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Participant Handbook

Sector
Food Processing

Sub-Sector
Bread and Bakery

Occupation
Processing-Bread and Bakery

Reference ID: **FIC/Q5003, Version 3.0**
NSQF level 4

Plant Biscuit Production Specialist

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Prime Minister of India

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SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Occupational Standards of

Job Role/ Qualification Pack: **'Plant Biscuit Production Specialist '** QP No. **'FIC/Q5003, NSQF Level 4'**

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** Valid up to the next review date of the Qualification Pack*

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(Food Industry Capacity & Skill Initiative)

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This participant handbook is dedicated to all the aspiring youth who desire to achieve special skills which would be a lifelong asset for their future endeavors and help them make a bright career in the Food Processing Sector.

FICSI is thankful to all organisations and individuals who have helped us in preparation of this participant handbook.

We also wish to extend our gratitude to all those who reviewed the content and provided valuable inputs for improving the quality, coherence, and content presentation of chapters.

About this book

This book is designed to provide skill training and/or upgrade the knowledge and basic skills to take up the job of a 'Plant Biscuit Production Specialist' in the 'Food Processing' sector. All the activities carried out by a specialist are covered in this course. Upon successful completion of this course, the candidate will be eligible to work as a Plant Biscuit Production Specialist.

This Participant Handbook is designed to enable training for the specific Qualification Pack (QP). Each National Occupational Standards (NOS) is covered across the Unit/s.

Key Learning Objectives for the specific NOS mark the beginning of the Unit/s for that NOS.

1. FIC/N5009: Prepare and maintain work area and process machineries for producing biscuits in industrial units
2. FIC/N5010: Prepare for production of biscuits in industrial units
3. FIC/N5011: Produce biscuits in industrial units
4. FIC/N5012: Complete documentation and record keeping related to production of biscuits in industrial units
5. FIC/N9001: Food safety, hygiene and sanitation for processing food products
6. DGT/VSQ/N0102: Employability Skills

Symbols Used


Key Learning Outcomes


Unit Objectives


Exercise


Tips


Notes


Activity


Summary

Table of Contents

Skill India
कौशल भारत-कुशल भारत

NCVET
कौशल गुणवत्ता प्रगति

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1. Introduction to Training Programme

FIC/N5009

Key Learning Outcomes

By the end of this module, the participants will be able to:

1. Explain the purpose of training.
2. Define food processing
3. List the various sector of food processing industry
4. Describe the various stages of food processing sector for converting raw materials to food products
5. List the various products of bread and bakery sub-sector
6. Explain the baking process
7. State the various roles and responsibilities of Plant biscuit biscuit production specialist

UNIT 1.1: Introduction to the Training Programme

Unit Objectives

By the end of this unit, the participants will be able to:

1. Explain the purpose of training
2. Discuss the National Occupational Standards and Qualification Pack

1.1.1 Purpose and Benefits of the Training Programme

This training programme is developed to impart specific skills to individuals who wish to be Grain Mill Operator. The training programme is based upon the National Occupational Standards for the food processing sector. The National Occupational Standards have been described in the following subsection of this chapter.

The training program will enable an individual to:

- prepare and maintain work area and process machineries for operating a grain mill;
- prepare for production of products from various grains;
- operate grain mill
- complete documentation and record keeping related to operating a grain mill;
- ensure food safety, hygiene and sanitation for processing food products.

After successful completion of training and passing the assessment, you will be issued a certificate.

Fig. 1.1.1. Skill cards

1.1.2 Introduction to QP and NOS

This training programme is intended for imparting basic skill and knowledge relevant to the job role, required to perform at a food processing industry. This programme is based on qualification pack called Grain Mill Operator. The Qualification Pack Code for Grain Mill Operator is FIC/Q1003. This is also called a QP.

A QP consists of a set of National Occupational Standards (NOS). NOS specify the standard competency a worker must achieve when carrying out a function at the workplace.

Under Grain Mill Operator QP, there are five NOSs which detail the functions to be performed at work site as Grain Mill Operator.

NOS Code	Major Function/Task
FIC/N5009	Prepare and maintain work area and process machineries for producing biscuits in industrial units
FIC/N5010	Prepare for production of biscuits in industrial units
FIC/N5011	Produce biscuits in industrial units
FIC/N5012	Complete documentation and record keeping related to production of biscuits in industrial units
FIC/N9001	Food safety, hygiene and sanitation for processing food products
DGT/VSQ/N0102	Employability Skills

UNIT 1.2: Overview of the Food Processing Industry

Unit Objectives

By the end of this unit, the participants will be able to:

1. List the various sectors of the food processing industry
2. Define food processing
3. Describe the various stages of food processing for converting raw materials to food products

1.2.1 Food Processing

Agriculture is the backbone of the Indian economy. The produce from various agriculture-based occupations is primarily used for consumption within the country. It is exported to different parts of the world as well. Agricultural produce is also used as raw material in the food processing industry.

Food processing is the method used to convert raw materials into food products. They could be processed foods, ready-to-eat foods, food additives or foods used to prepare other food products. Besides food processing, the food industry also relies on food preservation as an important method to store food products for longer periods of time.

The food processing industry in India is divided into several sub-sectors. They are:

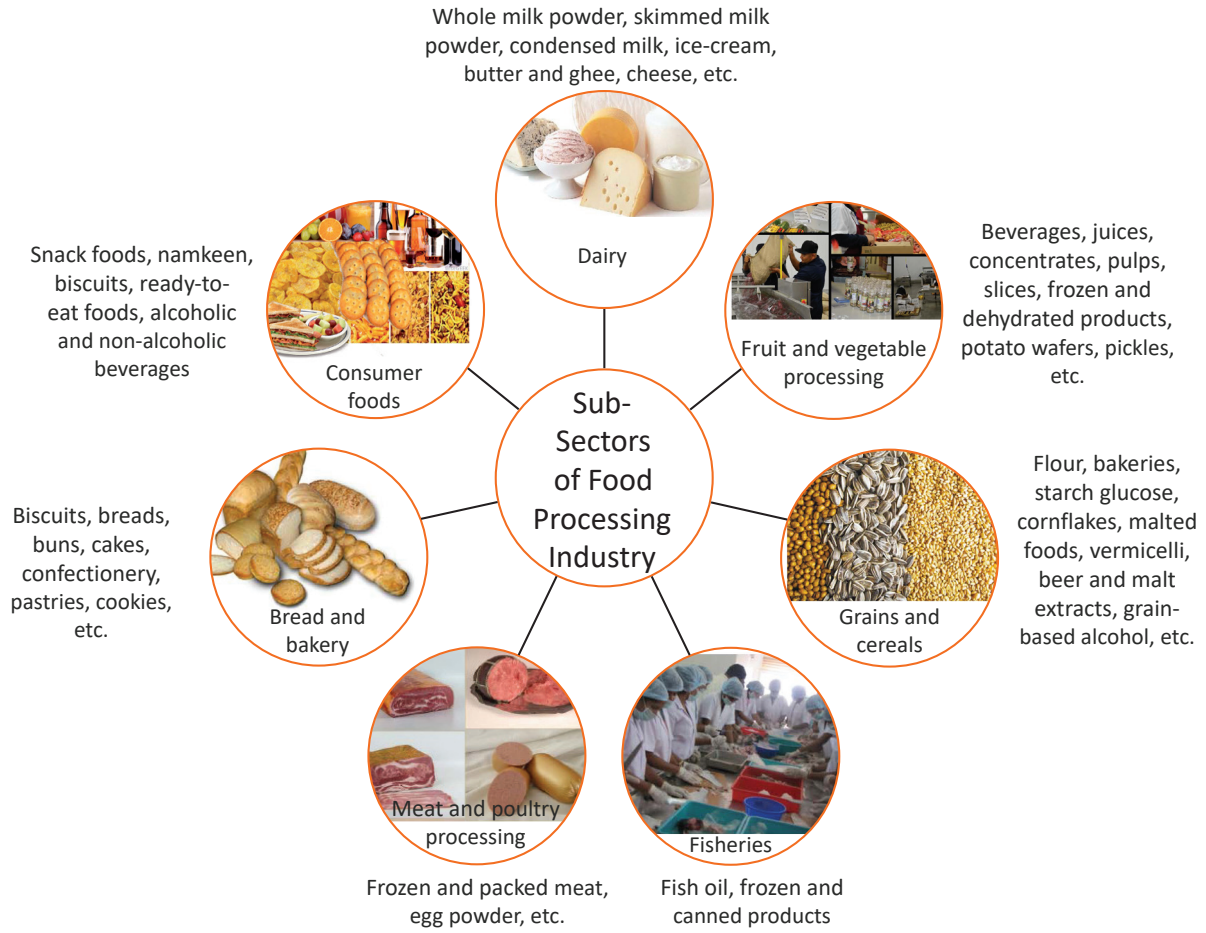

Fig. 1.2.1. Sub-Sectors of food processing industry

The Indian food industry is a star sector in India with bright prospects for growth and development. The Indian food and grocery market is the sixth-largest in the world. The food industry, particularly the food processing sector in India, has shown immense potential due to its quick-paced growth. Food processing ranks fifth in the country in terms of its production, growth, export, and consumption. One of the recent trends that is seen in this sector is online ordering of food. Even though this segment is still in its early stages of development, it is growing at an increasingly fast pace.

The food industry is implementing stringent food safety and quality measures in order to attract more investors and ensure the safety of its existing consumers. All these factors will have a positive impact on the way the sector functions and also on the job market in the country.

Women have always been associated with preparing food for the family or the household, but today, women are breaking this stereotype and turning entrepreneurs in this sector. Women are also becoming professional chefs and bakers, and contributing to the economy and towards the sector.

1.2.2 Journey of Food from Harvest to Consumer

The following chart shows the journey that food material goes through to become a final, consumable product to various customers.

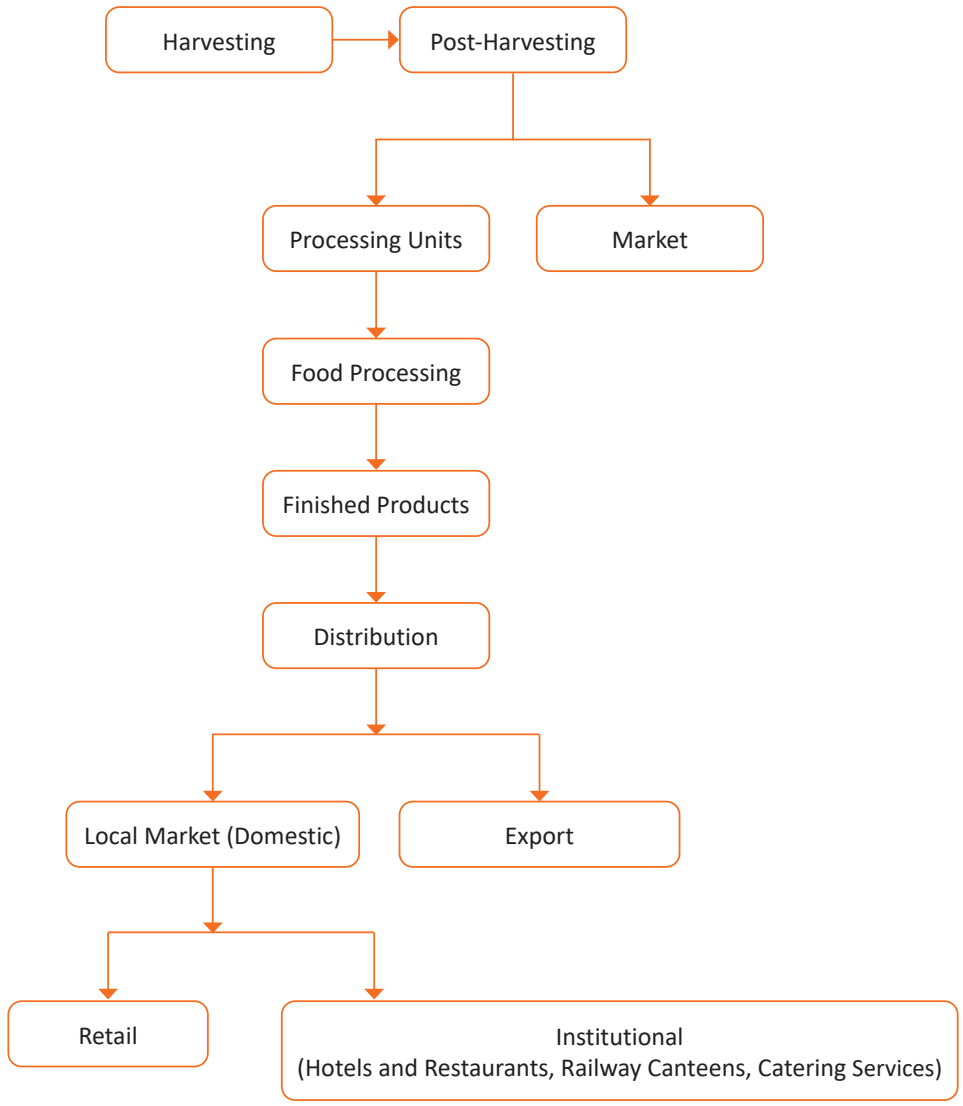

Fig. 1.2.2. Journey of harvested food

UNIT 1.3: Introduction to the Baking Industry and Bakery Products

Unit Objectives

By the end of this unit, the participants will be able to:

1. List the various products of the bread and bakery sub-sector
2. List the various types of industries within the bakery sub-sector
3. Explain the baking process

1.3.1 Introduction to the Bread and Bakery Industry

A bakery is an establishment that prepares baked goods. Baked goods are produced using two methods viz. fermentation and non-fermentation. Depending upon the process of production, baked products are classified as:

Fermented Products	Non-fermented Products
Breads and buns	Cookies
Cakes	Biscuits
Croissants	Crackers

Fermented Products

Fig. 1.3.1. Breads and buns

Fig. 1.3.2. Cakes

Fig. 1.3.3. Croissants

Non-fermented Products

Fig. 1.3.4. Cookies

Fig. 1.3.5. Biscuits

Fig. 1.3.6. Crackers

Depending upon the size of the organisation, the volume of production, and the turnover, the bread and bakery sub-sector is divided into:

- Small industries (includes tiny, home, and cottage industries);
- Medium industries
- Large industries

Following is a process chart giving an overview of the entire process of baking:

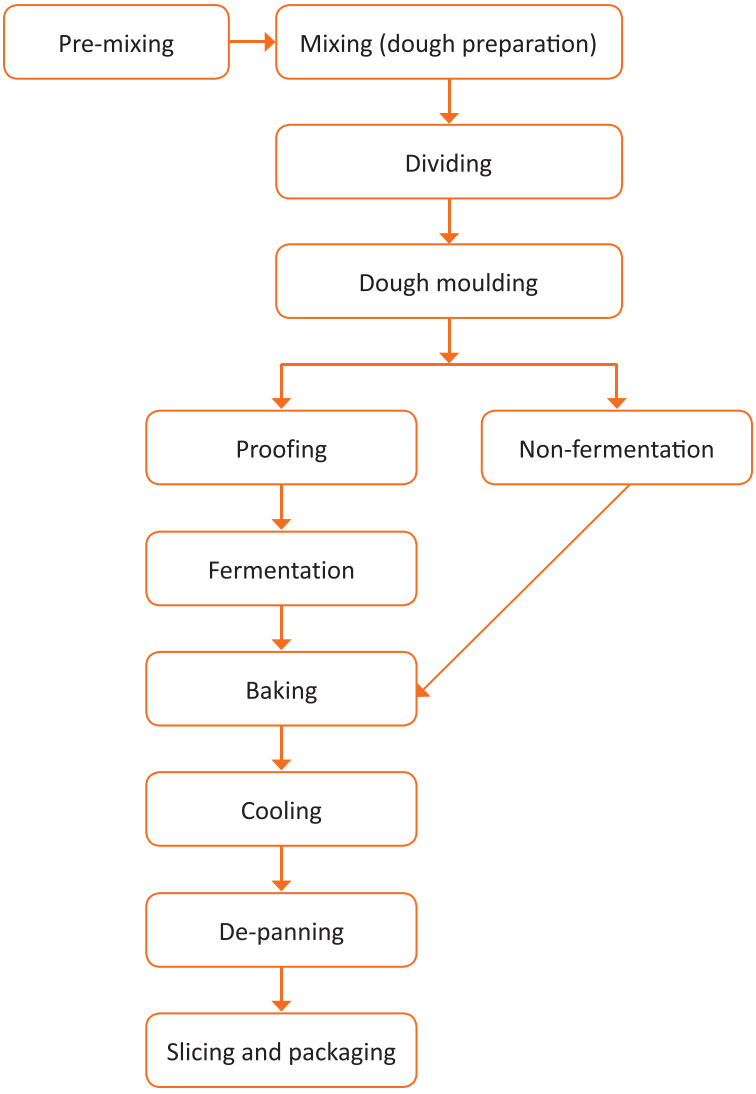

Fig. 1.3. 7. Overview of the baking process

UNIT 1.4: Roles and Responsibilities of Plant Biscuit Specialist

Unit Objectives

By the end of this unit, the participants will be able to:

1. Understand the roles and responsibilities of a Plant Biscuit Production Specialist

1.4.1 Job Description

Plant biscuit production specialist produces biscuits in industrial units by weighing, mixing, kneading, rolling/ sheeting, cutting, moulding, baking, cooling, etc. either manually or using machineries following the defined SOPs of the plant/ unit. The production process followed by the specialist is defined by the Standard Operating Procedures of the factory and the specialist has to ensure that the SOP is diligently followed.

