



World Skill Development Institute

Beer, Whisky and Cider Production Technology

Course Duration – 6 months.

The alcoholic and non alcoholic beverages are being used by human being since centuries back. Accompanying the increase in the variety of consumption there has been a parallel increase in the variety of alcoholic and non alcoholic beverages offered for sale. The alcoholic drinks market is broadly classified into five classes, starting from beers, wines, hard liquors, liqueurs and others. Similarly non alcoholic drinks market is broadly classified into carbonated drinks, non carbonated drinks and hot beverages. These include juices, energy drinks, carbonated drinks, tea, coffee and bottled water. The commercial success of a soft drink formulation depends upon a number of factors. A strong, well placed advertising campaign will bring the consumer to purchase the new product but, thereafter, the level of repeat sales will reflect the degree of enthusiasm with which the new drink has been received. The dramatic growth of fruit juice and non carbonated fruit beverage markets worldwide has been made possible by the development of new packs and packing systems and improvements in traditional packaging. Tropical fruits are the newest arrivals on the juice and fruit beverage market. Whisky is the portable spirit obtained by distillation of aqueous extract of an infusion of malted barley and other cereals that has been fermented. It can be considered as the product of distillation of an unhopped beer. Beer is the world most widely consumed alcoholic beverage; it is the third most popular drink overall, after water and tea. Rum is a distilled alcoholic beverage made from sugarcane by products such as molasses, or directly from sugarcane juice, by a process of fermentation and distillation. The Indian alcoholic market has been growing rapidly for the last ten years, due to the positive impact of demographic trends and expected changes like rising income levels, changing age profile, changing lifestyles and reduction in beverages prices.

Some of the fundamentals of this course are flavourings and emulsions, syrup room operation, fruit juices and comminuted bases, acids, colours, preservatives and other additives, high intensity sweeteners, packaging systems for fruit juices and non carbonated beverages, grape juice processing, processing of citrus juices, juice processing for pasteurized single strength, equipment for extraction and processing of soft and pome fruit juices, chemistry and technology of citrus juices and by products, legislation controlling production, labelling and

marketing, biochemical events during brewing fermentations, outline of the whisky producing process, types of beer brewed, aroma compounds of rum and their formation, cider and perry etc.

The alcoholic and non alcoholic beverages described in this course are beer, wine, rum, whisky, cider and different types of fruit juices with packaging systems and other relevant parameters related to their manufacturing. The course will be very helpful to technocrats, new entrepreneurs, research scholars and for those who are already in to this field.

