## Food Packaging Technology Handbook (3rd Revised Edition)

Author: NIIR Board of Consultants Engineers Format: Paperback ISBN: 9788193733981 Code: NI93 Pages: 528 Price: Rs. 1,895.00 US\$ 50.95 Publisher: NIIR PROJECT CONSULTANCY SERVICES Usually ships within 5 days

Food Packaging Technology Handbook (3rd Revised Edition)

(Biodegradable Films, Materials, Polymers, Aseptic Packaging, Labels and Labelling, Packaging of Cashew Nuts, Dairy Products, Milk, Fish, Meat, Shrimps, Canning of Vegetables, Fruits with details of Machinery and Equipments)

Food packaging technology is primarily concerned with packaging activities regarding protection of food products from biological, physical or chemical agents. With the growth of modern civilization, people are getting more concerned with hygiene and quality of the food.

The packaging industry's growth has led to greater specialization and sophistication from the point of view of health and environment friendliness of packing material. The demand on the packaging industry is challenging, given the increasing environmental awareness among communities. The food packaging industry is growing at the rate of 22 to 25 per cent per annum. In near future it is going to be a booming industry.

Packaging has played a critical role as a differentiator in promoting brands, especially for packaged food products. With the increase in urbanization and emergence of supermarkets and hypermarkets, differentiating food products through the aesthetic appeal of packaging has become important for food manufacturers. Furthermore, consumers are increasingly paying more attention to the ingredients and contents of the package. This provides an opportunity for the food packaging technology & equipment manufacturers as food manufacturers need to differentiate their products by conveying the benefits of packaging technology on the labels and packets, such as shelf life, the time required for preparing the food, and nutritional contents to the consumers.

Biodegradable packaging is produced using biopolymers, which are molecules often found in living organisms, like cellulose and proteins. This means they can be safely consumed, degrade quickly, and often be created from waste plant products. The main applications of bio-based and biodegradable plastics are currently in (food) packaging, food service ware, (shopping) bags, fibres/nonwovens and agricultural applications. Bio-based drop-in plastics such as bio-PE and bio-PET are identical to fossil-based counterparts and can be used in exactly the same applications.

The more recently developed bio-based plastics (bio-PE and bio-PET) are also mainly used in food packaging. The increasing awareness of the environmental impact of packaging products and a willingness to replace packaging materials by alternatives with e.g. a lower carbon footprint or made from renewable

resources are the main driver for development and the use of these materials.

This book gives comprehensive account of food packaging, which is the most important part to preserve the food for a long time. The present volume has been written primarily for the benefit of new entrepreneurs, technologists, technical libraries and for those who want to diversify in the field of food industry.

## Contents

CONTENTS 1. Introduction Containment Protection/Preservation Communication Utility Packaging Systems Primary Packaging Secondary Packaging Tertiary Package Unit Load Consumer/Industrial Packaging **Biodegradable Packaging Development of Bioplastic Biopolymers** Starch Based Plastics (Biodegradable) Bio-based and Biodegradable Plastics from Genetically Modified Organisms

 2. Biodegradable films for Food Packaging and Application of Nanotechnology in Biodegradable Food Packaging Biodegradable Polymer Films for Food Packaging Biodegradable Polymers from Biomass Products Starch Cellulose Other Materials Pectin Chitin and Chitosan Proteins Advantage and Limitations of Biodegradable Polymer Nanotechnology in Biodegradable Polymer

3. Biodegradable Materials for Food Packaging Applications
Materials
Aliphatic Polyesters
Manufacturing Process
Manufacturing Filament Yarn
Polymerization
Drying
Melt Spinning
Drawing the Fiber Winding Manufacturing Staple Fiber Drawing Tow Crimping Setting Cutting Polylactide Aliphatic Copolymer (CPLA) Polycaprolactone (PCL) Synthesis and Physicochemical Properties of PCL Poly (Lactic Acid) (PLA) PLA Processing Extrusion Injection Molding Injection Stretch Blow Molding Cast Film and Sheet Thermoforming **Polyurethane Foams** Processing Technology Fillers for Bio based Packaging Materials Cellulose Fiber Wood Fiber **Technical Requirements** Types of Degradable Plastic **Oxo-Biodegradable Plastic** Fossil Resources Hydro-Biodegradable Plastics

