
UNIT 12 PACKAGING MATERIALS AND OTHER FOOD INGREDIENTS

Structure

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12.0 OBJECTIVES

After reading this unit, we would be able to:

1 differentiate the types of packaging materials used for dairy products;

1 explain the different properties of these materials;

1 classify these materials for dairy products;

- 1 explain the importance of packaging specification; and
- 1 discuss the relevant Indian standards of various Packaging materials.

12.1 INTRODUCTION

The Indian packaging industry is just over four decades old but within the span of last four decades, a remarkable growth has taken place. This is mainly due to enhancement of consumer's consciousness towards health and hygiene. At the same time, there has been a big revolution of consumerisation in the country.

Due to this fact, the development of packaging material options have been increased to a great extent over the years, but we will be discussing the packaging materials which have exclusive applications for dairy products.

12.2 PACKAGING MATERIAL

All the packaging material used for dairy products can be classified into 3 categories i.e. Flexible, rigid and semi rigid. Different materials under these 3 categories are discussed below:

12.2.1 Flexible Packaging Materials

It has been estimated that there would be average growth of 20-25% of consumption of flexible packaging materials by the end of 2010 A.D. Different types of Flexible material used for packaging milk and milk products is discussed below.

i) Paper and Paper Board

Paper could be simply explained as a combination of fibres, joined together by means of binding agent. However, a number of chemicals are also used to improve different properties of paper like brightness, opacity, strength properties etc. Paper and paper boards can be clearly differentiated by considering the grammage (gms/sq.metre). More than 180 grammage papers are called as paper board. Paper boards are having certain improved properties like high stiffness, high bending resistance and less water absorption etc.

Types of Paper and Paper Boards

Depending upon the properties, there are different types of paper and paper boards which have got wide application in packaging of dairy products. The details are as follows:

Paper

Tissue paper, Coated paper (Varnish coated, wax coated, plastic coated), Glassine paper, Art Paper, Kraft Paper, VPI paper, High Gloss Paper, Vegetable parchment paper and Grease proof paper (G.P.P)

Paper Boards

Duplex Board, Clay coated board, Triplex Board, Kraft Board, Coated board, Chip Board, Asphalted board, Straw board, Grey Board and Mill board

Properties of Paper Paper is used for the packaging due to the following advantages.

(1) Flexible in nature, (2) Easy amenable to printing, (3) Easy amenable to any kind of coating, (4) Good temperature resistance either high or low, (5) Excellent properties towards recycling, (6) High strength properties (7) Good insulation properties, (8) High gloss properties on smooth side (i.e. felt side), (9) Could be manufactured with high brightness properties, (10) Excellent folding endurance properties, (11) Good tear resistance Properties and (12) Compatibility with other packaging materials for lamination.

Properties for Paper Board

(1) Paper boards are having all the properties of paper, (2) In addition, these materials are having good dead fold characteristics, (3) High stiffness Properties, (4) Amenability to fabricate folding cartons, display carton etc. and (5) Less Cobb value as compared to paper.

Application for Dairy Products

- (1) Grease proof or butter paper is used for packaging of butter
- (2) Lined cartons are used for packaging of ghee
- (3) Folding cartons are used as intermediate packages for butter, milk based confectioneries etc.
- (4) Paper board is used as an important substrate for aseptic carton
- (5) Chip board is also used for the packaging of milk based Indian sweets like rasogulla, gulab jamun, sandesh, burfi etc.

ii) Aluminium Foils

What is Aluminium Foil

Aluminium foil is a continuous web/sheet of aluminium metal rolled to thickness/gauges ranging from 0.005mm to 0.2mm. It is produced from commercial purity aluminium with aluminium content of not less than 98% purer metal with 99.8% content is of more interest to the electrical industry. It is available as free unsupported or unlaminated or laminated to paper or film. It is available in plain, coloured, coated, lubricated and embossed forms.

Properties of Aluminium Foils

The important properties are as follows :

- (i) Impermeable, (ii) Non Toxic, (iii) Stable, (iv) Light, and heat barriers,
- (v) Tasteless and Odourless, (vi) Tagger, (vii) Tea chest lining, (viii) Stand up pouches, (ix) Retort pouch and (x) Multilayer laminates:

Advantages of Foil

- i. Tearing properties facilitates to use as sealing surface in the blister pack.

- ii. Extensively used for lamination due to impermeable properties.

iii) Plastic Materials

“A plastic material is solid at ordinary temperatures and allows appreciable and permanent change of form without losing its coherence on the application of pressure and heat.” Plastic materials are perhaps the most versatile group of materials used in packaging. The plastic resins are generally categorised in two ways i.e. thermoset and thermoplastic resin.