1.4.2 Personal Attributes of a Plant Biscuit Production Specialist

The most common attributes that Plant biscuit production specialist should possess are:

- Ability to plan, organize, prioritize, calculate and handle pressure.
- Possess reading, writing and communication skills.
- Stamina to be able to stand for long hours.
- Have personal and professional hygiene.
- Understanding of food safety standards and requirements.

1.4.3 Key Roles and Responsibilities

The key roles and responsibilities of a Plant Biscuit Production Specialist are:

- Prepare the tools and machines required to carry out the biscuit making tasks
- Basic maintenance of the tools and machines
- Proper storage of tools and machines
- Knowledge of basic hygiene and safety standards to be followed in the factory/plant
- Understanding of government rules and regulations regarding Food Safety
- Knowledge of Good Manufacturing Practices (GMP)
- Knowledge of hazard analysis and critical control point (HACCP)
- Organsing raw material for biscuit production
- Mixing of ingredients required in biscuit production
- Laminating and moulding the dough
- Undertaking baking of the dough
- Preparing different types of biscuits like centre-filled, sandwich etc.
- Cleaning equipment after work
- Knowledge of packing and handling material
- Maintaining sanitation and safety at the workplace

Notes

Scan the QR codes or click on the link to watch the related videos

https://www.youtube.com/watch?v=J-2EiMVNtpM&t=11s

Overview of Food processing industry

https://www.youtube.com/watch?v=ATF0GZPsBG8

Plant Biscuit Production Specialist

https://www.youtube.com/watch?v=sy2ImQvTMIQ

Introduction to the Bread and Bakery Industry

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2. Preparing Work Area, Tools and Equipment

Unit 2.1 - Tools and Equipment in Baking Process

Unit 2.2 - Sanitisation of the Work Area

FIC/N5009

Key Learning Outcomes

By the end of this module, the participants will be able to:

1. Identify various tools and equipment used in baking process
2. Use tools and equipment to carry out baking process
3. Dispose waste according to company SOP
4. Check working of various tools and equipment
5. Identify various chemicals and methods used for cleaning tools, equipment and surfaces
6. Clean tools, equipment and work surfaces
7. Carry out basic repairs

UNIT 2.1: Tools and Equipment in Baking Process

Unit Objectives

By the end of this unit, the participants will be able to:

1. Identify various tools and equipment used in baking process
2. Use tools and equipment to carry out baking process
3. Dispose waste according to company SOP

2.1.1 Tools and Equipment Used in Baking

A number of tools and equipment are required in baking process. A plant biscuit production specialist should be able to identify and appropriately use these tool/equipment. Some of the common tools/ equipment used are:

Sifter: It is used to separate coarse grains and fine particles of flour by means of flat sieves. Sifter or sifting machine is powered by a drive mechanism and the flour added to it gets separated from grains by inclined or horizontal sieves.

Fig.2.1.1: Sifter

Fig.2.1.2: Mixer

Mixers: Mixers are used to mix batter and prepare icing, dough and other fillings. Generally, there are two types of mixers; planetary and spiral. In a planetary mixer, the mixing bowl does not move while the mixing arm moves in a planetary movement. On the other hand, in a spiral mixer the bowls as well as the mixing arm/hooks move at the same time. Planetary mixers is used for all bakery products while spiral mixers are used to mix dough for products like bread, bagels, pizza crusts etc.

Divider/Rounder: Divider/Rounder is used to equally divide dough. Majorly it is used in bread making.

Fig.2.1.3: Divider

Fig.2.1.4: Dough Moulder

Dough Moulder: Dough moulder is used to give uniform shape to the dough.

Dough Sheeter: This machine is used to roll out dough in a consistent sheet along with desired thickness. In this machine, the dough is pressed between two or more rollers and is mostly used in production of pastries and biscuits

Fig.2.1.5: Dough Sheeter

Proffers/Proof Box: Proof boxes are used to provide sealed space to provide an environment for proper fermentation of dough by yeast. This provides warm temperature and controlled humidity for the dough.

Fig.2.1.6: Proffers

Laminator: Laminator is used for the production of rolled and/or laminated dough sheet lines of dough for pastries, biscuits etc. It makes the dough sheets thinner in order to provide textures for biscuits. Generally, laminators are classified as horizontal or vertical , depending on the orientation of the machine.

Fig.2.1.7: Laminator

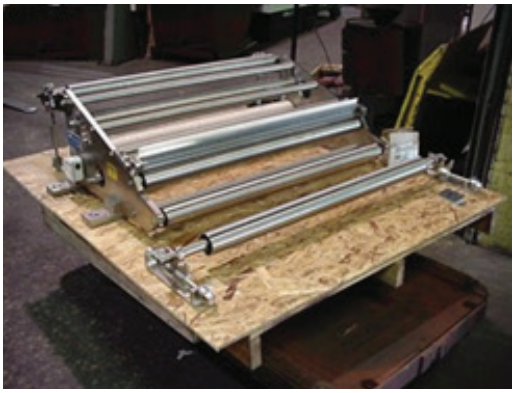

Fig.2.1.8: Gauge Roll Stand

Gauge Roll Stand: This machine is used to decrease the thickness of a dough sheet. Gauge roll stand is generally placed after dough sheeter or laminator in the bakery unit.

Depositors: Depositors are used to deposit precise portions of batter.

Fig.2.1.9: Depositors

Fig.2.1.10: Sprayers/Coaters

Sprayers/Coaters: Sprayers/coaters are used to spray a coat over baked products to give them a glazed look.

Rotary Cutters: These are a pair of rollers used to cut dough according to the shape of the desired biscuits.

Fig.2.1.11: Rotary Cutters

Dusters: Dusters are used to coat/dust the baked products with sugar/salt.

Fig.2.1.12: Dusters

Fig.2.1.13: Cooling Conveyor

Cooling Conveyor: These are used to cool baked products.

Packaging Machinery: Packaging machine is used to pack finished bakery products

Fig.2.1.14: Packaging Machinery

2.1.2 Baking Ovens

Baking ovens are the most important machines used in a baking unit. Ovens are basically thermally insulated chambers used to heat and bake bakery products like biscuits, breads etc. Different types of ovens are used to bake different baking products.

Some commonly used types of baking ovens are:

Cabinet Type	• Rack ovens and deck convection ovens	• Large sheet pans can be wheeled for baking in various heights	• Small and medium size bakeries use rack, deck, and reel ovens for baking. • Large bakeries • use continuous convection ovens as they are economical
Mechanical	• Reel oven and continuous tunnel convection	• The product moves on a conveyor belt inside the oven. • Useful for uniform baking of biscuit	
Masonry	• Wood fire ovens • Used in private shops and cafes • Optimum temperature of 450°C is maintained	Black ovens: • Heated by burning wood in chamber • The product is cooked in the same chamber	White ovens: • Heated by heat transfer • The product is baked in a different chamber

Fig.2.1.15: Types of baking ovens

Fig.2.1.16: Cabinet Type Oven

Fig.2.1.17: Cabinet Type Oven

Fig.2.1.18: Masonry Oven

Some other classifications of baking ovens are:

Direct fired ovens

In these ovens the heaters are inside the baking chamber. The products of combustion, carbon dioxide and water, are in contact with the dough pieces and only clean gas (or electric) heaters can be used in direct fired ovens. These ovens are most powerful for heat transfer. Electric ovens also come under direct fire ovens.

Fig.2.1.19: Direct fired oven

Fig.2.1.20: Indirect fired oven

Indirect fired ovens

In this type of ovens the products of combustion do not enter the baking chamber. In these ovens there is a heat exchanger system to heat the oven atmosphere. Indirectly fired ovens generally have one large burner per zone and this may be fuelled either by oil or gas. Either the hot gases from the burner or air from baking chambers are circulated through ducts which are in the baking chamber is circulated over a large heat exchanger near to the burner.

Hybrid ovens

In hybrid ovens, there are on or two direct fired zones that are followed by indirectly fired zones. In most indirectly fired ovens, there is not enough power to bake most types of biscuits (especially laminated), but indirect ovens are handy to facilitate moisture removal. In such situations, hybrid ovens, which have the best of both direct and indirect ovens, are used.

Fig.2.1.21: Hybrid oven

2.1.3 Health and Safety Measures for Bakery Equipment

Some health and safety measures that should be followed which using/operating bakery equipment are:

- Avoiding spillage of water on electrical components
- Cleaning the tools and equipment before and after each operation/use
- Ensuring regular maintenance and upkeep of machinery and tools
- Avoiding opening machines/equipment with sharp knives while using them.
- Performing maintenance and repair work only after unplugging the machines
- Regular check of machines like ovens for efficiency of valves
- Ensuring the parameters of machines (temperature, humidity etc.) are kept as prescribed

2.1.4 Waste Disposal

A lot of waste is generated in a bakery unit. However, most of the waste generated can be recycled or reused. It is important to understand the process of waste disposal in order to minimise cost and also contribute to building an eco-friendly environment.

Waste generated in a bakery can be classified as follows:

S No	Category	Includes
1	Packaging Waste	• Tins • Wrappers • Cardboard boxes • Bags • Polythene • Sacks • Plastic Trays and Pallets
2	Process Waste	• Flour dust • Dough • Sugar dust • Broken Biscuit • Burnt biscuits • Burnt or rejected loaves • Returned old bakery products
3	Solid Waste	• Metal parts/scrap • Paper • Dry Sludge • Wooden scrap
4	Other Waste	• Fat and oil • Machine Oil

Fig.2.1.22: Classification of bakeries

The proper method of disposing the above mentioned waste is mentioned below:

- **Packaging Waste:** Most of the waste under this category can be recycled by means of using these to package other material.
- **Process Waste:** Most of the process waste under this category can be sold to cattle feed dealers as the matter can be used to feed cattle. However, utmost precaution should be taken to ensure that such matter is free from any contamination.
- **Solid Waste:** Metallic scrap can be sold to scrap dealers, Dry Sludge and other can be sold to land filling contractors. Bakery waste water can be treated can be used for gardening and other cleaning purpose.
- **Other Waste:** These can be sold to recyclers.

UNIT 2.2: Sanitisation of the Work Area

Unit Objectives

At the end of this unit, you will be able to:

1. State the materials and equipment used in cleaning and maintenance of the work area and machineries
2. List the various cleaning chemicals required

2.2.1 Cleaning and Sanitisation

Cleaning and sanitisation of the work area is extremely important for every food-handling operation. Hence, it is important to know:

- What types of materials and equipment must be used to clean the work area?
- How to use these materials and equipment?
- The method of cleaning the work area
- The frequency of cleaning the process machineries

The food processing industry follows standard procedures for cleaning the work area. This is to ensure that there is no bacterial growth due to presence of leftover food particles. For cleaning purposes, the work area is divided into two. They are:

Food contact surfaces	**Non-food contact surfaces**
Work tables	Overhead structures
Utensils	Walls, ceilings, and shields
Equipment	Lighting equipment
Tools like knives	Refrigeration equipment
Machines that process foods	Air conditioning, heating or ventilating systems

Fig. 2.2.1. Food contact and non-contact zones in a production area

Equipment, Chemicals, and Sanitisers Used for Cleaning

Every organisation in the food processing industry follows a cleaning schedule. For instance, a processing unit may follow a weekly, monthly or yearly cleaning schedule. To clean the processing unit, the following equipment and tools are used:

- Cleaning or washing tank
- Cleaning knives and spoons
- Cleaning or sanitising agents
- Cleaning brushes and scrubbers
- High spray nozzle jets

Fig. 2.2.2. Cleaning knives and spoons

Fig. 2.2.3. Cleaning agents and equipment

Fig. 2.2.4. Cleaning in a washing tanks

Fig. 2.2.5. Cleaning floors of production area

Fig. 2.2.6. Cleaning equipment parts

Some common types of cleaners and sanitising agents to clean the food contact and non-food contact surfaces are:

Cleaning agents	Used for	Risk	Safety measure
Hypochlorites like potassium hypochlorite, sodium hypochlorite, and calcium hypochlorite	Cleaning stainless steel food contact surfaces	Leads to corrosion	Ensure pH and concentration levels are maintained
Liquid chlorine	Internal cleaning of stainless steel equipment and vessels	Leads to corrosion	Ensure concentration levels are maintained
Hydrogen peroxide	Killing bacterial spores, pathogens, spoilage organisms, and other microorganisms	Has a strong odour	Use in well-ventilated and open spaces
Ozone	Cleaning food-contact and non-food-contact surfaces like equipment, walls, floors, drains, conveyors, tanks, and other containers; Killing microbes	No risk involved since it leaves no residue	Safe to use

Table 2.2.1: Types of cleaning agents and it's use

Storage of Sanitisers and Disinfectants

Sanitisers and disinfectants are packed and labelled in a proper manner. They are kept in a safe area within the storeroom. The cleanliness of this area is maintained at all times.

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3. Preparing For Biscuit Production

Unit 3.1 - Basic Calculations

Unit 3.2 - Selection of Raw Material and Handling

FIC/N5010

Key Learning Outcomes

By the end of this module, the participants will be able to:

1. Understand Food Microbiology
2. Read and Understand Production Order
3. Check availability of raw material
4. Calculate weight of dough required
5. Plan production sequence
6. Ensure working of machines and equipment
7. Calculate process time for production
8. Assign work to workers
9. Weigh material required and check quality of material
10. Organise and start machines

UNIT 3.1: Basic Calculations

Unit Objectives

By the end of this unit, the participants will be able to:

1. Use basic mathematics for various calculations in day-to-day processes

3.1.1 Raw Material and Manpower Estimation

The raw material is something that is used to produce a product. The availability of raw materials affects the production process which in turn affects the revenue of an organization. Raw material's availability assists manufacturing units in conducting production processes following the requests and wishes of the consumer. Raw material inventories are fundamental in pickle and paste making processing because the uncertain demand and availability of raw materials due to seasonal reasons can cause complications over costs incurred. Moreover, raw materials is an investment that affects the financial stability and listed as a current asset on a company's balance sheet. So, it is important to apply best practices for managing raw material inventory. There are two subdivisions of raw materials:

Direct Materials are those resources that are part of or incorporated into the finished product. For example in pickle and paste industry vegetables, oil, spices etc.

Indirect Materials are those resources consumed during the manufacturing process but are not part of the finished product. For example disposable tools, protective equipment, cleaning supplies, fuel, light bulbs etc.

It is important to determine the value of opening and ending inventory for estimating raw materials for pickle and paste making as per production requirements. It is calculated as follows:

Raw Materials Inventory = Beginning Inventory + Raw Materials Purchased - Cost Of Goods Sold

1. **Beginning/opening inventory value -** The value is obtained from the previous accounting period balance sheet as the closing inventory.

Opening Inventory = (Cost Of Goods Sold + Ending Raw Materials Inventory) - Raw Materials Purchased

2. **Closing/ ending inventory value –** It is the inventory on hand at the close of an accounting period. The value is revealed on the balance sheet.

Ending Inventory = (Raw Materials Purchased + Beginning Raw Materials Inventory) - Cost Of Goods Sold

3. **Raw material Purchased –** it is calculated as:

Raw Materials Purchased = (Ending Inventory – Beginning Inventory) + Cost Of Goods Sold

4. **Cost of goods sold (COGS) –** It appears as an item in the income statement during the accounting period.

Cost of goods sold = Begining inventory + Purchases – ending inventory

Note:-

- **Beginning Inventory -** Value of a company's inventory at the start of an accounting period.
- **Ending Inventory -** Value of goods still available for sale and held by a company at the end of an accounting period.
- **Raw Materials -** Vegetable, fruits, ingredients, spices, oil etc.
- **Good Sold -** Accumulated total of all costs used to create a product which has been sold.

To calculate manpower requirements for pickle and paste production, divide the value of goods and services produced by the total hours worked by employees over a specified period. Here are the steps to estimate manpower for production.