4. Biodegradable Polymers in Food Packaging Polymers
Biopolymers
Origin and Description of Biobased Polymers Starch
Production Process
Polylactic Acid
Poly (hydroxyalkanoates) (PHAs)
PHAs Production
Polycaprolactone (PCL)
Cellulose and Derivatives

5. Packaging Materials for Processed Foods Metal Cans Materials Used in Can Manufacture The Steel Base Thickness of Steel Base Mechanical Properties Basic Types of Metal Plate Surface Finish The Tin Coating Marking of Differentially-Coated Plate K Grade Tinplate Grading of Tinplate General

Tin-Free-Steel (TFS) Sheets Tinplate and Its Application Aluminium Cans Manufacture of Three-piece Cans Side Seam Welding Types of Side Seam Welders Other Types of Side Seams Can Ends Manufacture of Ends Flanging, Beading and Double Seaming Lacquers and Their Application Plastic Lamination The Future for Can Coatings **Discolouration in Lacquered Cans** Lacquer Performance The Cans The Two-Piece Can DRD Cans **D&I or DWI Cans Container Innovations** Corrosion of Tinplate **Corrosion in Lacquered Cans** Permissible Limits of Tin Limits for Lead Can Sizes Inspection and Tear-down Examination of Double Seam On the Seam After Tear Down **Critical Parameters Optical Measurements** Performance Testing Selection of Tin Coating Depending on the Corrosivity of Packs Specifications for the Metal Cans **Glass Containers** Composition of Glass Improvements in Glass Manufacture Hot and Cold End Treatment of Surface Coating Lightweight Containers **Glass Container Characteristics** Basic Parts of a Glass Container **Glass Neck Ring Finish Closures for Glass Containers** Parts of Glass Closures Vacuum Closures for Glass Containers (i) Pry-off (side-seal) Cap (ii) Lug-type or Twist Cap (Non-Baby Food Type) (iii) Lug Type Caps for Baby Foods (iv) PT (Press-on, twist-off cap) Sealing of Glass Containers Crown Corks

Procedure for Determining Capper Efficiency **Evaluation of Glass Container Closures** Pry-off (side seal) Type Caps Lug Type Caps Vacuum Measurements PT (Press-on, twist-off) Cap Cocked-up Cap and Dud Detections Sampling Plan and Inspection Tamper-Evidence of Processed Containers Plastic Packaging Material **General Properties** Polyethylene (PE) Polypropylene (PP) Polyethylene Terephthlate (Polyester) (PET) Polyamide (PA) or Nylon Polyvinylchloride (PVC) Polyvinylidene Chloride (PVDC) Polystyrene (PS) Polycarbonate Ethylvinylalcohol (EVOH) Polyvinyl Alcohol (PVA) Regenerated Cellulose (Cellophane) Cellulose Acetate (CA) Paper, Paperboard and Foil Pack Requirements Water Vapour Transmission (WVTR) of Plastics Oxygen Absorption Fabrication of Flexible and Rigid Plastic Packages **Container Fabrication** PP/Foil/PP Laminated Tray Co-extrusion Closures for Hot-Fill or Retortable Plastic Containers Cartons for Liquids Packaging Requirements for Distribution Off-flavours in Packed Food Can and Can Coatings Plastic Packaging Economic Considerations 6. Packaging Trend of Carbonated and "Still" Beverages Introduction **Carbonated Beverages** Basic Manufacturing/Packaging Technology Glass Bottles **Plastic Bottles** Bottling System **Bottle Filling** 

Bottle Crowning or Bottle Capping

Non-Carbonated Beverages / "Still" Drinks

**Aluminium Cans** 

Aseptic Packaging System (Tetrapak) Plastic Bottles Plastic Closures Purpose of Hot Filling Flexible Pouches Retortable Pouches Bag-In-Box System (a) Bags (b) Containers (c) Fillers

7. Aseptic Packaging of Foodstuffs Introduction The Product and Performance Range The Functionality of Steam Aseptic Machines Sterilization of Packaging Material Forming the Cups **Positioning Stations** Sterile Zone The Machine Technology Drive and Control Engineering Dosing Techniques Labelling Guidelines on Aseptic Packaging Aseptic Packaging and Low-Germ Packaging Aseptic Packaging Low-Germ and Recontamination - Free Packaging

8. Modified Atmosphere Packaging
Gases Used in Map
Techniques of Map
Gas Flushing
Compensated Vaccuum
Different Modified Atmospheres
High Oxygen Atmosphere Packaging
Low Oxygen Atmosphere Packaging
Vaccuum Packaging
Active Packaging or Functional Packaging or
Interactive Packaging
Packaging Materials

