



World Skill Development Institute

Food Processing and Canning

Course Duration – 1 Year.

Natural foods such as fruits and vegetables are among the most important foods of mankind as they are not only nutritive but are also indispensable for the maintenance of the health. India is the second largest producer of fruits and vegetables in the world. Fertile soils, a dry climate, clean water and abundant sunlight help the hard working farmers to produce a bountiful harvest. Although there are many similarities between fruits and vegetables, there is one important difference that affects the way that these two types of crop are processed like fruits are more acidic than vegetables. Food processing is the set of methods and techniques used to transform raw ingredients into food or to transform food into other forms for consumption. Food processing typically takes clean, harvested crops or butchered animal products and uses these to produce attractive, marketable and often long shelf-life food products. Canning is a method of preserving food in which the food is processed and sealed in an airtight container. Food preservation is the process of treating and handling food to stop or greatly slow down spoilage (loss of quality, edibility or nutritive value) caused or accelerated by micro organisms. One of the oldest methods of food preservation is by drying, which reduces water activity sufficiently to prevent or delay bacterial growth. Drying also reduces weight, making food more portable. Freezing is also one of the most commonly used processes commercially and domestically for preserving a very wide range of food including prepared food stuffs which would not have required freezing in their unprepared state. Fruits and vegetable processing in India is almost equally divided between the organized and unorganized sector, with the organized sector holding 48% of the share. The present course covers the processing techniques of various types of fruits, vegetables and other food products. This course also has details of equipments and machineries used in fruits, vegetables and food processing along with canning and preservation. This course is an invaluable resource for new entrepreneurs, food technologists and industrialists.

1.Characteristics of the Food Industry

Components of the Food Industry

Allied Industries

Interrelated Operations

2. Food Quality Assurance

The Need

A Role for Government

Microbiological Standards

A Role for Industry

Design of Company QA Program

Objectives

Raw Material Quality Assurance

In-process Quality Assurance

Finished Product Quality Assurance

3. Quality Factors in Foods

Appearance Factors

Color and Gloss

Consistency

Textural Factors

Measuring Texture

Texture Changes

Flavor Factors

Additional Quality Factors

Quality Standards

Planned Quality Control

4.Preserve, Candied and Crystallized Fruits and Vegetables

Preserve

General considerations

Candied Fruits/Vegetables

Process

Glazed Fruits/Vegetables

Crystallized Fruits/Vegetables

Problems in Preparation of Preserves and Candied Fruits

5.Food Preservation by Fermentation

Life with Microorganisms

Fermentation of Carbohydrates

Industrially Important Organisms in Food Preservation

Order of Fermentation

Types of Fermentations of Sugar

Fermentation Controls

Wine

Preservation

Sterilization Filtration

Beer

Vinegar Fermentation

Principles of Vinegar Fermentation

Vinegar Making

Preparation of Yeast Starter

Alcoholic Fermentation

Acetic Fermentation

Cheese

Kinds of Cheese

Cottage Cheese

Swiss Cheese

Blue Cheeses

6. Chemical Preservation of Foods

What Are Food Additives?