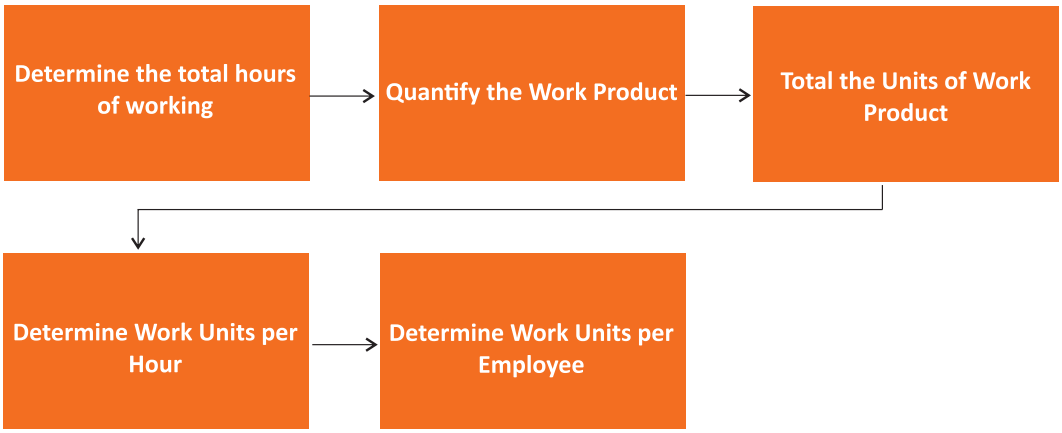

Fig. 3.1.2 Steps to Calculate Manpower Estimation for Production

3.1.2 Bakery Mathematics

A person working in a bakery unit should be able to perform basic calculations. The calculations are required to calculate the quantity of raw material to be used. Some fundamental units of measurements are detailed below:

S. No	Unit	Length (L)	Mass (M)	Time (T)
1.	C G S	Centimetre (cm)	Gram (gm)	Second (sec)
2.	F P S	Foot (ft.)	Pound (lb)	Second (sec)
3.	M K S	Meter (m)	Kilogram (Kg)	Second (sec)
4	S I Unit	Meter (m)	Kilogram (kg)	Second (sec)

Fig.3.2.3(a): Fundamental units of measurements

Name of the unit	Use
Kilogram (kg) or Gram (gm)	Used to measure weight of vegetables, fruits, flours, etc.
Litre (1) or millilitre (ml)	Used to measure liquid volume like water, oil. milk, etc.
Degree Celsius (*C) or Fahrenheit (-f)	Used to measure temperature
Time (minutes, hours, seconds)	Used to calculate the duration taken to complete any process

Fig.3.2.3(b): Fundamental units of measurements

Oven Baking Temperatures

Product	Cake	Pastry	Biscuits	Bread
Degrees (F)	350	450	425-450	400
Degrees(C)	176	232	219.232	204
Time (minutes)	45-60	15-20	10-15	30-40

Fig.3.2.3(c): Fundamental units of measurements

UNIT 3.2: Selection of Raw Material and Handling

Unit Objectives

By the end of this unit, the participants will be able to:

1. Read and Understand Production Order
2. Check availability of raw material
3. Calculate weight of dough required
4. Plan production sequence
5. Ensure working of machines and equipment
6. Calculate process time for production
7. Assign work to workers
8. Weigh material required and check quality of material
9. Organise and start machines

3.2.1 Understanding Order and Raw Material Availability

Before work of biscuit production is started, the production specialist has to ensure that the order received in clearly understood so that the product is as specified in the order received from the client.

Once the specialist has understood the order, the work is assigned to the workers appropriately.

Biscuit production requires certain raw material for production. Before commencing production the availability of raw material has to be ensured and all material collected at designated spots. Commonly used raw material in biscuit production are:

- **Flour:** This ingredient forms the base of almost every baked product and gives structure to the product. It must contain gluten which is a protein having elastic characteristic and plays an important all dough formation.
- **Sugar:** Sugar gives a good colour and sweet taste to the baked products. It also imparts light, tender and even texture to the baked goods. It enhances the fermentation process and adds to the effectiveness of the baker's yeast.
- **Fat:** It acts as an enriching agent and is used for lamination of the dough. It also provides volume and softness to the baked products. It acts as an emulsifying agent.
- **Eggs:** It gives a characteristic texture to the baked products by coagulating gets the right shapes in the baked goods. It is an excellent enriching agent.
- **Salt:** It strengthens the gluten formation and enhances the flavour and colour of the baked products. It also acts as a preservative and controls the growth of the yeast.
- **Water:** it helps to retain the shape and gives rise to the sponges by changing itself in to steam. It also acts as a source of moisture that strengthens the gluten in the bread dough

The specialist has to ensure that the correct amount of dough is arranged and accurately weighed. The amount of dough required depends on the quantity of biscuits to be produced.

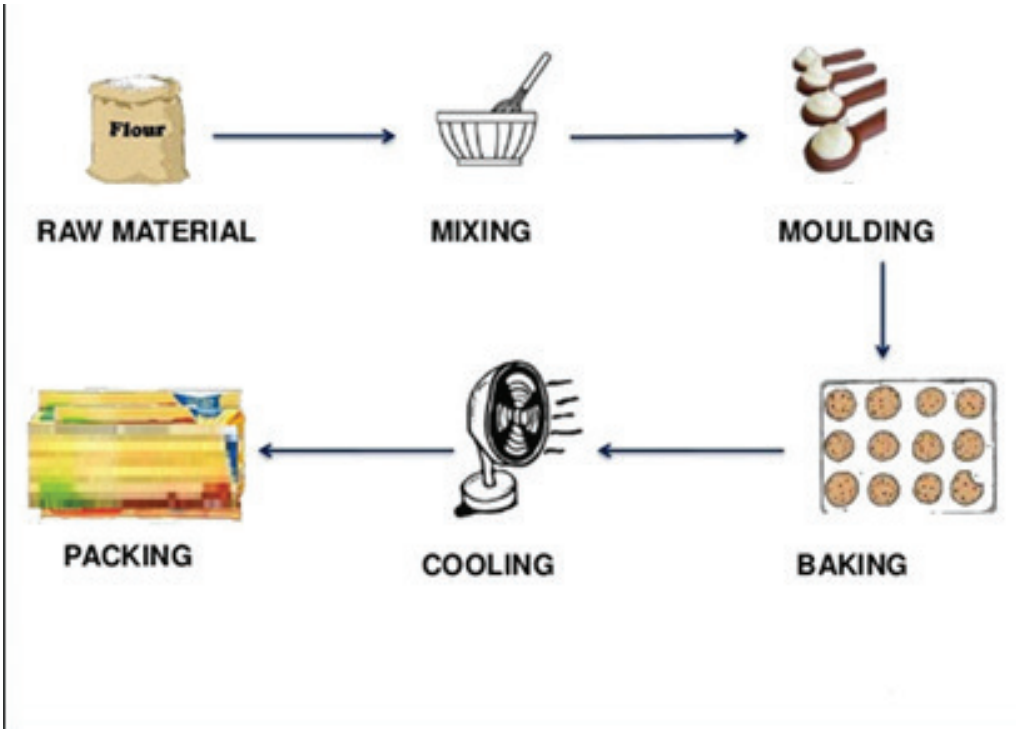

Fig.3.2.1: Raw Material Availability

3.2.2 Planning the Production Sequence

The main ingredients used in pickle making are fruits and vegetables. Different types of pickles are made based on the maturity of fruits and vegetables.

Ingredients used in pickle making are divided into groups based on their roles. The following table explains this classification

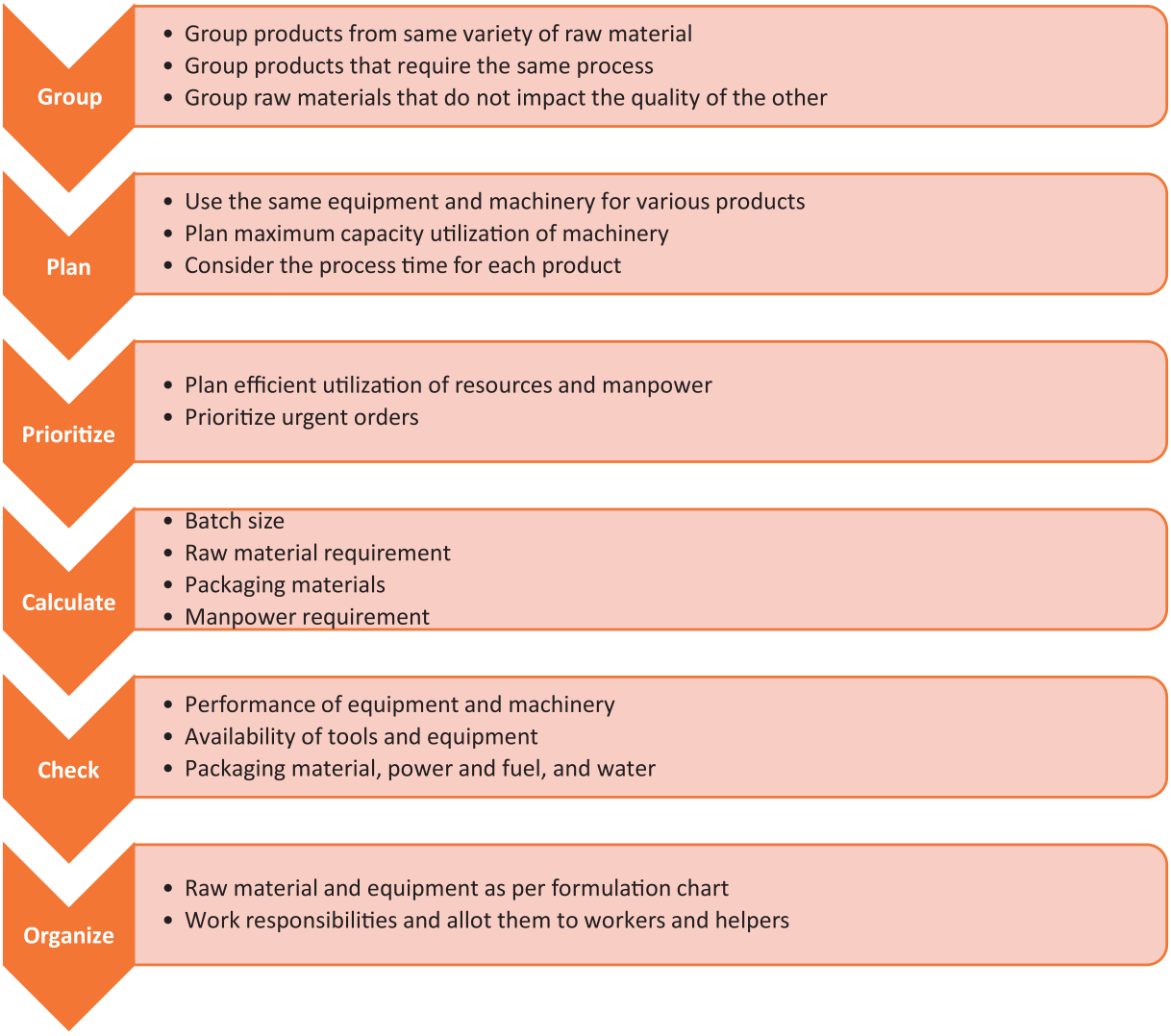

Fig. 3.2.2: Planning the Production Sequence

3.2.3 Selecting Raw Material

The raw material used in biscuit production has to be carefully selected to ensure quality of the final product. The raw material used on baking is categorised as follows:

Role	Type of raw material	Function
Structure builder Materials that form the base and act as the binder in a product	Flour	• Hold other ingredients for uniform dough mixing to make dough • Produce gases during fermentation and retain them during baking

Role	Type of raw material	Function
	Egg	• Whipped egg forms foam which acts as a leavening agent • Provides colour and flavour
	Milk solid	• Provides enrichment • Provides wholesome flavour, colour, and taste
Tenderiser Materials that give softness/ fluffiness/ crunchiness to the product	Sugar	• Imparts sweet taste • Softens gluten • Gives colour • Imparts texture
	Salt	• Strengthens and tightens the dough • Compacts the gluten protein to hold carbon dioxide • Gives taste to product
	Shortening (fats like butter, margarine, vegetable oil)	• Imparts shortening effect to the dough • Makes the dough more extensible • Improves the taste
	Baking chemicals like baking powder	• Aerates products to make them porous and crisp
Moisteners Material that gives slight wetness to the product	Water	• Helps to mix the ingredients to make uniform dough • Helps in gluten development during mixing
	Antioxidants	• Helps to check rancidity of products, keeping them fresh
	Liquid part of milk	• Helps in the development of gluten
	Egg	• Provides nutritive value
Flavouring agents Materials that enhance the taste	Flavour and colour (synthetic or natural)	• Imparts and improves specific flavour and colour to the products
	Imparts and improves specific flavour and colour to the products	• Provides a characteristic aroma and taste
	Fruits and nuts	• Adds a specific taste to the products
	Other cereal flours and starches	• Dilutes the effect of strong flours • Imparts specific taste and flavour to the product
Emulsifier/ additives Materials which help in mixing flavouring agents and fats	GMS (Glycerol Monosterate) lecithin, SSL (Sodium Stearoyllactylate) are commonly used	• Helps in uniform dispersion of fats and fat soluble colours and flavours in water.

Fig.3.2.4: Raw material used in baking

3.2.4 Ascertaining Quality of Raw Material

To ensure the raw material being selected is of highest quality, certain parameters have to be followed. Few of them are:

Raw material	Bread	Biscuits/cookies	Cake
Flour (clean, characteristic taste and smell, free from insects, fungus infection, rodent contamination and dirt, dusted bran particle, and other foreign matter	High protein, strong flour, good water absorption (60-65 %), high starch, bit granulated (medium)	Soft flour, water absorption of 55 %, fine flour; Certain biscuits require strong flour	Soft flour, low water absorption of 50 %, fine flour
Sugar (according to different particle size used are: granular sugar (7.30 mesh), castor sugar (30-30 mesh), pulverized sugar (80-120 mesh), and icing sugar (120 mesh and above)	Powdered sugar if required, sugar acts as the substitute for honey or molasses	Fine powdered sugar or glucose, malt extract fructose, honey	Fine powdered sugar/ sugar syrup which is de-odorized by passing through activated charcoal and is clear in colour is used
Milk/milk products	Dry milk, which has very less fat content but high water absorption	Milk powder in water	Toned milk
Fat	Oil with low viscosity	Hydrogenated vegetable oil (dalda)	Butter
Yeast	Dry yeast as it mixes faster when added through water		
Egg	Not applicable	Fresh eggs used (if required)	Fresh eggs used

Fig.3.2.5: Ascertaining Quality of Raw Materia

3.2.5 Baking Processes

Commonly two types are used in bakery production. These to processes are detailed below:

Continuous	• A mechanical process which runs non-stop till the process is complete • An automatic machine is used • No manual labour involved • Proofing is done in a flow as a part of process • It saves labour cost • Machine controls are set only once at the start of the entire process • Biscuits, cookies, etc. are baked using this process

Batch	• A process which is done step wise • Semi-automatic machines used • Manual labour is involved • Proofing is done in groups of intervals • For each batch, machine setting is required • Bread, cake, etc. is baked using this process

Fig.3.2.7: Baking Processes

3.2.6 Storage of Raw Material and Biscuits

In a bakery unit, storage of raw material and finished products is of utmost importance. For storage of raw material following things have to be considered:

- Stock rotation methods like FIFO (Firs- In-First-Out) and FEFO (First-Expired-First-Out), especially for perishable raw material.
- Coolers are set at appropriate cooling temperatures (e.g. 41 °F/5°C) for safety.
- Leftovers from a process are stored appropriately.
- Potentially hazardous items are thawed in the refrigerator, not at room temperature.
- Newly raw materials are stored in the manufacturers' original packaging.
- Eggs and egg washes are never stored above baked products to avoid cross contamination.
- Raw materials are stored at least 6 inches (15 cm) above the floor.
- All the bins containing ingredients are covered in order to safeguard them from rodents and pests.
- All raw materials stored are properly labelled

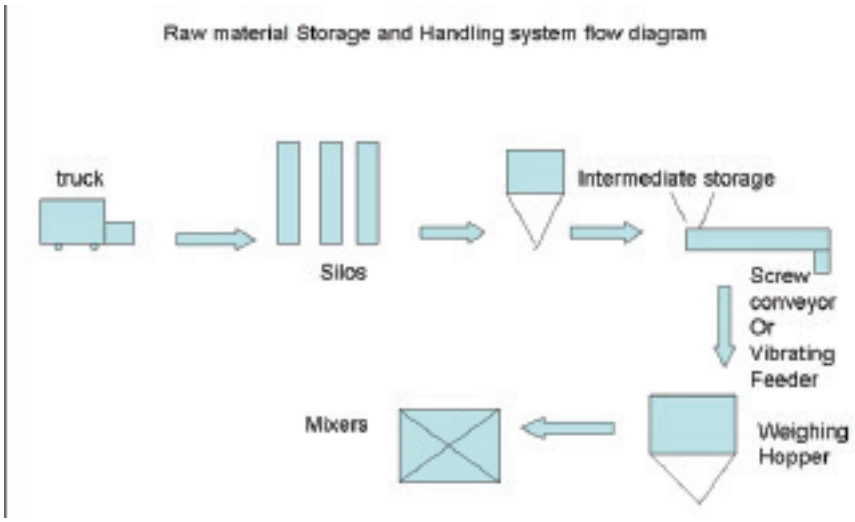

Fig.4.1.11: Raw material storage and handling system

Storage of baked products follows following parameters:

- Stock rotation methods like FIFO and FEFO is used to rotate finished products.
- Bakery items which may contain perishable ingredients like cream, cheese or eggs must be kept under refrigeration.
- Products that may have a longer shelf life can be stored at room temperature.
- All finished products are stored with labels of its ingredients and shelf life.