9. Labels and Labelling
Definition
Purpose of Labels
Identification
Information
Decoration
Types of Labels
Plain Paper Labels
Pre-gummed Paper Labels

Thermoplastic Paper Labels Pressure-sensitive Paper Labels Plain Paper Labels Pre-gummed Paper Labels Thermoplastic Labels Pressure Sensitive Labels or Self-Adhesive Labels Swing Labels — Tie on Tags Printing of Labels Alternative Markings Surface Treatment Materials Used for Labels Papers Foil and Laminates Plastics Adhesives Labelling Machinery Regulations Labels for Freight Containers Information Position Language Pictorial Markings for Handling Instruction IS **Recent Trends** 

10. Packaging of Milk Packaging of Milk and Milk Products Liquid Milk Concentrated Milks Milk Powder Ice Creams Butter Ghee Cheese Indigenous Milk Products

11. Trends for Cheese and Other Dairy Products Packaging Milk Powder-Bulk Milk Powder-Retail Butter Yogurt Ice-Cream Cheese Cheese - Retail

12. Packaging of Malted Milk Foods Introduction Present Packaging System Glass Containers Variant Advantages Disadvantages

Modality of Usage Pet Containers Varient Advantages Disadvantages Modality of Usage Flexible Packaging Materials Process of Packaging (Schematic) Varient Browns (Malted milk food) Whites (Malted milk food) Nutritional Health Beverage Advantages Disadvantages Modality of Usage Significance of Packaging on FFS **Functional Requirement** 

13. Packaging of Cashew Nuts
Introduction
Packaging System

(a) Specification of Tinplate Containers
(b) Specification for CFB Box

Recent Developments
Alternate Packaging Systems

(a) Bag - in - Box (Flexible) System
(b) Bag - in - Box (Semirigid System)
Consumer Packs

14. Lined Cartons for Packaging of Food Products Concept of Lined Carton Packaging System Manufacture of Lined Cartons Sequence of Operation Printing Varnish/lamination Punching Folding & Lining **Carton Filling & Sealing Machines** Sequence of Operation Vacuum & Gas Flushing Constituents of the Lined Carton Tests Liners Criteria for the Selection of Liners 1. The Product to be packed which includes 2. Performance properties include 3. Marketing Demands include Versatility of Lined Cartons Product: Package Compatibility Future Prospects of the Lined Carton Packaging System

15. Canning of Vegetables and Animal Products Asparagus White Variety Beans Green (french waxed) Broad Bean, Field Bean, Pigeon Pea (green) and **Cluster Bean** Cabbage Carrots Cauliflower Corn Whole-Grain Corn Cream Style Corn Creamogenised Corn Vaccum-Packed Whole-Kernel Corn without Brine Cultivation and Maturity Husking Silking Grading Whole-grain Corn Filling Cream-style Corn Handling of A10 Cans of Cream-style Corn Corn-on-the-Cob Drumsticks Gourds (Cucurbits) Mushroom Okra Peas Potato Spinach Tomato **Crushed Tomato** Canning of Acidified Vegetables A. Lowering the pH Using Acid B. Lowering the pH by Fermentation **Fermentation Procedure** Microbial Changes during Fermentation pH Considerations in the Thermal Processing of Acidified Vegetables Canning of Fermented Vegetables Sterilisation Requirements Process Schedule for Vegetables Packed in Glass Containers Thermal Process Schedule for Marine and Animal Products Process Schedule for Soups

16. Canning of Fruit ProductspH Considerations in the Canning of FruitsStrength of Covering SyrupPink Discolouration in Canned Fruits

Apricot Cherries Guava Grapes Mango Muskmelon (Cucutnis melo) Mandarin Orange (Citrus reticulata, Blanco) Segments Papaya (Carica papaya) Peaches Pears Pineapple **Process Schedule Crushed Pineapple** Plums Canned Dried Prunes Strawberries Fruit Cocktail Strained Baby Foods Fruit Juices, Beverages, Pulps and Concentrates **Tomato Juice** 17. Packaging of Fish in Modified Atmospheres Introduction Modified Atmosphere Packaging Application to Fish **Norwegian Practice** Disadvantages Conclusion 18. Packaging of Fresh Meat Product Characteristics **Packaging Principles** Packaging Materials & Techniques 19. Packaging of Shrimps Introduction Product Forms Processing and Packaging (a) Glazing (b) Code Slip (c) Inner Wrap (d) Primary Carton (e) Master Carton (f) Closure and Reinforcement Marking Storage and Transportation **Quality Control and Inspection System** New Trends Packaging Requirements for IQF Shrimps Consumer Packs for IQF Shrimps 1. Deep Drawn Plastic Pouches 2. Printed Preformed Pouches

