

## Entrepreneur India

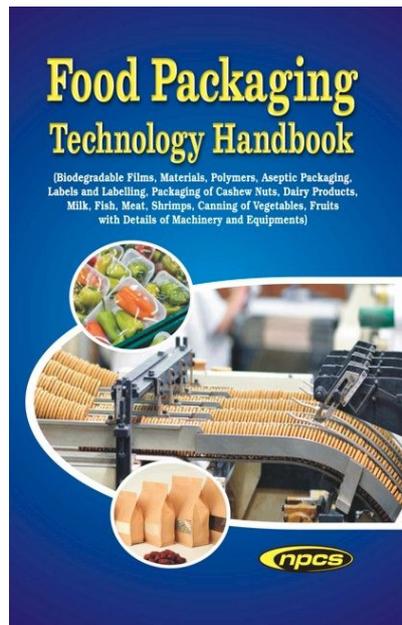
106-E, Kamla Nagar, New Delhi-110007, India.

Tel: 91-11-23843955, +91 9097075054

Mobile: +91-9097075054

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

Website: www.entrepreneurIndia.co



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

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

Poly lactide 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

Poly(lactic 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 Terephthalate (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 Vacuum

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

Variant

Advantages

Disadvantages

Modality of Usage

Flexible Packaging Materials

Process of Packaging (Schematic)

Variant

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 Tinsplate 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  
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**

NIIR Project Consultancy Services (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. Its various services are: Pre-feasibility 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.