Importance of Chemical Additives

Legitimate Uses in Food Processing

Undesirable Uses of Additives

Safety of a Food Additives

Functional Chemical Additive Applications

Specific Uses of Chemical Additives

Additives Permitted and Prohibited in the United States

Chemical Preservatives

Microbial Antagonists

Sorbic Acid

Antibiotics

Quality Improving Agents

Other Chemical Additives

Artificial Flavoring

Artificial Coloring

7. Cold Preservation and Processing

Distinction Between Refrigeration and Freezing

Refrigeration and Cool Storage

Requirements of Refrigerated Storage

Controlled low Temperature

Air Circulation and Humidity

Modification of Gas Atmospheres

Changes in Food During Refrigerated Storage

Freezing and Frozen Storage

Initial Freezing Point

Freezing Curve

Changes During Freezing

Choice of Final Temperature

Food Composition

Noncompositional Influences

Freezing Methods

Air Freezing

Packaging Considerations

Some Additional Developments

8. Heat Preservation and Processing

Sterilization

Commercially Sterile

Pasteurization

Blanching

Selecting Heat Treatments

Heat Resistance of Microorganisms

Thermal Death Curves

Margin of Safety

Heat Transfer

Conduction and Convection Heating

Cold Point in Food Masses

Determining Process Time and Process Lethality

Protective Effects of Food Constituents

Different Temperature-Time Combinations

Heating Before or After Packaging

9. Food Pickling and Curing

Pickled Fruits and Vegetables

Use of Salt Stock

Sour Pickles, Sweet Pickles, Processed Dill Pickles

Sauerkraut

Olives

Fermented And Pickled Products

Deterioration

Nutritional Value

Bloater Damage Control

Controlled Fermentations in Commercial Brining Tanks

Brine Recovery

Defect Reduction

The Principles of Fish Salting

The Influence of the Composition of Salt

Commercial Methods of Salting Fish

Brine-salting

Dry-salting

Comparative Efficiency of Brine-salting and Dry-salting

Some-curing Processes

Cold-smoking (Heavy Salt Cure)

Smoked Salmon

Hard-smoked Salmon

Meat Curing and Smoking

Pickled Meats

Salt

Sugar and Corn Syrup Solids

Nitrite and/or Nitrate

Nitrosamines

Phosphates

Sodium Erythorbate

Cured Meat Color

Role of Nitrite and/or Nitrate in Meat Color

Sausages and Table-ready Meats

Dry Sausage Manufacture

Processing

Fermentation

10. Food Preservation by Drying

Drying-A Natural Process

Dehydration-Artificial Drying

Dehydration vs. Sun Drying

Why Dried Foods?

Dehydration Permits Food Preservation

Humidity-Water Vapor Content of Air

RH-The drying Medium

Types of Driers

Adiabatic Driers

Heat Transfer through a Solid Surface

Criteria of Success in Dehydrated Foods

Freeze-Dehydration (Freeze Drying)

Triple Point of Water

Temperature Changes in Meat Freeze-dehydration

Influence of Dehydration on Nutritive Value of Food

Dehydration of Fruits

Dehydration of Vegetables

Dehydration of Animal Products

Dehydration of Fish

Dehydration of Milk

Dehydration of Eggs

Packaging of Dehydrated Foods

11. Food Preservation by Canning

Temperature vs. Pressure

Heat Resistance of Microorganisms Important in Canning

Factors Influencing the Heat Resistance of Spores

Heat Resistance of Enzymes in Food

Heat Penetration into Food Containers and Content

Storage of Canned Foods

External Corrosion of Cans

Coding the Pack

Influence of Canning on the Quality of Food

Color

Flavour and Texture

Protein

Improvements in Canning Technology

Retort Pouches

Testing a Good Seal

Hazard Analysis

12. Pickles

Preservation with Salt

Preservation with Vinegar

Preservation with Oil

Preservation with Mixture of Salt, Oil, Spices and Vinegar

Problems in pickle making

13.Chutneys and Sauces/Ketchups

Chutneys

Recipes for chutneys

Sweet mango chutney

Apple chutney

Plum chutney

Wood apple chutney

Apricot chutney

Papaya chutney

Tomato chutney

Aonla chutney

Sauces (Ketchups)

Recipes for sauces (ketchups)

Tomato sauce

Apple sauce

Plum sauce

Papaya sauce

Mushroom sauce

Aonla sauce

Problem in the preparation of sauces/ketchups

14.Mushroom Processing

Dehydration

Preparation of ketchup

Preservation with salt and acetic acid

Pickling

Canning

Mushroom poisoning

15. Tomato Processing

16. Jam, Jelly and Marmalade

Jam

Problems in jam production

Jelly

Important considerations in jelly making

Pectin

Acid

Sugar

Judging of end-point

Marmalade

After pectin extraction

17. Freezing of Fruits and Vegetables

Preparation of fruits/vegetables for freezing

Methods of freezing

Sharp freezing (Slow freezing)