Some of the important thermoplastic materials which have got extensive application in packaging like polyethylene, polypropylene, polyvinyl chloride, polyester, nylon or polyamide, polystyrene etc. These polymeric materials are normally classified into different group based on the polymerisation process and molecular structure like

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| (a) Polyolefins - | Polyethylene and Polypropylene (PP) |
| (b) Polyvinyl group - | Polyvinyl Chloride (PVC) |
| (c) Condensation - | Polyester(PET), Nylon-6 or Polyamide (PA) |
| (d) Styrene Polymers - | Polystyrene (PS) and Expanded polystyrene (EPS) |
| (e) Carbonate group - | Polycarbonate (PC) |

(a) Polyolefins Groups

The properties of different polymeric films are as follows :

Low density Polyethylene (LDPE) film

Density ranges from 0.910 – 0.925 gms/cc, Average molecular weight is 3×10^5 , Resistance to heat is about 180 – 212⁰F, Translucent type of clarity, Water absorption is 0.015%, Permeability to gas is 1.0 cc/m²/ 24hrs at 27⁰C & 1 atmospheric pr., Good tensile strength properties & high percentage of elongation, Good dart impact resistance, Resistance to the effect of weak acids and alkalies and Good barrier to moisture vapour.

Linear Low Density Polyethylene (LLDPE)

High film tensile strength properties as compared to LDPE, High percentage of elongation as compared to LDPE, High tear strength properties, Better stress crack resistance and low temperature brittleness, Improved stiffness properties, Excellent Puncture resistance and Excellent heat seal properties.

Medium Density Polyethylene (MDPE) film

Density varies from 0.926 – 0.940 gm/cc, Average molecular weight is 2×10^5 , Resistance to heat is 220 – 250⁰F, Translucent type of clarity, Percentage of water absorption is 0.01, Permeability to gas is 1.33 cc/m²/24 hrs at 27⁰ & 1 atms. Pressure, Very resistance to the effect of weak acids, alkalies etc. Exposure to sunlight turn its colour to yellowish.

High Density Polyethylene (HDPE) film

Density varies from 0.941 – 0.965 gm/cc, Average molecular weight is 1.25×10^5 , Resistance to heat is 250°F, Opaque in nature, High barrier to moisture vapour, Permeability to gas is less as compared to other polyethylene film and exposure to sunlight turn it yellowish.

High molecular high density polyethylene film (HMHDPE)

High mechanical strength in both directions, Has got pleasant translucence in clarity, High tear resistance properties, Does not impart any taste or odour, Suitable for food contact application, Less elongation as compared to other polyethylene film and Excellent moisture barrier properties.

(vi) Polypropylene (PP) film

High tensile strength, High chemical resistance and high temperature performance than HDPE.

Very low permeability to moisture vapour and gas compared to polyethylene, High transparency, Chemical inertness and High softing point.

(b) Polyvinyl Chloride (PVC)

It is hard, brittle and transparent materials, Low GTR, Moderate WVTR and good resistance to fat and oil, Glass like clarity, Good mechanical strength, Retention of flavour, Excellent printability, Lower weight/ volume ratio and Resistance to chemicals.

(c) Condensation Polymer

Polyester film (PEF) film

It has got excellent gloss & thus enhance sales appeal.

Very Low moisture and gas permeability.

High mechanical strength.

Resistance to tear, puncture, burst and flex crack.

Dimensionally stable over a wide range of temp. from 70°C to + 130°C

Excellent machinability.

Excellent printability

Light in weight & thus economise the transport expenditure.

Free from all kinds of additives and thus does not contribute off flavours

Good surface properties for metallization.

Polyamide or Nylon-6 film

High mechanical strength, High elongation capability, Excellent resistance to cutting,

perforation, abrasion and bursting, High chemical resistance to oils and fats, Outstanding impermeability to gases and vapours, Easy printability, Easy metallising, Economical (considering best yield/kg) and Could be biaxially oriented.

(d) Styrene Polymers

Polystyrene (PS)

Polystyrene is not flexible in nature unlike LDPE and PP and is mostly used as rigid containers in the field of packaging. The important features or properties of this polymer are as follows :

Crystal clarity of containers, Availability in attractive light or dark colours, Lustrous finish, Rigidity and dimensional stability, Resistance to chemicals, Easy processing, Good barrier to moisture and ability to take post moulding decorations like hot stamp foiling, screen printing, inlay foil moulding etc.

Expanded Polystyrene (EPS)

Expanded polystyrene (EPS) is neither flexible nor rigid in nature rather the materials are cushioning in nature. Normally, these materials are called as 'thermocole'.

The important properties of this material are as follows :

Fully resistant to dilute acid, alkalis, alcohols, sea water but reacts with aliphatic hydro carbons, ketones etc., The density (kg/m^3) varies from 20-30, Stress at 10% compression (kg/cm^2) is 1 to 1.4, Shear strength (kg/cm^2) from 6 to 8, Flexural Strength (kg/cm^2) ranges from 2.5 to 3, Tensile strength (kg/cm^2) is from 2.5 to 3.2, Thermal conductivity at 10°C (k. cal. $\text{m/hr. m}^2\ ^\circ\text{C}$) is 0.028, Water vapour transmission rate is ranging from 0.6 to 1 $\text{gms/m}^2/14\text{hrs}$ at 38°C & 90% RH, Water absorption % volume after 7 days immersion is 0.6, Has no

nutritive value for any known organism and does not provide a breeding ground for fungi, bacteria or insects and its contact with food stuff is perfectly safe.