Flexible Vacuum Packed Pouches in Paper Board Cartons Labelling and Marketing for IQF Shrimps

20. Equipment Commonly used for Food Processing and Preservation **Design Considerations** Indian Scenario Special Development Needs High Speed Specialised Centrifugal Separators Large Capacity Spray-drying and Roller-drying Plants Evaporation and Aroma Recovery Plants Specialised Energy Efficient Heat Exchangers Aseptic Processing and Packaging Equipment Special Types of Forming and Cooking Machinery Latest Types of Freezing and Freeze Drying Equipment System Designs R & D Efforts Food Machinery Listing Equipments commonly used in Food Preservation Food Dehydration (a) Sun Dryer Solar Dryer (b) Cabinet or Tray Dryer (c) Tunnel Dryer (d) Conveyor Dryer (Conveyor band dryer/belt dryer) (e) Spray dryer (f) Freeze Dryer (g) Drum Dryer (h) Fluidized Bed Dryer (i) Spouted Bed Dryer (j) Flash Dryer (k) Microwave Dryer Food Irradiation Food Irradiation Technology (a) Ionizing Radiations (b) Sources of Radiations (c) Process Control Food Freezing and Refrigeration (a) Refrigeration Systems in Cold and Freezer Storage (b) Compression Refrigeration System Ammonia Systems Food Canning Metal or Tin Cans Glass Cans

21 Active Packaging

Active Packaging Technologies Antimicrobial Packaging Ethylene Scavengers Oxygen Scavenging Carbon Dioxide Scavenging or Release Humidity Buffering Films and Liquid Water Removal Modified Atmosphere Packaging (MAP) Aroma and Odour Removal Regulations Market Scenario

22. Nanotechnology in Food Packaging Nanomaterials in Food Packaging Nanocomposites Silver Nanoparticles and Nanocomposites as Antimicrobial Food Packaging Materials Nanosensors Oxygen Sensors Stress and Temperature Sensors Biosensors Advantages Nanotechnology to Food Packaging Market Scenario

- 23. BIS Specifications
- 24. Sample Plant Layouts
- 25. Photographs of Machinery with Supplier's Contact Details

## About NIIR

NIR PROJECT CONSULTANCY SERVICES (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. NPCS is manned by engineers, planners, specialists, financial experts, economic analysts and design specialists with extensive experience in the related industries.

Our various services are: Detailed Project Report, Business Plan for Manufacturing Plant, Start-up Ideas, Business Ideas for Entrepreneurs, Start up Business Opportunities, entrepreneurship projects, Successful Business Plan, Industry Trends, Market Research, Manufacturing Process, Machinery, Raw Materials, project report, Cost and Revenue, Pre-feasibility study for Profitable Manufacturing Business, Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Business Opportunities, Investment Opportunities for Most Profitable Business in India, Manufacturing Business Ideas, Preparation of Project Profile, Pre-Investment and Pre-Feasibility Study, Market Research Study, Preparation of Techno-Economic Feasibility Report, Identification and Section of Plant, Process, Equipment, General Guidance, Startup Help, Technical and Commercial Counseling for setting up new industrial project and Most Profitable Small Scale Business.

NPCS also publishes varies process technology, technical, reference, self employment and startup books, directory, business and industry database, bankable detailed project report, market research report on various industries, small scale industry and profit making business. Besides being used by manufacturers, industrialists and entrepreneurs, our publications are also used by professionals including project engineers, information services bureau, consultants and project consultancy firms as one of the input in their research.

Our Detailed Project report aims at providing all the critical data required by any entrepreneur vying to venture into Project. While expanding a current business or while venturing into new business, entrepreneurs are often faced with the dilemma of zeroing in on a suitable product/line.

NIIR PROJECT CONSULTANCY SERVICES , 106-E, Kamla Nagar, New Delhi-110007, India. Email: npcs.india@gmail.com Website: NIIR.org

Sat, 27 Apr 2024 12:48:06 +0530