Quick freezing

By direct immersion

Advantages

Disadvantages

By indirect contact with refrigerant

By air blast

Cryogenic freezing

Dhydro-freezing

Freeze-drying

Changes during freezing and storage for frozen products

Freezing process for fruits and vegetables

18.Vinegar

Types of vinegar

Steps involved in vinegar production

Outline Scheme of Vinegar Production

Preparation of vinegar

Slow process

Orleans slow process

Quick process (Generator or German process)

Precautions

Problems in vinegar production

19.Drying and Dehydration of Fruits and Vegetables

Advantages of dehydration over sun-drying

Spoilage of dried products

Reconstitution test for dried/dehydrated products

Reconstitution test

20.The Canning Process

Cans

Types of Cans

Square and Pullman Base

Pear Shaped

Round Sanitary

Drawn Aluminum

Oblong

Can Materials

Retorts

Non agitating Retorts

Continuous Agitating Retorts

Hydrostatic Retorts

Establishment of Retort Schedule

Pasteurized Canned Products

Closing

Pasteurizing Cook

Cooling

Storage and Shelf Life

Aseptic Canning

21.Food Freezing

Development of a Frozen Food Industry

The Freezing Point of Foods

Percentage Water Frozen vs. Temperature of Food and
Its Quality

Size of Ice Crystals Formed

Volume Changes During Freezing

Refrigeration Requirements in Freezing Foods

Freezing in Air

Freezing by Indirect Contact with Refrigerants

Direct Immersion Freezing

Packaging Requirements for Frozen Foods

Influence of Freezing on Microorganisms

Influence of Freezing on Proteins

Influence of Freezing on Enzymes

Influence of Freezing on Fats

Influence of Freezing on Vitamins

Freezing of Bakery Products

Packaging

Storage Life of Frozen Bread

Cookies and Cakes

Frozen Dairy Foods

The Ice Cream Industry

Basic Ingredients

Manufacture of Ice Cream

The Mix

Pasteurization

Homogenization

Cooling

Freezing

Hardening

Hazard Analysis

Hazard Categories

22.Cookie and Cracker Production Technology

Ingredients Handling

Mixing

Dough Relaxation and Fermentation

Dough Machining and Forming

Dough Relaxing

Cutting Stage

Scrap Return

Salter or Sugar Sprinkling

Rotary Molding

Extruder-Dough Formers

Wire Cut

Rout Press

The Fruit Bar Coextruder

Baking

Direct-Fired Ovens, Gas Fired

Convection (Indirect) Ovens

Post Conditioning

Secondary Processes

Icings

Enrobing

Sandwiched Cookies and Crackers

Biscuit Packaging

23.Snack Foods

Introduction

Popcorn

Four Types of Popcorn

Mechanism of Popping

Quality factors

Processing

Formulated Puffed Snacks

Ingredients

Other Grain Products

Expandable Ingredients

Frying Fats

Antioxidants

Sweeteners

Other Ingredients

Extruders and Extruding

Types of Extruders

Snacks that Are Cooked and Formed

Drying

24. Breakfast Cereals

Introduction

Present Status

Processing of Hot-serve Cereals

Wheat Cereals

Corn Cereals

Oat Cereals

Processing Ready-to-Eat Breakfast Cereals

Flakes

General Considerations

Corn Flakes

Wheat flakes

Bran Flakes

Shreds

Shredded Wheat Biscuits

Puffed Cereals

General Considerations

Oven-puffed Rice

Puffing by Extrusion

Sugar-coated Products

Ovens

25. Canned Meat Formulations

Corned Beef Hash

Federal Meat Inspection Regulations

Preparation

Meat

Potatoes

Onions

Canning

Beef Stew

Federal Meat Inspection Regulations

Preparation