Multilayer Plastic Film

In order to have all the properties in a single form of polymeric materials so as to meet the requirement of processed food products especially for dairy products with desired shelf-life, a remarkable development has taken place to produce multiplayer plastic film either as laminate form or Co-extruded form.

Properties of multi layer Co-extruded Plastic films

High barrier properties to moisture and oxygen gas, improved in flexural endurance properties, dart impact strength properties is increased, no possibility of delamination of individual layer unlike laminates, Cheaper as compared to laminates and amenable to easy printing on surface.

Check Your Progress - 1

(1) How do you differentiate between paper and paperboard.

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(2) Indicate the important types of paper and paper board.

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(3) Explain five important properties of paper.

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(4) Explain five important properties of aluminium foil.

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(5) What are the important groups of plastic materials used in packaging?

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(6) Indicate two important application of aluminium foil in packaging of dairy products?

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(7) How many types of multi layer plastic film are used in packaging?

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(8) Give two examples of application of plastic laminate and Co-extruded films for dairy products.

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12.2.2 Rigid Packaging Material

A wide variety of rigid packaging materials has been developed over a period of time. The most important packaging material like metal container have been widely used for the packaging of milk powder since long due to certain important properties like complete barrier to light, oxygen gas and moisture. In addition, glass bottles are also used for the packaging of flavoured milk and fresh milk. But now-a days, the application of flexible pouches have gone ahead to glass bottle for the packaging of pasteurised chilled milk. The plastic bottles are also used to a great extent for the packaging of dairy products. The corrugated fibre board boxes are considered to be the most important transport packaging materials for all processed food products including dairy products.

i) Glass Containers

Glass is the oldest packaging materials and used as containers for over 3000 years. The first glass container was made in Egypt in 1500 B.C. Despite of having certain inherent characteristic like fragility, tare weight, the glass containers have made an established application in packaging of dairy products.

PROPERTIES OF GLASS

Chemically Inert, Non – Permeable, Transparent, Mouldable, Excellent impact strength, light Weight, unlimited Supply and see through property

Advantages of Glass Packaging

High or low temperature resistance, do not contaminate the contents with crystals or fibres, climatic variation do not affect the glass container, see through property, can be made in any size shape and capacity, does not taint, pollute or affect the quality of product, there are Various types of closures for glass container made of metal, plastic, cork or rubber and Impermeable to moisture and gases thus suitable for processed food products.

COMPOSITION

The main constituent of glass are sand, lime stone and soda ash. The sand used is known as silica or glass sand. In some cases, arsenic, selenium and cobalt oxides in proper proportion are added to make clear glass. The green or brownish shade in glass comes from the impurities in natural sand, mainly iron. Boron from boraxis added to glass to make the container stronger and to increase its resistance to acids. Colours are added to glass, of (small quantities of chromium, cobalt, iron and other colorants depending on the colour required). For amber (brown) glass, carbon and sulphide are added.

TYPES OF GLASS

The three universally accepted standard are :

All soda lime glasses are mainly Type III.

Type II : This is the same glass as Type III but the inside of the glass container is coated at the time of manufacture, usually with sulphur.

Type I : This is Borosilicate glass which has the added property of almost complete neutrality.

APPLICATION OF GLASS CONTAINERS

Glass containers have wide application for the packaging of pharmaceuticals, dairy, liquor, breweries, food products, soft drinks, cosmetics, chemicals, inks and other industries.

ii) Metal Containers

Metal containers could be made from either aluminium, tinplate or tin free steel. But the tinplate container have got extensive application in packaging of dairy product especially skimmed milk powder.

There are two types of tinplate container namely :

- a) Open Top Sanitary Can.
- b) General Line Can

a) Open top sanitary can.

These cans are made of three pieces i.e. body, top and bottom ends. Hence, this OTS cans are also called as 3 piece can. These containers are normally round in shape, extensively used for skimmed milk powder.

Normally, the metal can of size 1 kg or 500 gms are used for the packaging of milk powder. These metal cans are also used for the packaging of condensed milk of either 500 gms or 1000 gms capacity.

b) General Line Container

General line containers are ranging from tiny containers to 15 lts capacity containers for packaging of milk based biscuits or vanaspati.

PROPERTIES OF METAL CANS

This materials are completely opaque, Complete barrier to moisture, oxygen gas as well as light, Amenable to print with multicolour decoration, Provides longer shelf life to dairy products, High impact strength to withstand stress during transit and Lighter in weight as compared to glass container.

iii) Plastic Containers

Plastic containers are also used as an alternate rigid packaging materials for the packaging of dairy products mainly milk powder and ghee.

PROPERTIES OF PLASTIC CONTAINERS

Could be manufactured in different size, shape and capacity, High barrier to moisture and oxygen gas, It is possible to manufacture the containers in different colours, Impact strength could be improved, Plastic containers could be manufactured with handle to facilitate to carry, Could be made either opaque or transparent, Amenable to make surface printing and it is possible to make leakproof container.

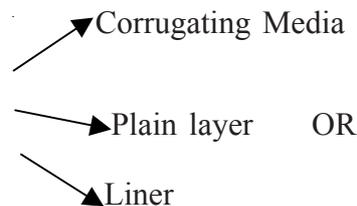
APPLICATIONS

- i) Packaging of milk powders, ghee etc.
- ii) PET bottles are also used for the packaging and storage of butter under refrigeration.

