materials, and storage and distribution requirements
- Demonstrate knowledge of sensors and tracking devices used in food packaging systems
- Identify and solve the food packaging problems

Definition of Packaging

- The Packaging Institute International (PII) defines packaging as the enclosure of products, items or packages in a wrapped pouch, bag, box, cup, tray, can, tube, bottle or other container form to perform one or more of the following functions: containment, protection, preservation, communication, utility and performance.
- If the device or container performs one or more of these functions, it is considered a package.

Packaging Situation in World

- US packaging industry worldwide $600 Bn (exclude Machineries)
- 24% US packaging market
- Western European packaging dominated (Germany, France, Italy & UK)
- Paper and paperboard leads with plastics about 36% world market
- World packaging industry growing rate 3-5% per annum

Development of Packaging (Indian)

- Metal cans and glass bottles to rigid and flexible plastics printed cartons
- Flexible packaging replaced with all forms of rigid packaging
- Laminate tube replaced with aluminium collapsible tube
- Metal closure for PET bottles and jar replaced by plastic closure

Package, Packaging, Packing:

- Package-physical entity contain product
- Packaging- discipline
- Packing-enclosing of an individual item (or several items) in a package or container.
- Or process

Function of Food Packaging

- 4 basic function
  - **Containment**
  - **Protection**
  - **Convenience and**
  - **Communication**

Containment

- To contain product (moving/storing)
- **Key factor** than other function
- Production to ultimate destination
- Without containment product goes contamination by any other means
- **Main function:** contributes to protecting and preserving products during their distribution.

Protection/preservation

- Two broad damage
- Physical damage e.g. Shock, Vibration, Compressive forces, etc.
- Environmental damage exposure to water, light, gases, odors, microorganisms
- Main function: protect or reduce damage to the package contents.

Communication

- Provide information (written text)
- elements of the packaging design (package shape, color, recognized symbols or brands.)
- Packaging (''silent salesman'')
- Another function (UPC and RFID)

Utility/Convenience

- Consumers demand products that fit into their lifestyles
- These function encompasses all the packaging attributes that provide added value and convenience to the users of the product and/or package.
- Convenience features such as ease of access, handling, disposal, product visibility etc.

THE PURPOSES/ ROLE OF PACKAGING:

- **Physical protection** – Physical protection means protect the food materials from mechanical shock, vibration, electrostatic discharge, compression, temperature etc.

- **Barrier protection** – Barrier protection means protect the food materials from entry to oxygen, water vapor, dust, etc. Modified atmospheres or controlled atmospheres are also maintained in some food packages. Keeping the contents clean, fresh, sterile and safe for the duration of the intended shelf life is a primary function.

- **Information transmission**- Packaging also provides information to the consumer. For example, how to use, transport, recycle, or dispose of the package or product, nutritional value, ingredient declaration, net weight, expiry/best- before date and manufacturer information.

- **Containment or agglomeration** – Small objects are typically grouped together in one package for reasons of storage and selling efficiency. For example, a single box of 1000 pencils requires less physical handling than 1000 single pencils. Liquids, powders, and granular materials need containment.

THE PURPOSES/ ROLE OF PACKAGING:

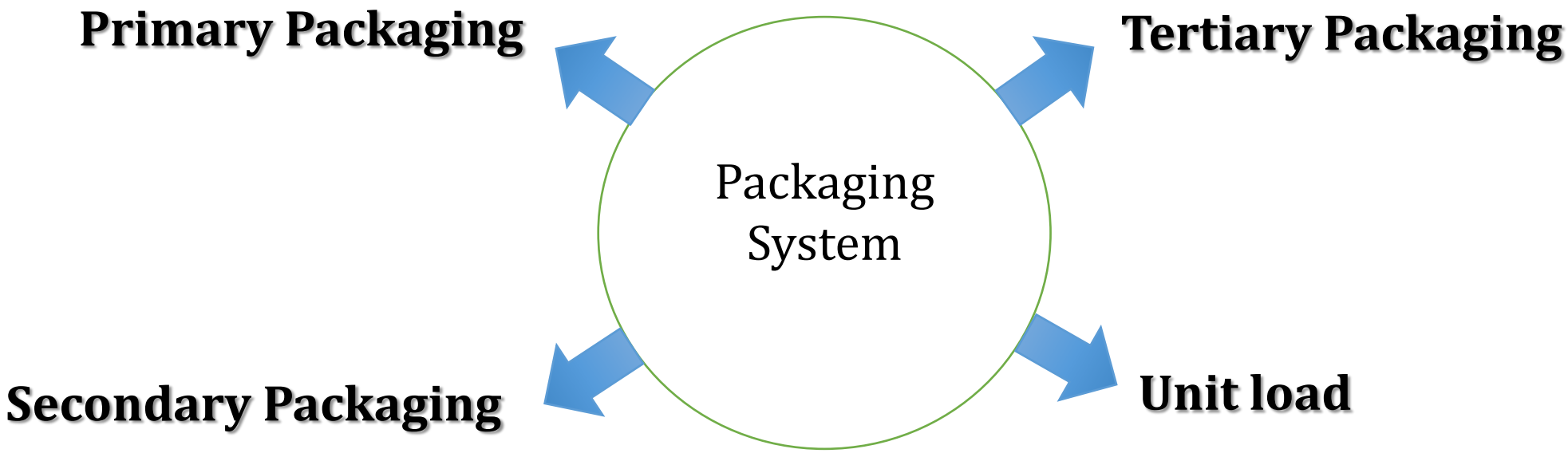
- **Marketing** – A package is the face of a product and often encourage consumers prior to purchase. Package graphic design and physical design have been important and constantly evolving phenomena for several decades. Most packaging is designed to reflect the brand's message and identity.

- **Security** – Security or safety means free from danger or threat. Package provides a barrier to microorganisms (pathogens and spoiling agents), insects, rodents, and other animals, thereby preventing disease and spoilage.

- **Convenience** – Packages can have features that add convenience in distribution, handling, stacking, display, sale, opening, reclosing, using, dispensing, reusing, recycling, and ease of disposal

Packaging systems

- Four Categories



Packaging systems

Primary package

Secondary package

Tertiary package

Quaternary package

Primary packaging

Secondary packaging

Tertiary packaging

Packaging system

Primary packaging system

- The **first-level package** that directly contacts the product is referred to as the “primary package.”
- Main function is to contain and preserve the product.
- For example, a beverage can or a jar, a paper envelope for a tea bag, an inner bag in a cereal box, and an individual candy wrap in a pouch are primary packages

Packaging system

- **Secondary packaging system**
- The secondary package contains two or more primary packages and protects the primary packages from damage during shipment and storage.
- Secondary packages are also used to prevent dirt and contaminants from soiling the primary packages

Packaging system

- **Tertiary packaging system**
- The tertiary package is the shipping container, which typically contains a number of the primary or secondary.
- It is also referred to as the "**distribution package**
- Main function is to protect the product during distribution and to provide for efficient handling
- A **corrugated box** is by far the most common form of tertiary package

Packaging system

- **Unit load packaging system**
- A unit load means a group of tertiary packages assembled into a single unit
- If the corrugated boxes are placed on a pallet and stretch wrapped for mechanical handling, shipping and storage, the single unit is referred to as a “unit load.”
- Aid in the automated handling of larger amounts of product
- A **fork-lift truck** or similar equipment is used to transport the unit load.

Packaging Systems

- Packaging systems can also be categorized into consumer and industrial packaging
- **Consumer packaging** means a package that will be delivered to the ultimate consumer in the retail store. Usually, primary and secondary packages fit in this category
- **Industrial packaging** means a package for warehousing and distribution to the retail store. Tertiary packages and unit loads fit in this category

CHARACTERISTICS OF PACKAGING MATERIALS:-

- They must protect the preparation from environmental conditions.
- They must not be reactive with the product.
- They must not impart to the product tastes or odors.
- They must be nontoxic.
- They must be FDA approved.
- They must meet applicable tamper-resistance requirements.
- They must be adaptable to commonly employed high speed packaging equipment.

SELECTION OF THE PACKAGING MATERIALS:-

- On the facilities available, for example, pressurized dispenser requires special filling equipment.
- On the ultimate use of product. The product may be used by skilled person in hospital or may need to be suitable for use in the home by a patient.
- On the physical form of the product. For example, solid, semi-solid, liquids or gaseous dosage form.
- On the route of administration. For example, oral, parenteral, external, etc.
- On the stability of the material. For example, moisture, oxygen, carbon dioxide, light, trace metals, temperature or pressure or fluctuation of these may have a deleterious effect on the product.
- On the contents. The product may react with the package such as the release of alkali from the glass or the corrosion of the metals and intern the product is affected.
- On the cost of the product. Expensive products usually justify expensive packaging.

Thanks to all……