Notes

Scan the QR codes or click on the link to watch the related videos

https://www.youtube.com/watch?v=soYqEHQYRyc

Machines and Equipment used in Baking Technician

https://www.youtube.com/watch?v=S68TG5SVBMk

Baking process

Skill India
कौशल भारत-कुशल भारत

NCVET
कौशल गुणवत्ता प्रगति

सत्यमेव जयते
GOVERNMENT OF INDIA
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& ENTREPRENEURSHIP

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RE IMAGINE FUTURE

FICSI
Food Industry Capacity and Skill Initiative

4. Producing Biscuits

Unit 4.1 - Producing Biscuits

FIC/N5011

Key Learning Outcomes

By the end of this module, the participants will be able to:

1. Identify different types of dough
2. Perform mixing operations for ingredients
3. Laminating Dough
4. Baking biscuits and preparing sandwich biscuits
5. Cool and Pack biscuits
6. Store raw material and finished products
7. Perform Post Process clean-up and Maintenance

UNIT 4.1: Producing Biscuits

Unit Objectives

By the end of this unit, the participants will be able to:

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5. Cool and Pack biscuits
6. Store raw material and finished products
7. Perform Post Process clean-up and Maintenance

4.1.1 Types of Dough

The most important and basic ingredient used in biscuit production is dough and dough in turn is made from flour. Dough is formed when sugar, fat and other ingredients (water, colour etc.) are added to flour and mixed. Water serves as the binding agent in dough.

Fig.4.1.1: Dough

After mixing is done, the dough is then divided into small pieces of different shape and size as specified in the order. These pieces of different shapes and sizes are baked into biscuits.

Consistency of the dough is a very important factor, notwithstanding if the dough is processed using machine or hand. The consistency of dough is checked by the amount of water present and also by the temperature of the dough. The more wet and warm the dough the softer it is.

When considering the making of a biscuit dough one must think not only about what happens in the mixer but also in the period afterwards. Generally there are two types of biscuit dough,

- Hard
- Short.

The difference between these two is the consistency which is determined by the amount of water available in the dough. When the water content is high (and therefore a relatively low level of fat) the blending with the flour involves the formation of gluten from the hydrated proteins. The formation of gluten requires mechanical work like kneading, and hard doughs are also known as "developed" doughs. When the quantity water is less and that of fat is higher and the mixing is designed so that little or no gluten is formed as the flour hydrates, this is called a short dough.

Developed Doughs

This type of dough is used to make crackers and semi-sweet biscuit types. The fat and sugar levels are relatively low. Sustained mixing action is required, to develop the gluten. In the case of cream crackers

and soda crackers the gluten is further modified after mixing during a period of fermentation. For semi-sweet biscuits the gluten development takes place in the mixer and the time taken for mixing is longer.

Usually for all types of cracker, doughs are mixed in only one stage of mixing. All the ingredients are loaded into the mixer and the mixing proceeds. This process is known as an "all in" mix process. Puff doughs are a special type of developed dough. In the course of dough piece forming a laminated structure must be developed and the layers are separated by soft, semisolid, plasticised fat. The fat must be maintained cool which means that the dough must also be cool or cold. Thus, puff doughs must be mixed and stood so as to maintain low temperatures (usually around 15°C or less). Iced water will be used at dough mixing and a chilled room is required to hold the dough and in which to make the laminations.

Semi-sweet doughs are different from cracker doughs. They have more sugar and fat in the formulation and they are not fermented after mixing. A considerable amount of work is needed to get the gluten into an optimum condition.

Short Doughs

Short doughs vary in their formulations. The dough pulls apart easily, there is minimal elasticity and extensibility, and thus it is said to be "short". The formation of gluten is delayed or kept very limited because the level of fat is high and the level of water low.

In the first stage of this procedure of mixing the sugar and most of the other ingredients are also added. This allows the sugar to dissolve in the water and all ingredients to become well dispersed. Generally the first stage takes several minutes of mixing. There is little or no development of heat as the mixture is very soft. The second stage, after addition of the flour, will be very short, perhaps as little as one minute, depending upon the efficiency of the mixing action. The time is very critical to prevent the development of gluten and thus toughening the dough. During the second stage of mixing there is insufficient time for the water to become totally absorbed into the flour. Hydration continues passively after the mixing has finished. This means that the dough is much softer at the end of mixing than it is after 30 minutes standing. This change must be allowed for in the dough handling before rotary moulding or sheeting.

Batters

Some "biscuits" are made from fluid batters; normally these are based on egg and are really variants of cake formulas. These batters are mixed with high sheer mixers in order to incorporate air bubbles which form the basis of the baked structure.

4.1.2 Dough Formation/Mixing

The moulding of dough in various forms is known as dough forming. Dough forming is done after mixing the ingredients as per the finished product. This is done using three methods:

Lamination

Lamination is the process of alternating layers of dough and butter to make the biscuit crisper. There are three types of laminators: Horizontal, vertical, and stacked horizontal. The purpose of laminating can be stated by the following:

- It is a method of repairing a poor dough sheet with pre-sheeter rolls.
- The dough is folded at 90° angles to make it uniform in two directions.

- Rolling and folding of the dough enhances the gluten, which makes the dough suitable for baking a desirable structure.
- A layer of fat is inserted between layers of dough to give it a characteristic, flaky structure.

Lamination process is done in two different styles: folding and cut-and-lay.

Folding	Cut and Lay
• A thin sheet is laid backward and forward on a conveyor. • The sheets are laid in a zigzag pattern with alternate 'triangles' of the upper and lower surfaces of the original sheet.	• A sheet is cut into square pieces and it matches the width of the gauge roll to move forward continuously. • The cut pieces are laid on top of one another in succession behind the previous one.

Fig.4.1.2: Styles of lamination process

Rotary Moulding

In Rotary moulding method, soft dough is moulded. Uniform fermented/unfermented dough is sheeted through a set of roller which is further moulded by rotary moulding method. The chart given below explains the rotary moulding process of biscuits:

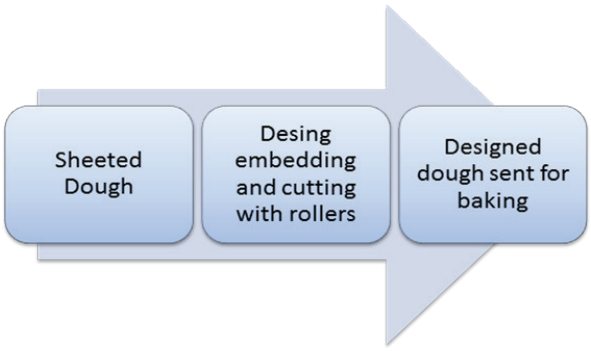

Fig.4.1.3: Rotary moulding process

Extrusion

Extruder-dough formers are used when the dough is soft and evenly pourable. Products made from this method are irregularly shaped. The dough extrusion machine consists of a hopper that is used to compress dough to form the desired shape. The final product shape depends on the mechanism used for pressing the dough. The two methods, generally used are:

- **Wire Cut:** It is used for semi-liquid/vicious dough. The dough contains coarse particles in this process. Dough is dropped as chunks.
- **Rout Press:** It is used for thinner liquidly dough. The dough is fine. Dough is poured as a ribbon.

4.1.3 Laminating

The purpose of laminating is to build up a layered structure by rolling the dough then folding it and turning it through 90° at least once before gauging to the final thickness for cutting. This develops the gluten and gives a delicate flaky structure in the baked biscuit. In many cases another material, such as fat, is introduced between the layers to encourage further separation of the layers during baking. Originally laminating was done manually using a reversing brake but now automatic laminators are used Dough lamination is now used principally for cream cracker and puff doughs but any developed (hard) dough can be laminated with benefit. If semisweet or savoury cracker doughs are made using sodium metabisulphite or enzyme to modify the gluten, it is not necessary to laminate, as straight sheeting and gauging will produce satisfactory biscuits.

Generally the following types of automatic laminator are used:

- Vertical with continuous lapper and one sheeter - This usually is composed of a three roll sheeter with cutter scrap incorporation, two or three gauge rolls, cracker dust spreader on part of the sheet and a zig-zag lapper capable of building up about 10 or 12 layers. The advantage of this type of laminator is the continuous smooth action of most parts, but the disadvantages are:
  - There are stresses introduced in the laminated dough at the edges due to folds.
  - The exposure of top and bottom of the sheet on successive Vs of the folded dough (this can mean that the scrap dough is alternately exposed if incorporated in one side of the sheeter).
  - The cracker duster is intermittent in action and must be synchronised with the lapper. Also the filling dust is normally only between every other lamination.
- **Vertical with continuous lapper but with two sheeters:** Here two-roll sheeters make sheets and filling dust is incorporated prior to subsequent gauging. The advantage of this type would appear to be that the filling can be spread continuously over the full width of the sheet, but disadvantages are the same as for the previous type of laminator combined with the fact that by using two roll sheeters. poor sheets may be formed and it is these sheets that have to "hold" the filling.
- **Horizontal laminators:** These are similar in performance to the vertical types, but the sheeting and gauging (also the cracker dust filling) occurs on units spread out horizontally before the lapper more like conventional biscuit cutting machines. The disadvantage of this type is that the whole machine takes a lot of floor space because a right angle bend in the line of plant is required where the lapper is sited. The advantage is that more than one lapper can be used if required, introducing a second "turn" to the dough. It is usual to use two three roll sheeters in horizontal laminator systems and cracker dust or more fatty fillings can be added between the two sheets (that is, on the lower sheet of dough).

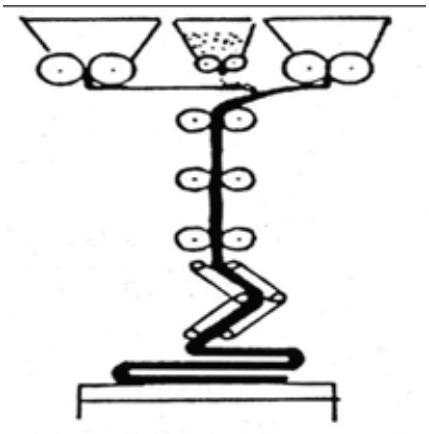

Fig.4.1.4: Vertical with continuous lapper

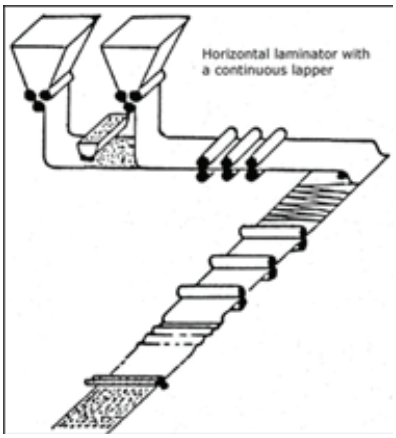

Fig.4.1.5: Horizontal laminators

4.1.4 Mixing

Mixing is one of the most important steps in the baking insdustry. This process gives uniformity to dough, enhancing the taste of the product. Commonly, three types of processes are used:

1. **Creaming Mixing:** This process is done in two or three stages
   - In the first stage, sugar and fats are mixed together.
   - In the second stage, chemicals are mixed followed by addition of salt and flour to the cream mixture.
   - This method helps in coarse, powdery soft dough that is ideal for biscuits.
2. **All-in-one Mixing:** This process is done is one single step.
   - Salt, leavening chemicals, colour, flavour, and milk powder are sieved in a tub with flour, sugar, etc. and mixed together with the aid of water to make satisfactory level of dough.
   - This process is generally ideal for transferring dough into sheets for lamination.
3. **Fermented Dough:**
   - All in one mixing and fermentation: All the ingredients including yeast mixed to form a dough that is allowed to ferment for 3-8 hours.

Further, the dough is developed for lamination/cutting process

Two stage mixing and fermentation: A sponge is made by mixing yeast water and flour and fermented for 15-20 hours.

Sponge textured dough is further mixed with remaining ingredients and kept for fermentation for 2-3 hours, which is later used for lamination, etc.

4.1.5 Baking Biscuits

Baking is an important process, in biscuit/bakery units. The design of an oven is principally a matter of heat transfer, and its control, but for the baker what happens is a matter of temperatures and turbulence at specific stages.

Heat and temperature are not the same. It is relatively easy to measure temperatures in an oven but difficult to measure heat/heat flux, which is the rate at which heat is being transferred. Heat is transferred much more effectively if the air is moving near the dough piece at a given temperature.

Nearly all biscuits are now baked in band or travelling ovens with several independently controlled zones. This means that oven conditions such as temperature, movement and humidity of the atmosphere may be changes during the course of the baking. Baking times for biscuits are quite short, ranging from 2.5-15 minutes.

While baking, there are four major changes to the dough piece that can be observed. These are the following:

- A large reduction in product density (the dough gets thicker) associated with the development of an open absorbent or crumbly structure.
- A shape change associated with shrinkage or spread and increase of thickness.
- Reduction of moisture level between 1-4%.
- A change in colour of the surface (reflectance)

4.1.5.1 Baking Plain Bisuits

The process of baking plain biscuits is:

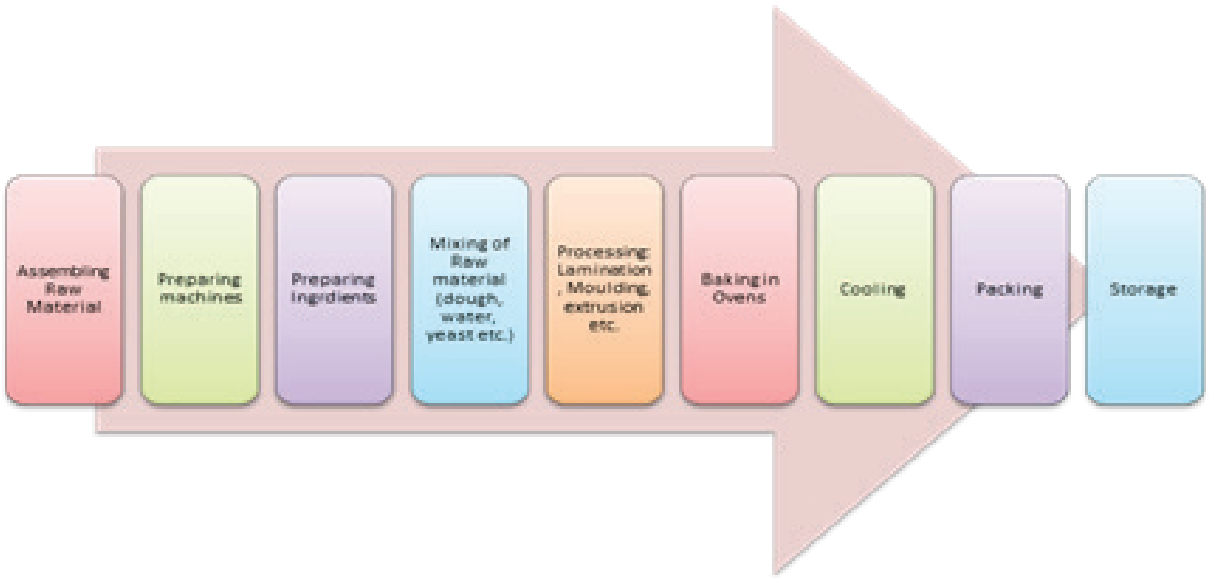

Fig.4.1.6: Process of baking plain biscuits

4.1.5.1 Baking Plain Bisuits

The process of baking plain biscuits is:

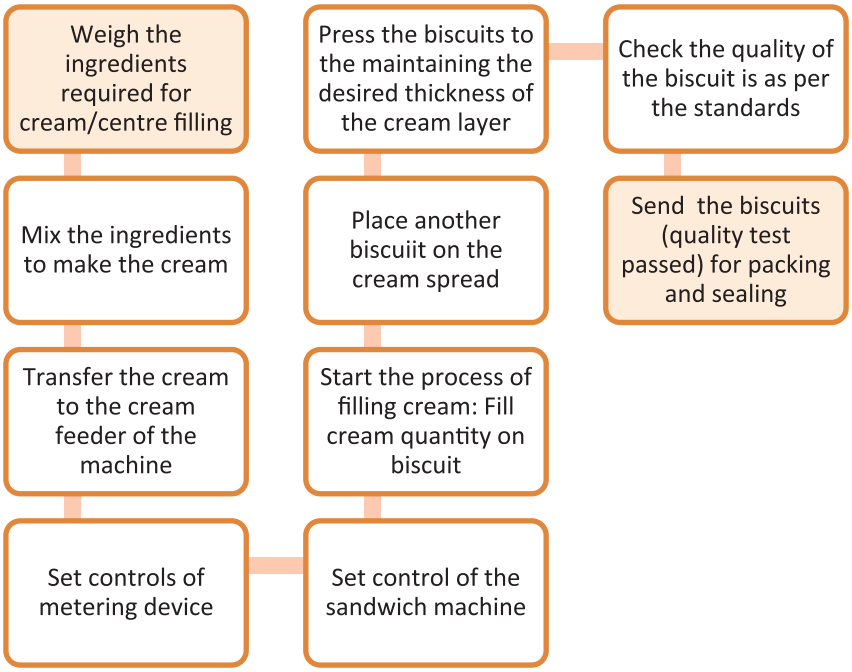

Fig.4.1.6: Mechanised process of centre filled cream biscuits

4.1.6 Quality Check of Biscuits

After the product is baked it has to be checked for quality. This is done to ensure that organisational standards are maintained. Following checks are performed to verify quality:

Test	Observation Process	Performing the Test
Sensory	Colour	Observe the baked product
Physical	Appearance, texture, size	Observe the baked product
Chemical	Sugar, acidity, sponginess, salt	Cut of sponginess, taste for sugar/salt
Organoleptic	Taste, flavour, rancidity	Tasting

Fig.4.1.7: Quality Check of Biscuits

4.1.7 Packing of Biscuits

Before packing of biscuits, they need to be cooled. Cooling is also done to ensure that the baked product does not lose its moisture content. Generally, two types of cooling systems are followed in baking industry:

- **Atmospheric multi-tier conveyer cooling:** The products from the oven band travel on a canvas web having single, double or three tiers. They are cooled slowly by the surrounding atmosphere.
- **Forced draft-cooling conveyer cooling:** In this process, filtered air is blown against the direction of product coming out of the oven on the cooling conveyer. This ensures cooling of products faster than the atmospheric type.