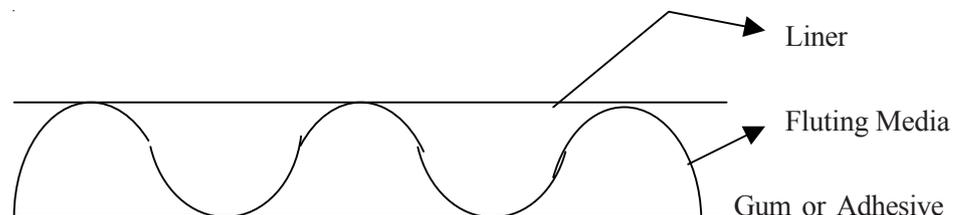
iv) Corrugated Fibre Board Boxes

Corrugated fibre board boxes are the world's most popular and environment friendly packaging materials. The intelligent use of corrugated fibre board boxes can replace some of the use of wood, thermocole and plastics.

A single layer of kraft paper is passed through the corrugating machine to get the corrugations or fluting media and then stuck into a plain layer of kraft paper by means of adhesives or gum to form 2 layer or 2 ply corrugation roll.



Subsequently, the 2 ply corrugation roll could be converted into 3 ply corrugated fibre board by pasting an another Kraft liner or facing material. In the same manner, corrugated fibre board could be made either of 3 ply or 5 ply or 7 ply by means of pasting the corrugation roll and facing material. This could be illustrated with the following diagram.

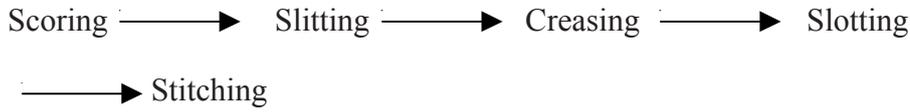


3 Ply or Single Wall Corrugated Fibre Board.

5 Ply or DOUBLE WALL CORRUGATED FIBRE BOARD

7 Ply OR TRIPLE WALL CORRUGATED FIBRE BOARD.

The corrugated fibre board is converted into corrugated fibre board boxes by considering the following steps.



ADVANTAGES OF CORRUGATED FIBRE BOARD BOXES

- i) Availability of raw materials i.e. Kraft paper and adhesive.
- ii) The technology of box making is simple.
- iii) Availability of box making machineries.
- iv) Cost effective.
- v) Amenable to make display package.
- vi) Tare weight of box is less resulting to the reduction of freight cost.
- vii) Maximum utilization of storage space due to collapsing nature of boxes.
- viii) Recognised as Eco-friendly packaging materials.
- ix) Facilitates to have excellent printing on the outer surface of the boxes.
- x) Easy to handle in the shop floor due to collapsing nature as compared to wooden box.

LIMITATIONS

- i) Strength properties are influenced by the environmental condition.
- ii) Requires special condition for storage to maintain the strength properties.
- iii) Shortage of best quality of kraft papers in India.
- iv) Lack of technology in the converting machineries.

APPLICATIONS OF CFB BOXES

Visual merchandising, danglers, and promotional material, Die-cut box for display pack, Extensively used for office stationery items like- trays, pen-stand, filing cabinets, folders for conferences etc., Explored around the world by various designers in its application in furniture item, Wide application for making educational aids, toys etc., As a unit pack for the packaging of horticultural produce, Popularly used as transport packages for all types items including dairy products.

Check Your Progress - 2

1) What are the important properties of glass?

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2) Give five examples of applications for glass containers?

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3) What are the constituents of glass ?

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4) What are the different types of metal cans?

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5) Explain the important properties of metal cans?

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6) Indicate the important properties of plastic containers?

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7) What are the important raw materials for making CFB box?

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8) Mention the important steps to be followed for the manufacturing of CFB boxes?

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9) Indicate five important advantages of CFB boxes?
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12.2.3 Semirigid Packaging Materials

The semi rigid packaging materials are those materials which are neither rigid nor flexible in nature. The important packaging materials under this category are discussed below:

i) Folding Carton

The folding cartons are primarily made from duplex board or triplex board. The duplex board of having grammage ranging from 220 gsm to 300 gsm are used to convert into folding carton by means of different steps like creasing, scoring, slotting and finally gluing.

PROPERTIES OF FOLDING CARTON

Amenable to more number of colour printing, Ease of handling, distribution and storage at retail outlet under refrigeration, Amenable to make pilfer proof closing device, Stiffness nature of folding carton facilitates to stack the product easily, Empty cartons provide excellent space utilization due to collapsing in nature.

APPLICATION OF FOLDING CARTON

Mainly used as intermediate pack for the Butter, sweets like Sohan papri, and milk burfi.

ii) Lined Carton

The term indicates that this package is made of paper board and then lined internally with appropriate packaging materials.