1.CARBONATION AND FILLING

Introduction

Carbonation

The nature and effects of carbonation

Properties of carbon dioxide

Equilibrium pressure

Measurement of carbonation

Carbonation determination

Carbonators

Designs of carbonators

Air exclusion

Proportioners

Fillers and Filling Valves

Basic filling valve operation

Filling valve development and the

influence of ambient filling

2.EFFECTIVE APPLICATION OF QUALITY CONTROL

Introduction

Evolution of QC in the Soft Drinks Industry

Concept of quality

Evolution of soft drinks QC

The Small-to-Medium-Sized Business

Contract packing

Setting up a cost-effective system for QC

Product and packaging innovation

National Operations with Multiple Plants

Impact of industry concentration

Organisation of QC at plant level

Centralised organisation for quality

Bottling versus canning QC requirements

Equipment selection for quality

Development of in-line quality-monitoring equipment

Potential quality problem areas

Product recall

Water quality and treatment

Statistical QC

Microbiology

Dispensed soft drinks

International QC and QA of Soft Drink Operations

The franchise system

Technical services

The international quality assurance laboratory

Ingredient quality

Packaging quality

Trouble-shooting the theory in practice

The Future

Influence of packaging

New ingredients formulation and sanitation requirements

Role of the soft drinks associations

The final word

3.FLAVOURINGS AND EMULSIONS

Flavourings

Legislation

Creation

Production

Emulsions

Manufacture

Application of Flavourings and Emulsions

Selection

Methods of use

Evaluations

4 SYRUP ROOM OPERATION

Introduction

Syrup Room Design

Wall finishes

Floors and drainage

Ceilings and lighting

Heating, ventilating and air conditioning

Syrup Room Equipment

Storage, mixing tanks and systems

Pipework, fittings and connections

Ingredient flow

Pumps

Measurement of liquid

Filtration of ingredients

Ultraviolet sterilisation

Pasteurisation

Homogenisation

Syrup Room Materials Storage and Handling

Sugar

High-fructose glucose (Corn) syrup

Acids

Sweeteners

Preservatives

Flavourings

Colours

Fruit juices and comminuted bases

Syrup Room CIP Systems and Detergents

Design of a CIP unit

Rate of flow in pipelines for CIP

Calculation of reynolds number

Choice of detergents

Automaton and computerisation in syrup rooms

Typical system description

Typical operating sequence for syrup manufacture

Multiple Component Mixing Plant

Construction

Control and operation

Future Developments

5.ACIDS, COLOURS, PRESERVATIVES AND OTHER ADDITIVES

Introduction

Acids

Carbonic acid

Citric acid

Tartaric acid

Phosphoric acid

Lactic acid

Acetic acid

Malic acid

Fumaric acid

Ascorbic acid

Colours

Preservatives

Micro-organisms and soft drinks

Sulphur dioxide

Benzoic acid and benzoates

Esters of para-hydroxy-benzoic acid

Sorbic acid and sorbates,

Other Additives

Emulsifiers

Stabilisers

Saponins

Anti-oxidants

The Safety of Food Additives

6.HIGH-INTENSITY SWEETENERS

Introduction

Use of Intense Sweeteners

Current Sweeteners

Acesulfame K

Aspartame

Cyclamate

Saccharin

Stevioside/Stevia

Thaumatococin

Dihydrochalcones

Potential New Sweeteners

Alitame

Sweetener Approval and Regulation

Future Use of Intense Sweeteners

7. CARBOHYDRATE SUGARS

Introduction

History

Carbohydrate Sugars

Granulated sugar

Liquid sugar

Glucose syrup: high-fructose syrup

Quality

Trade requirement

Quality assurance management

Sugar analysis

Transportation and Delivery

Bulk delivery of granulated sugar

Bulk delivery of Liquid carbohydrate Sugars

Security of delivery

Storage

Granulated sugar in bags

Granulated sugar in bulk

Liquid carbohydrate sugars

On-site Dissolving of Granulated Sugar

Batch dissolving

Continuous dissolving

High-capacity dissolving

8.PACKAGING SYSTEMS FOR FRUIT JUICES AND NON-CARBONATED BEVERAGES

Introduction

The Fresh Cold Fill System

The Hot Fill System

Filling Equipment for Gable Top Cartons

Packing Materials for Gable Top Cartons

Product Protection and Product/Pack Interaction

General considerations

Cold filled juices

Hot filled juices

Flavour

Packaging of Frozen Concentrated Juices (FCJ)