Fig.4.1.8: Packing of Biscuits

Packing

The material utilised to pack, protect, and handle the delivery and preservation of finished goods from the production unit to the consumer is called packaging material.

A pack is more than a means of conveniently and safely sending biscuits to the consumer. It also allows the display of information about type, weight, contents, manufacture, price, age, etc. which may be required by company policies or law.

The main purpose of a pack is to organise the correct weight or number of biscuits. The biscuits may be single in a pack, in a single column, in a series of short columns side by side, in a jumble or in some other less common arrangement.

Materials used for packing baked products are selected if they fulfil following parameters:

- Protect from foreign odour, contamination, heat, and moisture
- Protect from mechanical damage
- Help in easy handling of product
- Are easy to carry
- Increase or maintain product's shelf life
- Follow legal compliance for values and ingredients for consumers

Packaging is categorized as:

Primary packaging	Secondary packaging
• It is the packaging that comes in direct contact with the product. • Wax coated or laminated, bopp film paper is used • E.g. Bread and bun packaging is generally made of a base coated paraffin wax.	• It is the packaging that is used for transportation, warehouse storage/handling • Cardboard boxes, CBB made of craft papers, tins are used often • E.g. Plastic crates that contain breads and buns

Fig.4.1.9: Categorization of Packaging

In addition to these, some other material are also used to pack bakery products, these are:

- **Flexible material (laminates) –** Used for family packs of biscuits
- **Cardboard boxes:** Used for Cakes
- **Display boxes:** Used for Cookies, cakes, biscuits
- **Sachets or vertical pouches:** Used for Cookies and cakes
- **Polybags:–** Used for Breads

Fig.4.1.10: Packaging of biscuits

Packing process involves a number of processes. Generally in bakery units, a method known as Modified Atmosphere Packaging (MAP) is used. This method uses gases like carbon dioxide and nitrogen in order to increase the shelf life of the products. The process is explained below:

- Thermoforming:
  - The packing material is drawn from the reel into a heating station to soften.
  - It is sent to forming station where it is moulded into a shape of the container with aid of vacuum and air pressure.
- Pre-Formed Container Mechanism:
  - An automatic tray sealer holds a tray/container held on conveyor chains throughout the length of the machine.
  - The product is loaded into a tray.
  - Then it is passed into a gas chamber together with the top lidding material where gas is flushed and the tray is sealed.
- Horizontal or vertical form-fill- seal:
  - A fully automated system and machines form their own flexible or semi-rigid containers from a base film in the forming station.
  - Heat softens the film before it is moulded in desired shape and size with the aid of vacuum.
  - The formed containers are loaded with the product.
  - Covering is done in the vacuum and gas chamber.
  - Heat-sealed and sent for cutting, tamping, and labelling.

Types of packaging	Primary packaging	Secondary packaging	Tertiary packaging	Transit packaging
Meaning	• Comes in direct contact with the food and holds the product and features labeling	• Creates ease of manual movement of products	• Used for long distance transportatio n and distribution	• Used to bun-dle the boxes or crates for ease of trans-portation and distribution overseas
Packaging Materials	**Flexible packaging material:** (Plastic/Thermofor med) • Cellophane • MST, MSAT, Coated Cellophane (MXXT) • Biaxially Oriented Polypropylene film commonly known as BOPP. • Duplex OPP or OPP combinations (pearlised or metallised) such as OPP/PE, OPP/PET • Low density polyethylene (LDPE) • Polypropylene (PP) • Polyester/LDPE laminates • Metallised Polyester / Poly • Paper/Foil/Poly • Waxed paper wrappers • Polyethylene film Cast Polypropylene (CPP) • Poly Vinyl Chloride (PVC)	• Cardboard box (laminated/p lain) • Paper bags • Small cartons boxes	• Large carton boxes	• Palletised crates • Large carton

Types of packaging	Primary packaging	Secondary packaging	Tertiary packaging	Transit packaging
	Thermoformed Plastic Trays: • Polyestyrene or PVC • PVDC coated nylon, polyester • LDPE, PP, Ethylene Vinyl Alcohol, Polystyrene **Paper Packaging Products:** • Paper bags • Plastic laminated boxes • Plain boxes • Parchment paper • Foil based laminated boxes **Metal Packaging Products:** • Tin plated containers			
Products packed	• Bread • Biscuits • Cookies • Pastries • Cakes • Buns • Rusk • Pies • Doughnuts • Muffins etc.	• All Products	• All Products	• All Products

Fig. 4.2.5. Packaging material

4.1.8 Post Process Cleaning and Maintenance

Once the baking process is complete, post-process cleaning and maintenance process is followed. This is depicted below:

Post Production maintenance is the upkeep of machines/equipment once the production process is over. After the production is done, all food-handling equipment and tools are cleaned. Machineries are also checked for smooth and efficient functioning. The maintenance process of machineries may be classified as:

Routine maintenance	Periodic maintenance	Breakdown maintenance
Refers to checking and resolving any fault in the machinery after every batch production. It also includes regular maintenance and up-keep of the machine.	Refers to checking and resolving any fault in the machinery at scheduled intervals. These could be every day, week, month, and/or year.	Refers to checking and resolving any fault in the machinery if they breakdown.

Fig. 4.1.12: Post Process Cleaning and Maintenance

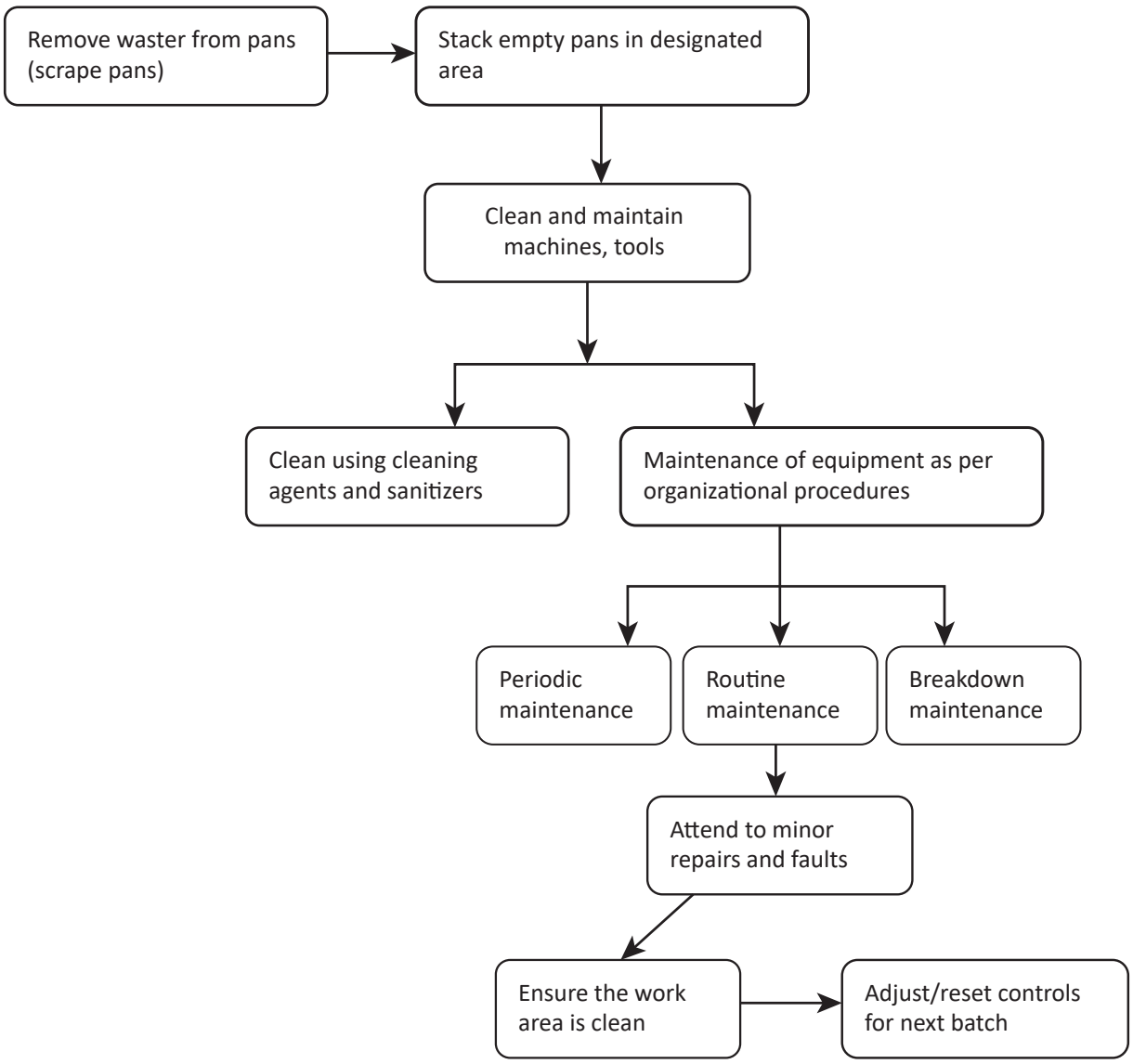

Fig.4.1.13: Post Process Cleaning and Maintenance

Practical

Objective

Produce biscuits in industrial units.

Method:

1. Select the ingredients as per the production schedule for the final products to be produced.
2. Refer the quality manual available at the processing plant for checking the quality parameters of each ingredient.
3. Measure each ingredient as per the SOP to prepare the final products.
4. Identify the equipment and machines required as per the SOP.

5. Sieve each ingredient using sifter.
6. Transfer the ingredients to a mixer.
7. Set the speed (RPM) and time for mixing as per the SOP and start the mixing process.
8. Check the consistency of the mixture visually for uniform distribution to ensure perfect blending.
9. The dough is ready. Allow it to rest for 20 – 30 minutes at 20 OC.
10. Start the dough forming process (moulding the dough) to make the biscuit crispier.
11. For browner tops, brush the tops with milk or melted butter.

Precautions:

1. Ensure that the consistency of mixture is achieved as per specifications.
2. Ensure uniform distribution of ingredients while mixing.
3. Mixing also depends on the speed of the mixer, quality of the flour and the temperature required for mixing. Refer to the specifications in the SOP for the settings.
4. Check and control the RPM of the machine to maintain the dough quality.
5. During manual cutting, avoid twisting the cutter as biscuits may rise unevenly.
6. During re-rolling (manual) add as little additional flour as possible.

Observation:

Sr. No.	Ingredients	Quality checked (yes/no)	Weight	Consistency/ specification of mixture achieved (yes/no)	Rolling done (yes/no)	Shape/ Size	Thickness
1							
2							
3							
4							
5							
6							

Conclusion:

Sr. No.	Low side refrigerant charging
1	
2	
3	
4	
5	
6	

Practical

Digestive biscuits

Raw materials	Quantity
Flour	2 kgs
Vegitable oil	500 gms
Sugar	100 gms
Eggs	4 nos
Sodium bi-carbonate	7 gms
Milk	1.25 liters

1. Sieve the flour and sodium bi-carbonate using a sifter.
2. Beat vegetable oil and sugar together to a mix till it becomes light and creamy.
3. Transfer the creamed mixture to an electric mixer.
4. Add sieved flour slowly to the creamed mixture ensuring that the amount of air that has been beaten in does not reduce.
5. Ensure that the ingredients are mixed uniformly to form dough.
6. Knead the dough to make it smooth.
7. Roll the dough to about 4-5mm thickness.
8. Cut the dough using different shaped cutters.
9. Transfer the cut dough into the baking tray.
10. Now bake it in a hot oven at of 200-250°C for 15-20 minutes.
11. Transfer the baked biscuits onto wire cooling racks.
12. Pack and seal the biscuits with primary and secondary packaging as per specifications provided.

Chocolate chips biscuits

Product specifications	
Dimensions	55 mm diameter
Thickness	12.0 mm
Weight	15.0 gms
Appearance	Round, irregular with chips visible
Colour	Golden brown
Texture	Short
Flavour	Rich with chocolate
Moisture	2.5 – 3 %

Raw materials	Quantity
Flour	100 gms
Flour	100 gms
Shortening	55.98 gms
Granulated sugar	50.05 gms
Brown sugar	0.76 gms
Whole egg powder	1.24 gms
Vanillin	0.10 gms
Invert syrup	1.24 ml
Salt	0.96 g
Ammonium bicarbonate	0.29 g
Sodium bicarbonate	0.67 g
Chocolate chips	30.00 g
Water	19.14 ml

1. Sieve the flour and sodium bi-carbonate using a sifter.
2. Do the mixing is in two stages on a horizontal or a vertical mixer.
3. At the first stage mix gently the shortening, sugar, water, salt, egg powder, vanilla, invert syrup and ammonium bicarbonate.
4. Check the ingredients are mixed to dissolve the sugar and have achieved a creamy emulsion.
5. At the second stage add the flour and sodium bicarbonate.
6. Continue the mixing at a low speed for one minute to obtain a homogenous mixture without hydration of the flour and formation of the gluten.
7. Add the chocolate chips or nuts to the dough.
8. Allow enough time to disperse evenly through the dough.
9. Bake the dough in the indirect radiant oven for 7 minutes.
10. Set the temperature of oven between 180 - 200 degree Celsius.
11. Set the moisture content between 2.5 - 3.0%.
12. Keep the ratio of cooling to baking time 1:1.5.

Marie biscuits

Raw Materials	Quantity
Wheat flour	100 gms
Corn flour	4.41 gms
Maize	14.70 gms
Granulated sugar	25.59 gms
Invert syrup 80%	7.94 ml

Raw Materials	Quantity
Shortening (fat)	11.03 gms
Lecithin	0.57 ml
Salt	0.88 gms
Soda	0.67 ml
ACP (Acid Calcium Phosphate)	0.08 gms
Protease	0.02 gms
SMS 10% solution	0.02 ml
Sodium bi-carbonate	0.73 gms
Water	26.47 ml

13. Sieve the flours (wheat, maize, corn) and sodium bi-carbonate using a sifter.
14. Using the "all in one mix" on a horizontal mixer, mix all the ingredients for 20-25 minutes.

Fig.4.2.5. Horizontal dough mixer

15. Once the dough is mixed and reached 40 to 42OC maintain the temperature remove the dough.
16. Roll the dough to about 3-5 mm thickness (using laminator).
17. Cut the sheeted dough using round shaped cutters.
18. Transfer the cut dough to baking trays.
19. Now bake it in a pre heat hot oven at of 200-220°C for 10-15 minutes.
20. Transfer the baked biscuits onto wire cooling racks.
21. Pack and seal the biscuits per specifications provided.

Precautions:

- Care should be taken while using heating elements.
- Always use oven gloves to while using the oven for baking products.
- Ensure that the oven door is not open during the baking process. Baked products should be properly cooled before packing.

- Ensure that the time and temperature of baking is controlled so that the quality of the final product is not affected.
- Ensure that the baked biscuits are not left on the baking trays, after baking to avoid condensation and thus lose texture of the final product.