PROPERTIES OF LINED CARTON

- 1 Very economical as compared to metal containers.
- 1 Provides excellent shelf life due to excellent barrier properties against moisture, gas, light of the internal liner material.
- 1 Easy to stack at the outlet due to rectangle in shape.
- 1 Could be made available at different capacity ranging from 100 ml, 200 ml, 1 kg, 2 kg.
- 1 Suitable to pack solid, semi solid as well as liquid product.

- 1 Amenable to print on the outer surface.
- 1 Easy open device in the form of notch or spout facilitate.
- 1 Tailor made lined cartons.

APPLICATION OF LINED CARTONS

Packaging of ghee, khoa, Skimmed milk powder under vacuum condition and Malted milk food.

iii) Aseptic Carton

In this system, both the package and the product are sterilized separately and then the packaging operation is carried out under aseptic (sterile) conditions. This system offers a long storage life for about three months with out any preservatives or refrigeration. The carton is formed by using three important materials like

- (a) Paper board (about 80%) : Provides mainly the rigidity and stiffness.
- (b) Polyethylene (about 15%) : Contribute to have heat seal and also provide barrier to microorganisms.
- (c) Aluminium foil (about 5%) : Mainly responsible to provide barriers against air, light and off flavour.

Combining each of these three materials has enabled carton to produce a packaging material with optimal properties and excellent performance characteristics.

PROPERTIES OF ASEPTIC CARTONS

Higher degree of safety, hygiene and nutrient, retention, Preserving taste and freshness, can be kept for months, efficient device to achieve this function by using minimum quantity of material, a good example of resources efficiency and lightest packaging material.

iv) Thermoformed Containers

The containers or packages are made by means of thermoforming techniques.

The containers could be made in the form of tub or plastic cups. The containers are closed by means of plastic lid made of either polyethylene (PE) or polypropylene (PP).

PROPERTIES OF THERMOFORMED CONTAINERS

Amenable to screen printing on the surface, Provides high barrier against moisture, gas and light, Lighter in weight as compared to other packaging material, Resistance to low temperature and thus suitable to refrigeration, suitable to make toiler made design based on the mould, could be amenable to make coloured containers and easy to handle and are hygienic.

APPLICATIONS

Packaging of butter, ice cream, Dahi, Shrikhand, etc., yogurts, concentrated

products like Kheer, Payasam, Rabri, Kaalakand, gulub jamun, pedha, Rasgolla, sandesh, Ras malai etc. and burfi.

Check Your Progress - 3

(1) What do you mean by folding carton ?

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(2) Give two examples of the application of folding carton?

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(3) Write down five alternate structure of liner used in lined carton for dairy products?

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(4) Indicate the important three packaging materials used in Aseptic Cartons?

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(5) What are the different forms of Aseptic Cartons available in India?

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(6) Explain the important properties of Aseptic Cartons?

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(7) How do you define Thermoformed Containers?

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(8) What are polymeric materials used for manufacturing thermo formed containers?

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(9) Write down two different types lid used in thermoformed containers?

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(10) Give two examples of application of thermoformed containers for dairy products?

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12.3 STANDARDS AND QUALITY ASPECT

Standards are the outcome of any standardization activity, formulated and approved either by any recognised authority or by any individual organisation in order to make the system more easy, transparent, safe and comfortable.

Standardization thus defined as an activity giving solution for repetitive application to problems, essentially in the spheres of science and technology and economics, aimed at the achievement of the optimum degree of order in a given context. Generally, this activity consists of the process of formulating, issuing and implementing standards.

The standards are used as a reference or guidelines to maintain the quality of any product. Quality is an index as measurement that has to be done through grading or classification technique and should be explicit and may involve a combination of chemical, physical and mechanical as well as biological properties.

In general, the quality assurance of any product is required to fulfill the following aspects :

¹ Fitness for the purpose of use.

1. Totality of features and characteristics of a product or service that bear of its ability to satisfy instated or implied needs.
1. Customer satisfaction or customer delight.
1. Conformance to customer requirements.

i) Standards of Packaging Materials

In order to fulfill the requirement of quality aspect for the packaging of raw material manufacturers, converters and user industries, a number of standards have been formulated, issued and published by national and international authorities. These standards are mainly used by that as a guidelines to maintain the quality during on line production, purchase of packaging materials and also by the user industries to ascertain the quality of the packaging materials for different properties.

The following national and international bodies are involved to formulate and publish the standards of packaging materials used for dairy products.

- (a) ASTM : American Society for Testing and Materials.
- (b) BIS : Bureau of Indian Standards
- (c) TAPPI : Technical Association of the Pulp and Paper Industry
- (d) ISO : International Standards Organisation
- (e) DIN : Deutsche Institute for Normung
- (f) NF : Normer Francaises

However, the important standards published by national and International bodies for maintaing the quality aspects in terms of test methods and procedures for various packaging materials are here under :

1. IS 3025 (Part 5) 1983 : Methods of sampling and test (Physical and Chemical) for waste paper - Part 5 (order)
2. IS 3025 (Part 8) 1984 : Methods of sampling and test (Physical and Chemical) for water and waste paper - Part 8 (Taste dating)
3. IS 2798 1998 : Methods of test for plastic container
4. IS 8747 1977 : Methods of test for environmental stress crack resistance of Blow moulded polyethylene containers.
5. IS 9894 1981 : Methods of test for smoothness / roughness of paper
6. ASTM E 398 – 03 : Water vapour transmission rate of sheet materials using dynamic relative humidity measurements.
7. ASTM D 638 – 87 B : Standards test methods for tensile properties of plastics
8. IS 1060 (Part 1) 1966 : Methods of sampling and test for paper and allied products
9. IS 1327 1988 : Methods of determination of mask of tin coating of tinplate