Filling in Glass Containers

Plastic Containers and Pouches

9.GRAPE JUICE PROCESSING

History of Grape Juice Processing in North America

Grape Cultivars

The Chemistry of Grape Juice

Carbohydrates

Acids

Mineral content

Phenolic

Volatiles

Modern Grape Juice Processing

Harvesting/ripening

Stemmer/crusher operation

Hot-break process

De-juicing/pressing operation

Coarse filtration

Bulk storage and tartrate precipitation

Enzyme clarification

Polish (fine) filtration

Hot fill

Process Alternatives

Cold-pressing

Aseptic process

Concentration

Sulfur dioxide preservative

10.PROCESSING OF CITRUS JUICES

Introduction

Fruit Harvesting and Transport

Unloading and Storage of Fruit

Fruit Transfer from Storage Bins to Extractors

Juice Extraction and Finishing

Extractors

Finishing

Juice Processing for Pasteurized Single Strength

Juice Processing for Concentrate

Characteristics of 1950s evaporators

Modern evaporators for citrus fruit

Essence Recovery

Chilled Juice from Concentrate

Pulp Wash

Frozen Pulp Processing

Manufacture of Citrus Cold Pressed Oil

Manufacture of Livestock Feed from Citrus Peel

Peel dryer

Waste heat evaporator

11. APPLE JUICE

General Background

Juice extraction

Pomace disposal

Blending and packaging

Natural Style Juices

Clarified Juice and Concentrate

Enzyming

Pulp enzyming

Fining

Concentrates

Hazes and deposits

Authentication and Adulteration

Composition of Apple Juice

Sugars and sorbitol

Starch & pectin

Organic acids

Protein and amino acids

Polyphenols and colour

Minerals

Volatile components

Other flavour aspects

Microbiology

Food Tests

Test for the presence of pectin in clarified Juice

Test for the presence of starch

Test fining with gelatin

Test fining with gelatin/kieselsohl

Test for overfining

12.EQUIPMENT FOR EXTRACTION AND PROCESSING OF SOFT AND POME FRUIT JUICES

Introduction

Modern juice processing methods

Juice Extraction Systems

Fruit storage and handling

Milling

Pressing

Comparison of pressing systems

European grape pressing

Pre-treatment with Pectolytic Enzymes

Post-press Clarification

Decantation

Centrifugation

Earth filtration

Rotary vacuum filters

Sheet filtration

Cartridge filters

Membrane filtration

Concentration/Aroma Recovery

Rising film evaporators

Falling film evaporators

Centrifugal evaporators

Heat recovery from evaporated water

Aroma recovery

Pasteurisation

Flash pasteurisation

Batch pasteurisation

In-pack pasteurisation/hot filling

Fruit Juice Plant Layout

Materials of construction

Fruit reception

Handling and washing fruit

Seasonal problems

Effluent treatment

Juice storage

Summary

13.CHEMISTRY AND TECHNOLOGY OF CITRUS JUICES AND BY-PRODUCTS

Principal Citrus Cultivars

Origin of citrus

Commercial citrus regions

Citrus growing areas

Effect of frost

Effect of soil

Composition and Structure of Citrus Fruits and Juices of Various Cultivars

General relationship

Organic acids

Carbohydrates

Color pigments

Vitamins and inorganic constituents

Flavonoids

Lipids

Operational Procedures and Effects on Quality and Shelf Life of Citrus Juices

Outline of good manufacturing and processing procedures

Concentrate handling for reprocessing and/or

reconstruction

Sanitation or stabilization

Water for reconstitution use

Processing of chilled high and low pulp reconstituted orange juice

Finished product handling and storage

Citrus Juice Flavor Enhancement with Natural Citrus Volatiles

Components of citrus juice flavor

Citrus flavor enhancement technology

Citrus oils and aroma and their recovery

Pectic Substances and Relationship of Citrus Enzymes to Juice Quality

Effect of Time, Temperature and other Factors on Citrus Products

14. LEGISLATION CONTROLLING PRODUCTION, LABELLING AND MARKETING

Fruit Juices, Concentrated Fruit Juices and Fruit Nectars, Introduction

Fruit juice regulations in EEC countries

Fruit juice regulations in the United States and Canada

Fruit juice regulations in other major countries

Fruit juice standards produced by codex alimentarius

Non-Carbonated Fruit Beverages

Introduction

Fruit drink regulations in EEC countries

Fruit drink regulations in other European countries

Fruit drink regulations in the United states and Canada

Fruit drink regulations in other major countries

15.TROPICAL FRUIT JUICES

Introduction

Guava

Mango

Passion fruit

Pineapple

Other Tropical Fruits

Acerola

Banana

Kiwifruit

Lulo

Papaya

Soursop

Umbu

Tropical Fruit Juices in Europe Today

The Future

16.WHISKY 418

Introduction

History of Whisky Production

Outline of the Whisky-producing Process

Individual Operations

Raw materials

Mashing and cooking

Fermentation

Distillation

Maturation and ageing

Blending and colouring

Effluent disposal and spent grains recovery

Organoleptically Important Components of Whisky

Concentrations of organoleptically important compounds

Chemical nature of organoleptically important compounds

Contribution of compounds to organoleptic properties

Origin of organoleptically important compounds

17.BEER

Introduction

Historical Aspects of Brewing

Prehistoric and early historic

Brewing in Europe

Outline of the Brewing Process

Malting

Suitability of barley for brewing

the malting process

Kilning

Mashing

Brewing liquor

Mash-tun ingredients other than malt

Mashing systems

Enzymolysis in the mash tun

Sparging

Direct Conversion of Barley to wort

Wort Boiling and Cooling

General

Hops and hopping

Wort clarification and cooling

Fermentation

Brewing yeasts

Biochemical events during brewing fermentations

Physical behaviour of yeast

Fermentation systems

Beer Treatments

Maturation and conditioning

Haze prevention

Yeast removal

Pasteurization

Post-fermentation bittering

Beer Properties

Colour and clarity

Foam

Flavour and aroma

General composition and dietary value of beer

Beer Defects

Gushing

Microbiological spoilage

Oxidation flavour, stale flavour and other off-flavours

The State of the Industry

Types of beer brewed

18.RUM

Introduction

Production of Rum

Types of rum and the raw materials used

Pretreatment of the raw materials

Fermentation

Distillation

Maturing

Aroma Compounds of Rum and their Formation

Higher alcohols

Fatty acids

Esters

Phenolic compounds

Nitrogenous compounds

Sulphur-containing compounds

Lactones

Carbonyl compounds

19.TABLE WINES

Introduction

Some Economic Aspects of the History of Wine Making

Grapes

Must Treatment

Alcoholic Fermentation

Post Fermentation Operations

Microbiological Stabilization

Malo-lactic fermentation

Microbiological spoilage,

Sulphur dioxide addition

20.CIDER AND PERRY

Introduction

Definition of cider and perry

Outline of the process of cidermaking

Historical aspects

Composition

Juice

Fermentation and storage

Disorders

Technology

Fruit supply

Juice production

Juice treatment

Fermentation and storage

The final cider

Ancillary products