Observation:

Sr. No.	Products baked	Baking temperature/ time	Cooling time	Quality test passed (yes/no)
1				
2				
3				
4				
5				
6				

Conclusion:

Write your conclusions here:

Sr. No.	Conclusion
1	
2	
3	
4	
5	
6	

Notes

Scan the QR codes or click on the link to watch the related videos

https://www.youtube.com/watch?v=N382yRgS6q0

Packaging of Bakery Products

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5. Documentation

Unit 5.1 - Documentation and Record Keeping

FIC/N5012

Key Learning Outcomes

By the end of this module, the participants will be able to:

1. State the need for documenting and maintaining records of raw materials, process, and finished products;
2. State the method of documenting and recording the details of raw material to final finished product;
3. State ERP system and maintaining documentation via ERP

UNIT 5.1: Documentation and Record Keeping

Unit Objectives

By the end of this unit, the participants will be able to:

1. State the need for documenting and maintaining records of raw materials, process, and finished products;
2. State the method of documenting and recording the details of raw material to final finished product.

5.1.1 Need for Documentation

Every organisation has to maintain records of raw material procurement, production processes, and sales. This is to ensure that the business runs effectively and is profitable. Listed below are some reasons why there is a need for documentation:

- It gives detailed knowledge about running of the business
- It helps to control product quality
- It helps to keep track of the money invested in the business
- It helps to identify the separate costs of raw material or product ingredients
- It helps to identify the production cost of a particular process
- It helps to ensure that quality assurance procedures are followed
- It helps to ensure that the production unit is running smoothly/effectively
- It works as an evidence for legal procedures
- It helps to set an appropriate product price
- It helps to take corrective measures at the right time

5.1.2 How to Keep Records?

Every food processing organisation follows a more or less similar way of keeping records. Production records keep a log of:

- The quantity and type of raw materials
- The quantity and type of ingredients used
- The processing conditions in which production took place (e.g. the temperature set or the air pressure applied)
- The product quality

Product quality can be maintained only when:

- The same quantity and quality of ingredients and raw materials are mixed in every batch
- A standard formulation is used for every batch
- Standard process parameters are applied for every batch

Every batch of food is given a batch number. This number is recorded in:

- Stock control books (where raw material procurement is noted)
- Processing log books (where production process is noted)
- Product sales records (where sales and distribution is noted)

The batch number must correlate with the product code number, which is printed on labels. This helps the processor to trace any fault found in a batch back to the raw material used or the production process.

Example of a stock control book:

• Product Name			• Batch Number	
• Raw material*	• Supplier	• Results of inspection for:		
		A	B	C

5.1.3 Introduction to ERP Solutions

How to Keep Records

Every baking organization follows a more or less similar way of keeping records. Production records keep a log of:

- The quantity and type of baking ingredients
- The processing conditions in which production took place (e.g. the temperature set or the air pressure applied)

The product quality

- Product quality can be maintained only when:
- The same quantity and quality of ingredients are mixed in every batch
- A standard formulation is used for every batch

Standard process parameters are applied for every batch

- Every batch of food is given a batch number. This number is recorded in:
- Stock control books (where ingredient procurement is noted)
- Processing logbooks (where production process is noted)
- Product sales records (where sales and distribution is noted)

The batch number must correlate with the product code number, which is printed on labels. This helps the processor to trace any fault found in a batch back to the ingredients used or the production process.

Example of a stock control book:

• **Product Name**			• **Batch Number**	
• **Baking ingredients**	• **Supplier**	• **Results of inspection for:**		
		A	**B**	**C**

Notes

Scan the QR codes or click on the link to watch the related videos

https://www.youtube.com/watch?v=kcpGlHBpphA&t=62s

Documentation

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6. Health and Hygiene

Unit 6.1 - Health and Safety

Unit 6.2 - First Aid and CPR

FIC/N9001

Key Learning Outcomes

By the end of this module, the participants will be able to:

1. Discuss the importance of safety, hygiene and sanitation in the baking industry
2. Discuss the relevant HACCP principles to be followed in the baking industry
3. Describe various GMP as per FSSAI and GHP followed in the organization
4. Describe hazards and its types

UNIT 6.1: Health and Safety

Unit Objectives

By the end of this unit, the participants will be able to:

1. Gain knowledge about safety including hazards, accidents, safety signs and signals.
2. Understand the Heinrich Pyramid.
3. Orient with Water Systems at Plant, Engineering related tools and techniques to operate the machine safely.
4. Understand the clean room classifications and requirements.
5. Relate with the clean room behaviour practices.
6. Use Material Data Safety Sheet and Process of Safety Analysis.
7. Orient with Fire Safety concepts, PPEs action to be taken in case of fire emergency at shop floor.
8. Perform Job Safety Analysis for various production machines/ equipment and provide the critical information to concerned team members.
9. Manage emergency procedures and apply first aid.
10. Learn about basic professional and communication skills necessary to perform work successfully.

6.1.1 What is an Accident?

Safety is a major factor behind the success of any Industry besides two other factors, Quality and Productivity. Industrial safety means the safeguarding of man, machine and material from the injuries and damages, which are the consequences of an accident. An accident is also leads to loss of productivity, which ultimately affects the socio-economic conditions of the organization as well as a nation.

The accident is defined as “An Unplanned/Undesired event giving rise to death, ill health, injury, damage or other losses to personnel or property”.

Fig.7.1.1: Accident

6.1.2 Accident Prevention and the Domino Theory

The absence of an understanding of the causes of accidents make it difficult to prevent accidents. Since a long time various attempts have been made to develop a prediction theory of accident causation, but so far none has been universally accepted. Researchers from different fields of science and engineering have been trying to develop a theory of accident causation which will help to identify, isolate and ultimately remove the factors that contribute to or cause accidents. “The domino theory” developed by the W.H. Heinrich (1931) posits five metaphorical dominoes labeled with accident causes and is one of the most known and accepted theory.

- Ancestry and social environment
- Fault of a person
- Unsafe act together with mechanical and physical hazard
- Accident
- Damage or injury

Heinrich's Domino Theory states that accidents result from a chain of sequential events, metaphorically like a line of dominoes falling over. When one of the above dominoes falls, it triggers the next one and the next continuously. But removing a key factor (such as an unsafe condition or an unsafe act) prevents the start of the chain reaction.

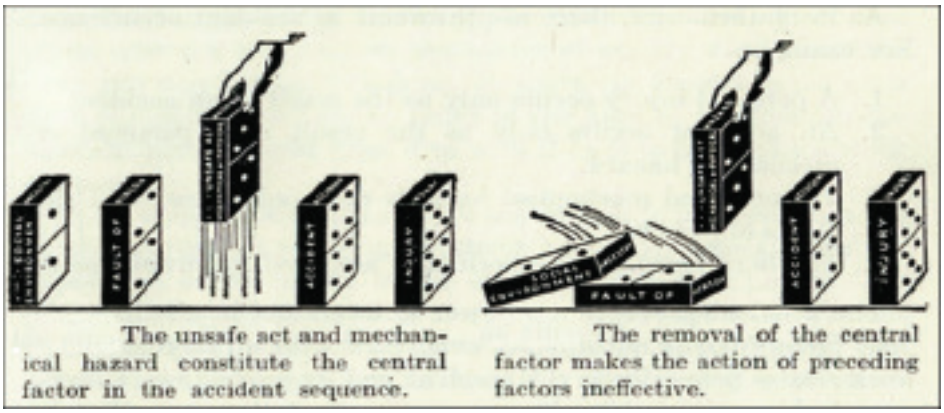


Fig.6.1.2: Heinrich's Domino Theory

Heinrich proposed that:

Fig.6.1.3: Heinrich's Proposed

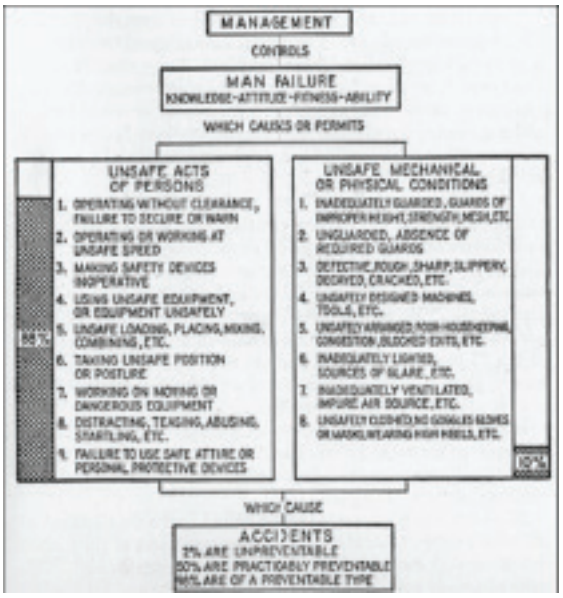


Fig.6.1.4: Chart of Direct and Proximate Accident Cause

6.1.3 Heinrich's Loss Control Triangle

Heinrich collected the data about workplace injuries from insurance claims as well as from workplaces (usually Supervisors). From analysis of the data, Heinrich proposed that for every major injury there are 29 minor injuries and 300 no-injury accidents. Most people working in health and safety would have seen some variation of this formula in presentations containing triangles with different coloured horizontal bands representing the different severity of injuries and the ratios between them.

Most commonly, these are used by proponents of Behaviour Based Safety (BBS) programs and are often called Heinrich's Triangle or Bird's Triangle (after Frank Bird who revised Heinrich's classifications in 1969).

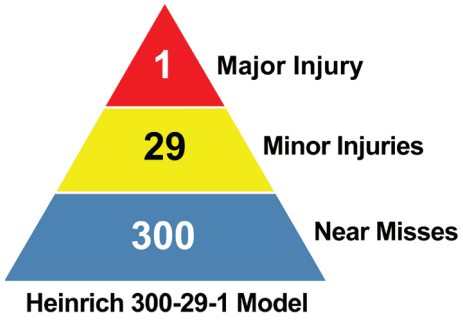


Fig.6.1.5: Heinrich's Loss Control Triangle

6.1.4 Accident Prevention and Control

Relation between Unsafe act, Unsafe Condition and Hazard

As per Dominos theory, unsafe act or conditions are responsible for the incident because when somebody does any unsafe act and creates an unsafe condition actually the person creates a hazard which leads to the accident. To prevent any accident we must understand the unsafe act, unsafe condition and the hazard.

- **Unsafe Act:** Any act that deviates from a generally recognized safe way or specified method of doing a job and create a hazard to themselves, another person, or equipment like not obeying the traffic safety rules.
- **Unsafe Condition:** A condition in which something exists that varies from a normal accepted safe condition and if not corrected, could cause injury, death, or property damage like chemical spill.
- **Hazard:** A source or a situation with a potential to cause harm in terms of human injury or ill health, damage to property, damage to environment, or a combination of these.

Fig.6.1.6: Hazards

All potential hazards of a particular process or activity must be identified to prevent the accidents. There are various techniques to identify the hazards in industries like Safety Audits, HAZOP (Hazard Operability Study), JSA (Job Safety Analysis) etc.

There are various hazards in the industries like:

- Physical hazard
- Electrical hazard
- Mechanical hazard
- Chemical hazard
- Ergonomical hazard etc.

Accidents cannot be prevented without controlling the hazards. Following is hazard control hierarchy, in order of decreasing effectiveness:

- Elimination
- Substitution
- Engineering
- Administration
- Personal protective equipment

Elimination

It is the most effective hazard control method. In this control method hazard is removed from the source physically. For example, if employees must work high above the ground, the hazard can be eliminated by moving the piece they are working on to ground level to eliminate the need to work at height.

Substitution

Substitution is the second most effective hazard control. It involves replacing something that produces a hazard (similar to elimination) with something that does not produce a hazard. For example, Instead of organic solvents (causes various effects on body) consider using water-detergent solutions. To be an effective control, the new product must not produce another hazard.

Engineered controls

The third most effective means of controlling hazards is engineered controls. These do not eliminate hazards, but rather isolate people from hazards. Engineering controls are methods that are built into the design of a plant, equipment or process to minimize the hazard. For example, using a fume hood for handling of the chemicals, fume hoods can remove airborne contaminants as a means of engineered control. "Enclosure and isolation" creates a physical barrier between personnel and hazards, such as using remotely controlled equipment.

Administrative controls

Administrative controls are changes to the way people work. Examples of administrative controls include procedure changes, employee training, and installation of signs and warning labels (such as those in the Workplace Hazardous Materials Information System). Administrative controls do not remove hazards, but limit or prevent people's exposure to the hazards, such as completing road construction at night when fewer people are driving.

Personal protective equipment

Personal protective equipment (PPE) includes gloves, respirators, hard hats, safety glasses, high-visibility clothing, and safety footwear. PPE is the least effective means of controlling hazards because of the high potential for damage to render PPE ineffective. Additionally, some PPE, such as respirators, increase physiological effort to complete a task and, therefore, may require medical examinations to ensure workers can use the PPE without risking their health.

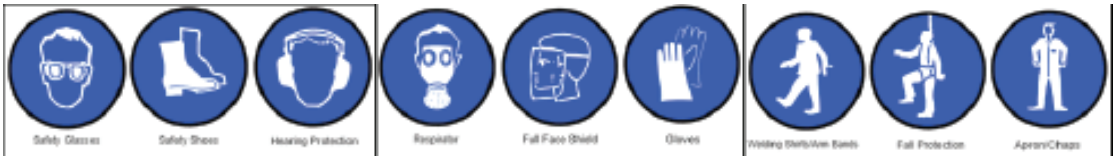
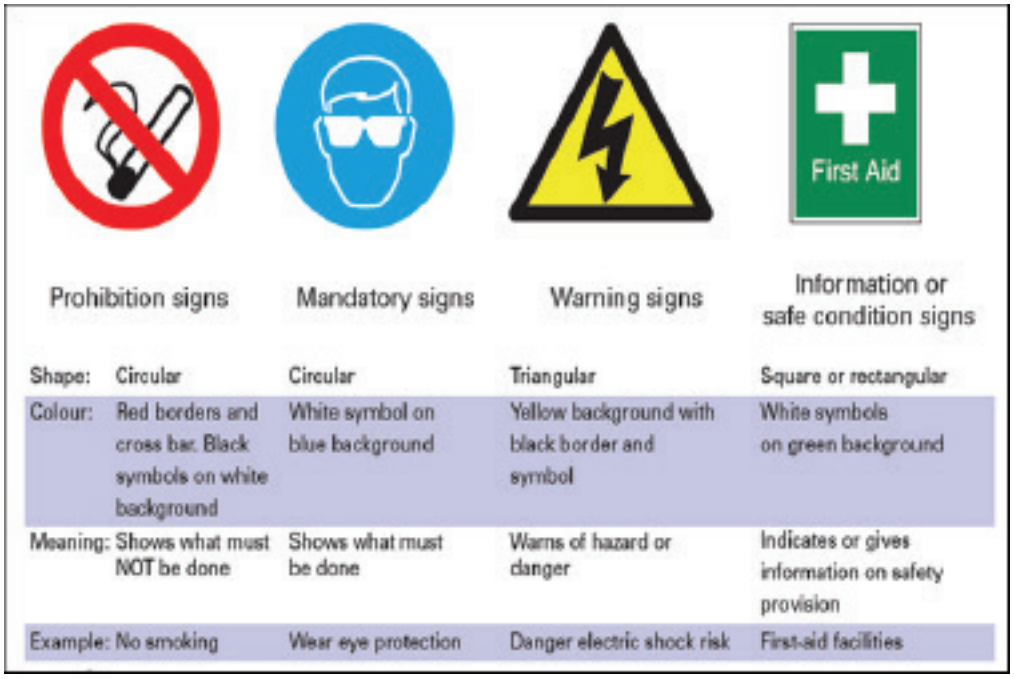


Fig.6.1.7: PPEs

6.1.5 What is a Safety Sign?

A safety sign is a sign providing information or instruction about safety sign at work by means of a signboard, a colour, an illuminated sign or acoustic signal, a verbal communication or hand signal.