10. IS 4006 (Part 2) – 1985 : Methods of test for paper and pulp based packaging materials
11. IS 4006 (Part 3) – 1985 : Methods of test for paper and pulp based packaging materials
12. IS 5285 - 1998 : Methods of test for Fibre Analysis of paper and board
13. IS 7028 (Part 6) – 1987 : Performance tests for complete, filled transport packages
14. IS 7063 (Part 1) – 1973 : Methods of test for corrugated fibreboard part 1 thickness board
15. IS 7063 (Part 3) – 1976 : Methods of test for corrugated fibreboard part 3 water resistance of glue bond by immersion
16. IS 7063 (Part 4) – 1976 : Methods of test for corrugated fibreboard
17. IS 8402 – 1987 : Methods of sampling and test for pressure sensitive adhesive tapes
18. IS 9030 – 1979 : Methods for determination of seam strength of jute fabrics including their laminates
19. IS 9845 - 1998 : Methods of analysis for determination of overall migration of constituents of plastics materials and articles intended to come in contact with foodstuffs
20. IS 7031 – 1987 : Methods of conditioning for testing of complete, filed transport packages

ii. Quality Parameters of Packaging Materials

Quality is a peculiar or essential characters, It is a distinctive inherent features, property and virtue, It is the degree of excellence or degree of conformance to standard, Quality is an inherent or intrinsic excellence of character type i.e. superiority in kind.

iii. Specifications of Packaging Materials

This aspect could be further simplified as follows:

A particular packaging materials with respect to different quality parameters could be checked in one laboratory repeatedly or various testing laboratories to obtain the test results. Based on the series of test results, a reference line could be drawn to standardise the test results and finally, these test results are considered as specifications to ascertain the quality matrix of packaging materials. But this is possible only when similar type of packaging materials are used for the testing in the laboratory. However, there could be certain deviations in test results obtained from various laboratories. These deviations are mainly due to the following factors.

The type of testing equipment used, The nature of calibration of the equipment, The level of accuracy of the equipment, Test method and procedures adopted, he type of sampling plan followed, The level of accuracy of test samples, The

environmental condition of the laboratory, The level of technical know-how of the any test.

Check Your Progress - 4

1) What do you mean by Quality?

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2) How do you define standardization?

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3) What are the different types of standards?

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4) Indicate the important national and International bodies responsible for the publication of standards?

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5) Explain the factors involved to the deviations of test results in the laboratory?

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6) Write down five important Indian Standards related to test methods?

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7) What are important International Standards published related to test method (Any 5)?

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8) Indicate five important standards related to specification of packaging material?

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12.4 LET US SUM UP

In this unit, we have been able to learn about the definition and importance of packaging. As discussed, packaging is defined as the co-ordinated system of preparing goods for transport, distribution, storage, retailing and end use. In short, packaging serves two basic functions, i.e. marketing and logistics. In the angle of marketing function, any package of dairy products will provide information about the product inside and promotes the product through innovative graphics, and convenient size and shape. And thus, the package acts as “silent salesman” and thus it relates the final interface between the company and the customers.

From a logistics perspective, the role of packaging is a means of ensuring safe delivery of goods to the ultimate consumer in a safe and sound condition of minimum overall cost.

In order to fulfil the requirement of market and consumer, the knowledge of different packaging materials used for dairy products is to be learnt.

We have learnt about different types of packaging materials in details in this unit. For dairy products, the various types of packaging materials like paper and paper board, folding carton, flexible film and laminates, metal containers, glass containers, plastic containers have been discussed. In addition, corrugated fibre board boxes which are normally used as transport package has also been explained elaborately. The information about semi rigid packaging materials like paper board carton for aseptic pack, lined carton, collapsible tube which are the modern packaging materials for dairy products have also been covered.

In addition, the importance of standards, types of standards, quality aspect and finally the specification of various packaging materials with respect to the application of dairy products have also been discussed.

We have also learnt from this unit about different National and International organizations, responsible for the publication of different

standards related to packaging. In addition, the important standards performing

to test methods and procedures, specification of packaging materials have been covered in this unit.