Meat

Potatoes

Carrots

Onions

Preparation

Canning

Chili Con Carne

Federal Meat Inspection Regulations

Preparation

Canning

Vienna Sausages

Federal Meat Inspection Regulations

Preparation

Canning

Meat Balls with Gravy

Federal Meat Inspection Regulations

Preparation

Canning

Sliced Dried Beef

Federal Meat Inspection Regulations

Preparation

Drying and Smoking

Canning

Luncheon Meat

Federal Meat Inspection Regulations

Preparation

Canning

Processing

Sterile

Pasteurized

Potted Meat

Federal Meat Inspection Regulations

Preparation

Canning

Canned Hams-Pasteurized and Sterile

Federal Meat Inspection Regulations

Preparation

Smoking

Canning

Filling and Pressing

Closing

Processing

Pasteurized

Sterile

Plastic Packaged Hams

Preparation

Packaging

Processing

26.Cured or Smoked Meats

Hams

Classification of Ham

Internal Temperature

Added Substance

Presence of Bone

Commercial Ham Manufacture

Curing

Smoking/Cooking

Cooked Ham

Baked Ham

Preparation

Country Ham

Preparation

Westphalian Ham

Preparation

Scotch Ham

Prosciutti Ham

Preparation

Honey Cured Hams

Preparation

Bacon

Canadian Bacon

Wiltshire Bacon

Beef Bacon

Jowl Bacon

Fat Backs and Heavy Bellies

Smoked Pork Loin

Picnic

Shoulder Butt

Corned Beef

Smoked Fresh Meat

Dried Beef

Procedure

Smoked and Cured Lamb

Smoked Tongue

Pickled Pigs Feet

27.Sausage Formulations

Ground Sausages

Instructions

Semidry or Summer Sausages

Instructions

Dry Sausages

Instructions

Emulsion-Type Sausages

Instructions

Liver Sausage and Braunschweiger

Instructions

Speciality Items

Instructions

Mortadella

Instructions

Linguica (Portuguese Sausage)

Instructions

28.Processing of Rice

Introduction

Quality of Rice

Milling of Rice

Small-scale Milling

Modern Conventional Milling

Abrasive Milling of Rice

Lye-peeling

Extractive Milling

Rice Flour

Further Processing of Rice

Boiling and Steaming

Parboiling

Quick-cooking Rice

Shelf-stable Cooked Rice

Rice Cakes

Rice Milk

29. Creaming, Emulsions, and Emulsifiers

Emulsifier and Emulsions

Classification

Hydrophilic-Lipophilic Balance (HLB)

Oil-in-Water Emulsions

Type of Emulsifier used in Cookies and Crackers

Phosphatides and Lecithin

Synthetic Emulsifiers

Function of Emulsifiers in Cookies and Crackers

Eggs

Emulsifier

Mixing Operation in Cookie and Cracker Doughs

Mixing Operation

Creaming Method

Two-stage Method

Three-stage Method

Baking Cookies and Crackers

Emulsion Stability

Viscosity

To Lower Viscosity

To Increase Viscosity

Elevated Temperature

Inversion Phase

Phase Equilibria

Batter Aeration

30.Principles of Food Packaging

Introduction

Functions of Food Packaging

Requirements For Effective Food Packaging

Types of Containers

Primary, Secondary, and Tertiary

Form-Fill-Seal Packaging

Hermetic Closure

Food-Packaging Materials and Forms

Metal

Metal Cans

Can Construction

Can Corrosion

Can Sizing

Glass

Glass Containers

Paper, Paperboard, and Fiberboard

Plastics

Laminates

Retortable Pouches and Trays

Edible Films

Wood and Cloth Materials

Package Testing

High Barrier Plastic Bottles

Aseptic Packaging in Composite Cartons

Military Food Packaging

Directory Section

Suppliers of the Plant and Machinery

Addresses of Packaging Machinery

Suppliers of Raw Material Suppliers