106-E, Kamla Nagar, New Delhi-110007, India. Tel: 91-11-23843955, 23845654, 23845886, +918800733955 Mobile: +91-9811043595

Email: npcs.ei@gmail.com, info@entrepreneurindia.co Website: www.entrepreneurIndia.co

## Food Packaging Technology Handbook (4th Revised Edition)

Code: NI93	Format: paperback
Indian Price: ₹1995	US Price: \$200
<b>Pages:</b> 480	ISBN: 9788193733981
Publisher: NIIR PROJECT CONSULTANCY SERVICES	

# **Description**

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.

## **Content**

**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** 

Aluminium Cans

Non-Carbonated Beverages / "Still" Drinks

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

Recent Trends

IS

### 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 Products pH Considerations in the Canning of Fruits Strength of Covering Syrup

16. Canning of Fruit Products
pH Considerations in the Canning of Fruits
Strength of Covering Syrup
Pink 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 Project Consultancy Services (NPCS)**

NIIR Project Consultancy Services (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. Its various services are: Prefeasibility study, New Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Preparation of Project Profiles and Pre-Investment and Pre-Feasibility Studies, Market Surveys and Studies, Preparation of Techno-Economic Feasibility Reports, Identification and Selection of Plant and Machinery, Manufacturing Process and/or Equipment required, General Guidance, Technical and Commercial Counseling for setting up new industrial projects and industry. NPCS also publishes various technology books, directories, databases, detailed project reports, market survey reports on various industries and profit making business. Besides being used by manufacturers, industrialists, and entrepreneurs, our publications are also used by Indian and overseas professionals including project engineers, information services bureaus, consultants and consultancy firms as one of the inputs in their research.

NIIR PROJECT CONSULTANCY SERVICES 106-E, Kamla Nagar, New Delhi-110007, India. Tel: 91-11-23843955, 23845654, 23845886, +918800733955 Mobile: +91-9811043595

Email: npcs.ei@gmail.com, info@entrepreneurindia.co Website: www.entrepreneurIndia.co