12.5 KEY WORDS

- ANNEALING** : Regulated way of cooling an article to eliminate internal stress and thus breakage.
- THROAT** : The channel of the furnace through which the molten glasses passed away.
- PARASITE** : The thermoplastic material when extruded in the form of pipe under blow moulding process, is called as parasites.
- HTST** : High temperature short time.
- BLANCHING** : A technique by which the enzymes of fruits and vegetables are inactivated by dipping into hot water.
- FREEZE BURN** : During freezing moisture is lost from the surface of the product, the product tissue become dry and tough brownish, a grainy spot occurs on the surface, so called 'Freeze Burn'.
- PARISON** : A semi finished container or a blank mould made of cast iron, used normally prior to sent the gob into finished mould, called Parison.
- GOB** : A stream of glass cut off to a predetermined diameter and length of shears to form a glass containers.
- RADIATION DRYING** : This is the techniques by which heat is transferred by radiation process like sun drying.
- EMA** : Equilibrium modified atmosphere containing 2.5% oxygen and 3.8% carbon dioxide could delay the maturation process and the softening the vegetables, microbial spoilage and enzymatic browning.
- CREASING** : To make the marking on the corrugated fibre board according to the dimension of box.
- SLOTING** : To cut the board according to the marking in the blank.
- SPOUT** : An opening device made of plastic normally fitted to lined carton.
- SNAP-ON** : A kind of lid which is placed on the thermoformed container by putting pressure downwards.
- HIPS** : High impact polystyrene – a kind of polymeric material
- VPI** : Vapour phase inhibitor – a kind of coating on paper to avoid corrosion

12.6 SOME USEFUL BOOKS

Modern Food Packaging, published in 1998 by Indian Institute of Packaging, E-2, MIDC Area, Chakala, Andheri (East), Mumbai-400093

Moulding of Plastics, edited by Norbert M-Bikales, Consultant Chemist, Livingston, New Jersey, published by WILEY-Interscience, a division of John Wiley & Sons, Inc, New York in 1971.

Beverages and Food World, Vol.29, No.2. a special publication during AAHAR 2002 exhibition in February 2002. Published by Mr. Norman J. da. Silva, The Amalganated Press, Narang House, Ambalal Doshi Marg, Mumbai-400001.

Packaging Technology educational volumes, (Set-A), published in 2001, by Indian Institute of Packaging, E-2, MIDC Area, Chakala, Andheri (East), Mumbai-400093.

12.7 ANSWERS TO CHECK YOUR PROGRESS

Your answer should include the following points:

Check Your Progress – 1

- (1)
 - 1 It is differentiated mainly by grammage
 - 1 Grammage of paper is upto 180 gsm.
 - 1 More than 180 gsm is called paperboard.
- (2)
 - 1 Chipping into small pieces and pulping.
 - 1 Digesting the pulp into chamber under heat.
 - 1 Passing through wire and then drying roller
 - 1 Calendering
 - 1 Shifting and packing
- (3)
 - 1 Tissue paper, kraft papers, high gloss paper
 - 1 Grease proof paper, glassine paper
 - 1 Duplex board, Triplex board, chip board
 - 1 Clay coated board
- (4)
 - 1 Flexible in nature
 - 1 Easy amenable to printing
 - 1 Good insulation properties
 - 1 Good tear resistance properties
- (5)
 - 1 Impermeable
 - 1 Non toxic
 - 1 Excellent barrier to moisture, oxygen gas and light

- 1 Resistance to low temperature
- 1 Dead fold characteristics
- (6) 1 Polyolefin group – PE, PP
 - 1 Polyvinyl group – PVC
 - 1 Condensation group – polyester, nylon or polyamide
 - 1 Styrene polymer – polystyrene, high impact polystyrene
 - 1 Carbonate group – polycarbonate
- (7) 1 Packaging of milk powder in aluminium foil based laminate
 - 1 Packaging of milk chocolate in foil based flexible laminate
- (8) 1 Co-extruded film – 3 layers, 5 layers
 - 1 Laminated form – 2 layer, 3 layer, 4 layer
- (9) 1 12 micron polyester / 12 micron metallised polyester / 50 micron polyethylene (Laminate) packaging of milk powder
 - 1 12 micron polyester / 9 micron aluminium foil / 50 micron polyethylene (laminate) – packaging of skimmed milk powder
 - 1 High density polyethylene / low density polyethylene / linear low density polyethylene (co-extruded) – packaging of ghee.
 - 1 Low density polyethylene / linear low density polyethylene (co-extruded) – packaging of fresh milk.
- (10) 1 True
 - 1 True
 - 1 True
 - 1 True
 - 1 False

Check Your Progress - 2

- 1) 1 Chemically inert
 - 1 Non – permeable
 - 1 Transparent
 - 1 Strength
 - 1 Light weight
 - 1 Unlimited supply
- 2) 1 Packaging of flavoured milk, ghee, fresh milk, payasam, and toned milk.
- 3) 1 The main constituents are soda, lime stone and soda ash
 - 1 Other ingredients like arsenic, selenium and cobalt oxides are added to make clear glasses.
 - 1 Boron is added to make stronger
 - 1 Carbon and sulphide are added to make amber (brown) coloured glass
- 4) 1 Type I – Borrosilicate glass

- 1 Type II – Sulphur coated glass
- 1 Type III – Soda lime glasses
- 5) 1 Can be fabricated easily
 - 1 Impermeable to light, gases and moisture
 - 1 Non-toxic
 - 1 Amenable to heat sterilization
 - 1 Amenable to printing.
- 6) 1 Blow moulding
 - 1 Extrusion blow moulding
 - 1 Stretch blow moulding
 - 1 Injection blow moulding
 - 1 Co-extrusion blow moulding
- 7) 1 Fabricate in different size, shape and capacity
 - 1 Improved impact strength properties
 - 1 Could be made either transparent or opaque
 - 1 Could be made in different colour
 - 1 Could have handle to carry.
- 8) 1 Kraft liner, fluting media and adhesive
- 9) 1 Scoring, slitting, slotting, joining and closing
- 10) 1 Eco-friendly packaging material
 - 1 Manufacturing technology is very simple
 - 1 Availability of raw materials
 - 1 Availability of machinery supplier
 - 1 Space utilization in godown is excellent due to collapsing in nature.