A signboard is a sign which provides information or instructions by a combination of shape, colour and a symbol or pictogram which is rendered visible by lighting of sufficient intensity. In practice, many signboards may be accompanied by supplementary text, example: 'Fire exit', alongside the symbol of a moving person. Signboards can be of the following types:



Shape:	Circular	Circular	Triangular	Square or rectangular
Colour:	Red borders and cross bar. Black symbols on white background	White symbol on blue background	Yellow background with black border and symbol	White symbols on green background
Meaning:	Shows what must NOT be done	Shows what must be done	Warns of hazard or danger	Indicates or gives information on safety provision
Example:	No smoking	Wear eye protection	Danger electric shock risk	First-aid facilities

Fig.6.1.8: Various signboards

Below warning signs are used to identify different types of harmful substances:

Symbol	Meaning	Symbol	Meaning
	E Explosive		O Oxidising
	F Highly flammable		T Toxic

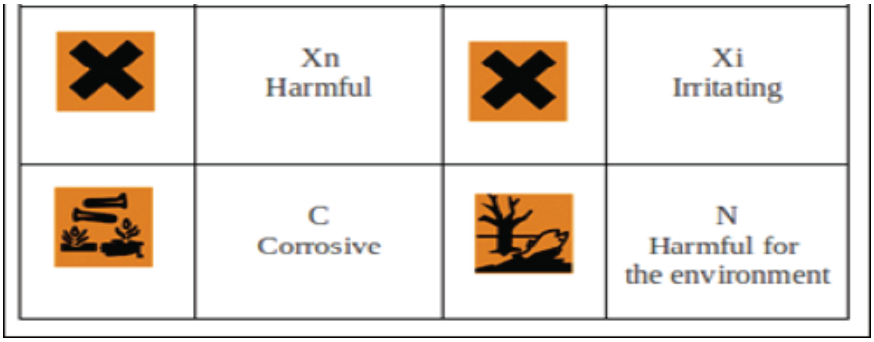


Fig.6.1.9: Warning signs for Harmful substances

6.1.6 Prohibition Signs

Fig.6.1.10: Prohibition Signs

6.1.7 Warning signs – General

Fig.6.1.11: Warning signs - General

6.1.8 Mandatory Signs

Fig.6.1.12: Mandatory Signs

6.1.9 Emergency Escape and First-Aid Signs

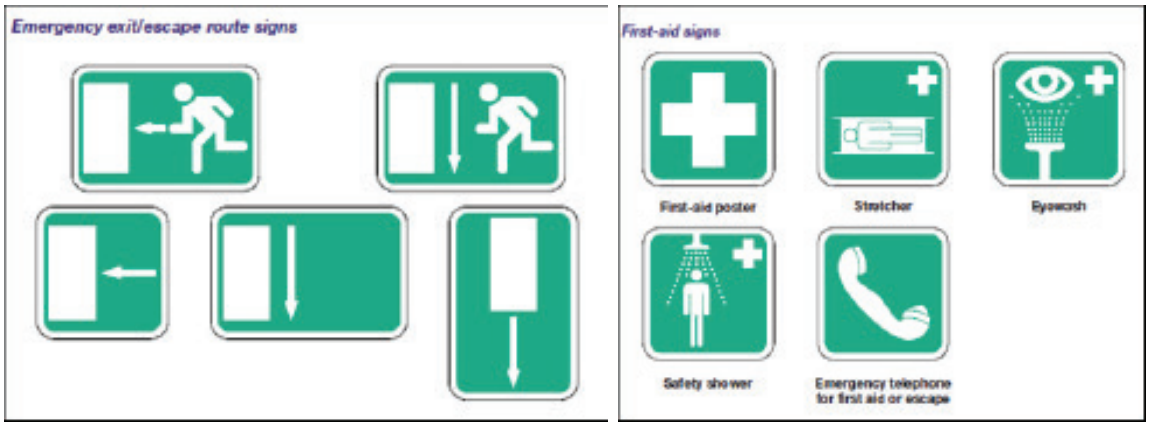


Fig.6.1.13: Emergency Escape and First-Aid Signs

6.1.10 Acoustic signals

Acoustic signals should be set at a level which is considerably higher in terms of frequency than the ambient noise. It is also important for signals to be easily recognisable, particularly in terms of pulse length and the interval between pulses or groups of pulses. Ensure that acoustic signals are not used more than one at a time. Prefer a device that can emit an acoustic signal at variable frequencies.

6.1.11 Using Hand Signals

Hand signals can be used to direct hazardous operations such as crane or vehicle manoeuvres. Ensure that the signals are precise, simple and easy to make and to understand. Check also that the signaller is competent to make hand signals and is trained in their correct use.

6.1.12 Using Verbal Signals

Verbal signals can also be used to direct hazardous operations. Such signals can be spoken messages given either by human or artificial voice, and either given directly or recorded. Spoken messages must be clear, concise and understood by the listener.

6.1.13 HACCP

Hazard Analysis and Critical Control Point (HACCP) is an international food safety regulation that is followed to reduce the risk of hazards in a food-processing unit. It is a system that identifies possible hazards and controls them at various points of the production process. The HACCP is based on seven principles:

1. **Hazard Analysis:** Evaluating production process and identify the points where hazards; physical, chemical and biological may be present
2. **Identify Critical Control Points:** Identify critical points in the process plan where hazards may occur. Plan preventive measures at critical point to control risk
3. **Establish Critical Limits:** Mention the boundary line between safe and unsafe processes. Mention limit until which critical point may be controlled

4. **Establish Monitoring System:** Establish a process of monitoring all the systems for critical point and limits
5. **Establish Corrective Measures:** Specify corrective actions to be followed when critical limits are crossed
6. **Verification Procedures:** State the verification process to ensure HACCP principles are applied and followed. Test HACCP plan and ensure compliance. Check if the HACCP plan helps to prevent hazards
7. **Follow Record-keeping:** Kee reords of the critical points, maintian log of situations when critical limits exceed, state corrective measure applied, include reocrds of development and maintenance of system.

Example of an HACCP Plan

Operational step	Hazard	Control measure	Critical limit	Monitoring method	Corrective action	Responsibility	Record
Procurement of raw material	Physical (dirt, stone particles)	Supplier guarantee specifications established by quality assurance department	As per company internal specifications	Supplier guarantee certificate is visually confirmed	Reject materials if not accompanied by supplier guarantee	Store manager	Supplier guarantee
	Chemical (toxins, pesticides from raw material)	Relative humidity of the store to be maintained					
	Microbiological (high microbiological load of raw materials, presence of pathogenic bacteria)	FIFO system should be established		Monitor temperature and humidity of storage			Store temperature logs

Fig.6.1.14: HACCP plan

6.1.13.1 GMP

Health and hygiene is the most important aspect of any industry related to food processing. In bakery units, Good Manufacturing Practices (GMP) are generally followed. GMP guidelines are set by Food Safety Standards Authority of India (FSSAI). These guidelines generally ensure the quality and safe processing of food items. GMP is a qualitative approach to manufacturing rather than merely being a quantitative one and confirms that the food being produced is free from microbial contamination, spoilage and production faults.

The GMP focuses on:

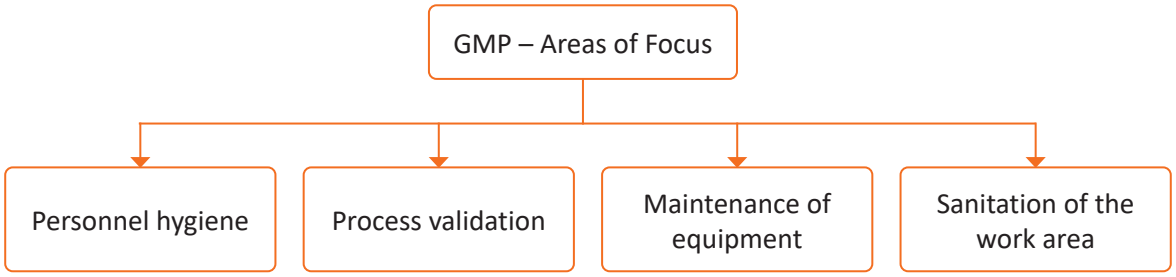


Fig.6.1.15: GMP process

Area of focus	GMP
Personnel hygiene	• Your organisation follows strict hygiene and sanitation guidelines • You are provided training on Good Manufacturing Practices (GMP) • You are in a sound health condition during working hours • You follow high standards of cleanliness • Your processing unit has enough facilities for toilets and wash stations
Sanitation of the work area	• The processing unit where you work is located in a clean, pollution-free area • The entire processing unit is well ventilated and has adequate lighting • The entire work area follows high standards of cleaning and sanitisation • There is a designated area for keeping utensils and equipment. It is kept clean and pest-free at all times
Equipment maintenance	• The equipment used for processing foods is protected against contamination from lubricants, metal fragments, fuel, and contaminated water • The cleaning and maintenance of tools, materials, and equipment is an easy process • The organisation follows a cleaning and sanitising drill as per daily, weekly, and monthly schedules
Process validation	• All processes of production, like raw material procurement, execution, storage, packaging, and logistics follow strict organisational parameters • Quality checks are conducted at each step of production. This helps to ensure that food quality is maintained as per prescribed norms and standards • The stock rotation of finished product follows the FEFO and FIFO methods. This is to ensure that there is a minimum chance of food spoilage. It will also help to retain the taste of processed foods

Fig.6.1.16: focus area of GMP

6.1.14 Personal Protective Equipment (PPEs)

For controlling the hazard, engineering control is the best control and the use Personal Protective Equipment (PPEs) is the last way out or a supplementary control used as a barrier between hazard and a person. There are various PPEs are used in industries to prevent the exposure to different body parts.

Eye and Face Protection

Safety Goggles are used when working with or around chemicals, flying objects, dust or welding. For most situations, safety glasses with side shields are adequate. For more hazardous operations where there is potential for chemical splashing or explosion, safety goggles or a face shield which are rated for chemical splash protection should be used.

Specification: "Poly-carbonate Safety Goggles" Safety goggles are made to protect eyes from chemical splashes, falling objects, flying objects etc. They have got side shields to protect eyes against lateral hazards.

Fig.6.1.17: Goggle

Gloves and Hand Protection

The right type of glove provides the much needed hand protection in the chemical laboratory, electrification work or welding work. Protective gloves are required to be used for protection of the hands against the injurious effect of chemicals, heat, heavy material, oil etc.

It is recommended that appropriate gloves be used when handling hazardous chemicals, toxins and materials of unknown toxicity, corrosives, and hot / cold objects. Particular attention should be given to chemicals, which have "Skin" information on the MSDS sheet.

The degree of protection required will depend on the hazards associated with the chemical in question, the type and scale of experimental work being performed, and individual work habits.

Fig.6.1.18: Gloves

Lab Coats and Aprons

Lab coats or aprons are worn to absorb or deflect spills and prevent corrosive or toxic substances from reaching the skin. Cotton is the preferred material for a standard coat; it is reasonably slow burning. Plastic or rubber aprons should be used when handling large quantities of concentrated acids and other corrosives.

Fig.6.1.19: Lab Coats and Aprons

Respiratory Protection

Fig.6.1.20: Respiratory Protection

Respiratory protection is not normally required when working in the lab, due to the combination of engineering controls (such as fume hoods), safe work procedures, as well as the relatively small amounts of chemicals used in the lab. To determine the need for a respirator, the lab supervisor or other competent individual must perform a hazard assessment if as a result of the hazard assessment it is determined that respiratory protection is required, then those lab personnel requiring the protection must receive training on the proper use, care, and maintenance of respiratory equipment.

The air, we breathe, is sometimes contaminated with dust, vapors, toxic fumes or gases, which may affect adversely to the respiratory system.

Various types of respiratory protective equipments are provided which enable us to breathe in uncontaminated atmosphere even in the presence of contamination.

- Self Contained Breathing Apparatus Set: It consists of a back mounted fresh air cylinder having 200 bar pressure, connected with hose and facemask, for breathing purpose. It can be used in the emergencies like leakage of hazardous gas/chemical, Fire etc. It is independent equipment and can be used to prevent toxic gas inhalation during working in highly toxic environment or in emergency for rescue purpose. The cylinder breathing capacity available is 30-45 minutes.
- Cartridge Type half/full face Gas Masks:

Specification	Half Face Mask	Full Face Mask
It is used to protect the respiratory system, where concentration of hazardous gas, dust, vapor etc. is low by volume in the atmosphere.		

Fig.6.1.21: Mask and its uses

UNIT 6.2: First Aid and CPR

Unit Objectives

By the end of this unit, the participants will be able to:

1. Apply first aid on an injured person.
2. Understand the procedures of doing CPR .

6.2.1 First Aid

First aid is the assistance given to any person suffering a sudden illness or injury, with care provided to preserve life, prevent the condition from worsening, and/or promote recovery. It includes initial intervention in a serious condition prior to professional medical help being available, such as performing CPR while awaiting an ambulance, as well as the complete treatment of minor conditions, such as applying a plaster to a cut. First aid is generally performed by the layperson, with many people trained in providing basic levels of first aid, and others willing to do so from acquired knowledge. Mental health first aid is an extension of the concept of first aid to cover mental health.

There are many situations which may require first aid, and many

countries have legislation, regulation, or guidance which specifies a minimum level of first aid provision in certain circumstances. This can include specific training or equipment to be available in the workplace (such as an Automated External Defibrillator), the provision of specialist first aid cover at public gatherings, or mandatory first aid training within schools. First aid, however, does not necessarily require any particular equipment or prior knowledge, and can involve improvisation with materials available at the time, often by untrained persons.

Vital Signs	Good	Poor
Heart Rate	60-100 beats per minute	Less than 60 or greater than 100 beats per minute
Respirations	14-16 breaths per minute	Less than 14 breaths per minute
Skin	Warm, pink and dry	Cool, pale and moist
Consciousness	Alert and orientated	Drowsy or unconscious

Fig.7.2.2: Vital Signs

Awareness	Assessment	Action	Aftercare
• Observe • Stop to Help	• Assess what is required to be done • Ask yourself, 'Can I do it?'	• Do what you can • Call for expert medical help • Take care of your and the bystander's safety	• Once you have assisted the victim, stay with him/ her till expert care arrives

Fig.6.2.3: Four A's of First Aid

While delivering First Aid always remember:

- Prevent deterioration.
- Act swiftly, deliberately and confidently.
- Golden Hour – First 60 minutes following an accident .
- Platinum Period – First 15 minutes following an accident.
- Prevent shock and choking.
- Stop bleeding.
- Loosen victim's clothes.
- Regulate respiratory system.
- Avoid crowding/over-crowding.
- Arrange to take victim to safe place/hospital.
- Attend to emergencies first with ease and without fear.
- Do not overdo. Remember that the person giving first aid is not a doctor.

Injury	Symptom	Do's	Don'ts
Fracture	• Pain • Swelling • Visible bone	• Immobilise the affected part • Stabilise the affected part • Use a cloth as a sling • Use board as a sling • Carefully Transfer the victim on a stretcher	• Do not move the affected part • Do not wash or probe the injured area
Burns (see Degrees of Burn table)	• Redness of skin • Blistered skin • Injury marks • Headache/seizures	• In case of electrical burn, cut-off the power supply • In case of fire, put out fire with blanket/coat • Use water to douse the flames • Remove any jewellery from the affected area • Wash the burn with water	• Do not pull off any clothing stuck to the burnt skin • Do not place ice on the burn • Do not use cotton to cover the burn
Bleeding	• Bruises • Visible blood loss from body • Coughing blood • Wound/Injur y marks • Unconsciousness due to blood loss • Dizziness • Pale skin	• Check victim's breathing • Elevate the wound above heart level • Apply direct pressure to the wound with a clean cloth or hands • Remove any visible objects from the wounds • Apply bandage once the bleeding stops	• Do not clean the wound from out to in direction • Do not apply too much pressure (not more than 15 mins) • Do not give water to the victim

Injury	Symptom	Do's	Don'ts
Heat Stroke/ Sun Stoke	• High body temperature • Headache • Hot and dry skin • Nausea/Vomiting • Unconsciousness	• Move the victim to a cool, shady place • Wet the victim's skin with a sponge • If possible apply ice packs to victim's neck, back and armpits • Remove any jewellery from the affected area • Wash the burn with water	• Do not let people crowd around the victim • Do not give any hot drinks to the victim
Uncon-sciousness	• No movement of limbs • No verbal response or gestures • Pale skin	• Loosen clothing around neck, waist and chest • Check for breathing • Place the victim's legs above the level of heart • If victim is not breathing, perform CPR	• Do not throw water or slap the victim • Do not force feed anything • Do not raise the head high as it may block the airway

Fig.6.2..4: First Aid for different types of injuries

1st Degree Burn	2nd Degree Burn	3rd Degree Burn	4th Degree Burn
Will recover itself in a few days. Action Required: Place under running water.	Serious but recovers in a few weeks. Action Required: Place clean wet cloth over the burnt area.	Very Serious and will require skin grafting. Action Required: Place a clean dry cloth over the burnt area.	Extremely Serious and requires many years with repeated plastic surgery and skin grafting, is life threatening. **Action Required:** Leave open and prevent infection.

Fig.6.2.5: Degree of Burns

6.2.2 Splints and Aids of Torso

A splint is a bandage that immobilizes a broken bone. Sometimes this is done by using rigid objects such as sticks or boards. For some injuries, however, this isn't possible and the only option is to tie the broken limb to the body.

6.2.2.1 Splints

When applying a splint, do not attempt to straighten the break. This will only cause further injury and more pain. Instead, simply apply the splint to the break the way it is.

When using rigid material

Always use long enough pieces to reach the joints beyond the break. For example, when splinting a forearm, the material should be long enough to touch both the wrist and the elbow. This helps keep the material in place and prevents too much pressure from being applied to the wound.

- Always put padding between the rigid material and the body to keep the victim comfortable.
- Tie knots between the rigid material and the body (in mid-air) when possible. This makes them easier to untie. If this is not possible, tie knots over the rigid material.
- To splint the forearm, surround the break with rigid material and snugly bandage it to the arm with wide cloth strips. A newspaper or magazine, curled into a "U" shape, works very well.

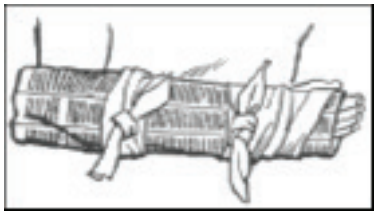


Fig.6.2.6: Splint the Forearm

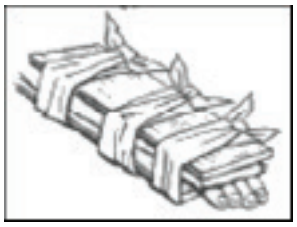


Fig.6.2.7: splint the Wrist

- Splint the wrist in the same way. The entire forearm should be immobilized.
- To splint the elbow, use enough rigid material to go from the armpit to the hand. The entire arm should be immobilized. Do not attempt to straighten or bend the elbow; splint it in position.
- To splint the upper leg, use long pieces of rigid material that will reach from the ankle to the armpit. Above the hips, tie long straps around the torso to hold the top of the splint in place.
- To splint the lower leg, use rigid material long enough to go from the knee to the foot. The foot should be immobilized and unable to turn. Be sure to use lots of padding, especially around the ankle.

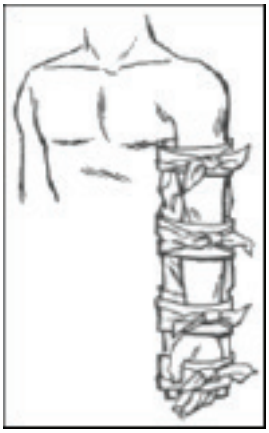


Fig.6.2.8: Splint the Elbow

Fig.6.2.9: Splint the Upper Leg

Fig.6.2.10: Splint the Lower Leg

6.2.3 CPR

Basic life support (BLS) is a level of medical care which is used for victims of life-threatening illnesses or injuries until they can be given full medical care at a hospital.

First aid is as easy as ABC – airway, breathing and CPR (cardiopulmonary resuscitation). In any situation, apply the DRSABCD Action Plan .

DRSABCD stands for:

- **Danger:** Always check the danger to you, any bystanders and then the injured or ill person. Make sure you do not put yourself in danger when going to the assistance of another person.
- **Response:** Is the person conscious? Do they respond when you talk to them, touch their hands or squeeze their shoulder?
- **Send for help:** Call ambulance.
- **Airway:** Is the person's airway clear? Is the person breathing? If the person is responding, they are conscious and their airway is clear, assess how you can help them with any injury.

Fig.6.2.11: Basic life support chart

If the person is not responding and they are unconscious, you need to check their airway by opening their mouth and having a look inside. If their mouth is clear, tilt their head gently back (by lifting their chin) and check for breathing. If the mouth is not clear, place the person on their side, open their mouth and clear the contents, then tilt the head back and check for breathing.

- **Breathing:** Check for breathing by looking for chest movements (up and down). Listen by putting your ear near to their mouth and nose. Feel for breathing by putting your hand on the lower part of their chest. If the person is unconscious but breathing, turn them onto their side, carefully ensuring that you keep their head, neck and spine in alignment. Monitor their breathing until you hand over to the ambulance officers.
- **CPR (cardiopulmonary resuscitation):** If an adult is unconscious and not breathing, make sure they are flat on their back and then place the heel of one hand in the centre of their chest and your other hand on top. Press down firmly and smoothly (compressing to one third of their chest depth) 30 times. Give two breaths. To get the breath in, tilt their head back gently by lifting their chin. Pinch their nostrils closed, place your open mouth firmly over their open mouth and blow firmly into their mouth. Keep going with the 30 compressions and two breaths at the speed of approximately five repeats in two minutes until you hand over to the ambulance officers or another trained person, or until the person you are resuscitating responds.
- **Defibrillator:** For unconscious adults who are not breathing, an automated external defibrillator (AED) is applied. An AED is a machine that delivers an electrical shock to cancel any irregular heart beat (arrhythmia), in an effort get the normal heart beating to re-establish itself. Please ensure that a trained person is there to apply the AED. If the person responds to defibrillation, turn them onto their side and tilt their head to maintain their airway.

1. Airway

Once you have assessed the patient's level of consciousness, evaluate the patient's airway. Remember, if the patient is alert and talking, the airway is open. For a patient who is unresponsive, make sure that he or she is in a supine (face-up) position to effectively evaluate the airway. If the patient is face-down, you must roll the patient onto his or her back, taking care not to create or worsen an injury. If the patient is unresponsive and his or her airway is not open, you need to open the airway. Head-tilt/chin-lift technique can be used to open the airway.

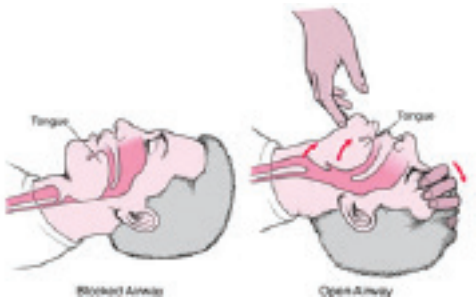


Fig.6.2.12: Airway

Head-tilt/chin-lift technique

To perform the head-tilt/chin lift technique on an adult:

- Press down on the forehead while pulling up on the bony part of the chin with two to three fingers of the other hand.
- Tilt the head past a neutral position to open the airway while avoiding hyperextension of the neck.

2. **Cardiopulmonary resuscitation**

Cardiopulmonary resuscitation circulates blood that contains oxygen to the vital organs of a patient in cardiac arrest when the heart and breathing have stopped. It includes chest compressions and ventilations as well as the use of an automated external defibrillator.

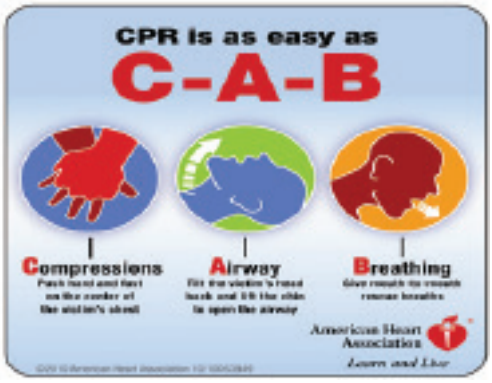


Fig.6.2.13: CAB

- **Compressions:** One component of CPR is chest compressions. To ensure optimal patient outcomes, high-quality CPR must be performed. You can ensure high-quality CPR by providing high-quality chest compressions, making sure that the:
  - Patient is on a firm, flat surface to allow for adequate compression. In a non- healthcare setting this would typically be on the floor or ground, while in a healthcare setting this may be on a stretcher or bed.
  - The chest is exposed to ensure proper hand placement and the ability to visualize chest recoil.
  - Hands are correctly positioned with the heel of one hand in the center of the chest on the lower half of sternum with the other hand on top. Most rescuers find that interlacing their fingers makes it easier to provide compressions while keeping the fingers off the chest.

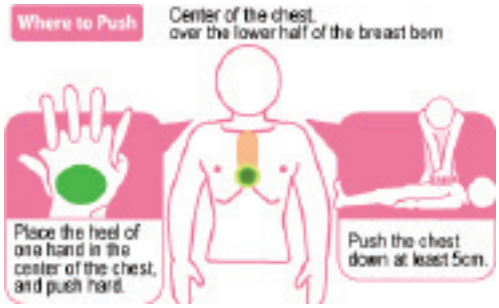


Fig.6.2.14: Compressions

  - Arms are as straight as possible, with the shoulders directly over the hands to promote effective compressions. Locking elbows will help maintain straight arms.
  - Compressions are given at the correct rate of at least 100 per minute to a maximum of 120 per minute, and at the proper depth of at least 2 inches for an adult to promote adequate circulation.
  - The chest must be allowed to fully recoil between each compression to allow blood to flow back into the heart following the compression.
  - For adult co-workers, CPR consists of 30 chest compressions followed by 2 ventilations.
- **Ventilations:** Ventilations supply oxygen to a patient who is not reathing. They may be given via several methods including:

  Mouth-to-Mouth

  - Open the airway past a neutral position using the head-tilt/chin-lift technique.
  - Pinch the nose shut and make a complete seal over the patient's mouth with your mouth.
  - Give ventilations by blowing into the patient's mouth. Ventilations should be given one at a time. Take a break between breaths by breaking the seal slightly between ventilations and then taking a breath before re-sealing over the mouth.

Pocket mask

CPR breathing barriers, such as pocket masks, create a barrier between your mouth and the patient's mouth and nose. This barrier can help to protect you from contact with a patient's blood, vomitus and saliva, and from breathing the air that the patient exhales.

- Assemble the mask and valve.
- Open the airway past the neutral position using the head-tilt/chin-lift technique from the patient's side when alone.
- Place the mask over the mouth and nose of the patient starting from the bridge of the nose, then place the bottom of the mask below the mouth to the chin (the mask should not extend past the chin).
- Seal the mask by placing the "webbing" between your index finger and thumb on the top of the mask above the valve while placing your remaining fingers on the side of the patient's face. With your other hand (the hand closest to the patient's chest), place your thumb along the base of the mask while placing your bent index finger under the patient's chin, lifting the face into the mask.

6.2.4 Performing CPR for an Adult

- **Step 1:** Check the scene for immediate danger: Make sure you're not putting yourself in harm's way by administering CPR to someone unconscious. Do whatever is necessary to move yourself and the other person to safety.
- **Step 2:** Assess the victim's consciousness: Gently tap his or her shoulder and ask "Are you OK?" in a loud, clear voice. If he or she responds agreement "Yeah" or such, CPR is not required. Instead, undertake basic first aid and take measures to prevent or treat shock, and assess whether you need to contact emergency services. If the victim does not respond, continue with the following steps.
- **Step 3:** Do not check for a pulse: Unless you're a trained medical professional, odds are you'll spend too much valuable time looking for a pulse when you should be doing compressions.
- **Step 4:** Check for breathing: Make sure that the airway is not blocked. If the mouth is closed, press with your thumb and forefinger on both cheeks at the end of the teeth and then look inside. Remove any visible obstacle that is in your reach but never push your fingers inside too far. Put your ear close to the victim's nose and mouth, and listen for slight breathing. If the victim is coughing or breathing normally, do not perform CPR.

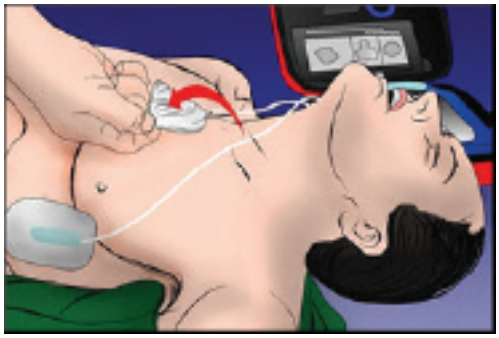
- **Step 5:** Place the victim on his or her back: Make sure he or she is lying as flat as possible-this will prevent injury while you're doing chest compressions. Tilt their head back by using your palm against their forehead and a push against their chin.

• **Step 6:** Place the heel of one hand on the victimâ€™s breastbone, 2 finger-widths above the meeting area of the lower ribs, exactly in the middle of the chest.	
• **Step 7:** Place your second hand on top of the first hand, Palms-down, interlock the fingers of the second hand between the first.	
• **Step 8:** Position your body directly over your hands, so that your arms are straight and somewhat rigid. Don't flex the arms to push, but sort of lock your elbows, and use your upper body strength to push.	
• **Step 9:** Perform 30 chest compressions. Press down with both hands directly over the breastbone to perform a compression, which helps the heart beat. Chest compressions are more critical for correcting abnormal heart rhythms (ventricular fibrillation or pulseless ventricular tachycardia, heart rapidly quivering instead of beating). You should press down by about 2 inches (5 cm).	
• **Step 10:** Minimize pauses in chest compression that occur when changing providers or preparing for a shock. Attempt to limit interruptions to less than 10 seconds.	

• **Step 11:** Make sure the airway is open. Place your hand on the victim's forehead and two fingers on their chin and tilt the head back to open the airway. If you suspect a neck injury, pull the jaw forward rather than lifting the chin. If jaw thrust fails to open the airway, do a careful head tilt and chin lift. If there are no signs of life, place a breathing barrier (if available) over the victim's mouth.	
• **Step 12:** Give two rescue breaths (optional). If you are trained in CPR and totally confident, give two rescue breaths after your 30 chest compressions. If you've never done CPR before, or you're trained but rusty, stick with only chest compressions.	
• **Step 13:** Repeat the cycle of 30 chest compressions. If you're also doing rescue breaths, keep doing a cycle of 30 chest compressions, and then 2 rescue breaths; repeat the 30 compressions and 2 more breaths. You should do CPR for 2 minutes (5 cycles of compressions to breaths) before spend time checking for signs of life.	

6.2.5 CPR Using AED

• **Step 1:** Use an AED (automated external defibrillator). If an AED is available in the immediate area, use it as soon as possible to jump-start the victim's heart. Make sure there are no puddles or standing water in the immediate area.	
• **Step 2:** Fully expose the victim's chest. Remove any metal necklaces or underwire bras. Check for any body piercings, or evidence that the victim has a pacemaker or implantable cardioverter defibrillator (should be indicated by a medical bracelet) to avoid shocking too close to those spots. Make sure the chest is absolutely dry and the victim is not in a puddle. Note that, if the person has a lot of chest hair, you may need to shave it, if possible. Some AED kits come with razors for this purpose.	

• **Step 3:** Attach the sticky pads with electrodes to the victim's chest. Follow the instructions on the AED for placement. Move the pads at least 1 inch (2.5 cm) away from any metal piercings or implanted devices. Make sure no one is touching the person, when you apply the shock.	
• **Step 4:** Press analyse on the AED machine. If a shock is needed for the patient, the machine will notify you. If you do shock the victim, make sure no one is touching him or her. • **Step 5:** Do not remove pads from the victim and resume CPR for another 5 cycles before using the AED again. Stick on adhesive electrode pads are intended to be left in place.	

6.2.6 Chain of Survival

Chain of Survival is a sequential process for providing treatment to victims of SCA outside of a hospital setting. More people can survive SCA if the following steps occur in rapid succession:

- Cardiac arrest is immediately recognized and the emergency response system is activated
- Early cardiopulmonary resuscitation (CPR) is started with an emphasis on chest compression
- Rapid defibrillation occurs
- Effective advanced life support is begun
- Integrated post-cardiac arrest care is provided
- Quick execution of each step is critical because the chances of survival decrease 7 to 10 percent with each passing minute.

Notes

Scan the QR codes or click on the link to watch the related videos

https://www.youtube.com/watch?v=RS4A-uczS6E&t=554s

GHP,GMP & HACCP

https://www.youtube.com/watch?v=daNjRoP_I0c&t=87s

Personnel hygiene and employee facilities

https://www.youtube.com/watch?v=daNjRoP_I0c&t=83s

Hygiene and sanitation

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7. Employability Skills

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Employability Skills

8. Annexure

Module No.	Unit No.	Topic Name	Page No	Link for QR Code (s)	QR code (s)
1. Introduction to Training Programme	UNIT 1.1: Introduction to the Training Pro-gramme	1.1.1 Purpose and Benefits of the Train-ing Programme	10	https://www.youtube.com/watch?v=J-2EiMVNtpM&t=11s	Overview of Food processing industry
	UNIT 1.4: Roles and Responsibilities of Plant Biscuit Specialist	1.4.3 Key Roles and Responsibilities	10	https://www.youtube.com/watch?v=ATF0GZPsBG8	Plant Biscuit Production Specialist
	UNIT 1.3: Introduction to the Baking Industry and Bakery Products	1.3.1 Introduction to the Bread and Bakery Industry	10	https://www.youtube.com/watch?v=sy2ImQvTMIQ	Introduction to the Bread and Bakery Industry
3. Preparing For Biscuit Production	UNIT 3.2: Selection of Raw Material and Handling	3.2.1 Understanding Order and Raw Ma-terial Availability	36	https://www.youtube.com/watch?v=soYqEHQYRyc	Machines and Equipment used in Baking Technician
		3.2.4 Ascertaining Quality of Raw Ma-terial	36	https://www.youtube.com/watch?v=S68TG5SVBMk	Baking process

Module No.	Unit No.	Topic Name	Page No	Link for QR Code (s)	QR code (s)
4. Producing Biscuits	UNIT 4.1: Producing Biscuits	4.1.1 Types of Dough	56	https://www.youtube.com/watch?v=N382yRgS6q0	Packaging of Bakery Products
5. Documentation	UNIT 5.1: Documen-tation and Record Keeping	5.1.2 How to Keep Records?	62	https://www.youtube.com/watch?v=kcpGlHBpphA&t=62s	Documentation
6. Health and Hygiene	UNIT 6.1: Health and Safety	6.1.13 HACCP	87	https://www.youtube.com/watch?v=RS4A-uczS6E&t=554s	GHP,GMP & HACCP
		6.1.13.1 GMP	87	https://www.youtube.com/watch?v=daNjRoP_I0c&t=87s	Personnel hygiene and employee facilities
		6.1.14 Per-sonal Protec-tive Equip-ment (PPEs)	87	https://www.youtube.com/watch?v=daNjRoP_I0c&t=83s	Hygiene and sanitation
Employability Skills				https://www.skillindiadigital.gov.in/content/list	

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