Check Your Progress - 3

- 1) 1 Cartons made of either duplex board or triplex board.
 - 1 Cartons made by means of creasing, scoring, slotting, folding and then joining by means of glue.
 - 1 Used mainly as intermediate packs for dairy products like butter, indian sweets, milk based confectioneries etc.
- 2) 1 Packaging of milk burfi, vacuum packed in flexible laminate
 - 1 Packaging of sohan papri filled in thermoformed plastic containers.
- 3) 1 Paper with extrusion coated polyethylene
 - 1 Two layered laminated like polyester / polyethylene
 - 1 Three layered laminate like BOPP / Metallised polyester / Polyethylene
 - 1 Three layered laminate like PET / Al – foil / PE
 - 1 Three layered co-extruded film like LDPE / HDPE / LLDPE

- 4)
 - 1 Paper board (80%)
 - 1 Polyethylene (about 15%)
 - 1 Aluminium foil (about 5%)
- 5)
 - 1 Tetra Brick Aseptic (TBA)
 - 1 Tetra Classic Aseptic (TCA)
 - 1 Tetra Fino Aseptic (TFA)
 - 1 Tetra Wedge Aseptic (TWA)
- 6)
 - 1 Higher degree of safety, hygiene and nutrient retention in foods
 - 1 Preserving taste and freshness
 - 1 A good example of resources efficiency
 - 1 Lightest packaging materials as compared to glass, metal or plastic containers
- 7)
 - 1 A container is made of thermoforming technique
 - 1 Thermoplastic materials are softened by means of heat, followed by vacuum drawing to the mould and the cooling
 - 1 Extensively used for dairy products like ice cream, shrikhand, dahi etc.
- 8)
 - 1 Polyethylene (PE)
 - 1 Polypropylene (PP)
 - 1 High impact polystyrene (HIPS)
 - 1 Acrylo Butadiene – Styrene (ABS)
 - 1 Polyvinyl chloride (PVC)
- 9)
 - 1 Snap on type
 - 1 Hinged type
- 10)
 - 1 Packaging of ice cream, Indian sweets

Check Your Progress - 4

- 1)
 - 1 Quality is a peculiar or essential character.
 - 1 It is a distinctive inherent features, property and virtue.
 - 1 It is the degree of conformance or standard.
 - 1 It is a inherent character or superiority in kind.
- 2)
 - 1 As an activity giving solution for repetitive application to problems.
 - 1 It aims to achieve the optimum degree of orders in a given context.
 - 1 Activity consists of process of formulating, issuing and implementing standards.
- 3)
 - 1 Basic standards
 - 1 Terminology standards
 - 1 Specification standards
 - 1 Test methods standards

**Packaging Materials
and Other Food
Ingredients**

- 1 Code of practice standards
- 4) 1 ASTM : American Society for Testing and Materials.
- 1 BIS : Bureau of Indian Standards
- 1 TAPPI : Technical Association of the Pulp and Paper Industry
- 1 ISO : International Standards Organisation
- 1 DIN : Deutsche Institute for Normung
- 1 NF : Normer Francaises
- 5) 1 Type of testing equipments
- 1 The degree of accuracy of the equipments
- 1 The nature of calibration of equipments
- 1 The type of sampling plan followed
- 1 The environmental conditions of the laboratory
- 1 The level of technical know how of analysis
- 6) 1 IS : 2771 – Specification for corrugated fibre board boxes
- 1 IS : 1060 – Methods of sampling and test for paper and allied products
- 1 IS : 2508 – Specification for low density polyethylene
- 1 IS : 1327 – 1988 – Methods of determination of mass tin coating on tinfoil
- 1 IS : 4006 – Methods of test for paper and pulp based packaging material
- 7) 1 ASTM E 398 – 03 : Water vapour transmission rate of sheet materials using dynamic relative humidity measurements.
- 1 ASTM D 638 – 87 B : Standards test methods for tensile properties of plastics
- 1 TAPPI (T 523 om – 87) : Dynamic measurement of water vapour transfer through sheet material
- 1 ASTM D 689 – 96 a : Standard test method for internal tearing resistance of paper
- 1 ASTM D 3078 – 84 : Standards test method for leaks in heat seal flexible packages
- 8) 1 IS 6956 – 2001 Covered paper specifications
- 1 IS 2508 – 1984 : Specification for low density polyethylene
- 1 IS 2818 (part 1) – 1990 Indian Hessian – Specifications
- 1 IS 2580 – 1982 : Specification for jute sacking bags for packing cement
- 1 IS 3794 – 1966 : Specification for Liverpool twill (1-twill) bags